Pure Water C-630®

Commercial Distillation System

OWNERS MANUAL

Published by:

The Commercial Products Division
Pure Water
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SAFETY PRECAUTIONS

- The C-630 operates at high temperatures and at elevated pressures. Follow all necessary precautions when near the equipment.
- The C-630 should be installed by a qualified electrician in accordance with national and local electrical codes.
- The C-630 should be installed by a qualified plumber in accordance with national and local plumbing codes.
- The C-630 Commercial Distillation System is extremely heavy. Exercise extreme caution when lifting the unit.
- Always disconnect the C-630 from its electrical power source before servicing or opening of the access panels.
- The C-630 should be placed in a location that will prevent damage to personnel and/or merchandise in the unusual event of a leak or discharge of steam from the unit.
- Do not allow the C-630 to be exposed to freezing temperatures. Freezing could result in serious damage to the unit.
- The C-630 requires feedwater of zero hardness to operate. This is accomplished by the softener installed with this system. Failure to maintain the softener can result in scale buildup in the C-630 heat exchange surfaces. This could reduce the efficiency of the machine.

FOR THE RECORD

You should record both the Serial Number and date of purchase below for future reference.

Date of Purchase: _____ Model: C-630 _____

Serial Number: _____

Date of Installation: _____

Installer: _____

Manufactured by:

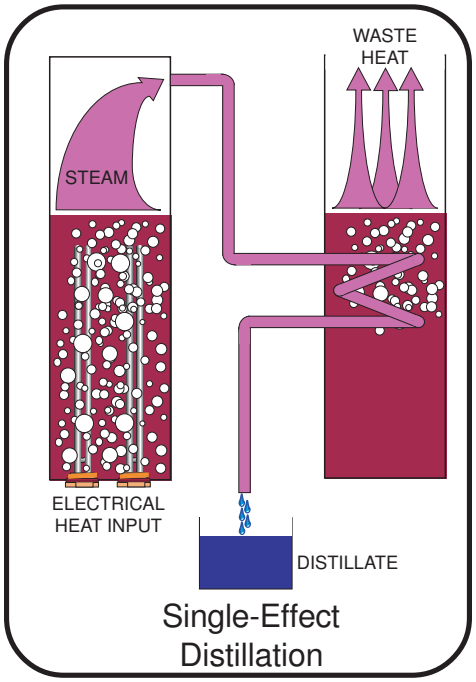
Pure Water
4120 NW 44th
Lincoln, NE 68524
Phone: 402-467-9300
Fax: 402-467-9393

INTRODUCING THE C-630
WHAT IS MULTIPLE-EFFECT DISTILLATION?

The C-630 utilizes state-of-the-art, multiple-effect technology to produce up to 630 gallons (2,270 liters) per day of high quality distilled water more efficiently than typical distillation systems—approximately 1/6th the cost of typical distillation systems.

Distillation Basics

Distillation is the process by which tap water is boiled to produces steam. In typical distillation, the steam is condensed by either blowing cool air across a condensing coil (air-cooled distillation systems) or by passing it through a water-cooled heat exchanger (water-cooled distillation systems).



Single-Effect Distillation

With typical distillation, one can say the heat (or energy) of condensation is not reused. This is called "single-effect distillation". The technical term for the energy to condense the water is the "latent heat of vaporization".

Multiple-Effect Distillation

"Multiple effect" gets it's name from the fact that more than one boiling chamber or "effect" is used to produce distilled water. Very large multiple-effect system utilize up to 24 effects (or sometimes called boiling chambers) to produce distilled water for commercial and industrial applications.

With multiple-effect technology, the energy contained in the steam produced in the first boiling chamber is reused to boil more water in subsequent boiling chambers. This recycling of energy provides the energy saving feature of multiple-effect distillation. Since there are six different boiling chambers in a C-630, it produces distilled water for approximately 1/6 the cost of typical distillation.

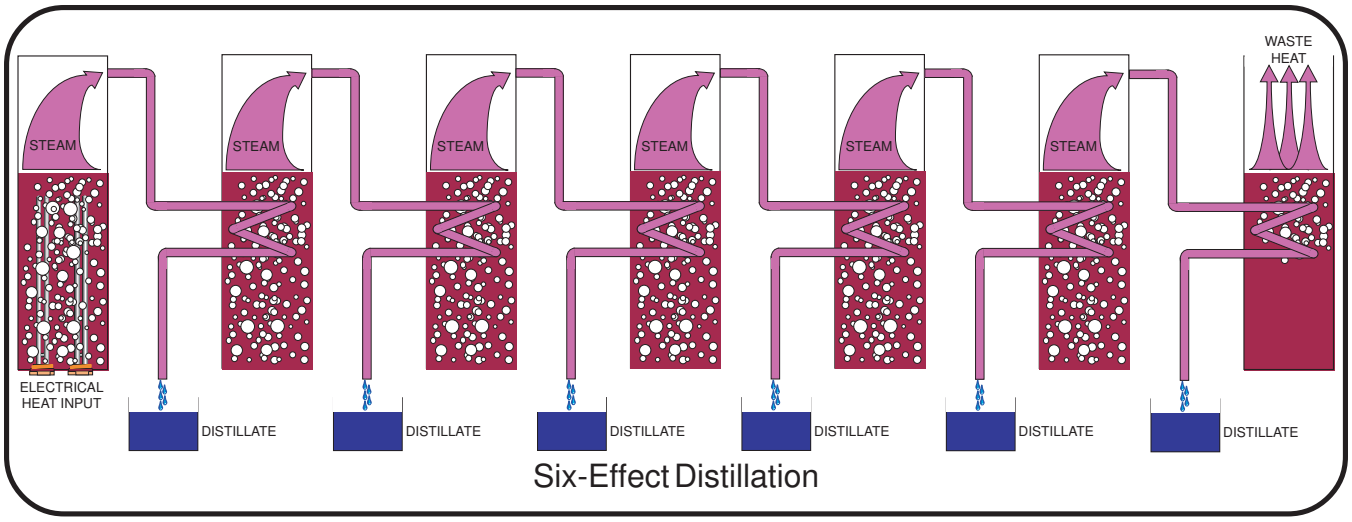
This is due to the fact that the C-630 utilizes six separate boiling chambers with only one chamber containing heating elements. The water is initially boiled in chamber #1 at approximately 110° C.

The steam from boiling chamber #1 is collected and passed through a heat exchanger within boiling chamber #2. Boiling chamber #2 also contains tap water on the exterior of the heat exchanger. The steam from boiling chamber #1 is at a higher temperature than the surrounding tap water which causes the tap water to boil. When the tap water in chamber #2 is boiled, the steam from chamber #1 is condensed into distilled water.

The steam produced in boiling chamber #2 is collected and passed through a heat exchanger within boiling chamber #3. Boiling chamber #3 also contains tap water on the exterior of the heat

exchanger. The steam from boiling chamber #2 is at a higher temperature than the surrounding tap water which causes the tap water to boil. The steam from boiling chamber #3 is collected and passed through a heat exchanger within boiling chamber #4. The process continues through chambers #5 and #6.

At this point, the distilled water is hot, only slightly below boiling temperature. To gain the maximum efficiency possible from



Six-Effect Distillation

this system, the hot distilled water is passed through a final heat exchanger located in the Raw Water Preheater/Final Condenser. Since the water is below 100° C, no boiling is able to take place. (If boiling did take place in chamber #7, this would be a 7 effect system.)

In chamber #7, the hot distilled water is used to heat the tap water that will be flowing into boiling chamber #1. This preheating feature further reduces the amount of energy it takes to boil the water in chamber #1.

INTRODUCING THE C-630

The C-630:

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INTRODUCING THE C-630

Flow Diagram of the C-630:

This diagram is a simple representation of the C-630. Different colors represent the 4 flows through the machine, they are raw water, steam, distilled water, and volitile organics. Each of the main components are shown.

1. **Raw Water Inlet**
   Raw water enters the machine at this location. If you are using a recycling unit, refer to your recycling unit manual for installation instructions. Refer to page 23 for feedwater specifications.

2. **Distillate Cooler**
   This chamber cools the distillate before it enters the transfer tank. The raw water temperature is increased by the heat exchange.

3. **Raw Water Preheater/Final Condenser**
   This chamber condenses the steam from the final (#6) chamber. The raw water temperature is increased by the heat exchange. The raw water will be close to the boiling point before it enters the #1 chamber.

4. **Boiling Chamber #1 Level Control**
   The #1 boiling chamber is different than any of the other chambers in that it has heating elements to provide the heat energy that is required for boiling. To protect the heating elements, there is an additional sensor in the level control. This additional low level sensor turns the heating elements off if a minimum water level is not maintained.
   The normal level control consists of 3 distinct parts:
   The level control sensor—Determines the level of water in the chamber sightglass by reading the change in density in that section of the sight tube.
   The level control sensor light—This light turns on when the sensor reads a low level in the sight tube.
   The Chamber Inlet Solenoid—Opens to allow raw water to enter the chamber when it is activated by the level control sensor. This valve should be open when the level control sensor light is on.

5. **Heating Elements**
   These heating elements provide all of the heat for the C-630. 14,000 watts of energy are required for proper operation of the machine. There are 3 safeties built in to the machine to protect the heating elements:
   a. Each heating element has a breaker so if the element draws more amperage than it should, then the breaker will trip.
   b. A low water level sensor in boiling chamber #1 will turn the heating elements off if the water level drops and could potentially have the heating elements in air. The

heating elements would burn out if exposed to the air when they are on.

c. A mechanical over-temperature sensor will turn the heating elements off if the temperature exceeds the normal parameters.

6. **Boiling Chamber #1 Separator**
When water boils vigorously, small droplets of water can be carried along with the steam. To improve the purity of the distilled water this chamber forces the small droplets to separate, and only allowing the steam to be carried into the next chamber.

7. **Steam/Distilled Heat Exchanger**
Steam from the #1 boiling chamber enters the distilled section of the #2 boiling chamber. This is where the energy in the steam is transfered to the raw water in the #2 chamber.

8. **Boiling Chamber #2 Level Control**
The normal level control consists of 3 distinct parts:
The level control sensor—Determines the level of water in the chamber sightglass by reading the change in density in that section of the sight tube.
The level control sensor light—This light turns on when the sensor reads a low level in the sight tube.
The Chamber Inlet Solenoid—Opens to allow raw water to enter the chamber when it is activated by the level control sensor. This valve should be open when the level control sensor light is on.

9. **Volatile Transfer Tube Chamber 2 to 3**
There are volatiles (chemicals with lower boiling points than water), and uncondensible gases (gases that once in the gas form cannot be readily changed into liquid again) in the raw water. These gases pass through the distilled sections of the distiller until they enter the Volatile Chamber (#34).

10. **Boiling Chamber #2 Separator**
When water boils vigorously, small droplets of water can be carried along with the steam. To improve the purity of the distilled water this chamber forces the small droplets to separate, and only allowing the steam to be carried into the next chamber.

11. **Steam/Distilled Heat Exchanger**
Steam from the previous boiling chamber enters the distilled section of the boiling chamber. This is where the energy in the steam is transfered to the raw water in the boiling chamber.

12. **Distilled Transfer Tube Chamber 2 to 3**
Allows the condensed distilled water to transfer from one distilled chamber to the next.

13. **Boiling Chamber #3 Level Control**

Refer to #8.

14. **Volatile Transfer Tube Chamber 3 to 4**
Refer to #9.

15. **Boiling Chamber #3 Separator**
Refer to #10.

16. **Steam/Distilled Heat Exchanger**
Refer to #11.

17. **Distilled Transfer Tube Chamber 3 to 4**
Refer to #12.

18. **Boiling Chamber #4 Level Control**
Refer to #8.

19. **Volatile Transfer Tube Chamber 4 to 5**
Refer to #9.

20. **Boiling Chamber #4 Separator**
Refer to #10.

21. **Steam/Distilled Heat Exchanger**
Refer to #11.

22. **Distilled Transfer Tube Chamber 4 to 5**
Refer to #12.

23. **Boiling Chamber #5 Level Control**
Refer to #8.

24. **Volatile Transfer Tube Chamber 5 to 6**
Refer to #9.

25. **Boiling Chamber #5 Separator**
Refer to #10.

26. **Steam/Distilled Heat Exchanger**
Refer to #11.

27. **Distilled Transfer Tube Chamber 5 to 6**

Refer to #12.

28. **Boiling Chamber #6 Level Control**
Refer to #9.

29. **Volatile Transfer Tube Chamber 6 to the Volatile Chamber**
The Volatiles that have collected through the entire distillation process pass through this tube to the volatile chamber so they can be removed.

30. **Boiling Chamber #2 Separator**
Refer to #11.

31. **Steam/Distilled Heat Exchanger**
The steam from the #6 boiling chamber enters the Raw Water Preheater/Final Condenser (#3). The heat (energy) in the steam transfers to the raw water that will enter the #1 boiling chamber. The distilled water then goes to the Valatile Chamber (#34).

32. **Distilled Transfer Tube Chamber 6 to Volatile Chamber**
The collected distilled water from chambers #2-#5 go through this tube to the Volatile chamber.

33. **Vent Condenser Flow Control**
The vent condenser is responsible for creating the "suction" that draws the volatiles out of the volatile chamber. This is achieved by introducing cold water into a steam or near-steam temperature environment. The cool water causes the steam to collapse and a suction is created. Adjusting this valve will optimize your C-630. The temperature reading for this temperature is shown on the main control panel. Adjust this valve until the temperature is in the green section on the readout. Refer to page 11.

