



Classic
Electrically Heated Stills
OPERATION MANUAL
AND PARTS LIST
SERIES 2112

Model Numbers

A1011 A1015
A1013 A1016

With and Without FAC Controls

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Safety Information

Alert Signals



Warning

Warnings alert you to a possibility of personal injury.



Caution

Cautions alert you to a possibility of damage to the equipment.



Note

Notes alert you to pertinent facts and conditions.

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. Care should be taken when installing, operating or servicing Barnstead products. The specific safety notes pertinent to the Thermo Scientific Barnstead Electrically Heated Stills are listed in safety information section.

Your Barnstead Electrically Heated Still 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, please pay attention to the alert signals throughout the manual.

Warnings

To avoid electrical shock, always:

1. 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.
2. Do not connect unit to electrical service until instructed to do so.
3. Disconnect from the power supply prior to maintenance and servicing.

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 feed only. Sanitizing/cleaning agents must be used in compliance with the instructions in this manual. Failure to comply with the above could result in explosion and personal injury.

SAFETY INFORMATION

3. Avoid splashing disinfecting solutions on clothing or skin.
4. Ensure all piping connections are tight to avoid leakage of chemicals.
5. Always depressurize chemical lines before disassembly.
6. Ensure adequate ventilation.
7. Follow carefully the manufacturers' safety instructions on labels of chemical containers and Material Safety Data Sheets (M.S.D.S.).
8. "Caution: Hot Surface. Avoid Contact."
9. Refer servicing to qualified personnel.

Use of this product in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

This equipment is designed for indoor use only.

Introduction

Thermo Scientific Barnstead electrically heated water stills are available in four sizes; 1, 2, 5 and 10 gallons per hour of distilled water. The distilled water produced by the stills contains not more than 1.0 ppm total solids, with a pH value of 5.4 to 7.2 and an electrical resistance of not less than 300,000 ohms at 25°C when the stills are operated on most potable water. The stills are designed to use not more than 9 gallons of cooling water and feedwater combined, for each gallon of distilled water produced. The still consists of: an evaporator with its heat supply, a condenser, and devices to control the water level and salt concentration in the evaporator, a Q baffle for pyrogen removal and a low water cutoff control. The operating characteristics for each size still are shown in the Installation Diagram.

Evaporator

Still evaporators are the vertical, cylindrical double-wall type with air-insulating space. The evaporators are built sufficiently high and wide to provide ample vapor disengaging space and operation at low velocity.

The evaporator shell is of polished stainless steel. The inner shell (boiler) is fabricated of copper, brass and bronze. The evaporator cover is brass, finished in polished nickel and is provided with a Q baffle. All surfaces that contact the vapor and distillate are coated with pure tin to prevent metallic contamination. A water level sight glass is provided on all 5 and 10 gph stills.

Condenser

Still condensers are the horizontal type, slightly inclined and atmospherically vented for final elimination of volatiles. The condensers are fabricated of copper and brass and are finished in polished nickel. All surfaces that contact the vapor and distillate are coated with pure tin to prevent metallic contamination. A distillate delivery tube of block tin is provided to connect the distillate outlet of the condenser to a storage tank or other suitable container.



Note

Heater life may be reduced when operated above maximum stated voltage. Operation of still at a voltage less than the stated voltages will cause a drop in still output. Electrically heated stills wired for 240 volts AC, 2 or 3 wire, will operate on 208 volts, 2 or 3 wire respectively with resultant 25 percent drop in distillate capacity. Special heaters for 208 volts are needed to obtain rated still output. The electric heaters will burn out if operated in air. To eliminate the possibility of heating element burnout, a solid state low water cutoff control is provided.

Features Provided

All stills are equipped with a deconcentrator to continuously deconcentrate impurities from the evaporator and retard scale formation. A constant level device with hot well arrangement is provided for evaporator water level control and for primary elimination of volatile impurities. All stills are equipped with a drain valve. Cooling water discharge piping is provided between the cooling water outlet of the condenser and the constant level device. Self-resetting solid state low water cutoff controls prevent the heating elements from burning out in a low water situation.

Electric Heat

Electrically powered, immersion type heaters are used to give complete heat transfer and maximum heating efficiency.

Low Water Cut-Off

Electric current to the still heating elements is controlled by an ON/OFF switch and a self-resetting low water cut-off. The solid state low water cutoff is designed to prevent damage caused by low water conditions in the still evaporator.

When the water level is at a safe level in the still evaporator (the water level is above the immersion type heaters and makes contact with the probe), the circuit across probe terminals is completed. The completion of this circuit, after a two-second delay to prevent contactor chatter, will start the contactor to energize the contactor coil to connect the heater service to the still. Opening of the probe circuit (water no longer makes contact with the probe) will stop the contactor without delay.

The Barnstead solid state low water cutoff is designed to prevent damage caused by low water conditions in the evaporator of Barnstead electrically heated water stills. The low water cutoff consists of the Barnstead Solid State Low Water Control, a probe assembly for installation on Barnstead stills, and still heat control (contactor).

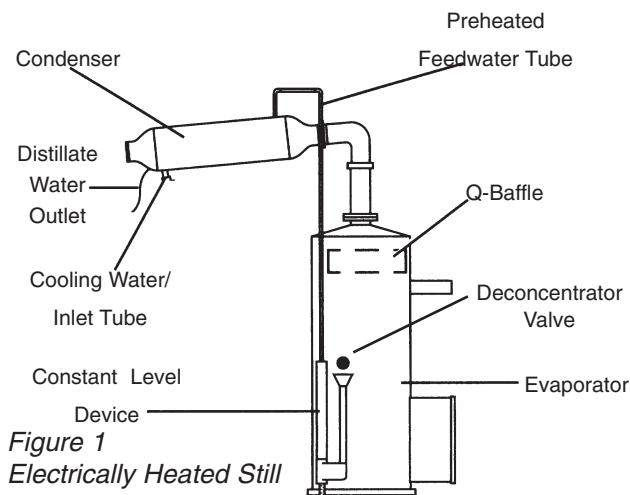


Figure 1
Electrically Heated Still

Still Heat Control

The heat control consists of a cabinetized contactor, located in Control Box, designed for wall mounting. The contactor is provided to control the heat supply to the still heating elements, as determined by the low water cutoff controller. See Figure 8 for information on the contactor size required for a given size still and the available heating service. Unpack the still carefully so as not to damage any of the parts. Ensure that all parts are removed from the container before discarding the packing materials.

On/Off Control/Still Power

The Control Box has an ON/OFF power circuit breaker on the side of the Control Box. This switch will control the power to the control section and the still main power (power to elements).

