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WAR DEPARTMENT TECHNICAL MANUAL

FIELD X-RAY FILM PROCESSING EQUIPMENT ITEMS 9611500 AND 9611700, 9605500

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WAR DEPARTMENT
WASHINGTON 25, D. C., 16 APRIL 1945

TM 8–629, Field X-ray Film Processing Equipment, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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CONTENTS

PART ONE. INTRODUCTION.

			Paragraph	Page
Section	*I.*	General.		
		Scope	1	1
		Records	2	1
	II.	Description and data.		
		Description	3	1
		Data	4	10
	III.	Tools, parts, and accessories.		
		Tools	5	11
		Parts and accessories	6	11

PART TWO. OPERATING INSTRUCTIONS.

Section	*IV.*	General.		
		Scope	7	15
	V.	Service upon receipt of equipment.		
		Remove packing and crating	8	15
		Assemble	9	15
		Preoperative procedures	10	21
		Initial operation	11	25
		Used equipment	12	26
	VI.	Controls and instruments.		
		General	13	26
		Controls	14	26
		Instruments	15	32
	VII.	Operation under usual conditions.		
		General	16	32
		"ON" and "OFF" operation	17	33
		General precautions during normal operation	18	33
	VIII.	Operation of auxiliary equipment.		
		General	19	33
		Emergency power source	20	34
	IX.	Operation under unusual conditions.		
		Scope	21	34
		Extreme cold	22	34
		Extreme heat	23	35
		Sand and dust	24	35
		Dampness and excessive humidity	25	35

PART THREE. MAINTENANCE INSTRUCTIONS.

Section	*X.*	General.		
		Scope	26	36
	XI.	Special organizational tools and equipment.		
		General	27	36

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		Paragraph	Page
XII.	Lubrication.		
	Lubrication	28	36
XIII.	Preventive maintenance service.		
	General information	29	36
	Operator maintenance (first echelon)	30	38
	Organizational maintenance (second echelon)	31	39
XIV.	Trouble shooting.		
	General	32	40
	Water does not cool	33	40
	Water does not heat	34	42
PART FOUR. AUXILIARY EQUIPMENT.			
Section XV.	Description and data.		
	Description	35	43
	Tabulated data	36	44
	Tools, parts, and accessories	37	44
	Operating instructions	38	46
	Service upon receipt of used equipment	39	51
	Calibrated water valve	40	51
	Operation under usual conditions	41	51
	Operation under unusual conditions	42	52
	Maintenance instructions	43	52
	Maintenance operation	44	53
	Shipment and storage	45	54
XVI.	X-ray field unit, dryer and loading bin combination: complete with air circulator. For field processing unit.		
	Description and data	46	55
	Operating instructions	47	58
	Controls	48	60
	Operation under usual conditions	49	60
	Maintenance instructions	50	60
	Trouble shooting	51	60
	Auxiliary equipment	52	61
	Storage and shipment	53	62
PART FIVE. REPLENISHMENT OF DICHLORODIFLUOROMETHANE (FREON, F 12) REFRIGERANT GAS IN REFRIGERATION SYSTEM OF ARMY FIELD PROCESSING UNIT.			
Section XVII.	General.		
	Indication of low gas (F 12) pressure	54	63
XVIII.	Equipment and tools.		
	General	55	63
	Tools	56	63
	Equipment	57	66
XIX.	Replenishment procedure.		
	Connecting tank gauges and equipment	58	66
	Correlating temperatures and pressures	59	68
	Removal of replenishment equipment	60	69
	Leak detector torch (Halid Lamp)	61	70
	To free refrigerant expansion valve when stuck	62	70

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APPENDIX.

			Paragraph	Page
Section	*I.*	Shipment and storage.		
		General	1	71
		Pre-disassembly procedure	2	71
		Disassembly procedure	3	71
		Storage procedure	4	72
		Shipment	5	72
		Weights for processing unit	6	72
	II.	References.		
		Technical Manuals	7	72
		Technical Bulletins	8	72
		Army Service Forces Medical Supply Catalog	9	72
		List of forms mentioned in manual	10	73
		List of abbreviations used in manual	11	73

INDEX 74

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PART ONE

INTRODUCTION

Section I. GENERAL

1. SCOPE

a. These instructions are published for the information and guidance of the personnel to whom this equipment is assigned. They contain information on the operation and maintenance of the equipment as well as descriptions of the major units and their functions in relation to the other components of the equipment. They apply only to the *X-ray field unit processing unit, for darkroom* and are arranged in five parts; Part One—Introduction; Part Two—Operating Instructions; Part Three—Maintenance Instructions; Part Four—Auxiliary Equipment; and Part Five—Replenishment of Dichlorodifluoromethane (Freon, F 12) Refrigerant Gas.

b. Reference to applicable Technical Manuals are included in the appendix at the end of the manual. Those parts keyed on the illustrations with Medical Department numbers and formal nomenclature are regularly supplied as spare parts. All requisitions for spare parts should be submitted in accordance with latest ASF Supply Catalog MED 7 for this equipment.

2. RECORDS

No standard maintenance forms or records are required to be kept on this equipment except as the medical officer in charge may direct.

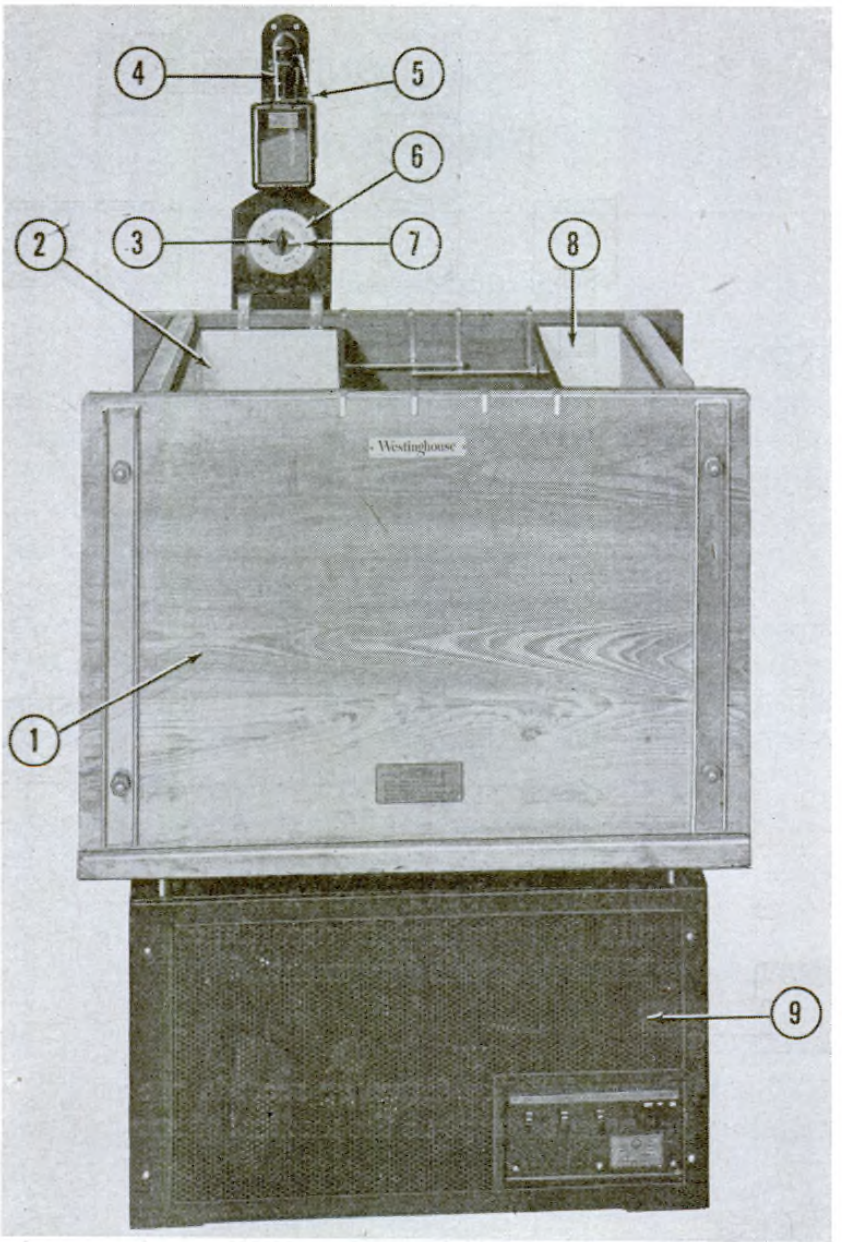
Section II. DESCRIPTION AND DATA

3. DESCRIPTION

a. GENERAL. (1) The X-Ray Field Unit Processing Unit raises or lowers water temperature admitted from community sources to 65° F. by means of a 1,200-watt electrical heater and refrigerant evaporator coil immersed in the mixing chamber.

(2) Continual circulation of water is maintained whether the unit is used as a closed system (no fresh water piped in from an outside source) or when fresh water is admitted from an outside

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Med. Dept. No.	Nomenclature	Med. Dept. No.	Nomenclature
1.	Tank assembly.	6. 9R20068	CLOCK, INTERVAL TIMER, WESTEX:
2.	Fixer tank insert.		
3.	Setting dial.		
4. SR00907	LAMPHOLDER, MEDIUM SCREW, PULL-CHAIN TYPE:	7.	Minute pointer.
		8.	Developer tank insert.
5.	Pull chain.	9.	Base assembly.

Figure 1. Medical Department Item 9611500 X-ray field unit processing unit, for darkroom, new style 981574.

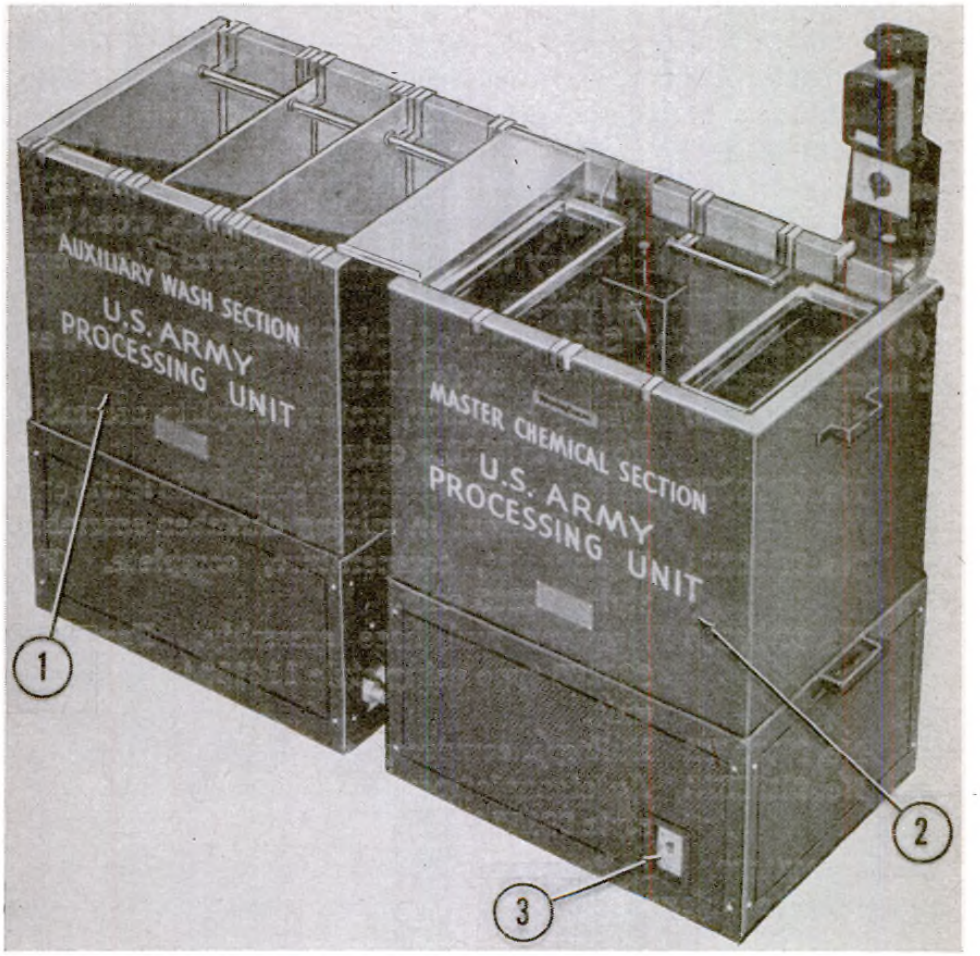
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source to the mixing chamber. This circulation is accomplished by a small pumping system.

b. IDENTIFICATION. Unit is shipped in two crates:

(1) *Part one crate (16 cubic feet)*—containing tank assembly, will be marked "Upper Section," with tank sizes, serial numbers, transformer number, part number, name of contractor, order number, delivery order number, model number, and name of item.

(2) *Part two crate (9 cubic feet)*—containing the base assembly, will be marked "Item 9611500 two part item," as well as name



Med. Dept. No.	Nomenclature
1.	Old style metal auxiliary wash tank.
2.	Old style processing unit main reservoir metal tank.
3. SR00886	SWITCH, TOGGLE, 20-AMP., 125-V., SINGLE-POLE, SINGLE-THROW, HEAVY-DUTY, FLUSH:

Figure 2. Medical Items 9611500 and 9611700 X-ray field unit processing unit, and auxiliary wash tank, old style metal tank group 980205.

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of contractor, order number, delivery order number, serial number, model number, and name of item.

c. DIFFERENCE IN MODELS. (1) The Processing Unit is issued in one model only, but two styles of tank groups have been manufactured with minor improvements on the base assemblies. The old style tank group consists of an all metal main reservoir tank with stainless steel developer and fixer tank inserts (fig. 2 (2)) which is the manufacturer's style No. 980205. The new style tank group has a cypress wood main reservoir tank with enameled iron developer and fixer tank inserts (fig. 1) and is designated by the manufacturer as style No. 981574.

Complete base and tank assemblies are interchangeable, and all parts are interchangeable except as noted in (2) below. Both styles have the same capacities and efficiency of operation.

(2) *Interchangeability of parts.* (*a*) *Tank group.* All corresponding parts are interchangeable. Some parts required for style 981574 are not required in style 980205, such as tie rods, wood base gaskets, and fittings necessary to secure and reinforce a tank constructed of wood and its fittings.

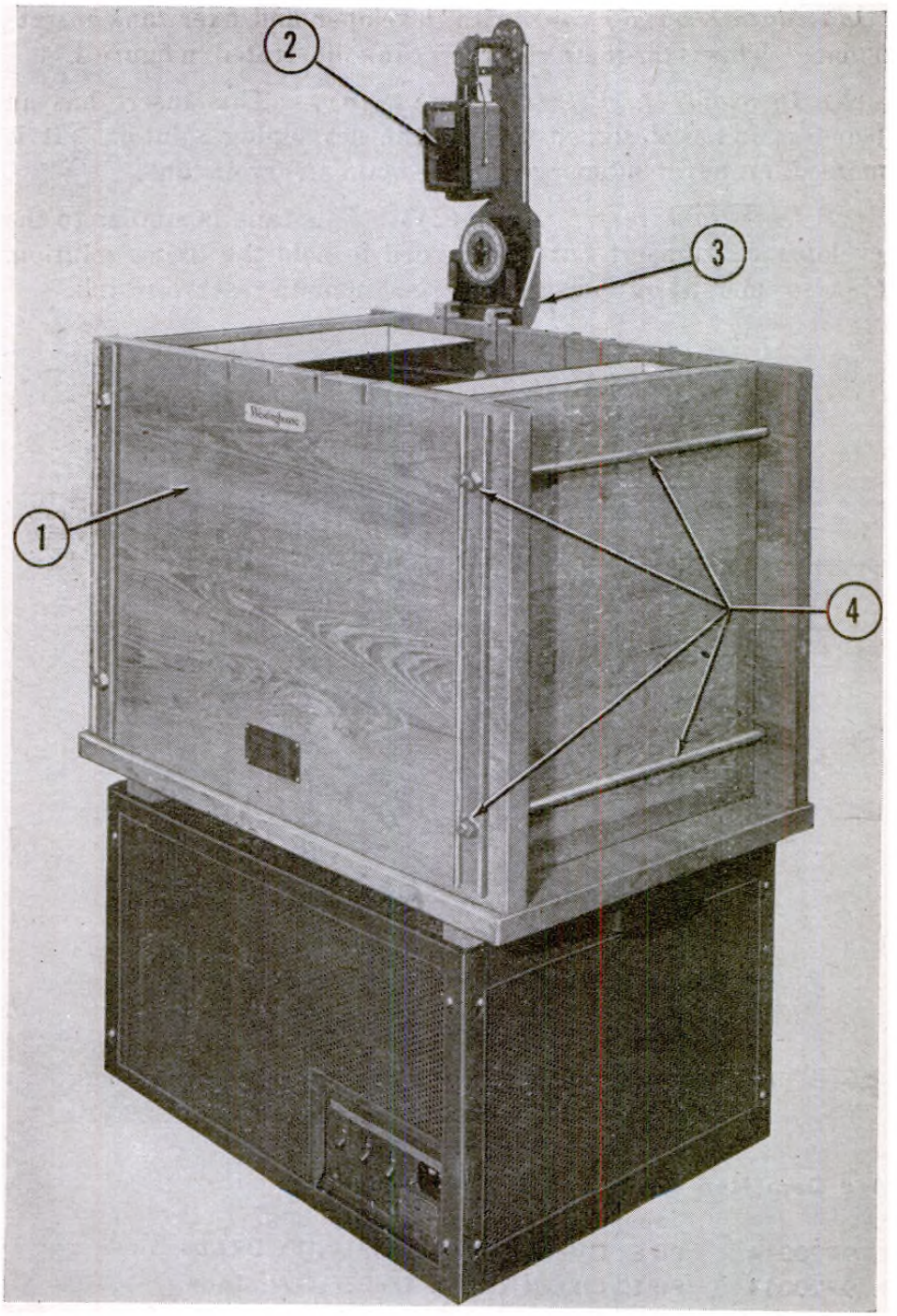
(*b*) *Base assembly.* Some parts of style 980205 and 981574 are not interchangeable. They are as follows:

No. 9R20330	Mixing chamber, water, complete assembly. For style 980205 only.
No. 9R20332	End plate refrigerating coil. This is the only part different in mixing chamber assembly.
No. 9R20334	Thermostat, temperature, complete. For style 980205 only.
No. 9R20336	Receiver and base assembly. For style 980205 type using style 1141504 compressor unit.
No. 9R20338	Bullseye, compressor. Not on Style 981574.
No. 9R20328	Autotransformer, 50-cycle operation. For style 981574 only.

d. ASSEMBLIES. The Processing Unit consists of two major assemblies. The tank assembly (fig. 1 (1)) and base assembly. (See fig. 1 (9).)

(1) *Tank assembly.* The tank assembly consists of cypress wood (fig. 3 (1)) or metal (fig. 2(2)) main reservoir tank, which holds temperature controlled water for washing the film. It contains two tank inserts, one for developing solution and the other for fixing solution. The fittings include rack hangers for film holders, the darkroom timer, the darkroom safelight and connecting fittings. A break-down of this assembly follows:

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Med. Dept. No.	Nomenclature
1.	Cypress wood main reservoir tank.
2. 9R20066	SAFELIGHT, COMPLETE: Without bulb.
3. 9R20056	BRACKET, SAFELIGHT AND TIMER COMPLETE:
4.	Tank batten nuts ½ x 13 hex and tie rods.

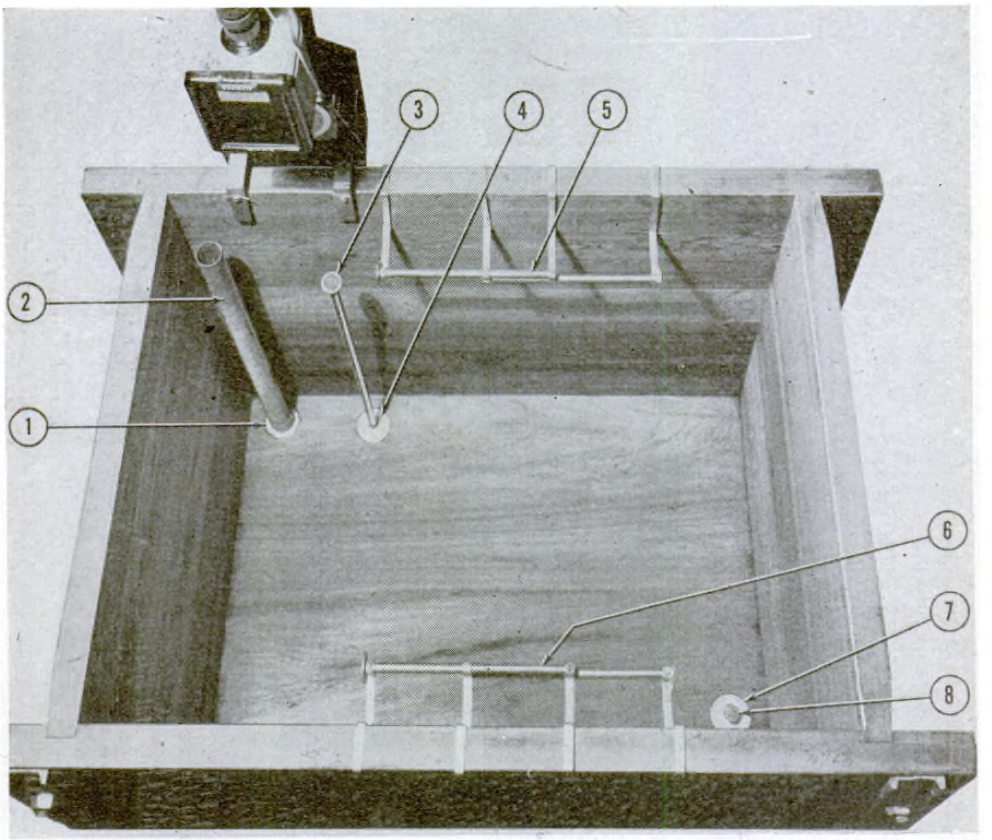
Figure 3. Side view processing unit assembled.

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(*a*) *Main reservoir tank* with developer and fixer tank inserts in place. This is the main reservoir tank illustrated in figure 4.

(*b*) *Developer tank insert* (fig. 1 (8)). This insert has an open top and is designed to hold the developing solution. It is emersed but never submerged in the main reservoir tank.

(*c*) *Fixer tank insert* (fig. 1 (2)). This tank is similar to the developer tank insert but is designed to hold the fixing solution. It is also emersed but never submerged in main reservoir tank.



Med. Dept. No.	Nomenclature
1.	Community drain overflow fitting.
2. 9R20014	PIPE, OVERFLOW, COMMUNITY DRAIN: Tank.
3. 9R20011	PIPE, CIRCULATING, OVERFLOW: Tank.
4.	Recirculating pipe fitting.
5. 9R20070	RACK, FILM DEVELOPMENT HOLDER, REAR:
6. 9R20072	RACK, FILM DEVELOPMENT HOLDER, FRONT:
7.	Circulating inlet pipe fitting.
8. 9R20013	BUSHING, STRAINER, INLET PIPE: Tank.

Figure 4. Main reservoir tank.

