

Thermo Scientific Barnstead Biopure Distilled Water Center

Model 525 - Series 495

Operating Manual and Parts List 60151 (7006762) Rev. 1



| Models covered in this manual | |
|--------------------------------------|-----------------|
| Model Number | Voltage |
| A1085-B (6762) | 120V/240V, 1 PH |
| A1085-C (6763) | 120V/208V, 3 PH |
| A1085-D (6764) | 120V/240V, 3 PH |

MANUAL NUMBER 60151 (7006762)

| REV | ECR/ECN | DATE | DESCRIPTION | By |
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Important Read this instruction manual. Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance. s

Caution All internal adjustments and maintenance must be performed by qualified service personnel. s

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Section 1 Safety Information

This manual contains important operating and safety information. The user must carefully read and understand the contents of this manual prior to the use of this equipment.

Your Thermo Scientific Barnstead Biopure Distilled Water Center has been designed with function, reliability, and safety in mind. It is the user's responsibility to install it in conformance with local electrical codes. For safe operation, pay attention to Notes, Cautions, and Warnings throughout the manual.

Warnings

To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Disconnect from the power supply prior to maintenance and servicing.
3. Ensure that the equipment is connected to electrical service according to local and national standards. Failure to properly connect may create a fire or shock hazard.
4. Do not mount your Biopure directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electrical shock hazard if improperly located.

To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials; fire or explosion may result. This device contains components which may ignite such materials.
2. The ultraviolet lamp is a powerful source of ultraviolet radiation. Never expose the eyes or face to its direct rays. When replacing the lamp, always unplug the lamp to prevent accidental exposure.
3. Use this device with water feed only. Sanitizing/cleaning agents must be used in compliance with the instructions in this manual. Failure to comply could result in explosion and personal injury.
4. Wear eye and hand protection when using acid for cleaning, as spattering may occur.
5. Wall composition and construction, as well as fastener type, must be considered when mounting this unit. The mounting surface and fasteners selected must be capable of supporting a minimum of 275 lbs. Inadequate support and/or fasteners may result in damage to mounting surface and/or equipment. If you are unsure of mounting surface composition, condition and construction, or correct fasteners, consult your building maintenance group or contractor.
6. Follow carefully the manufacturers' safety instructions on labels of chemical containers and Material Safety Data Sheets (M.S.D.S.).
7. Refer servicing to qualified personnel.

Section 2 Technical Characteristics

| | SI Units | English |
|-----------------------------|-------------|-------------------------------|
| Distillate Rate | 18.9 l/hr | 5 gph |
| Storage Capacity | 95 liters | 25 gallons |
| Water Requirements | | |
| Quantity | 168 l/hr | 45 gph |
| Water Pressure Range | 276-621 kPa | 40-90 psi |
| Plumbing Connections | | |
| Cooling Water Inlet | --- | 3/8" O.D. tubing |
| Waste | --- | 3/8" O.D. tubing ¹ |
| Distillate Outlet | --- | 1/2" NPT ² |
| Overall Dimensions | | |
| Width | 914 mm | 36 in |
| Height | 1238 mm | 48-3/4 in ³ |
| Depth | 603 mm | 18-3/4 in ⁴ |
| Electrical Requirements | | 120/230 volts ⁵ |
| | | 1 phase, 60 Hz |
| | | 63 amperes |

¹ Must be atmospherically vented and gravity flow.

² This connection is plugged and is used only when customer wishes to connect to his distillate distribution system.

³ This dimension is increased to 2127 mm (83-3/4 inches) if optional base unit, Cat. No. A1521, is ordered for floor mounting purposes. The Model 525 is equipped with adjustable levelers for leveling the unit. Allow an additional 114 mm (4-1/2 inches) of space at the top of the unit for ultraviolet lamp removal.

⁴ Allow an additional 762 mm (30 inches) of space in the front of the unit to operate the unit.

⁵ This is considered the standard electrical service. The actual electrical service for each unit is indicated on the data decal on the outside of the electrical box front cover. The 120 power requirement is a separate dedicated line for the low water cutoff controls.

Section 3 Description

This manual includes description, theory of operation, operation and maintenance procedures for the Thermo Scientific Barnstead Model 525 (Cat. No. A1085) Biopure Distilled Water Center (Figure 3-1). The equipment is a self-contained, cabinetized, electrically heated still and storage tank combination; it is designed to produce 18.9 liters (5 gallons) per hour of distilled water, and to store 95 liters (25 gallons) of distilled water for extended periods while maintaining chemical and biological purity. The Model 525 consists of the following: a cabinet, an evaporator, a condenser, cooling water and drain controls, a low water cut-off, and an electrical control and service system.

Cabinet

The welded sheet steel cabinet supports and houses the components of the Model 525. The cabinet includes: a polycarbonate gauge glass in the center of the upper front panel to indicate the level of distillate in the tank; a faucet below the gauge glass to draw distillate from the tank; a meter at the left of the faucet to indicate distillate purity; an ON-OFF switch and STILL ON indicator lamp at the left of the purity meter; a sight port to the left of the gauge glass to observe the ultraviolet lamp in the tank; and a knob at the right of the gauge glass to manually operate the evaporator bleeder valve.

The components inside the cabinet are accessible either from the back, or from the front, by removing the screw-held upper and lower panels.

Evaporator

The vertically mounted, cylindrical evaporator contains the water to be distilled. The evaporator includes: six electric heaters to vaporize the water; a "Q" baffle to remove the entrained water particles and pyrogens from the vapor; a constant level device to maintain the proper water level in the evaporator; a bleeder valve to relieve surface impurities and foaming; and an automatic solenoid drain valve to drain the evaporator. The evaporator also includes a low water cut-off long and short electrode to sense the water level in the evaporator.

Condenser

The cylindrical condenser is connected to the top of the evaporator. The condenser receives the vapor from the evaporator and, by means of heat exchange between the cooling water flowing through the condenser tubes and the vapor flowing through the condenser shell, cools the vapor in the condenser shell to form the distillate. The condenser is vented to the atmosphere to eliminate gaseous impurities from the vapor.

Storage Tank

The rectangular storage tank, mounted in the cabinet beside the evaporator, has a capacity of 95 liters (25 gallons). The tank is provided with: a Ventgard filter to prevent airborne impurities from contaminating the distillate; a water seal which allows only air that has passed through the Ventgard to enter the tank; an ultraviolet lamp to maintain distillate purity; a level monitor to start and stop the still and prevent overflowing the tank; a polycarbonate gauge glass to observe distillate level in the tank; a draw-off faucet to obtain the distillate; and a sight glass to observe the ultraviolet lamp in the tank. A conductivity cell is installed in the faucet header in the draw-off faucet piping. The cell is connected to the panel-mounted distillate resistivity meter to measure distillate purity.

Cooling Water Controls

The cooling water controls include a manual shut-off valve, a strainer, a solenoid-operated shut-off valve to control the cooling water supply in response to the level monitor on the storage tank, and an automatic throttling valve to regulate cooling water flow according to its temperature.

Drain Controls

The drain controls consist of an automatic drain solenoid valve and an interval timer, to periodically drain the still according to the preset timing cycles on the timer (normally four hours).

Low Water Cut-Off

The self-restoring low water cut-off includes a relay (CR2) to remove current to protect the heaters in the evaporator against burning out and a short and long electrode to sense the water level in the evaporator.

Optional Distribution Pump Unit

The distribution pump unit (Catalog No. A1522) consists of an "A" size, 115VAC, 1-phase, 60-Hz pump with a recirculating bypass.

A SPST ON-OFF switch is provided at the pump motor to start and stop the pump. The pump draws distillate from the bottom of the tank and pumps it to the draw-off header where it can be drawn off through the draw-off and/or a connection in the header to the point of distribution. Recirculating bypass piping is provided to connect the top portion of the tank to the draw-off faucet header. A pressure switch is provided to protect the pump against damage in the event low water conditions exist in the storage tank. The optional distribution pump unit is only installed when the optional base unit, Cat. No. A1521, is provided. The base unit provides the necessary space for installing the pump unit.

Electrical Systems

The electrical system for the Model 525 includes: a service box to which the electrical supply is connected; a quadruplex outlet into which are plugged the ultraviolet lamp, the level monitor, the purity meter, and the automatic cooling water shut-off solenoid valve and automatic drain valve; a main power toggle switch with ON-OFF indications; a STILL CLEAN switch: a red STILL ON indicator lamp; and the distillate resistivity meter.

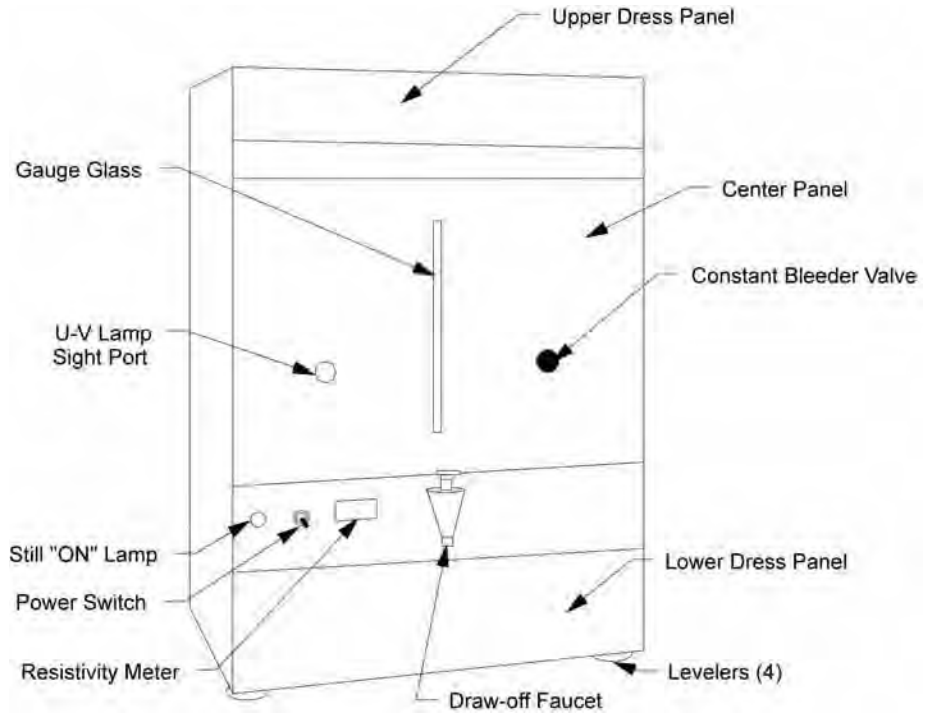


Figure 3-1. Model 525 (A1085)

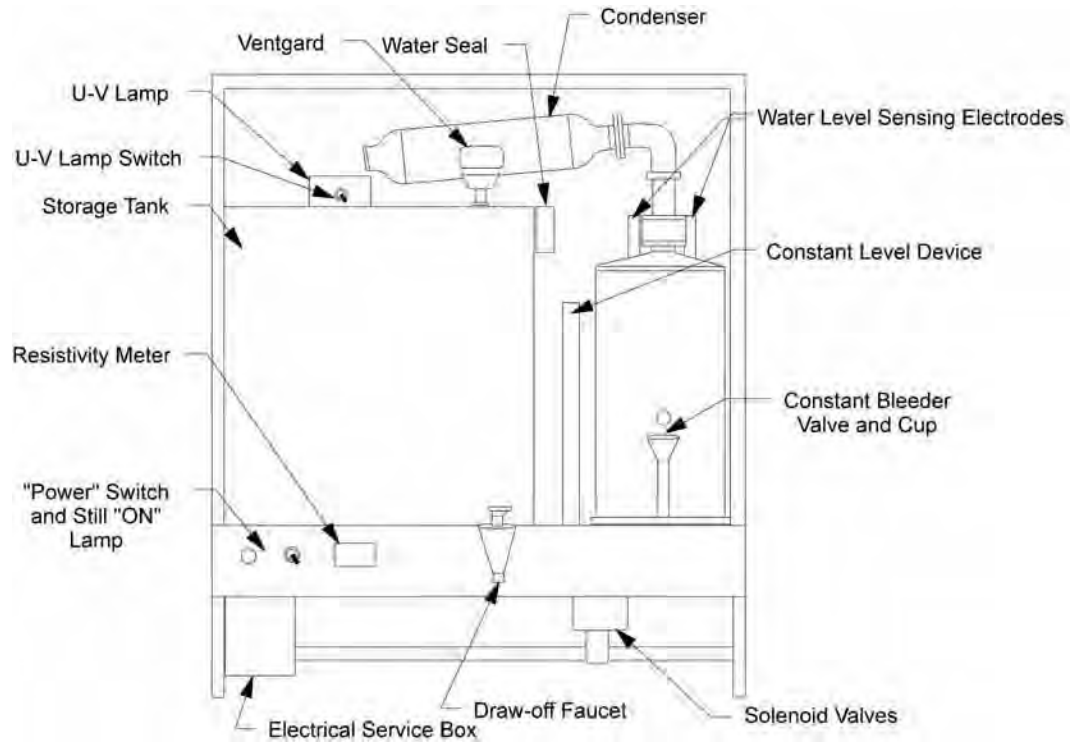


Figure 3-2. Model 525 (A1085) - Internal Front View

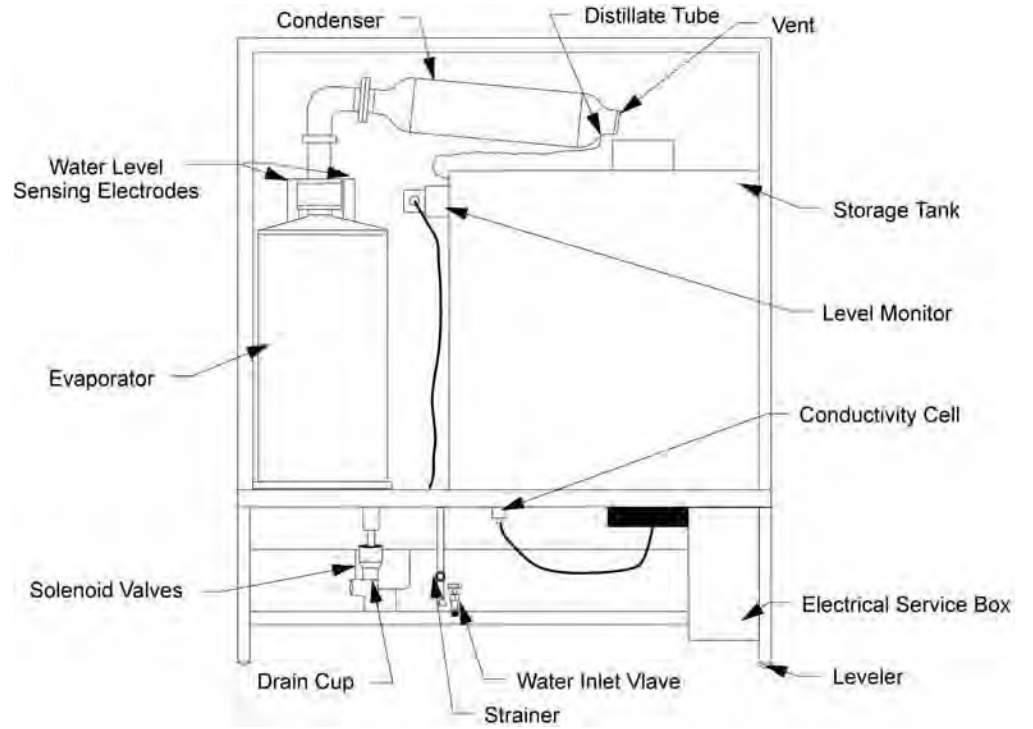


Figure 3-3. Model 525 (A1085) - Internal Rear View

Section 4 Installation

Unpack the Model 525 carefully so that none of the parts will be damaged. Make sure that all parts are removed from the shipping containers before discarding the packing materials.