34. **Volatile Chamber**
This chamber is filled with material that flashes Volatiles and Uncondensible gases back to a gaseous state. The distilled water is drawn off to the Distillate Cooler (#2). The Volatiles and Uncondensible gases that are in this chamber are drawn off through the Volatile Removal Line (#35).

35. **Volatile Removal Line**
This line connects the Volatile Chamber and the Vent Condenser/Blowdown Tank. The blowdown creates a suction on this tube. The suction draws the volatiles from the volatile chamber through this line to the Vent Condenser/Blowdown Tank.

36. **Distillate Line**

This line runs from the Distillate Cooler (#2) to the Distillate Transfer Tank (#41). This line has a filtered suction break so that the distilled water in the Distillate Cooler is not siphoned into the Distillate Transfer Tank.

37. **Drain Cooler Flow Control**
The cooling water for the drain has two different controls. First the cooling water turns on when the temperature reaches a setpoint on the circuit board. Refer to page 39. The second control is the flow control. This allows you to adjust the amount of cooling water that enters the chamber when the cooling water is on.

38. **Blowdown**
Allows the now-concentrated raw water from the distiller to go down the drain.

39. **Cooling Valve**
This valve opens to send heated water to the drain or to the recycling unit.

40. **Drain Line**
The now cool concentrated raw water is sent down this line to a built-in air gap system and to the external drain.

41. **Distillate Transfer Tank**
This tank holds the distilled water for testing before it is sent to any larger storage tank system.

42. **Purity probe**
This probe determines the purity of the distilled water in the transfer tank. If the purity is good, then the circuit board will have the Distillate Save Valve (#46) open and the Distillate Divert Valve (#47) closed. If the purity is below the correct standards, then the distilled water will continue to be sent through the Distillate Divert Valve until the purity becomes good again.

43. **Transfer Tank Mid Level Probe**
When the distillate in the transfer tank is being pumped to the main storage system or to the drain and the tank level drops below this probe, then the pump turns off.

44. **Tansfer Tank High Level Probe**
When the distillate in the transfer tank reaches this probe, and the external storage tank is not full, then the Distillate Pump (#45) will turn on. If the external storage tank is full when the water reaches this probe, then the machine will delay for 20-40 seconds and then shutdown. As a built-in safety so that if the water is not pumped below this probe in 20-40 seconds, then the C-630 will automatically shutdown.

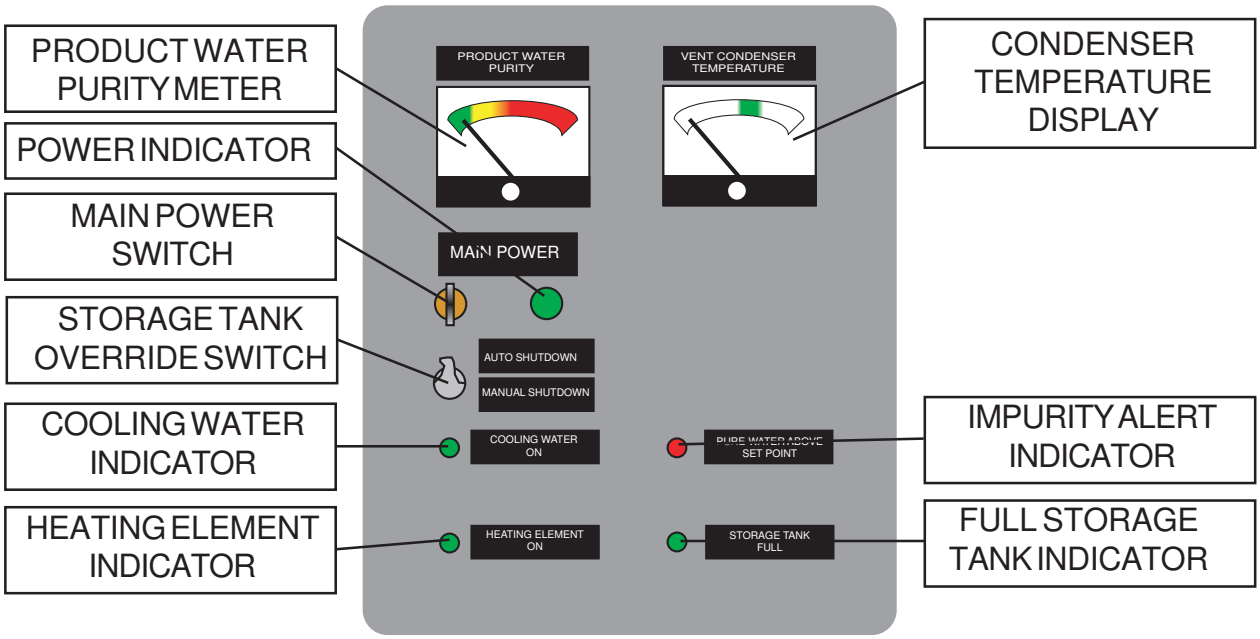
45. **Distillate Pump**
This pump draws water from the Distillate Transfer Tank (#41) and sends it to either the drain (If the purity is bad), or to the external storage tank. This is a "demand" pump, so if the pump power is turned on, then the pressure switch in the pump will pump water if the waterline pressure is below the setpoint.

46. **Distillate Save Valve**
This valve is open if the purity of the water in the Distillate Transfer Tank is in the good range. It is closed when the water is not good.

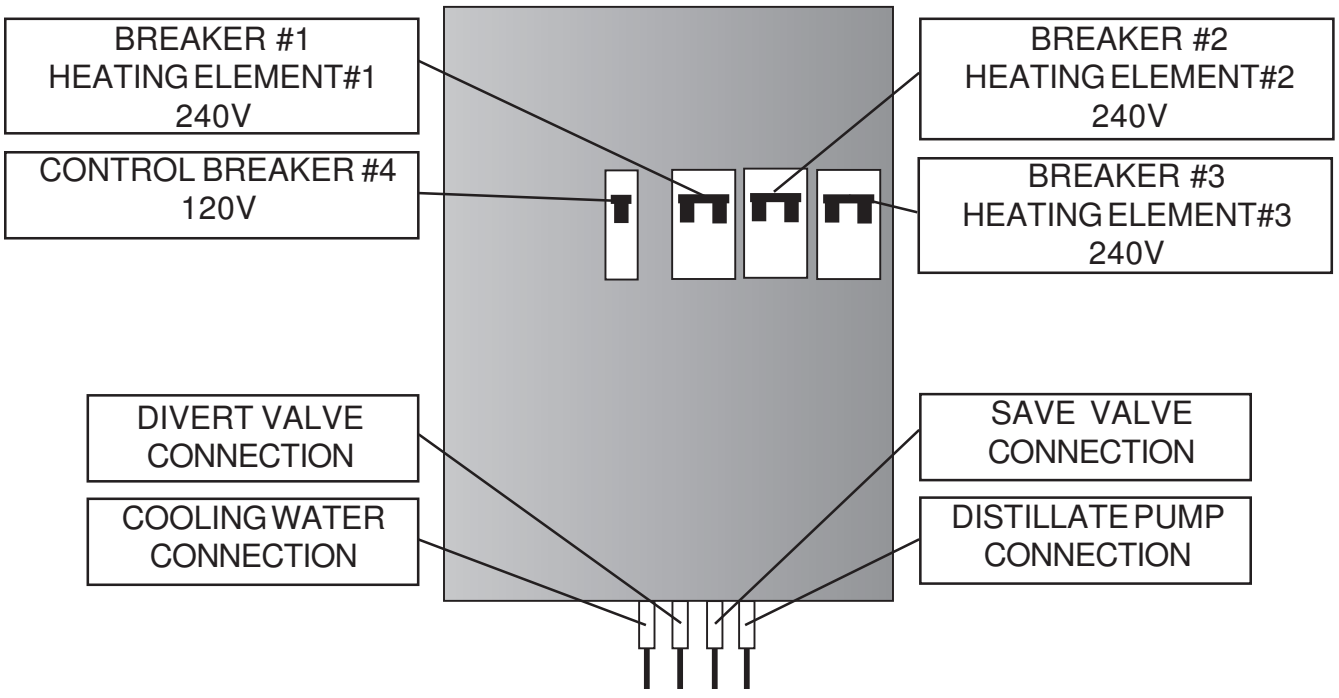
47. **Distillate Divert Valve**
This valve is open if the purity of the water in the Distillate Transfer Tank is not in the good range. It is closed when the water is good.

INTRODUCING THE C-630

The Main Control Box:



The Internal Circuit Panel:



INTRODUCING THE C-630

PRODUCT WATER PURITY METER

Indicates the purity level of the product water. This reading is taken from the bottom probe in the internal distilled water transfer tank. The setpoint for this meter is set for 3 ppm, and is controlled by the VR1 adjustment on the circuit board. Refer to page 21 is the setpoint is incorrect. If the TDS readng is below 3 ppm, then the Save Valve will be open and allow the distilled water to be pumped out of the transfer tank. If the TDS level increases above 3 ppm, then the Save Valve will close, and the Divert Valve will open and send the distilled water to the drain.

CONDENSER TEMPERATURE DISPLAY

This is a simple indicator used to calibrate the C-630 to optimum performance. The meter shows the temperature in the upper section of the drain chamber. Refer to page 39 to adjust the temperature to the green section of the meter.

POWER INDICATOR

Indicates that the control circuit has power.

MAIN POWER SWITCH

This switch will disconnect power from the control circuit. Under normal circumstances this key switch would not be used to stop the production of the distiller. The best methods of shutting down the machine is to turn the storage tank override switch to manual shutdown (See below), or have the storage tank level floats automatically shut the machine down. If you use the main power switch, then excess steam will be released at the drain chamber.

STORAGE TANK OVERRIDE SWITCH: (Normal position is Automatc Shutdown)

AUTOMATIC SHUTDOWN

The C-630 will automatically shutdown when the storage tank(s) are full, then automatically turn back on when the storage tank level drops.

MANUAL SHUTDOWN

The C-630 will simulate a full storage tank level. There will be a 20-40 second delay then the heating elements will automatically be turned off. To restart the machine the storage tank floats must be in the low position and then turn the switch to automatic shutdown.

COOLING WATER INDICATOR

This light indicates that the temperature in the drain chamber has exceeded 150½F. The cooling water valve will turn on and help the unit cool the water sent to the drain. This light should remain on during full production.

HEATING ELEMENT INDICATOR

This light indicates that the control circuit for the heating element breakers is powered. If the heating element breakers are on, and the water level in the first chamber is above the low level sensor, then the distiller is heating the water. When the storage tank becomes full, or the storage tank override switch is turned to manual shutdown, then the circuit will turn off after a short delay.

INTRODUCING THE C-630

IMPURITY ALERT INDICATOR
Indicates that the C-630 is above the purity setpoint. This means that the unit is diverting water to the drain instead of saving. Should correspond with the Product Water Purity Meter.

FULL STORAGE TANK INDICATOR
Indicates that the transfer tank is full. The internal pump should turn on and transfer the water from the transfer tank. If the main storage tank(s) are full, then the pump will not turn on and the unit will shutdown after a short delay.

BREAKER #1 HEATING ELEMENT#1 240V
Allows the C-630 to turn on the heating element when production is required. This protects the unit in the event that the heating element fails.

BREAKER #2 HEATING ELEMENT#2 240V
Same as above.

BREAKER #3 HEATING ELEMENT#3 240V
Same as above.

CONTROL BREAKER #4 120V
The 120V breaker provides power to all of the controls for the C-630. This includes the circuit board, solenoids, and the coils for each of the heating elements. If this is turned off, then the machine will not operate.

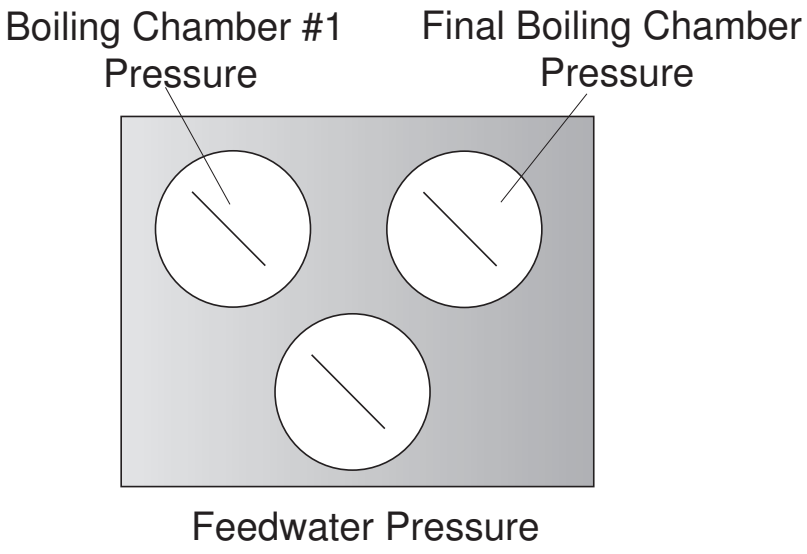
SAVE VALVE CONNECTION
Plug-in connection for the distilled water save valve.

DIVERT VALVE CONNECTION
Plug-in connection for the distilled water divert valve.