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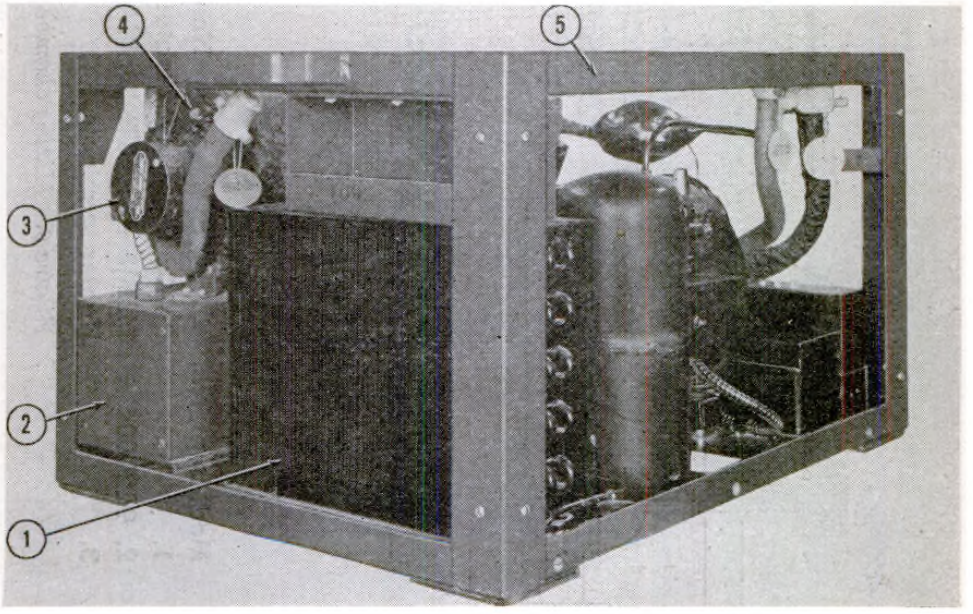
(*d*) *Front and rear film holder supports* (fig. 4 (5) and (6)), are placed in the main reservoir tank to support the film holders in a water bath.

(*e*) *Darkroom interval timer* (fig. 1 (6)). The timer is mounted on an upright bracket behind the main reservoir tank. It is adjustable for various developing times and at the end of the period rings a warning bell.

(*f*) *Darkroom safelight* (fig. 3 (2)). The safelight is also mounted on the upright bracket behind the main reservoir tank. It provides light for the operator of the equipment and at the same time protects undeveloped film from excessive light.

(*g*) *Fittings.* Fittings consist of the circulating inlet pipe bushing with strainer (fig. 4 (8)), recirculating overflow with strainer (fig. 4 (3)), and an overflow community drain pipe (fig. 4 (2)) which acts as an outlet to the community drain.

(2) *Base assembly* (figs. 5, 7, 9, and 12). The base assembly mechanism includes the systems for electrical refrigeration, heating, and pumping water through the entire unit. It is made up of

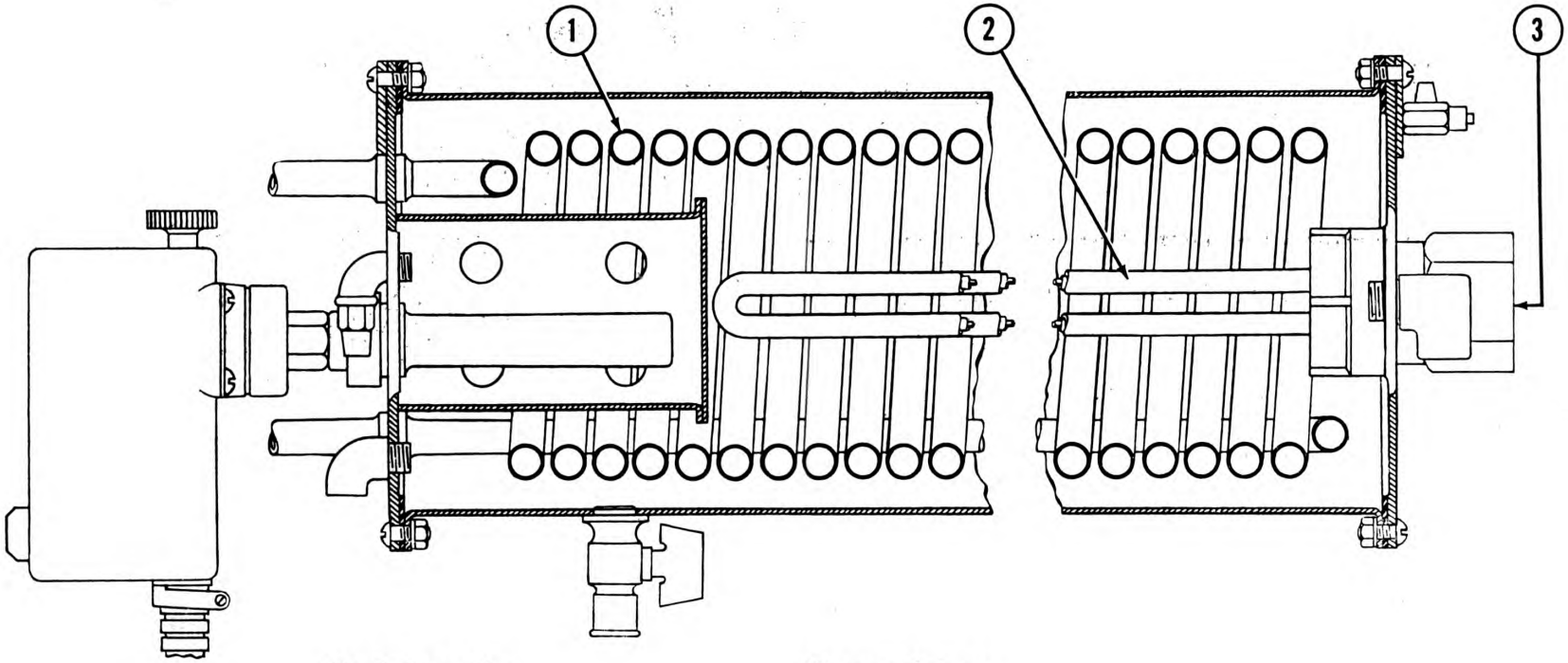


Med. Dept. No.	Nomenclature
1.	Condenser radiator.
2. 9R20124	RELAY, SWITCHBOX:
3. 9R20006	ELEMENT, HEATING, WATER, IMMERSED, 1,200-WATT:
4. SR00897	VALVE, AIR, RADIATOR, ⅛-INCH, COMPLETE:
5.	Base frame.

Figure 5. Base assembly, right side and back.

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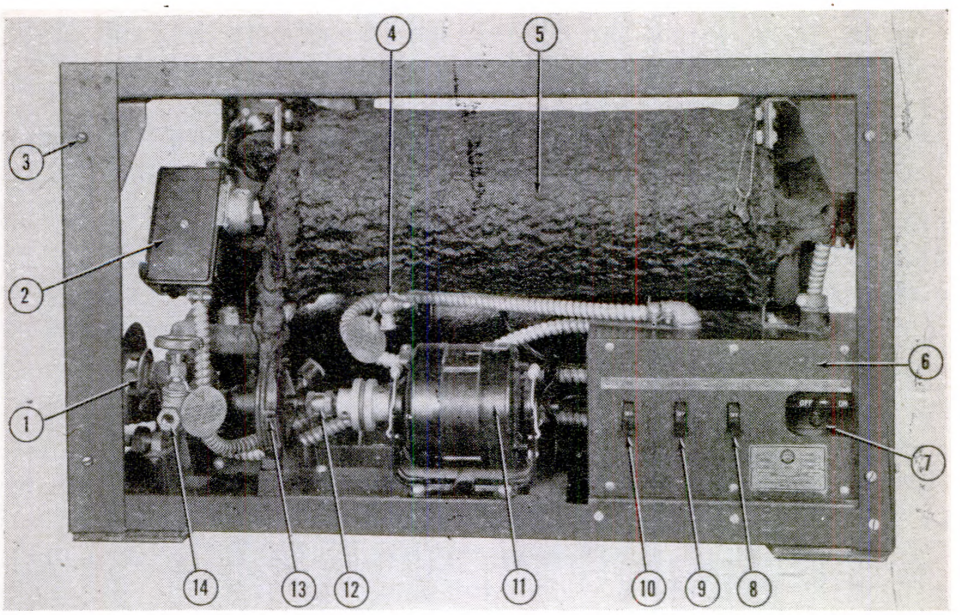
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Med. Dept. No.	Nomenclature
1.	Refrigeration evaporator coil.
2. 9R20006	ELEMENT, HEATING, WATER, IMMERSED, 1,200-WATT:
3.	Heater terminals.

Figure 6. Mixing chamber cross section.

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Med. Dept. No.	Nomenclature
1.	Valve dial support.
2. 9R20102	THERMOSTAT, TEMPERATURE, COMPLETE:
3.	Base screen retainer screw 10–32 x ½:
4.	Cock, gauge, tee head, male and female ⅛-inch brass. (Drain cock #3, on mixing chamber).
5.	Mixing chamber.
6.	Switchbox.
7. 9R20002	SWITCH, BREAKER, SINGLE-POLE, SENTINAL:
8. SR00886	SWITCH, TOGGLE, 20-AMP, 125-VOLT, SINGLE-POLE, SINGLE-THROW, HEAVY-DUTY, FLUSH: (Cooler switch).
9. SR00886	SWITCH, TOGGLE, 20-AMP, 125-VOLT, SINGLE-POLE, SINGLE-THROW, HEAVY-DUTY, FLUSH: (Heater switch).
10. SR00885	SWITCH, TOGGLE, 20-AMP, 125-VOLT, DOUBLE-POLE, SINGLE-THROW, HEAVY-DUTY, FLUSH: (Line switch).
11.	Circulating water pump motor. (Component of 9R20010 pump and motor, complete: Assembly).
12.	Pump, packing nut. (Component of 9R20010 pump and motor, complete: Assembly).
13.	Circulating water pump. (Component of 9R20010 pump and motor, complete: Assembly).
14.	Valve, globe, screwed ⅛-inch brass, emergency drain.

Figure 7. Base assembly, front view.

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a welded base frame (fig. 5 (5)), which supports the tank group and contains the mechanisms and fittings necessary to operate the unit. A break-down of this assembly follows:

(*a*) *Mixing chamber* (fig. 6 and fig. 7 (5)) contains the cooling and heating systems for the unit. Fresh water is mixed with overflow water in this chamber, raised or lowered to the proper temperature, and pumped into the main reservoir tank.

(*b*) *One thousand two hundred watt electrical heater* (fig. 6 (2)) immersed in the mixing chamber heats extraneous water as well as recirculated water to 65° F. before it is admitted to the main tank.

(*c*) *Refrigerator unit* (fig. 11) cools water (by evaporator coil (fig. 6 (1)) immersed within the mixing chamber) which is admitted from an outside source as well as recirculated to 65° F.

(*d*) *Circulating water pump and motor* (fig. 7 (13) and (11), respectively) maintain a constant change of water in the main reservoir tank by pumping recirculated overflow water from the main reservoir tank into the mixing chamber, thereby forcing the temperature controlled water back into the main reservoir tank.

(*e*) *Calibrated valve* (fig. 12 (7)) permits a flow under constant pressure of the maximum amount of water the unit can accommodate for heating or cooling.

(*f*) *Thermostatic temperature controls* (fig. 7 (2) and fig. 12 (2)). The thermostatic temperature control operates the electric circuits which activate either the heater or the refrigerator compressor as needed. (See fig. 10.)

(*g*) *Switch box* (fig. 7 (6)). The switch box contains master electrical controls for the main line (fig. 7 (10)), heater (fig. 7 (9)), cooler (fig. 7 (8)), and pump motor overload switch (fig. 7 (7)). Some of the earlier styles use only a main line switch. (See fig. 2 (3)). Only the newest units have been issued with the overload pump switch. (See fig. 10.)

(*h*) Connecting fittings, wiring, and piping carry the water, refrigerant, or electrical energy as needed.

4. DATA

a. PERFORMANCE. Variations of both air and water temperatures may affect the performance of this unit. If room temperatures are extremely high or low, film holders and films in turn will pick up the heat or cold and when admitted to the unit in large quantities will affect liquid temperatures. Extremely high or low temperatures of admitted water will also affect the performance of this unit in that a longer period of time must be allowed to stabilize liquid temperatures at 65° F.

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b. CAPACITIES. (1) *Main reservoir tank:* 41 gallons with developer and fixer insert tanks in place.

(2) *Developer insert tank:* 6 gallons.

(3) *Fixer insert tank:* 10 gallons.

(4) *Circulation water pump:* 20 gallons per hour.

(5) *Calibrated inlet valve.* Variable with temperature of admitted water and corresponding setting.

(6) *Film development capacities.* (*a*) One gallon of developer will process thirty-six 14 x 17 films (or their equivalent) before it should be discarded, at the following rate:

1 to 20—develop at NORMAL time.
21 to 29—develop at NORMAL time plus 1 minute.
30 to 36—develop at NORMAL time plus 2 minutes.

(*b*) One 14 x 17 film equals three 8 x 10 films.
One 14 x 17 film equals two 10 x 12 films.
One 14 x 17 film equals one 11 x 14 and one 8 x 10.

Note. It must be kept in mind that this developer depletion scale is for *1 gallon of solution* and may be applied in multiples of as many gallons as are required.

Section III. TOOLS, PARTS, AND ACCESSORIES

These tools, parts, and accessories will be kept with the equipment at all times

5. TOOLS

a. NONREVERSIBLE RATCHET WITH OFFSET HANDLE (fig. 8 (3)). This tool is for use with the compressor unit valves and will be designated as the ratchet wrench.

b. CRESCENT TYPE ADJUSTABLE WRENCH (fig. 8 (2)). This tool is all-purpose with this unit and will be designated as crescent wrench.

c. SPANNER FACE WRENCH (fig. 8 (1)). This tool is used on interconnecting handle fittings between the tank and base assemblies, and will be designated as spanner wrench.

6. PARTS AND ACCESSORIES

a. INLET OR DRAIN REDUCING NIPPLE (fig. 8 (4)). This fitting will be found in the tool kit and is used for either the community inlet pipe as a reducer fitting or on the community drain outlet as a reducer fitting. It will be designated as a reducer, inlet, or drain.

b. ORIFICE 20–50-POUND WATER PRESSURE (fig. 8 (7)), ORIFICE 10–20-POUND WATER PRESSURE (fig. 8 (6)), ORIFICE 0–10-POUND WATER PRESSURE (fig. 8 (5)). These orifices are used in conjunc-

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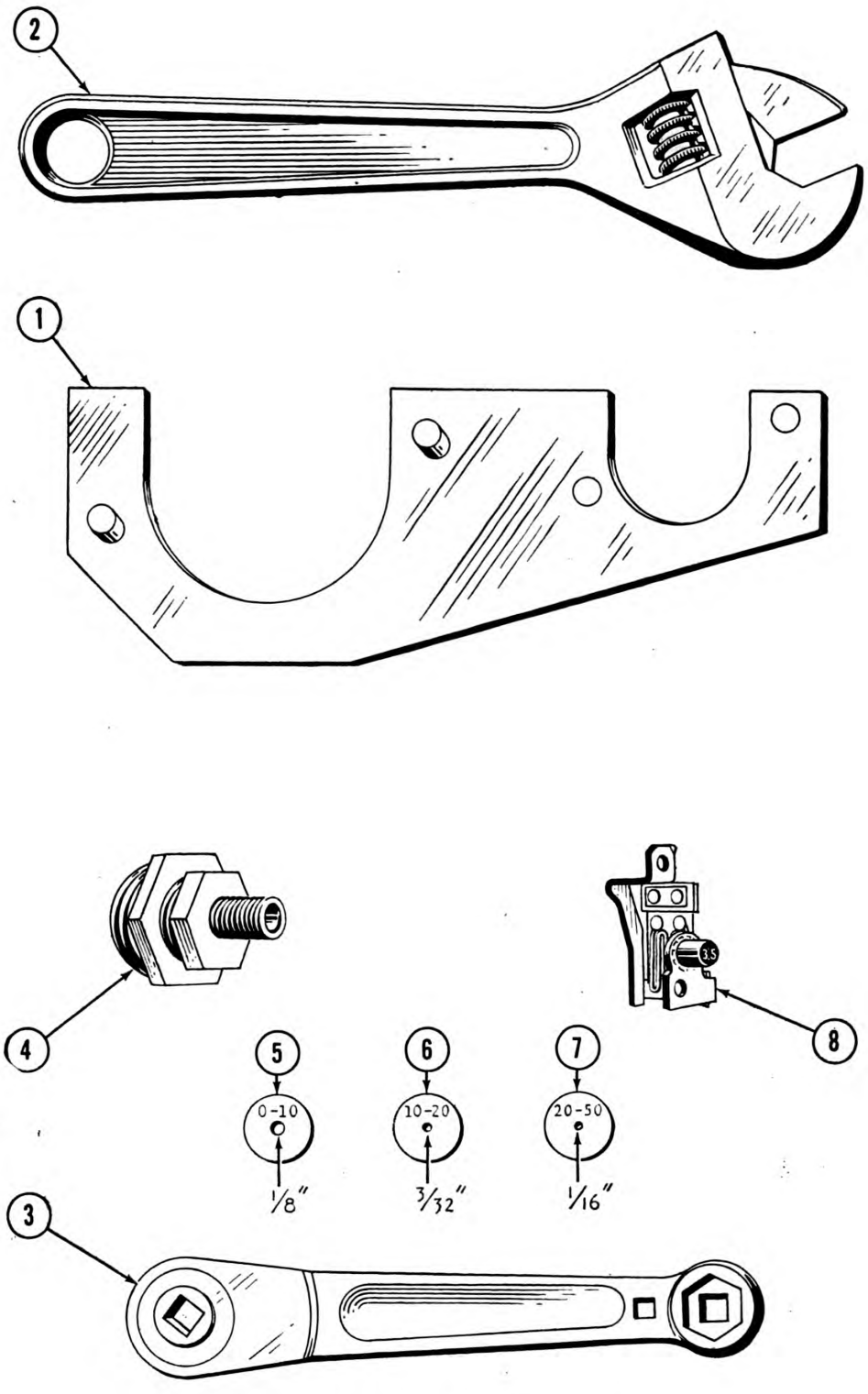


Figure 8. Tools, parts, and accessories.

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Med. Dept. No.	Nomenclature
1. TR00002	WRENCH, SPANNER, FACE, X-RAY:
2. TR01880	WRENCH, ADJUSTABLE, CRESCENT TYPE, SINGLE-END, 8-INCH, 1 1/32-INCH JAW OPENING:
3. TR00001	HANDLE, OFFSET, NONREVERSIBLE RATCHET, X-RAY:
4. 9R20318	NIPPLE, REDUCING, INLET OR DRAIN:
5. 9R20324	ORIFICE 0–10-LB PRESSURE, WATER:
6. 9R20322	ORIFICE 10–20-LB PRESSURE, WATER:
7. 9R20320	ORIFICE 20–50 LB PRESSURE, WATER:
8. 9R20122	ELEMENT, THERMAL, 3.5-AMP, BREAKER, SWITCH:

Key to Figure 8

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tion with the calibrated inlet valve to reduce or stabilize the incoming community water pressure. They will be designated as orifice.

c. THERMAL ELEMENT 3.5-AMP, FOR PUMP MOTOR OVERLOAD SWITCH (fig. 8 (8)). This small electrical resistance element is received with the tool kit and must be installed when 50-cycle current is used. To be designated as Thermal element 3.5-amp.

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PART TWO

OPERATING INSTRUCTIONS

Section IV. GENERAL

7. SCOPE

Part Two contains information for the guidance of the personnel responsible for the operation of this equipment. It contains information on the operation of the equipment with the description and location of the controls, instruments, and fittings.

Note. Failure or unsatisfactory performance of equipment will be reported on WD AGO Form 468.

Section V. SERVICE UPON RECEIPT OF EQUIPMENT

8. REMOVE PACKING AND CRATING

a. The unit is shipped in two crates, the smaller one containing the base assembly and tools, the larger one containing the main reservoir tank and related parts including the overflow pipes and strainer, light and timer bracket, the interval timer, the darkroom light, and the rack film holders and the tank inserts. Some units will also include a 50-cycle transformer.

b. Both crates should be unpacked in an upright position exercising care so as not to bend or damage the equipment. The accessories should be unwrapped and checked for damage before disposing of the wrapping materials. Place the accessory parts in a safe place while assembling the heavy parts of the unit.

9. ASSEMBLE

All water valves and connections are identified by means of numbered metal tags. Other parts are identified on the figures in this manual.

a. LOCATE BASE OF UNIT. After removing the packing materials, place the base assembly in the location where it is to be used, keeping in mind the following considerations:

(1) Allow at least 12 inches of air space all around the base to permit proper air circulation. A cool, dry, well-ventilated place is preferable.

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(2) The floor should be reasonably level to insure proper splash lubrication of the compressor.

(3) Always allow sufficient room for servicing the unit.

(4) Avoid a location where heated air discharge from the refrigerant condenser will be recirculated.

(5) The side with the water pump should be kept to the front.

(6) Avoid locations where the unit will be exposed to freezing temperatures after it is shut down, unless provision has been made to drain all water from the entire system.

b. REMOVE SIDE COVERS. (1) Loosen (do not completely remove) the four screws (fig. 7 (3)), which hold each side cover in place.

(2) Slip covers up and off.

c. FREE COMPRESSOR. (1) Remove blocks from under compressor unit.

(2) On spring mounted compressor units, loosen the three castellated hexagonal nuts on the base of the sealed compressor unit until they stop against the cotter pins which pass through each of the studs. The compressor will not float freely on its three mounting springs. (See fig. 9 (6).)

Caution: If the unit is to be transported, these nuts must first be locked in place or broken connections and loss of refrigerant will result.

d. ASSEMBLE TANK GROUP. (1) Screw the long 1-inch diameter overflow pipe into its fitting inside the main reservoir tank. (See fig. 4 (1).) Make hand tight only.

(2) Screw the long screened recirculating overflow pipe into its fitting beside the 1-inch pipe. (See fig. 4 (4).) Make hand-tight only.

(3) Mount safelight and timer. Mount the safelight and timer bracket (fig. 3 (3)) on the main reservoir tank as shown in figure 3. Remove the bottom colored glass window from the safelight, then remove the front colored glass window, screw the 10-watt bulb provided into the socket, and replace the glass windows. Screw the safelight assembly into the socket provided on the safelight and timer bracket. (See fig. 1 (4).) Position the interval timer as shown in figure 1.

e. TEST TANK GROUP FOR LEAKS (WOOD ONLY). (1) Without removing the plug in the circulating inlet fitting (fig. 4 (7)), fill the tank half full of water, and observe for leaks. If small seepage leaks appear, allow the tank a setting-up period of at least 1 hour.

(2) If at the end of the 1-hour period leaks still exist, tighten

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the eight tank batten nuts and tie rods (fig. 3 (4)) until the tank is watertight. Then test for another hour.

Caution: Do not tighten the tie rods too tight as it is possible to crush the tank.

(3) When tests show the tank is not leaking, drain the tank by removing the 1-inch overflow pipe and when drained replace the overflow pipe.

(4) Replace the plug with the short inlet pipe bushing with strainer. (See fig. 4(8).) Make handtight only.

f. MOUNT TANK GROUP ON BASE ASSEMBLY. (1) Carefully place the main reservoir tank in position on the base assembly with the long 1-inch overflow pipe to the left rear. The tank should fit snugly within the angle iron at the top of the base frame.

