

Thermo Scientific Automatic 210 Biopure Distilled Water Center

Series 2158

Operating Manual and Parts List LT2158X1 Rev. 0



Models covered in this manual	
Model number	Voltage
A1065-B (6759)	120/240, 1 phase
A1065-C (6760)	120/208V, 3 phase
A1065-D (6761)	120/240V, 3 phase

MANUAL NUMBER LT2158X1 (7006759)

0	147769/SI-10360	8/31/10	Transfer to Marietta (was LT2158X1 3/4/10)	ccs
REV	ECR/ECN	DATE	DESCRIPTION	By



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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Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.



Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.



Hot surface(s) present which may cause burns to unprotected skin, or to materials which may be damaged by elevated temperatures.



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Section 1 Safety Information

Important 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. Water purification technology employs one or more of the following: chemicals, electrical devices, mercury vapor lamps, steam and heated vessels.

Your Thermo Scientific Automatic 210 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 the Notes, Cautions, and Warnings throughout the manual.

Care should be taken when installing, operating or servicing Thermo Scientific products. The specific safety notes pertinent to this product are listed below.

Warnings

To avoid electrical shock:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. 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.
3. Do not mount 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.
4. This machine has more than one power supply connection point. Disconnect all power supplies before servicing.
5. Do not connect unit to electrical service until instructed to do so.

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. Use this device with water feeds only. Cleaning agents must be used in compliance with instructions in this manual. Failure to comply could result in explosion and personal injury.
3. Wear eye and hand protection when using acid for cleaning, as acid spattering may occur.
4. Avoid splashing cleaning solutions on clothing and skin.
5. Ensure all piping connections are tight to avoid leakage of chemicals.
6. Ensure adequate ventilation during cleaning.
7. Follow carefully the manufacturers' safety instructions on labels of chemical containers and Material Safety Data Sheets (M.S.D.S.).
8. Refer servicing to qualified personnel.
9. Disconnect from power supply prior to maintenance and servicing.

To ensure safe mounting:

1. Wall and bench 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 85 lbs.; inadequate support and/or fasteners may result in damage to mounting surface and/or equipment. If unsure of mounting surface composition, condition and construction, or correct fasteners, consult your building maintenance group or contractor.
2. Do not wall mount until instructed to do so.

Section 2 Installation

Unpack the Thermo Scientific Automatic 210 Biopure Distilled Water Center carefully so that none of the parts will be damaged. Ensure that all parts are removed from the containers before discarding the packing material.

Warning Do not wall mount until instructed to do so. s

Warning Do not connect unit to electrical service until so instructed. s

Siting

Move the Distilled Water Center to the desired operating location. The unit may be wall mounted or bench top mounted. For bench top mounting installations, the optional bench mounting stand (Catalog No. A1066) is required for ease of servicing. The unit should be located in an area accessible to the water supply, waste service and electrical service. The installation illustration shows the dimensions of the unit so that the location can be checked for adequate space. A clearance of 13 inches is allowed under the draw-off faucet when the unit is bench top mounted.

Wall Mounting

Warning 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 260 lbs.; inadequate support and/or fasteners may result in damage to mounting surface and/or equipment. If unsure of mounting surface composition, condition and construction, or correct fasteners, consult your building maintenance group or contractor. s

Warning Do not mount the Distilled Water Center directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electrical shock hazard if improperly located. s

Wall Mounting (continued)

Mount the Thermo Scientific Distilled Water Center on a wall as follows:

1. Install customer supplied 3/8" lag bolts in the wall. Ensure that they are on the same level. See the Installation illustration on the following pages.
2. Lift the unit into position so that the holes in the unit are aligned with the mounting studs. Secure the unit in place with customer supplied nuts.

Bench Mounting

The optional bench mounting stand (Catalog No. A1066) is shipped disassembled. Install the stand and Distilled Water Center on a wall as follows:

1. Secure the three tie bars to the two stand ends with the screws and nuts provided. Two tie bars are installed inside and at the upper stand end corners. The remaining tie bar is installed inside at the lower center portion of the stand ends.
2. Place the bench mounting stand on the bench in a position (levelers down) that will allow the Distilled Water Center to be mounted on the stand.
3. Lift the Distilled Water Center and lower it onto the stand so that the two tabs fit into the distilled water center frame channel. The stand should be approximately flush all around with the Distilled Water Center frame. If it isn't, lift the Distilled Water Center and rotate the stand 180°.
4. Level the equipment with the four levelers provided.

Plumbing Connections

Connect the water and waste service connections to the unit. Ensure that the service lines are supported independently. Ensure that the water supply can maintain a pressure of 30 psi. If severe pressure fluctuations exist, a pressure regulator should be installed in the water service line to prevent erratic operation of the distilled water center. **Ensure that the waste service line is atmospherically vented and gravity flow.** The unit may be piped through the wall or from below the cabinet.

Note Be aware that the waste water temperature coming from the drain of the Distillation system. The temperature of the waste water can reach as high as 180°F.

Plumbing Connections (cont.)

Warning This device is to be used with water feeds only. 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

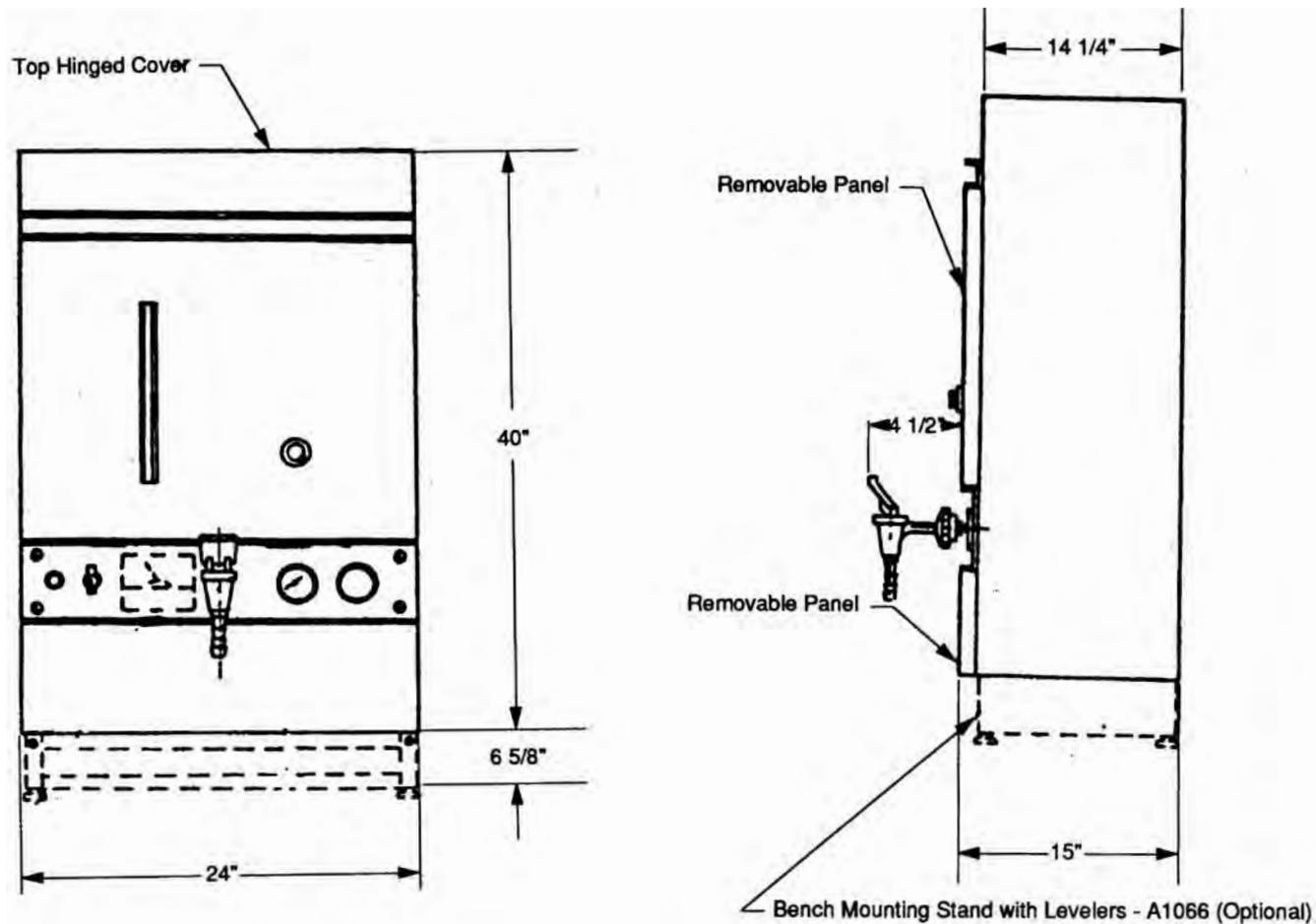


Figure 2-1a. Distilled Water Center Installation

Plumbing Connections (cont.)

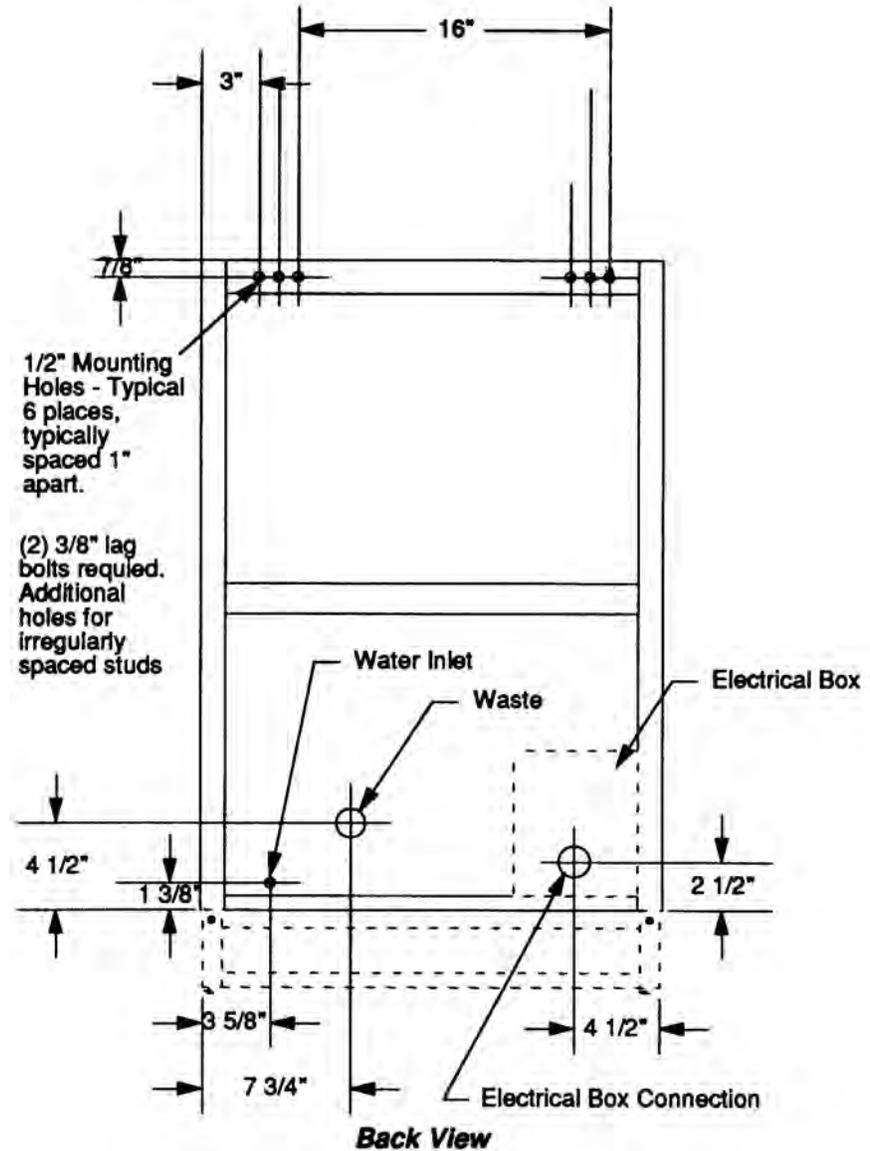


Figure 2-1b. Distilled Water Center Installation (back)

Note The unit may be piped through a wall or from below the cabinet.

A - Raw Water Inlet - 30 psig, 1/2" copper

B - Waste - atmospherically vented gravity flow, 1-1/2" cast elbow. Do not use PVC piping on waste line.

C - Electrical Knockout - 7/8" x 1-1/8".