Unpacking

Over Temperature Protection

This device will shut off the power to the heating elements of the still if the temperature in the boiler section exceeds a given preset temperature of the Over Temperature Protection Device. This will prevent the elements from running away on temperature.

Unpacking

Unpack the still carefully so as not to damage any of the parts. Ensure that all parts are removed from the container before discarding the packing materials.

Package Contains:

Evaporator

Condenser

Control Cabinet and Cables

Distill Tube

Floor Stand

Evaporator Fill Tube

Installation



Note

The floor stand (still) must be secured to the floor before mounting the still or Control Cabinet.

Siting

Move the still evaporator to the operating location and install the evaporator so that it is level and plumb.

Accessories

All operating and convenience accessories purchased with the still should be installed after the still has been assembled on its mounting and before connecting the service lines to the still.



Note

The still is not designed to support the service piping. Ensure that the service piping is adequately supported. If no control valves were purchased with the still, a shutoff valve and throttling valve should be installed in the cooling water supply line, just before the still.

Plumbing Connections

Ensure that all fittings are tight in the still and still accessory piping and connect the water and waste service to the still as shown in the installation diagram.

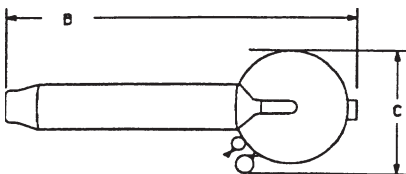


Figure 2
Top View

Dimensions in Inches				
Electric Heat				
Still Cap (GPH)	1	2	5	10
Height	64	68	77	87
Width B	27	25	38	48
Depth C	10	11	14	14

* Overall height includes enough clearance to facilitate condenser removal.

INSTALLATION

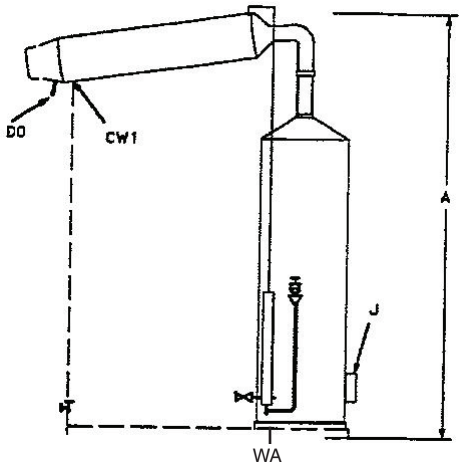


Figure 3
Front View

Service Line Sizes in Inches				
Still Capacity (GPH)	1	2	5	10
CW - Cooling Water Supply	1/4	1/4	1/4	3/8
WA - Waste	1/2	1/2	3/4	3/4

Notes

CW-1: Cooling water inlet connection 1, 2, 5 and 10 GPH stills (water supply pressure - 40 to 90 psi.)

J: Junction box for heating element connections on electrically heated stills.

DO: Distillate outlet.

WA: Waste line must be atmospherically vented and gravity flow.

Electric Heat Requirements							
Model Number	Still Capacity	KW	Amps at 120V 2 Wire 1 Phase	Amps at 240V 3 Wire 1 Phase	Amps at 208V 4 Wire 3 Phase	Amps at 240V 3 Wire 3 Phase	
A1011	1 GPH	2.3	23	12	NA	NA	
A1013	2 GPH	6	NA	26	17	NA	
A1015	5 GPH	13	NA	57	36	NA	
A1016	10 GPH	26	NA	NA	NA	66	

Cooling Water and Inlet Pressure Requirement				
Still Capacity	1 GPH	2 GPH	5 GPH	10 GPH
Cooling Water Requirement	30 L/hr 8 GPH	61 L/hr 16 GPH	151 L/hr 40 GPH	303 L/hr 80 GPH
Inlet Water Pressure	40-90 psi 2.8-6.3 kg/cm ²	40-90 psi 2.8-6.3 kg/cm ²	40-90 psi 2.8-6.3 kg/cm ²	40-90 psi 2.8-6.3 kg/cm ²

Electrical Connections

Connect the electrical heating service to the Control Cabinet. Customer must supply adequate on-off control for electrical heating service.

1. Connect the low water cutoff probe cable to the Control Cabinet.
2. Connect the electrical service to the Control Cabinet. The heater electrical service requirements will be indicated on the nameplate decal at the base of the still evaporator.

Operation



Warning

A fire hazard may result if the still is used with a flammable liquid. "Caution: Hot Surface. Avoid Contact."



Note

During the procedures listed below, check all connections for leaks and tighten as required.



Note

The cooling water inlet and throttling valves are shown in dotted lines. If these were not purchased with the still, they must be installed in the cooling water inlet line by the customer to ensure proper operation.



Caution

Ensure that the water level in the evaporator is above the heating elements before turning on the still. The heaters are the immersion type and will burn out if operated in air. The water level should be safe when water issues steadily from the deconcentrator valve.



Note

Ideally, the temperature of the steam and gases escaping the vent should be 70°C or higher. To measure the vent temperature, use a thermocouple probe, such as the Thermo Scientific PM20700 Digital Pyrometer, inserted into the vent.



Note

Circuit breaker on side of Control Cabinet will shut down power to the control section and still power.

Stills Without FAC Controls

Initial Startup

The first time that the still is started, or after cleaning, operate the still as follows:

1. Close the drain valve.
2. Open the deconcentrator valve slightly.
3. Open the cooling water inlet valve.
4. Open the cooling water throttling valve about 1/2 turn.
5. When water begins to issue steadily from the deconcentrator valve, turn on the still heat supply circuit breaker on side of Control Cabinet then the control ON/OFF switch.
6. When the still begins to produce distilled water, close the deconcentrator valve and adjust the cooling water throttling valve until a puff of steam issues from the condenser vent. Discard the first two hours production of distillate to allow the still to clean itself out.
7. Adjust the deconcentrator as described below.

Initial Operation

The first time the still is operated, or after cleaning, set the Control Cabinet "ON/OFF" switch to ON position, open the manual drain valve and operate the still according to the basic still operating instructions. The lighted switch will remain lit as long as the switch is in the ON position. The "Still On" (amber) lamp will light when the water in the evaporator makes contact with the probe. The still is started and stopped with the "ON/OFF" control switch.