(2) If the metal tank is issued, the tank should be firmly locked in place by means of the thumb screws provided on the base which screw into the main reservoir tank.

g. MAKE PLUMBING CONNECTIONS. (1) Connect tank coupling No. 1 (fig. 9 (1)) to the connector fitting of the inlet pipe bushing on the right front. (See fig. 4 (7).)

(2) Connect tank coupling No. 2 (fig. 9 (5)) to the connector fitting of the recirculating pipe on the left rear. (See fig. 4 (4).)

(3) Connect the other tank coupling No. 2 (fig. 9 (4)) to the connector fitting of the long 1-inch community drain overflow pipe on the left rear. (See fig. 4 (1).)

(4) Connect the community drain piping to fitting No. 5 on the lower end of the 1-inch community drain overflow pipe.

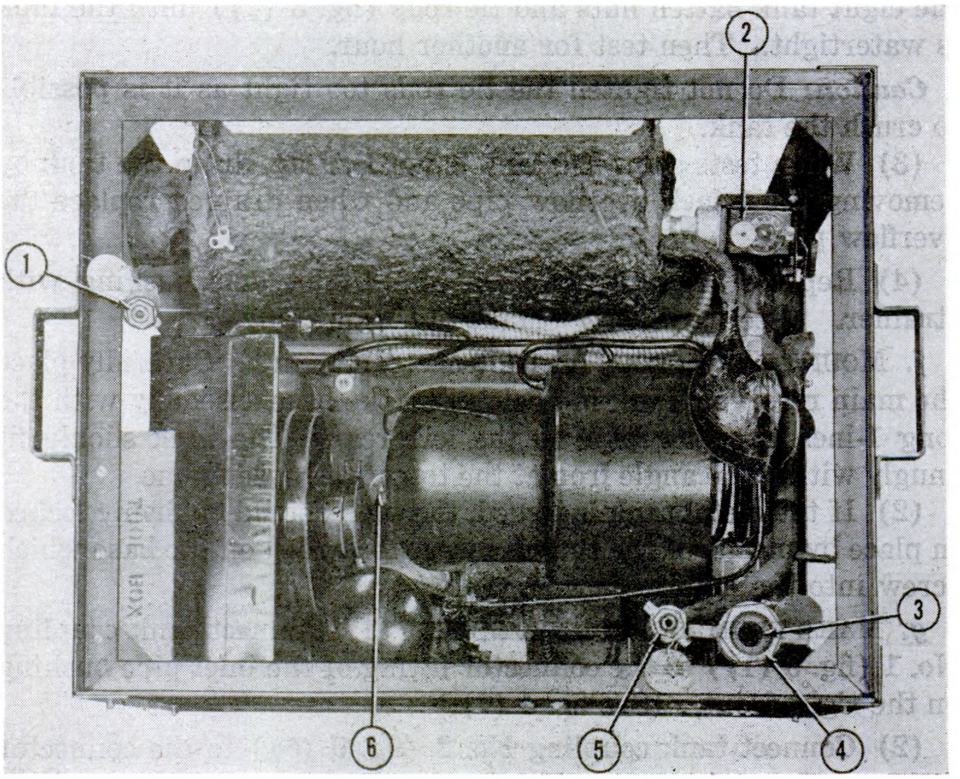
(5) Connect community cold water supply to coupling No. 4 (fig. 12 (8)) on the calibrated No. 4 TAG valve. The reducer supplied in the tool kit may be utilized for this purpose if necessary. (See pars. 14*d* and *e*.)

h. MAKE ELECTRICAL CONNECTIONS FOR 60-CYCLE OPERATION. (1) Connect the equipment to single-phase, 115-V., 60-cycle, AC power supply.

(2) Ground the unit by means of a ¾-inch metal rod or pipe driven at least 3 feet into moist earth or connect the grounding lead provided (fig. 12 (9)) to a cold water pipe. The point of contact between the ground lead and the rod or pipe should be clean and bright.

i. MAKE ELECTRICAL CONNECTIONS FOR 50-CYCLE OPERATION. (1) For 50-cycle operation of the Processing Unit the refrigerator unit has to be operated in conjunction with a 9R20328 Autotransformer.

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Med. Dept. No.	Nomenclature
1.	Circulation tube coupling with handle.
2.	Range adjustment knob.
3.	Drain tube bushing.
4.	Community drain tube coupling with handle.
5.	Recirculating tube coupling with handle.
6.	Mounting spring, compressor.

Figure 9. Base assembly, top.

(*a*) The capacity of the circulating pump and motor will be lowered to 5/6 of the 60-cycle capacity.

(*b*) The heater circuit is undisturbed.

(*c*) The cooling capacity of the unit on 50-cycles is 83 percent of that on 60-cycle operation.

(2) Connecting the 9R20328 Autotransformer for 50-cycle operation. Due to the fact that the capacity of the 9R20328 Autotransformer is limited only to supplying power for the refrigerator unit, the following changes must be made:

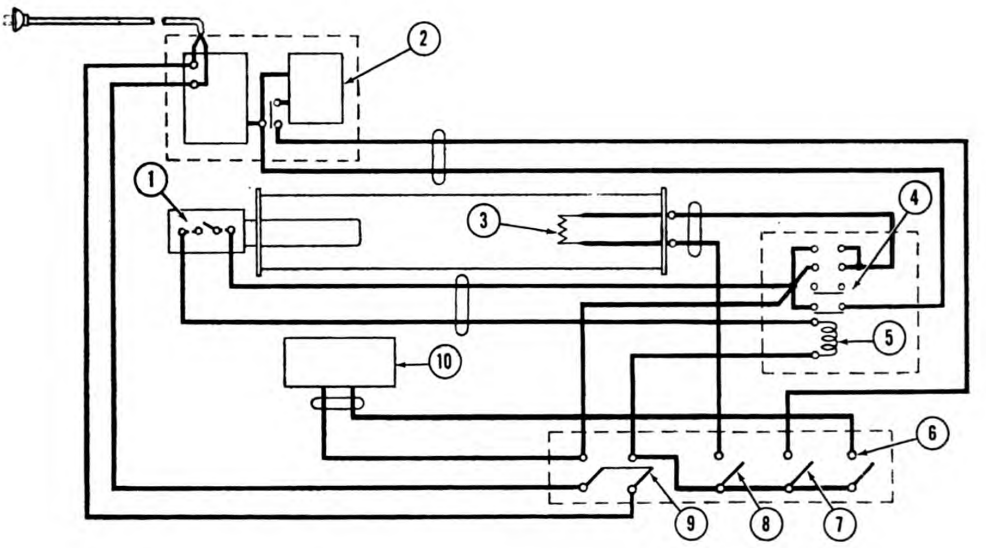
(*a*) The present feed for the refrigerator is removed.

(*b*) The PS–PF terminals of the 9R20328 Autotransformer are connected to the points in the circuit where the refrigerator feed is obtained.

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(*c*) The refrigerator feed is now connected to the autotransformer terminals S1 and S2.

(*d*) The remainder of the circuit is left undisturbed. (See fig. 10.)



Med. Dept. No.	Nomenclature
1. 9R20102	THERMOSTAT, TEMPERATURE, COMPLETE:
2.	Compressor motor.
3. 9R20006	ELEMENT, HEATING, WATER, IMMERSED, 1,200-WATT: (1,200-WATT, ELECTRIC HEATER).
4. 9R20124	RELAY, SWITCHBOX:
5.	Solenoid.
6. 9R20002	SWITCH, BREAKER, SINGLE-POLE, SENTINAL:
7. SR00886	SWITCH, TOGGLE, 20-AMP, 125-V., SINGLE-POLE, SINGLE-THROW, HEAVY-DUTY, FLUSH: (Cooler switch).
8. SR00886	SWITCH, TOGGLE, 20-AMP, 125-V., SINGLE-POLE, SINGLE-THROW, HEAVY-DUTY, FLUSH: (Heater switch).
9. SR00885	SWITCH, TOGGLE, 20-AMP, 125-V., DOUBLE-POLE, SINGLE-THROW, HEAVY-DUTY, FLUSH: (Line switch).
10.	Circulating water pump motor: (Component of 9R20010 pump and motor, complete: Assembly).

Figure 10. Wiring diagram.

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(3) If after operation the circuit breaker continues to break the pump motor circuit, follow the explanation and instructions in paragraph 9*j*.

j. INSTALLATION OF 3.5-AMP. THERMAL ELEMENT FOR PUMP CIRCUIT BREAKER. (1) The pump motor circuit breaker which serves as the ON-OFF switch in the switch box for the pump contains a 3.1-ampere thermal heater as shipped. This is the proper breaker rated heater to be used in this unit on 60-cycle operation. However, should the unit be operated on 50-cycle current, then the pump motor will draw more current, the amount of which varies somewhat with each individual motor and pump unit. Under certain conditions with elevated temperatures the breaker or ON-OFF switch may keep breaking to OFF because of the motor drawing slightly more than 3.1 amperes on 50-cycle and the elevated (room) temperature. If this condition should occur on 50 cycles, then the 3.1-ampere thermal heater in the water pump motor circuit breaker should be replaced by the accompanying 3.5-ampere thermal heater as in (2) below. This allows the motor to operate at higher currents which the motor can safely do as long as it is running. Do not use the 3.5-ampere thermal heater for 60-cycle operation as the 3.1-ampere heater furnishes protection against a stalled pump and a possible burned out motor which is unusual but possible if the pump should get clogged up with some foreign material. The 3.5-ampere heater does not furnish this protection on 60 cycles but does on 50 cycles. Do not use the 3.5-ampere heater unless the above trouble occurs.

(2) To change heater element turn off the power supply and lift off the front perforated panel from the base; then proceed with the following steps:

(*a*) Remove the front cover of the switch box by removing the six roundhead screws holding it in place. In the upper right-hand end of the switch box is the ON-OFF switch for the pump which is also the circuit breaker.

(*b*) Remove the front cover of the breaker by removing the one screw in the front of it.

(*c*) Remove the two screws in the left-hand upper and lower corners of the breaker which hold the breaker in place.

(*d*) Trip the breaker by exerting slight pressure to the left by means of the finger on the vertical bimetallic strip to the right of the red button.

(*e*) Slide the thermal heater out by pulling gently on the red button and slide the new heater in.

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(*f*) Replace all the covers, reset the breaker, and the unit is again ready for operation.

10. PREOPERATIVE PROCEDURES

a. CORRECT CALIBRATED VALVE AND ORIFICE. If it is desired to have a flow of community water blend continuously with recirculated water in the reservoir, proceed as follows:

(1) Measure the community water pressure and insert proper orifice into the union on the calibrated No. 4 TAG valve. (See par. 14*e*.)

(2) Determine temperature of community water with a thermometer.

Note. Allow community water to run freely for at least 15 minutes before taking the final reading.

(3) Set the pointer (fig. 12 (6)) on the calibrated No. 4 TAG valve to the nearest corresponding Fahrenheit temperature reading on the dial. (See fig. 12 (5).)

(4) The water now passing through the unit will be a mixture of community and recirculated water, part of which will continually flow into the community drain over the top of the 1-inch overflow pipe in the tank. It is important that the calibrated valve be set very carefully if water temperature in the main reservoir tank is to be maintained. (See par. 14*d*.) The valve adjustment should be changed with the seasons, or whenever there is likely to be an appreciable change in community water temperature.

b. CHECK REFRIGERANT LINE. The liquid line valve (fig. 11 (3)), suction line valve (fig. 11 (6)), and receiver valve (fig. 11 (1)) on recent issues have been shipped open. This is contrary to policy but of necessity due to shortage of tools supplied with this equipment. However, an easy check may be made of the position of the valves by turning on the equipment; if the compressor does not operate, although the water temperature calls for cooling, you can assume the valves are in "closed" position.

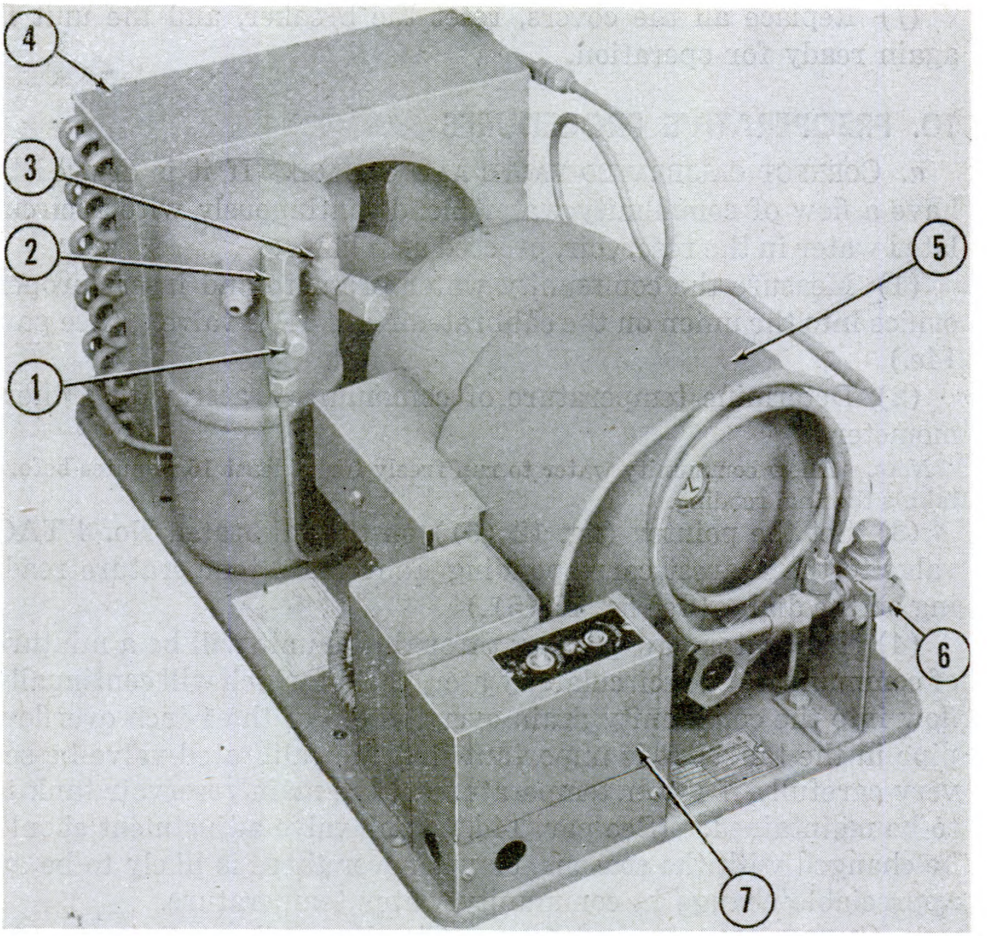
c. REFRIGERANT VALVES IN CLOSED POSITION. With valves in closed position proceed as follows:

(1) Remove protective screw cap from the "liquid line shut-off valve" (fig. 11 (3)) located on the right side of the liquid refrigerant receiving tank. This is a valve with a copper tubing coming off the top.

(2) Remove the protective screw cap from the "receiver shut-off valve" located on the right side of the liquid refrigerant receiving tank. (See fig. 11 (2).)

(3) Remove the protective screw cap from the "suction line shut-off valve" (fig. 11 (6)) located near the No. 5 TAG fitting.

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Med. Dept. No.	Nomenclature
1.	Receiver valve.
2.	Protective screw cap.
3.	Liquid line valve.
4.	Refrigeration condenser.
5.	Compressor.
6.	Suction and support valve.
7.	Refrigerant pressure control.

Figure 11. Refrigerator unit.

(4) By means of the special ratchet wrench provided with the equipment, open the "liquid line shut-off valve" *all the way* by turning the stem in a counterclockwise direction until it stops. Replace the protective screw cap, and tighten it moderately with a wrench.

(5) By means of the special ratchet wrench open the "receiver shut-off valve" *all the way* by turning the stem in a counterclock-

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wise direction until it stops. Replace the protective screw cap, and tighten moderately with a wrench.

Caution: Do not operate the unit with "receiver shut-off valve" closed. Failure to open this valve before the unit is started will build up excessive pressure in the cylinder head and may damage the compressor.

(6) By means of the ratchet wrench, open the "suction line shut-off valve" *all the way* by turning the stem in a counterclockwise direction until it stops. Replace the protective screw cap, and tighten moderately with a wrench.

Caution: Do not operate the unit with the "suction line shut-off valve" closed. Failure to open this valve before the unit is started will cause oil from the compressor crankcase to be pumped into the liquid receiver tank.

d. POSITION OF WATER VALVES FOR AN OPEN SYSTEM (community water source and drain). (1) Close emergency drain valve No. 3 TAG. (See fig. 7 (14).)

(2) Close water drain cock No. 3 TAG on mixing chamber. (See fig. 7 (4).)

(3) Close air bleeder valve on mixing chamber (use key provided). (See fig. 5 (4).)

(4) Open calibrated valve No. 4 TAG (fig. 12 (7)) all the way by giving it a half turn to the 65° position at which it will stop.

Note. All water valves and cocks close in a clockwise direction.

(5) Open the community water supply line valve (not part of the equipment) slowly until it is completely open. When the water level in the main reservoir tank has reached the top of the 1-inch overflow pipe, shut off the No. 4 TAG calibrated valve by giving it a half turn to the "closed" position. At average community water pressure of about 45 pounds per inch, it should take about 2 hours to fill the tank. If faster filling is desired, a supplementary source of water should be provided and the water fed into the tank by a hose or other suitable means.

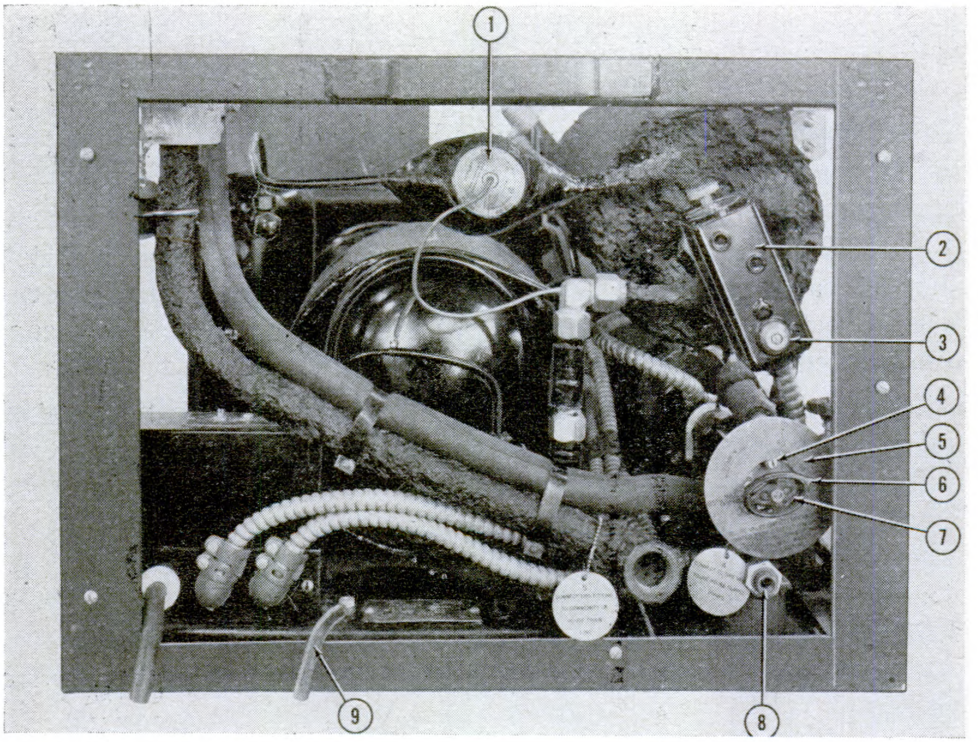
Note. Do not use excessive force when operating calibrated No. 4 TAG valve or the accuracy of the calibration may be affected. Turning it gently to the "closed" position will effectively shut off all water flow.

(6) With the reservoir tank filled to the proper level examine all three couplings underneath the tank, as well as other parts of the water system, for leaks.

e. POSITION OF VALVES AS A CLOSED UNIT. If a community water and drain supply is not available, proceed as follows:

(1) Close emergency drain valve No. 3 TAG. (See fig. 7 (14).)

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Med. Dept. No.	Nomenclature
1.	Refrigeration expansion valve.
2. 9R20102	THERMOSTAT, TEMPERATURE, COMPLETE:
3.	Differential adjustment knob.
4.	Retainer screw for calibrated dial 6–32 x ⅜.
5.	Graduated valve dial.
6.	Index pointer.
7.	Valve, globe, screw, ⅛-inch brass calibrated.
8.	Union, pipe, female, ⅛-inch, ground joint, brass inlet.
9.	Wire No. 8, copper, stranded insulated.

Figure 12. Base assembly, left side.

(2) Close water drain cock No. 3 TAG on mixing chamber. See fig. 7 (4).)

(3) Close air bleeder valve on mixing chamber (use key provided). (See fig. 5 (4).)

(4) Close calibrated valve No. 4 TAG. (See fig. 12 (7).) Fill the main reservoir with water of a temperature as close to 65° F. as can be obtained until the water level has reached the top of the 1-inch overflow pipe. With the developer and fixer tanks in place, the main reservoir tank capacity is approximately 41 gallons. With these tanks removed, the reservoir capacity is approximately 56 gallons.

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f. BLEED WATER SYSTEM. To make certain that the water circulating system is functioning properly and that the water pump has not become airbound, proceed with the following steps, *with the unit in operation.*

(1) Check the water level in main reservoir tank to make certain it is even with the top of the 1-inch overflow pipe.

(2) By means of the key wrench provided, carefully open the "Air Bleeder Vent" very slightly. (This is located at the heater end of the mixing chamber. (See fig. 5 (4).)) Keep this vent open until all trapped air has left the system and water begins to come out freely after which it should be closed. Be careful not to allow water from this vent to come in contact with the heater relay in the housing directly underneath.

(3) As a final check on whether circulation is taking place, hold a small piece of soft paper over the long screened overflow circulation pipe near the 1-inch drain line. If the paper is sucked to the pipe, the water system is circulating satisfactorily. *It is important that all air be removed from the water system if proper temperature control is to be obtained.* The water pump will continue to operate all the time providing its switch is in the "ON" position. Throwing off the "line" switch will completely shut down the entire unit.

g. CHECK POWER SOURCE OF BASE ASSEMBLY AND SAFELIGHT. Plug in the safelight cord and the base assembly cord to the outlet of single-phase 115-volt, 60-cycle, AC power supply.

11. INITIAL OPERATION

a. Turn on the line, pump, heater, and cooler switches located on the lower right-hand side of the base assembly. Both the condenser fan and water pump should now begin to operate. The sealed compressor unit will also operate if the water temperature is above 65° F. With the starting of the compressor, the refrigerant will be free to circulate throughout the system, and the compressor should be permitted to operate until it shuts down automatically. If the water temperature is below 65° F., the heater unit will operate instead of the compressor.

b. The equipment is now in full operation and the temperature of the water in the main reservoir tank will be raised or lowered (depending upon the initial temperature of the water) until an average value of 65° F. is reached, at which temperature it will be maintained over a range of from 62° to 68° Fahrenheit.

c. Replace the four perforated side covers on the base.

d. Providing the calibrated valve has previously been turned to the "closed" position and the unit is operated with the community

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water source position, the pointer of the calibrated valve points to the nearest Fahrenheit reading on the dial.