Location

Move the Model 525 to the desired operating location. Figure 4-1 shows the dimensions of the unit so that adequate space can be provided in the operating location. Level the unit with the levelers provided.

Assembly

If the ultraviolet lamp and a U-shaped trap for the waste line are packaged separately with the Model 525, install these items as follows:

Warning U.V. radiation is harmful to eyes. Lamp must be installed prior to turning on. s

1. Install the ultraviolet lamp as follows (see Figure 7-2 in the Maintenance section):
 - a. Lift the top, black front cover.
 - b. Pry the solid rubber shipping grommet from the storage tank cover, and fit the groove of the new rubber grommet into the hole in the tank cover.
 - c. Insert the ultraviolet lamp protective sheath through the hole in the grommet; lubricate the sheath with distilled water, and twist the sheath as it is being inserted into the grommet.
 - d. Install a lamp in the electrical housing and install the electrical housing in position on the tank cover; secure the housing with the three nuts and washers provided.
 - e. Plug the ultraviolet lamp electrical cord into the lower left-hand outlet in the quadruplex outlet on the electrical control box; the electrical box is located at the left end of the lower panel, inside the cabinet. The ultraviolet lamp cord can be plugged in from the rear of the unit, which is open, or the lower front panel can be removed by removing the two panel screws to gain access.

Assembly (continued)

2. Install the U-shaped trap on the 1-1/4" waste line. Access to the waste line is best gained from the rear of the unit.
3. Ensure that a filter element is installed in the Ventgard filter, as described in the Maintenance section (see Figure 7-1).
4. The distillate tube is shipped separately. Connect the distillate tube to the end of the condenser and also to the water seal.

Connections

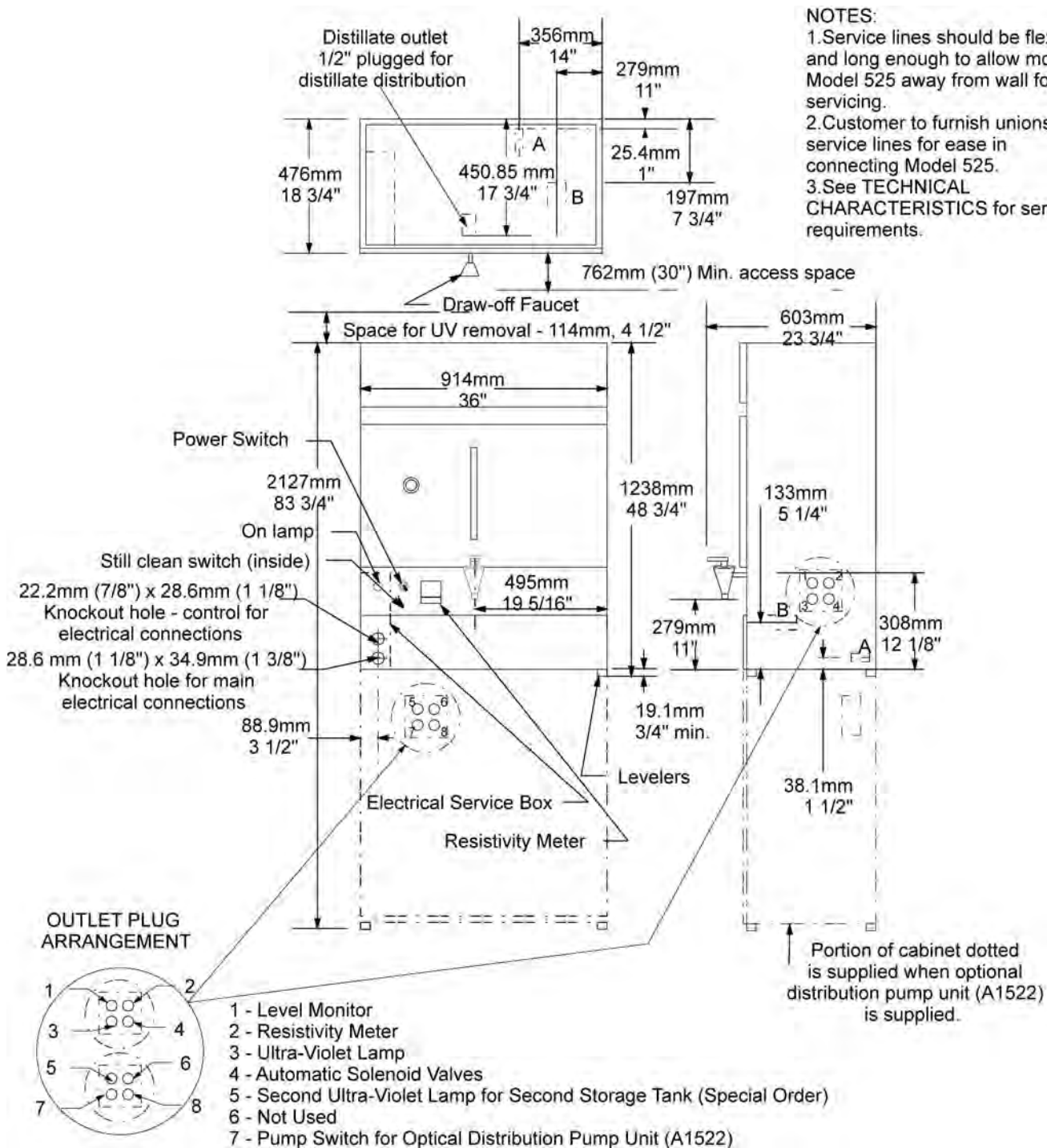
To permit moving the Model 525 away from the wall for servicing, sufficiently long flexible hoses and electrical cable should be used for the external service connections. Make the following connections, using Figures 3-3 and 4-1 as guides:

Warning Use a properly grounded electrical outlet of correct voltage and current handling capacity. Ensure that the equipment is connected to electrical service according to local and national standards. Failure to properly connect may create a fire or shock hazard. s

Caution Ensure that the cabinet is grounded and that the "Power" and "Still Clean" switches are set to OFF. The "Still Clean" switch is located on the side of the electrical box behind the front panel. s

Note If the Model 525 heater circuit is wired to 208VAC, 1-phase, 2 wire or 3-phase, 3 wire electrical service, there will be a 25-percent drop in distillate capacity. The unit will operate properly at ± 5 percent of the voltage listed on electrical box data decal. s

1. Connect the cooling water inlet and waste piping to the service lines. See Figure 4-1 for connection sizes.
 - a. Ensure that the cooling water supply can maintain a minimum pressure of 276 kPa (40 psi) while supplying water at 168 liters (45 gallons) per hour.
 - b. Ensure that the waste line is atmospherically vented and gravity flow.
2. If the Model 525 is equipped with optional distribution pump unit (see Description section), connect the distribution pump to the point of distribution as follows:



| | A - Cooling Water Inlet | B - Waste |
|--------------------------------------|-------------------------|-------------------------|
| Normal Recommended Service Line Size | 3/8" O.D. | 1-3/8" O.D. |
| Actual Pipe Size at Still | 3/8" O.D. Tube Female | 1-3/8" O.D. Tube Female |

Figure 4-1. Component Locations

Connections (continued)

- a. Remove the lower panel on the front of the cabinet.
 - b. Connect tubing to the draw-off faucet header connection shown in Figure 4-1.
 - c. Connect the other end of the tubing to the point of distribution.
3. Wire the electrical service to the Model 525 electrical box, as shown in the wiring schematic. Refer to the data decal on the outside of the electrical box front cover for selecting the proper electrical service for operating the unit.
- a. Use the wiring schematic as a guide when making the electrical connections.
 - b. Make sure that the ultraviolet lamp, the level monitor, the distillate resistivity meter, and the automatic cooling water shut-off and drain valves are plugged into the correct receptacles, as shown in Figure 4-1.

Section 5 Operation

Initial Operation

The first time that the Model 525 is started, or is restarted after cleaning, the following checks and adjustments should be made. See Figures 3-1, 3-2, and 3-3 for the locations of the operating controls and the adjustments.

1. Remove the lower panel of the cabinet by loosening the two captive screws.
2. Ensure that the STILL CLEAN switch is in the OFF position.
3. Shut the storage tank draw-off faucet.
4. Open the manual cooling water valve.
5. Set the POWER switch to the ON position. When the water rises to a sufficient level in the still evaporator, the STILL ON lamp will light.
6. Adjust the deconcentrator (constant bleeder) valve, as described in DECONCENTRATOR ADJUSTMENT in this section.
7. Check all connections for leaks and tighten as required.
8. Allow the still to operate for about thirty minutes.
9. Check the calibration of the DISTILLATE RESISTIVITY (purity) meter, as described in the Maintenance section.
10. Set the ultraviolet lamp switch to the ON position. Check that the lamp is lighted by viewing the lamp through the sight glass port at the left of the distillate level gauge glass.

Warning Ultraviolet radiation is harmful to skin and eyes. View UV lamp through sight glass port only.

11. The STILL ON lamp should go out when the distillate level in the storage tank reaches a point about 16mm (5/8 inch) from the top of the gauge glass. If the still does not shut down at this point, check the operation of the level monitor switch (see Maintenance section).

Initial Operation (continued)

12. Fill and drain the storage tank at least two times to ensure that the tank is cleaned out. This is accomplished through the draw-off faucet to a suitable drain.

Note Step 12 in this procedure is normally performed after the unit has been cleaned as described in the Maintenance section to ensure adequate cleaning. s

13. The Model 525 is designed to produce distillate at the rate of 18.9 liters (5 gallons) per hour. Check the distillate output as follows:
 - a. Set the POWER switch to the OFF position.
 - b. Disconnect the distillate delivery tubing between the condenser and storage tank at the storage tank.
 - c. Loosen the nut securing the distillate delivery tubing to the condenser and swivel the distillate delivery tubing to a position that will allow distillate to issue from the tubing into a beaker at the rear of the unit.
 - d. Tighten the nut to secure the distillate delivery tubing in the new position.
 - e. Place a beaker underneath the open end of the tubing and set the POWER switch to the ON position. The Model 525 should be producing distillate at the rate of 315 ml/min (5 gph).
 - f. When it is found that the still is producing distillate at a satisfactory rate, set the POWER switch to the OFF position and reconnect the distillate delivery tubing between the condenser and storage tank.

Note If the Model 525 has been wired to a 208VAC, 1-phase, 2-wire or 3-phase, 3-wire electrical service, there will be a 25-percent drop in distillate capacity. The unit will produce distillate at the rated capacity at ± 5 percent of the voltage listed on the electrical box data decal. s

14. Install the lower panel on the cabinet and operate the unit as described in NORMAL OPERATION.

Normal Operation

Starting and stopping the Model 525 during normal operation is accomplished as described below.

1. To start the unit:
 - a. Set the POWER switch to the ON position. The STILL ON lamp will light if the distillate level in the storage tank is low and there is a sufficient amount of water in the still evaporator.
 - b. Set the ultraviolet lamp switch to the ON position, if this has not been done already.

Note The ultraviolet lamp should be replaced after 90-days use; see the Maintenance section for directions on replacing the lamp. The Ventgard filter element should be replaced every 60 days, or after 3785 liters (1000 gallons) have been drawn from the distillate storage tank; see the Maintenance section for directions on replacing the Ventgard filter element. s

- c. Note the purity of the distillate in the storage tank, as indicated by the DISTILLATE RESISTIVITY meter. The distillate resistivity meter provides a constant distillate purity indication, automatically, as the distillate leaves the draw-off faucet. The meter scale is calibrated 0-19 ppm (ionizable impurities), with equivalent indications in megohms resistance from .025 to 18, making possible constant monitoring of the water purity.
 - d. If the Model 525 is equipped with an optional distribution pump unit (see the DESCRIPTION section), operate the distribution pump unit as follows:
 - i. Remove the lower panel on the front of the cabinet.
 - ii. Set the pump motor ON/OFF switch to the ON position.
2. Set the pump motor ON/OFF switch to the Off position and replace the lower panel when the storage tank is nearly empty or when the desired amount of distillate has been delivered to the point of distribution.

(continued)

Normal Operation (continued)

3. The Model 525 will start and stop automatically in response to the demands made upon the distillate supply in the storage tank. If the Model 525 is to be shut down completely, proceed as follows:
 - a. Set the power switch to the OFF position.
 - b. If the storage tank is to be drained, set the ultraviolet lamp switch to the OFF position. The storage tank is drained through the draw-off faucet. If the unit is being stopped for servicing, close the cooling water valve.

Deconcentrator Adjustment

The function of the deconcentrator (constant bleeder) is to maintain a minimum concentration of dissolved impurities in the evaporator, thereby reducing to a minimum, scale formation and a tendency to foam. The deconcentrator is adjusted as follows:

- **Permanent Hard Water or Softened Water.** The deconcentrator valve should be left open at all times to bleed water from the evaporator at a rate of approximately 1-1/2 times the capacity of the still. This valve should be left open permanently at the required setting.
- **Temporary Hard Water.** If the feedwater to the evaporator is high in temporary hardness, i.e., high in bicarbonates, the deconcentrator valve should be closed. The reason for this is that bicarbonates in solution tend to precipitate out at temperatures exceeding 65.6°C (150°F). With the deconcentrator valve open, a larger quantity of feedwater passes through the evaporator, precipitating out bicarbonates, increasing the amount of scale formed. Keeping the deconcentrator closed will result in an increased concentration of solids in the evaporator, thereby creating a tendency to foam. This condition is automatically corrected by the unit draining automatically.

Section 6 Theory of Operation

Distillation

The water in the evaporator to be distilled is vaporized by heat transfer from the six electric immersion type heaters. The vapor rises from the evaporator through the "Q" baffle, where it is stripped of any entrained water particles and pyrogenic contaminants. The vapor passes from the "Q" baffle to the condenser, where it is cooled by the cooling water flowing through the condenser tubes to form the distillate. The distillate then flows by gravity from the condenser to the distillate storage tank. In the storage tank, the ultraviolet lamp maintains the sterility of the distillate. The Ventgard filter ensures that only clean air enters the tank to replace the distillate drawn off.

Cooling Water System

The cooling water system consists of the automatic cooling water shut-off valve, the condenser, and the automatic cooling water throttling valve and sensing element.

1. The cooling water is turned on and off by the automatic cooling water shut-off solenoid valve, which is closed when its coil is de-energized. With the POWER switch at ON, and the level monitor switch closed (tank not full), the coil of the solenoid is energized. Energizing the coil opens the valve and allows cooling water to flow. When either the POWER switch is at OFF, or the level monitor switch is open (tank full), the coil is de-energized and the valve is closed by spring action, stopping cooling water flow.
2. The cooling water flowrate is regulated by the automatic cooling water throttling valve, a bellows-operated valve that opens on temperature increase and closes on temperature decrease. The valve is opened and shut by the bellows, which is actuated by its temperature sensing element in the condenser cooling water discharge line.
3. The cooling water enters the condenser to cool the vapors from the evaporator to form the distillate.
4. The cooling water leaves the condenser and passes the sensing element for the automatic cooling water throttling valve. The sensing element is temperature sensitive; it causes the automatic cooling water throttling valve to open or close, in response to cooling water temperature, to maintain the proper cooling water flowrate.
5. The cooling water is then piped to the constant level device. The constant level device maintains the water level in the evaporator. Excess raw (cooling) water entering constant level device overflows to waste.