Deconcentrator Adjustment

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

1. **Permanent Hard Water or Softened Water (Softened feed is not recommended).** The deconcentrator valve should be left open at all times to bleed water from the evaporator at approximately 1-1/2 times the capacity of the still. This valve should be left open permanently at the required setting. Care should be exercised to see that it is never clogged. The valve should be inspected periodically and if required, disassembled and cleaned with a brush or scraper.
2. **Temporary Hard Water.** If the feedwater to the evaporator is high in temporary hardness, i.e., high in bicarbonates, the deconcentrator valve should be closed. The reason for this is that bicarbonates in solution tend to precipitate out at temperatures exceeding 150°F. With the deconcentrator valve opened, a larger quantity of feedwater passes through the evaporator, precipitating out bicarbonates, increasing the amount of scale formed. Keeping the to 150° deconcentrator closed will result in an increased concentration of solids in the evaporator as time goes on, thus creating a tendency to foam. This condition is corrected by draining the still through the drain valve at frequent intervals.
3. **Demineralized Water**
When demineralized water is used as feedwater the deconcentrator valve may be kept closed.

Stills With FAC Controls

Normal Operation

Starting - Start the still as follows:

1. Open the drain valve.
2. Open the deconcentrator valve slightly, if not adjusted.
3. Open the cooling water inlet valve (one full turn).
4. When water begins to issue steadily from the deconcentrator valve, turn on the circuit breaker and control ON/OFF switch.

As long as the control "ON/OFF" switch is in the ON position, the still will start and stop automatically, depending on the stored distilled water distribution requirements and the operating cycle of the interval drain timer. To stop the still, set the control "ON/OFF" switch to the OFF position. When this is done, the still will drain automatically.

5. If necessary, adjust the cooling water throttling valve until a puff of steam issues from the condenser vent.

Stopping - Stop the still as follows:

1. Shut off the control ON/OFF switch to the OFF position..
2. The cooling water inlet valve will close.
3. The drain valve will open and let the still drain completely.



Caution

Ensure that the water level in the evaporator is above the heating elements before turning on the still. The heaters are the immersion type and will burn out if operated in air. The water level should be safe when water issues steadily from the deconcentrator valve.



Note

Ideally, the temperature of the steam and gases escaping the vent should be 70°C or higher. To measure the vent temperature, use a thermocouple probe, such as the Thermo Scientific PM20700 Digital Pyrometer, inserted into the vent.



Note

Do not change the setting of the cooling water throttling valve and deconcentrator valve.

Still Diagram Without FAC Controls

**Note**

Valves shown in dotted lines must be installed by customer. Available as optional equipment.

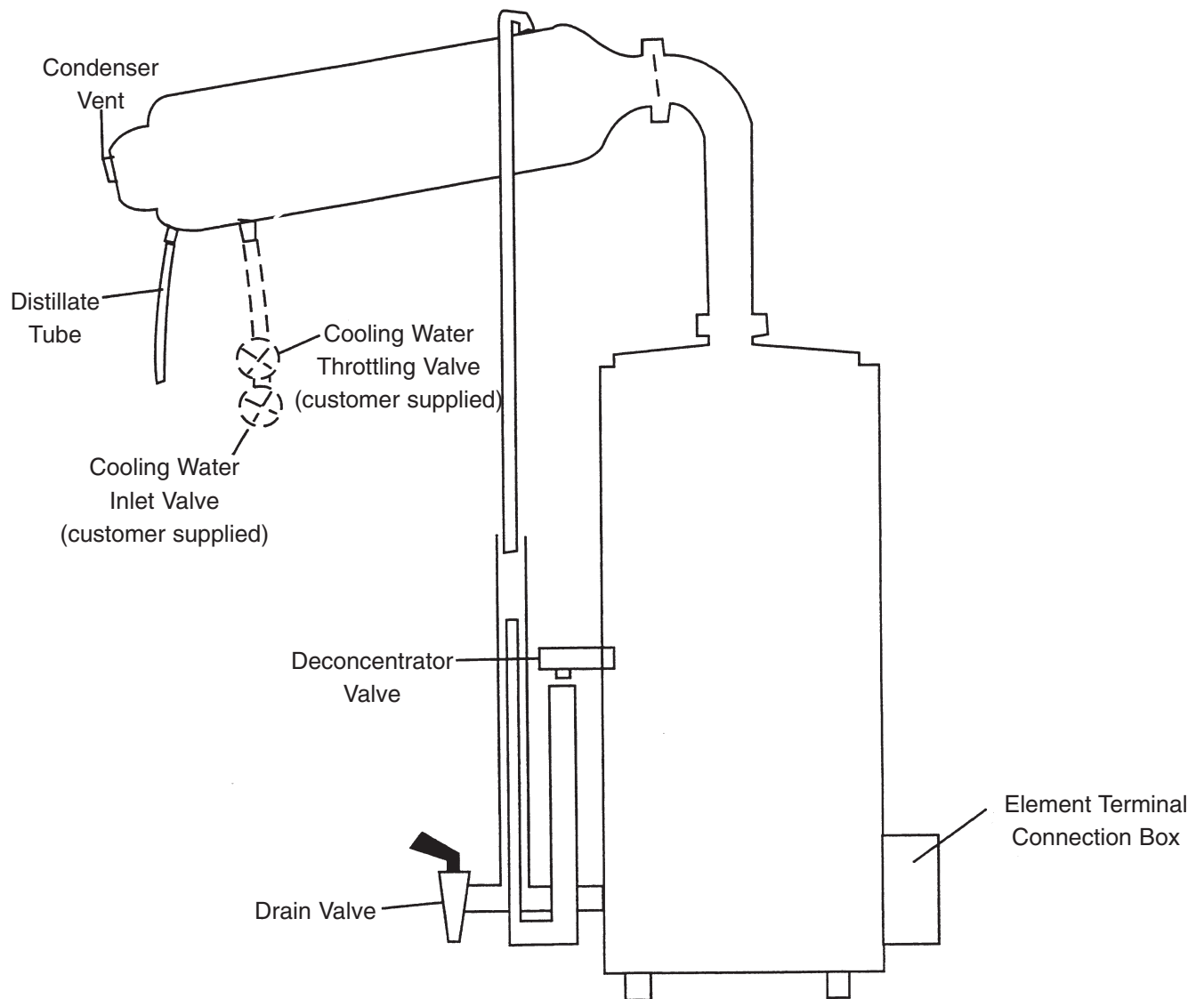


Figure 4
Operating Controls

Maintenance and Servicing



Note

If desired, 10% solutions of sulfamic or acetic acids may be used instead of the HCl. Sulfamic and acetic acids have an advantage over hydrochloric acid in that they will not corrode the metal parts being cleaned. **Under no circumstances should any concentrated acid be allowed to come in contact with tinned surfaces.**



Warning

Always wear protective clothing and eye shields when handling acid. Disconnect from the power supply prior to maintenance and servicing. Refer servicing to qualified personnel.