Electrical Connections

Wire the electrical service to the unit as shown in the wiring schematic (at the end of this manual). Refer to the nameplate data on the side of the electrical box, located at the lower left front of the distilled water center, for selecting the required electrical service. Ensure your electrical source matches the voltage and phase your Distilled Water Center is wired for. Remove the lower panel to observe the nameplate. The panel is removed by reaching underneath the unit and pushing the panel retaining strip up to disconnect it from the frame inside and at the center of the unit, and pulling the panel out at the bottom and down. Access to the terminal board is achieved by removing the plate containing the nameplate on the side of the electrical box.

Note All models of the Automatic Bio-Pure 210 Distilled Water Centers require a separate 120V/15 Amp source voltage connected to the electrical box shown in the exploded parts drawings included in this manual. Refer also to schematics at the end of this manual.

Preparation for Use

Before operating the Distilled Water Center, ensure that a filter element is installed properly in the Ventgard. Access to the Ventgard can be accomplished by lifting the hinged cover on top of the cabinet. Refer to “Ventgard Element Replacement” in the Maintenance section for proper installation of the filter element.

Section 3 Principle of Operation

The Automatic 210 Biopure Distilled Water Center consists primarily of an evaporator (boiler) which holds the water during the evaporation process; electric immersion type heating elements installed in the evaporator to boil the water; a condenser which condenses the steam from the boiler to form the distillate; and a storage tank to store the distillate.

The water to be purified enters the condenser where it is heated by the steam passing through the evaporator. The preheated water leaves the condenser and then flows through a capillary block. The temperature of the water is transmitted from the temperature sensing element in the capillary block to the cooling water gauge on the control panel. The preheated water is then fed to the evaporator as required by the constant level device which maintains the proper water level in the evaporator. An overflow connected to the drain is provided to handle the excess cooling water.

Water in the evaporator is vaporized by the electric heating elements. The vapor passes up through a “Q” baffle to strip the vapor of pyrogenic impurities. The vapor then passes up through the vapor pipe into the condenser where the vapor is condensed to distilled water by the cooling water flowing through the condenser. The condenser is vented to atmosphere to eliminate any gaseous impurities. A deconcentrator, installed in the evaporator, automatically maintains a minimum concentration of dissolved impurities in the evaporator to reduce to a minimum any scale formation and tendency to foam. The distillate then enters the storage tank.

Storage Tank

The 10-gallon storage tank is equipped with a self-closing distilled water draw-off faucet so that the distilled water can be drawn from the tank. As distilled water is withdrawn, air enters the tank through a Ventgard. The Ventgard is equipped with a system of breather valves which allow the contaminated air to contact the element only when the air passes through the element to replace water drawn from the storage tank. When water is drawn from the tank, it is replaced by ambient air which enters the Ventgard through an intake valve. The air then passes through the filter element where particles are filtering out and gases absorbed. Finally, the purified air enters the tank through a second intake valve. When the water level rises in the tank, the intake breather valves automatically seal, and air is expelled through an exhaust valve.

Storage Tank (continued)

Legend	
A -	Storage Tank
B -	Condenser
C -	Condenser Vent
D -	Condenser Cover Hold-Down
E -	Ventgard
F -	Capillary Block
G -	Vapor Pipe Connector
H -	Vapor Pipe
I -	Low Water Cutoff Electrode Assemblies
J -	Mounting Holes for Wall Mounting
K -	Evaporator
L -	Constant Level Device
M -	Automatic Drain Valve
N -	Automatic Water Shut-Off Valve
O -	Waste Cup P-Water Shut-Off Valve
Q -	Waste Service Connection
R -	Water Service Connection
S -	Level Monitor
T -	Electrical Box

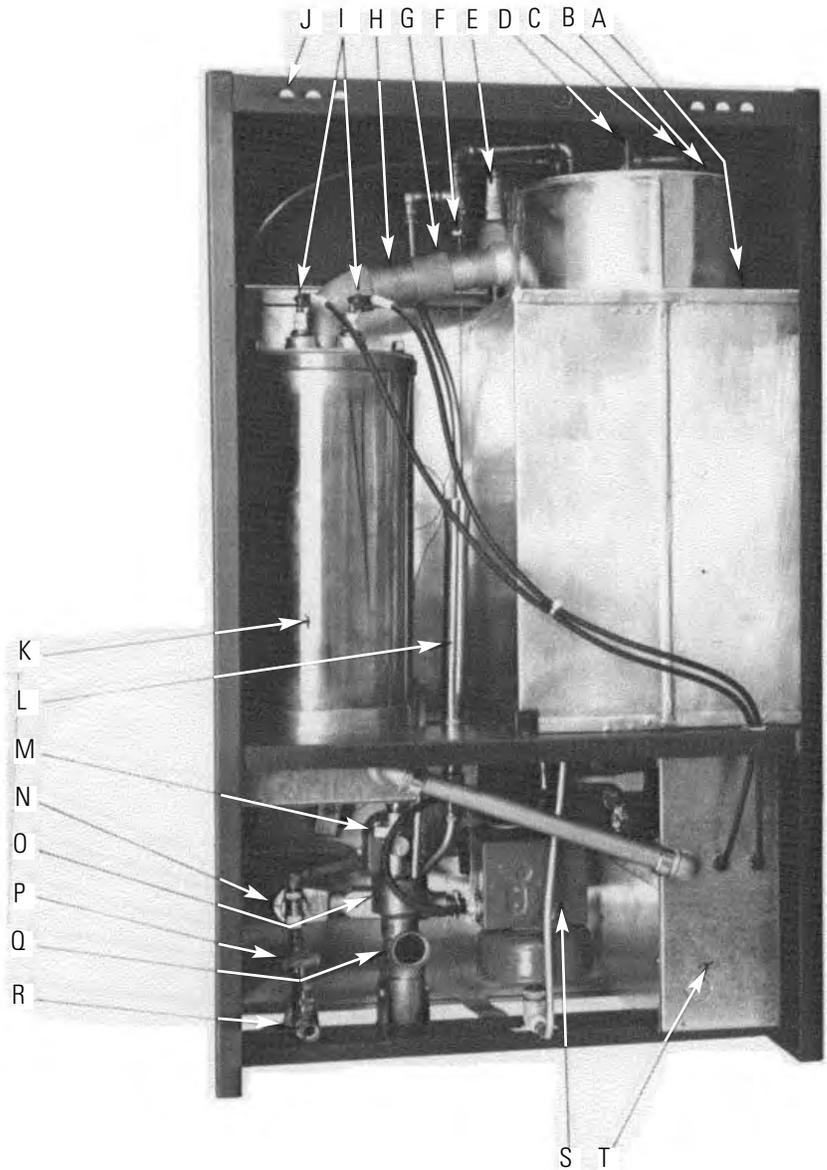


Figure 3-1. Distilled Water Center - Back Removed

Automatic Water Shut-Off Valve

Water flow to the Automatic 210 Biopure Distilled Water Center is controlled by the automatic water shut-off valve, which is a solenoid valve that is closed when its coil is deenergized. When the POWER switch contacts on the the interval timer contacts are closed, the coil of the solenoid valve is energized. Energizing the coil opens the valve and allows water to flow to the Distilled Water Center. When either the POWER switch or the level monitor switch contacts are opened or the interval timer operates to open its contacts, the coil is de-energized, and the valve is closed by spring action, shutting off the water flow to the Distilled Water Center (see the Solenoid Valve Assembly Drawing in the Parts List section).

Automatic Drain Valve

Draining of the Distilled Water Center is controlled by the automatic drain valve, which is a solenoid valve that is open when its coil is de-energized. This coil is connected in parallel with the coil of the automatic water shut-off valve so the automatic drain valve opens when the water valve closes. Hence, the Distilled Water Center drains at the same time that the water flow to the Distilled Water Center is shut off (see the Solenoid Valve Assembly Drawing in the Parts List section).

Level Monitor

As discussed above, water flows to the Distilled Water Center when the switch contacts in the level monitor are closed, and it is shut off when the switch contacts are open. The switch is actuated by the movement of a stainless steel device that reacts to the varying pressure caused by the changing level of the distillate in the storage tank. As the level of the distillate lowers, the pressure on the device decreases until, at a predetermined setting, the switch contacts close and starts the Distilled Water Center. As the tank fills, the level rises, increasing the pressure on the device until at another predetermined (see Level Monitor in the Maintenance section) setting the switch opens and shuts off the Distilled Water Center.

Note Level monitor is factory set. s

Interval Drain Timer

Periodic draining of the Distilled Water Center is accomplished by the interval timer. The timer shuts off the water and opens the drain valve once each cycle (every 4 hours.) The distilled water center is equipped with a 4 hour timer which is adjusted at the factory. With a 4 hour timer, the Distilled Water Center operates for 4 hours minus the time required for draining. If necessary, the length of the drain cycle may be readjusted as described in the Maintenance section. This drain cycle will not display on lights to indicate the Distilled Water Center is in the drain cycle mode. This mode is 10 to 15 minutes long, after which the Distilled Water Center will automatically restart (see Interval Timer in Maintenance section).

Note Interval drain timer is factory set. s

Note When the Interval timer is in the drain cycle, the Distilled Water Center will stop production of distilled water but it will not be indicated on the display of the Water Center itself. Wait 10 to 15 minutes and the Water Center will re-start. If not, refer to the Troubleshooting section of this manual. s

Low Water Cut-off

Electric current to the Distilled Water Center heating elements is controlled by the POWER switch, the level monitor, the drain timer and a self-restoring low water cutoff. If the water level in the Distilled Water Center evaporator drops below the safe operating level (below the low water cutoff electrodes), a relay will open (CR2) to remove current to protect the heating elements against burning out. When the water level rises to make contact with the low water cutoff electrodes, the low water cutoff will allow the heating elements to receive current. The low water cutoff will not reset until the water reaches a safe operating level (see Evaporator Assembly in Parts List section).

Section 4 Operation

Warning 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. s

Initial Operation

The first time the Thermo Scientific Distilled Water Center is operated, or after servicing, operate the unit as follows:

1. Open the water shut-off valve in the water inlet line. If the unit is wall mounted, access to this valve can be gained by removing the lower front panel (see Biopure Exploded View in Parts List section, item 32).
2. Remove the upper front panel by lifting the top hinged cover and lifting the panel up, and pulling the panel out.
3. Open the COOLING WATER CONTROL VALVE (two full turns) and set the POWER switch on the front panel to ON to allow water to flow to the Distilled Water Center condenser and fill evaporator.
4. Open the deconcentrator valve slightly by turning the knob counter-clockwise (one full turn).
5. When the water rises to a sufficient level in the Distilled Water Center evaporator, the STILL ON lamp will light. Water will issue from the deconcentrator valve into the waste funnel. Allow sufficient time for the unit to heat up and then adjust the COOLING WATER CONTROL VALVE until the COOLING WATER OUTLET TEMPERATURE gauge indicates approximately 90° F. A slight puff of steam should issue from the condenser vent during operation.* **Note:** The inlet water flow temperature may have to be adjusted from 90°F up to as much as 140°F to get proper operation of the Water Center.

* *The cooling water outlet temperature throttling valve may need to be adjusted to obtain the slight puff of steam from the condenser vent.*
6. Adjust the deconcentrator valve, as described in Deconcentrator Adjustment in this section.
7. Check all connections for leaks and tighten as required.

Initial Operation (continued)

8. Discard the distillate through the drawoff faucet until the unit has cleaned itself out. The draw-off faucet handle may be lifted up so that the faucet will stay open. If DISTILLATE RESISTIVITY meter is provided, the distillate can be discarded until the desired distillate purity is achieved. A storage tank distillate level gauge is provided on the front of the unit for a visual indication of how much distillate is in storage.
9. When the tank is 1/4 full, open the tin tube connector to level monitor. Refer to Distilled Water Center Exploded View drawing in the Parts List section. Allow the air in the line to be removed, then tighten the connector. Be careful not to overtighten the connection.
10. Install all panels.

Normal Operation

During normal operation, the Automatic 210 Biopure Distilled Water Center may be started and stopped by setting the POWER switch to ON or OFF, as required. If the unit is being stopped for servicing, the water shut-off valve may be closed and the storage tank drained through the drawoff faucet.

Deconcentrator Adjustment

The function of the deconcentrator 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 3 gph. This valve should be left open permanently at the required setting.

Temporary Hard Water - If the feed water 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 150°F. With this deconcentrator valve open, a larger quantity of feed water 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 every four hours.