COOLING WATER CONNECTION
Plug-in connection for the cooling water valve.

DISTILLATE PUMP CONNECTION
Plug-in connection for the distilled water transfer pump.

INTRODUCING THE C-630

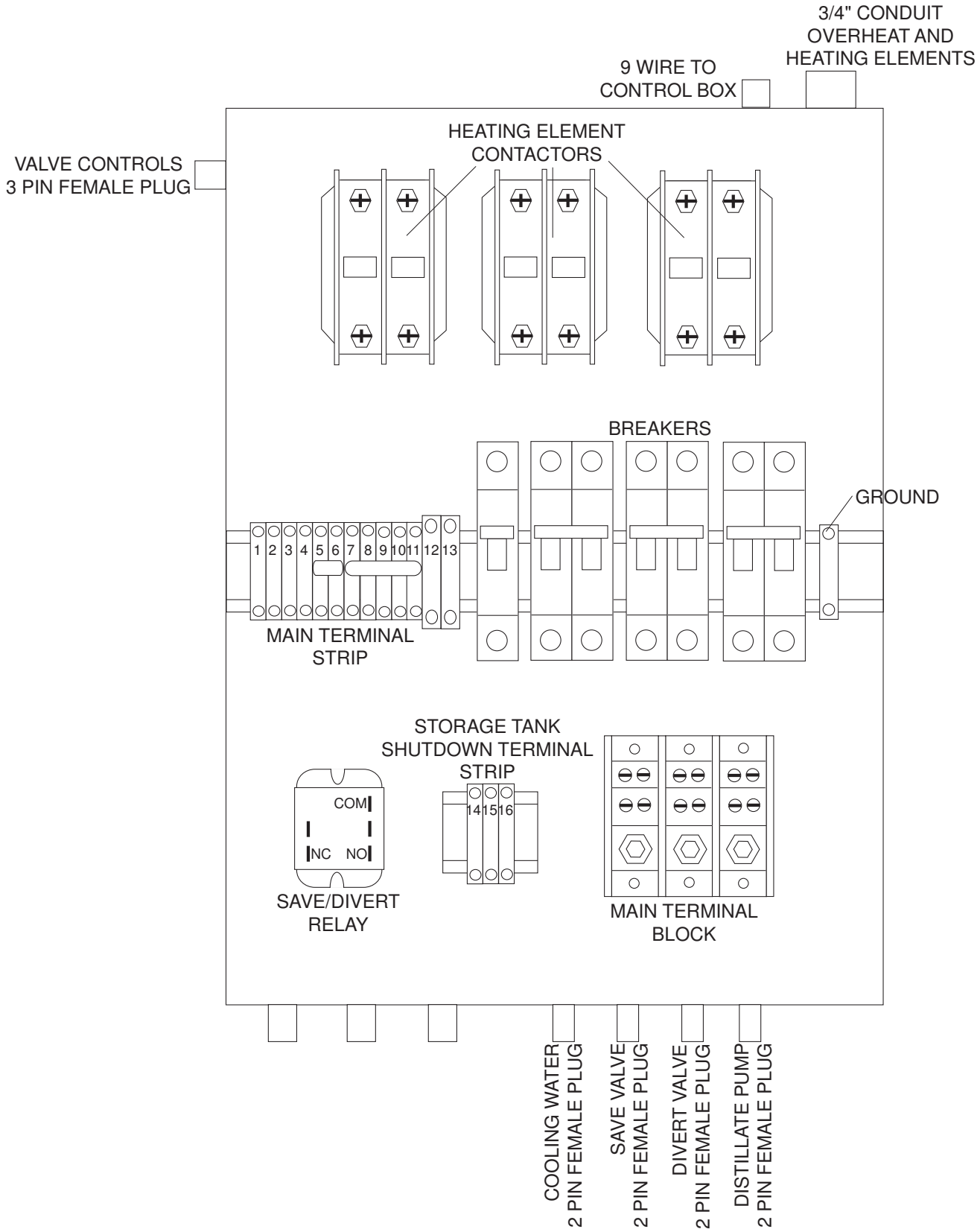


BOILING CHAMBER #1 PRESSURE
Indicates the pressure in the #1 Boiling Chamber. The pressure should be between 15 and 18 PSI when operating. Higher pressures can indicate scale build-up on the heat exchange surfaces. Lower presures can indicate that either your wattage is too low, or a heating element is off or not functioning. See troubleshooting on page 41.

Final Boiling Chamber Pressure
Indicates the pressure in the final Boiling Chamber. The pressure should be between 1 and 4 PSI when operating. If the pressure is not in this range, it could be caused by an incorrectly adjusted cooling water (See page 39.) or the heating element wattage is incorrect. See page 37.

Feedwater Pressure
Indicates the feedwater pressure entering the C-630. On startup, this reading should be between 35PSI and 75PSI. (Adjustment is on page 38.) During operation the pressure will increase due to thermal expansion. If the pressure exceeds 75 PSI, the the pressure regulator will allow backflow to prevent damage. Pressures above 75 PSI could indicate a damged or incorrectly adjusted pressure regulator.

INTRODUCING THE C-630



INTRODUCING THE C-630

HEATING ELEMENT CONTACTORS

One contactor for each of the three heating elements. These contactors connect and disconnect power to the heating elements when they recieve a signal from the control circuit board.

CIRCUIT BREAKERS

The single breaker is the control (120V) circuit. The 3 double breakers are for each of the heating elements. During operation all of the breakers should be on. These breakers protect the C-630 if any portion of the machine draws to many amps.

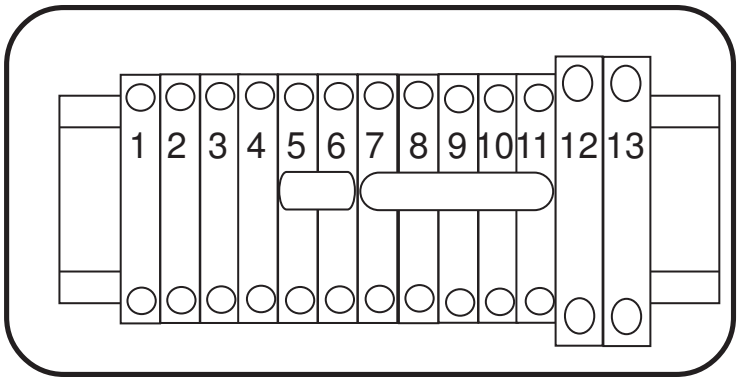
GROUND

Connect the ground wire to this location.

MAIN TERMINAL STRIP

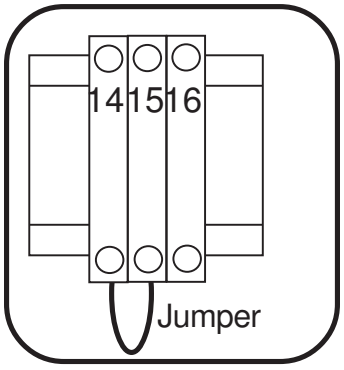
This terminal strip allows easy connections for wiring for the unit.
Wires to the top of terminal strip:

1. B3 Divert
2. B12 Cooling
3. B6 Pump
4. B15 Heaters
5. B1 Hot Line
6. Hot Line to Valve Controls
7. B7 Neutral
8. Not Used
9. Neutral Line to Valve Controls
10. Neutral to Heater Contactor Coils
11. Neutral Jumper to #12
12. To Valve Controls
13. Ground



SAVE/DIVERT RELAY

Controls the save and divert valves. This relay ensures that only one of the valves is open at any given time.



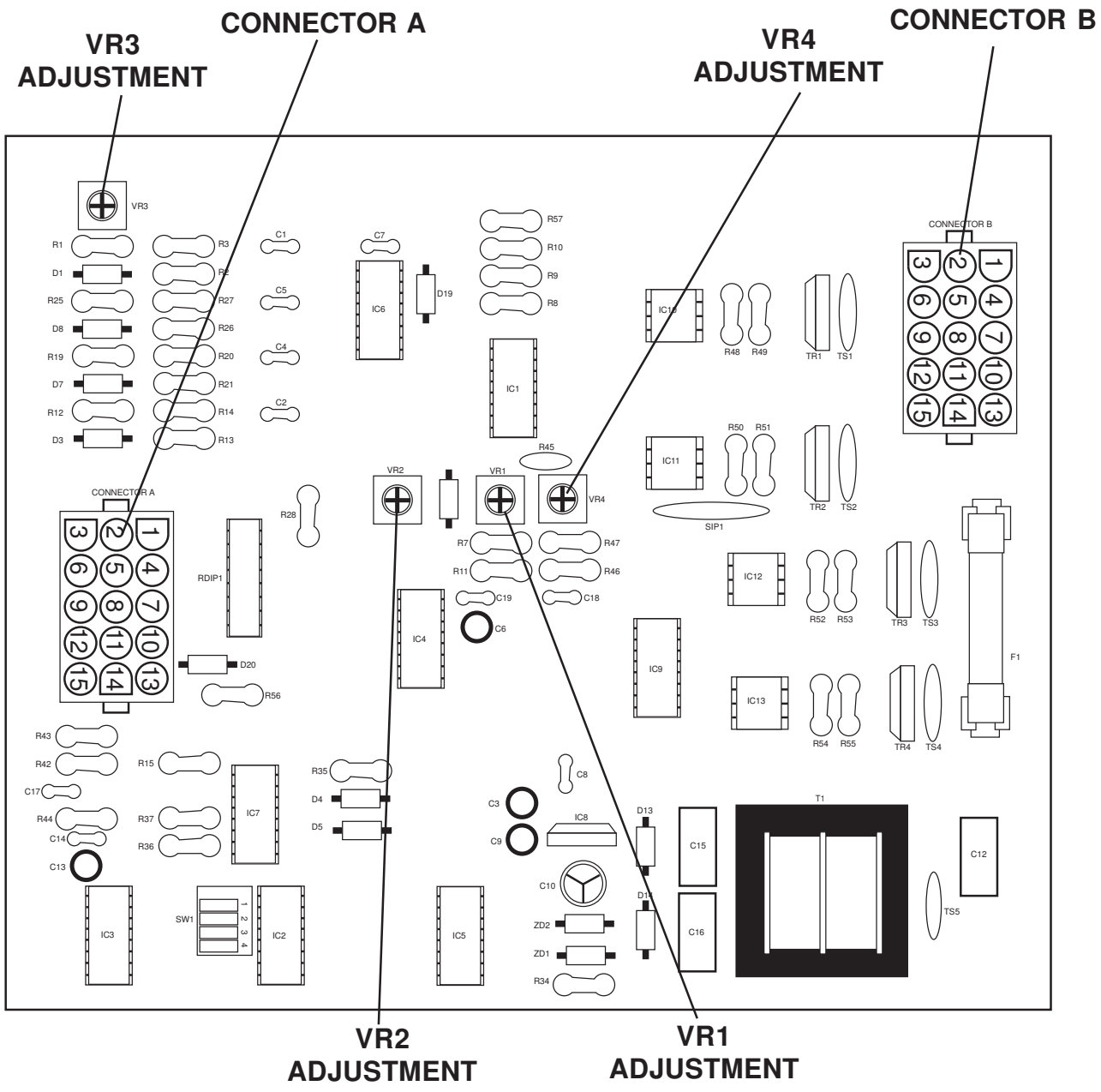
STORAGE TANK SHUTDOWN TERMINAL STRIP

This is where the external storage tank is connected to the C-630. Remove the jumper and connect the two float wires instead of the jumper.

MAIN TERMINAL BLOCK

The main connection for the power entering the C-630.

INTRODUCING THE C-630
CIRCUIT BOARD



INTRODUCING THE C-630
CIRCUIT BOARD

This board controls all of the functions of the machine except for the individual boiler level controls. The circuit board has 4 adjustable potentiometers that control different setpoints for the machine.

CONNECTOR A (High Voltage Outputs)

1. Purity LED
2. Not Used
3. Transfer Tank High Level Probe
4. Not Used
5. Purity Meter
6. Transfer Tank Mid-Level Probe
7. Storage Tank Full LED
8. Not Used
9. Low Water Safety Probe #1 Sight Tube
10. heating Element Indicator LED
11. Cooling Water Indicator LED
12. Transfer Tank Purity Probe
13. Ground for LEDs
14. Vent Condenser Probe
15. Vent Condenser Probe

CONNECTOR B

1.
2. Not Used
3. Divert Control-Orange wire to terminal block #1
4. Ground-Green wire to ground in high power box
5. Not Used
6. Pump Control-Violet wire to terminal block #3
7. Neutral-White wire to terminal block neutral #7
#4
8. Not Used
9. Not Used
10. Power In from Keyed Switch
11. Not Used
12. Cooling water control-Blue wire to terminal block #2
13.
14. Not Used
15. Heating element control-Yellow wire to terminal block

VR1 ADJUSTMENT

This potentiometer is the product water purity setpoint adjustment. The correct setpoint is at 3 ppm. This is adjusted at the factory and should not need to be adjusted in the field.

VR2 ADJUSTMENT

This potentiometer is the the time delay for the low water sensor in the #1 boiling chamber. This should not need adjustment.

VR3 ADJUSTMENT

This potentiometer is the adjustment for the low water sensor. It should always be set in the fully-clockwise position.