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. For best results all solutions and water should be heated. But you do not want to bring water to boil. The various methods of cleaning are described below:

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 10% solution of inhibited HCl. This acid cleaner is available commercially or may be prepared using 20 parts water and 6 parts 30% HCl. When using the acid, do not allow the acid to remain in contact with the part for more than 20 minutes. Flush the part thoroughly after using the acid cleaner. A 5% Sodium Bicarbonate solution may be used to remove any acid left on the part.

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 feedwater. This type of scale may be removed with a strong detergent solution. The detergent solution should be allowed to be in contact with the scale or sludge for 24 hours. Rinse off the parts with water after cleaning.

Silica Scale Removal. Silica scale is usually clear and shiny and hard to detect visually. It is very hard and cannot be removed with an acid solution. Silica scale formation can be reduced by controlling the quality of the feedwater by routing it through a mixed bed deionizer. It is best removed with a blunt instrument.

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, or the distilled water transmission tubing) to remove any bio-

**Warning**

Avoid splashing the isopropyl alcohol solution on open cuts.

**Caution**

Do not use chlorine bleach for biological cleaning. The chlorine will interact with and damage the tinned surfaces.

logical contamination from the affected part. This may be accomplished as follows:

1. Immerse the part in an isopropyl alcohol or a mild detergent (not containing bleach) solution overnight. Do not rinse the part with water after cleaning. Drain parts before reassembly.
2. After the still is reassembled and has operated for 30 minutes to flush, reduce the cooling water flow rate with the cooling water throttling valve until steam issues from the condenser vent at least 12 inches. Operate the still in this manner for 30-60 minutes. Ventilate the room during this operation.

Disassembly for Cleaning

The frequency of cleaning will depend upon the purity of the water being used. For example, the evaporator should require infrequent cleaning if it is fed partially purified water; however, the cooling water side of the condenser will have to be cleaned at more frequent intervals due to the fact that raw water is flowing through it and it will scale up sooner. The still should be inspected at frequent intervals until cleaning intervals are determined. Disassemble, inspect, and clean the still as follows:

1. Shut off Main Power switch and drain the still.
2. Shut off the water supply to the still.
3. Remove the condenser from the still. Inspect the cooling water side of the condenser for scale and clean as required. If required, clean the distilled water side of the condenser as described under "Biological Cleaning."
4. Disassemble until the interior of the evaporator is visible. The evaporator cover, high purity chamber and QBaffle may be removed as a unit and the interior of the evaporator will be visible. Inspect the interior of the evaporator for scale. Remove as much scale as possible manually.

**Note**

Stills equipped with a high purity chamber or preheater should not be cleaned with acid unless the high purity chamber can be removed. The fumes given off by the acid may damage the tin coating used in these accessories.

5. Disassemble the drain line and clean as required. Ensure that the drain line is clear (including the drain opening in the evaporator) before using detergent or acid cleaners. Reassemble the drain line.
6. Soft scale may be removed as described under “Soft Scale Removal.” Silica scale may be removed as described under “Silica Scale Removal.” To remove hard scale or organic scale, fill the evaporator with concentrated acid (see “Hard Scale Removal”) or detergent solution (see “Organic Scale and Sludge Removal”) or detergent solution (see “Organic Scale and Sludge Removal”) as required.
7. Inspect the constant level device and drain line. Clean as required.
8. If the still is equipped with a gauge glass, remove and clean the gauge glass cocks and gauge glass:
 - a. Unscrew the nuts that hold the gauge glass in place.
 - b. Lift the gauge glass up into the top gauge glass cock about 1/2 inch.
 - c. After the bottom of the gauge glass is clear of the bottom gauge glass cock, move it away from the still and remove it from the upper gauge glass cock.
 - d. Remove and clean the gauge glass cocks and clean the gauge glass.
9. Reassemble the still. Assembly is essentially the reverse of disassembly.
10. Connect the water, waste and distillate lines.
11. Start the still as described under “Initial Startup.”
12. Lower the cooling water flow rate (with the cooling water throttling valve) until steam



Caution

Ventilate the room during this operation.

spouts out of the condenser vent at least 12 inches. Operate in this manner for 30-60 minutes to sterilize and clean out the still.

13. Adjust the still as described in "Initial Operation."

Theory of Operation

The still consists primarily of a boiler or evaporator which holds the water during the evaporation process; electric heating elements of the immersion type inserted in the evaporator to boil the water; and a condenser which condenses the steam from the boiler to form the distillate.

The water to be purified enters the condenser where it is heated by the steam passing through the evaporator. The preheated water is 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 for the excess cooling water.

Water in the evaporator is vaporized by the electric heating elements. The steam passes up through the vapor pipe into the condenser where it is condensed to distilled water. The condenser is vented to atmosphere to eliminate the gaseous impurities. All stills are equipped with a deconcentrator and an extra high evaporator to permit operating a still from hard water supplies. The deconcentrator automatically maintains a minimum concentration of dissolved impurities in the evaporator, thus reducing to a minimum the scale formation and tendency to foam.

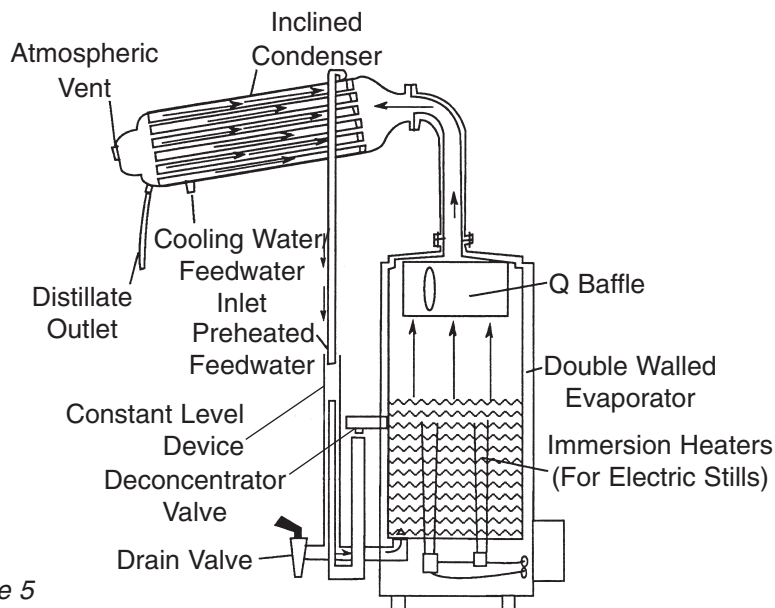


Figure 5

Troubleshooting

This section contains troubleshooting, testing and repair instructions. A troubleshooting chart is included to help the repair specialist find the difficulty quickly.