Legend	
A -	Deconcentrator Valve
B -	Removable Panel
C -	Hinged Cover
D -	Storage Tank Distillate Level Gauge
E -	STILL ON Lamp
F -	Power Switch
G -	Distillate Resistivity Meter
H -	Removable Panel
I -	Drawoff Faucet
J -	Cooling Water Outlet Temperature Gauge
K -	Cooling Water Control Valve

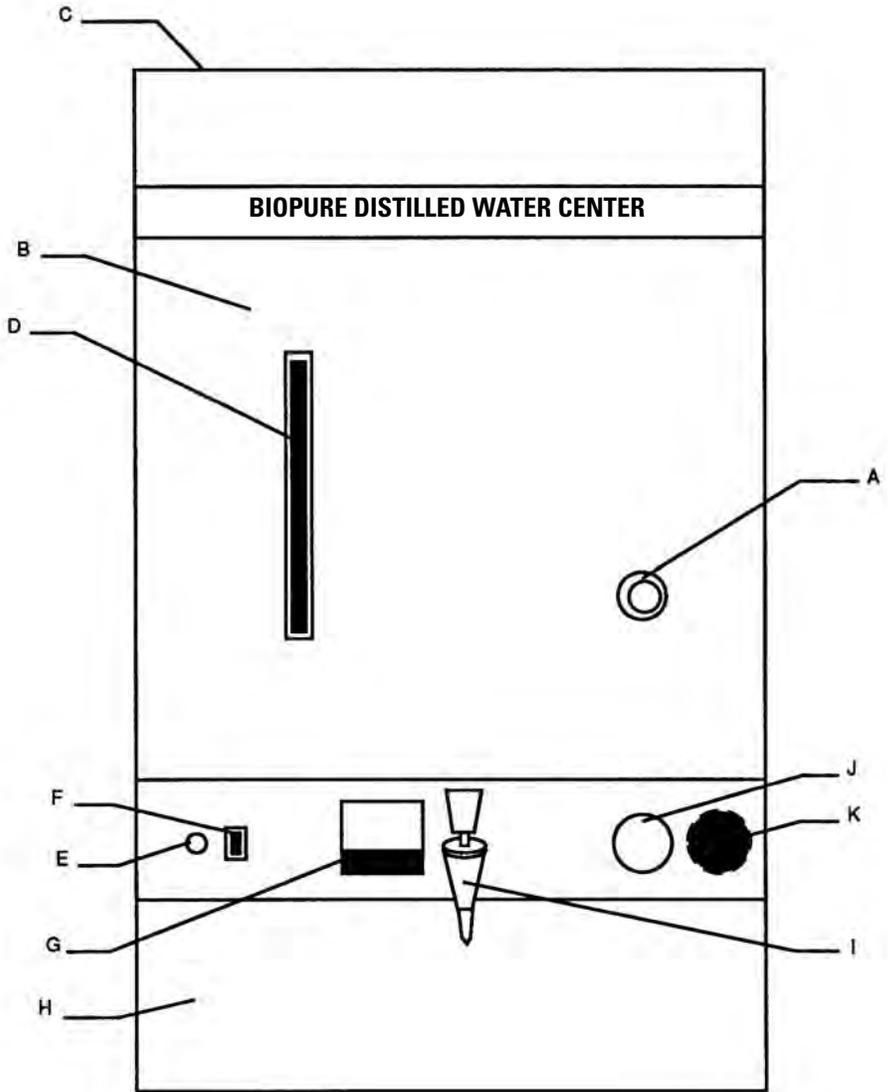


Figure 4-1. Distilled Water Center - Front View

Section 5 Maintenance

Warning This machine has more than one power supply connection point. Disconnect all power supplies before servicing. Refer servicing to qualified personnel. s

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

Do not heat isopropyl alcohol solutions.

Ensure all piping connections are tight to avoid chemical leakage.

Ensure adequate ventilation during cleaning.

Warning Avoid splashing any acid solution. Wear eye and hand protection when using acid for cleaning, as acid splattering may occur. s

Cleaning Methods

Cleaning requirements fall into two classes: scale removal and biological cleaning. Scale removal may be accomplished chemically or mechanically. Biological cleaning is accomplished with an isopropyl alcohol solution. The various methods of cleaning are as follows:

Soft Scale Removal

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

Hard Scale Removal

Hard scale may be removed by using a solution of 10% inhibited hydrochloric acid. This acid solution is readily available commercially or can be prepared using 20 parts water and 6 parts 30% hydrochloric acid. Flush the part thoroughly after using the acid solution. A 5% sodium bicarbonate solution may be used to remove any acid left on the part.

Caution When using the acid solution, do not allow the acid to remain in contact with the part for more than 20 minutes. Under no circumstances should any acid cleaner be allowed to come in contact with tinned surfaces, such as the distilled water wide of the condenser, distilled water transmission tubing and drawoff faucet, "Q" baffle or storage tank. s

Hard Scale Removal (continued)

Note If inhibited hydrochloric acid is not available, a 10% solution of sulfamic or acetic acid may be used as a substitute. Expose the part to sulfamic or acetic acid for a time of 2 to 3 hours. Sulfamic and acetic acid have an advantage over hydrochloric acid; they will not corrode the metal parts being cleaned. s

Organic Scale and Sludge Removal

If the scale has a dark brown or black color, it may be formed from organic impurities present in the water. Use the procedure outlined under “Hard Scale Removal” for removal of organic scale and sludge.

Silica Scale Removal

Silica scale is very hard and cannot be removed with an acid solution. Silica scale can be removed with a blunt instrument or by applying the cold shock treatment. The cold shock treatment consists of heating the part and then drenching it with cold water. The sudden contraction of the metal tends to crack the scale.

Biological Cleaning

Biological cleaning is used on the parts that come in contact with the distillate such as the distilled water side of the condenser, distilled water transmission tubing and drawoff faucet, “Q” baffle, and the storage tank. This may be accomplished as follows:

1. Parts that come in contact with steam vapors, such as the distilled water side of the condenser, will be biologically cleaned by the steam vapors.
2. For parts that are in contact with distilled water, such as the distilled water transmission tubing and drawoff faucet, isopropyl alcohol can be used as a satisfactory disinfectant.

Warning Avoid splashing disinfecting solutions on clothing or skin. s

Consult Material Safety Data Sheets for proper handling of chemicals.

Disconnect from the power supply prior to maintenance and servicing.

Disassembly for Cleaning

The frequency of cleaning will depend upon the purity of the water being used. The distilled water center should be inspected at frequent intervals until cleaning intervals are determined. Disassemble, inspect, and clean the distilled water center as follows:

1. Shut off and drain the Distilled Water Center (see Normal Operation).
2. Lift the top hinged cover up so that the unit can be serviced from the top.
3. Remove the upper front panel by lifting the panel up and pulling it out.
4. Remove the lower panel by reaching underneath the unit and pushing the panel retaining strip up to disconnect it from the frame inside and at the center of the unit and pulling the panel out at the bottom and down.
5. Slide the vapor pipe connector toward the condenser to disconnect the vapor pipe/evaporator cover/"Q" baffle assembly from the condenser. Be careful not to damage the two O-rings in the collar.
6. Disconnect the low water cutoff electrical leads from the electrode assemblies by pulling the lead clips up from the electrode assembly terminals.
7. Remove the wing nuts securing the evaporator cover to the evaporator and remove the evaporator cover.
8. Slide the vapor pipe connector off the portion of the vapor pipe connecting to the condenser and inspect the O-rings inside the connector for damage. Replace the O-rings if necessary.
9. Inspect the electrode assemblies for scale and clean as required.
10. Inspect the heating elements inside the evaporator for scale and the interior of the evaporator for scale and clean as required.
11. Remove and clean the waste cup.
12. Remove and clean the constant level device.
13. 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 if required.

Disassembly for Cleaning (continued)

14. Remove and inspect the deconcentrator funnel and tubing. Clean as required.
15. Screw the condenser cover hold-down up into the frame and remove the condenser cover from the condenser. The condenser coil and cover are one assembly.
16. Inspect the cooling water side of the condenser for scale and clean as required.
17. Inspect the distillate side of the condenser and clean as required.
18. Clean the inside surfaces of the tank first with a mild detergent and distilled water. It is not necessary to heat the distilled water.
19. Rinse the tank surfaces with distilled water.
20. The draw-off faucet and distribution piping can most easily be cleaned by draining the cleaning solution and rinse water through them.

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

21. After cleaning with detergent, use isopropyl alcohol and thoroughly sponge the inside surfaces of the tank. Expose the surfaces to the solution overnight. Then thoroughly rinse the tank again with distilled water.
22. Use the same cleaning methods as described in Steps 18, 19, and 20 to clean the tank distillate level gauge.
23. Reassemble the Distilled Water Center. Do not install the panels at this time.
24. Start the Distilled Water Center as described in “Initial Operation.”
25. Lower the water flow rate with the COOLING WATER CONTROL VALVE until steam spouts out of the condenser vent at least 12 inches. This requires a low flow rate of water to the condenser. Operate the unit in this manner for at least 30 to 60 minutes to sterilize and clean out the unit.

Warning Ventilate the room during this operation. s

26. Readjust the distilled water center as described in “Initial Operation” and install the front panels and top hinged cover.

Test for Condenser Leaks

Test the condenser for leaks as follows:

1. Remove the lower and upper front panels, and lift the top hinged cover up so that the condenser cover and coil assembly can be removed.
2. Stop the Distilled Water Center from operating.
3. Screw the condenser cover and coil assembly hold-down up into the frame and remove the cover and coil assembly from unit.
4. Attach an air hose to one of the condenser cooling water connections and plug the remaining connection.
5. Apply about 5 psi of air pressure to the condenser.
6. Submerge the entire condenser in a tank of water. If any air bubbles come from the condenser, replacement is necessary.

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

Condenser Test for Scale

Test the condenser for scale as follows:

1. Adjust the COOLING WATER CONTROL VALVE so that just a puff of steam issues from the condenser vent. In extreme cases of scale, steam will blow heavily from the condenser vent even with the COOLING WATER CONTROL VALVE is completely open. Ensure that the water pressure is at least 30 psi. Low water pressure will cause steam to blow heavily from the condenser vent.

Heating Element Test and Replacement

Warning This machine has more than one power supply connection point. Disconnect all power supplies before servicing. s

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

1. Set the POWER switch to the OFF position.
2. Remove the lower front panel and close the water shut-off valve in the water inlet line.
3. Disconnect the electrical heat supply to the distilled water center terminal board. Access to the terminal board can be achieved by removing the plate on the side of the electrical box.
4. Remove the cover on the box directly below the evaporator and disconnect the electrical leads and bus bars from the heating element terminals. Tag the leads to facilitate reassembly.
5. To test each heating element for an open circuit, use a volt, ohms meter. Place the meter leads across the terminals of the element. If you get a reading of approximately 20 ohms, the element is good. If you get an infinite reading or a zero reading, the element is bad.
6. 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 meter will register a resistance reading. Mark all damaged heating elements.
7. Lift the top hinged cover up and remove the upper front panel.
8. Slide the vapor pipe connector toward the condenser to disconnect the vapor pipe/evaporator cover/"Q" baffle assembly from the condenser. Inspect the O-ring for any damage.
9. Disconnect the low water cutoff electrical leads from the electrode assemblies by pulling the lead clips up from the electrode assembly terminals.
10. Remove the wing nuts securing the evaporator cover to the evaporator and remove the evaporator cover.
10. Inspect the heating elements inside the evaporator. Warped or split elements should be replaced.

Heating Element Test and Repl. (continued)

11. 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.
12. Clean the area where the new heater will be installed. 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.
13. Install the bus bars and wiring between heater terminals. Retighten the heater retaining screws to eliminate the possibility of leakage.
14. Add water to the evaporator by hand to ensure that none of the heating elements are leaking.
15. Reassemble the distilled water center and reconnect the electrical heat supply to the terminal board.

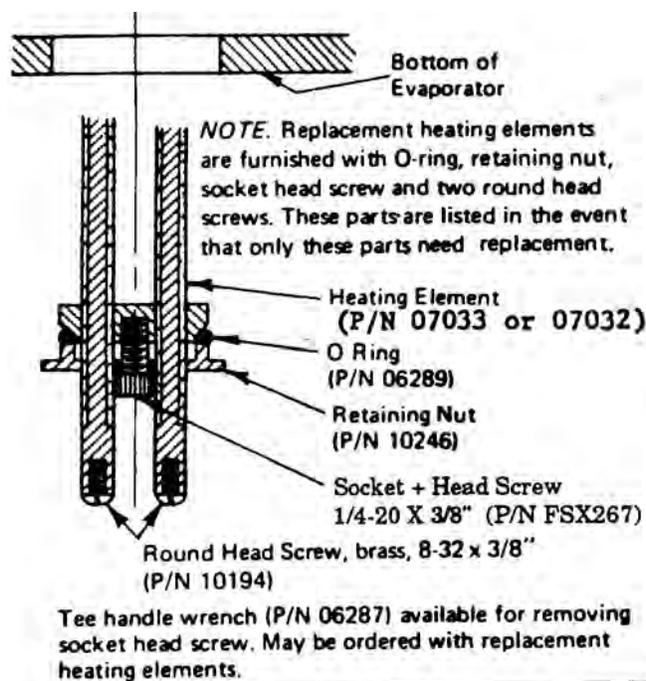


Figure 5-1. Heating Element Replacement

Automatic Water and Drain Valves

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

Solenoid Temperature

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

Cleaning

A periodic cleaning of the solenoid valves is desirable. The time between cleanings will vary, depending on service conditions. In general, if the voltage to the coil is correct, sluggish valve operation or excessive leakage will indicate that cleaning is required. Also, a noisy or inoperative solenoid valve is usually caused by foreign matter preventing the valve from sealing properly. In order to clean the valve, disassemble it in accordance with instructions given below.