Drain System

The drain system consists of an automatic drain valve and an interval timer.

1. The drain valve is an automatic solenoid valve that opens when its coil is de-energized. The coil is connected in parallel with the coil of the automatic cooling water shut-off valve (see the wiring schematic), so that the drain valve opens when the water valve shuts. The still will be automatically drained when the water to the still is shut off.
2. The interval timer is a four-hour timer that is factory adjusted (see Figure 7-4). The timer shuts off the water and opens the drain valve once each cycle. The timer allows the still to operate for four hours minus the time required for draining the still. Timer cycles can be readjusted as described in the Maintenance section.

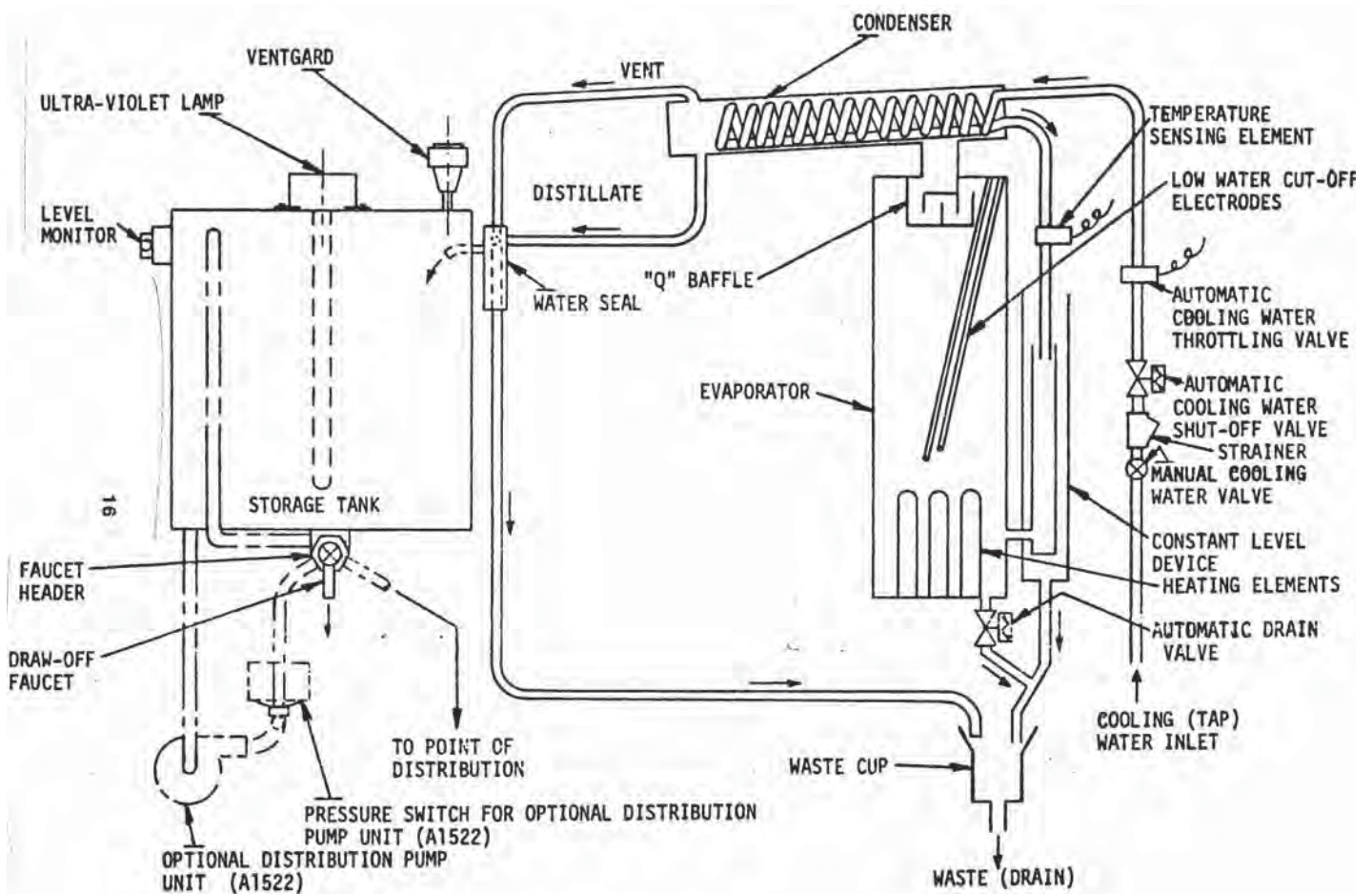


Figure 6-1. Flow Schematic (A1085)

Low Water Cut-Off

Electric current to the still heating elements is controlled by the POWER switch and a self-restoring low water cutoff. If the water level in the still evaporator drops below the safe operating level (below the low water cut-off electrodes), a relay will operate (CR2) to remove current to protect the heating elements against burning out. When the water level rises to make contact with the low water cut-off electrodes, the low water cut-off will allow the heating elements to receive current. The low water cut-off will not reset until the water reaches a safe operating level.

Section 7 Maintenance

This section is included to allow the performance of regular preventative maintenance, as well as light corrective maintenance and trouble shooting of the Model 525 Biopure Distilled Water Center.

Troubleshooting

The troubleshooting charts at the end of this section have been prepared to aid in diagnosing and correcting the more common troubles encountered in the operation of the Model 525.

Ventgard Element Replacement

The chemicals in the filter element have a limited capacity. Therefore, the filter element should be replaced every 60 days, or after 3785 liters (1000 gallons) of distillate have been drawn from the storage tank, whichever comes first. A filter element can be stored almost indefinitely in a cool, dry place, provided its protective packing seal has not been broken. Replace the Ventgard filter element as follows (see Figure 7-1):

1. Remove the top, black front cover from the cabinet.
2. Unscrew the Ventgard upper chamber and remove it from the lower chamber.
3. Remove the gasket from the top of the old filter element. The gasket may be stuck to the inside of the upper chamber.
4. Remove the old filter element. Make sure that the gasket is not stuck to the bottom of the element.
5. Ensure that the internal disc (element seat) is properly installed. The ribbed side of the valve should face upward. Make sure that there is a gasket installed above and below the element seat.

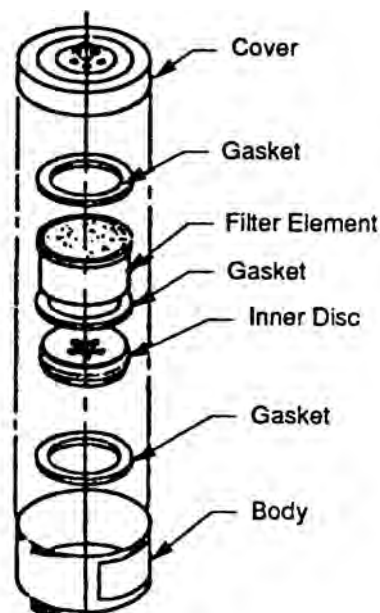


Figure 7-1. Ventgard Element Replacement

Ventgard Element Replacement (cont.)

6. Remove the protective packaging from a fresh filter element, and install the element with the cotton portion facing upward.
7. Install the gasket on top of the filter element.

Note If the gaskets are found to be damaged, replace gaskets. ▲

8. Install the upper chamber on the lower chamber and close the upper cabinet panel.

Ultraviolet Lamp Replacement (cont.)

Continuous operation of the ultraviolet (UV) lamp in the storage tank will require that the lamp be replaced every 90 days.

Warning The ultraviolet lamp is a powerful source of ultraviolet radiation. Never expose the eyes or face to its direct rays. When replacing the lamp, always unplug the lamp to prevent accidental exposure. ▲

Replace the ultraviolet lamp as follows (See Figure 7-2):

1. Remove the top, black front cover from the cabinet.
2. Set the ultraviolet lamp switch to the OFF position and unplug the lamp cord from the convenience outlet.
3. Remove the nuts and washers that secure the electrical housing to the top of the distillate storage tank.
4. Lift the lamp assembly straight up until the lamp is clear of the protective sheath.

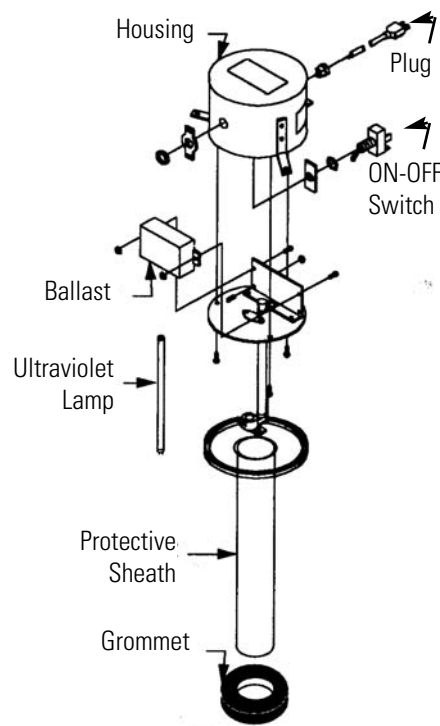


Figure 7-2. UV Lamp Replacement

Ultraviolet Lamp Replacement (cont.)

5. Rotate the lamp 90° to remove the lamp from its socket.
6. Install a new lamp by inserting it into its socket and rotating it 90° to lock it in place.
7. If it is necessary to clean the protective sheath, pull it straight up with a twisting motion to free it from the grommet. Lubricate the sheath with distilled water to facilitate reinstalling the sheath into the grommet.

Note The outer surface of the lamp must be wiped clean with lintless, sterile gauze pads. Any traces of fingerprints, perspiration, etc., must be removed from the lamp because they will reduce its effectiveness. s

8. Reinstall the ultraviolet lamp assembly on the storage tank and plug-in the cord.
9. Reinstall the top cover.

Distillate Resistivity Meter Calibration

Calibrate the meter as follows:

1. Set the POWER switch to the OFF position.
2. Check the zero alignment of the meter needle to the meter scale. If alignment is necessary, rotate the zero adjustment screw on the face of the meter below the scales until the needle is aligned with the line that indicates the beginning of the meter scale. A small screwdriver may be used for this adjustment.
3. To calibrate the meter further: Remove the bottom panel of the Model 525 cabinet. Remove the wires that connect the meter to the conductivity cell in the draw-off faucet header. Connect a known resistance across the cell terminals on the bottom of the meter. A 500k-ohm resistance is provided in the meter circuit (see the wiring schematic). By adding a resistance of 500kohms to the circuit, a reading of 1 megohm should be indicated on the meter scale.
4. If a resistance of 1-megohm is not indicated on the meter scale, set the POWER switch to the ON position and, with a screwdriver, adjust the potentiometer on the bottom of the meter to make the meter reading correspond to the simulated resistance.

Cooling Water Valve Adjustment

When the Model 525 is being operated to produce the rated distillate output (as described under INITIAL OPERATION), just a puff of steam should be issuing from the condenser vent, detectable at the water seal. If too much steam is issuing from the vent, cooling water flow through the condenser must be increased. To increase cooling water flow, adjust the automatic cooling water throttling valve as follows:

Note The condenser vent outlet is connected by tubing to the top connection (overflow) on the water seal on the storage tank. Steam flow from the condenser vent can be observed at this point. ▲

1. To lower the opening point (allow more water to flow), turn the adjusting screw on top of the valve clockwise. The closing point is not adjustable; the valve closes at approximately 2°C (3° to 5°F) below the opening point.
2. After adjusting the valve, check to see that just a puff of steam is issuing from the condenser vent (see Note above).

Cooling Water and Drain Valves

These valves are similar in construction and operation, so their maintenance is discussed jointly.

Solenoid Temperature

When the solenoid is energized for an extended period, the solenoid enclosure becomes hot and can be touched by hand only for an instant. This is a safe operating temperature. Excessive heating will be indicated by smoke, and the odor of burning coil insulation.

Cleaning

A periodic cleaning of the solenoid valves is both desirable and necessary. The time between cleanings will vary, depending upon service conditions. In general, sluggish valve operation or excessive leakage will indicate that valve cleaning is required. A noisy or inoperative solenoid valve is usually caused by foreign matter preventing the valve from seating properly. Disassemble the valve for cleaning in accordance with the instructions given below.

Coil Replacement

New coils are available from Thermo Scientific; order by their proper part number (01124 for the 1/2-inch drain valve, and 01121 for the 1/4-inch cooling water valve). Before disassembling the solenoid, set POWER and STILL CLEAN switches to the OFF position, shut off the cooling water supply, and disconnect the coil lead wires. Then proceed as follows (See Figures 7-3 and 7-4):

Note To maintain distillate sterility, do not draw any distillate from the storage tank while the valves are being serviced. The ultraviolet lamp is de-energized while the POWER switch is in the OFF position. s

For the 1/4-inch cooling water valve (Part No. 01417):

1. Remove the retaining clip (red hat) and slide the housing off the solenoid base sub-assembly.
2. Slide the spring washer and the coil off the solenoid base sub-assembly and replace the coil with a new one.
3. Reassemble the spring washer, housing, and retaining cap.

For the 1/2-inch drain valve (Part No. 01418):

1. Remove the retaining clip (red hat) and slide the housing sub-assembly off the core assembly.
2. Separate the halves of the housing, remove the coil, and replace with a new one.
3. Reassemble the housing, sub-assembly, and retaining clip.

Valve Disassembly and Reassembly

A spare parts kit is available for each size of valve. These kits contain the parts identified by asterisks (*) in Figures 8 and 9. Order the kits by their part numbers; 01125 for the 1/4-inch cooling water valve, and 01130 for the 1/2-inch drain valve. Before disassembling the valve, set the POWER and STILL CLEAN switches to the OFF position, shut off the cooling water supply, disconnect the coil leads, and remove the valve from the piping. Remove the coil as described above, and proceed as follows: (See Figures 7-3 and 7-4):

Valve Disassembly & Reassembly (cont.)

For the 1/4-inch cooling water valve:

1. Remove the solenoid base subassembly from the bonnet with an end wrench. Be careful not to lose the core spring from the end of the core assembly. The bonnet gasket can now be removed if it is to be replaced.
2. Remove the four screws that hold the bonnet and diaphragm-core assembly to the body; separate these three parts. The body gasket can now be removed if it is to be replaced.
3. After thoroughly cleaning and replacing any damaged or worn parts, reassemble in the reverse order.

For the 1/2-inch drain valve:

1. Remove the solenoid base subassembly from the bonnet with an end wrench. Be careful not to lose the core spring from the end of the core assembly. The bonnet gasket can now be removed if it is to be replaced.
2. Remove the spring retainer and core spring.
3. Remove the two screws that secure the pipe adapter to the body and separate these two parts. The adapter gasket can now be removed if it is to be replaced.
4. Remove the disc spring and disc guide.
5. Remove the core-disc subassembly and push out the seat and seat gasket.

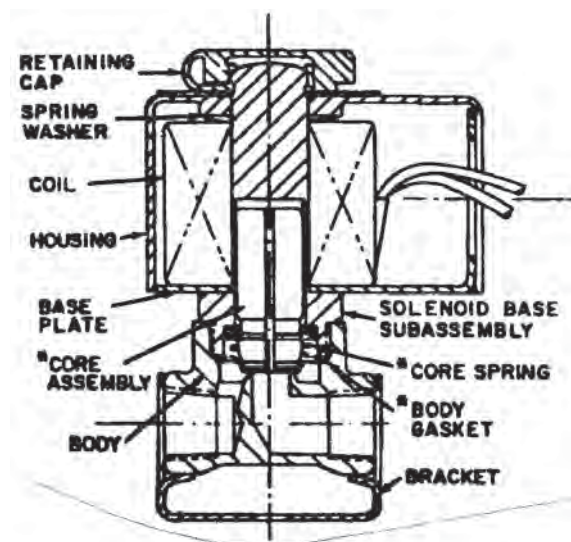


Figure 7-4. Automatic Cooling Water Shut-Off Valve

Valve Disassembly & Reassembly (cont.)