VR4 ADJUSTMENT

This potentiometer is the cooling water setpoint. This opens the cooling water valve when the drain water temperature reaches 150° F +/- 5°. This setpoint works in conjucntion with the drain cooler flow control. The setpoint opens the valve to allow the flow of cooling water to enter the unit, but the drain cooler flow control adjusts the amount of water that enters the unit. See page 391 for information on the drain cooler flow control.

To adjust this setpoint:
With the distiller in full production, switch the machine to the manual shutdown mode. After a small delay the heating elements will turn off. The vent condenser temperature will begin to drop. Monitor the Vent Condenser Temperature meter and the cooling water light. When the temperature reaches 150° F +/- 5° then the light should turn off. If it does not turn off, then use a small screwdriver to adjust the setpoint on the VR4 potentiometer.

INSTALLATION REQUIREMENTS

NOTE: *Failure to follow the manufacturers instructions on electrical or feedwater requirements or testing requirements will void the warranty and can cause severe damage to the C-630.*

NOTE: *Installation and Initial start-up must be performed by a Pure Water certified technical supervisor to meet warranty requirements.*

ELECTRICAL REQUIREMENTS

Voltage	208V	220V	240V	_____
Actual Continuous Amps	72	68	63	_____
Supply Circuit Minimum Amps*	83	79	72	_____

*All electrical work should be done by a licensed electrician. A licensed electrician can adjust the supply circuit amps to match local electrical code requirements.

<u>If your electrical supply is outside of these parameters contact Pure Water before installation.</u>

FEED WATER REQUIREMENTS

Hardness: ..... 0 grains
TDS: ..... >3000 ppm
Sediment/Particulate ..... none larger than 25 microns
Silica: ..... 0 ppm
Chlorine: ..... 0 ppm
Pressure: ..... 40 PSI-75 PSI (With no recyling unit)
Water Supply: ..... 2 GPM above pretreatment maximum
Inlet Fitting: ..... 1/2" FPT to the C-630
Drain Requirements: ..... See Note
Pressure Relief: ..... See Note

Drain Location: You must first choose an appropriate place for the C-630. It is necessary that there be a floor drain close to the proposed location.

Hardness: It is essential that the C-630 be operated with a Pure Water dual-alternating tank softener, to pretreat the incoming (feed) water. This provides a constant supply of softened water to the C-630 at all times. The softener must be a "Demand Regeneration Unit" not a timer driven softener.
The water hardness should be checked on a daily basis to ensure that the softener is operating properly to eliminate potential damage to the C-630.

Total Dissolved Solids: If the TDS is higher than 3000 ppm have a Pure Water chemist review the water analysis.

Sediment/Particulate: If sediment or particulate matter in the water exceeds 25 microns it

can cause the solenoids to "stick" open or closed. Install a 25 micron filter in the feedwater line if necessary.

Silica: Contact Pure Water, Inc immediately if there is Silica in your water.

Chlorine: If there is Chlorine or a large amount of volatile organics in the water supply, then a Carbon Filter tank must be used. If a carbon filter is not used, then serious damage could occur to the C-630.

Pressure: >40 PSI: If the water pressure is below 45 PSI the C-630 can "starve" or not have enough water for proper operation. If this is the case, a booster pump system might be required.

<75 PSI: Adjust the pressure regulator to reduce the pressure.

Water Supply: The C-630 can use up to 2 Gallons per Minute when operating. When calculating the total water supply necessary, add the maximum usage of water by the softener and carbon filter and then add 2 GPM for the C-630.

Inlet Fitting: The water inlet on the C-630 is 1/2" FPT. Do not use an inlet line that is smaller than 1/2" as the unit might not have adequate supply for proper operation.

Drain Requirements: The C-630 has a built-in contaminant water draining system. The contaminant water draining system requires 3/4 inch flexible tubing. This tubing should be connected at the lower outlet of the contaminant water drain. This is a gravity feed drain and must always flow in a downward direction to eliminate possible overflow. Contaminant water temperature will typically range between 38°C and 71°C (100°F to 160°F). There will be up to 40 gallons of contaminated water draining per hour from the C-630 during normal operation. The contaminant water tubing should be run to a floor drain.

NOTE: *Some plumbing applications utilize PVC (Polyvinyl Chloride) which may require you to use a catch tank to cool the water prior to draining.*

Pressure Relief: The C-630 is designed with a pressure relief valve connected to boiler #1. In the event of a malfunction, this pressure relief valve will open when the pressure exceeds 30 psi, the 1/2 inch OD stainless steel pipe extruding from the bottom of the valve downward is provided.

NOTE: *If an extension is added to this pipe, it must not restrict the flow.*

INSTALLATION OF THE C-630

This equipment was thoroughly tested at the factory and found to be operating according to the manufacturers specifications.

Installation Options:

1. **Operator Installation:**
   The operators can elect to install the equipment. It is necessary that qualified professionals be used for the installation. Not choosing factory installation may affect any warranties on Pure Water equipment.

2. **Factory Installation:**
   Pure Water, Inc. technical experts can be engaged to supervise installation, start-up procedures and training. This will **not** forego the need for the operator to have a qualified plumber and electrician on hand. Contact Pure Water for factory installation information.

ELECTRICAL CONNECTION:

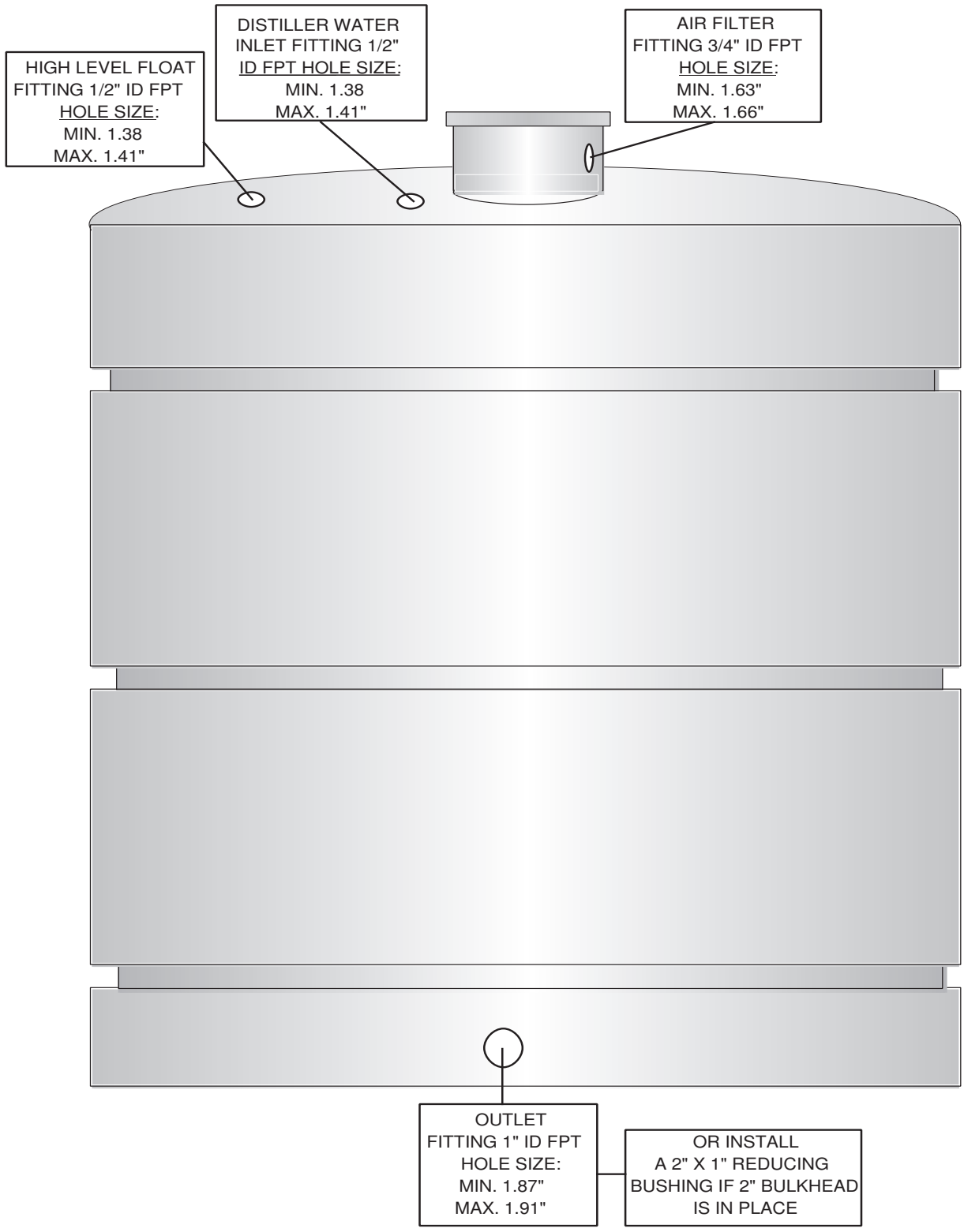
INSTALLATION OF THE C-630

1. Uncrate and place the unit in the correct positions. This location should have the electrical connection, water connection, and drain connections as close to the C-630 as possible. If pretreatment is required, the softener and carbon filter must be in the waterline before it travels to the C-630. Once in the correct location, make sure that the unit is level.

2. It is very important when placing the storage tank, to sweep and clean the floor beneath the tanks. Once the tanks are full, each tank will weight in excess of 2,000 pounds, any large particles under the tank can be forced through the bottom of the tanks by the weight. Before drilling the holes in the storage tank, plan how each of the lines will be connected to the wall clamps but still allow access for any servicing. The illustration on page 27 shows the height of where the fittings should be, not necessarily the direction of the fittings. A typical installation will have all of the connections facing the wall except for the water outlet. The water outlet should be accessible so that you can open and close the valves in any extended shutdown or in an emergency situation.

INSTALLATION OF THE C-630

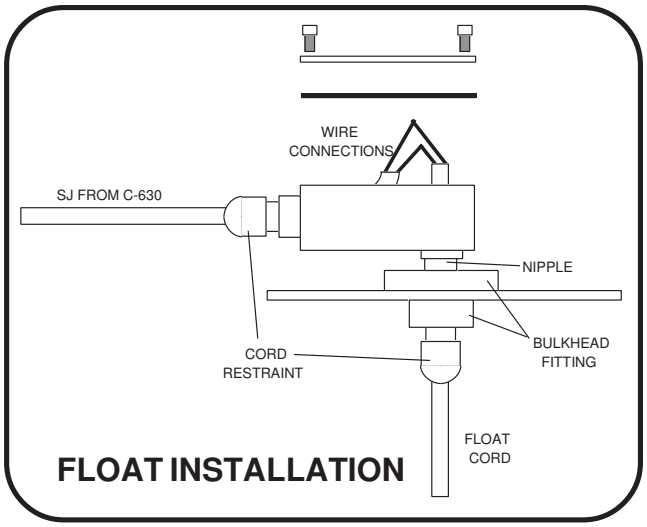
3. Drill holes for the C-630 distiller storage tank:



INSTALLATION OF THE C-630

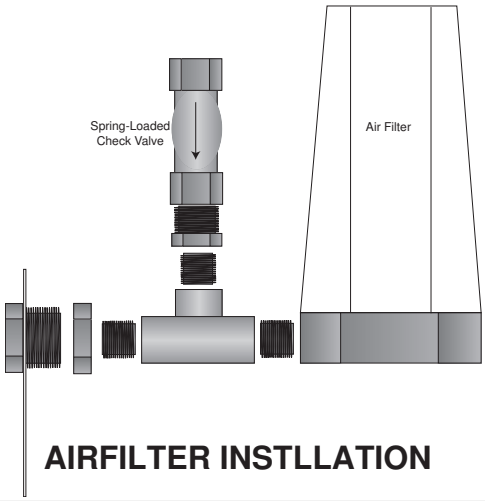
4. Install the floats and fittings in the storage tank:

   (1) On/Off Float
   Set so that the float will turn the distiller off when the tank is full.
   Do not cut the float cord until you have filled the storage tank. Then you are a better judge of the level that results.



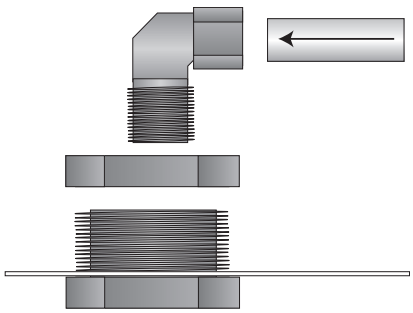
FLOAT INSTALLATION

Install the air filter in the tank. ***When installing bulkhead fittings above the waterline, it is very important to remove and discard the bulkhead gasket.*** If this is not done, then airborne ozone will deteriorate the gasket.