Coil Replacement

New coils are available by calling Technical Services. Order by their part numbers: part no. 01121 for the 1/4 NPT automatic water valve and part no. 01124 for the 1/2 NPT automatic drain valve. Before disassembling the solenoid, set the POWER switch to the OFF position, remove the lower panel and close the water shut-off valve in the water inlet line, allow the evaporator to drain, and disconnect the automatic valve from the electrical outlet. Then proceed as follows (see accompanying illustrations of the valves:)

For the automatic water valve:

1. Remove the retaining cap and slide the housing off the solenoid base subassembly.
2. Slide the spring washer and the coil off the solenoid base subassembly and replace the coil with a new one.
3. Reassemble the spring washer, housing and retaining clip.

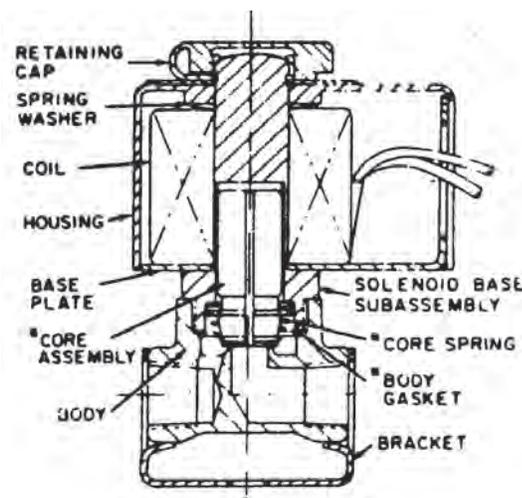


Figure 5-2. 1/4 NPT Auto Water Valve

Coil Replacement (continued)

For the automatic drain valve:

1. Remove the retaining cap, nameplate and housing cover.
2. Slide the housing with coil, yoke, sleeves (one top and one bottom), and insulating washer (one top and one bottom), off the solenoid base subassembly.
3. Remove the coil from the yoke and replace with a new coil.
4. Reassemble in reverse order.

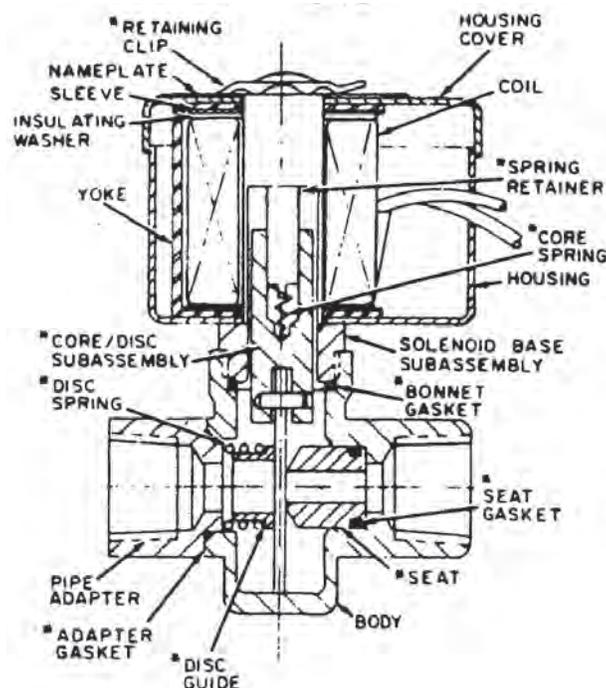


Figure 5-3. 1/2 NPT Auto Drain Valve

Valve Disassembly and Reassembly

A spare parts kit is available for each size of valve. These kits contain the parts identified by asterisks (*) in the automatic water and drain valve illustrations. Order kits by their part numbers: part no. 01125 for the 1/4 NPT automatic water valve and part no. 01130 for the 1/2 NPT automatic drain valve. Before disassembling the valve, set the POWER switch to the OFF position, remove the lower panel and close the water shut-off valve in the water inlet line, allow the evaporator to drain, disconnect the automatic valve from the electrical outlet, and remove the valve from the piping.

Valve Disassembly and Reassembly (continued)

Remove the coil as described in “Coil Replacement” and proceed in accordance with the following instructions:

For the automatic water valve:

1. Remove the solenoid base subassembly from the body with an end wrench. The body gasket can now be removed if it is to be replaced.
2. Remove the core assembly and the core spring from the solenoid base subassembly and separate them.
3. Remove the mounting bracket by removing the pipes in each end of the body.
4. After cleaning thoroughly and replacing any damaged or worn parts, reassemble in reverse order.

For the automatic drain valve:

1. Remove the solenoid base subassembly from the body with an end wrench. Be careful not to lose the spring retainer and core spring, which fit into the end of the core/disc subassembly. 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 hold the pipe adapter to the body and separate these parts. The adapter gasket can now be removed if it is to be replaced.
4. Remove the disc spring and the disc guide.
5. Remove the core/disc subassembly and push out the seat and seat gasket.
6. After cleaning thoroughly and replacing any damaged or worn parts, reassemble in reverse order.

Level Monitor

The level monitor (Figure 5-4) has two adjustments: the cut-in adjustment and the differential adjustment. The cut-in adjustment determines how far the water level in the tank will drop before the still will start to replenish the supply. The differential adjustment determines the point at which the still will shut off to prevent the tank from overflowing.

Note It is important to note that all level monitors are preset from the factory with SW1 at 17" and the DB1 at 7".

Note SW1 on the display is the cutout point, DB1 indicates the cut-in point.

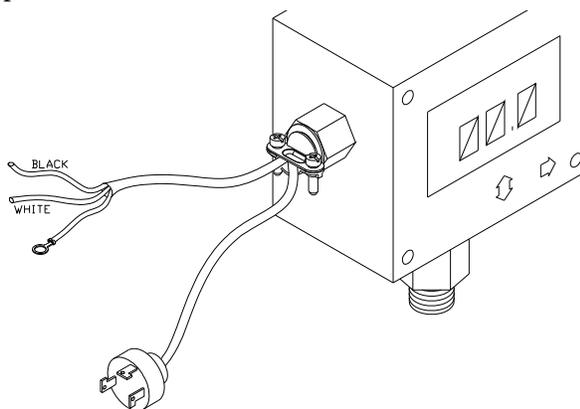


Figure 5-4. Level Monitor

Set the cut-in point (DB1) as follows:

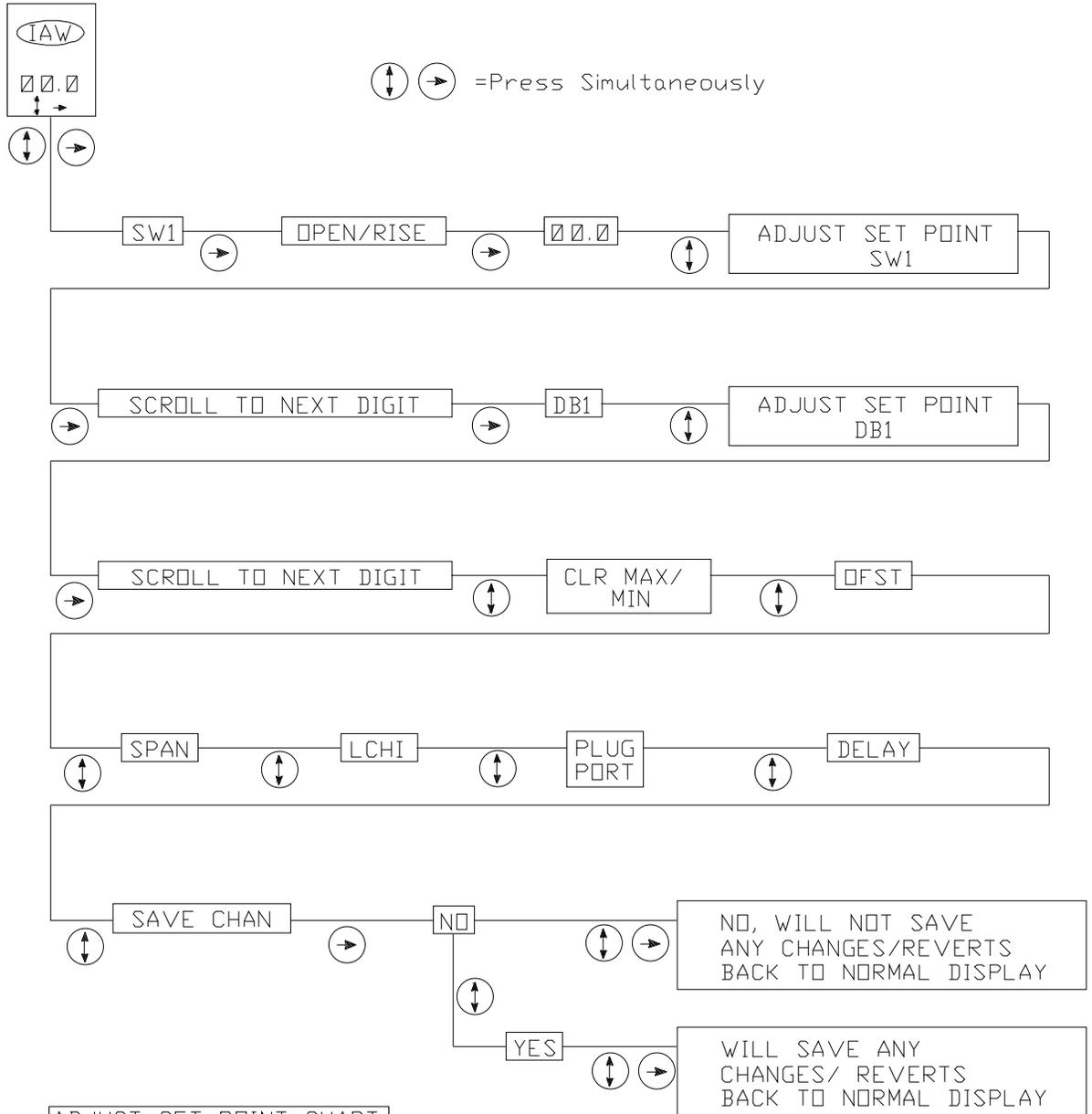
1. Determine the point at which the level monitor should turn on the still. This is the cut-in point (DB1). Ensure that the cut-in point is above the level monitor connection on the tank.
2. Measure the distance from the monitor connection to the cut-in point. This is the cut-in distance in inches.
3. Refer to program charts for instructions to adjust your DN1 level.

Set the cut-out point (SW1) as follows:

1. Determine the point at which the still should shut off. This is the cut-off point. Ensure that the cut-off point is below the tank overflow.
2. Measure the distance from the level monitor connection on the tank to the cut-out point below the overflow and enter that distance in (inches) the Level Monitor. See program chart to instruct you on how to enter the level in the monitor.

Figure 5-5. Programming Flow Chart (Direct Acting)

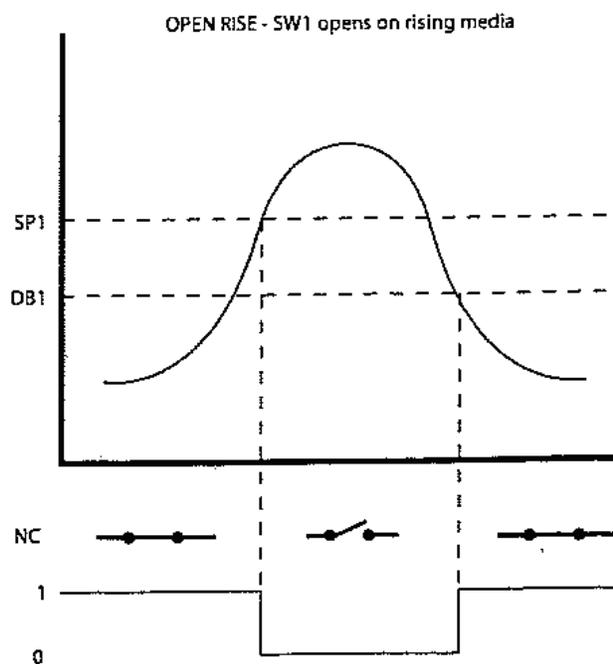
Programming Flow Chart (Direct Acting)
SW2112X1 LEVEL MONITOR



ADJUST SET POINT CHART	
SW1 (inches)	DB1 (inches)
00.0"	00.0"
01.0"	01.0"
02.0"	02.0"
03.0"	03.0"

Level Monitor Instructions

1. From the display simultaneously press the ↓ ↑ & → arrows to enter into the level adjustment pause.
2. SW1 will appear on the display. Press → , the display will show “OPEN/RISE” then press → , the display will show.
3. At this point, you will enter the height (inches) of the Still shut off point (SW1). Enter the measured valve (inches) by pressing ↓ ↑ .
4. To advance to the next digit, press →, When complete press ↓ ↑ button. “CLR MAX/MIN” will appear, then press ↓ ↑ button to scroll through the following displays: OFST, SPAN, LCHI, PLUG PORT, DELAY, SAVE CHAN, (save change).
5. Once the display shows SAVE CHAN, press → . NO will appear on the display. Press ↓ ↑ → simultaneously to save the change and revert back to normal operation display.