- After thoroughly cleaning the parts, and replacing any damaged or worn parts, reassemble the valve in the reverse order of the above steps.

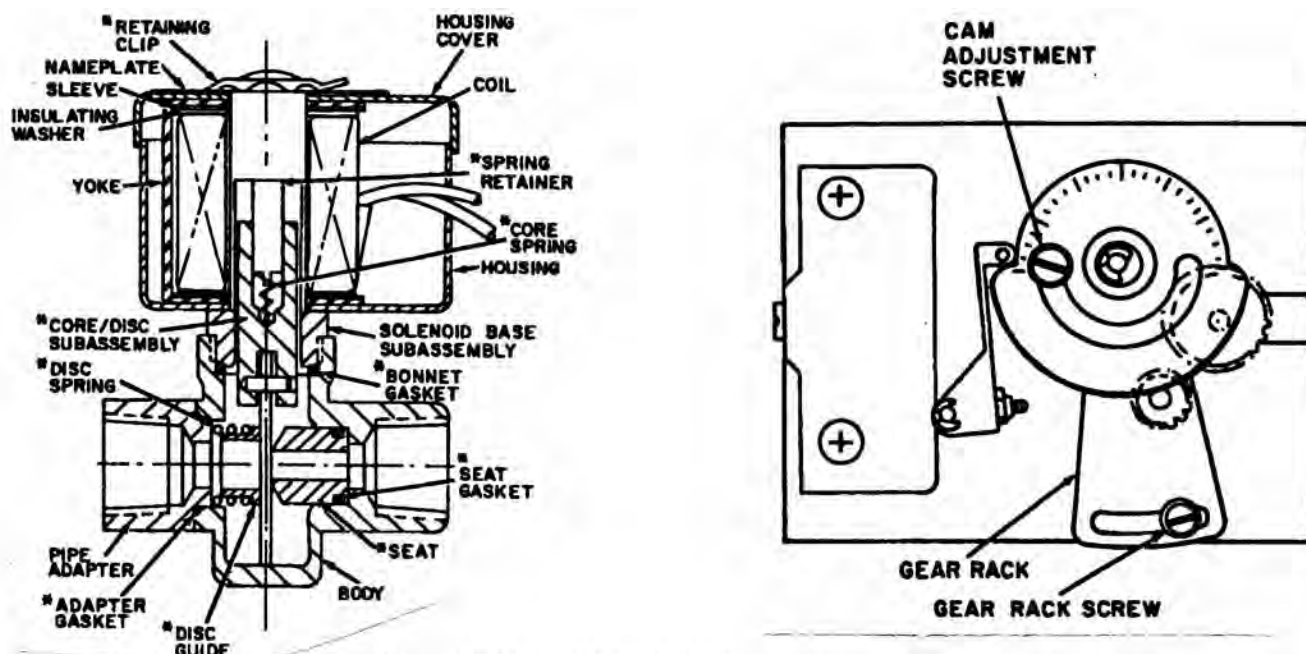


Figure 7-5. Automatic Drain Valve and Interval Timer

Interval Timer

As stated in the Theory of Operation Section, automatic, periodic draining of the still is accomplished by the interval timer (see Figure 7-5). The timer is a four-hour timer, and is adjusted at the factory for the correct drain duration. With the four-hour timer, the still will operate for four hours minus the time required to drain the still. Hard water conditions or excessive scale formation may dictate shorter timing cycles. If a different timing cycle is desired, the present gear rack can be substituted for a gear rack with a different timing cycle. The timer is limited to a minimum two-hour timing cycle gear rack, or a maximum eighteen-hour timing cycle gear rack. If drain duration adjustment is necessary, proceed as follows:

- Loosen the cam adjustment screw.
- Rotate the top cam to the desired position. The recommended adjustment is at the first calibration (equal to 2-1/2 percent of the total timing cycle, or a six-minute draining period with the four-hour timer).
- Tighten the cam adjustment screw.

Interval Timer (continued)

If gear rack replacement is necessary, proceed as follows:

1. Remove the gear rack screw and washer.
2. Remove the old gear rack and install the new gear rack.

Note To prevent binding of the gear, ensure that there is a slight amount of gear play before tightening of the gear rack screw. s

3. Replace and tighten the gear rack screw.

Level Monitor

There are no adjustments to be made to the level monitor. It is simply a mechanical float-and-switch device. The float rises on high water level, actuates the switch, which breaks the electrical circuit to the still when the storage tank is full. If the level monitor fails to function properly, replace the entire unit.

Cleaning Methods

Cleaning requirements fall into two categories: scale removal and biological cleaning. Scale removal can be accomplished either chemically or mechanically. Biological cleaning is accomplished with an isopropyl alcohol solution. The various methods of cleaning are described in the following paragraphs.

Warning This device is to be used with water feeds only. Sanitizing/cleaning agents must be used in compliance with instructions in this manual. Failure to comply could result in explosion and personal injury.

Wear eye and hand protection when using acid for cleaning, as acid spattering may occur.

Carefully follow manufacturer's safety instructions on labels of chemical containers and material safety data sheets.

Note A 10-percent solution of sulfamic or acetic acid can be substituted for the HCl if desired. Sulfamic and acetic acids have an advantage over HCl in that they will not corrode any metal parts contacted.

Caution Under no circumstances should any acid cleaner be allowed to come in contact with tinned surfaces. All surfaces that contact the purified steam and distillate, such as the "Q" baffle, the distillate side of the condenser, and the distillate transmission piping, are tinned.

Note Observe the steam at the overflow connection on the water seal. The condenser vent is piped to this connection.

Cleaning Methods (continued)

Soft Scale Removal. Soft scale can be removed with a stiff bristle brush. After cleaning, all scale particles should be flushed out with water.

Hard Scale Removal. Hard scale can be removed by using a 10-percent solution of inhibited hydrochloric acid (HCl). This acid cleaner is available commercially, or can be prepared by using 20 parts water to 6 parts 30-percent HCl. When using the acid cleaner, do not allow the acid to remain in contact with the part for more than 20 minutes. Flush the part thoroughly after using the acid cleaner. A 5-percent sodium bicarbonate solution can be used to flush off any remaining acid from the part.

Silica Scale Removal. Silica scale is very hard and cannot be removed with acid or detergent solutions. Silica scale can be removed with a blunt instrument.

Organic Scale and Sludge Removal. If the scale is of dark brown or black color, it could have been formed from organic impurities present in the water. Remove this type of scale with a strong detergent solution. The detergent solution should be allowed to contact the scale or sludge for 24 hours. Rinse the parts with water after cleaning.

Biological Cleaning. Biological cleaning is used on parts that contact the distillate, such as the distillate side of the condenser and the distillate transmission piping. To remove biological contamination from these parts, proceed as follows:

1. Immerse the affected part in a one-percent isopropyl alcohol solution overnight. Do not rinse the part with water after cleaning.
2. After the Model 525 is reassembled and operating, reduce the cooling water flowrate until steam issues from the condenser vent at least 305mm (12 in.). Operate the still in this manner for a period of 30 to 60 minutes. Ventilate the room during this operation.

Disassembly for Cleaning

The frequency of cleaning cycles will depend on the purity of water being used in the evaporator. The 525 should be inspected frequently until cleaning intervals can be determined. Disassemble, inspect, and clean the unit as follows:

Note To maintain distillate sterility, do not draw any distillate from the storage tank while the unit is being serviced or cleaned. The ultraviolet lamp is deenergized when the POWER switch is in the OFF position. s

Disassembly for Cleaning (continued)

1. Set the POWER switch to the OFF position. The evaporator drain valve will open and allow the evaporator to drain.
2. Shut the manual cooling water shut-off valve.
3. When the still evaporator is drained, set the STILL CLEAN switch to the ON position. This will energize the solenoid valve circuit, closing the drain valve.
4. Remove the condenser from the cabinet by disconnecting all tubing from the condenser, disconnecting the low water cutoff electrical leads from the electrode assemblies by pulling the lead clips up from the electrode assembly terminals, and removing the six wing nuts securing the evaporator cover to the evaporator. The condenser and evaporator cover - "Q" baffle assembly can now be removed from the still as one assembly.
5. Inspect the electrode assemblies for scale and clean as required.
6. Inspect the cooling water side of the condenser for scale, and clean as required.
7. Inspect the distillate side of the condenser, and clean as required. See "Biological Cleaning" in this section.
8. Inspect the interior of the evaporator, and the heating elements inside the evaporator, and clean as required.
9. Remove hard or organic scale from the inside of the evaporator as follows:
 - a. Break the union between the constant level device and evaporator, and install a blank plug in the half-union, and reconnect the union.
 - b. Ensure that the manual cooling water shutoff valve is closed, and the STILL CLEAN switch is in the ON position. This will stop the still and energize the drain valve solenoid, causing the valve to shut. This will prevent the acid cleaner (Step c below) from draining from the still.
 - c. Fill the evaporator with acid cleaner (refer to the paragraph on "Hard Scale Removal", above) or detergent solution (refer to the paragraph on "Organic Scale and Sludge Removal" above) as required.
 - d. Install a blanking plate over the top of the evaporator.

Disassembly for Cleaning (continued)

Note Soft scale and silica scale can be removed as described previously in the paragraphs on "Soft Scale Removal" and "Silica Scale Removal." s

10. Inspect the constant level device, trap assembly, bleeder cup and other drain piping, and clean as required.
11. Unscrew the deconcentrator valve knob until the valve stem is removed. Inspect and clean the interior of the deconcentrator valve as required. Replace the O-ring, part number 06162, if required.
12. Inspect all tubing leading to and from the condenser, and clean as required.
13. Reassemble the Model 525 and start the still, as indicated in the Operation section. If it is found after operating the still and filling the tank with the newly produced distillate that the purity of the distillate drawn off through the draw-off faucet is unsatisfactory, stop the still, drain the storage tank through the draw-off faucet, and clean the inside of the storage tank. This is accomplished as follows:
 - a. Remove the nuts securing the cover to the storage tank, and remove the cover.
 - b. Clean the inside surfaces of the tank and cover first with a mild detergent and distilled water. It is not necessary to heat the distilled water.

Caution Always use distilled water for cleaning and rinsing. Raw water will defeat the purpose of cleaning and will attack the tinned surfaces of the tank. s

- c. Rinse the tank and cover surfaces with distilled water.
- d. Drain the cleaning solution and rinse water through the draw-off faucet and distribution piping to clean these components.
- e. After cleaning with detergent and rinsing, use isopropyl alcohol and thoroughly sponge the inside surfaces of the tank and cover. Expose the surfaces to the solution overnight. Then thoroughly rinse the tank and cover again with distilled water.
- f. Install the cover on the storage tank and secure it in place with the nuts provided.

Note After the cleaning procedures have been accomplished, ensure that the blanking plate and plug are removed from the unit, that the cooling water valve (manual) is open, and that the STILL CLEAN switch is set to the OFF position. s

Condenser Test for Scale

Test the condenser for scale as follows:

Note Observe the condenser vent steam at the water seal on the storage tank. s

Warning This device is to be used with water feeds only. Sanitizing/ cleaning agents must be used in compliance with instructions in this manual. Failure to comply with the above could result in explosion and personal injury. s

Wear eye and hand protection when using acid for cleaning, as acid spattering may occur.

Carefully follow manufacturer's safety instructions on labels of chemical containers and material safety data sheets.

1. Adjust the automatic cooling water throttling valve until just a puff of steam issues from the condenser vent. Insure that a minimum cooling water pressure of 276kPa (40 psi) is applied to the unit.
2. If the rated distillate output of the still cannot be maintained with just a puff of steam issuing from the condenser vent and cooling water at full flow. the condenser is probably scaled and in need of cleaning. Remove the condenser and clean as described in Step d, below.
3. Set the POWER switch to the OFF position.
4. Refer to the paragraph on Hard Scale Removal, above, for the recommended types of acid cleaning solutions. Slowly pour an acid cleaning solution into the cooling water side of the condenser through a funnel inserted into one of the cooling water connections. Connect the other cooling water connection to a drain.

Caution Do not add the acid cleaning solution rapidly. If any bicarbonate scale is present, gas will be released in considerable amounts. Allow the solution to remain in the condenser for 15 to 20 minutes, then drain. Wash the interior of the condenser thoroughly after using the acid cleaning solution. Under no circumstances should the acid cleaning solution be allowed to enter the tinned (Distilled Water) side of the condenser. s

Note It is advisable that if a low velocity pump capable of recirculating acid is available it should be used to recirculate acid through the condenser until it quits foaming. Rinse with cold water when finished. s

Note The condenser cannot be repaired and must be replaced as a unit. s

5. Install the condenser on the evaporator.

Test for Condenser Leaks

1. Set the POWER switch to the OFF position and remove the condenser from the still.
2. Attach an air hose to one of the condenser cooling water connections and plug the remaining connection.
3. Apply about 34.5kPa (5 psi) of air pressure to the condenser.
4. Submerge the entire condenser in a tank of water. If any air bubbles come from the condenser, replacement is necessary.

Heating Element Test and Replacement

Whenever a heating element is suspected of not operating properly, test and, if necessary, replace a heating element as follows:

1. Set the POWER switch to the OFF position.
2. Remove the heater covers directly below the evaporator and disconnect the electrical leads and bus bars from the heating element terminals. Tag the leads to facilitate reassembly.
3. To test each heating element for an open circuit, apply a current across the terminals. Use a test light in series with the applied current. If the test light does not light, the heating element is burned out. Mark all damaged heating elements.
4. To test each heating element for a short circuit, connect one test lead to the evaporator bottom and the other to each terminal (one at a time). If the heating element is short circuited, the test light will light. Mark all damaged heating elements.
5. Disconnect all tubing from the condenser.
6. Disconnect the low water cut-off electrical leads from the electrode assemblies by pulling the lead clips up from the electrode assembly terminals.
7. Remove the six wing nuts securing the evaporator cover to the evaporator. The condenser evaporator cover - "Q" baffle assembly can now be removed from the still as one assembly to gain access to the heating elements inside the evaporator.
8. Inspect the heating elements inside the evaporator. Warped or split elements should be replaced.

Heating Element Test & Replacement (cont.)

9. To remove an inoperative or damaged heater, loosen the screw under the heater and push out the heater. If the heater is badly scaled, remove the retaining nut and rock the heater back and forth (from inside the evaporator) to break the scale.
10. Install a new heater in place of the old heater. Tighten the screw only enough to hold the heater in place. This will allow you to rotate the heater when installing the bus bars.
11. Install the bus bars and wiring between heater terminals. Retighten the heater retaining screws to eliminate the possibility of leakage.
12. Add water to the evaporator by hand to ensure that none of the heating elements are leaking. Plug any openings in the evaporator to accomplish this.
13. Reassemble the heater covers and condenser on the still.