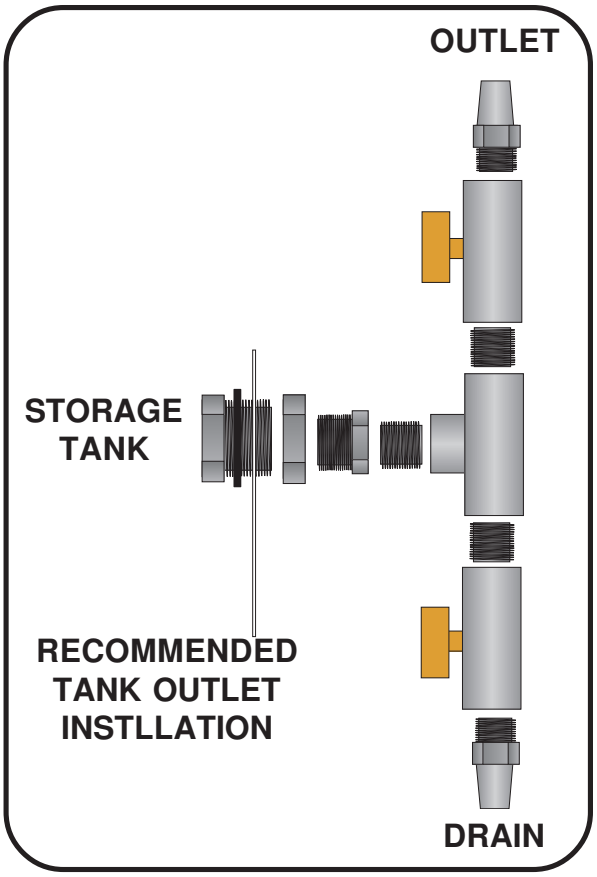
AIRFILTER INSTLLATION

Install the water Inlet fitting. ***When installing bulkhead fittings above the waterline, it is very important to remove and discard the bulkhead gasket.*** If this is not done, then airborne ozone will deteriorate the gasket.


INLET INSTLLATION

INSTALLATION OF THE C-630

Install the outlet fittings. Use teflon tape on all non-bulkhead fittings to ensure that there will be no leaking.Make sure that the gasket is on the flat side of the bulkhead fitting.
If it is on the thread-only side, then it will never seal properly.



Once all of the storage tank fittings are installed,
use a wet/dry vacuum to remove any plastic shavings or particles from the tanks. Seal any small holes in the tank
using silicone. Put duct tape over the fittings to keep the tanks clean until the hoses are attached. Install the 0.2 micron filter in the air filter housing.

INSTALLATION OF THE C-630

5. Running Hoses
:

For a profesional appearance and proper operation, it is important to plan which hoses will run in which location. The simple rules to follow are:

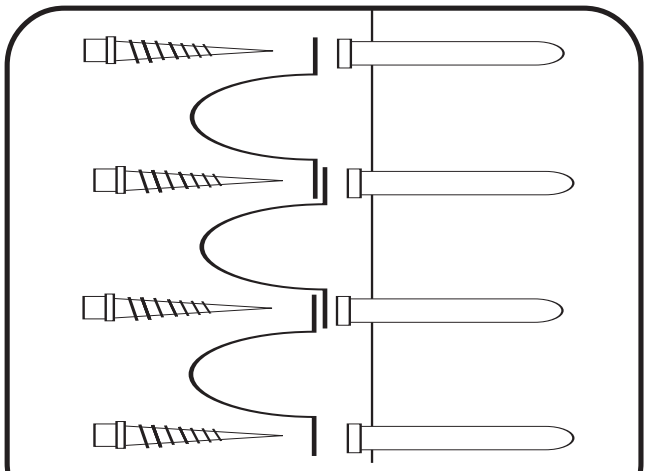
a. The blowdown line should be a maximum of 10 feet long.

b. Hoses should be kept off the floor as much as possible, as they will collect dirt over time. Unless you use a raised floor bracket.

c. The blowdown line is a gravity line, and should be kept as low as possible.

d. Hoses should be clamped a maximum of 16”(40 cm) apart, or the hoses will sag over time and will have a bad appearance.

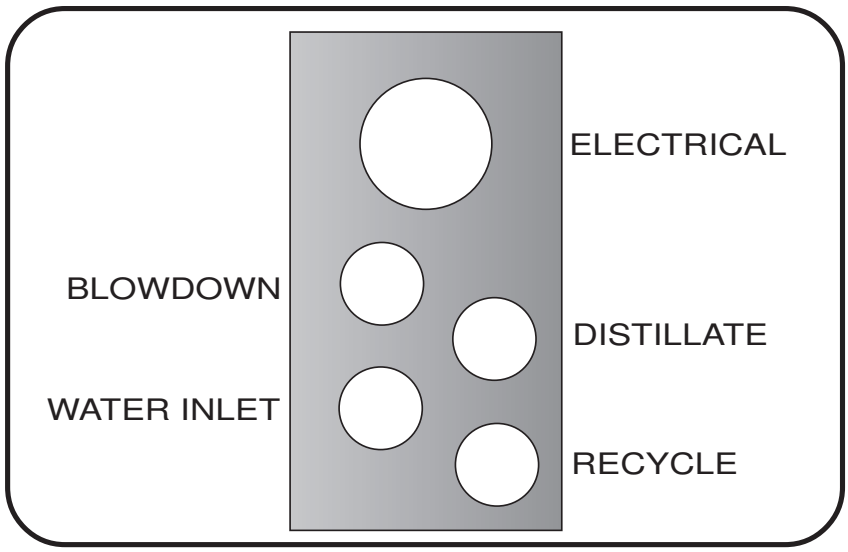
e. When planning hose placement, make sure not to have hoses overlap. (example: the shortest hose should be on top of the other hoses.)



HOSE CLAMP INSTALLATION

6. Connecting Hoses

There are only 2 connection locations on the C-630. The first is for the drain pan on the bottom of the unit. A hose should be connected and run on the floor to the floor drain. This drain pan will collect any water that is manually drained from the tanks. All other connections are shown below.



INSTALLATION OF THE C-630

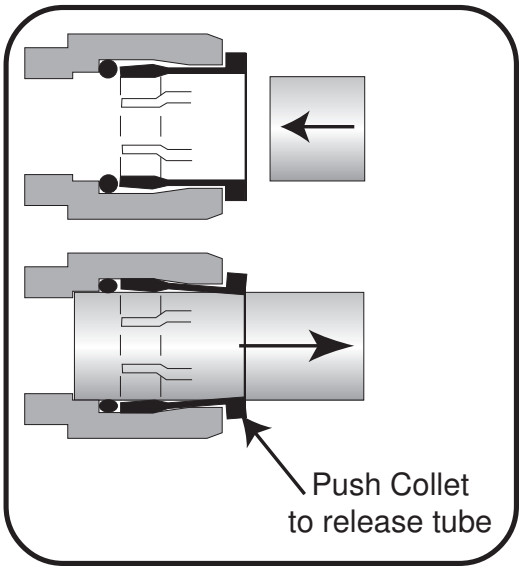
Note: There are many fittings on the C-630 that use "John Guest" fittings. These fittings provide not only effective seals, but also are very easy to separate for maintenance or servicing.

To Connect a tube to a John Guest fitting:

1. *Cut the tube so that it has a flat end.*
2. *Insert the tube firmly, you must push the tube past the O-ring to seal.*
3. *Pull the tube to make sure that it is properly attached.*

To Remove a tube:

1. *Release pressure from the line (it is impossible to remove the tube while pressurized.)*
2. *Push the collet evenly on all sides toward the fitting.*
3. *Pull the tube out.*

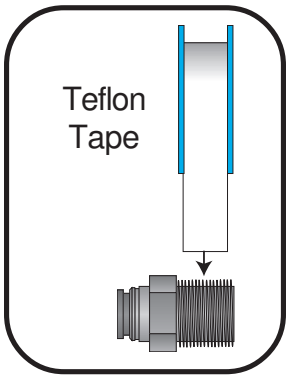


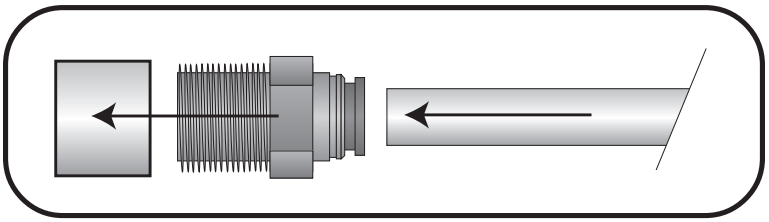
a. Connecting the Feedwater line:

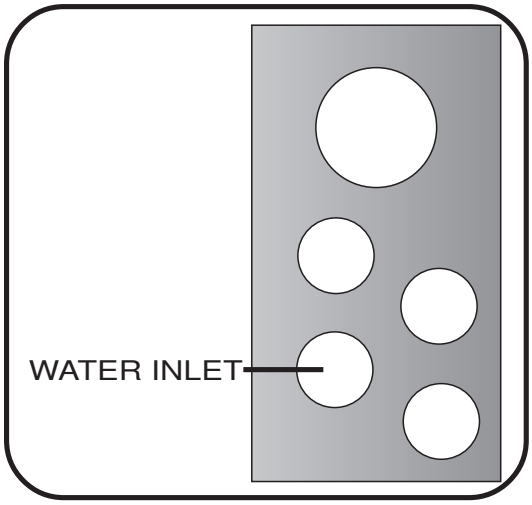
1. Wrap the treads on a 1/2" MPT x Quick Fit (John Guest Fitting).

2. Screw the fitting into the proper inlet location.

3. Run 1/2" tubing from the pretreatment system aong the wall (using clamps to secure in place.) Insert the tubing into the John Guest fitting. Pull on the tube to make sure that it is seated properly.

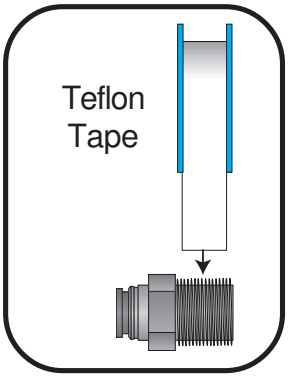






INSTALLATION OF THE C-630

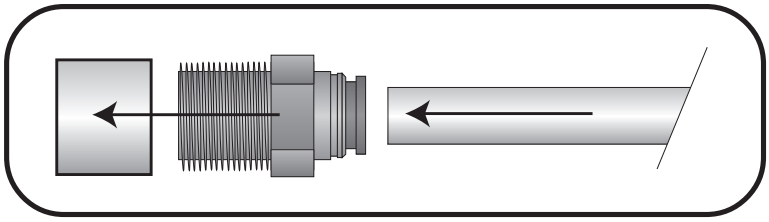
b. Connecting the Distillate line:

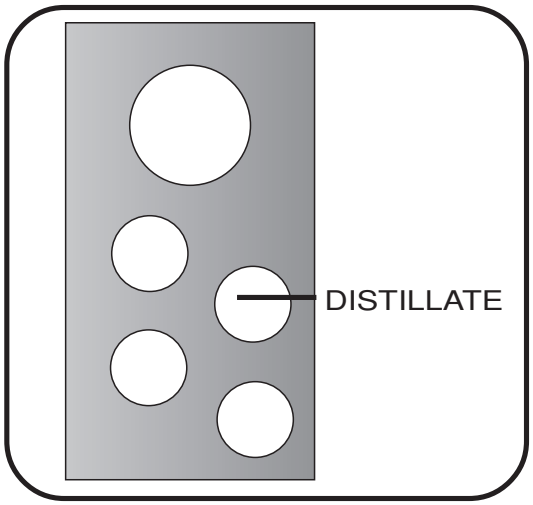


1. Wrap the treads on a 1/2" MPT x Quick Fit (John Guest Fitting).

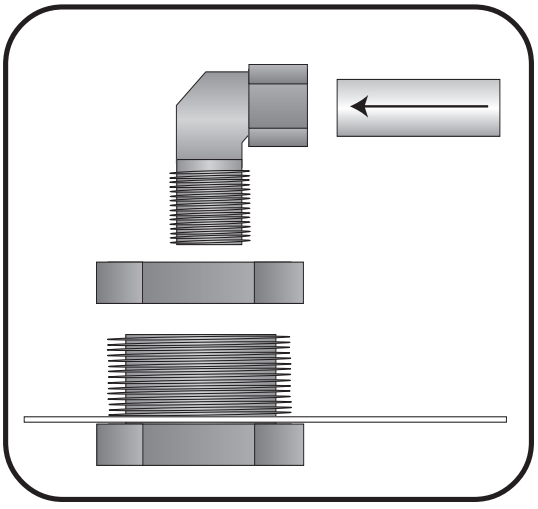
2. Screw the fitting into the proper inlet location.

3. Insert the tubing into the John Guest fitting on the C-630. Pull on the tube to make sure that it is seated properly.





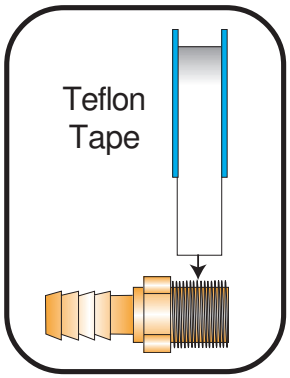
4. Run the 1/2" tubing from the C-630 aong the wall (using clamps to secure in place.) Connect the end of the tubing into the Inlet Bulkhead assembly on the storage tank. Tighten the nut onto the tube.