Tests for Condenser Leaks

Visual Test. A simple test for condenser leaks may be performed as follows:

1. Shut off Main Power switch to the still heating elements.
2. Let the cooling water flow through the condenser until the condenser is cold.
3. Note whether there is a flow, even in drop quantities, from the distillate outlet. If there is a continuous flow, it is possible that there is a leak from the cooling water side to the distillate side. If this is the case, the condenser must be replaced.

Pressure Test. If a more positive test is required, proceed as follows:

1. Remove the condenser from the still.
2. Remove the cooling water discharge tubing. Plug the discharge connection on the condenser with a plug or stopper.
3. Attach a hose to the cooling water inlet connection on the condenser and apply about 5 psi air pressure to condenser. Ensure that the plugs used to seal the condenser do not leak air.
4. Submerge the entire condenser in a tank of water.
5. If any air bubbles come from the condenser, replacement is necessary.

**Note**

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

**Caution**

Do not add the acid cleaning solution rapidly for if any bicarbonate scale is present, gas will be released in considerable amounts. Do not use the acid cleaning solution on the tinned (Distilled Water) side of the condenser.

Condenser Test for Scale

Test the cooling water side of the condenser for scale as follows:

1. Adjust the cooling water throttling valve so that just a puff of steam issues from the condenser vent.
 - A. In extreme cases of scale, steam will always blow from the condenser vent, even when the cooling water throttling valve is wide open.
 - B. Ensure that a minimum cooling water pressure of 30 psi is maintained. A drop in cooling water pressure will cause steam to blow from the condenser because of inadequate cooling.
2. Remove the condenser if the discharge pipe is cool enough to hold. Inspect the interior of the condenser for scale. If scale is present, pour the acid cleaning solution (see "Hard Scale Removal") into the condenser through one of the cooling water connections.
3. Let the solution remain in the condenser for 15-20 minutes, then drain. Repeat if necessary until scale is removed.
4. Wash the interior of the condenser thoroughly after using acid solution.
5. Install the condenser on the still.

**Warning**

To avoid electrical shock, this product must be disconnected from the power supply prior to performing the following maintenance and servicing.

Heating Element Test and Replacement

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

1. Shut off Main Power switch to the still. Close the water supply valves to the still. Open the drain valve and let the still drain completely.
2. Disconnect the electrical supply to the still control box.
3. Remove the bottom plate from the still evaporator. Disconnect the electrical leads and bus bars from the heating element terminals. Tag the leads to facilitate reassembly.
4. To test each heating element for open circuit, disconnect one lead to each element, one element at a time. Use a ohm meter to test the resistance of each element. If you register resistance (approx. 10-20 ohm) the element is good. If you show no resistance value at all, the element is defective in series with the applied current. If the test light does not light, the heating element is burned out. Mark all damaged heating elements.
5. To test each heating element for short circuit, connect one test lead to the boiler bottom and the other to each terminal (one at a time). If the heating element is short circuited, the ohm meter will show resistance. Mark all damaged heating elements.
6. Remove the evaporator cover from the still and inspect the heating elements from the inside of the evaporator. Warped or split elements should be replaced.
7. 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.

TROUBLESHOOTING

8. 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.
9. Install the bus bars and wiring between heater terminals. Retighten the heater retaining screws to eliminate the possibility of leakage.
10. Add water to the evaporator and ensure that none of the heating elements are leaking.
11. Reassemble the still and connect the electrical service to the control box.

Heating Elements

Listed below are the heating elements available. The heating elements now have compression nuts. These are directly interchangeable with the older threaded types. Heating elements are shipped complete as shown in Figure 6.

Still Catalog No. (Capacity)	Heater Catalog No.	Heater Wattage	Heater Type	Quantity Required
A1011 (1 GPH)	07031	650	U	4
A1013 (2 GPH)	07033	1000	Y	6
A1015 (5 GPH)	07029	2160	P	6
A1016 (10 GPH)	07028	2160	O	12
A1016X003 (10 GPH)	07029	2160	P	12



Note

Heater replacement data stamped inside still junction box cover.



Note

Replacement heating elements are furnished with O-ring, retaining nut, socket head screw and two round head screws. These parts are listed in the event that only these parts need replacement.

Tee handle wrench (P/N 06287) available for removing socket head screw. May be ordered with replacement heating elements.

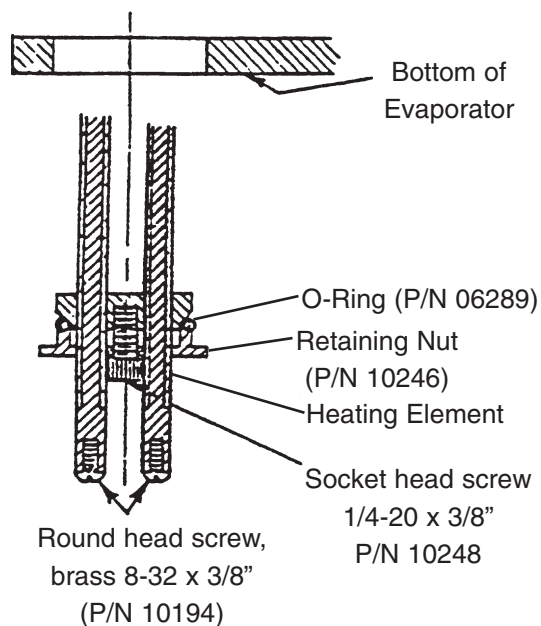


Figure 6 Heating Element Replacement

Troubleshooting Chart

Symptom	Probable Cause	Test and Remedy
Drop in purity.	Dirty still. Volatile impurities in feedwater.	Inspect evaporator for scale, clean as required. Test distillate for CO ₂ , NH ₃ , etc. Reduce cooling water flow to help eliminate volatiles from condenser.
Pyrogenic or organic contamination of distillate.	Dirty still. Leak in condenser. Bacteriological growth in distilled water.	Inspect evaporator for excess scale, clean as required. Test condenser for leaks or replace as required. Inspect the suspected parts. Clean with alcohol if required. (See "Biological Cleaning.")
Drop in distillate capacity.	Excess scale on heating unit. Low voltage. Leak in drain valve. Damaged inoperative heaters.	Inspect and clean as required. Check voltage. If less than specified in wiring diagram, notify electrician. Ensure drain valve is closed and not leaking. Check wiring, connections, etc. Test heaters and replace if necessary.
Steam blowing from condenser.	Low cooling water flow rate. Low cooling water pressure. Excess scale in condenser. High voltage.	Readjust throttling valve. Check cooling water pressure. Should be at least 30 psi. Inspect condenser for scale. Check voltage. If over the rated voltage, shut down still immediately. Notify electrician.
Water blowing from condenser.	Condenser leak. Trapped distillate line. High concentration of solids in evaporator.	Test condenser for leaks. Repair or replace as required. Inspect distillate lines for any restrictions or trapping. Ensure deconcentrator is adjusted properly and drain still more often.
Still starts but will not produce distillate.	No electrical power to heater circuit.	Check power to control box. Check contactor points and replace if badly burned. Check that low water cutoff probe is properly installed in accordance with instructions. Check thermal cut off.