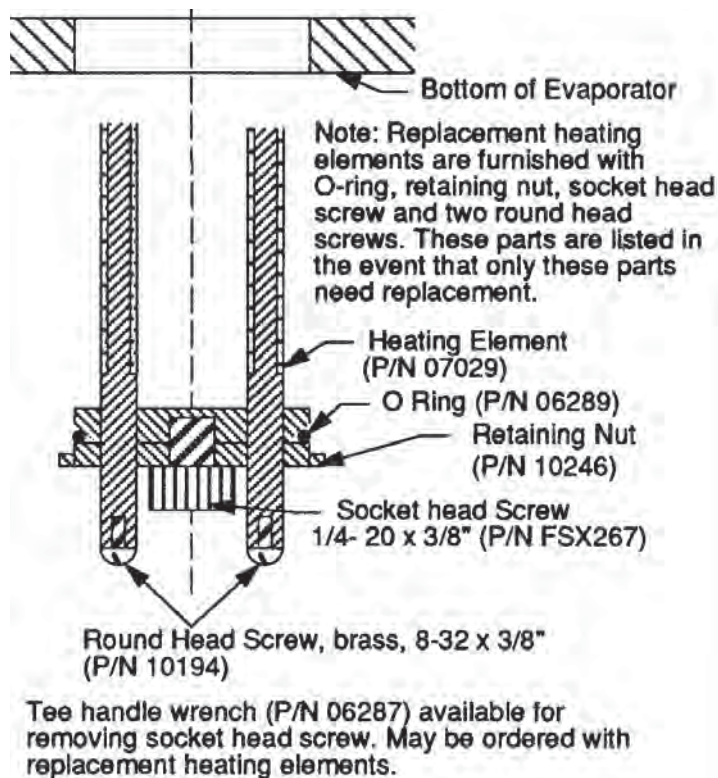


Figure 7-6. Heating Element Replacement

**This heating element (Part Number 07029) is used on units wired for the four electrical services shown on wiring schematic. Any other electrical services require special heating*

Water Strainer Cleaner

Maintenance of the strainer at the cooling water inlet (located just after the water shut-off valve) consists of cleaning the wire mesh strainer periodically as follows:

1. Set the POWER switch to the OFF Position.
2. Shut off the water shut-off valve.
3. Remove the plug that holds the strainer in the body and remove the strainer.
4. Thoroughly flush the wire mesh with water and reassemble.

Pump Shaft & Rotary Seal Replacement

If your unit has the optional distribution pump unit, the impeller shaft and rotary seal can be replaced as follows:

1. Disconnect the piping from the pump at the unions.
2. Unplug the pump and pressure switch cords from the convenience outlet receptacles.
3. Remove the four screws, nuts, and washers securing the pump to the pump support, and remove the pump-pressure switch assembly from the pump support. Support the pump while the pump is being disconnected from the pump support to prevent it from dropping and damaging the pressure switch.
4. Remove the six cover screws (1) that secure the cover (2) to the pump body.
5. Remove the cover (2) and gasket (4) and discard the gasket.
6. Loosen the socket head (or square head) Set screw (5), and remove the impeller (6).
7. Remove the seal load spring (7), spring retainer (8), and the seal head from the shaft extension (11).
8. Carefully slide the pump body (3) with pressed-in rotary seal insert and seal seat (10) from the shaft.
9. Carefully push seal seat (10) from the seal insert (12).

Pump Shaft & Rotary Seal Repl. (cont.)

Carefully inspect the shaft extension for scoring or worn conditions at the packing area. If the shaft extension shows any signs of damage, replace the shaft extension as follows:

1. Hold the motor shaft and turn the shaft extension clockwise to unscrew the shaft extension from the motor shaft. Remove the slinger ring.
2. Install the replacement extension shaft to the motor shaft, turning the extension shaft until the shoulder bottoms on the motor shaft. Reinstall the slinger ring.

Note It is important to inspect the replacement shaft for runout. A maximum dial indicator reading of 0.003" TIR (total indicated reading) is permissible at the impeller end of the shaft extension. The shaft may be trued by very gently tapping close to the slinger ring. Extensive shaft runout will damage the seal and cause leaks. Make sure that shaft runout is within the 0.003" TIR limit before reinstalling the seal and impeller. s

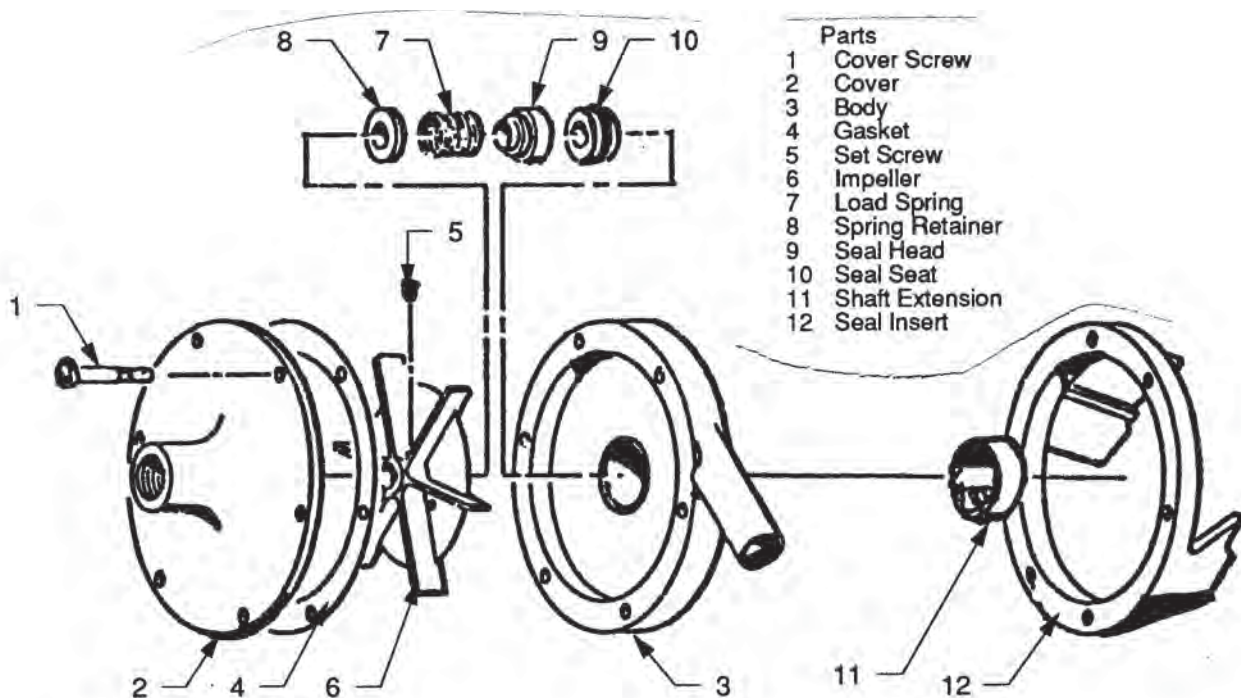


Figure 7-7. Distribution Pump Shaft and Rotary Seal

Pump Shaft & Rotary Seal Repl. (cont.)

The rotary seal is replaced in the reverse order of disassembly.

Proceed as follows:

1. Install the new seal seat (10) into the seal insert (12), and install the pump body (3) onto the shaft adapter.
2. Wet the shaft extension with water. Wipe the lapped face of the new seal head (9) with a clean, soft, lint-free cloth, and push the seal head onto the shaft until the lapped face contacts the mating face of the seal seat (10).
3. Install the new seal load spring (7) and spring retainer (8).
4. Install the impeller (6) to the shaft extension, making sure that there is 0.020" to 0.025" clearance between the impeller and the pump body wall. Secure the impeller in place with the set screw (5).
5. Coat both sides of the new gasket (4) with a non-contaminating gasket compound, and position the gasket on the pump body.
6. Install the cover (2); install the six screws (1) and tighten evenly all around.

Pressure Switch

If you have the optional distribution pump, the normally open pressure switch is installed at the discharge side of the pump to protect the pump from damage by operating dry in the event the storage tank is emptied. The pressure switch is adjusted properly with the pump stopping when the distillate level in the storage tank gauge glass is 12.7mm (1/2 inch). Adjust the pressure switch as follows:

Caution Do not exert any downward pressure on the adjustment screw. A more accurate adjustment can be accomplished if a small wrench is used instead of a screwdriver. s

1. With the system operating, remove the cover from the pressure switch and adjust the pressure switch. To raise the shut-off point, rotate the adjustment screw counter-clockwise. To lower the shut-off point, rotate the adjustment screw clockwise. The adjustment is very sensitive and will require very little rotation of the adjustment screw. For example: 1/16 of a turn will change the adjustment by 31.8mm (1-1/4 inches).

Pressure Switch (continued)

2. With the pump motor ON/OFF switch set to ON, the pump should shut off at the 12.7mm (1/2 inch) distillate level, as indicated above. Install the pressure switch cover when the correct adjustment is made.

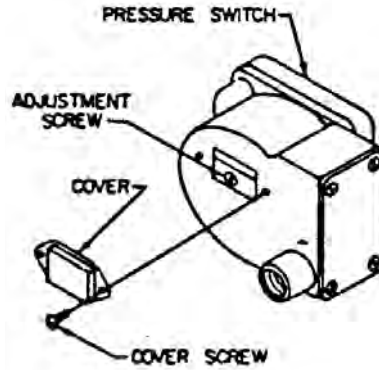


Figure 7-8. Pressure Switch Adjustment

Section 8 Troubleshooting

| Problem | Probable Cause | Test and Remedy |
|--|--|--|
| Model 525 will not start. | Storage tank full. | Drain storage tank to level monitor cut-in point. Check level monitor and replace if condition cannot be corrected. |
| | No electrical power to control circuit. | Make sure main circuit breakers in supply are on. If they are on and trouble still exists, notify plant electrician. |
| | | Check POWER switch, and replace if faulty. |
| | | Check interval timer microswitch and replace if faulty. |
| Interval timer in drain cycle. | Wait a sufficient amount of time to complete drain cycle. See INTERVAL TIMER in Maintenance section. | |
| Model 525 starts but will not produce distillate. | Inadequate cooling water supply. | Check the manual shut-off valve in cooling water inlet piping is open. |
| | Malfunction in automatic drain valve. | Check automatic cooling water shut-off valve, and clean or repair as required. |
| | | Check that drain valve is shut and not leaking. Clean and repair per instructions in Maintenance section. |
| | | No electrical power to heater circuit. |
| Ensure that leads are connected to low water cut-off electrode assembly terminals. | | |
| Model 525 will not stop. | Storage tank empty. | Check tank for leaks, and repair or replace. |
| | Malfunction in Level Monitor. | Check Level Monitor. Replace if condition cannot be correction. |
| | Malfunction in Automatic Cooling Water Shut-Off Valve. | Check automatic shut-off valve and clean or repair as required. |

Section 8
Troubleshooting

| Problem (cont.) | Probable Cause (cont.) | Test and Remedy (cont.) |
|---|--|---|
| Model 525 will not drain. | Evaporator drainline clogged. | Inspect automatic drain valve and drain line for obstructions or dirt. Clean and/or replace as required. |
| | Interval timer motor not operating. | Check wiring to motor. Check timer adjustment in accordance with instructions in Maintenance section. |
| Drop in distillate purity. | Dirty evaporator. | Inspect evaporator for scale and clean as required. See CLEANING METHODS and DISASSEMBLY FOR CLEANING. |
| | Distillate resistivity meter out of calibration. | Calibrate meter. If meter does not calibrate, return to factory for repair or replacement. |
| | Volatile impurities in feedwater. | Test distillate for CO ₂ , O ₂ , etc. Reduce cooling water flow to help eliminate volatiles from condenser. |
| Pyrogenic or organic contamination of distillate. | Dirty evaporator. | Inspect evaporator for excess scale and clean as required. |
| | Leak in condenser. | Test condenser for leaks and replace if required. |
| | Bacteriological growth in distillate system. | Inspect the suspected parts and clean as required. See CLEANING METHODS and DISASSEMBLY FOR CLEANING. |
| Drop in distillate capacity. | Excessive scale on heating elements. | Inspect heating elements and clean as required. See HEATING ELEMENT TEST AND REPLACEMENT. |
| | Leak in automatic drain valve. | Repair or replace automatic drain valve. |
| | Low cooling water pressure. | Check water pressure and increase as required. |
| | Damaged or inoperative heating elements. | Check wiring, connections, etc. Test heating elements and replace if necessary. |

| Problem (cont.) | Probable Cause (cont.) | Test and Remedy (cont.) |
|--|---|---|
| Water blowing from condenser. | Condenser leaking. | Test condenser for leaks and replace if necessary. |
| | Trapped distillate line. | Inspect distillate lines for any restriction or trapping and clear as required. |
| Steam blowing from condenser. | Low cooling water flow rate. | Readjust automatic cooling water throttling valve. |
| | Low cooling water pressure. | Check cooling water pressure and increase as required. |
| | Excess scale in condenser. | Test condenser for scale and clean as required. |
| Improper operation of automatic cooling water shut-off valve or drain valve. | Faulty control circuit. | Check electrical system by energizing valve solenoid. A metallic click indicates solenoid is operating. Absence of click indicates loss of power supply. |
| | Burned-out coil. | Check for open-circuited coil and replace if required. |
| | Low voltage. | Check voltage across coil leads. Voltage must be at least 85 percent of nameplate rating. If voltage is too low, notify plant electrician. |
| | Incorrect pressure. | Check valve pressure. Pressure must be within range specified on valve nameplate. If pressure is incorrect, notify plant maintenance personnel. |
| | Excessive leakage. | Disassemble valve and inspect internal parts. Clean all parts and remove any dirt in the piston holes. Replace parts that are worn or damaged with complete spare parts kit for best results. |
| Model 525 starts but will not deliver distillate to the point of distribution. | Draw-off faucet plugged. | Clean storage tank and clean or repair draw-off faucet. |
| | Pump motor burned out. | Repair or replace the pump. Also, see PUMP IMPELLER SHAFT AND ROTARY SEAL REPLACEMENT. |
| | Faulty pump motor ON/OFF switch. | Replace the pump motor ON/OFF switch. |
| | Pressure switch will not operate to start pump. | Adjust pressure switch. Replace pressure switch if found to be faulty. |

Section 9 Parts List

This section contains Parts List information for the Model 525 Biopure Distilled Water Center. When ordering parts, be sure that the proper part number and quantity are specified. Also, provide the serial number and catalog number (A1085) of the equipment. The serial number will be found on the data decal on the outside of the front cover of the electrical service box.