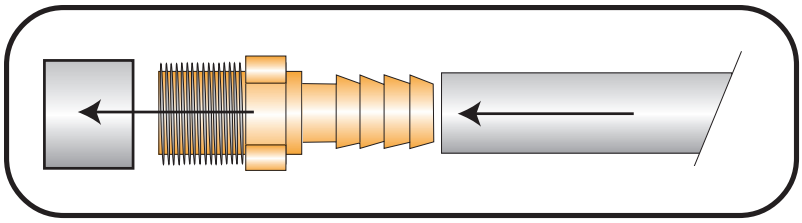


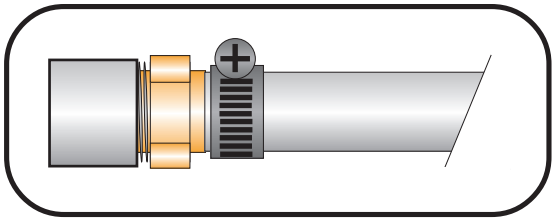
INSTALLATION OF THE C-630

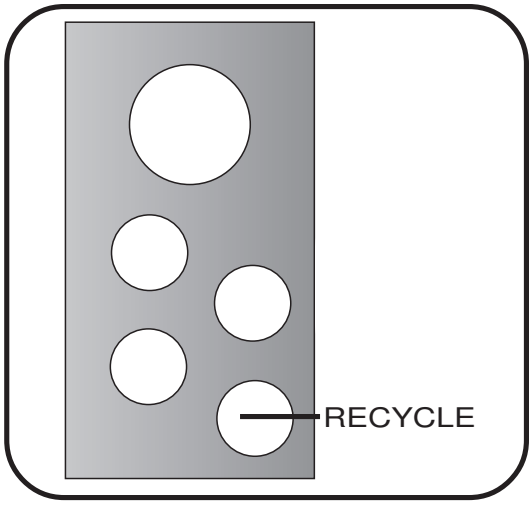
b. Connecting the Recycle line:

1. Wrap the treads on a 1/2" MPT x barb brass fitting.
2. Screw the fitting into the proper inlet location.
3. Insert the tube onto the fitting on the C-630.
4. Put a hose clamp around the tube and tighten onto the fitting.









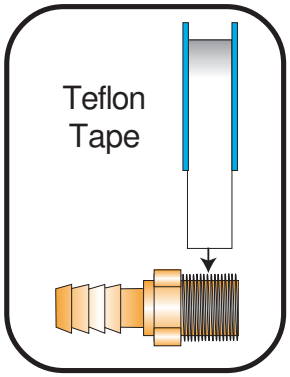
5. If you do not have a recycling unit:
   Run the 5/8" tubing from the C-630 along the floor (using clamps to secure in place.) Clamp to the floor drain so that there is a 2" air gap between the tube outlet and the drain.

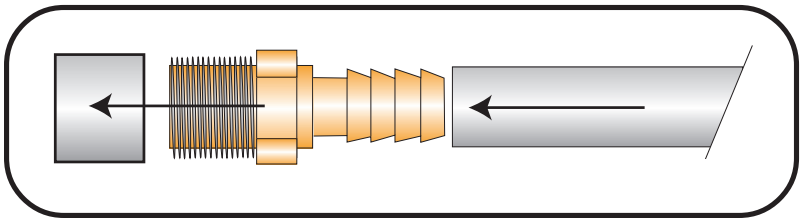
   If you have a recycler:
   Follow the installation instructions in the recycler manual.

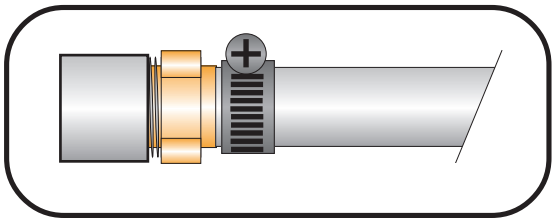
INSTALLATION OF THE C-630

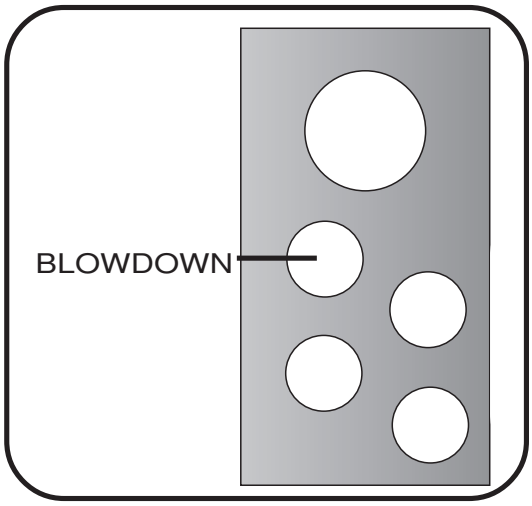
b. Connecting the Blowdown (Drain) line:

1. Wrap the treads on a 1/2" MPT x barb brass fitting.
2. Screw the fitting into the proper inlet location.
3. Insert the tube onto the fitting on the C-630.
4. Put a hose clamp around the tube and tighten onto the fitting.







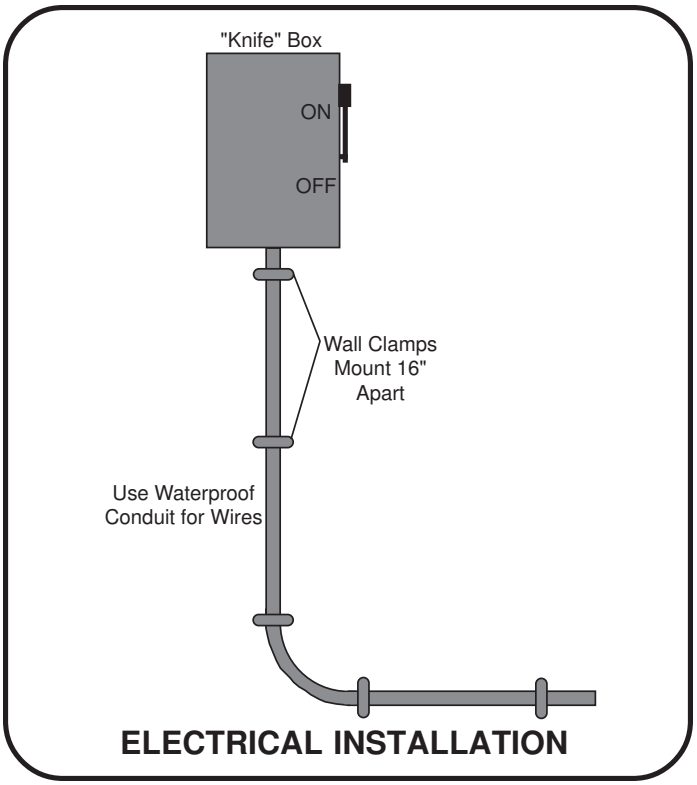


5. Run the 5/8" tubing from the C-630 along the floor (using clamps to secure in place.) Clamp to the floor drain so that there is a 2" air gap between the tube outlet and the drain.

INSTALLATION OF THE C-630

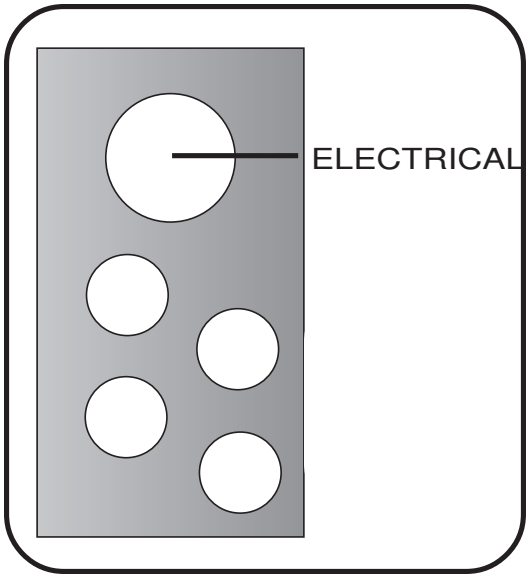
8. Electrical Connections

All electrical connections should be performed by a certified electrician to conform to local, state or national regulations. There should be a main circuit breaker box in a centralized location. In addition, there should be separate “knife” style disconnect boxes (for each piece of equipment). The knife boxes should be at least 4 feet off the ground. All wiring should be run in liquid tight conduit. The conduit should be clamped to the wall in a similiar fashion as the hoses.



ELECTRICAL INSTALLATION

Connect the watertight conduit to the C-630 in the connection panel.



INSTALLATION OF THE C-630

A qualified electrician will need to wire the C-630 into a 240 volt 90 amp single or three phase (which you ordered) in accordance with national and local electrical codes. The circuits should be protected by a 90 amp fast blow fuse or a 90 amp circuit breaker. In the event that your voltage is outside this level, Pure Water, Inc. can provide alternatives.

CAUTION: BEFORE REMOVING ANY PANEL ON THE C-630, BE SURE THAT THE UNIT IS DISCONNECTED FROM THE POWER SOURCE.

ELECTRICAL HOOK-UP FOR SINGLE PHASE:

When hooking up a single phase line, bring your cord up through the bottom of the circuit breaker box, which is located inside the front panel. Attach the ground wire (green) to the appropriate post. Attach the hot legs to two of the 3 slots on the main terminal block.

Notes: *1. A jumper wire has been preattached between two of the legs on the terminal block.*
2. The 120V circuits throughout the machine use a neutral that is from an internal transformer.

ELECTRICAL HOOK-UP FOR THREE PHASE:

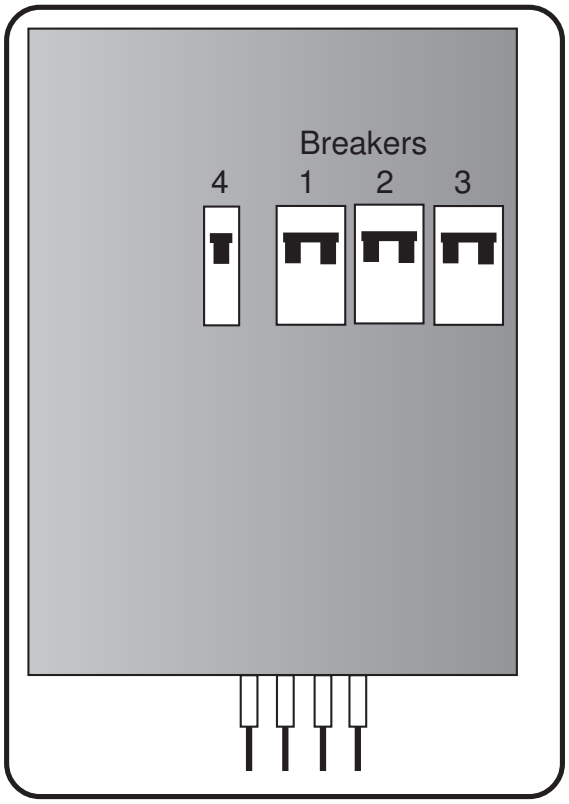
When hooking up a three phase line, bring your cord up through the bottom of the circuit breaker box, which is located inside the front panel. Attach the ground wire (green) to the appropriate post (G), and the neutral wire (white) to the appropriate post (N). Connect each hot wire to each or the connections (L1, L2, L3). There must not be a jumper wire between Posts (L1) and (L3).

Note: *The 120V circuits throughout the machine use a neutral that is from an internal transformer.*

PROPERLY SIZING HEATING ELEMENTS:

INSTALLATION OF THE C-630

The unit has three heating elements, each with its own breaker. Breakers 1, 2, and 3 are the heating element breakers, while breaker #4 is the unit main power breaker. The single phase breaker (#4) is the control system. This provides power to the circuit board, level sensors, solenoids and the pump. If breaker #4 is off, then there will be no power to any of the other breakers.



Total current draw for the heating elements should be approximately 14,000 to 15,000 watts. The C-630 cannot operate above 240 volts. If your electrical supply is outside these parameters, contact Pure Water, Inc. for alternative electrical installations.

To calculate the actual wattage in your machine:

Heating Element 1

_____ Amps
x_____Volts
=_____Watts A

Heating Element 2

_____ Amps
x_____Volts
=_____Watts B

Heating Element 3

_____ Amps
x_____Volts
=_____Watts C

_____WattsA
+_____WattsB
+_____WattsC
=_____Total Watts

INITIAL STARTUP OF THE C-630

Now that you have completed the following:

1. Installed the Pretreatment (Softener, Carbon Filter, Sediment Filter),
2. Installed the Storage Tank,
3. Connected all on the Water lines,
4. Connected the power correctly,

you are now ready to start the system.

Initial Startup:

1. Open the Feedwater supply valve. Allow water to fill up the softener.

2. Open the fitting to the Carbon Filter.

3. Fill the Carbon Filter with water. If it is a large tank carbon filter (not a carbon block filter), then you should allow the filter to sit overnight 3/4 full of water. If you do not, then the water will carry the loose carbon into the sediment filter, the distiller, or to the drain.

4. Turn the internal breakers off in the C-630.

5. Turn the knife box power on.

6. Have an electrician test for correct voltages in the internal breaker box.

7. Turn control breaker on.

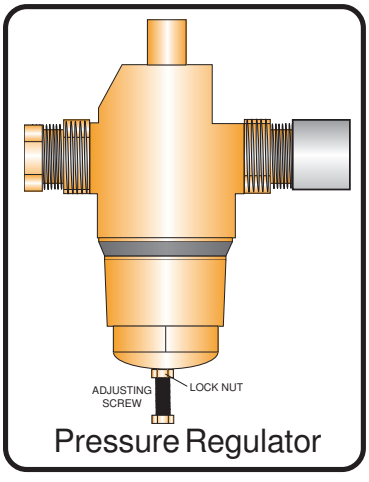
8. Turn the main power key to on. This key should remain in the on position even when the distiller has automatically shut-down.

9. Look at the inlet water pressure. If it is above 35-40 PSI, then adjust the pressure regulator to 35-40 PSI on startup.