12. USED EQUIPMENT

Upon receipt of class B or used equipment, follow the same procedure as outlined in paragraphs 8, 9, 10, and 11. In addition, a run in time should be allowed with a manual check of the water temperature by means of an accurate thermometer suspended in the center of the main reservoir tank, as well as thorough lubrication of the equipment as outlined in paragraph 28. The most important inspection of this equipment will be visual.

Section VI. CONTROLS AND INSTRUMENTS

13. GENERAL

All controls have been carefully set at the factory, but as an additional check on a new installation, a thermometer should be suspended in the main body of water at about the center of the tank and readings taken whenever the heater relay (fig. 5 (2)) operates. At 62° F. the cooling unit compressor (fig. 11 (5)) should automatically shut off and the heater (fig. 6 (2)) turn on. At 68° F. the heater should automatically turn off and the cooling unit compressor turn on. If the final thermometer readings, after equilibrium is reached, are found to be respectively lower and higher than these values, a corresponding adjustment of the thermostatic water temperature control (fig. 7 (2)) must be made. (See par. 14*b*.) If the community water, or ambient temperatures are higher than 65° F., the "Heater" switch (fig. 7 (9)) should be turned off and the "Cooler" switch (fig. 7 (8)) turned on. If lower than 65° F., the "Heater" switch should be turned on and the "Cooler"' switch off. Turning off the "main line" switch (fig. 7 (10)) disconnects all circuits from the main line.

14. CONTROLS

a. The motor pump circuit breaker trips off automatically due to an amperage overload drawn by the water pump motor. This control is located on the upper right-hand corner of the switch box. (See fig. 7 (7) and fig. 10 (6).) When tripped out this switch may be reset as follows:

(1) Allow about 20 seconds for the thermal element within the switch to cool.

(2) Push the switch lever firmly to its "OFF" position.

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(3) Then push switch lever to the "ON" position.

b. THERMOSTATIC WATER TEMPERATURE CONTROL. (1) The adjustable water temperature control (fig. 7 (2), fig. 12 (2), and fig. 10 (1)) maintains the water in the mixing chamber at a constant average temperature, depending upon the setting selected. It is the only adjustment provided for directly controlling the water temperature. It has been set for 65° F. at the factory, which should be satisfactory for all normal operations. If it should become necessary to make an adjustment, turn the range adjustment knob on (fig. 9 (2)) the top of the control clockwise to raise the average water temperature, and counterclockwise to lower it. The knob should not be turned too much in order to avoid going too far past the setting desired. The temperature control should be observed before placing the upper main reservoir tank on the pedestal base. The range setting and dial and the differential adjustment knob are easily seen.

Note. If it should become necessary to make an adjustment, on an old style 980205 unit Thermostatic Water Temperature Control which is on the first style issued, loosen the locking screw on the range adjustment lever and move the latter to the left to lower the average water temperature, and to the right to raise it. The cover should be removed and the contacts observed during this operation. Move the adjustment lever only sufficiently to make or break the contacts, as the case may be, in order to avoid going too far past the desired setting.

(2) In operation the thermostatic temperature control automatically turns both the cooling compressor, and the heating unit on and off through the relay as the occasion demands. As the temperature of the water in the mixing chamber drops to 62° F., the contacts of the water temperature control close, thereby energizing the relay which in turn opens the compressor motor circuit and turns on the heater. As the temperature rises to 68° F., the control contacts open, deenergizing the relay which opens the heater circuit and starts the compressor. (See fig. 10.) This is repeated continuously as long as the equipment is in operation. The differential has been set at the factory. If it should be necessary to change the differential, it can be done by turning the differential adjustment knob (fig. 12 (3)) on the lower rear of the temperature control slightly in the "WIDER" direction to increase the differential and turn in the direction opposite to the "WIDER" direction indicated on the knob to decrease the differential.

(3) It is important that the actual automatic shutting-off and starting of the compressor be performed by this control and *not by the refrigerant pressure control.* Whenever a change in adjustment is made on the water temperature control, this point should be checked as outlined in *c* below.

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c. REFRIGERANT PRESSURE CONTROL. The refrigerant pressure control (fig. 11 (7)) directly controls the operation of the sealed-in compressor so far as circulation of the refrigerant is concerned but provides no direct control over water temperature.

(1) It has two adjustments, one marked "DIFF" and the other "RANGE." *The differential adjustment should never be tampered with except by a trained man in a fifth-echelon shop since special equipment is required to set it properly.*

(2) The range setting should be changed only if it is noted that the Refrigerant Pressure Control turns off the compressor motor before the Water Temperature Control has had a chance to perform this function. (See *b* above.) If such is the case, proceed as follows:

(*a*) Remove cover of *Water Temperature Control.* (See fig. 7 (2).)

(*b*) Turn range screw on Refrigerant Pressure Control *only* one-half turn in the "Colder" direction as indicated by the arrow.

(*c*) Wait for compressor to start automatically and observe whether closing of the contacts in the thermostatic water temperature control turns off the compressor.

(*d*) If the compressor stops before the thermostatic water temperature control contacts have closed, in adjusting a style 981574 unit, do not turn the "Range" screw any more in the "Colder" direction as the water may freeze on the refrigerant coil, causing a rupture of the cylinder. Check other factors such as restricted water flow. *Do not use the "RANGE" setting to obtain a lower water temperature—only the water temperature control can be used for this purpose.* (However, in adjusting a style 980205 unit proceed by turning the "Range" screw another half turn in the "Colder" direction and repeat the observation in (*c*) above. Continue adjusting the "Range" setting the "Colder" direction, one-half turn at a time, until the compressor is turned off only by the closing of the Water Temperature Control contact. *Again do not use the "RANGE" setting to obtain a lower water temperature—only the water temperature control can be used for this purpose.*)

d. CALIBRATED WATER VALVE CONTROL. (1) The calibrated water valve, identified as the No. 4 TAG valve (fig. 12 (7)) (see also fig. 13), provides a convenient means for continually blending community and recirculated water in the main tank.

(2) Since the quantity of community water which can be admitted without upsetting the temperature balance of the equipment is dependent on the community water temperature, this valve must

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be carefully set to conform to community water temperature at all times if satisfactory operation is to be expected.

(3) It is provided with a fixed graduated valve dial (fig. 12 (5)) calibrated in degrees Fahrenheit (from 40° to 90°), and an index pointer on the wheel. (See fig. 12 (6).) In operation, the community water temperature is first determined in terms of degrees Fahrenheit, after which the wheel pointer is carefully set to the corresponding temperature value on the dial.

(4) The 65° position on the dial represents the maximum opening of the valve, while the 90° position represents the minimum opening. If it is desired to shut off all community water, the pointer should be set to the "closed" position.

(5) Constant use of this valve over long periods of time may ultimately result in the introduction of slight inaccuracies due to normal wear of the valve seat. If this should occur, the necessary correction can quickly be made as follows:

(*a*) Slowly turn the valve wheel in a clockwise direction until the flow of community water just stops. Do not turn past this point by the use of excessive force.

(*b*) Loosen the four retainer screws (fig. 12 (4)) located on the inner circumference of the calibrated dial. This will permit the dial to turn.

(*c*) Turn the calibrated dial until the word "closed" is directly under the index pointer on the valve wheel.

(*d*) Tighten all four screws, being careful not to upset the adjustment. See *e* below, for additional information on the calibrated water valve.

e. CALIBRATED VALVE ORIFICE. (1) The calibration or the calibrated water valve control is based on a water pressure of about 10 pounds per square inch at the valve seat opening.

(2) Inasmuch as the various temperature values on the scale of the calibrated valve actually represents different degrees of opening, and are themselves based on a given quantity of water flow through that opening at 10 pounds per square inch pressure, it is important that this pressure be maintained at all times if accurate performance is to be expected.

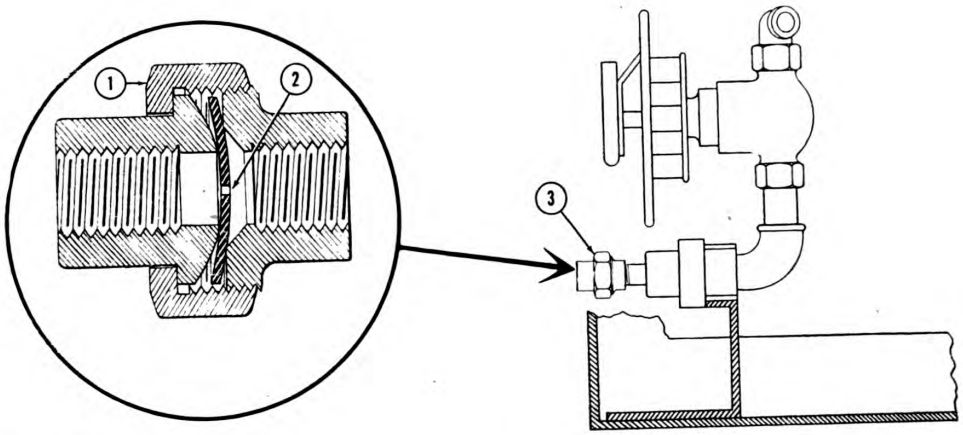
(3) In order to reduce community water pressures to the required 10 pounds per square inch, three pressure-reducing orifices (fig. 8 (5), (6), and (7)) each with a different size opening, are supplied with the apparatus.

The smallest ($\frac{1}{16}$ inch) size is shipped already mounted in the equipment and is suitable for community water pressures ranging from 20 to 50 pounds per square inch. The intermediate (3/32

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inch) size should be used on community pressures of 10 to 20 pounds per square inch, and the largest (⅛ inch) size 1 to 10 pounds per square inch pressures.

(4) To replace an orifice, open the small union on the No. 4 connection directly under the calibrated valve. (See fig. 13 (1) and (3).)



Med. Dept. No.	Nomenclature
1.	Small union on calibrated valve.
2.	Orifice: (See fig. 8 (5), (6), and (7).)
3.	Orifice union in place.

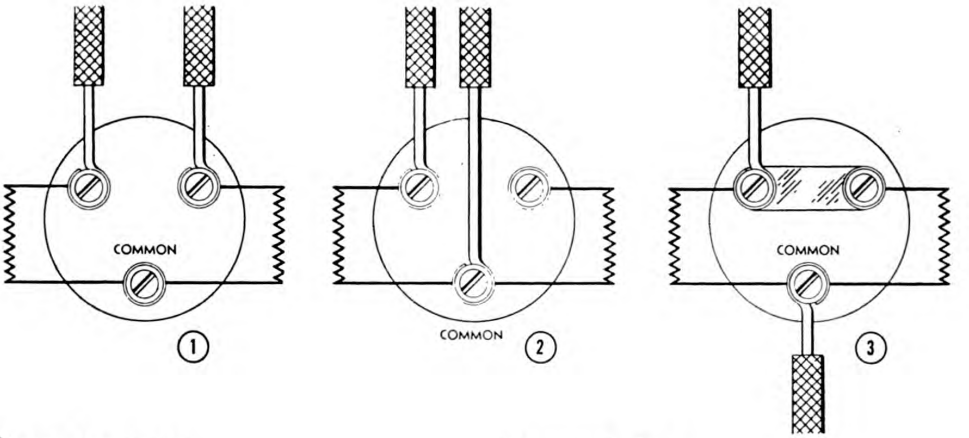
Figure 13. Orifice assembly.

Remove the orifice (fig. 13 (2)) replace it with one of the required size, and close the union.

f. WATER HEATER. (1) The water heating unit, the terminals (fig. 6 (3)) for which are located at one end of the mixing chamber, is of the immersion type, and has provision for three different degrees of heat. It can be turned on or off at will by means of the heater switch located on the lower right front of the base. If the community water, or ambient temperatures are higher than 65° F., the heater switch should be turned off and the cooler switch on. If lower than 65° F., the heater switch should be turned on and the cooler switch off.

(2) The equipment is originally shipped with the heater terminals connected as a 1,200-watt unit. (See fig. 14 (3).) However, if a slower heating is desired, the heater may be connected either as a 600-watt (fig. 14 (2)) or 300-watt (fig. 14 (1)) unit by changing the connections as shown in figure 14. (The lower terminal in all illustrations is the "common" lead.)

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Med. Dept. No.	Nomenclature
1.	300-watt, connection.
2.	600-watt, connection.
3.	1,200-watt, connection.

Figure 14. Heater connection.

(3) In order to avoid accidents, all power should be shut off at the main service switch before making any of the above changes.

g. CONTROL SWITCHES. (1) *Main line switch.* This switch is located at the left-hand side of the switch box, and controls the electrical power to the entire unit. It is labeled "line," and is an ordinary "ON" and "OFF" heavy-duty toggle switch. (See fig. 7 (10) and fig. 10 (9).)

(2) *Heater switch.* This switch is the center switch of the three toggle switches in the switch box and controls only the electrical power to the immersed water-heating element (fig. 7 (9) and fig. 10 (8)).

Providing admitted water from a community source is always above 65° F., this switch should be in the "OFF" position at all times.

(3) *Cooler switch.* This switch is the right-hand switch of the three toggle switches in the switch box (fig. 7 (8) and fig. 10 (7)) and controls only the electrical power to the compressor and condenser motors.

Providing admitted water from a community source is always below 65° F., this switch should be in the "OFF" position at all times.

(4) *Darkroom light switch.* This switch is on the darkroom light socket and is of the ordinary pull chain type. (See fig. 1 (5).) This light may be controlled separately whether the unit is in operation or idle.

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h. RELAY CONTROL. The relay (fig. 5 (2) and fig. 10 (4)) which energizes the compressor motor or the immersed heating element is located under the heater terminal end of the mixing chamber. Upon referring to figure 10 it is noticed, the thermostatic water temperature control (fig. 10 (1)) is open and the relay solenoid (fig. 10 (5)) is not energized, thus leaving the compressor motor (fig. 10 (2)) energized and the heating element (fig. 10 (3)) de-energized. However, if the thermostatic water temperature control's circuit is closed, the solenoid is energized thereby closing the heating element circuit and opening the compressor motor circuit.

The contact points are prone to rusting and sticking because of moisture and drippage. When this occurs remove the plate covering the relay box (fig. 5, part 2) and clean the contact points with a fine sand paper then readjust the points for correct contact and replace the relay cover.

15. INSTRUMENTS

There is only one instrument on this unit and it is the interval timer (fig. 1 (6)) mounted above and behind the main reservoir tank on the darkroom light bracket. This interval timer may be set to give an auditory bell signal after an elapse of any desired time up to 15 minutes.

a. This setting of time elapse is accomplished by lifting the "minute pointer" (fig. 1 (7)) slightly and placing it so the arrow is corresponding to the desired time. The "minute pointer" is held in place by ratchet teeth and has a bumper protruding from it to stop the "setting dial." (See fig. 1 (3).)

b. No winding is necessary for this timer as movement of the "setting dial" winds the clock mechanism as well as the bell mechanism.

The "setting dial" should always be turned in a clockwise direction and return to rest on the "O."

Section VII. OPERATION UNDER USUAL CONDITIONS

16. GENERAL

The technical operation of this equipment is the responsibility of the medical officer in charge. The instructions in this manual cover mechanical operation only.

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17. "ON" AND "OFF" OPERATION

a. When the Processing Unit is assembled and ready for operation it may be put into operation by closing the main line switch, heater switch, cooler switch, and pump switch circuit breaker, all of which are located in the switch box at the lower right-hand corner. With these switches in the "ON" position the water should be given a reasonable length of time to normalize to 65° F., at which time the unit is ready for use.

b. Operation of the unit may be stopped by throwing the line, heater, and cooler switches into the "OFF" position.

18. GENERAL PRECAUTIONS DURING NORMAL OPERATION

a. If at any time this unit is necessarily disconnected from its power supply, make certain the power supply conforms to the requirements called for before reconnecting the equipment.

b. Be sure the equipment is grounded before operation.

c. Always keep the equipment in a level position during operation.

d. Always try to fill the main reservoir tank with water which is as close to 65° F., as possible. This will result in less waiting time before the unit is ready for use.

e. Do not operate the unit without water—a burned-out heater may result.

f. Never attempt to raise or shift the entire unit by means of the handles on the base assembly.

g. If for any reason the water level should drop below the top of the line intake pipe, or the unit is not maintaining the desired water temperature, open the heater and cooler switches to "OFF" position then open the air bleeder vent in accordance with paragraph 10*f* before restoring the unit to normal operation.

h. Check the water contents of the main reservoir tank for clearness and cleanness as the unit will not operate efficiently with dirty water. A complete change of water should be made at least once a week.

Section VIII. OPERATION OF AUXILIARY EQUIPMENT

19. GENERAL

Medical item No. 9611700—X-ray Field Unit Processing Unit, Auxiliary Wash Tank, and Medical item No. 9605500—X-ray Field Unit, Dryer and Loading Bin Combination: complete with Air Circulation: for Field Processing Unit are the only two auxiliary

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items used with the Processing Unit that this manual will discuss. They will be completely covered in part IV of this manual.

20. EMERGENCY POWER SOURCE

Often it is necessary to supply power to the Processing Unit from other than community sources. This may be accomplished by utilizing the Medical item No. 9606000 X-ray Field Unit, Generator, Gasoline Electric, or Engineers item No. 17–5403.500–000 Generator Set, Portable, Gasoline-Engine Driven, Skid-Mounted 3KW, 115-Volt, 1-phase, 60-cycle: Make and model unspecified, or other sources available if they can produce 2,500 watts of power at 110 volts, single-phase, 60-cycle.

Caution: In using Medical item No. 9606000 X-ray Field Unit Generator for the Army Field Processing Unit—*no other item should be drawing power from this unit at the same time.* It must be considered as a temporary emergency source of power only.

Section IX. OPERATION UNDER UNUSUAL CONDITIONS

21. SCOPE

This section covers the exceptions or additions to instructions for normal operation (sec. VII) that will be necessary for operation under unusual conditions.

22. EXTREME COLD

It is obvious to the operator why this unit must not be exposed to extremely cold temperatures during operation, or when it is filled with water as the water may freeze. If the unit must be exposed to freezing temperatures, all water must be removed from the main tank and all parts of the circulating water system including the pump and mixing chamber. This may be accomplished by the following steps.

a. Open all electrical circuits at the switch box by snapping them to the "OFF" position.

b. If rapid draining is desired of the main reservoir tank, unscrew the 1-inch overflow drain at the left rear of the main reservoir tank. (See fig. 4 (2).)

c. Close all valves conducting water from a community source into the unit and turn the calibrated inlet valve (fig. 12 (7)) to the "CLOSED" position.

d. Open emergency drain valve (fig. 7 (14)) at lower left-hand of unit with No. 3 metal tag attached to drain pumping system.

Note. Valve No. 3 (fig. 7(14)) is the *master water drain valve* to be used only when the equipment is to be subjected to freezing temperature and it is

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desired to drain all water from the entire system. It is not intended to be used for routine draining of the reservoir tank. When valve No. 3, is to be opened to drain the tank and system, connect it to the community drain piping.

e. Open pet cock valve (fig. 7 (4)) on the underside of the mixing chamber also with a metal No. 3 TAG attached.

23. EXTREME HEAT

When it is necessary to use the Processing Unit under conditions of extreme heat, it is necessary to permanently remove the four screened sides from the base assembly to allow free circulation of air through the condenser (fig. 11 (4)) and around the compressor (fig. 11 (5)) and the water pump motor. (See fig. 7 (11).)

24. SAND AND DUST

a. During conditions of sand and dust, precaution must first be taken to keep foreign particles out of the developer, and fixer tank inserts and from the main reservoir tank primarily for good radiographic results. Secondarily, foreign particles must be kept from the recirculating water as they produce both a clogging and abrasive effect on the recirculating pump.

b. Care must be exercised at all times to keep dust or dirt from clogging the condenser radiator (fig. 5 (1)), thereby causing poor circulation of air and inefficient operation of the cooling unit.

25. DAMPNESS AND EXCESSIVE HUMIDITY

a. The Processing Unit, although protected in part by insulating material, is subject to rust and corrosion because of inherent moisture from splash and drippage. This coupled with a humid or damp climate is extremely detrimental to the hour usage of this unit.

b. It is recommended that under these conditions the four screened sides of the base assembly be permanently removed and close visual inspection of the equipment be maintained to see that it remains free from accumulated moisture on any base assembly metal parts.

c. When a continued moisture condition exists on the equipment two steps are advisable.

(1) Locate the equipment in as dry a place as is convenient on a raised wooden platform of about 4 inches under which air may circulate freely.

(2) Wipe all metal parts in the base assembly with a dry rag first and then with an oiled rag to give them a protective coating of oil. This should be accomplished daily on all metal surfaces whether they are painted or unpainted.

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PART THREE

MAINTENANCE INSTRUCTIONS

Section X. GENERAL

26. SCOPE

Part Three contains information for the guidance of the personnel of the using organizations responsible for the maintenance (first- and second-echelon) of the Army Field Processing Unit. It contains information needed for the performance of maintenance services.

Section XI. SPECIAL ORGANIZATIONAL TOOLS AND EQUIPMENT

27. GENERAL

No special tools are issued to the using organization with this equipment other than those covered in section III on tools, parts, and accessories.

Section XII. LUBRICATION

28. LUBRICATION

See figure 15 for lubrication instructions on the Processing Unit.

Section XIII. PREVENTIVE MAINTENANCE SERVICE

29. GENERAL INFORMATION

Preventive maintenance services as prescribed by Army Regulations are a function of using organizations echelons of maintenance. These services consist generally of: before, during, and after operation services, and weekly services performed by the operator; as well as scheduled services performed by organizational maintenance personnel.

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WAR DEPARTMENT LUBRICATION ORDER LO 8-629

14 OCTOBER 1944

X-RAY PROCESSING UNIT, FIELD

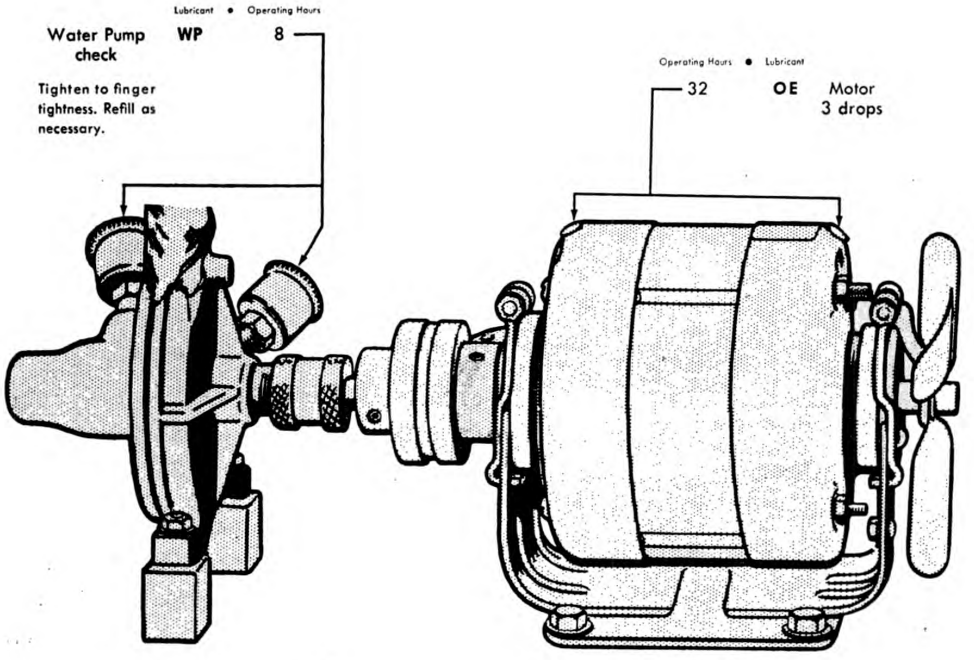
(WATER PUMP AND MOTOR, WESTINGHOUSE STYLES 981574 AND 980205)

Reduce intervals under severe operating conditions.