Recommended Spare Parts List

| Part No. | Description | Quantity |
|----------|-----------------------------------|----------|
| 04181 | Ballast, Ultraviolet Lamp | 1 |
| 21566 | Cell, 1.0 constant | 1 |
| 01439 | Contact, 60 amp, 3 pole | 1 |
| 21652 | Electrode, Long | 1 |
| 21653 | Electrode, Short | 1 |
| L1900 | Faucet, tin lined, 3/8" | 1 |
| 01024 | Gasket, Electrode | 2 |
| 06272 | Gasket, Evaporator Cover | 1 |
| 06480 | Gasket, Tank Cover, 1/8" neoprene | 1 |
| 07029* | Heating Unit, Type P, 2160W, 120V | 6 |
| 04163 | Lamp, Socket, red | 1 |
| 04141 | Lamp, Ultraviolet | 1 |
| 33050 | Level Monitor | 1 |

Recommended Spare Parts List (continued)

| Part No. | Description | Quantity |
|-----------------|--|-----------------|
| 01398 | Pump, "A" Size, 115V, 60Hz, 1 phase | 1*** |
| 01030 | Relay, 110V | 1 |
| 04201 | Starter, Ultraviolet Lamp | 1 |
| 02118** | Strainer, brass, 1/4" | 1 |
| 01076 | Switch, Pressure, 110V, 1/4" | 1*** |
| 04153 | Switch, SPST, 3 amp, 250V | 1 (2***) |
| 01038 | Timer, 115V | 1 |
| 01119 | Valve , Solenoid, drain, 2-way, 1/2" | 1 |
| 01114 | Valve , Solenoid, water, 2-way, 1/4" | 1 |
| 25005 | Valve Flapper, Water Seal | 1 |
| 21272 | Valve, Bleeder | 1 |
| 02071** | Valve, Globe, needle, 1/4", brass | 1 |
| 01068 | Valve, Temperature regulating, direct acting, 3/8" | 1 |
| 25001 | Ventgard Filter Element | 1 |
| 25002 | Ventgard Gasket | 3 |
| 25004 | Ventgard Valve, Rubber Check | 3 |

**This heating unit (Part Number 07029) is used on units wired for the four electrical services shown on wiring schematic. Any other electrical services require special heating unit.*

***Standard hardware item. Can be purchased locally.*

****Recommended if optional distribution pump has been installed.*

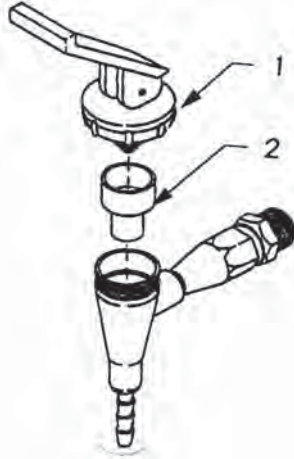


Figure 9-1. Faucet

Faucet Parts List

| Index No. | Description | Part No. |
|-----------|-------------|----------|
| | Faucet | L1900 |
| 1 | Handle | 02101 |
| 2 | Seat Cup | 02006 |

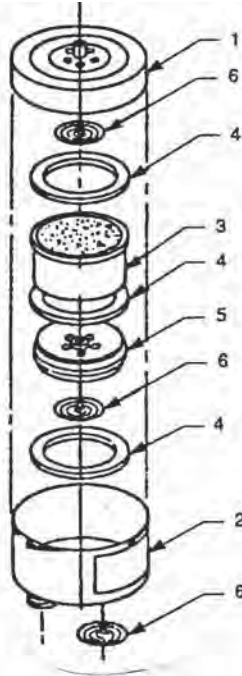


Figure 9-2. Ventgard

Ventgard Parts List

| Index No. | Description | Part No. |
|-----------|---------------------|----------|
| | Ventgard | H3120 |
| 1 | Upper Chamber | 25012 |
| 2 | Lower Chamber | 25011 |
| 3 | Filter Element | 25001 |
| 4 | Gasket | 25002 |
| 5 | Internal Disc | 25010 |
| 6 | Valve, Rubber Check | 25009 |

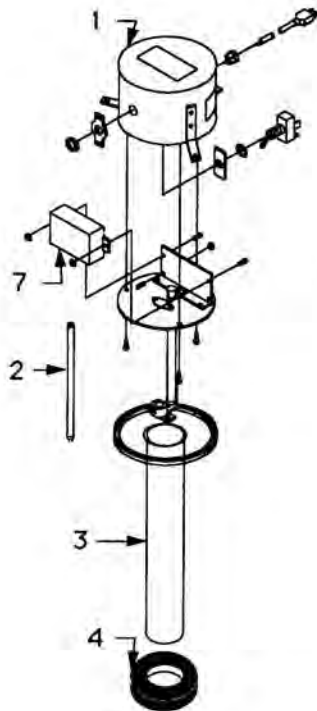


Figure 9-3. Ultraviolet lamp

Ultraviolet Parts List

| Index No. | Description | Part No. |
|-----------|------------------------------------|----------|
| | Ultraviolet Lamp | H4005 |
| 1 | Lamp Assembly, 50/60Hz | 04139 |
| 2 | Lamp | 04141 |
| 3 | Tube (Sheath) | 04140BI |
| 4 | Grommet | 06137 |
| 5 | Nut, Machine Head, brass #10-24UNC | 10046* |
| 7 | Ballast | TN657X1A |

*Standard hardware item. Can be purchased locally.

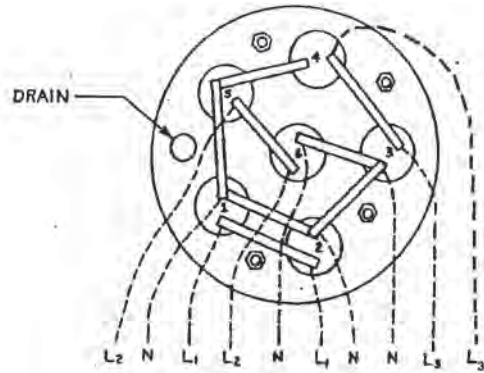
Ordering Procedures

Refer to the Specification Plate for the complete model number, serial number, and series number when requesting service, replacement parts or in any correspondence concerning this unit.

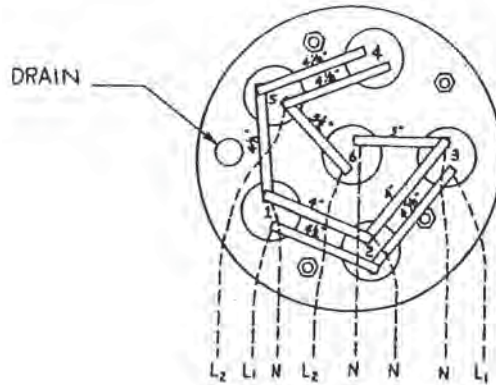
All parts listed herein may be ordered from the Thermo Scientific dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed, check first with your dealer. If the dealer cannot process your request, then contact our Technical Services Department.

Prior to returning any materials to the manufacturer, please contact our Customer Service Department for a “Return Goods Authorization” number (RGA). Material returned without a RGA number will be refused.

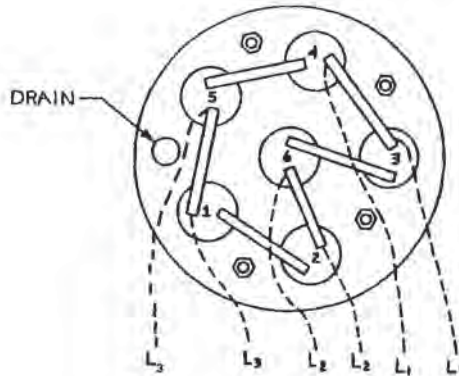
Section 10 Wiring Diagrams and Exploded Views



120/208 VAC, 3 phase, 4 wire, 50/60 Hz



240 VAC, 1 phase, 2 wire, 50/60 Hz &
120/240 VAC, 1 phase, 3 wire, 50/60 Hz



240 VAC, 3 phase, 3 wire, 50/60 Hz

Figure 10-1. Arrangement of Heating Elements

For continuation of lines, see applicable schematic on following page.

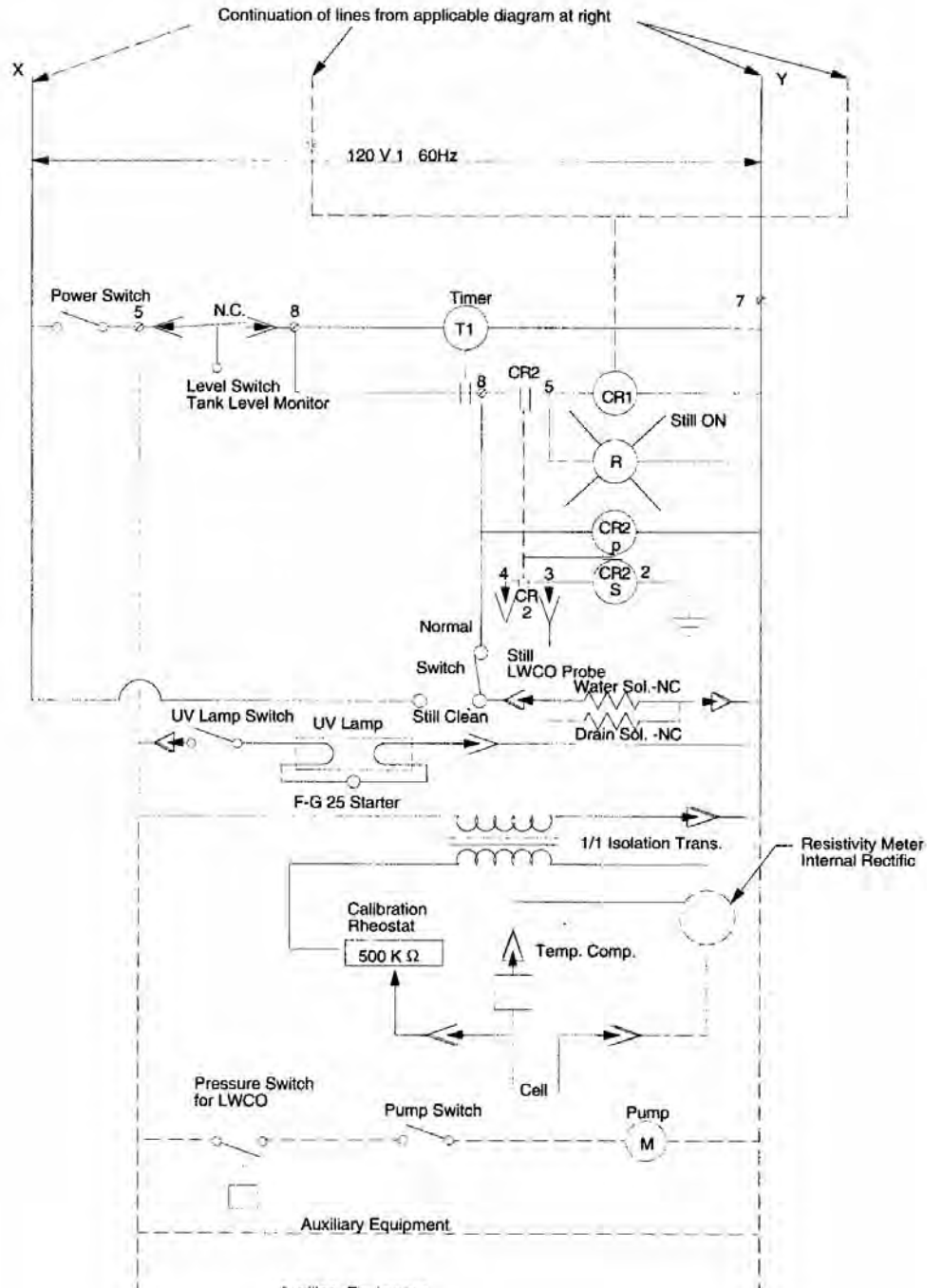
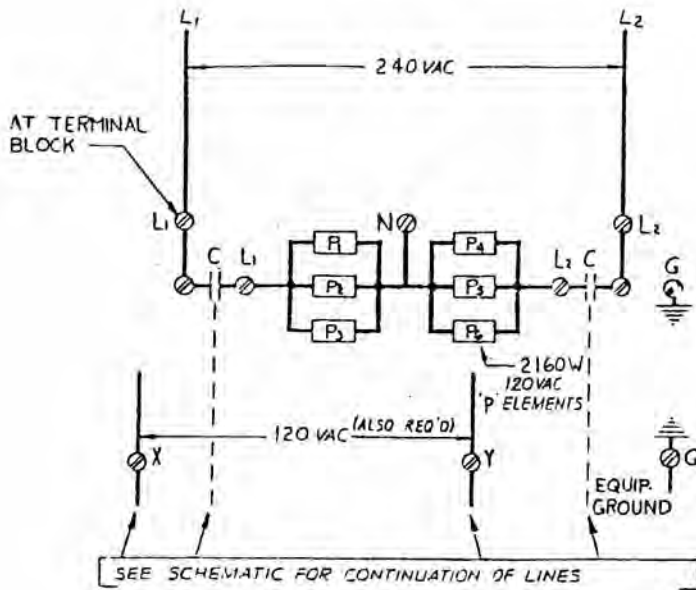
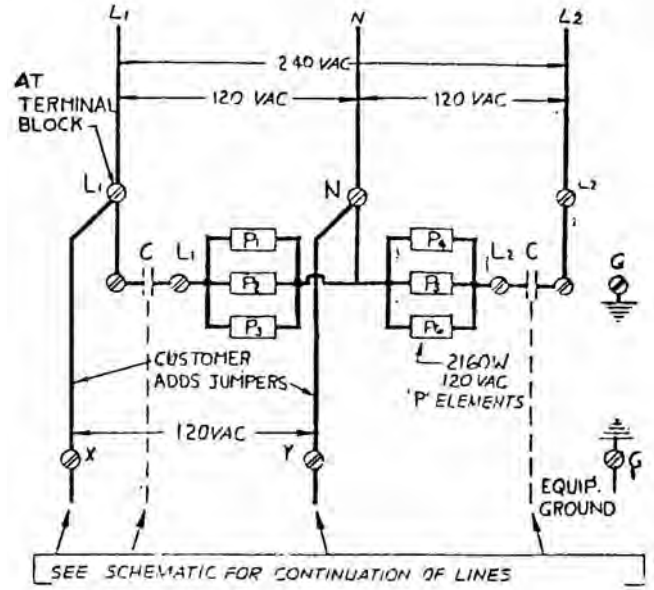


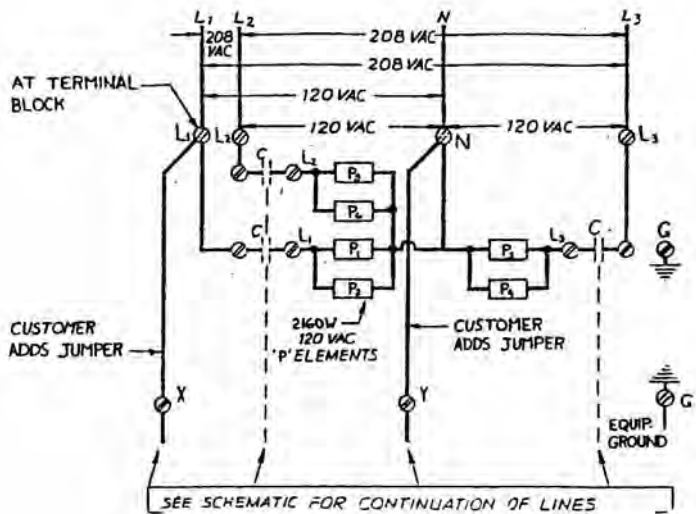
Figure 10-2. Control Schematic



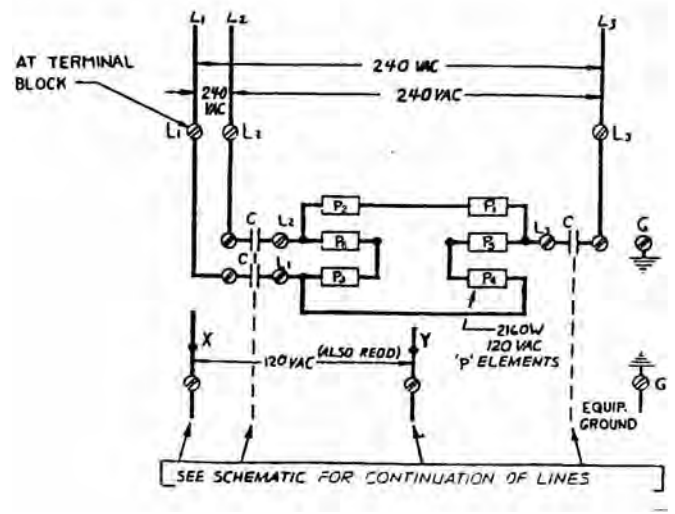
Schematic for 240 VAC, single phase, 2 wire, 50/60 Hz. Full load current is 55 amps.
NOTE: 120 VAC, single phase must also be supplied.