SW1 - Opens on Rinse (cut-out point)

DB1 - Closes on Fall (cut-in point)

Level Monitor Instructions (cont.)

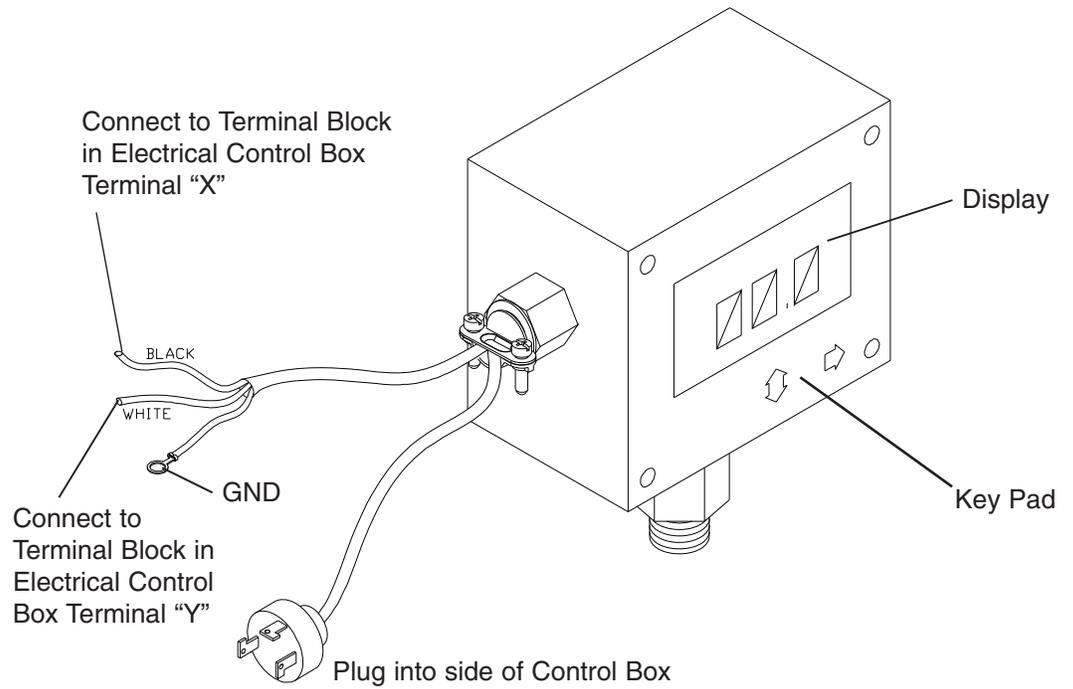


Figure 5-6. Level Monitor Installation

Note *Contacts R-B

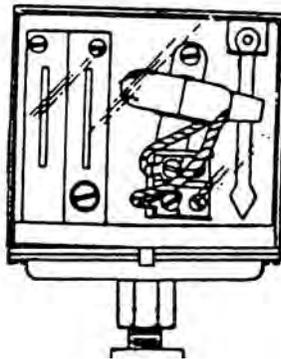


Figure 5-7. Level Monitor - Used on Units Before 2009

Interval Drain Timer

As stated in the PRINCIPLE OF OPERATION section, periodic draining of the Distilled Water Center is accomplished by the interval timer. A four hour timer is supplied and adjusted at the factory. With a four hour timer, the Distilled Water Center operates for 4 hours minus the time required for draining. **If necessary, readjust the timer as follows:**

1. Set the POWER switch to the OFF position.
2. Remove the lower front panel.
3. Remove the cover on the front of the electrical box to gain access to the timer.
4. For the Distilled Water Center, the recommended adjustment is at the first calibration - equal to 2½ percent of the timing cycle, or a 10 to 15 minute draining period.
5. Loosen the cam adjustment screw.
6. Rotate the top cam to the desired position. Tighten the cam adjustment screw.

Note When the Interval Timer is in the Drain Cycle mode, the Distilled Water Center will shut down. Example, if the Distilled Water Center is in the middle of refilling the tank when the interval timer goes into the drain cycle mode, the Distilled Water Center will shut down even though the tank is not full. No lights will indicate this mode. After 15 to 20 minutes, the Distilled Water Center will automatically restart. s

Note When the Interval Drain Timer is in the draining period, the unit will shut down the inlet solenoid valve and drain solenoid valve, along with the power to the heating elements for approximately 10 to 15 minutes. The front display does not indicate that the unit is in the drain mode. Unit will start up on its own. s

Replace the gear rack as follows:

1. Remove the gear rack screw.
2. Remove the old gear rack and install the new gear rack.
3. Replace and tighten the gear rack screw. To prevent gear binding, ensure that there is a slight amount of gear play before tightening the gear rack screw.

Note The entire cam may be rotated to start the timing cycle manually. s

Interval Drain Timer (continued)

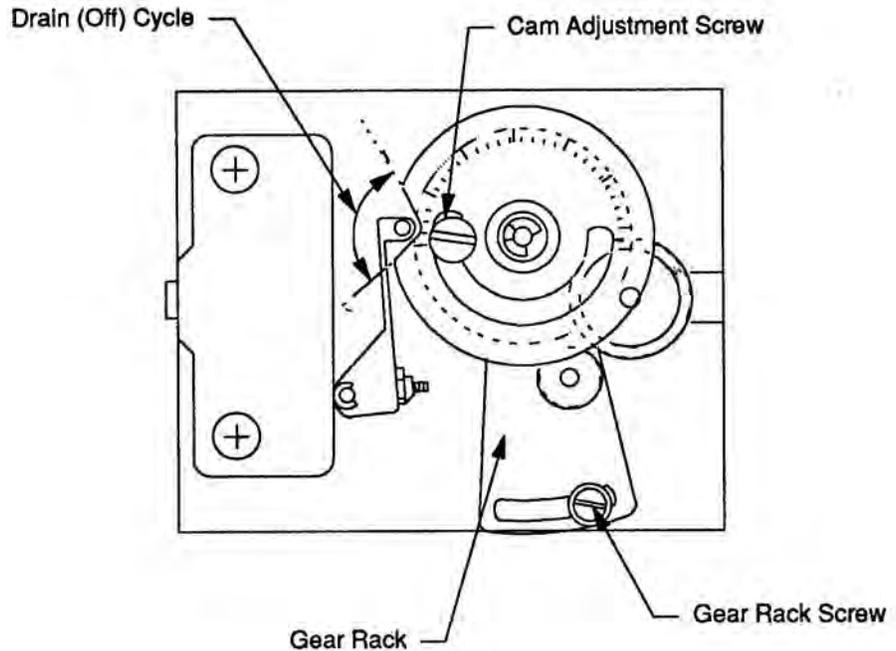


Figure 5-6. Interval Timer

Ventgard Element Replacement

The chemicals in the filter element have a limited capacity. The filter element should be replaced every 60 days or after 1000 gallons have been drawn from the storage tank (replacement filter part number 25001). A filter element may be stored in a cool, dry place almost indefinitely, provided the plastic bag has not been opened.

Replace a Ventgard element as follows:

1. Lift the top hinged cover up to remove the Ventgard.
2. Turn the Ventgard cover one quarter turn counterclockwise and remove.
3. Remove the gasket from the top of the old filter element. The gasket may be stuck to the inside of the cover.
4. Remove the old filter element. Ensure that the gasket is not stuck to the bottom of the filter element.
5. Ensure that the inner disc is installed properly. The inner disc is marked THIS SIDE UP. There should be a gasket installed above and below the inner disc.
6. Remove the plastic wrapping from a fresh filter element.

Ventgard Element Replacement (cont.)

7. Install the fresh filter element with the cotton portion facing upward.
8. Install the gasket on top of the filter assembly.
9. Install the cover on the body.

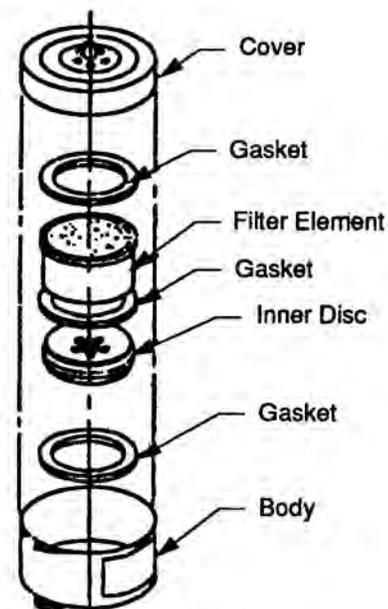


Figure 5-7. Ventgard Element

Distillate Resistivity Meter Calibration

See Figure 8-5. Calibrate the meter as follows:

1. Set the POWER switch to OFF.
2. Check the zero alignment of the meter needle to the meter scale. If required, rotate the zero adjustment screw until the meter needle is aligned with the line indicating the beginning of the meter scale. The zero adjustment screw is located on the face of the meter below the scales.
3. To calibrate the meter further, remove the lower front panel and disconnect the wires connecting the meter to the conductivity cell in the piping to the draw-off faucet, and connect a known resistance across the cell terminals on the bottom of the meter. A 500,000 ohm resistor is installed in the meter circuit (see the wiring schematic).
4. Set the POWER switch to ON and adjust the potentiometer on the bottom of the meter case with a screwdriver to make the scale indication correspond to the simulated resistance.

Section 6 Troubleshooting

Symptom	Probable Cause	Test and Remedy
Drop in purity.	Unit dirty.	Inspect evaporator for scale and clean as required. See Cleaning Methods and Disassembly for Cleaning.
	Distillate resistivity meter out of calibration.	Calibrate meter.
	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.	Unit dirty.	Inspect evaporator for scale and clean as required.
	Leak in condenser.	Test condenser for leaks and replace if required.
	Bacteriological growth in distilled water.	Inspect the suspected parts. Clean as indicated in "Biological Cleaning" under Cleaning Methods.
Drop in distillate capacity.	Excess scale on heating elements.	Inspect and clean as required. See Heating Element Test and Replacement.
	Low voltage.	Check voltage. If it is less than what is stated on nameplate on side of electrical box, notify an electrician. See note under Electrical Connections.
	Leak in automatic drain valve.	Ensure automatic drain valve is closed and not leaking.
	Damaged or inoperative heating elements.	Check wiring, connections, etc. Test heating elements and replace if necessary.
Steam blowing from condenser.	Low cooling water flowrate.	Readjust Cooling Water Control Valve.
	Low cooling water pressure.	Check cooling water pressure. It should be at least 30 psi.
	Excess scale in condenser.	Inspect condenser for scale.

Section 6
Troubleshooting

Symptom (cont.)	Probable Cause (cont.)	Test and Remedy (cont.)
Water blowing from condenser.	Condenser leak.	Test condenser for leaks and replace if required.
	Trapped distillate line.	Inspect distillate lines for any restrictions or trapping.
Distilled Water Center will not stop.	Storage tank empty.	Check tank for leaks and repair it. Ensure that draw-off faucet is not open or leaking. Repair draw-off faucet if necessary.
	Malfunction in level monitor.	Check level monitor differential adjustment. Replace level monitor if condition cannot be corrected.
		Check the power source to level monitor 120VAC to make sure you have power to Level Monitor. Replace Level Monitor if you have 120VAC line cord and it's set correctly.
	Malfunction in solenoid valve.	Check drain solenoid valve; clean or repair.
Distilled Water Center will not drain.	Automatic drain valve or drain line clogged.	Inspect the automatic drain valve and line for foreign matter and clean as required.
	Interval timer motor not operating.	Check wiring to motor. Also check timer adjust.
Improper operation of water or drain solenoid valve.	Faulty control circuit.	Check electrical system by energizing solenoid. A metallic click indicates solenoid is operating. Absence of click indicates loss of power supply. Check for open-circuit or grounded coil, broken lead wires or splice connections.
	Burned-out coil.	Check for open-circuit coil and replace if necessary.
	Low voltage.	Check voltage across coil leads. Voltage must be at least 85% of nameplate rating. If voltage is too low, notify plant maintenance personnel.
	Incorrect water 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.