Parts List

Index No.	Description	A1011 (1 GPH)	A1013 (2 GPH)	A1015 (5 GPH)	A1016 (10 GPH)	
1	Condenser	21058	21060	21062	21064	
2	Distillate Delivery Tube	20622	20624	20624	21904 (36")	
	48" Distillate Delivery Tube W/O Adapter	20631	20633	20633	-----	
	Distillate Tube Adapter (End) - Not Shown	01449	01450	01450	-----	
3	Cooling Water Discharge Tube	21881	21882	21883	-----	
4	Cooling Water Discharge Elbow	03702	03702	03426	03411	
5	Vapor Pipe Gasket (A1016-X003 only)		-----	-----	21152	
6	Evaporator Cover	21195	21197	21199	21535	
7	Knurled Nut	03719	03719	03469	03469	
8	Evaporator Cover Gasket	06271	06271	06272	06272	
9	Evaporator	21123	21127	21131	21300	
10	Constant Level Device	21320	21321	21167	21301	
11	Deconcentrator Valve	21272	21272	21043	21043	
12	Deconcentrator Funnel	21281	21282	21041	21619	
13	Drain Valve	02096	02096	02096	03506	
	Heating Elements (See Note 1) (Not Shown)	07031	07033	07029	07028	
14	Q Baffle (Not Shown)	G1650	G1650	G1651	G1651	
	Thermal fuse	FZ2112X1	FZ2112X1	FZ2112X1	FZ2112X1	

PARTS LIST

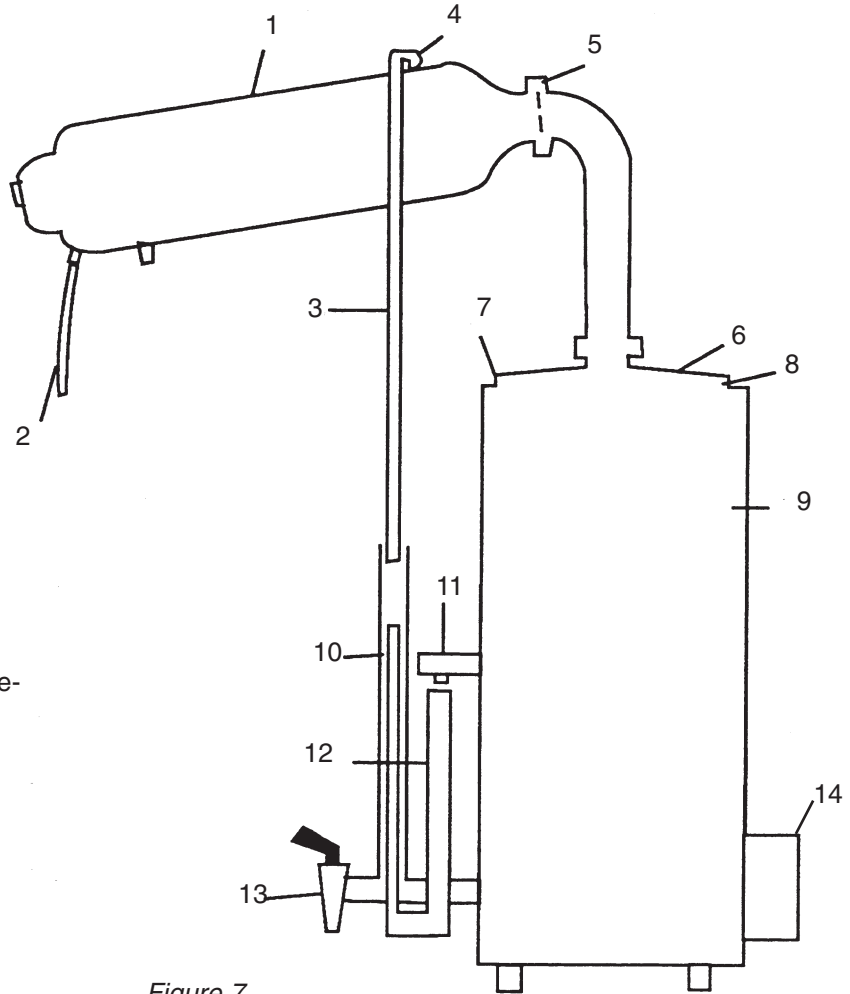


Figure 7



Note

For more details on heating elements, refer to "Heating Element Replacement."

Other Parts Not Illustrated	Part No.	
	(1-2 GPH)	(5-10 GPH)
Gauge Glass Cocks	-----	02002
Gauge Glass	-----	06038
O-Rings (Gauge Glass)	-----	06041