Requisition replacement Lubrication Orders from The Adjutant General. See lists in FM 21-6.

Clean with solvent, dry cleaning or oil, fuel, diesel.

DO NOT LUBRICATE—Refrigerant condenser fan motor.



KEY

OE—Oil Engine SAE 10.
WP—Grease, water pump.

Armies (2); Corps (2); Depts (10); Sv C (5); 1D 8 (4) (2); 1B 8 (2) (1); 1R 8 (3) (2) (1); 1C 8 (2); Base C (5); Numbered Air Forces (5); Med Deps, Continental (5) except St Louis Med Dep (50), T of Opn (10); PE (2); ASFTC Med (10).

1D 8 (4): T/O & 8-550.
1D 8 (2): No T/O & E Named Gen Hosp.
1B 8 (1): T/O & E 8-611; 8-610.
1B 8 (2): T/O & E 8-520.
1R 8 (3): T/O & E 8-581; 8-580, Evac Hosp.
1R 8 (2): T/O & E 8-560, 8-510; 8-590; 8-572S.
IR 8 (1): T/O & E 8-580, Conval. Hosp.
IC 8: T/O & E 8-187, 8-667; 8-534; 8-537T; Hosp Ship Co.
For explanation of symbols, see FM 21-6.

Copy of this lubrication Order will remain with the equipment at all times; instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 14 October 1944.
[A. G. 300.8 (14 October 1944)]

BY ORDER OF THE SECRETARY OF WAR.
G C MARSHALL,
Chief of Staff.

OFFICIAL
J A ULIO,
Major General,
The Adjutant General.

Figure 15. Lubrication Order 8–629.

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30. OPERATOR MAINTENANCE (FIRST ECHELON)

a. BEFORE OPERATION SERVICES. (1) If the unit has been disconnected from its original power source, always make certain that the power supply conforms to the requirements called for before connecting the equipment.

(2) Always check the ground for proper connection before operating.

(3) If the unit has been shifted, be sure it is in a level position.

(4) Always try to fill the main reservoir tank with water which is as close to 65° F., as possible. This will result in less waiting time before the unit is ready for use.

(5) Visually inspect around the unit to make sure it is free from debris so air may circulate freely.

(6) Check lubrication of pump motor and water pump by referring to the Lubrication Order 8–629. (See fig. 15.)

Note. Never use excessive quantities of oil or grease as the water may become contaminated.

(7) Check water pump shaft for leaks around pump packing if leaking tighten pump packing nut. (See fig. 7 (12).) In adjusting the pump packing nut to compensate for packing wear, do not tighten it to such an extent that it will cause overheating of the pump shaft.

(8) Be sure the water requirement is satisfied by having the water level in the main reservoir tank to the top of the 1-inch overflow drain, otherwise a burned out heater may result.

(9) The screen mesh strainers on top of the outlet and inlet water pipes should be examined and cleaned. Their purpose is to keep foreign materials out of the pump and other portions of the water circulating system, and they should be in place at all times while the unit is in operation.

b. DURING OPERATION SERVICES AND INSPECTION. (1) Make an occasional check of the water temperature in the main tank manually with a suspended thermometer.

(2) If for any reason the water level should drop below the top of the circulating water overflow pipe, or the unit is not maintaining the desired water temperature, open the air bleeder vent in accordance with paragraph 10*f* after the water requirement has been satisfied.

(3) Observe all main reservoir tank to base assembly couplings for leakage.

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(4) Observe water pump shaft for water leakage.

(5) Observe main reservoir tank for condensation to prevent sweat drippage onto the base assembly; if condensation does appear wipe dry with a dry rag.

(6) Occasionally observe recirculating pipe screen making sure it is clean and open.

c. AFTER OPERATION SERVICE AND INSPECTION. (1) Wipe all condensation or drippage from the exterior of the main reservoir tank as well as from the base assembly mechanism.

(2) Correct any leakage that became apparent during operation.

(3) See the Lubrication Order 8–629 (fig. 15) and lubricate the unit, if necessary, according to the chart.

(4) If the unit is to be exposed to freezing temperature, drain all water in accordance with paragraph 22.

(5) Clean screen mesh strainers on recirculating overflow drain and on inlet pipe.

d. WEEKLY SERVICE. (1) Clean out dust from the condenser radiator. (See fig. 5 (1).)

(2) Wipe entire base assembly with a slightly oily rag to prevent corrosion and rust of metal parts whether painted or unpainted.

(3) Check pump packing on water pump (fig. 7 (12)) and replace if necessary.

(4) Clean the insert tank and the main reservoir tank by scrubbing and thoroughly flushing with fresh water. This is necessary because of the possible contamination of community water.

Note. The film water racks and the film hanger adapters are silver plated and thus will discolor depending on conditions. This discoloration will have no effect on the parts and may be removed if desired by a mild silver cleaner, such as, powdered chalk and water.

(5) Consult Lubrication Order 8–629 (fig. 15) and lubricate if necessary.

31. ORGANIZATIONAL MAINTENANCE (SECOND ECHELON)

a. Maintenance by using organization (second echelon) will consist of visual inspection for general cleanliness of the equipment, the checking of electrical contacts, water connections, fulfillment of lubrication requirements, and over-all operation.

b. Certain minor adjustments and correction of trouble may also be accomplished by the organization as stated in section XIV on trouble shooting.

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Section XIV. TROUBLE SHOOTING

32. GENERAL

This section will not cover all troubles and their remedies as it is impossible to establish a "rule" for equipment becoming inoperative. Some of the following remedies will refer the equipment to a higher echelon, such as a fourth- or fifth-echelon maintenance and repair shops, as organizational tools, and equipment will not be adequate for major repairs.

33. WATER DOES NOT COOL

Possible causes	*Possible remedies*
a. NO POWER.	
(1) "Cooler" or "Line" switch open.	Close switch.
(2) Main line feed switch open.	Close switch.
(3) Blown fuse.	Check for and replace.
(4) Broken lead wire.	Test and replace if necessary.
b. NO WATER CIRCULATION.	
(1) Water level below top of recirculating pipe.	Turn off unit and proceed as in paragraph 10*f*.
(2) Water valves not open or closed in accordance with instructions.	See paragraph 10*d* or *e*.
(3) Water pump motor not operating.	Check for no power supply. Check for broken connections. Check "Line" switch. Check for too tight a setting of the pump packing nut. If burned out motor or broken pump impeller refer to higher echelon.
(4) Water pump air bound.	Follow the procedure as outlined in paragraph 10*f*. If this fails to clear all trapped air out of the pump, remove both grease cups with pump still operating and insert a toothpick or small object into the bearing holes to break up grease. After all air has been removed, replace grease cups after referring to figure 15.

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Possible causes	*Possible remedies*
(5) Water pump clogged.	Refer to higher echelon.
c. MIXING CHAMBER AIR BOUND.	
(1) Unit sucking air through recirculation screen inlet because of improperly maintained water level.	Open air bleeder valve in accordance with paragraph 10*f*.
d. SEALED COMPRESSOR MOTOR NOT OPERATING.	
(1) No power.	Cooler or line switches open. Close. Check power source.
(2) Thermostatic water temperature control contact fails to open.	Clean and readjust contacts and see paragraph 14*b*.
(3) Relay not contacting properly on normally closed contact.	Clean and readjust contact. See paragraph 14*h*.
(4) Refrigerant pressure control contacts dirty, or not closing properly.	Clean and readjust contact. See paragraph 14*c*.
(5) Starting capacitor burned out.	Refer to higher echelon.
(6) "Liquid line," "suction line," or "receiver" shutoff valves not open. (This will cause refrigerant pressure control contacts to remain open.)	Open valves as per paragraph 10*c*.
(7) Refrigerant expansion valve stuck.	Refer to higher echelon.
e. REFRIGERATING UNIT NOT COOLING.	
(1) Liquid line, suction line, or receiver valves only partly open.	Completely open valves in accordance with paragraph 10*c*.
(2) Loss of refrigerant gas due to broken line or slow leak.	Refer to higher echelon.
f. WATER TEMPERATURE CONTROL NOT FUNCTIONING.	
(1) Air in mixing chamber.	Open air bleeder vent in accordance with paragraph 10*f*.

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Possible causes	*Possible remedies*
(2) Thermostatic element defective.	Check setting of control with thermometer immersed in main reservoir tank water. If confirmed, refer to higher echelon.
(3) Moving contacts jammed.	Remove cover and correct.

34. WATER DOES NOT HEAT

HEATING ELEMENT NOT OPERATING.

(1) No power.	Heater or line switches open. Close.
(2) Thermostatic water temperature control contacts fail to close or making poor contact.	Correct in accordance with paragraph 14*b*.
(3) Relay not contacting properly on normally open contact.	Adjust in accordance with paragraph 14*b*.
(4) Burned out relay coil.	Refer to higher echelon.
(5) Poor connection on heater terminals.	Remove cap (fig. 5 (3)). Remove wires, clean stud wires, and replace.
(6) Heater elements burned out.	Refer to higher echelon.

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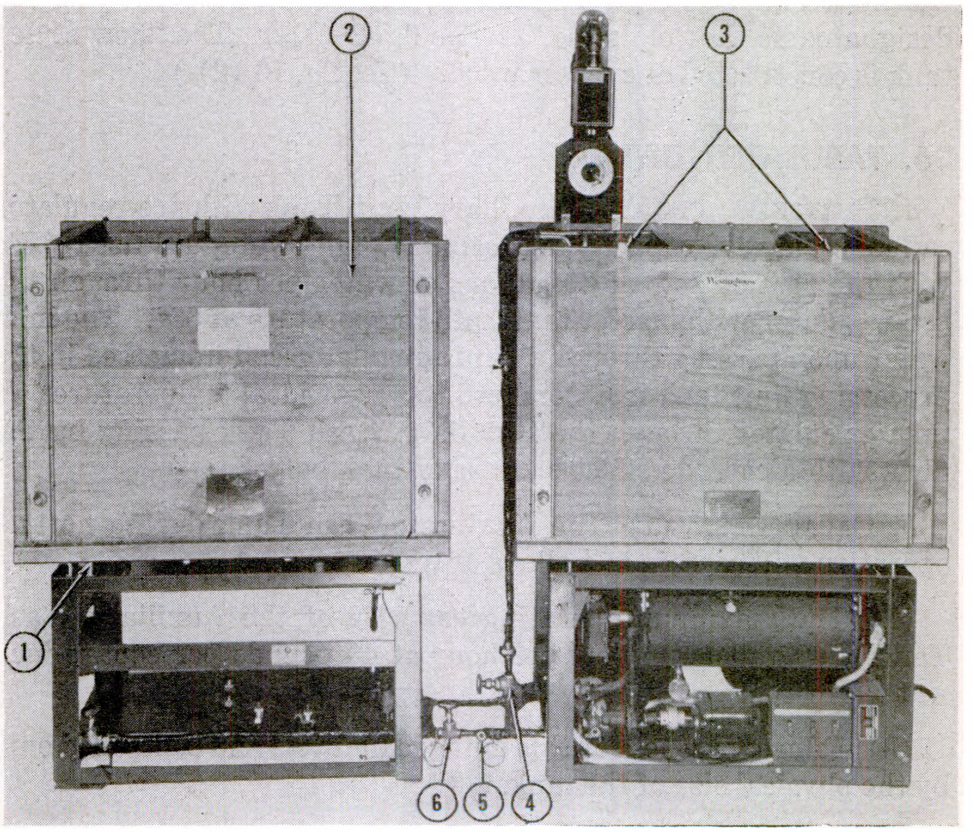
PART FOUR

AUXILIARY EQUIPMENT

Section XV. DESCRIPTION AND DATA

35. DESCRIPTION

The major piece of auxiliary equipment which accompanies the Processing Unit is Medical item 9611700 X-ray Field Unit Processing Unit, Auxiliary Wash Tank. The Auxiliary Wash Tank (fig. 16 (1)) with thermal pre-regulator (fig. 19) has been designed



Med. Dept. No.	Nomenclature
1.	Auxiliary wash tank assembled.
2.	Cypress wood tank.
3.	Pre-regulator bracket.
4.	Circulation valve tag No. 10.
5.	Community water source inlet tee tag No. 9.
6.	Inlet valve tag No. 11.

Figure 16. Processing Unit and Auxiliary Wash Tank connected for operation.

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to operate in conjunction with the Processing Unit and to maintain a water temperature in the Auxiliary Wash Tank suitable for washing films when a community water supply is used.

a. IDENTIFICATION. The unit is shipped in two crates with the identifying marking of medical item number, manufacturer's model number, manufacturer's style number, cubic footage and weight, nomenclature, and whether part one or part two of a two part item. If the unit has been uncrated, it may be identified by the illustrations in this section of the manual.

b. DIFFERENCE IN MODELS. As with the Processing Unit the Auxiliary Wash Tank has been manufactured in two styles. It was first manufactured with steel main reservoir tank which is designated as the "old style." (See fig. 2 (1).) The "new style" tank is constructed of cypress wood. (See fig. 16 (2).)

36. TABULATED DATA

a. PERFORMANCES. The Auxiliary Wash Tank with pre-regulator coil in use has the capacity to cool 90° F., inlet water at least 10° F., with the rate of flow of 30 gallons of water per hour through the pre-regulator with master tank bath temperature of 65°. The inlet water upon passing through the pre-regulator coil immersed in the processing unit tank is normalized to a near ideal temperature. It then circulates through the Auxiliary Wash Tank passing by the films with a cascade effect because of tank baffles.

b. CAPACITIES. (1) The Auxiliary Wash Tank during normal operation will contain 55 gallons of water.

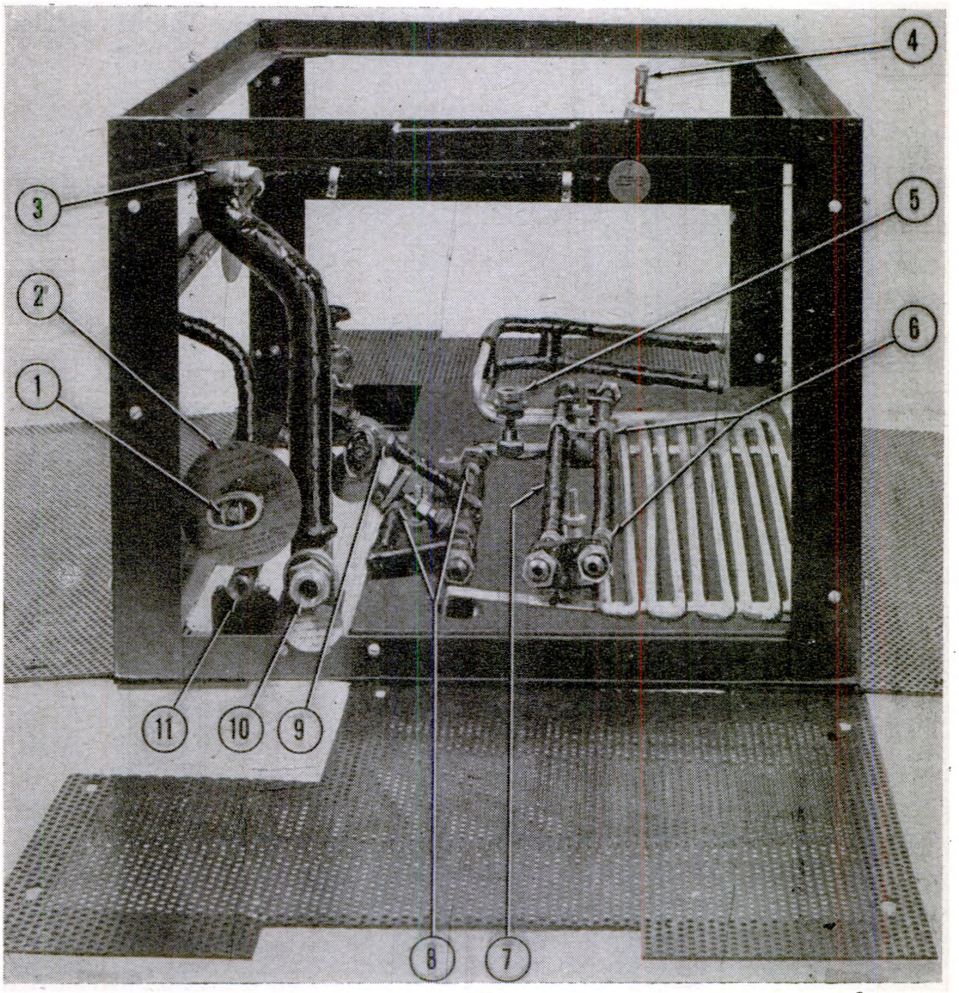
(2) The maximum operating capacity of the Auxiliary Wash Tank is 60 gallons in flow per hour at 40 pounds per square inch water pressure.

(3) Film capacities for this unit are limitless and controlled only by the physical size of the tank.

37. TOOLS, PARTS, AND ACCESSORIES

There are no tools, and parts furnished with the Auxiliary Wash Tank and only those accessories necessary in assembling the unit. The only tools necessary for the assembling of this unit are a crescent wrench to tighten the unions, a screw driver for the removal and replacement of the perforated side covers and the spanner wrench furnished with the Processing Unit to tighten base tank fittings.

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Med. Dept. No.	Nomenclature
1.	Calibrated valve.
2.	Calibrated valve dial.
3.	Community drain tank coupling tag No. 2.
4.	Inlet tank coupling tag No. 4.
5.	Hose fitting tag No. 12.
6.	Pre-regulator tubing clamp to base.
7.	Pre-regulator tubing.
8.	Valve and fitting section clamp to base.
9.	Valve and fitting section.
10.	Community drain fitting tag No. 5.
11.	Auxiliary tank inlet coupling tag No. 7.

Figure 17. The auxiliary wash tank base.

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38. OPERATING INSTRUCTIONS

Note. Failure or unsatisfactory performance of equipment will be reported on WD AGO Form 468.

Service upon receipt of new equipment is as follows:

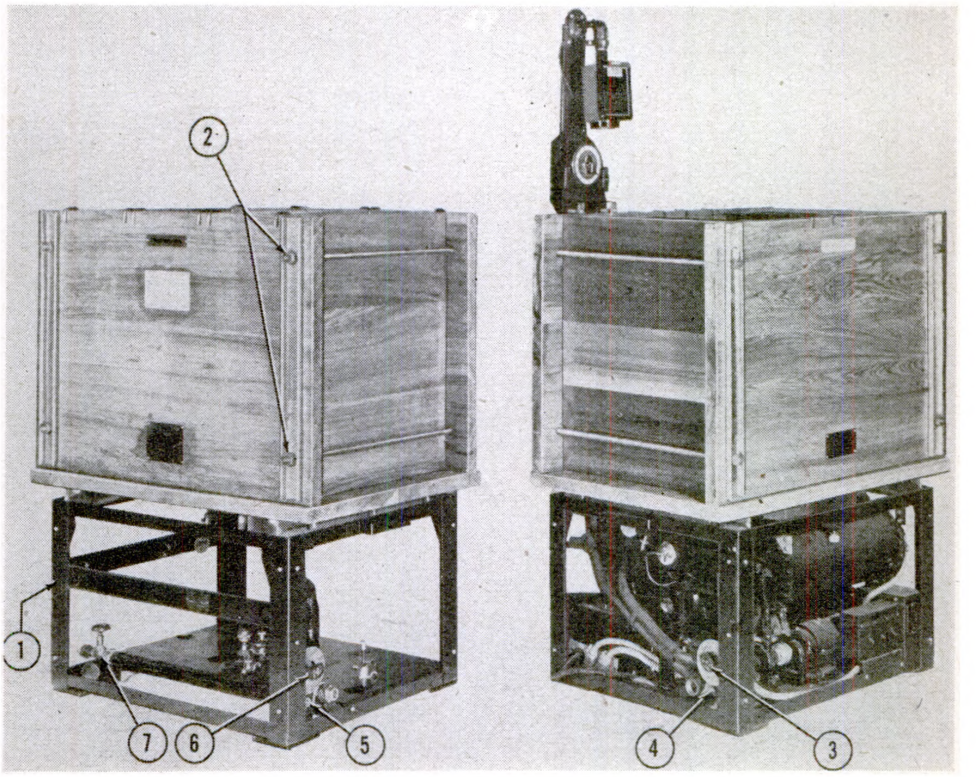
a. UNCRATING. Place the crates in upright position near the location in which the unit will be installed. Remove all packing taking care not to pry against the contents, thereby causing damage. Examine all parts for possible damage. The complete apparatus consists of a base containing inner-connecting piping and a thermal pre-regulator disassembled in three parts and fastened in the base as shown in figure 17, union and hose fitting, part of which is fastened in the base, and upper tank containing baffles, six film hanger supports, a drip pan, one short inlet fitting with strainer, one plug, and one long community overflow drain pipe.

b. ASSEMBLING. Examine figure 16 to obtain a picture of the appearance of the assembled unit. All water valves and connections are identified by means of numbered metal tags; other parts are identified on the illustrations.

(1) Set the base in place beside the master film Processing Unit so that the calibrated valve (fig. 17 (1) and fig. 18 (6)) of the auxiliary base is facing the calibrated valve (fig. 18 (3)) of the Processing Unit and the two bases are approximately 11 inches apart. Never install the unit where it will be exposed to freezing temperature unless provision has been made to drain all water from the entire system. Also make sure the unit is in a reasonably level position.

(2) *Connecting two units.* When the pre-regulator is to be used assemble as follows: Remove the section of valves and fittings on which are attached TAGS No. 8, 9, and 11 from the base by loosening the clamps (fig. 17 (8)) holding it in place. This section connects between figure 18 (5) and figure 18 (4) which is the Auxiliary Tank inlet and Processing Unit inlet, respectively. Connect the untagged end of this section, which is opposite to the end tagged No. 8, to the Processing Unit inlet union which is tagged No. 4 (fig. 18 (4)) *after removing the hose fitting and collar and tail part of the union tagged No. 4.* (*See fig. 13 (1).*) Caution must be exercised here as this union contains the orifice of the Processing Unit and this orifice or the suitable orifice must be placed in the union collar of this pre-regulator section being joined to the union part tagged No. 4. Now position the base of the Auxiliary Unit so that the end of the section with the half union tagged No. 8 (fig. 19 (2)) can be joined to the Auxiliary Tank inlet union tagged No. 7

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Med. Dept. No.	Nomenclature
1.	Auxiliary tank base.
2.	Tie rod nuts ½ x 13.
3.	Processing unit calibrated valve.
4.	Processing unit inlet coupling.
5.	Auxiliary Tank inlet coupling tag No. 7.
6.	Calibrated valve.
7.	Auxiliary master drain valve tag No. 3.