Schematic for 120/240 VAC, three phase, 3 wire, 50/60 Hz. Full load current is 55 amps.



Schematic for 120/208 VAC, three phase, 4 wire, 50/60 Hz. Full load current is 36 amps.



Schematic for 240 VAC, three phase, 3 wire, 50/60 Hz. Full load current is 33 amps.
NOTE: 120 VAC, single phase must also be supplied.

Figure 10-3. Schematics

For all diagrams: Connect to a separately fused source. See Control Schematic for continuation of lines.

Section 10

Wiring Diagrams and Exploded Views

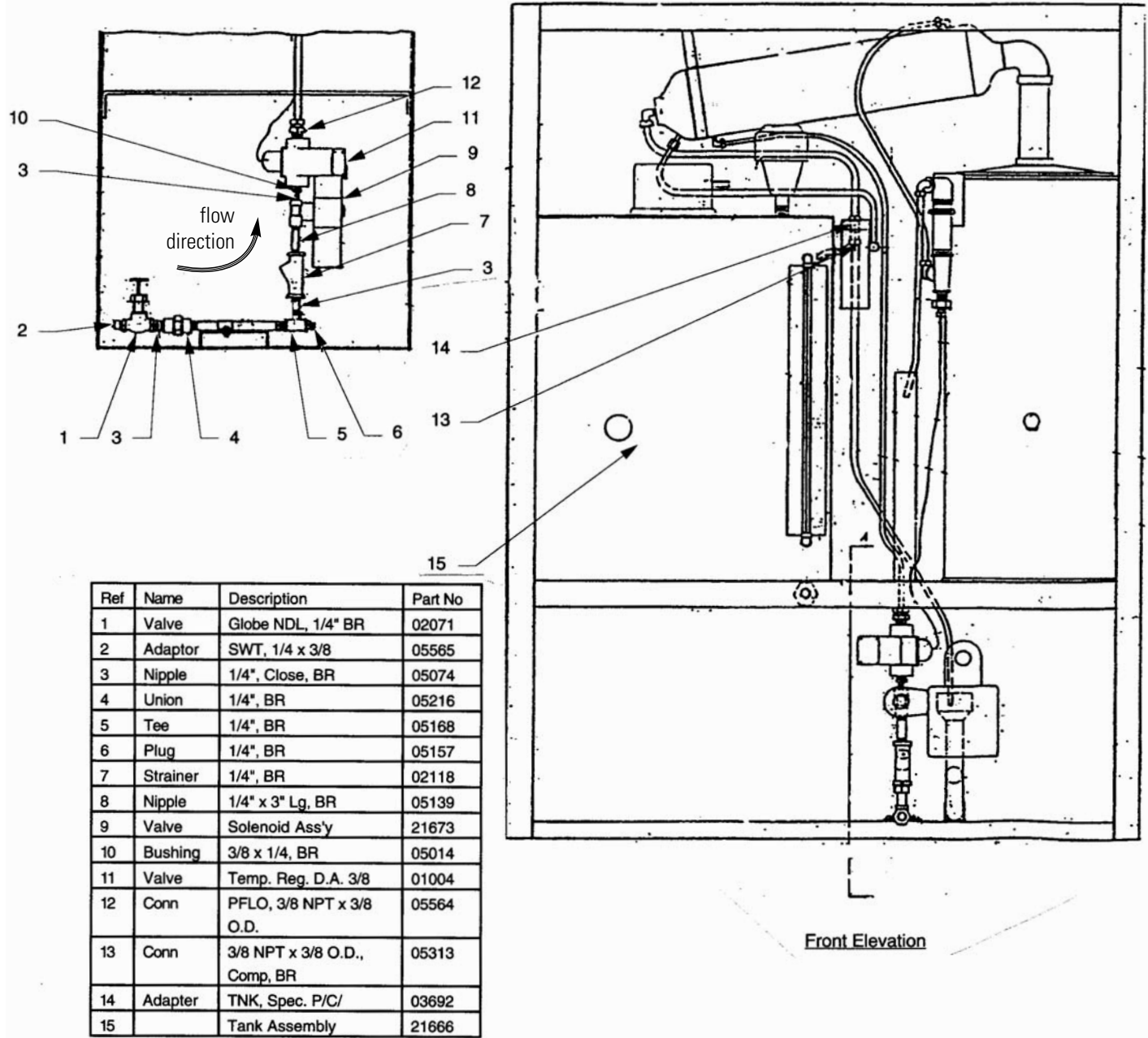
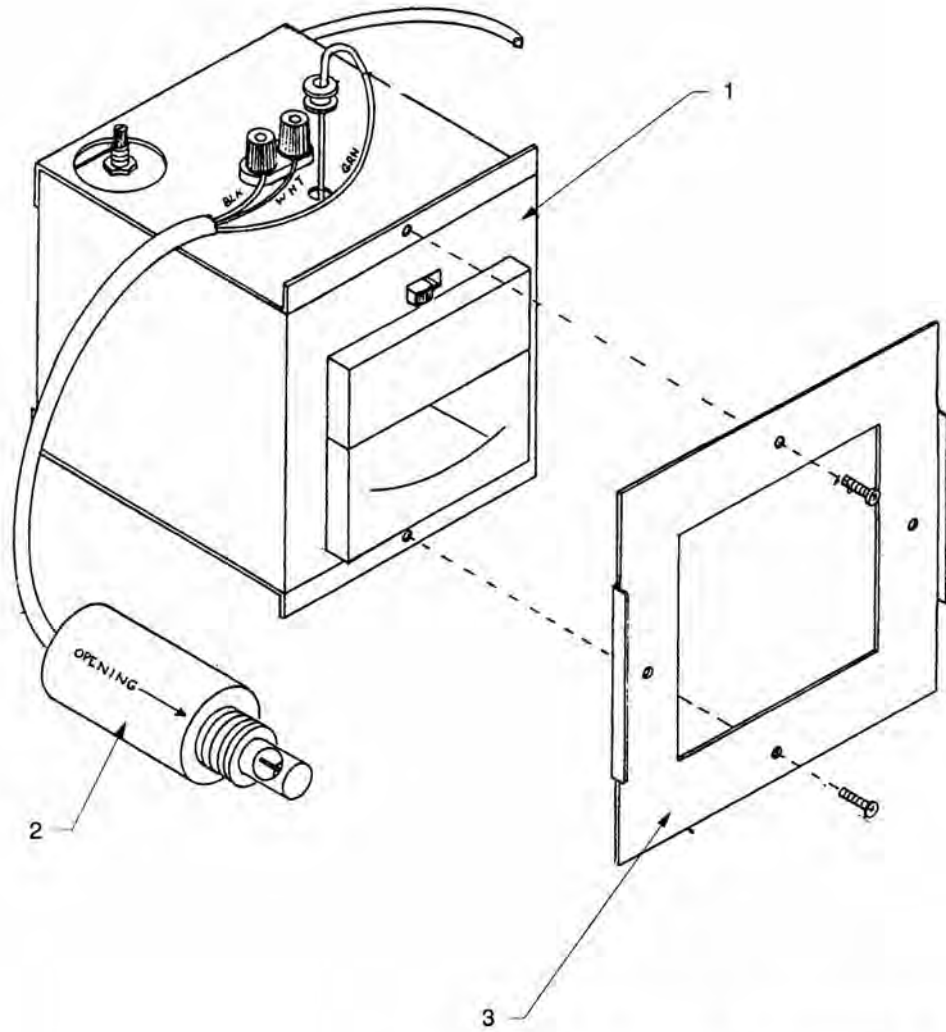
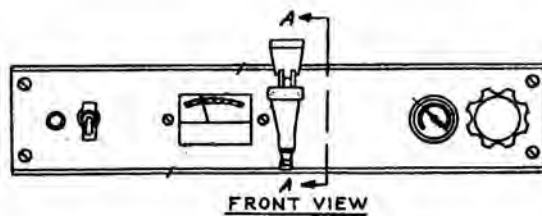


Figure 10-4. Piping Diagram



| Ref | Name | Part No. |
|-----|-------------|----------|
| 1 | Meter | 15518 |
| 2 | Cell | 21566 |
| 3 | Panel Mount | 21564 |

Purity Meter



Purity Meter Cell Location

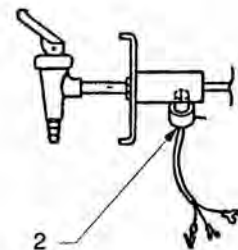
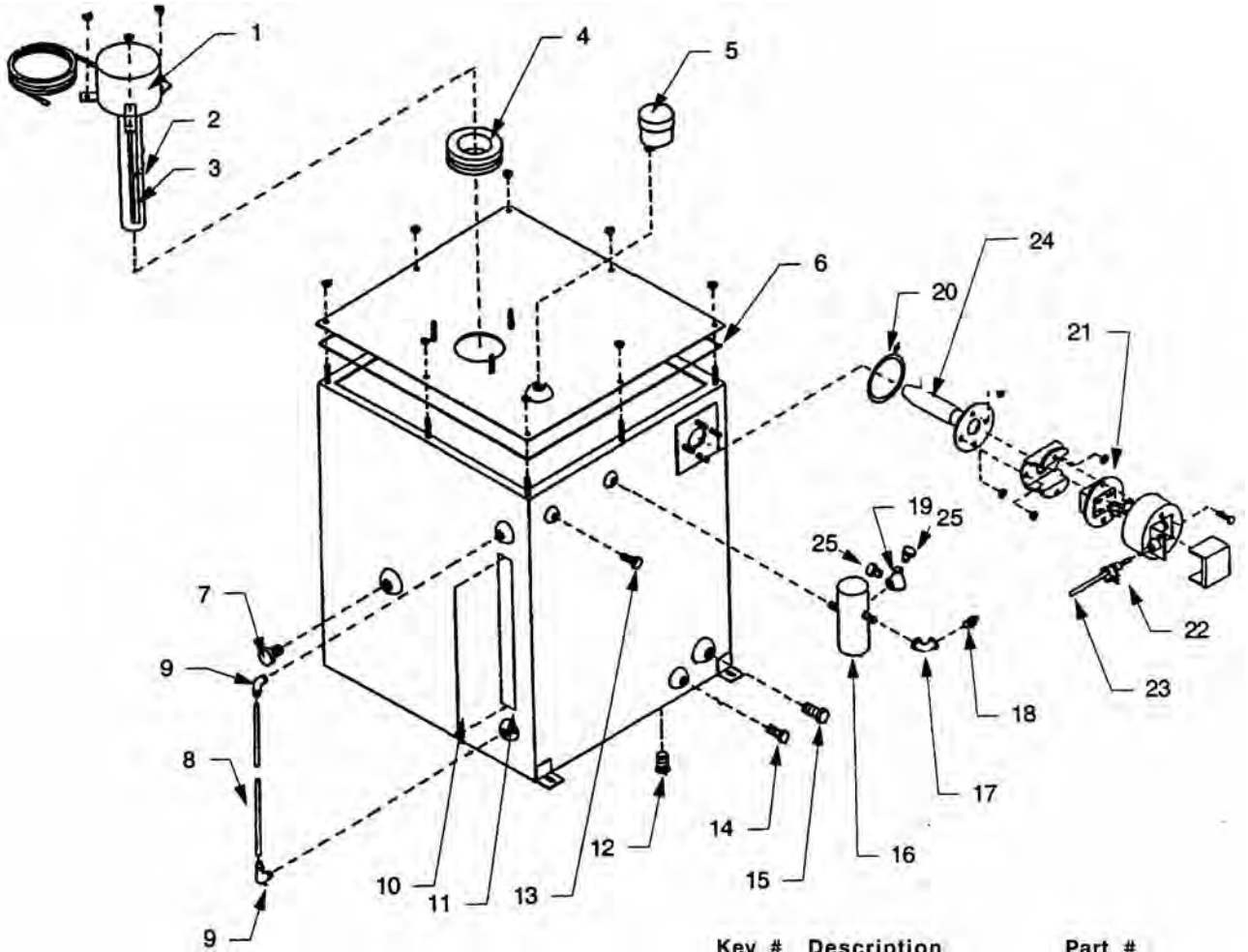


Figure 10-5. Purity Meter

Section 10

Wiring Diagrams and Exploded Views



| Key # | Description | Part # |
|-------|-----------------------|------------|
| 1 | UV Lamp Assembly | 04139 |
| 2 | UV Quartz Tube | 04140BI |
| 3 | UV Lamp | 04141 |
| 4 | Grommet, UV Tank | 06137 |
| 5 | Ventgard | H3120 |
| 6 | Gasket | 06480 |
| 7 | Sight Plate | 06511 |
| 8 | Sight Glass | TU495X61 |
| 9 | Sight Glass Holder | 03694 |
| 10 | Black Plastic Tape | 06436 |
| 11 | White Adhesive Tape | 06435 |
| 12 | 1/2" plug | 03760 |
| 13 | 1/4" plug | 03648 |
| 14 | 3/8" plug | 03649 |
| 15 | 1/2" plug | 03760 |
| 16 | Seal | H3130 |
| 17 | Elbow | 03612 |
| 18 | Tank adapter, 1/4 NPT | 03692 |
| 19 | Tee | PM495X141 |
| 20 | O-ring | 06174 |
| 21 | Switch assembly | SW495X1A |
| 22 | Connector | CEX13 |
| 23 | Cordset | CR495X6 |
| 24 | Float | PM495X109A |
| 25 | Bushing | PM495X45A |