Symptom (cont.)	Probable Cause (cont.)	Test and Remedy (cont.)
Distilled Water Center will not start.	Storage tank full.	Drain storage tank to level monitor cut-in point.
	Trapped distillate line.	Ensure that main circuit breakers in electrical supply are on. If they are on and trouble still exists, notify plant electrician.
		Check voltage. If appreciably lower than rated voltage, notify plant electrician.
		Check level monitor adjustment and circuit connections at monitor and at electrical box. Replace monitor if condition cannot be corrected.
		Check the power source to level monitor 120VAC to make sure you have power to Level Monitor. Replace Level Monitor if you have 120VAC line cord and it's set correctly.
		Check POWER switch and replace if faulty.
		Check interval timer microswitch and replace if faulty.
		Check connections in electrical box and tighten as necessary.
		Ensure that solenoid valve cords are plugged into electrical outlet.
		Check solenoid valves and clean or repair in accordance with instructions in this section.
Distilled Water Center starts but will not produce distillate.	Inadequate water supply to Distilled Water Center.	Ensure that water shutoff valve in water inlet line is open and cooling water control valve is adjusted properly.
		Check solenoid valves and clean or repair.
	Malfunction in automatic drain valve.	Ensure that drain valve is closed and not leaking. Clean or repair if necessary.
	Low voltage to heater circuit.	Check voltage. If it is less than what is stated on nameplate on side of electrical box, notify electrician.

Section 6
Troubleshooting

Symptom (cont.)	Probable Cause (cont.)	Test and Remedy (cont.)
Water Center starts but will not produce distillate.	No electrical power to heater circuit.	Check all wiring and connections in the electrical box.
		Check contactor coils and points and replace contactor if burned out.
		Ensure that leads are connected to low water cutoff electrode assembly terminals.

Section 7 Technical Characteristics

Distillate capacity	.2 gph	
Storage Capacity	10 gal.	
Water Requirements		
Quantity	16-20 gph.	
Water Pressure	.30-90 psi.	
Plumbing Connections		
Water Supply	.½” Copper	
Waste	.1¼” cast elbow*	
Overall Dimensions		
Height	.40 in.	**
Width	.24 in.	
Depth	.15 in.	
Electrical RequirementsOptions:		
A1065-B	.240V	1 Phase
A1065-C	.208V	3 Phase
A1065-D	.240V	3 Phase

* *Must be atmospherically vented and gravity flow.*

** *This dimension is increased to 46-5/8” if optional bench mounting stand (catalog no. A1066) is ordered for bench top mounting purposes. The stand is equipped with adjustable levelers for leveling the unit and allows easy working space for repairs and maintenance.*

****See nameplate data on side of electrical box located at lower left front of distilled water center. Remove lower panel to observe nameplate.*

Section 8 Parts List

This section contains parts list information for the Distilled Water Center.

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, contact our Technical Services Department for a "Return Materials Authorization" number (RMA). Material returned without an RMA number will be refused.



Figure 8-1. Faucet Part No. L1900

Ventgard Parts List

Index No.	Description	Part No.
	Ventgard Assembly (includes items 1-8 below)	H3120
1	Cover	25012
2	Body	25011
3	Filter Element	25001
4	Gasket	25002
5	Inner Disc	25010
6	Valve, Flapper	25009
7	Elbow, Brass, Tin-plated 1/2" NPT, 90°	03614
8	Nipple, 1/2" NPT x 2"	03638
	Tape, Teflon, Roll (not shown)	06078

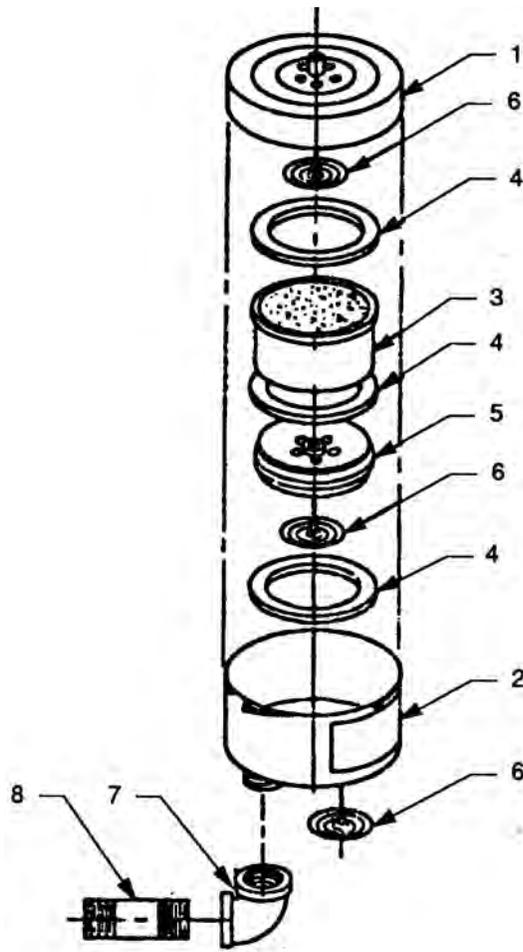


Figure 8-2. Ventgard Exploded View

Recommended Spare Parts

Description	Part No.
Filter Element, Ventgard	25001
Gasket, Ventgard	25002
Flapper Valve, Ventgard	25009
Coil, Water Solenoid Valve	01121
Kit, Solenoid Valve (parts included are identified by asterisks in the AUTOMATIC WATER AND DRAIN VALVES illustration in the MAINTENANCE section.)	01125
Coil, Drain Solenoid Valve	01124
Kit, Solenoid Valve (parts included are identified by asterisks in the AUTOMATIC WATER AND DRAIN VALVES illustration in the MAINTENANCE section.)	01130
Level Monitor, Direct	SW1258X1
O-Ring, Vapor Pipe and Slide Connector	06174
O-Ring, Bleeder Valve	06162
Heater, Evaporator, Type "Y" 1000 WTS 120V	07033 A1065-B, A1062-D, A1065-C
Gasket, Evaporator, Ethylene Propylene	06743
Thermometer, Remote with Cell	02095
Valve, Water Shut-off, Gate 3/8 BR.	02047
Valve, Cooling Water Control, 1/4 BR. needle	02120
Cell, Purity Meter	21566
Low Water Cut-off, Electrical Assembly	21563
Bulb, Pilot, NE51H, Electrical Box	04162
Timer, 4Hr 115V 60 Hz, Electrical Box	01038
Switch, SPST, 10A 250V, Electrical Box	04153

Section 8
Parts List

Ref. No.	Qty.	Description	Part No.
1	1	Valve	01319
2	2	Nipple	04018
3	1	Tee	04099
4	1	Valve	01318
5	2	Connector	04073
6	1	Connector	CEX13
7	1	Cord set	CR495X4
8	1	Cover	04100
9	1	Washer	FW495X3

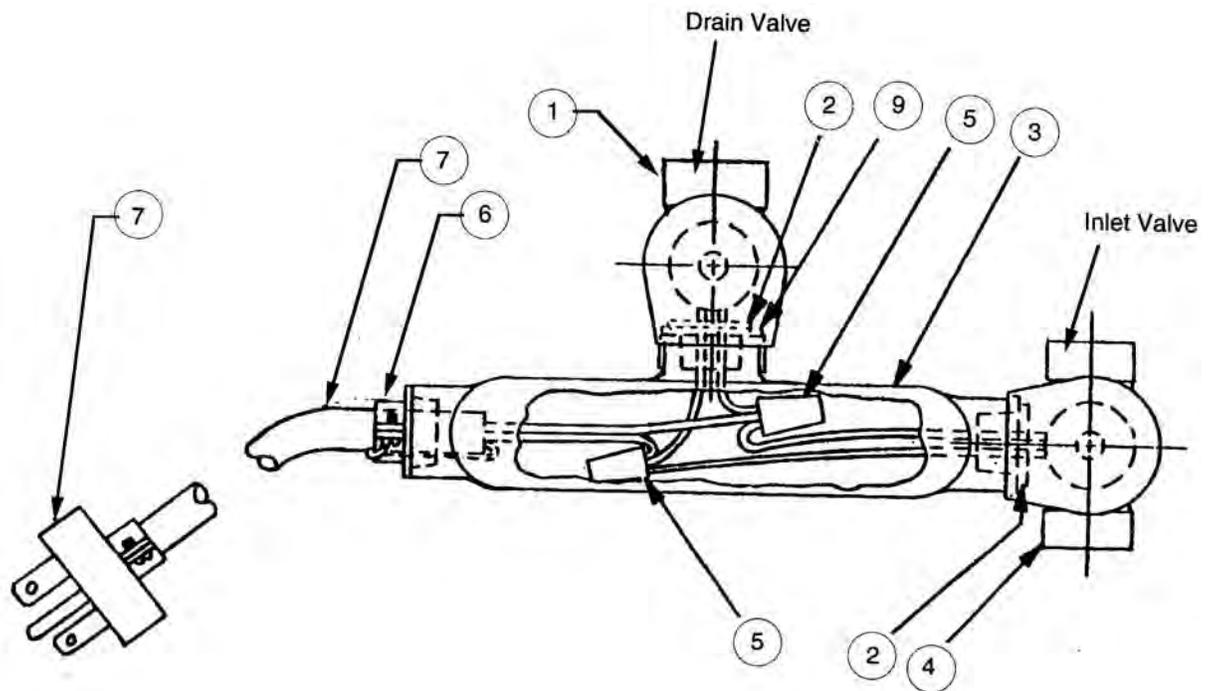


Figure 8-3. Solenoid Valve Assembly

Ref. No.	Qty.	Description	Part No.
1	2	Connector	03694
2	1	Tape	06436
3	1	Sight Glass	23904
4	1	Tee	06435
5	1	Nipple	03623
6	1	Nipple	05073
7	1	Nipple	03693
8	1	Elbow	03612
9	1	Elbow	05043
10	1	Nipple	05134
11	1	Conn PFLO	05449
12	1	Ventgard	H3120
13	1	Tee	05301
14	1	VAP Pipe	21435
15	1	Tank/Cond	21555
16	1	Elbow	05060
17	1	Bushing	05008
18	3	Nipple	03625
19	1	Elbow	05516
20	1	Elbow	03614