Figure 18. Respective position before connecting units.

(fig. 17 (11)) and join them. The Processing Unit base and Auxiliary Tank base are now connected.

(3) *Assembling pre-regulator.* Remove the heat exchange section of the pre-regulator from the base by loosening clamps (fig. 17 (6)) and by means of its brackets or rack hang, this section on the front side of the main reservoir tank of the Master Film Processing Unit (fig. 16 (3)) so that the pre-regulator is immersed in the 65° F., water bath of the Processing Unit tank. The connecting tubes of the pre-regulator should now protrude over and down the forward part of the left end of the master tank. The pre-regulator is made up for use with either a wood type tank or a stainless steel type tank. As the pre-regulator comes from the fac-

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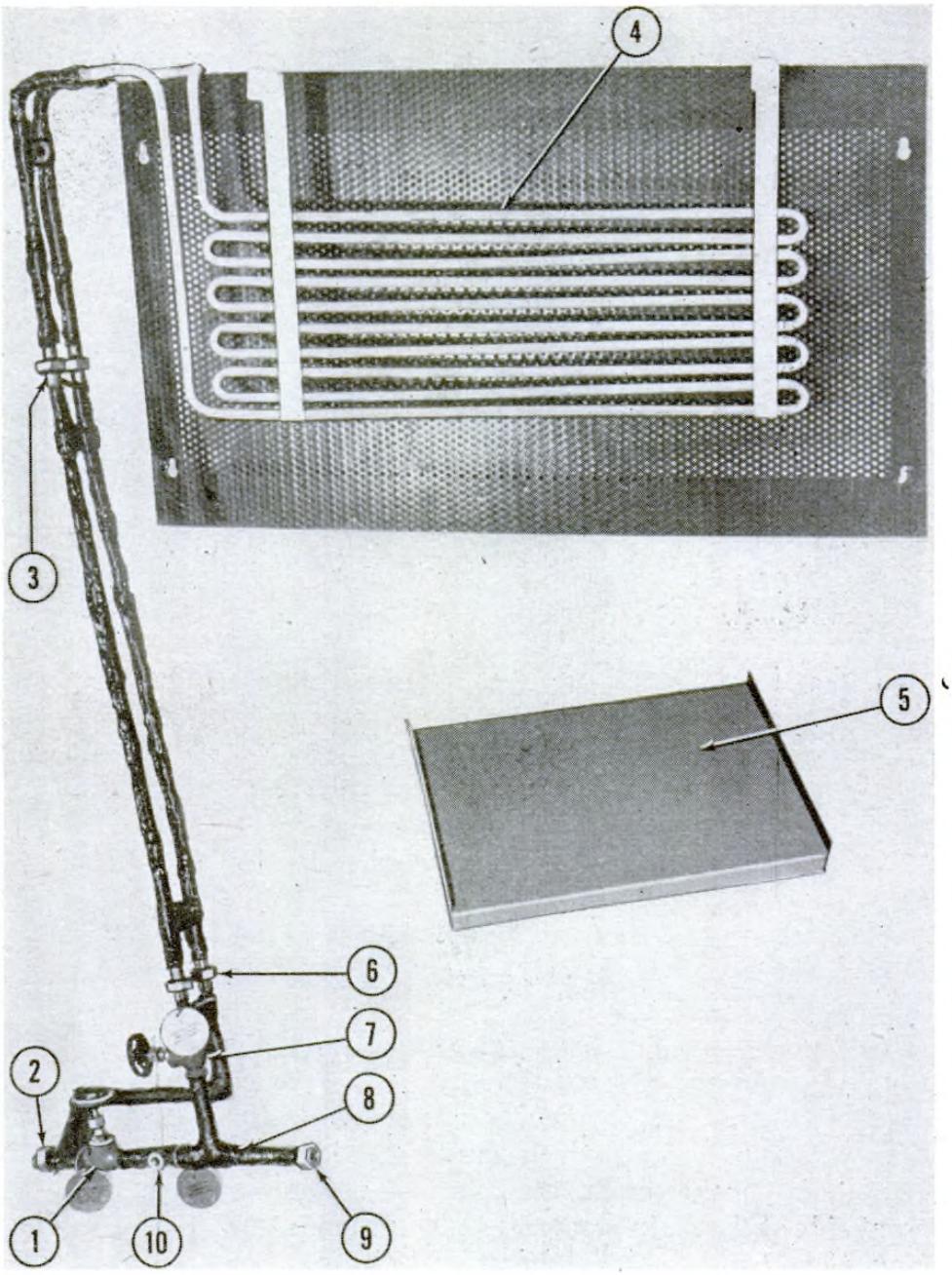


Figure 19. Thermal pre-regulator assembled and drip pan.

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Med. Dept. No.	Nomenclature
1.	Inlet valve tag No. 11.
2.	Auxiliary tank connection tag No. 8.
3.	Heat exchanger union.
4.	Thermal pre-regulator heat exchanger section.
5.	Drip pan.
6.	Pre-regulator tubing connection.
7.	Circulation valve tag No. 10.
8.	Inner connecting tubing Processing Unit to Auxiliary Wash Tank unit.
9.	Processing unit connection.
10.	Community water source inlet tee tag No. 9.

Key to Figure 19

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tory, it is dimensioned for use with a wood type of master tank. However, if it is to be used with stainless steel tank, then the two ⅛-inch brass nipples, 3 inches long, located just above and connected to the unions at the extremities of the heat exchanger section (fig. 19 (3)) must be replaced by the shorter nipples attached to these in an envelope.

(4) *Assembling pre-regulator to base connections.* Remove the straight double length of tubing containing union parts on each end from the base (fig. 17 (7)) and using this, connect the two sections of the pre-regulator covered in (2) and (3) above. The pre-regulator is now completely assembled and connections have been made at parts (2), (3), (6), and (9) of figure 19. Make sure these connections are watertight as they are all ground joint union connections.

(5) *Inspecting and placing tank.* Screw the long 1-inch overflow pipe into its fitting in the right front corner of the auxiliary tank. Be sure the ⅛-inch plated brass plug is in its fitting along side of the 1-inch pipe. The remaining inlet fitting should contain a ⅛-inch unplated brass plug. Fill the tank full of water and observe for leaks. If leaks are observed, allow the tank to set so as to swell tight. After leaks have stopped, drain the tank and replace the unplated brass plug with the short screened inlet pipe. Do not use a wrench on these parts—they should be fastened handtight only—except if necessary on the plated plug. See that the paper tubing thread protectors are removed from the ends of the inlet and outlet fittings in the base of the wood tank. Carefully place the main reservoir tank in place on the base with the nameplate to the front.

Caution: Do not tighten the tie rod nuts (fig. 18 (2)) on the tank except if the tank still leaks after it has swelled. Only tighten enough to stop a leak as it is possible to crush the tank.

(6) *Connecting tank to base.* Connect tank coupling tagged No. 1 (fig. 17 (4)) to the short, screened tank inlet fitting on the left rear. Connect tank coupling tagged No. 2 (fig. 17 (3)) to tank outlet fitting containing the long 1-inch overflow pipe.

(7) *Plumbing in community supply and drain.* Connect community drain piping to fitting tagged No. 5 (fig. 17 (10)) on lower end of 1-inch overflow pipe.

Note 1. Valve tagged No. 3 (fig. 18 (7)) is the master drain valve of the Auxiliary Unit to be used only when the equipment is to be subjected to freezing temperatures, and it is desired to drain all water from the entire system. It is not intended to be used for routine draining of the Auxiliary Tank. When valve tagged No. 3 is to be opened to drain the tank and system, connect it to the community drain piping.

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Connect community cold-water supply to the tee tagged No. 9 (fig. 16(5) and fig. 19(10)) by means of the hose fittings attached to union tagged No. 12 (fig. 17(5)) located on base platform of Auxiliary Tank. Close drain valve tagged No. 3. Close the pre-regulator valve tagged No. 10. Close the valve tagged No. 11. Close the calibrated valve in the Auxiliary Tank base.

2. All water valves close in a clockwise direction. Do not use excessive force when operating the calibrated valve or the accuracy of the calibration may be affected. Turning it gently to the "closed" position will effectively shut off all water flow.

(8) *Drip pan.* Place the drip pan (fig. 19 (5)) so as to connect between the Auxiliary Tank and Processing Unit tank.

(9) *Operation.* After the Army Processing Unit is in operation the Auxiliary Tank and Thermal Pre-regulator are ready to be put into operation. The "Caution" plate on the front of the Auxiliary Tank should be heeded.

39. SERVICE UPON RECEIPT OF USED EQUIPMENT

The procedure outline in paragraph 38 should be followed in assembling used equipment. In addition, a thorough visual inspection should be made of the unit and piping.

40. CALIBRATED WATER VALVE

The valve located in the front right-hand corner of the Auxiliary Tank base (fig. 17 (1) and fig. 18 (6)) provides a convenient means for controlling the flow of water in the Auxiliary Tank.

a. It is calibrated in gallons of water flow per hour for different water pressure.

b. The valve dial is graduated up to 60 gallons inflow per hour at 40 pounds per square inch water pressure.

c. To obtain the rate of flow at lower water pressures, multiply the dial reading by the correction factor for the respective pressure. The correction factors for 10, 20, and 30 pounds pressure are given on the face of the dial. (See fig. 17 (2).)

d. To shut off the flow of community water into the tank, set the index pointer of the valve dial to the "closed" position.

41. OPERATION UNDER USUAL CONDITIONS

a. OPERATION. Before the Auxiliary Unit is placed in operation, temperature reading of the community water supply should be made; this temperature reading should be determined only after the water has had sufficient time to discharge from the pipe and give a true reading which will continue. If the reading is from 60° to 80° Fahrenheit, it is not necessary to use the pre-regulator coil

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and the unit should be operated as in *b* below. However, should the temperature read below 60° Fahrenheit or above 80° Fahrenheit upon admittance to the unit, the pre-regulator should be put into service as described in *c* below.

b. COMMUNITY WATER SOURCE 60° TO 80° FAHRENHEIT. (1) Set the calibrated valve in the front right-hand corner of the Auxiliary Tank base (fig. 18 (6)) to the gallons of water flow per hour desired.

(2) Open valve tagged No. 11. (See fig. 16 (6) and fig. 19 (1).)

(3) Close valve tagged No. 10. (See fig. 16 (4) and fig. 19 (7).)

(4) If it should be found desirable not to use the pre-regulator and its piping at all because it is known that the community water supply will be at the proper temperature while using the Auxiliary Tank, then a direct water supply connection can be made to inlet coupling tagged No. 7. (See fig. 17 (11).) To do this, remove the collar and flange part of the union tagged No. 12 (fig. 17 (5)) located on the base platform and attached to inlet coupling tagged No. 7 making a complete union. Into this union screw the hose fitting adapter which was located either in the union part tagged No. 12 (fig. 17 (5)) or the water inlet tagged No. 9. (See fig. 19 (10).)

c. COMMUNITY WATER AT UNDESIRABLE TEMPERATURE. (1) Close valve tagged No. 11. (See fig. 16 (6) and fig. 19 (1).)

(2) Open valve tagged No. 10. (See fig. 16 (4) and fig. 19 (7).)

(3) The pre-regulator is now in use and the calibrated valve will read slightly higher due to water pressure losses in passing through the pre-regulator.

42. OPERATION UNDER UNUSUAL CONDITIONS

If the Auxiliary Wash Tank is to be used under unusual conditions as outlined in section IX, the same precautions should be taken where they comply. To drain this unit follow the instructions in paragraph 44*a*.

43. MAINTENANCE INSTRUCTIONS

a. PREVENTIVE MAINTENANCE. (1) When the Auxiliary Tank is filled with water examine the coupling underneath the tank as well as other parts of the water system for leaks.

(2) Keep the Auxiliary Wash Tank and base dry and free from drippage and condensation at all times where water does not come in actual contact with the unit.

b. WEEKLY SERVICES. (1) Drain tank.

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(2) Scrub and flush wood tank. This is necessary because of the possible contamination of community water.

(3) If it is desirable, remove the discoloration of the film hanger adapters and pre-regulator coil. However, this coloration will have no harmful effect on the parts as they are silverplated and will naturally discolor because of the conditions.

c. SEMIANNUAL SERVICES. (1) Perform services as specified for preventive maintenance and weekly services and thoroughly inspect the unit.

(2) Constant use of the calibrated water valve over long periods of time may ultimately result in the introduction of slight inaccuracies due to normal wear of the valve seat. If this should occur make the necessary corrections.

44. MAINTENANCE OPERATION

a. TO DRAIN TANK. (1) Remove the left and perforated base cover.

(2) Close valves tagged No. 10 (fig. 19 (7)) and tagged No. 11 (fig. 19 (1)) and open the calibrated valve of the Auxiliary Unit. (See fig. 17 (1).)

(3) Unscrew the long, 1-inch diameter overflow pipe in the Auxiliary Tank in a counterclockwise direction. This will allow the water in the two right-hand compartments to flow into the community drain.

(4) Connect the drain valve tagged No. 3 (fig. 18 (7)) to community drain. Now carefully unscrew only the upper front union located on the pre-regulator piping between the two wood tanks. (See fig. 19 (3).)

Note. Hold a small container under this union when unscrewing it so as to catch any water in the short vertical length of piping above it which may drain out.

(5) Now open drain valve tagged No. 3 (fig. 18 (7)) in the Auxiliary Tank base and the water in the left-hand compartment of the wood tank, the pre-regulator, and the piping in the base of the Auxiliary Unit will drain off. If air gets into the pre-regulator coil it will not completely drain as it will not siphon off. The water can be removed by blowing in one end.

(6) There will be some water left in the section of piping between the two tanks. This may be drained off if desired by closing the community supply line valve and the calibrated valve of Processing Unit (fig. 18 (3)) and opening valves tagged No. 10 and No. 11. The only water left in the system will now be in the Processing Unit. (For draining the Processing Unit, see par. 22.)

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b. To clean tank. (1) After water has been removed from the tank, scrub vigorously with a bristle brush.

(2) Flush the tank thoroughly with fresh water.

c. To remove discoloration from film hanger adapters and pre-regulator coil. Use a mild silver cleaner such as powdered chalk and water.

d. To correct inaccuracies of calibrated valve. (1) Slowly turn the valve wheel in a clockwise direction until the flow of community water just stops. Do not turn past this point by the use of excessive force.

(2) Loosen the four screws located on the inner circumference of the calibrated dial. This will permit the dial to turn.

(3) Turn the calibrated dial (fig. 17 (2)) until the word "closed" is directly under the index pointer on the valve wheel.

(4) Tighten all four screws, being careful not to upset the adjustment.

45. SHIPMENT AND STORAGE

Disassembly, draining, and preparation of unit for transit is as follows:

a. Remove the four perforated side covers from the base.

b. Drain the unit of all water as explained under paragraph 44*a*. In addition, close the community water supply line valve and the calibrated valve on the Processing Unit. Open valves tagged No. 10 and 11 to drain off any water left in this section of piping. Disconnect the community water supply.

c. After all the residual water has drained from the Auxiliary Tank unit and the pre-regulator close the valves tagged No. 3, 10, and 11.

d. Disconnect the pre-regulator and its connecting piping by unscrewing the unions (fig. 19 (3) and (6)) which are at the extremities of the straight vertical length of the double piping. Disconnect the unions at each end of the piping (fig. 19 (2) and (9)) containing valves tagged No. 10 and No. 11 which connects between the Processing Unit end and the Auxiliary Unit.

e. Disconnect the two Auxiliary Wood Tank couplings tagged No. 1 and No. 2. (See fig. 17 (4) and (3).)

f. Lift the Auxiliary Wood Tank from its base.

g. Fasten the three sections of the pre-regulator and piping in the base by means of the brackets and clamps provided as shown in figure 17.

h. Replace the four perforated side covers on the base. The unit is now ready for packing and transportation.

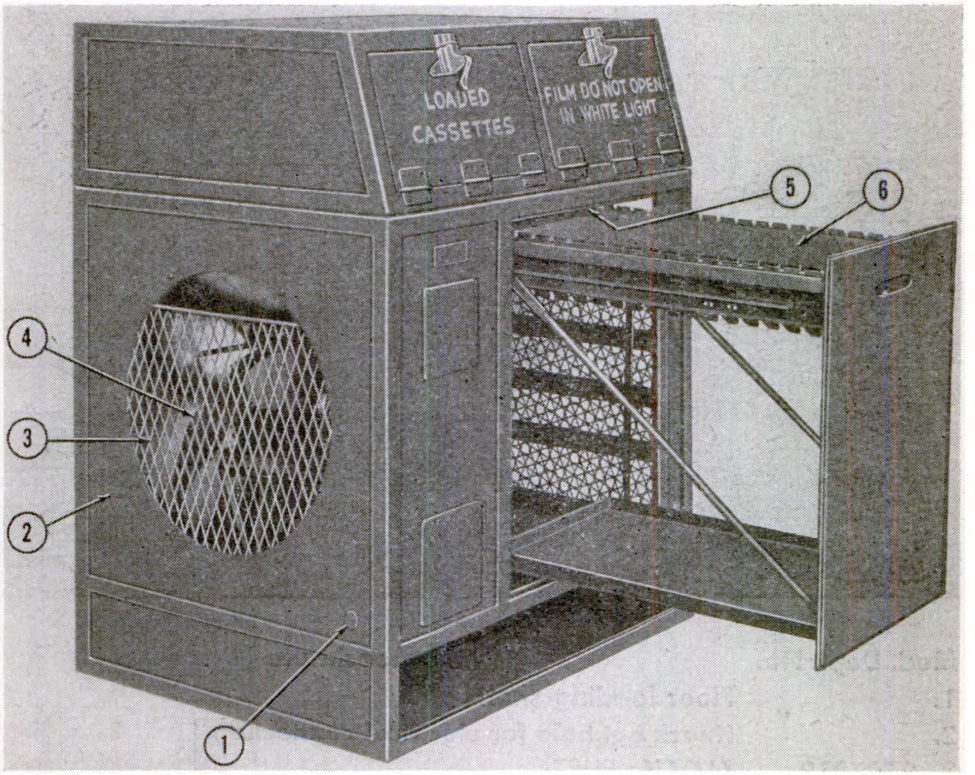
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Section XVI. X-RAY FIELD UNIT, DRYER AND LOADING BIN COMBINATION: COMPLETE WITH AIR CIRCULATOR. FOR FIELD PROCESSING UNIT

46. DESCRIPTION AND DATA

The second piece of auxiliary equipment which often accompanies the Processing Unit is Medical item No. 9605500 X-ray Field Unit, Dryer and Loading Bin Combination, with Medical item No. 9605600 X-ray Field Unit, Dryer and Loading Bin Combination, Hot Air Duct:

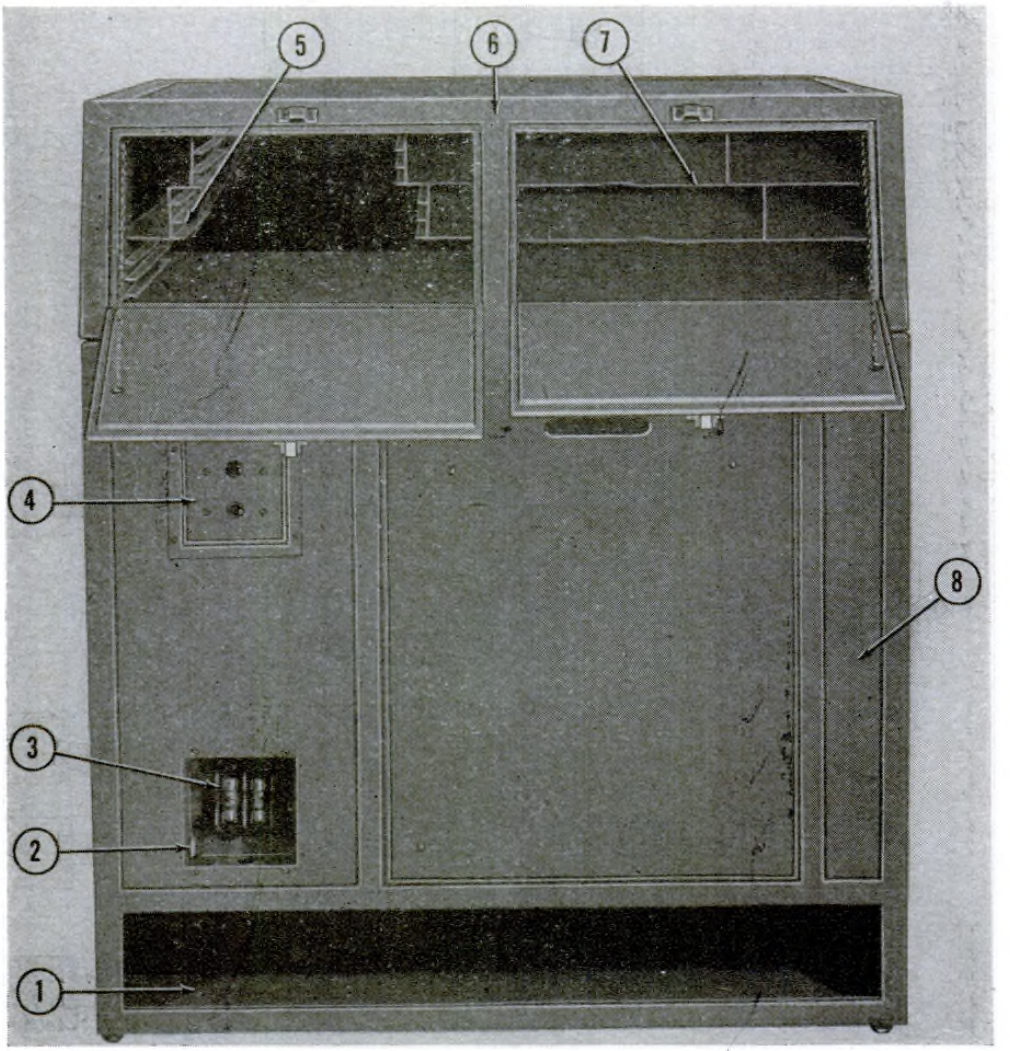
a. GENERAL INFORMATION. Item No. 9605500 (fig. 20) is intended for evacuation hospitals, general hospitals, and station hospitals. Occasionally it may be needed for use in a truck. It is



Med. Dept. No.	Nomenclature
1.	Knock out hole for electrical connection.
2.	Discharge side.
3.	Protective fan grill.
4.	Exhaust fan.
5.	Location of upper section lock.
6.	Drying rack.

Figure 20. Exhaust side view of dryer and loading bin combination.

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Med. Dept. No.	Nomenclature
1.	Floor loading shelf.
2.	Knock out hole for electrical connection.
3. 9R07212	BLOCK, FUSE:
4.	Switch block.
5.	Loaded cassette compartment.
6.	Upper section.
7.	Film storage compartment.
8.	Lower section.