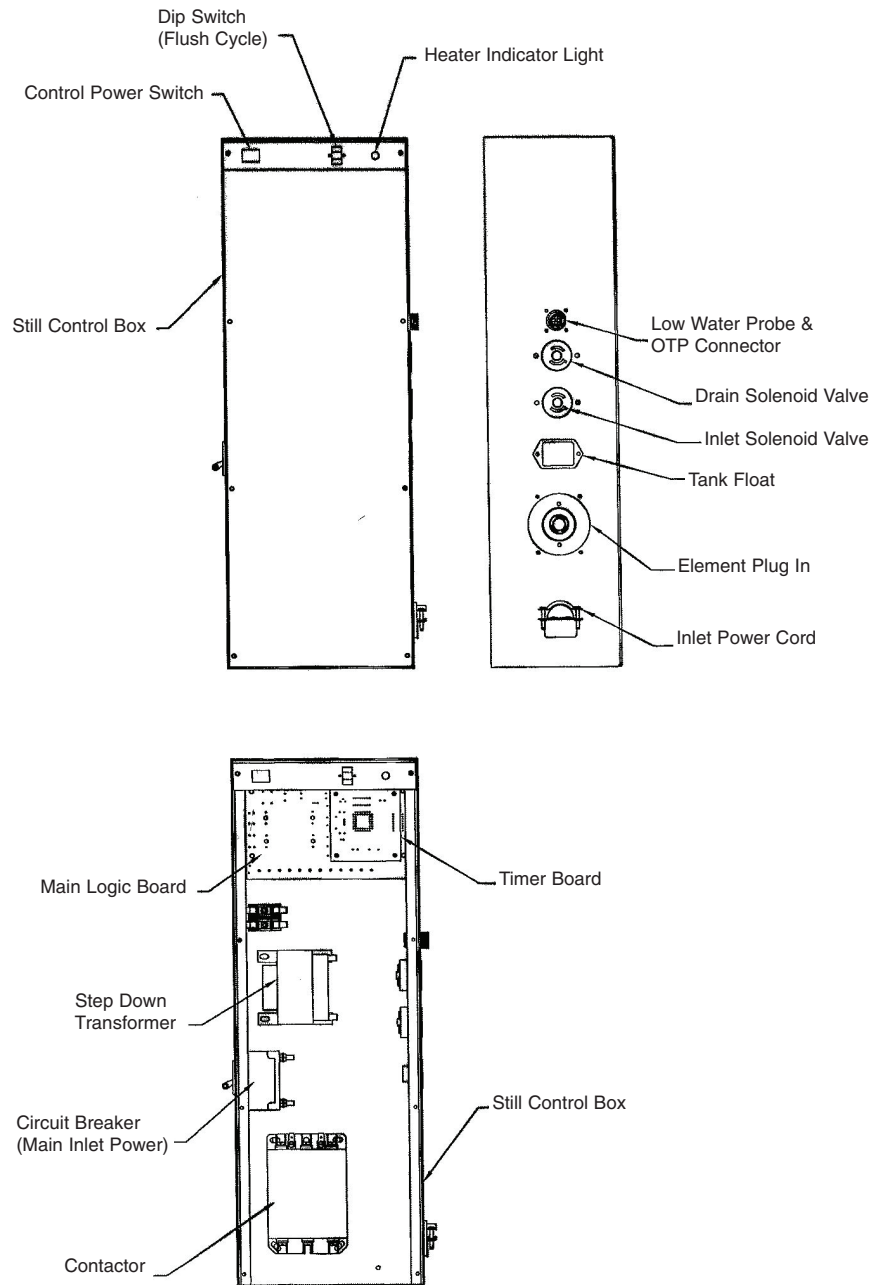


Figure 8
Still Box

PARTS LIST

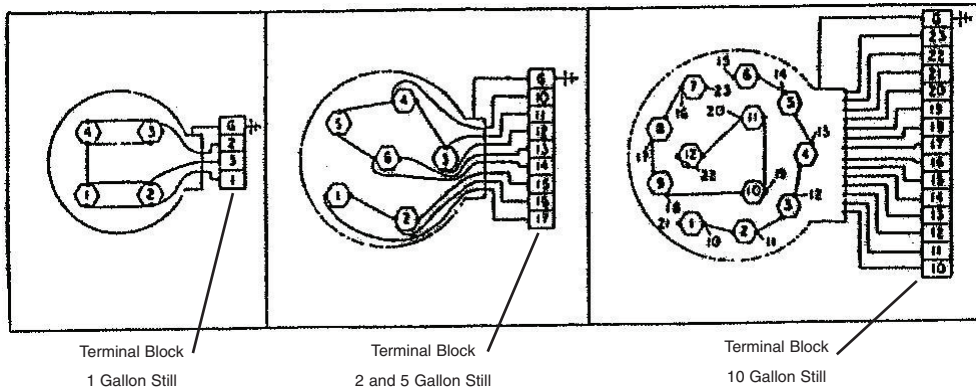


Figure 9

Catalog No.	Quantity & Type of Element	Voltage	Wattage	Total Watts
A1011	4 Type U	120	650	2600
A1013	6 Type Y	120	1000	6000
A1015	6 Type P	120	2160	13000
A1016	12 Type O	120	2160	26000

Notes

1. : Heater life may be reduced when operated above maximum stated voltage. Operation of still at a voltage less than the above stated voltages will cause a drop in still output.
2. Customer external connections and circuit protection must be capable of carrying the full load current in accordance with the national electrical code and local practice.
3. Still evaporator must be grounded.
4. O denotes terminal in junction box.
5. At 208 volts, the output is reduced by 25% of rated capacity. Special heaters for 208 volts are needed to obtain rated still output.
6. This nonstandard voltage will cause a 16% drop in still output capacity in a standard still. Special heaters may be ordered as an option to achieve rated capacity.

Flow Automatic Controls

Allows for completely unattended 24-hour operation when still is attached to tank. Adjustable drain timer/cycler 2-, 4-, 8- or 16- hour drain allows reduced still cleaning frequency.

Model No.	Where Use
G2100	1 and 2 GPH, 1 phase still
2101	2 GPH, 3 phase still
2110	5 GPH, 1 and 3 phase still
G2125	10 GPH, 3 phase still

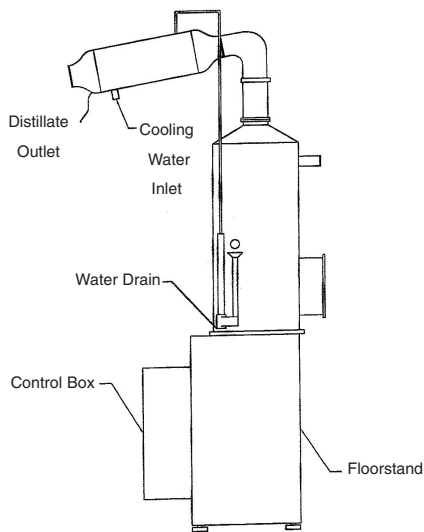


Figure 10
Steam Still mounted on Floorstand

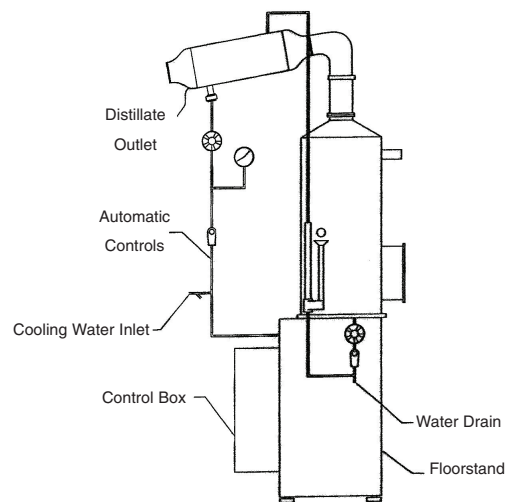


Figure 13
Steam Still with Automatic Controls mounted on Floorstand

Cartridge Pretreatment Kit for Classic Stills

The pretreatment kit removes scale-forming impurities from the feedwater to the still evaporator (boiler) while improving the distillate purity. Each pretreatment kit has a scale eliminator cartridge, Cat. No. D8921, containing ion-exchange resin to remove scale-forming impurities and activated carbon to remove chlorine and volatile organic impurities. The capacity of the cartridge is 750 grains as NaCl.