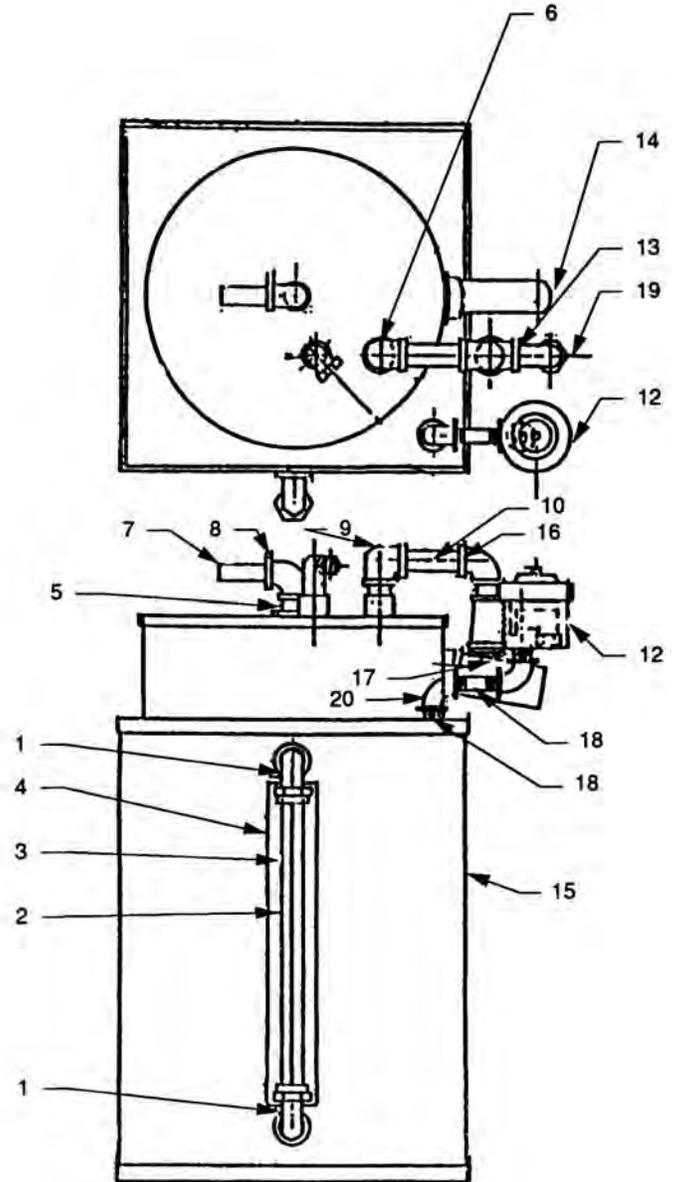


Figure 8-4. Tank Condenser Assembly

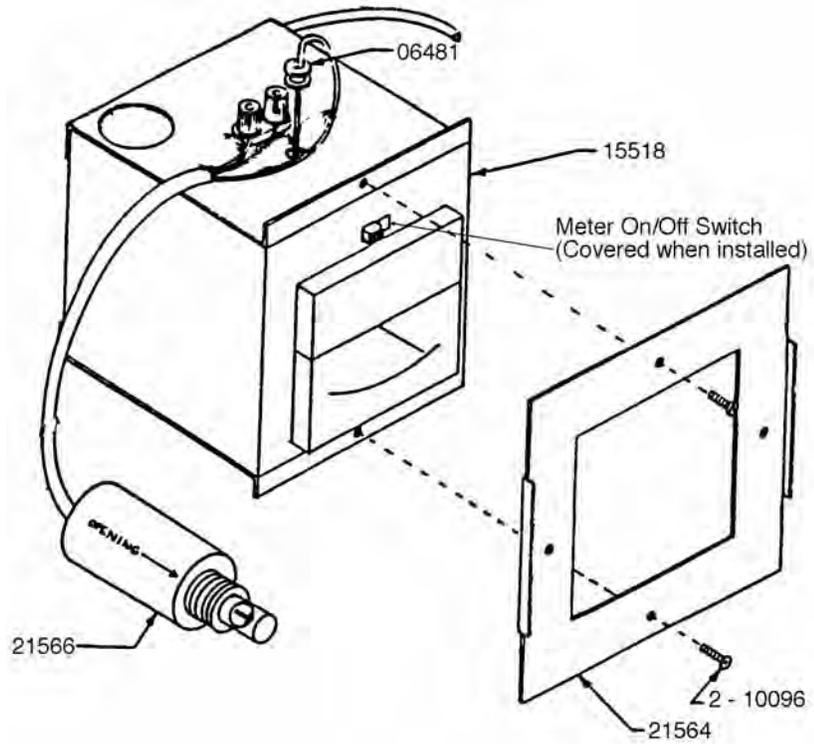


Figure 8-5. Purity Meter

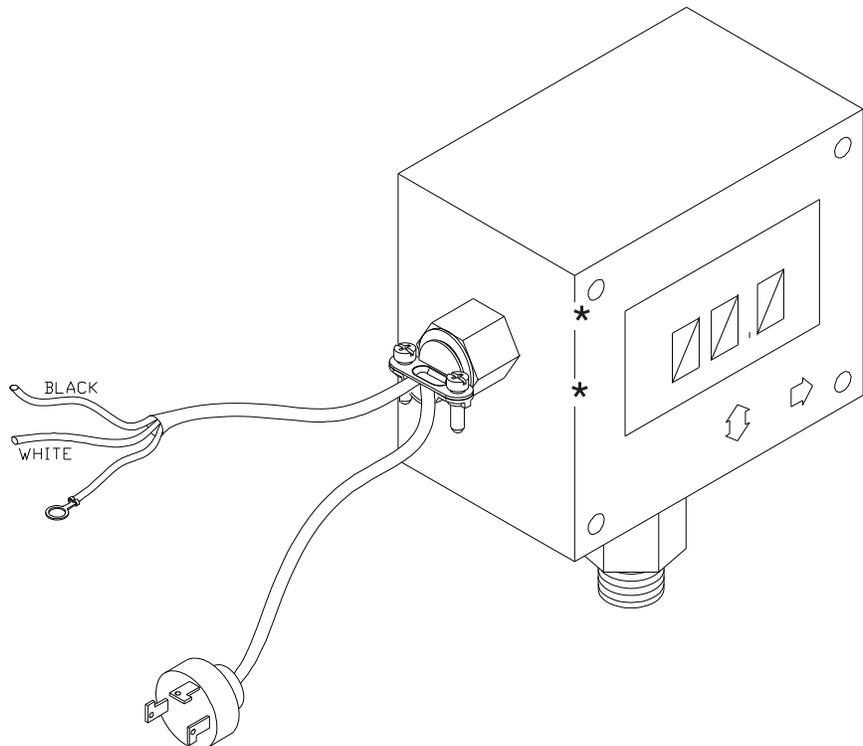


Figure 8-6. L.W.C.O. Electrical Box Assembly

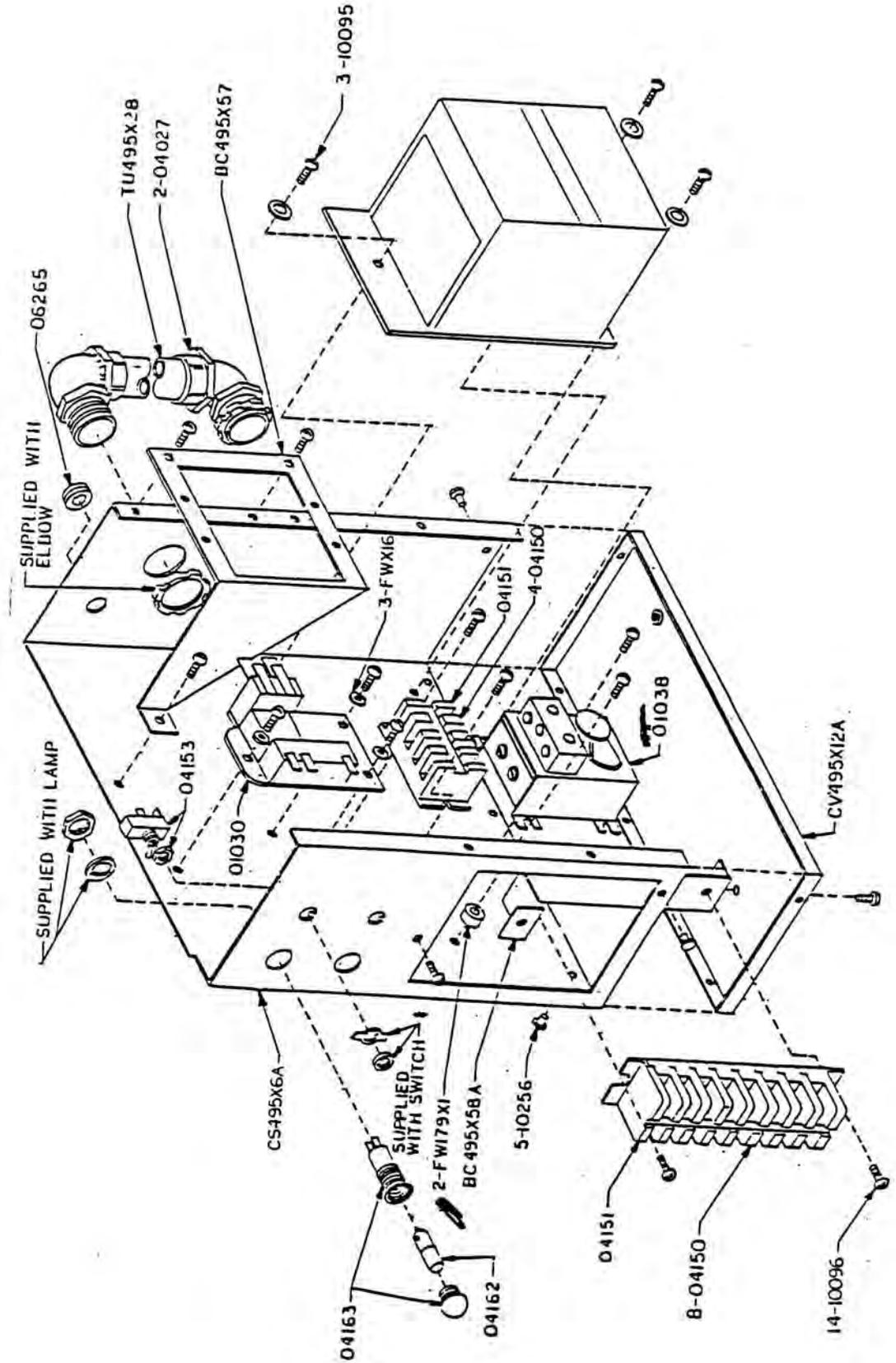


Figure 8-8. Electrical Box

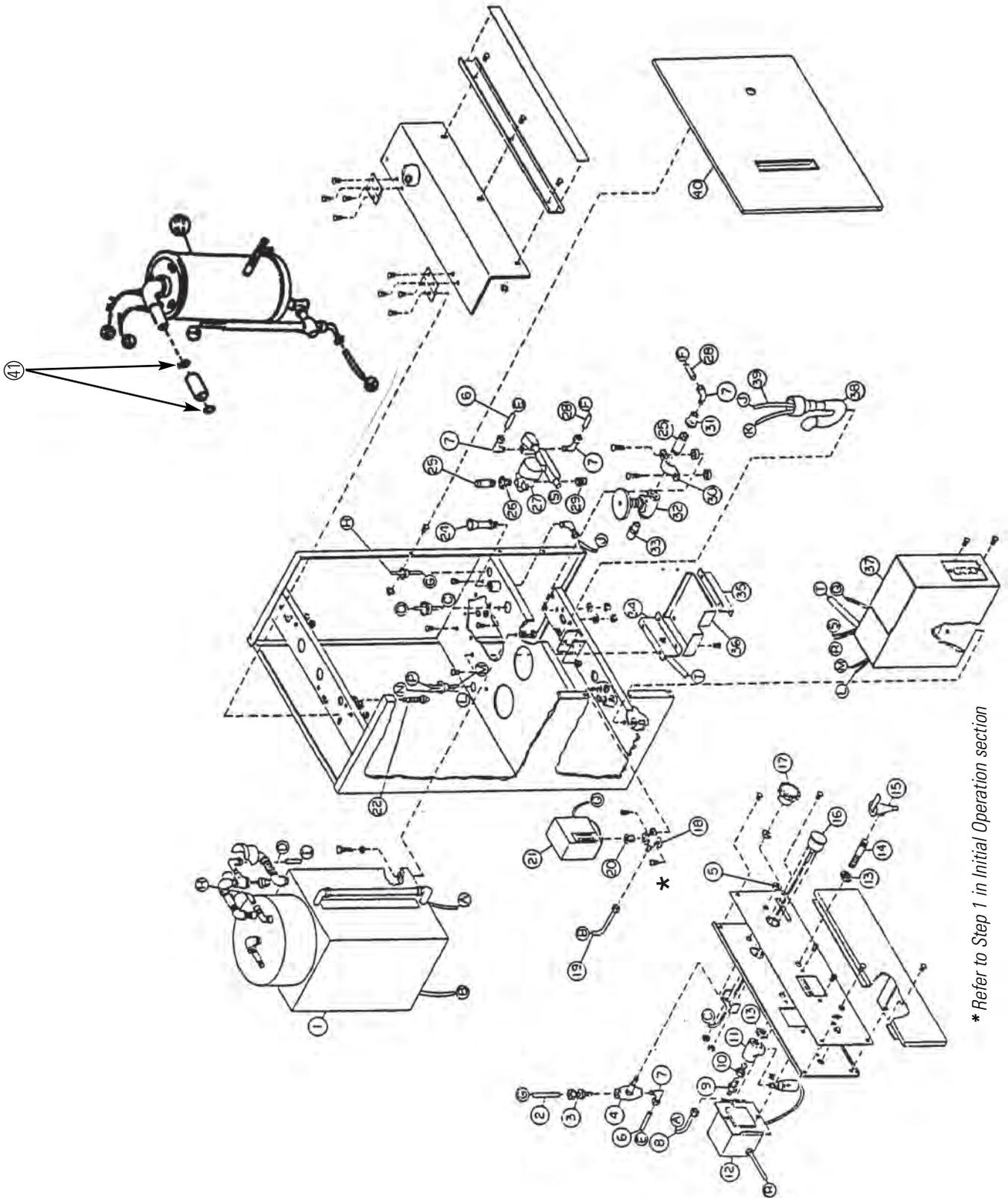


Figure 8-10. Distilled Water Center Exploded View

Index Number	Part Number	Description
1	21554	Condenser Assembly (for parts breakdown - Tank Condenser drawing)
2	TU495X46	Tubing
3	05328	Adapter
4	02120	Valve
5	10469	Nut
6	TU495X47	Tubing (Two 05450 required also)
7	05450	Elbow
8	21671	Distribution Tube
9	03692	Adapter
10	03581	Bushing
11	03669	Tee
12	15518	Meter (for parts breakdown - Purity Meter drawing)
13	03468	Locknut
14	06407	Nipple
15	L1900	Faucet
16	02095	Thermometer
17	02004	Knob
18	21571	Elbow
19	21444	Distribution Tube
20	03583	Bushing
21	SW1258X1	LWCO
22	10173	Spindle
23	23899	Evaporator Assembly (for parts breakdown - Tank Condenser drawing)
24	21577	Cup
25	05135	Nipple
26	DAD12	Bushing
27	21562	Solenoid (for parts breakdown - see Solenoid Valve drawing)
28	TU495X51	Tubing
29	05072	Nipple
30	03795	Clamp
31	05333	Coupling
32	02047	Valve
33	05282	Adapter
34	CS495X5A	Case Assembly
35	CS495X4A	Case Assembly
36	CV495X9	Cover
37	33042	Electrical Assembly (parts breakdown - Elec. Box and Details drawings)
38	21578	Trap Assembly
39	TU495X32	Tubing
40	21552	Upper Panel
41	06174	O-rings (2) required