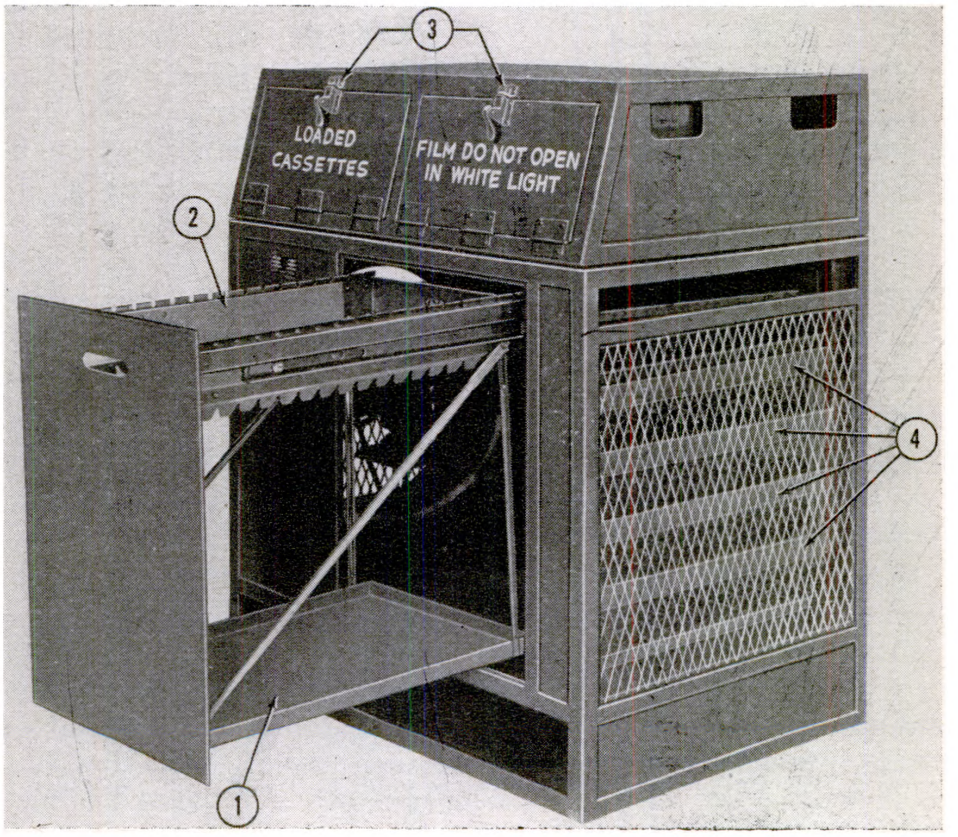
Figure 21. Front view upper section exposed.

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easily portable, being composed of two sections with three compartments.

(1) The upper section (fig. 21 (6)) is completely lead-lined, so as to afford protection against X-radiation. It consists of two compartments, a film storage compartment occupying the right half (fig. 21 (7)) and loaded cassette compartment occupying the left half. (See fig. 21 (5).) Racks have been provided in each of these two compartments to accommodate the three standard dimensions of X-ray films in use by the United States Army: 8- x 10-inch, 10- x 12-inch, and 14- x 17-inch films.

(2) The lower section (fig. 21 (8)) of the unit contains a drawer type of drying rack (fig. 22 (2) and fig. 20 (6)), four heater strips (fig. 22 (4) and fig. 23 (1)), exhaust fan (fig. 20 (4) and fig. 23



Med. Dept. No.	Nomenclature
1. 9R07208	PAN, DRIP:
2.	Drying rack.
3. 9R07206	LATCH:
4. 9R07210	HEATER STRIP:

Figure 22. Heater strip and air intake view.

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(3)), fan motor (fig. 23 (2)) with capacitor (fig. 23 and (9)), floor loading shelf (fig. 21 (1)) drip pan (fig. 22 (1)), switch block (fig. 21 (4) and fig. 23 (5)) and fuse block (fig. 21 (3) and fig. 23 (7)).

b. IDENTIFICATION INFORMATION. The unit is usually shipped as a one part item assembled as in figure 20; the crates will be marked with item number, nomenclature, weight and cubage.

(1) If the unit is shipped uncrated it may be identified by the illustrations in this section.

(2) This unit has been constructed either with right or left exhausts. The performance and operation of the unit is not changed.

c. DATA. (1) *Performance.* The unit drys film when placed in the lower section by means of an exhaust fan (fig. 20 (4)) which draws heated air through the lower section. This air is heated by means of four electrical resistance type heater strips installed on the lower section (fig. 22 (4)) opposite the exhaust fan.

(2) *Capacities.* The storage of film in the upper compartments is limited only by the physical size of the film stored in the unit. The lower compartment drying rack has accommodations for 18 films (as suspended on standard film hangers).

47. OPERATING INSTRUCTIONS

a. This part contains information for the guidance of the personnel responsible for the operation of this equipment. It contains information on the operation of the equipment with the description and location of controls.

Note. Failure or unsatisfactory performance will be reported on WD AGO Form 468.

b. SERVICE UPON RECEIPT OF NEW EQUIPMENT. The unit should be carefully uncrated and inspected for any damage.

(1) Place the unit where it is to be used, keeping in mind the discharge of warm moist air from the discharge side (fig. 20 (2)) of the unit. It is unwise for the discharge of the air to be contained within the same room where the unit is installed. It is therefore necessary to often use a hot air duct as shown in figure 24, and pipe the exhaust air to the outside.

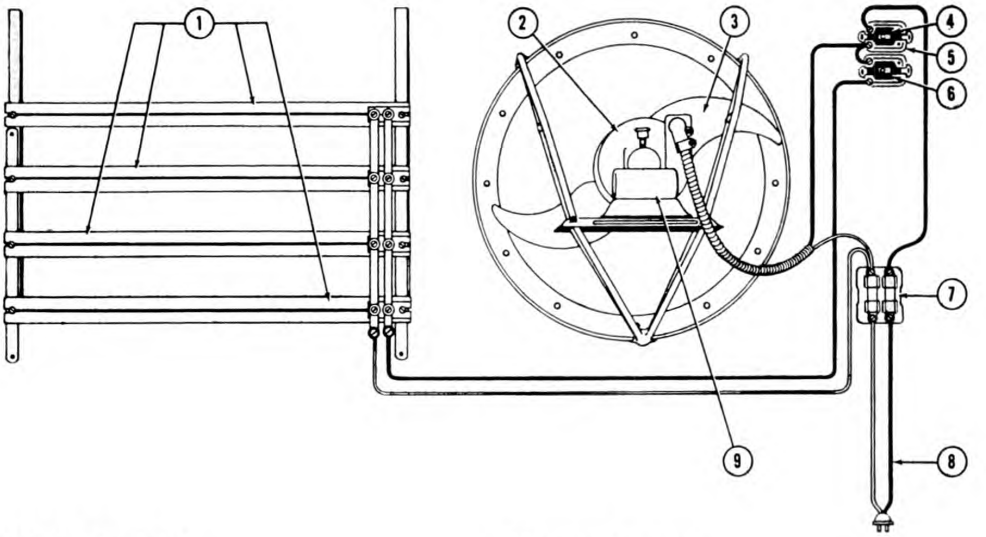
Note. Visually inspect the unit to determine which side of the lower section contains the exhaust fan as it may be either side of the unit.

(2) Make electrical connections. Run a line carrying 110-volt, 60-cycle, single-phase, AC through the knock-out holes (fig. 20 (1) and fig. 21 (2)) and connect the incoming line (fig. 23 (8)) to the two terminals on the bottom side of the fuse block (fig. 21 (3) and

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fig. 23 (7)) one terminal and fuse being used as ground and the other terminal and fuse being used as the "hat" side of the line.

Note. The heater strips are connected in parallel with the fan switch thereby making it impossible to energize the heater strips without first closing the exhaust fan motor circuit.



Med. Dept. No.	Nomenclature
1. 9R07210	HEATER STRIP:
2.	Fan motor.
3.	Exhaust fan.
4. 9R07204	SWITCH: (Exhaust fan motor switch).
5.	Switch block.
6. 9R07204	SWITCH: (Heater switch).
7. 9R07212	BLOCK, FUSE:
8.	Incoming line.
9. 9R07202	CAPACITOR, MOTOR:

Figure 23. Wiring diagram.

c. PREOPERATIVE PROCEDURE. (1) The exhaust fan motor switch (fig. 23 (4)) when placed in the "ON" position should energize the fan motor and the fan should be immediately set in motion. This also closes the circuit to the "Heater Strips" switch.

(2) The heater switch (fig. 23 (6)), when placed in the "ON" position, should energize the four heater strips and within a few seconds they should be warm to the touch. The heater strips may only be energized after the exhaust fan motor is energized.

(3) The door latches (fig. 22 (3)) of the upper section should be checked to see that they operate freely and hold the doors closed securely.

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(4) The top of the upper section should be wiped clean and dry as it may be used as a film loading bench.

d. SERVICE UPON RECEIPT OF USED EQUIPMENT. A thorough visual inspection of the entire unit should be made and the same procedure followed as outlined in *b* and *c* above.

48. CONTROLS

The only two controls of this unit are the switches located in the upper left-hand corner (fig. 21 (4)) of the unit, one of which will control the exhaust fan, the other the heater strips.

49. OPERATION UNDER USUAL CONDITIONS

Care should be exercised to keep the unit clean and dry at all times as the humidity caused by the damp film as well as film drippage often creates a condition of rust and deterioration of the unit. The "ON" and "OFF" operation of this unit remains the same as was stated in 47*c*.

50. MAINTENANCE INSTRUCTIONS

The two grease cups on the fan motor should be tested to finger-tightness weekly, and filled with Grease, general-purpose No. (CG) semiannually.

51. TROUBLE SHOOTING

a. HEATER ELEMENTS INOPERATIVE.

Possible causes	*Possible remedies*
(1) Fuse blown.	Check fuse block and replace fuse if necessary.
(2) Switch inoperative.	Check heating element switch and if inoperative, replace.
(3) Heating element burned out.	Refer to higher echelon.
(4) Faulty wiring.	Check for continuity with wiring diagram, figure 23.

b. EXHAUST FAN INOPERATIVE.

Possible causes	*Possible remedies*
(1) Fuse blown.	Check fuse block and replace fuse if necessary.
(2) Switch inoperative.	Check heating element switch and if inoperative, replace.
(3) Motor capacitor burned out.	Refer to higher echelon.

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Possible causes	*Possible remedies*
(4) Exhaust fan motor burned out.	Refer to higher echelon.
(5) Faulty wiring.	Check for continuity with wiring diagram, figure 23.

c. STORAGE AND LOADING BIN LATCHES INOPERATIVE.

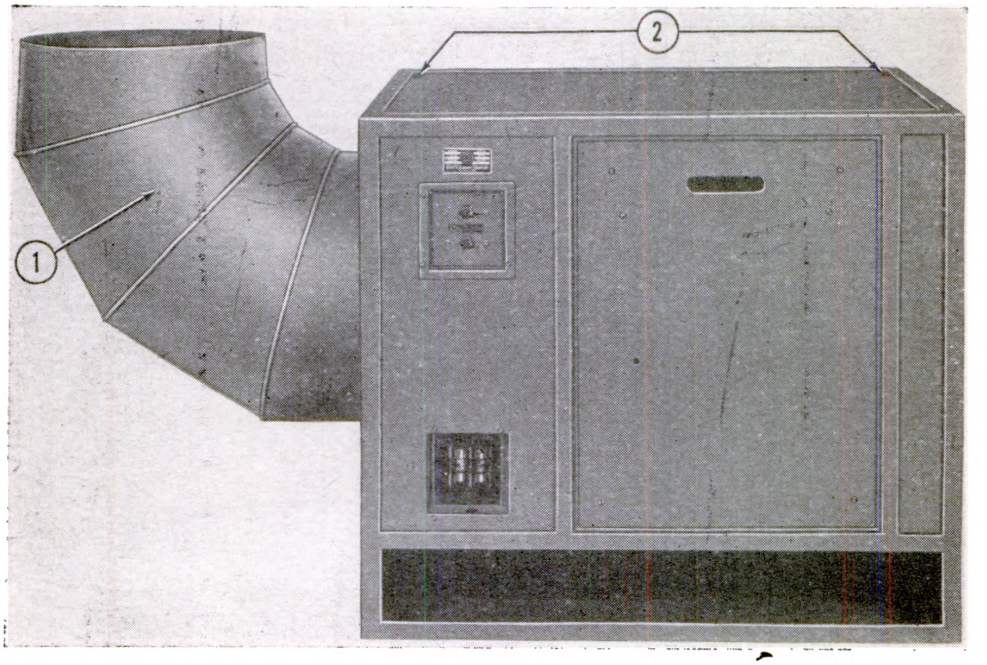
Possible causes	*Possible remedies*
(1) Spring broken or tension lacking.	Replace with new latch.

d. DRIP PAN UNUSABLE.

Possible causes	*Possible remedies*
(1) Rust and corrosion.	Replace.

52. AUXILIARY EQUIPMENT

If it is necessary to install the unit in a place where the exhaust air is to be carried to the outside use Medical item No. 9605600 X-ray Field Unit, Dryer and Loading Bin Combination, Hot Air Duct. This item should be requisitioned and installed as shown in figure 24, so that it protrudes through a wall or separating section.



Med. Dept. No.	Nomenclature
1. 9605600	HOT AIR DUCT:
2.	Recesses for engaging arms of upper section.

Figure 24. Dryer unit and hot air duct connected.

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Note. To install the hot air duct loosen the retainer screws that hold the protective fan grill (fig. 20(3)) and without removing the grill slip the hot air duct under the discharge side cut-out and tighten the retainer screws.

53. STORAGE AND SHIPMENT

a. If it is advisable because of weight and cubage factors to ship the unit in two parts (upper section and lower section separated), this may be done as follows:

(1) Open the lower compartment rack door and reach in and under the top of the lower compartment and release a spring type latch located in a corresponding position under the arrow in figure 20 (5).

(2) Raise the upper section front about 4 inches and pull forward to disengage the two small arms which fit into the top of the lower section. (See fig. 24 (2).)

(3) Remove the line wiring to the unit as well as the exhaust duct if one has been used.

(4) The unit is now ready for shipment in two sections.

b. The unit should be thoroughly cleaned and dried before crating.

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PART FIVE

REPLENISHMENT OF DICHLORODIFLUOROMETHANE (FREON, F 12) REFRIGERANT GAS IN REFRIGERATION SYSTEM OF ARMY FIELD PROCESSING UNIT

Section XVII. GENERAL

54. INDICATION OF LOW GAS (F 12) PRESSURE

Continual starting and stopping or continual running of the compressor motor are the only two reliable indications of a lack of Freon (F 12) in the refrigeration system. This is due to the inability of the compressor to build enough gas pressure so that it may be held for any length of time in the bellows of the refrigerant pressure control. (See fig. 11 (7).)

Note. Replenishment of F 12 in the Army Field Processing Unit will only be performed by fourth- or fifth-echelon repair shops or installations.

Section XVIII. EQUIPMENT AND TOOLS

55. GENERAL

A small number of tools and amount of equipment is necessary for adding F 12 from the cylinder (fig. 25 (17)) to the refrigeration system of the Processing Unit. These special tools and equipment are shown in figure 25. The equipment and tools may be drawn by the fourth- or fifth-echelon shops on requisitions for spare parts submitted in accordance with latest ASF Supply Catalog MED 7.

56. TOOLS

a. All tools listed in paragraph 5 will be needed.

b. In addition to the above tools supplied with the Processing Unit, the following are also required and may be drawn on requisitions.

(1) A tube cutter tool. (See fig. 25 (24).)

(2) Tube flaring tool size ¼-inch. (See fig. 25 (25).)

(3) A refrigerant leak detector torch (Halid Lamp). (See fig. 25 (26).)

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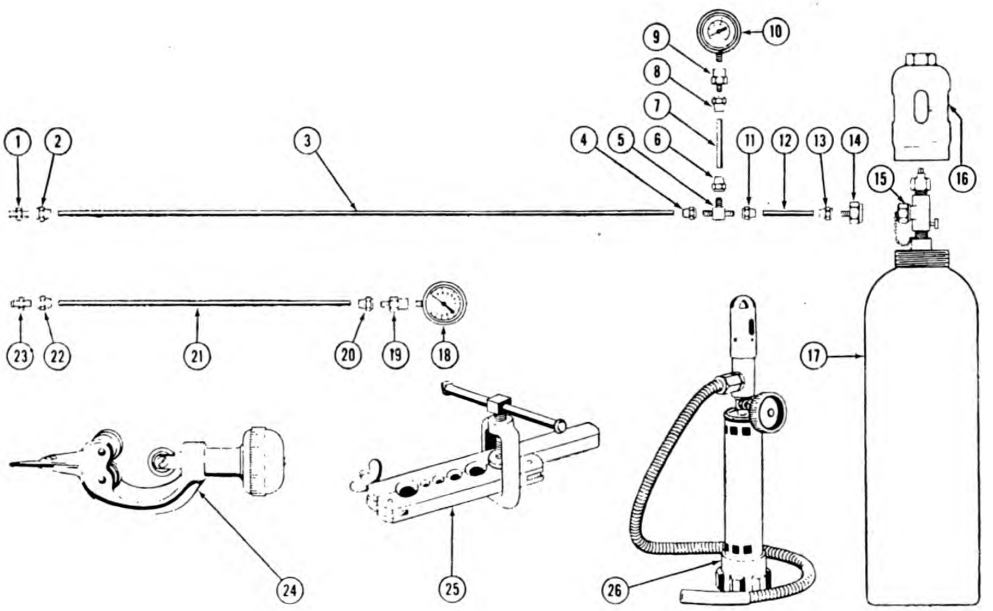


Figure 25. Tools and equipment unassembled.

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Med. Dept. No.	Nomenclature
1. SR01143	COUPLING, MALE, ¼-INCH TUBING TO ⅛-INCH PIPE:
2. SR01144	NUT, UNION, TUBING, ¼-INCH:
3. SR00782	TUBING, ¼-INCH, COPPER: (3 feet)
4. SR01144	NUT, UNION, TUBING, ¼-INCH:
5. SR01146	TEE, TUBING, ¼-INCH:
6. SR01144	NUT, UNION, TUBING, ¼-INCH:
7. SR00782	TUBING, ¼-INCH, COPPER: (3 inches)
8. SR01144	NUT, UNION, TUBING, ¼-INCH:
9. SR01147	COUPLING, ¼-INCH INSIDE PIPE THREAD TO ¼-INCH TUBING:
10. SR01149	GAUGE, FREON, ¼-INCH NPT, 30-INCH VACUUM TO 150 LB:
11. SR01144	NUT, UNION, TUBING, ¼-INCH:
12. SR00782	TUBING, ¼-INCH, COPPER: (3 inches)
13. SR01144	NUT, UNION, TUBING, ¼-INCH:
14. SR01148	ADAPTER, ¾-INCH CYLINDER FITTING TO ¼-INCH TUBING:
15.	Cylinder outlet cap.
16.	Cylinder cap.
17. 9R20008	GAS, F 12, 25 LB DRUM:
18. SR01150	GAUGE, PRESSURE, ¼-INCH NPT, 0 TO 300 LB:
19. SR01147	COUPLING, ¼-INCH INSIDE PIPE THREAD TO ¼-INCH TUBING:
20. SR01144	NUT, UNION, TUBING, ¼-INCH:
21. SR00782	TUBING, ¼-INCH, COPPER: (1 foot, 6 inches)
22. SR01144	NUT, UNION, TUBING, ¼-INCH:
23. SR01143	COUPLING, MALE, ¼-INCH TUBING TO ⅛-INCH PIPE:
24. TR02610	CUTTER, TUBING, ⅛-INCH TO ⅝-INCH RANGE:
25. TR02620	FLARING TOOL, ⅛-INCH TO ½-INCH TUBING:
26. TR00043	LEAK DETECTOR, REFRIGERANT, PROCESSING UNIT:

Key to Figure 25

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57. EQUIPMENT

a. GAUGES REQUIRED. (1) One standard pressure gauge 0 to 300 pounds (fig. 25 (18)) is needed to test Freon head pressures at the receiver tank. (See fig. 11 (1).)

(2) One compound Freon gauge (fig. 25 (10)) which will show a minimum of 30 inches vacuum and a minimum of 60 pounds pressure is required to read the suction and pressure on the suction side of the refrigeration system. (See fig. 11 (6).)

b. Five feet of ¼-inch copper tubing is required cut into the following lengths:

One piece, 3 feet in length. (See fig. 25 (3).)

Two pieces, each 3 inches in length. (See fig. 25 (7) and (12).)

One piece, 1 foot and 6 inches in length. (See fig. 25 (21).)

c. Eight union nuts for ¼-inch flared copper tubing. (See fig. 25 (2), (4), (6), (8), (11), (13), (20), and (22).)

d. Two half unions or male couplings, tube O.D. size ¼-inch, I.P.T. size ⅛-inch. (See fig. 25 (1) and (23).)

e. Two female couplings, tube O.D. size ¼-inch, I.P.T. size ¼-inch. (See fig. 25 (9) and (19).)

f. One three way tee union coupling, tube O.D. size ¼-inch. (See fig. 25 (5).)

g. One cylinder reducing adapter ¾-inch pipe to ¼-inch tubing. (See fig. 25 (14).)

h. One cylinder dichlorodifluoromethane (Freon, F 12). (See fig. 25 (17).)

Section XIX. REPLENISHMENT PROCEDURE

58. CONNECTING TANK GAUGES AND EQUIPMENT

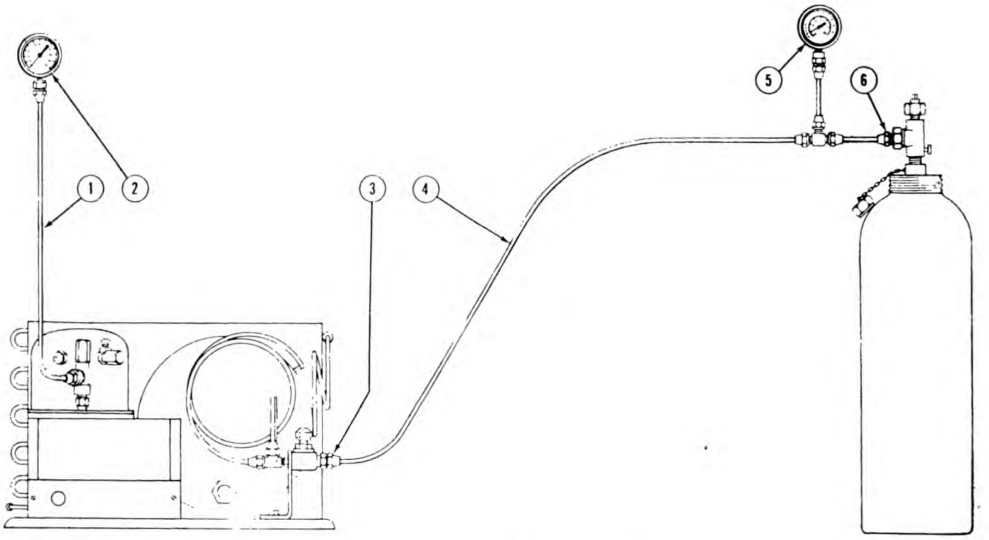
a. Cut the tubing into the proper lengths and lay out all tubing, fittings, and gauges as shown in figure 25. Place the flare nuts on the corresponding tubing. Flare the tubing and join all parts of the equipment solidly as shown in figure 26, so that no gas may escape.