10. Turn the shutdown switch to Automatic.

11. One at a time, turn the 3 heating element breakers on.

12. Wait until the distiller begins producing distilled water and is in full production. This will be evident when the pressure on the chamber #1 pressure gauge (See page 17) reaches 15-18 PSi and the sight tubes draw water at a relatively stable pace.



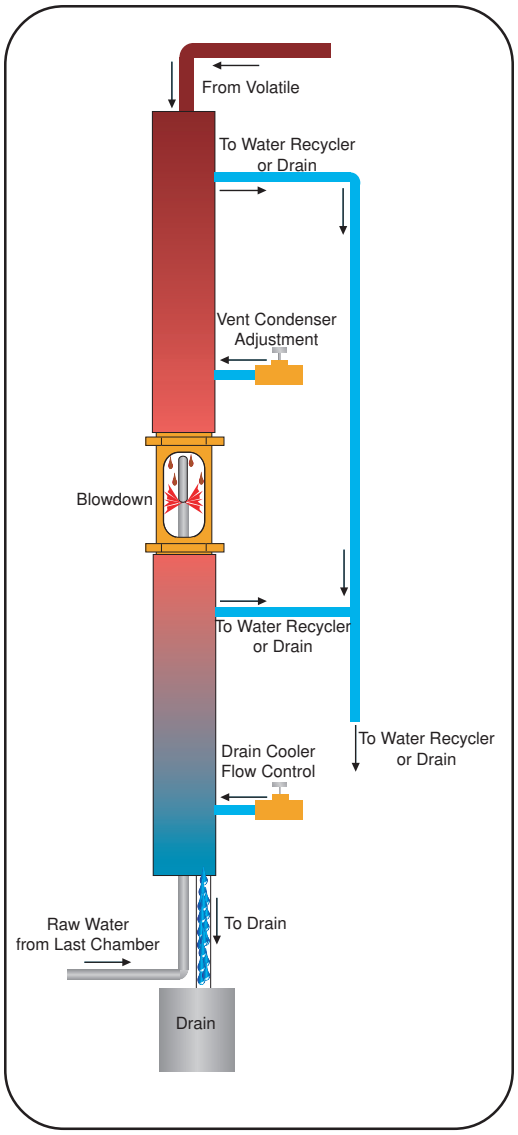
Pressure Regulator

INITIAL STARTUP OF THE C-630

13. Adjust the Vent Condenser Flow Control until the condenser temperature meter on the main control box is in the green range.

14. Adjust the Drain Cooler Flow Control to the desired temperature.

    The minimum amount of drain water would take the drain water to just below boiling. This can be determined by steam at the drain air gap. If desired or necessary, the Drain Cooler Flow control can be opened so that the drain water is much cooler. However this will send more raw water to the drain.



OPERATING PROCEDURES FOR THE C-630

Normal Operations Positions:

The C-630 is designed to operate automatically. When the storage tank is full, then the distiller will turn off. When the level in the storage tank drops below the float level, then the distiller will turn on. Automatic Operation Positions are as follows:

Keyed Main Power Switch ..... ON
Breaker #1 ..... ON
Breaker #2 ..... ON
Breaker #3 ..... ON
Breaker #4 ..... ON
Storage Tank Override Switch ..... Auto
Product Water Purity Meter ..... Green
Vent Condenser Temperature Gauge ..... Green
Incoming Water Pressure Gauge ..... 35-75 PSI
Incoming Water Pressure Gauge (wih recyling unit) ..... 10-75 PSI

The water pressure gauge should read 35-40 PSI when off, and can reach as high as 75 PSI when distilling.

Boiling Chamber #1 Pressure Gauge ..... 15-18 PSI
Final Condenser Pressure Gauge ..... 1-4 PSI
Sight Tube Levels ..... In Range

TROUBLESHOOTING THE C-630

Problem	Probable Cause	Solution
Distiller Will Not Turn On	Storage Tank Full	Wait for level to drop
	Power Off	Turn On
	Control Breaker Off	Turn On
	No Water is chamber #1	Check Feedwater Flow
		Check Level Sensor #1 and Solenoid #1. see page 8.
Pressure in Chamber #1 will not reach 15-18 PSI	One of the breakers is off	Turn breakers on.
	Heating Element has Failed	Use an Amp meter and check that the unit is still producing 14,000 Watts of power. Replace any bad element.
Pressure in Chamber #1 exceeds 15-18 PSI	Wattage is too High	Check Wattage. See page 37.
	Scale Buildup	Call Pure Water, Inc.
Purity is Bad	Sight Tube OverFilled	Drain Chamber and watch refill. Adjust sensor sensitivity if necessary see page 21.
	Volatile Vent Condenser Set Incorrectly.	See page 39.
	Purity Sensor Wire is grounded	Check wire for proper connection.
Single Sight Tube Level not Consisitent	Sensitivity Incorrect	See page 21.
	Continued Next Page	

TROUBLESHOOTING THE C-630

Problem	Probable Cause	Solution
Single Sight Tube Level not Consisitent (Continued)	Sensor Box malfunctioning	Swap sensor box with another box. If problem changes to the new chamber, then replace box. If problem stays at original chamber, then change sight tube.
	Sight Tube needs replacement	See page 45.
Pressure in Final Chamber other than 1-4 PSI	Cooling Water Ajustment Incorrect	See page 39.
	Heating Element Wattage is Incorrect	See page 37.
No water pumps to storage tank.	Purity is bad	See Purity is Bad on page 41.
	Storage Tank is Full	Check
	Storage Tank Full Light is On, but Storage Tank is not full *The storage tank full light will remain on from the time the storage tank is completely full until the float drops and re-starts the unit.*	Allow level to drop the float-unit will restart.
		Float jumper wire still installed. See page 19.
		Turn storage tank override switch to manual shutdown-if unit starts then replace float. If unit does not start then continue to next probable cause.
	Transfer Pump is not operating.	Check Pump
Transfer Pump is not operating.	Purity is bad	See Purity is Bad on page 41.
	Continued Next Page	

TROUBLESHOOTING THE C-630

Problem	Probable Cause	Solution
Transfer Pump is not operating. (Continued)	Storage tank is full.	If storage tank full light is on, then wait until storage tank lowers, or turn storage tank override switch to manual. *Do not keep switch in manual as storage tank may overflow.*
	Pump is getting no power.	Check power to pump.
	Board is not reading the transfer tank probes.	Jumper the top and middle probes to the frame. The pump should turn on.
	Bad Pump.	Replace Pump.

TROUBLESHOOTING THE C-630

Troubleshooting the Level Control system

The normal level control consists of 3 distinct parts:

The level control sensor light—This light turns on when the sensor reads a low level in the sight tube.

The level control sensor—Determines the level of water in the chamber sightglass by reading the change in density in that section of the sight tube.

The Level Control Solenoid—Opens to allow raw water to enter the chamber when it is activated by the level control sensor. This valve should be open when the level control sensor light is on.

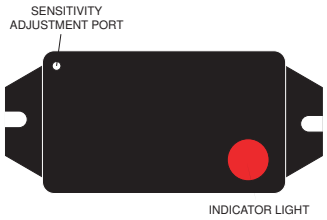
The question to ask when troubleshooting is : Is the Sensor and sensor control box asking for water?

Overflowing Sight Tube:
- Sight Tube is full
- Level Control Box Light is on
- Sensor and control box is asking for water. The problem is with either the sensor or control box.

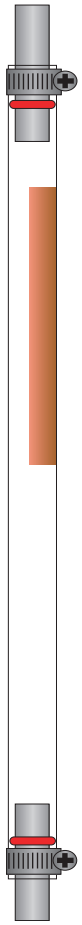
Overflowing Sight Tube:
- Sight Tube is full
- Level Control Box Light is off
- Sensor and control box is not asking for water. The problem is with the solenoid.

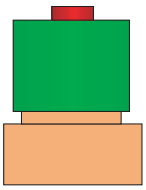
No Water in Sight Tube:
- Sight Tube is empty
- Level Control Box Light is on
- Sensor and control box is asking for water. The problem is with the solenoid or water feed.

No Water in Sight Tube:
- Sight Tube is empty
- Level Control Box Light is off
- Sensor and control box is not asking for water. The problem is with the sensor or level control box.



Level Control Box


Level Control Sensor


Level Control Solenoid

C-630 COMPONENTS

Installing a New Sight Tubes

The sight tubes should be replaced yearly as a preventative maintenance step.

1. Turn the unit off. Allow unit to completely cool.

2. Drain the water out of the boiling chambers that contain the sight tubes to be replaced.

3. Disconnect the wires that go to the level control box.

4. Loosen hose clamps on the sight tubes and remove the tubes.

5. Using a conical shaped tool, slightly flare the ends of the new tubing. Figure 1.

6. Slide the new tubing up onto and past the o-ring. Slide the other end of the tubing past the o-ring at the bottom. Figure

7. Make sure that the o-rings are seated poperly. Figure 3.

8. Hose clamp the tubing at both ends. Make sure that the hose clamps are on the outside of the o- rings. Figure 4.

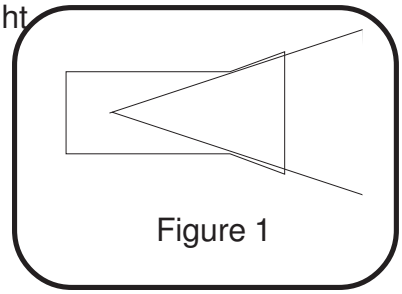


Figure 1

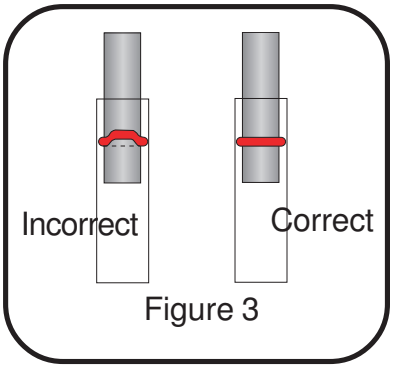


Figure 3

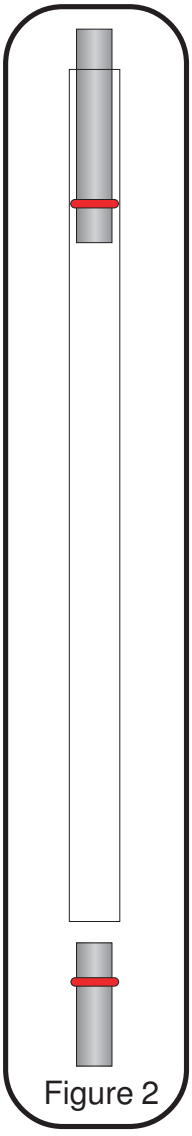


Figure 2

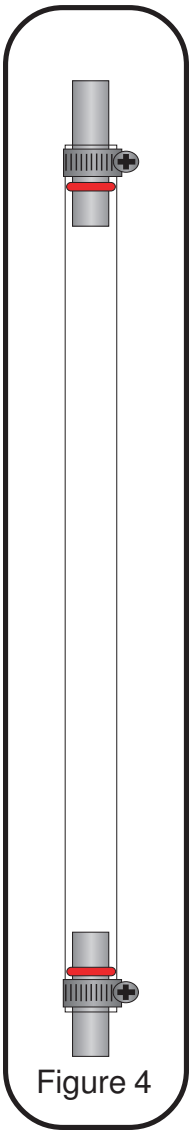
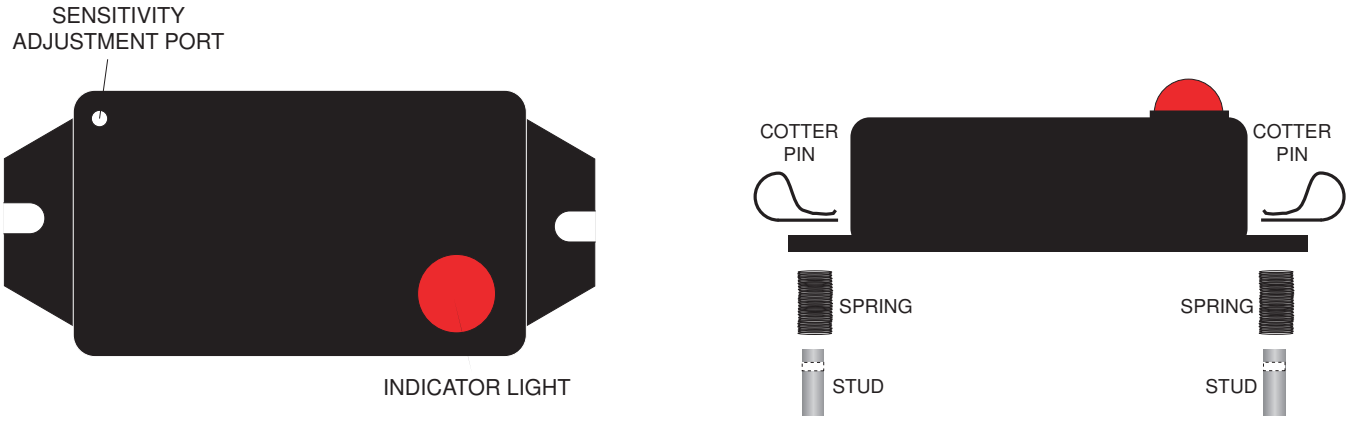