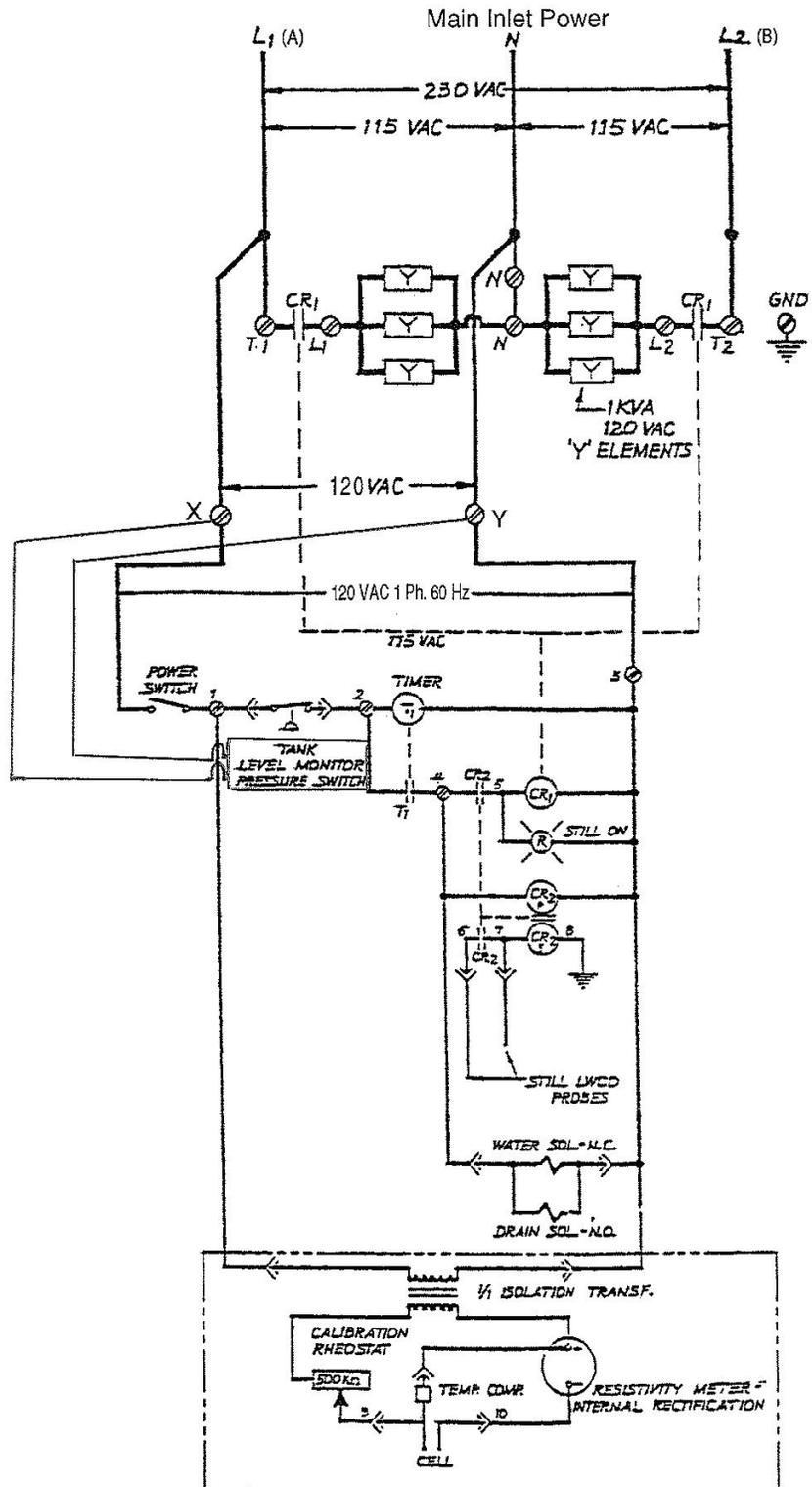


Figure 8-11. A1065-B 230 VAC Wiring Diagram

Section 8
Parts List

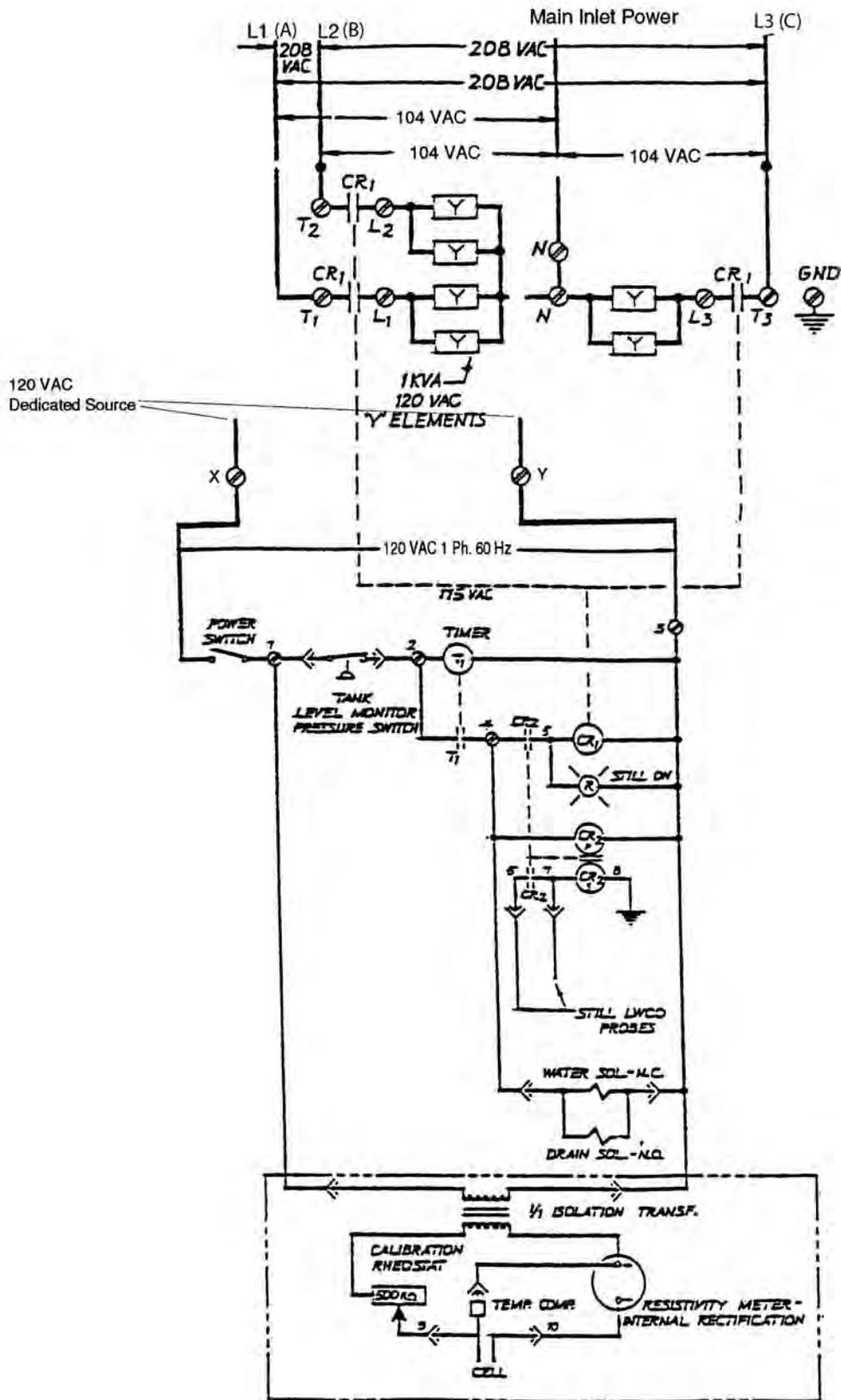


Figure 8-13. A1065-C 208 VAC Wiring Diagram

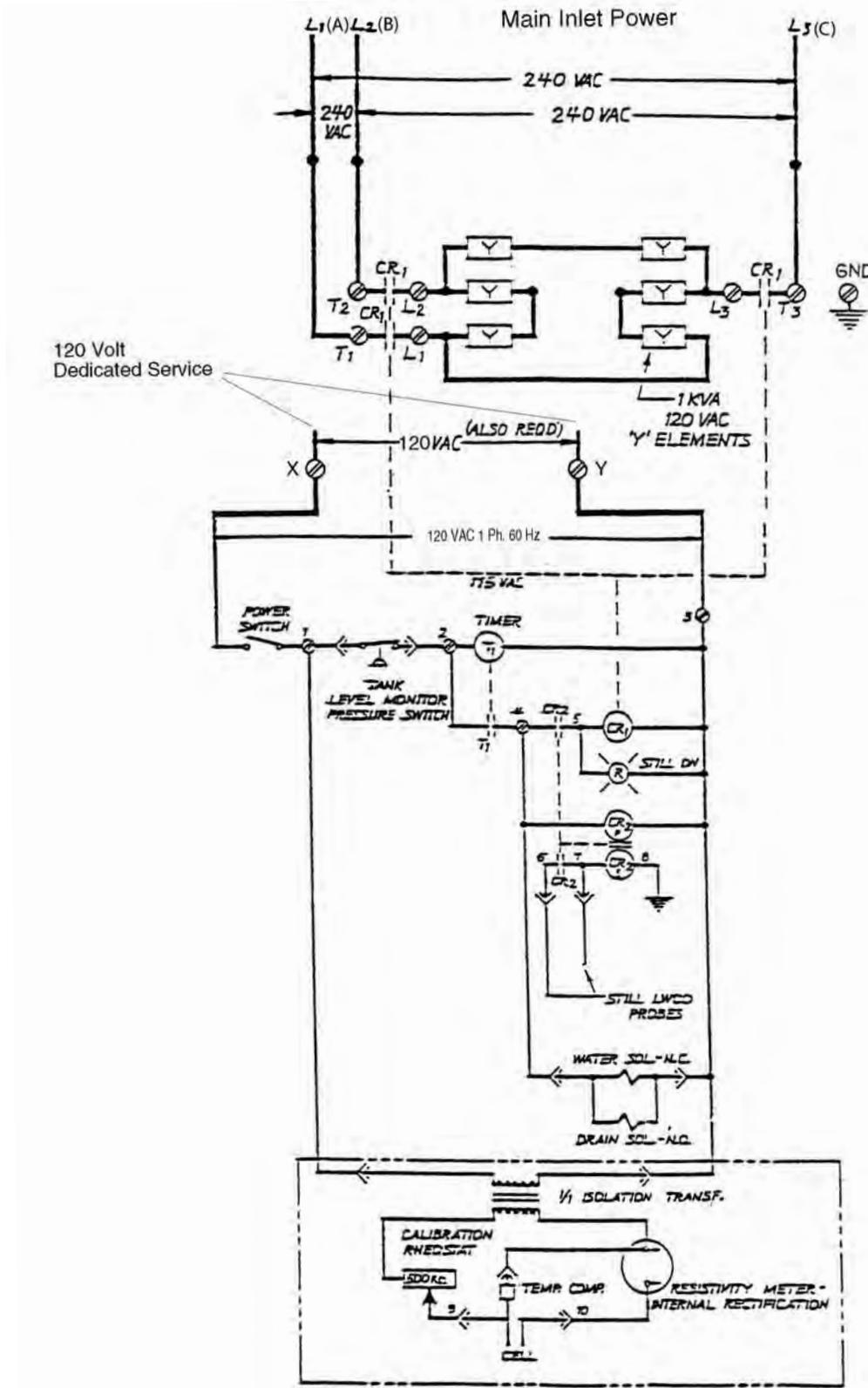


Figure 8-14. A1065-D 240 VAC Wiring Diagram

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