Note. Do not at this point join the tubing assemblies to the equipment.

b. Close the receiving tank valve. (See fig. 11 (1).) (All refrigerant valves on this unit are back seating and must be turned clockwise to close before the studs are removed to make a tubing connection.) With the valve closed, remove the cap and stud, and screw the receiver tank gauge assembly in tightly. (See fig. 26 (1) and (2).) Now crack the joint at the gauge by unscrewing the gauge slightly in its fitting. Turn the receiver tank valve

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counterclockwise slightly to purge the gauge assembly line of all air. As soon as the gauge assembly tubing feels cool to the touch, quickly screw the gauge into its fitting and make sure that all connections are gastight and the gauge is reading the pressure within the receiving tank. Now open the valve completely so that it back seats.



Med. Dept. No.	Nomenclature
1.	Assembly, receiver tank to gauge.
2. SR01150	GAUGE, PRESSURE, ¼-INCH NPT, 0 TO 300 LB: (Receiver tank head pressure gauge).
3.	Connection, suction line to gauge assembly.
4.	Assembly, cylinder to unit.
5. SR01149	GAUGE, FREON, ¼-INCH NPT, 30-INCH VACUUM TO 150 LB:
6.	Connection, cylinder to gauge assembly.

Figure 26. Refrigeration unit with receiver tank gauge and cylinder gauge assemblies connected.

c. PURGING SYSTEM OF ANY AIR. *With the unit disconnected and not operating* turn the base assembly on end so that the condenser radiator (fig. 5 (1)) is down; this will place the receiver tank in a horizontal position and any air trapped in the receiver tank will work out of the liquid or gaseous refrigerant to the top of the tank, as air is lighter than Freon. After the unit is in this position and has been inoperative for from 20 minutes to ½ hour, the receiver gauge assembly may be cracked at the gauge slightly to allow any air to escape. Once again when the line becomes frosty or cool to the touch, quickly tighten the gauge making the line gastight.

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(1) Another method to detect air in the refrigerant system trapped in the receiver tank is by the use of a Halid Lamp following the above procedure and taking a reading with the lamp where the gauge has been cracked to allow air and refrigerant to escape. (For use of Halid Lamp see par. 61.)

Caution: Care should be exercised in the purging of refrigerant lines to make sure, first, that the system and line is purged of all air, and second, that too much refrigerant is not lost in the process.

(2) After the unit has been purged of air, place it in an upright position.

d. Make sure the valve on the Freon (F 12) cylinder is tightly closed, then remove the two protective caps. (See fig. 25 (15) and (16).) Now connect the cylinder adapter (fig. 25 (14)) to the cylinder, then connect the assembled line and gauge to the adapter. (See fig. 26 (6).) Close the suction line valve and remove the cap and stud (fig. 11 (6)) and connect the cylinder unit assembly into this valve leaving the joint at the unit slightly cracked. Slowly open the cylinder valve to purge the cylinder to unit line. When the cracked joint is frosted or cool to touch, quickly close the cylinder valve and immediately tighten the connections at the unit. Then open the suction line valve.

e. Set the compressor in operation and check all connections in the entire unit for leaks with the refrigerant gas detector torch (Halid Lamp). (See par. 61.)

Caution: If the unit is not connected so that water runs through the mixing chamber, make sure the heater switch is in the "OFF" position. If there is no heater switch on the unit, disconnect the heater terminals so that the heater can not possibly burn out.

Note. The F 12 cylinder should always remain in an upright position so that only gas may get into the line when the unit is being charged, as the charging is done through the suction and return valve, and if liquid refrigerant gets into this valve it will be sucked into the compressor burning out the compressor motor and damaging the compressor valves. During charging of the unit the F 12 cylinder should be heated preferably by placing it in a pail of hot water.

59. CORRELATING TEMPERATURES AND PRESSURES

a. Take a temperature reading of the air directly over the condenser with an ordinary thermometer and refer to the chart on "operating discharge pressures" which follows, using only the "air temperature over condenser column" which corresponds closest to the reading you have made of the air temperature.

b. Take a reading of the receiver tank gauge (fig. 26 (2)) and find this reading in the correct column on the right-hand side of the chart.

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Chart for operating discharge pressures—lbs./sq. in. (gauges)

Suction pressure lb/sq. in. (gauge)	Air temperature over condenser				
	70°	80°	90°	100°	110°
	Receiver tank pressure lb (gauge)				
0	89	103	121	141	162
2	92	107	124	144	165
4	95	110	127	148	168
6	98	113	131	151	172
8	101	116	134	154	175
10	104	119	137	157	178
12	104	119	136	155	175
14	107	122	139	158	178
16	109	125	142	160	180
18	112	128	144	163	183
20	114	130	147	165	186
22	109	124	141	161	181
24	111	126	143	162	183
26	113	128	146	165	185
28	115	130	148	167	187
30	117	133	150	169	189
32	118	135	152	171	192
34	120	137	154	173	194
36	122	139	157	176	196
38	124	141	159	178	198
40	126	144	161	180	200
42	128	146	163	182	202
44	130	148	165	184	204

c. Follow across the left of the chart and find the suction pressure pounds which should read on the tank suction line gauge. (See fig. 26 (5).) If the gauge reading is lower than on the chart, add the necessary Freon by opening the tank valve slightly, until a correct reading of the gauges correlates with the readings of the chart.

Caution: Do not add gas too fast as you can overcharge as well as undercharge a refrigeration unit.

60. REMOVAL OF REPLENISHMENT EQUIPMENT

a. When the gauges and the chart correspond, immediately make sure that the cylinder valve is completely closed.

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b. After the unit has run for a few minutes and the pressures continue to correspond to the chart, although they may vary when the unit is operating and not operating, make sure that the receiver tank valve and suction line valve are completely closed. Disconnect the cylinder to suction line assembly and the receiver tank gauge assembly. Replace the plugs and the studs on the suction line valve and receiver tank valve. The unit is now in operation and fully charged.

61. LEAK DETECTOR TORCH (HALID LAMP)

a. Refrigerant leaks with Freon can be located by use of a leak detector torch (Halid Lamp). (See fig. 25 (26).) The torch consists of a special alcohol burner (some are for gasoline), the air for combustion being taken in through a flexible sampling tube. When air only is taken into the tube, the flame of the torch is colorless. When a mixture of air and a small amount of refrigerant is taken into the tube, the flame turns faintly green. A higher concentration of refrigerant increases the green color in the flame. A high concentration of refrigerant turns the flame a bright blue.

b. In using the leak detector torch, hold the inlet end of the sampling tube as close to the joint as possible without stopping off the air to the torch. Slowly proceed completely around each joint with the end of the sampling tube. Remember that an appreciable length of time is required for the sample to be drawn into the torch and that the indication, therefore, is not instantaneous. Since the refrigerant vapors are heavier than air, the drift is downward from a leak. The indication of refrigerant may therefore often be detected below a leak where it cannot be detected above.

c. If no leaks are found at lower pressures, turn out the liquid receiver service valve until a pressure of 15 pounds shows on the gauge; then retest for leaks.

d. If a leak is apparent, it can be stopped often times by tightening the joint.

62. TO FREE REFRIGERANT EXPANSION VALVE WHEN STUCK

At times the refrigerant expansion valve (fig. 12 (1)) may stick in a closed position on these units, and when this occurs they may usually be opened by the following method:

a. Close the liquid line valve (fig. 11 (3)) and pump down the unit until 20 inches of vacuum may be read on the suction line gauge.

b. Shut off the unit and crack the liquid line valve quickly and listen for a hissing through the refrigerant valve.

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APPENDIX

Section I. SHIPMENT AND STORAGE

1. GENERAL

These instructions cover the preparation for temporary storage and local shipment. Items to be prepared for temporary storage or local shipment are those ready for immediate service but not stored over 30 days. These instructions cover only the preparation of the item. Packing, crating, and method of shipment will be in accordance with existing Medical Department procedure.

2. PRE-DISASSEMBLY PROCEDURE

Before the Processing Unit is drained of water and the tanks flushed, it should be given a final lubrication in accordance with Lubrication Order 8–629. (See fig. 15.)

a. Check the pump packing on the water pump in accordance with paragraph 30.

b. With 5 gallons of water in the unit and the circulation and recirculation pipe in the main reservoir tank reversed, operate as a closed unit for at least 30 minutes. At the end of this time, if the temperature reading (manually taken) is correct, shut off the unit. If incorrect, make minor adjustments which are necessary, and if these are not adequate refer the unit to higher echelon.

3. DISASSEMBLY PROCEDURE

a. Completely drain the unit and scrub the unit vigorously with a bristle brush.

b. Remove the 110-V. line to the safelight from its receptacle and disconnect the main reservoir tank from the base assembly and allow to dry thoroughly, preferably in a warm dry place.

Note. Too rapid drying is not recommended as the tank may crack. When the tanks are dry, remove the safelight and timer bracket, clean and dry thoroughly, and store in the developer tank adequately wrapped and packed to prevent damage or breakage.

c. Remove all wiring (110-V. to base assembly and ground to base) from their connections and fold into the unit. Then remove or disconnect all piping connections if the unit has been used as an open unit.

d. Make sure that no water remains within the mixing chamber or water pump and lines.

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e. Allow the base assembly to dry thoroughly. Visually inspect the base assembly and remove any rust appearing on the surfaces of the unit by sanding with paper, Flint #2, or other suitable material.

f. When the base assembly is completely dry, thoroughly wipe all parts with an oily rag.

4. STORAGE PROCEDURE

If the unit is not to be moved, it now may be stored in its present condition for 30 days.

5. SHIPMENT

If the unit is to be locally shipped or moved extensively or stored for longer periods of time than were anticipated, it is advisable to place the base assembly and tank assembly in well-constructed and braced crates.

6. WEIGHTS FOR PROCESSING UNIT

Base assembly crated for shipment	294 lb
Base assembly uncrated ready for use	225 lb
Tank assembly crated for shipment	274 lb
Tank assembly uncrated for use	135 lb
Note. For the "all metal tank group" add	15 lb.

Section II. REFERENCES

7. TECHNICAL MANUALS

TM 8–280, Military Roentgenology.

8. TECHNICAL BULLETINS

TB MED 99, Life of Photoroentgen Films.

TM MED 117, Electrical Requirements for X-Ray Apparatus in the Field or in Temporary Installations.

9. ARMY SERVICE FORCES MEDICAL SUPPLY CATALOG

Introduction	MED 1
Index	MED 2
List of items for troops, posts, camps, and stations	MED 3
Organizational and higher echelon spare parts, X-ray Field Unit, Processing Unit for Darkroom	MED 7–9611500
List of all parts, 9611500 X-ray Field Unit, Processing Unit (when published)	MED 9

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10. LIST OF FORMS MENTIONED IN MANUAL

WD AGO Form 468, Unsatisfactory Equipment Report.

11. LIST OF ABBREVIATIONS USED IN MANUAL

AC	Alternating Current
AGO	Adjutant General's Office
AMP	Ampere
ASF	Army Service Forces
"DIFF"	Differential
F.	Fahrenheit
Fig.	Figure
In.	Inch
I.P.T.	Inside pipe thread
KW.	Kilowatt
LB	Pounds
MED 7	ASF Catalog MED 7
NO.	Number
O.D.	Outside diameter
Par.	Paragraph
PF	Primary Winding Finish
PS	Primary Winding Start
S2	Secondary Winding Terminal No. 2
Sec.	Section
Sq.	Square
TM	Technical Manual
V.	Volt
WD	War Department
65°	65 degrees

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INDEX

	Paragraph	Page
Abbreviations, list of	App.	73
Adapter, cylinder (F 12)	58*d*	68
After operation check	30*c*	39
Air space	9*a*(1)	15
Assemblies, Processing Unit	3*d*	4
Assembling Processing Unit	9	15
Assembling Tank Group Processing Unit	9*d*	16
Autotransformer (50-cycle operation)	3*c*(2) (*b*), 9*i*	4, 17
Auxiliary Wash Tank	35, 38*a*(2)	43, 46
Identification	35*a*	44
Difference in models	35*b*	44
Baffles, tank	36*a*	44
Base assembly, Processing Unit	3*d*(2)	7
Bleeding	10*f*	25
Bulleyes, compressor	3*c*(2) (*b*)	4
Calibration:		
Dial	14*d*(3)	29
Orifice	14*e*	29
Valve	3*d*(2) (*e*)	10
Valve and orifice	10*a*, 14*e*	21, 29
Valve, Auxiliary Wash Tank	40, 44*d*	51, 54
Water valve control	14*d*	28
Capacities	4*b*	11
Capacitor	46*a*(2)	57
Capacity, Auxiliary Wash Tank	36*b*	44
Capacities, Loading Bin and Dryer	46*c*(2)	58
Circuit breaker switch, pump motor	3*d*(2) (*g*), 9*j*(1)	10, 20
Circulation	3*a*(2)	1
Circulation check	10*f*(3)	25
Circulating inlet pipe bushing with strainer	3*d*(1) (*g*)	7
Circulating water pump and motor	3*d*(2) (*d*)	10
Class B equipment	12	26
Cleaning, Auxiliary Wash Tank	44*b*	54
Closed system	10*e*	23
Cooler switch	3*d*(2) (*g*), 13, 14*g*(3)	10, 26, 31
Condenser radiator	24*b*	35
Connecting Auxiliary Wash Tank	38*b*(6)	50
Controls	14	26
Controls, Dryer and Loading Bin	48	60
Control switch	14*g*	31
Community drain pipe	3*d*(1) (*g*)	7
Compressor	9*c*, 13, 58*e*	16, 26, 68
Compressor motor	14*h*	32
Compressor inoperative	33*d*	41

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	Paragraph	Page
Community water temperature	14*d*	28
Coupling No. 1, Processing Unit	9*g*(1)	17
Coupling No. 2, Processing Unit	9*g*(2), 9*g*(3)	17
Correcting calibrated valve and orifice	10*a*	21
Crating	3*b*	3
Part 1	3*b*(1)	3
Part 2	3*b*(2)	3
Crescent wrench	5*b*	11
Cylinder (F 12) adapter	58*d*	68
Darkroom light switch	14*g*(4)	31
Darkroom interval timer	3*d*(1) (*e*)	7
Darkroom safelight	3*d*(1) (*f*)	7
Developer tank insert	3*d*(1) (*b*)	6
Dichlorodifluoromethane	57*h*, 58*e*	66, 68
Disassembly, Auxiliary Wash Tank	45*a*	54
Disassembly procedure, Processing Unit	App.	71
Discoloration of accessories	30*d*(4)	39
Discoloration, Auxiliary Wash Tank	44*c*	54
Draining, Auxiliary Wash Tank	44*a*	53
Drain piping	9*g*(4)	17
Drain reducing nipple	6*a*	11
Drip pan, Auxiliary Wash Tank	38*a*, 38*b*(8)	46, 51
Drip pan, Loading Bin and Dryer Combination	46*a*(2), 51*d*	57, 61
Drying rack	46*a*(2)	57
During operation check	30*b*	38
Dust	24	35
Electrical connections, Loading Bin and Dryer	47*b*(2)	58
Electrical connections (50-cycle operation)	9*i*	17
Electrical connections (60-cycle operation)	9*h*	17
Electrical supply	9*h*, 9*i*	17
Element thermal 3.5-amp.	6*c*, 9*j*(1)	11, 20
End plate refrigerating coil	3*c*(2) (*b*)	4
Excessive moisture on base	25	35
Exhaust fan	46*a*(2), 46*c*(1), 48	57, 58, 60
Exhaust fan inoperative, Loading Bin and Dryer	51*b*	60
Extreme heat	23	35
F 12	57*h*, 58*e*	66, 68
F 12, pressure	59	68
Failure of equipment	7	15
Fan motor with capacitor	46*a*(2)	57
Film developing capacities	4*b*(6)	11
Film hanger supports, Auxiliary Wash Tank	38*a*	46
Film holder supports	3*d*(1) (*d*)	7
Film storage compartment	46*a*(1)	57
Fixer tank insert	3*d*(1c)	6
Flaring tool, tube	56*b*(2)	63

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	Paragraph	Page
Floor loading shelf	46*a*(2)	57
Freon	56, 58*e*	63, 68
Freezing	22	34
Fuse block	46*a*(2), 47*b*(2)	57, 58
Gauge, 0 to 300 pounds pressure	57*a*(1)	66
Gauge, compound	57*a*(2)	66
Generator, gasoline electric	20	34
Halid lamp	56*b*(3), 58*c*(1), 58*e*, 61	63, 68, 70
Heater, electrical, 1,200-watt	3*a*(1), 3*d*(2) (*b*), 13, 14*f*	1, 7, 26, 30
Heater elements inoperative, Loading Bin and Dryer	51*a*	60
Heater relay	13	26
Heater switch	3*d*(2) (*g*), 13, 14*g*(2)	10, 26, 31
Heater strips	46*a*(2), 46*c*(1), 47*b*(2), 48	57, 58, 60
Heater, water, 1,200-watt	3*a*(1), 3*d*(2) (*b*), 13, 14*f*	1, 10, 26, 30
Heating element inoperative	34	42
Hot air duct	52	61
Index pointer Processing Unit	14*d*(3)	29
Inlet pipe bushing with strainer	3*d*(1) (*g*)	7
Inlet reducing nipple	6*a*	11
Interchangeability of parts	3*c*(2)	4
Tank group	3*c*(2a)	4
Base assembly	3*c*(2b)	4
Interconnecting Auxiliary Wash Tank to Processing Unit	38*b*(2)	46
Interval timer	3*d*(1) (*e*), 15	7, 32
Latches, Loading Bin and Dryer Combination inoperative	51*c*	61
Leak detector torch	56*b*(3), 58*c*(1), 58*e*, 61	63, 68, 70
Leaks, water, Processing Unit	9*e*	16
Leaky water pump	30*a*(7)	38
Loaded cassette compartment	46*a*(1)	57
Location, Auxiliary Wash Tank	38*b*(1)	46
Location, Loading Bin and Dryer	47*b*(1)	58
Low water level	18*g*	33
Lubrication	28	36
Main line switch	3*d*(2) (*g*), 13, 14*g*(1)	10, 26, 31
Main reservoir tank	3*d*(1a)	6
Mixing chamber	3*c*(2) (*b*), 3*d*(2) (*a*)	4, 10
Mixing chamber air bound	33*c*	41
Mixing chamber and plate (*see* End plate refrigerating coil).		
Mounting Auxiliary Wash Tank	38*b*(5)	50
Mounting Tank Group Processing Unit	9*f*	17
Motor fan with capacitor	46*a*(2)	57
Nonreversible ratchet with offset handle	5*a*	11
Nipple reducing	6*a*	11

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	Paragraph	Page
"OFF" operation	17*b*	33
"ON" operation	17*a*	33
Open system	10*d*	23
Operation	11	25
Operation Auxiliary Wash Tank	38*b*(9), 41*a*	51
Orifices	6*b*, 14*e*	11, 29
Overflow community drain pipe	3*d*(1) (*g*)	7
Overflow pipe	9*d*(1)	16
Overflow pipe with strainer	3*d*(1) (*g*)	7
Performance	4*a*	10
Performance, Auxiliary Wash Tank	36*a*	44
Plumbing, Auxiliary Wash Tank	38*b*(7)	50
Plumbing connections, Processing Unit	9*g*	17
Power source	9*h*, 9*i*, 33*a*	17, 40
Precautions	18	33
Preventive maintenance, Auxiliary Wash Tank	43*a*	52
Preoperative procedure, Loading Bin and Dryer	47*c*	59
Pre-regulator	38*a*(2), 38*b*(3), 38*b*(4)	46, 47, 50
Pump motor overload circuit breaker switch	3*d*(2) (*g*)	10
Purging	58*b*, 58*c*, 58*c*(1), 58*d*	66, 67, 68
Ratchet wrench	5*a*	11
Recalibrating valve, Processing Unit	14*d*(5)	29
Receiver and base assembly	3*c*(2) (*b*)	4
Receiver tank	58*c*	67
Recirculating overflow pipe with strainer	3*d*(1) (*g*), 9*d*(2)	7, 16
References	App.	72
Refrigerant:		
Evaporator coil	3*a*(1)	1
Coil, end plate	3*c*(2) (*b*)	4
Expansion valve	62	70
Leak detector	56*b*(3), 58*c*(1), 58*e*, 61	63, 67, 68, 70
Line	10*b*	21
Pressure control	14*b*(3), 14*c*	27, 28
Valves closed	10*c*	21
Refrigeration system inoperative	33*e*	41
Refrigerator unit	3*d*(2) (*c*)	10
Relay control	14*h*	32
Resetting pump circuit breaker	14*a*	26
Safelight	3*d*(1) (*f*), 9*d*(3), 10*g*	7, 16, 25
Sand	24	35
Semiannual service, Auxiliary Wash Tank	43*c*	53
Service upon receipt of used Loading Bin and Dryer	47*d*	60
Shipment, Loading Bin and Dryer combination	53	62
Shipment, Processing Unit	App.	71

Digitized by Google
Original from UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

	Paragraph	Page
Side covers, Processing Unit	9*b*	16
Spanner face wrench	5*c*	11
Storage, Loading Bin and Dryer Combination	53	62
Storage, Processing Unit	App.	71
Strainer	30*a*(9)	38
Suction line valve	58*d*	68
Switch block	46*a*(2)	57
Switch box	3*d*(2) (*g*)	10
Tank assembly	3*d*(1)	4
Tank coupling No. 1, Processing Unit	9*g*(1)	17
Tank coupling No. 2, Processing Unit	9*g*(2), 9*g*(3)	17
Tank group	3*c*(1)	4
Technical operation	16	32
Temperature controls, thermostatic	3*d*(2) (*f*)	10
Testing for tank leaks, Processing Unit	9*e*	16
Thermal element 3.5-amp	6*c*, 9*j*(1)	14, 20
Thermal pre-regulator	38*a*, 38*b*(3), 38*b*(4)	46, 47, 50
Thermostat, temperature, complete	3*c*(2) (*b*)	4
Thermostatic temperature controls	3*d*(2) (*f*)	10
Thermostatic water temperature control	14*b*	27
Timer, interval	3*d*(1) (*e*), 15*a*	7, 32
Timer, bracket	9*d*(3)	16
Tubing, copper	57*b*	66
Tube cutter	56*b*	63
Unpacking Processing Unit	8	15
Unsatisfactory performance	7	15
Unsatisfactory performance, Auxiliary Wash Tank	38	46
Unsatisfactory performance, Loading Bin and Dryer	47*a*	58
Used equipment	12	26
Unusual conditions, Auxiliary Wash Tank	42	52
Valve, calibrated	3*d*(2) (*e*)	10
Valve, calibrated, Auxiliary Wash Tank	40, 40*d*	51
Valves, refrigerant	58*b*	66
Valve, suction line	58*d*	68
Water circulation	33*b*	40
Water heater	14*f*	29
Water level	10*f*(1)	25
Water pump	30*a*(6)	38
Water pump and motor	3*d*(2) (*d*)	10
Water pump motor	33*b*(3)	40
Water pump air bound	33*b*(4)	40
Water sources, Auxiliary Wash Tank	41*b*	52
Water source undesirable temperature, Auxiliary Wash Tank	41*c*	52

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	Paragraph	Page
Water supply	9g(5)	17
Water temperature	14d	28
Water valve, calibrated	14d	28
1,200-watt electrical heater	3a(1),(3d(2) (b), 13, 14f	1, 10, 26, 30
Weekly service	30d	39
Weekly service, Auxiliary Wash Tank	43b	52
Weights, Processing Unit	App.	72
Wrench, adjustable crescent	5b	11
Wrench, ratchet	5a	11
Wrench, spanner face	5c	11

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