Model No.	Description
G3628	Cartridge Pretreatment Kit for 1 and 2 GPH Stills (includes 1 cartridge)
D8921	Extra Pretreatment Cartridge

Enclosed in this package: Holder for wall mounting the cartridge, a flow meter for regulating the water flow through the cartridge, and the necessary piping and tubing to connect the scale eliminator cartridge to the still. For use with 1 and 2 GPH Classic Stills only.

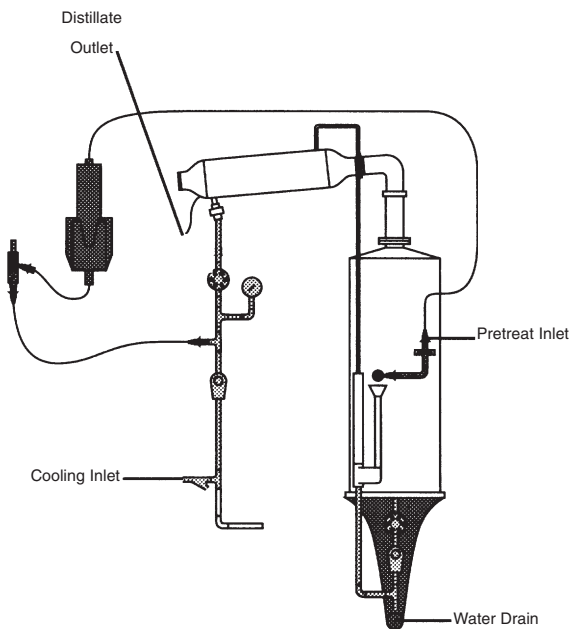


Figure 15
Pretreated Cartridge Kit for 1 and 2 GPH
Electric Stills with Automatic controls, mounted
on wall bracket

Accessories for Electric Stills

Accessory Numbers for Electric Stills

Accessory	A1011	A1013	A1015	A1016
Pretreatment Kit	G3628	G3628		
	D8921	D8921		
Fully Automatic Control	G2100	G2100 or G2101	G2110	G2120 or G2125

Tin-Coated Vertical Cylindrical Storage Tanks

Accessory	A1011	A1013	A1015	A1016
10 Gallon Cylindrical Storage Tank	B3043	B3043	B3043	B3043
Floorstand	H1000	H1000	H1000	H1000
25 Gallon Cylindrical Storage Tank	B3045	B3045	B3045	B3045
Floorstand	H1001	H1001	H1001	H1001
50 Gallon Cylindrical Storage Tank	B3046	B3046	B3046	B3046
Floorstand	H1002	H1002	H1002	H1002
100 Gallon Cylindrical Storage Tank	B3047	B3047	B3047	B3047
Floorstand	H1003	H1003	H1003	H1003
200 Gallon Cylindrical Storage Tank	B3049	B3049	B3049	B3049
Floorstand	H3230	H3230	H3230	H3230

ACCESSORIES FOR ELECTRIC STILLS

Tin-Coated Rectangular Storage Tanks

Accessory	A1011	A1013	A1015	A1016
25 Gallon Rectangular Storage Tank	B3027	B3027	B3027	B3027
50 Gallon Rectangular Storage Tank	B3028	B3028	B3028	B3028

Accessories to Accompany Tin-Coated Rectangular and Cylindrical Storage Tanks

Accessory	A1011	A1013	A1015	A1016
Ventgard	H3120	H3120	H3120	H3120
Water Seal	H3130	H3130	H3130	H3130
Ventgard and Water Seal	H3111	H3111	H3111	H3111
Replacement Filter for Ventgard	25001	25001	25001	25001
Ultraviolet Lamp	H4005	H4005	H4005	H4005
Replacement UV for 120V	04141	04141	04141	04141

Ordering Procedures

Please 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 we ask that you check first with your dealer. If the dealer cannot handle your request, then contact our Customer Service Department at 866-984-3766.

Prior to returning any materials, please contact our Customer Service Department for a "Return Materials Authorization" number (RMA). Material returned without an RMA number will be refused.

One Year Limited Warranty

This Thermo Scientific product is warranted to be free of defects in materials and workmanship for one (1) year from the first to occur of (i) the date the product is sold by the manufacturer or (ii) the date the product is purchased by the original retail customer (the "Commencement Date"). Except as expressly stated above, the MANUFACTURER MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCTS AND EXPRESSLY DISCLAIMS ANY AND ALL WARRANTIES, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF DESIGN, MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

An authorized representative of the manufacturer must perform all warranty inspections. In the event of a defect covered by the warranty, we shall, as our sole obligation and exclusive remedy, provide free replacement parts to remedy the defective product. In addition, for products sold within the continental United States or Canada, the manufacturer shall provide free labor to repair the products with the replacement parts, but only for a period of ninety (90) days from the Commencement Date.

The warranty provided hereunder shall be null and void and without further force or effect if there is any (i) repair made to the product by a party other than the manufacturer or its duly authorized service representative, (ii) misuse (including use inconsistent with written operating instructions for the product), mishandling, contamination, overheating, modification or alteration of the product by any customer or third party or (iii) use of replacement parts that are obtained from a party who is not an authorized dealer of Thermo Scientific products.

Heating elements, because of their susceptibility to overheating and contamination, must be returned to the factory and if, upon inspection, it is concluded that failure is due to factors other than excessive high temperature or contamination, the manufacturer will provide warranty replacement. As a condition to the return of any product, or any constituent part thereof, to the factory, it shall be sent prepaid and a prior written authorization from the manufacturer assigning a Return Materials Number to the product or part shall be obtained.

IN NO EVENT SHALL THE MANUFACTURER BE LIABLE TO ANY PARTY FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OR FOR ANY DAMAGES RESULTING FROM LOSS OF USE OR PROFITS, ANTICIPATED OR OTHERWISE, ARISING OUT OF OR IN CONNECTION WITH THE SALE, USE OR PERFORMANCE OF ANY PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, TORT (INCLUDING NEGLIGENCE), ANY THEORY OF STRICT LIABILITY OR REGULATORY ACTION.

For the name of the authorized Thermo Scientific product dealer nearest you or any additional information, contact us:

308 Ridgefield Court, Ashville, NC, 28806 USA

Phone: 1-866-984-3766

Fax: 1-828-665-4071

Web: www.thermo.com