Figure 4

C-630 COMPONENTS

Level Control Sensor Boxes



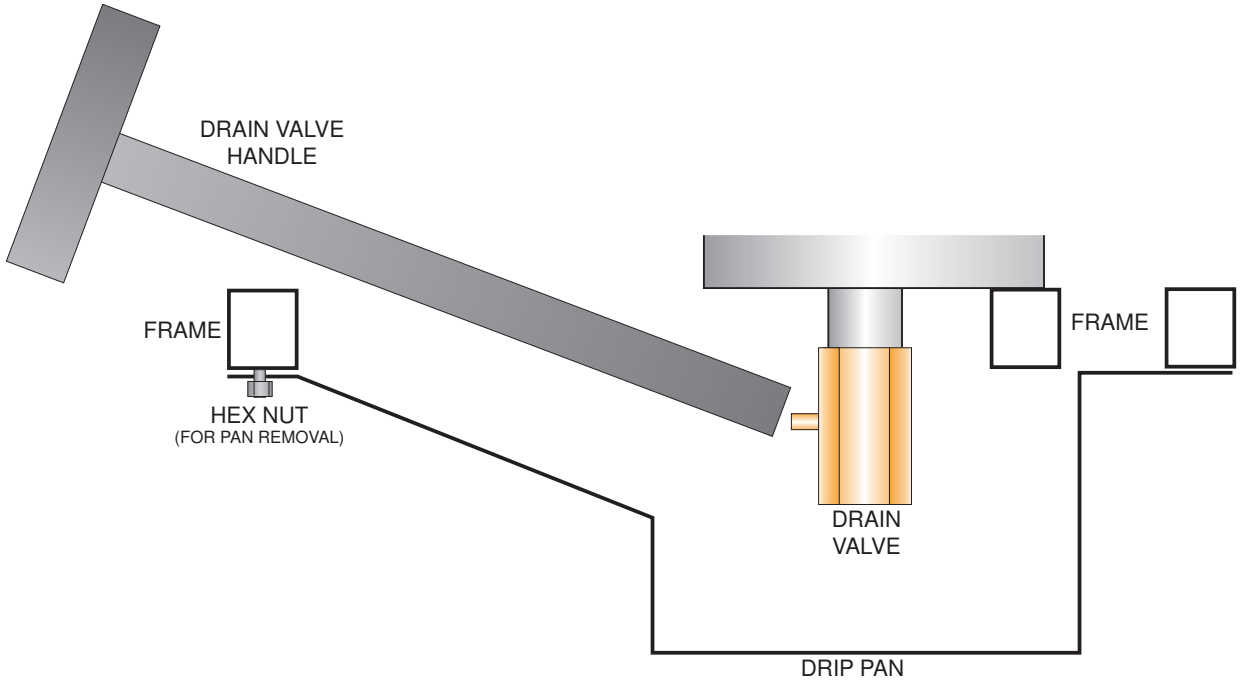
Each of the sight tubes has an individual (identical) level control sensor box. The circuit board reads the level of water on the sensor on the outside of the sight tube. When the water level drops, then the level control sensor will open the solenoid and allow more water to enter the boiling tank. When the water level increases to the setpoint, then the level control sensor will close the solenoid and stop water from entering the boiling tank.

To Adjust: Using a small screwdriver, adjust the sensitivity at the Sensitivity Adjustment Port. To increase the sensitivity rotate the screw clockwise. To decrease sensitivity, turn the screw counter-clockwise.

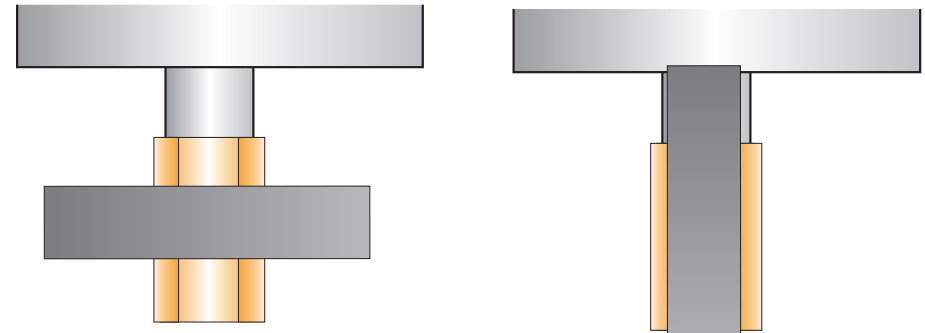
To Remove/Replace: The Level Sensor boxes are mounted to the C-630 with cotter pins and springs. To remove the level sensors, remove the cotter pins, then remove all of the wire couplings that attach to the level sensor control box. Attach the wire connectors to the new box and then remount to the C-630. Adjust the new level sensor sensitivity.

C-630 COMPONENTS

Draining the C-630



Side View

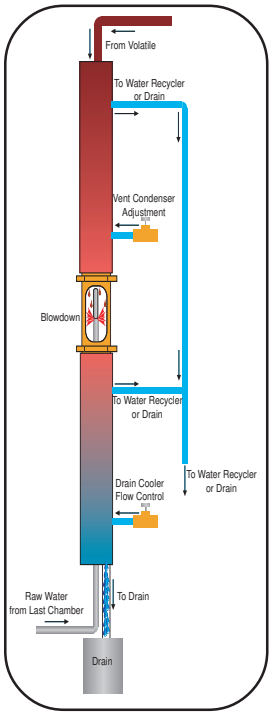


Front Views

C-630 COMPONENTS

Testing and Replacing the Needle Valves

The needle valves allow flow of cooling water, and vent condenser cooling water to the drain. This regulates the temperature of the vent condenser, and the temperature of the water going down the drain. As these needles deteriorate, more water will be sent down the drain.



To Test:

1. Allow the unit to come to full operating temperature and pressure. The cooling water light and solenoid must be open for this test.

2. Remove the recycle drain line from the drain so that it can be observed.

3. Completely close the cooling water and vent condenser needle valves.

4. The water flow from the recyle line should stop. If it does not, then the needle valves are deteriorated and should be replaced.

To Replace:

1. Allow machine to fully cool.

2. Turn off the water supply to the machine.

3. Switch the 3 heating element breakers OFF, and turn the C-630 ON.

4. Drain water from chamber #1 until the inlet pressure reaches 0 PSI.

5. Replace the needle valves.

6. Turn breakers and water supply ON.

7. Adjust cooling water and vent condenser needle valves (See page 39).

DESCALING THE C-630

If the pretreatment unit fails and the C-630 becomes scaled, then this process must be followed to bring your unit back to proper function. The C-630 is efficient primarily due to reusing the heat energy in steam. To exchange the energy, the C-630 boiling chambers have heat exchange surfaces. When scale builds up on these surfaces, then the energy cannot be transferred, and the entire system falls out of balance.

Indicators of Scale

1. Pressure in Boiling Tank #1 increases above the normal level.
2. Sighttube levels fluctuating dramatically.
3. Scale buildup in the feedwater tube from chamber #1 to chamber #2. This is the first place that scale buildup would occur in the C-630. The check this, perform the following:
   a. Turn C-630 off and allow it to cool down.
   b. Drain Boiling Tank #1 and #2 down.
   c. Remove insulation.
   d. Remove the feedwater tube from the #1 tank to the #2 tank inlet solenoid.
   e. Inspect the inside of the tube and note if there is a scale buildup. (This would appear as a white coating inside the tube.)
   f. Reassemble.

Descaling Process

WHAT IS REQUIRED:

QTY	*PWI PART #*	*ITEM*
1	19061	DEMAND PUMP
1	9563-25R	TUBING
1	6642	12 PK OF LUMEN
1	———	35 GALLON CONTAINER—SUPPLIED BY CUSTOMER

INSTRUCTIONS:

1. Shut off the water supply to the distiller. Remove the tubing from the water inlet fitting. (See daigram #1)

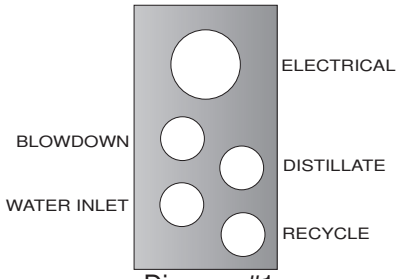


Diagram #1

DESCALING THE C-630

2. Disconnect the distilled water line from the internal storage tank and run it to a drain. (See Diagram #2)
Note: *Connect a jumper wire from the purity probe to the frame of the distiller. (Which will cause the distiller to constantly divert.)*

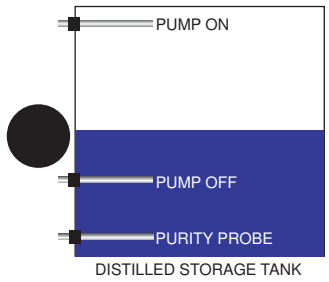


Diagram #2

3. Attach a new 1/2" tube to the inlet fitting on the distiller. (See Diagram #1) Attach the other end of the tube to the outlet side of the demand pump using the fittings supplied. (See Diagram #3)

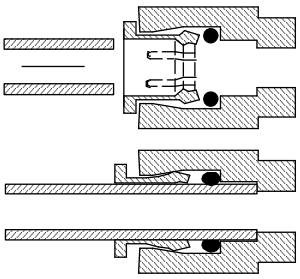


Diagram #3

4. Attach new tube to the inlet side of the pump with the supplied fitings and place the other end down to the bottom of a 35 gallon tank (the easiest 35 gallon container to use is a trash can.). The 35 gallon tank is where you will mix the acid solution. You might want to place a weight at the end of the tube to make sure that the tube stays at the bottom of the tank during the descaling procedure. (See Diagram #4)

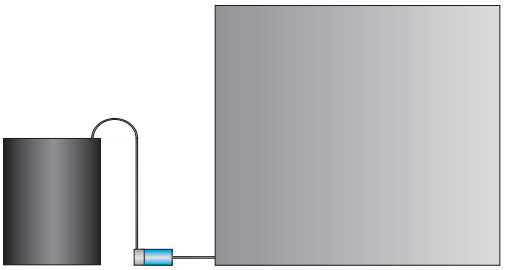


Diagram #4

5. Fill the mixing container with water and add lumen. (approximately 1/4 container of Lumen to 35 gallons of water.) Stir the solution. Use a pH paper to test the pH of the solution. The most effective pH range is 3.0 to 5.0, 3.0 is desired, but in many cases is not achievable. Slowly add lumen, stir and retest, if the pH is still decreasing, add more lumen. Repeat these steps until the pH will not continue to drop (any addition lumen at this point would be a waste.) or is at 3.0. (See Diagram #5)

Diagram #5

DESCALING THE C-630

6. Start the Distiller and plug the demand pump into a power source.

7. Monitor the distiller operation. Acid is highly conductive, and the level probes in the sight glasses may recieve false readings. If the water level in a sightglass and the light for that chamber does not light up, then there is a false reading. Disconnect the wire connected to the probe on the sightglass. The light should come on and water will enter the chamber. Leave the wire disconnected until the water level is approximately 3/4 full then replace the wire to the probe.

8. Monitor the water level in the acid tank. When the level drops to 1/2 of the container, add more water and lumen then retest the pH.

9. When you are easily able to maintain the correct water level in all sightglasses and pressure remains between 15 and 20 PSI in the boiling chamber, then most likely your pipes and tanks are clean.

10. Turn the power to the distiller and the demand pump off. Allow the C-630 time to cool down.

Note: *If you wish to check the effectivness of the descaling operation, drain tank #1 and #2. Remove the feedwater pipe connecting tank #1 and #2. This tube is the most likely to scale and would be a good representation of the conditions inside the tanks and tubes.*

11. Disconnect the line from the demand pump to the distiller inlet. Reconnect the regular water supply line. (See Diagram #6)

12. Turn the C-630 on. Allow the distiller to run and rinse the tubes out and down the drain. After 1-2 hours Connect the distilled water line back to the internal storage tank. (See diagram #7).
Note: *If you have placed a jumper from the purity sensor (in step #2), then disconnect the jumper.*

13. The C-630 is now ready for normal operations.

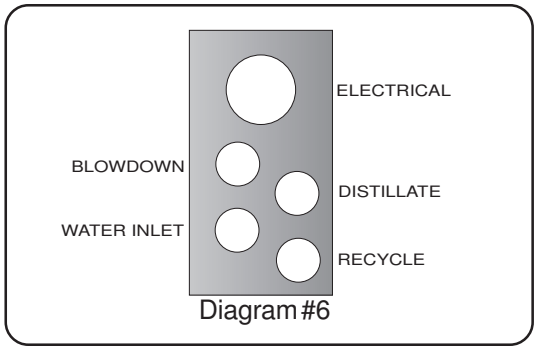


Diagram #6

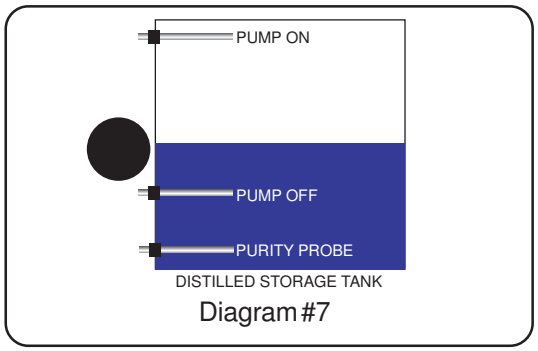


Diagram #7