Figure 10-6. Tank

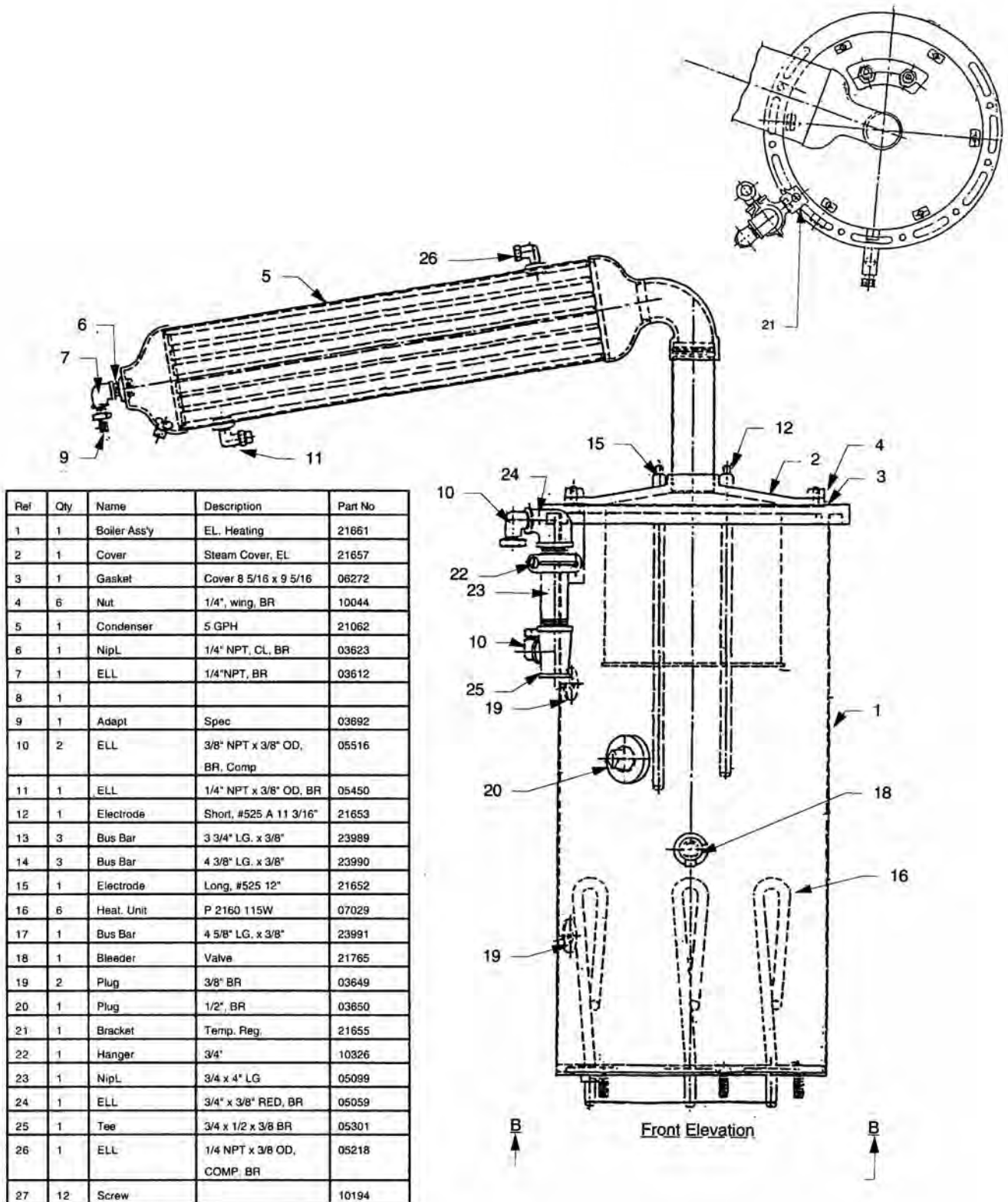
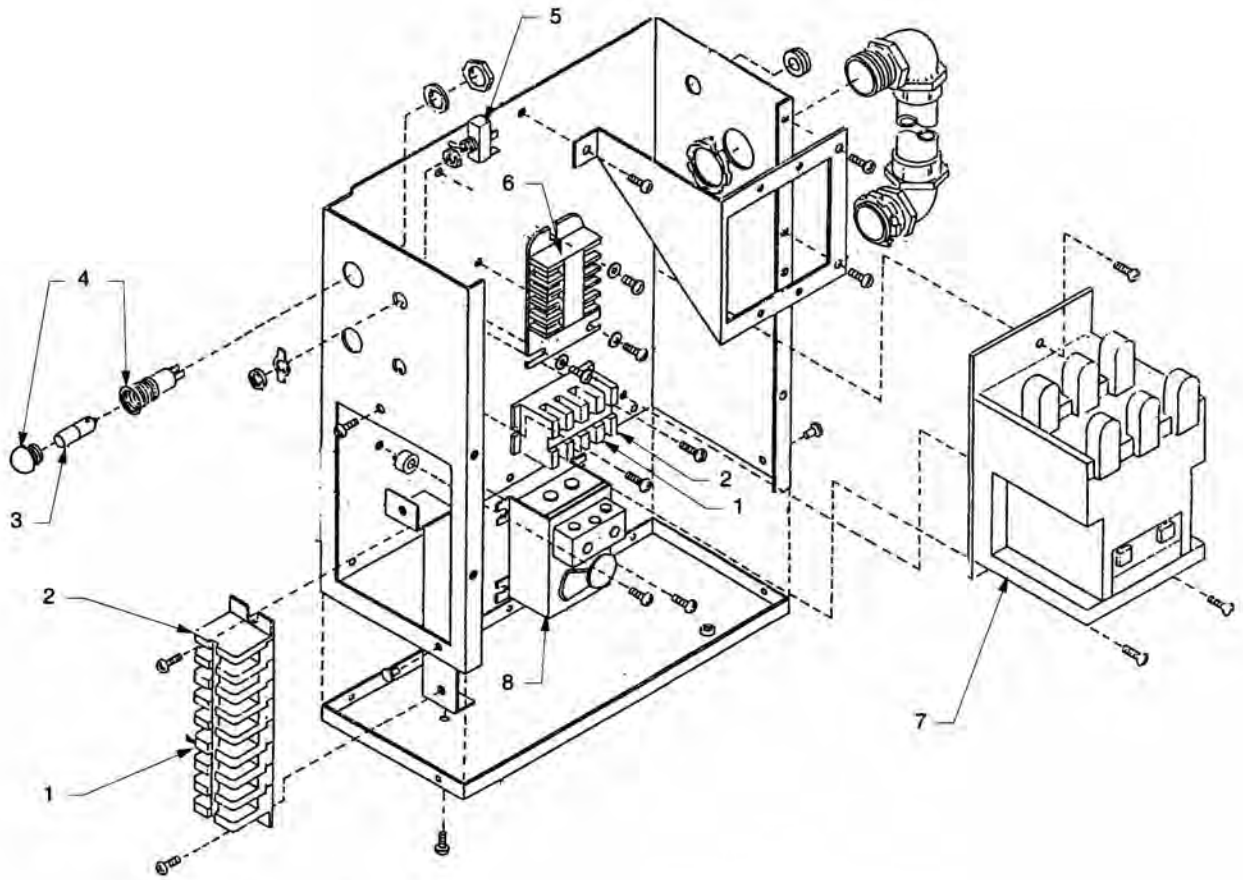


Figure 10-7. Still

Section 10

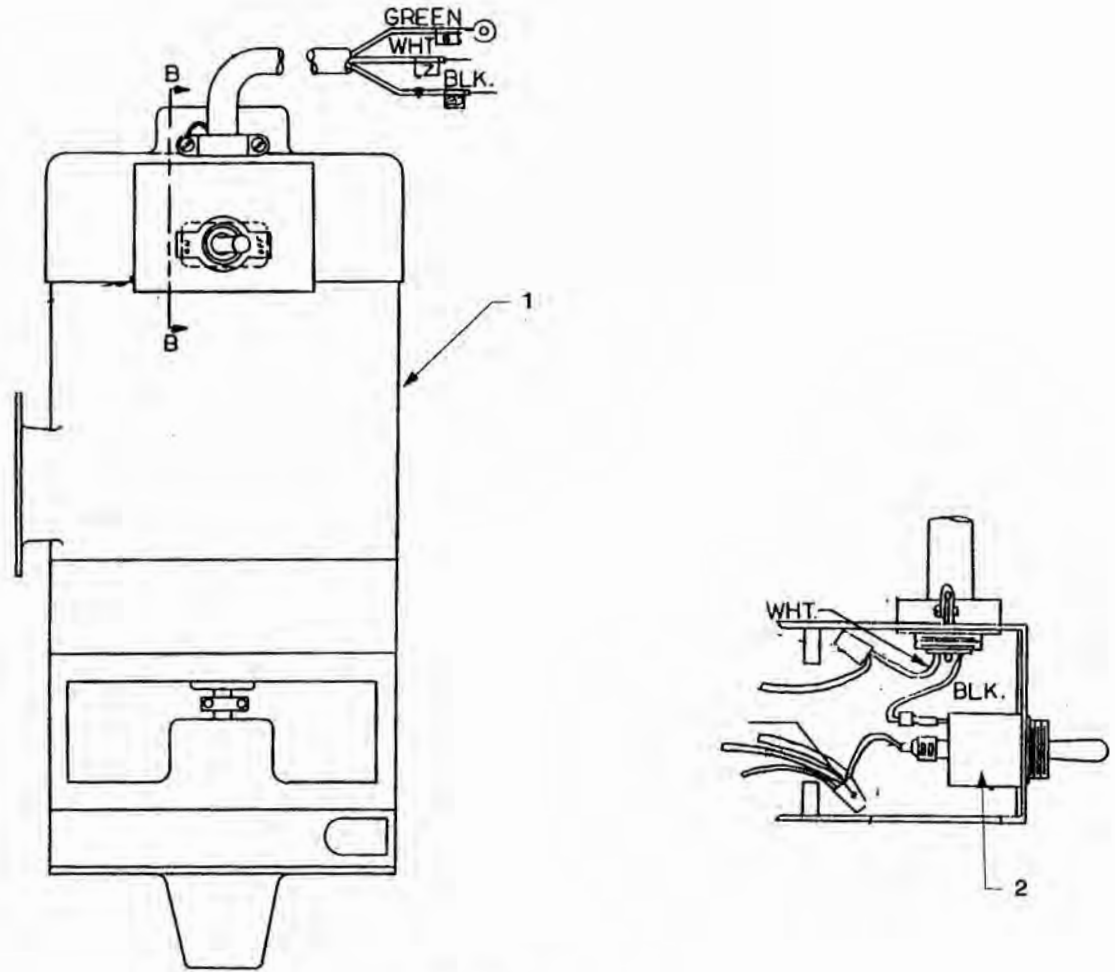
Wiring Diagrams and Exploded Views



Electrical Box

| Key Number | Description | Part Number |
|------------|----------------|-------------|
| 1 | Terminal Block | 04151 |
| 2 | Terminal Block | 04150 |
| 3 | Pilot Light | 04162 |
| 4 | Lamp Socket | 04163 |
| 5 | Toggle Switch | 04153 |
| 6 | Relay | RYX50 |
| 7 | Contactor | 01439 |
| 8 | Timer | 01038 |

Figure 10-8. Electrical Box



Pump Wiring

| Key Number | Description | Part Number |
|------------|---------------|-------------|
| 1 | Pump | 01398 |
| 2 | Toggle Switch | 04153 |

Figure 10-9. Pump Wiring

Section 10

Wiring Diagrams and Exploded Views

| Ref | Qty | Name | Description | Part No. |
|-----|-----|-------------------------|---------------------------|------------|
| 1 | 1 | Trap Ass'y | | 21578 |
| 2 | 1 | Screw | 1/4-20 x 2" LG, Hex, SS | 10086 |
| 3 | 1 | Nut | 1/4-20, Hex, SS | 10257 |
| 4 | 2 | Nipl | 1/2", BR, Close | 05072 |
| 5 | 1 | Tee | 1/2 x 1/2 x 3/8, BR | 05200 |
| 6 | 2 | Nipl | 3/8", BR, Close | 05073 |
| 7 | 1 | Union | 3/8", BR | 05215 |
| 8 | 1 | Overflow | Ass'y STD 5 Gal. | 21167 |
| 9 | 1 | Elb | 3/4 x 3/8, BR | 05059 |
| 10 | 1 | Conn. | 1/2" OD X 3/8 NPT, BR | 05336 |
| 11 | 1 | Tubing | 1/2" OD X 7" LG - CU | TU495X44 |
| 12 | 1 | Bleeder Cup | | PM495X100A |
| 13 | 1 | Conn, 3/8" OD X 3/8, BR | | 05313 |
| 14 | 1 | Tubing | 3/8" OD - Cut to Fit - CU | TU495X31 |
| 15 | 8 | Nut | 3/8", BR, Hex | 10258 |
| 16 | 1 | Nipl | 1/2" NPT X 2" LG, BR | 05117 |
| 17 | 1 | Plug | 3/8", BR | 05155 |
| 18 | 8 | Washer | | 10399 |
| 19 | 2 | Nut | | 10275 |
| 20 | 2 | Screw | | 10095 |
| 21 | 2 | Washer | | FWX16 |
| 22 | 1 | Bracket | | BC495X25A |
| 23 | 2 | Washer | | 10276 |
| 24 | 4 | Washer | | 10267 |

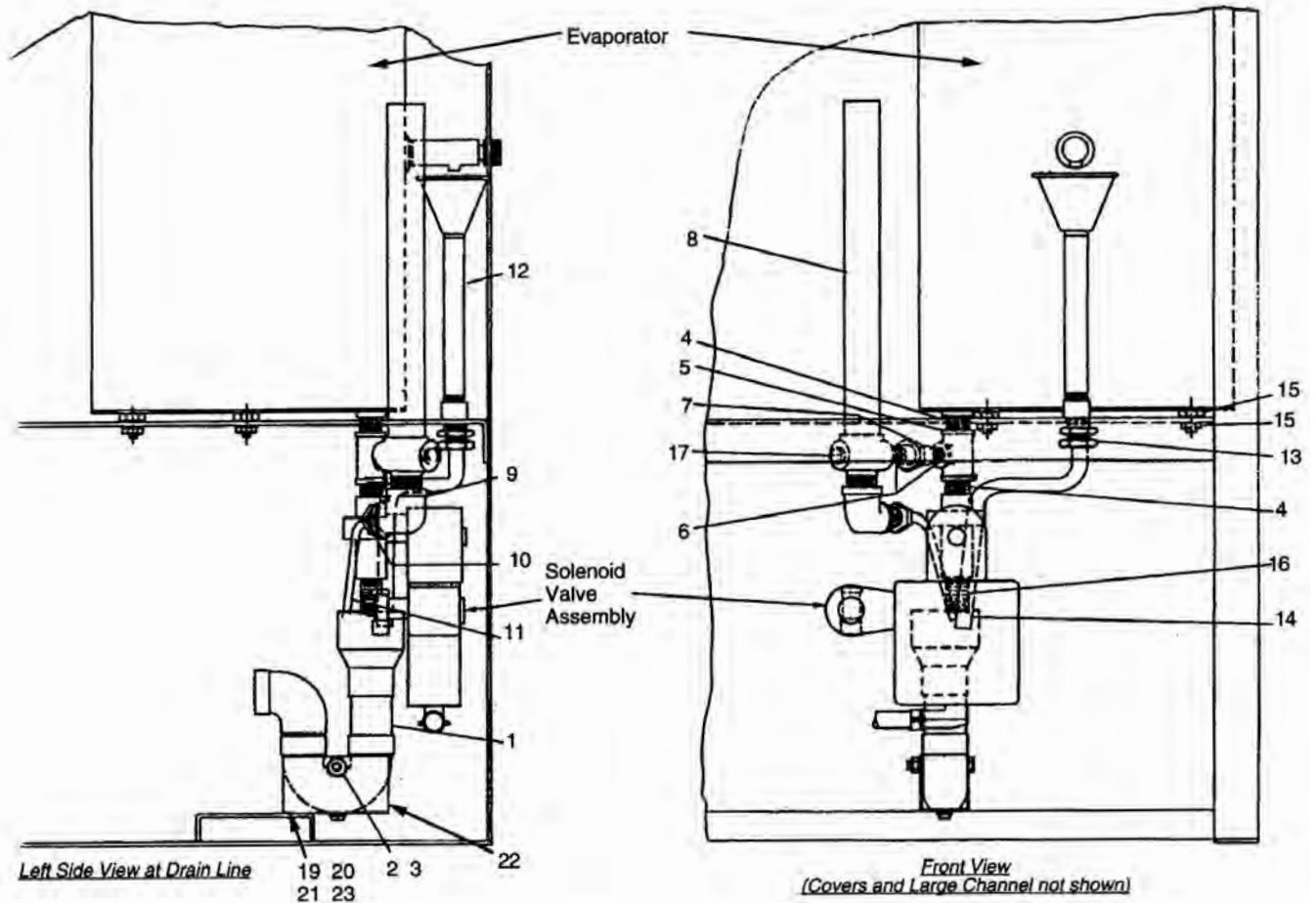


Figure 10-10. Drain Piping

Thermo Fisher Scientific
401 Millcreek Road
Marietta, Ohio 45750
United States

www.thermofisher.com

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