Thermo
SCIENTIFIC

Type A1007 Electrically Heated Portable Still

OPERATION MANUAL
AND PARTS LIST
SERIES 919

LT919X1 • 3/11/09

Table of Contents

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.

Your Thermo Scientific Barnstead electrically-heated portable still has been designed with function, reliability, and safety in mind. It is your responsibility to install it in conformance with local electrical codes. This manual contains important operating and safety information. You must carefully read and understand the contents of this manual prior to the use of this equipment. For safe operation, please pay attention to the alert signals throughout the manual.

Important Information

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 this Barnstead product are listed on the next page.

Warnings

To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.

2. Ensure that the equipment is connected to electrical service according to local and national standards. Failure to properly connect may create a fire or shock hazard.

3. Do not mount this portable still directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electrical shock hazard if improperly located.

4. Disconnect from the power supply before 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. This device is to be used with water feeds only. Sanitizing/cleaning agents must be used in compliance with instructions in this manual. Failure to comply with the above could result in explosion and personal injury.

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

4. Avoid splashing disinfecting solutions on clothing or skin.

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

6. Do not add the acid cleaning solution rapidly — if any bicarbonate scale is present, gas will be released in considerable amounts.

7. "Caution - Hot Surface. Avoid Contact." The exterior of the still becomes hot during operation and will remain hot for some time after the still has been turned off.

8. Refer servicing to qualified personnel.

Introduction

The Barnstead Electrically Heated Portable Still provides high quality distilled water at the rate of 1.8 liters/hour. The still is designed to use approximately 14.4 liters of cooling water and feed water combined for each 1.8 liters of distilled water produced. Two electrically powered, immersion-type heaters are used to give complete heat transfer and maximum heating efficiency. An automatic low water cut-off device is incorporated to protect the heaters against a low water condition.

Principles of Operation

The water to be purified enters the condenser at the water inlet. As the water flows around the outside of the condenser tube, it becomes preheated almost to boiling. The preheated water leaves the condenser through the discharge tube and is fed into the constant level device. The constant level device maintains a constant water level in the evaporator. The excess hot water (which may be used elsewhere as plain hot water) flows to drain. In the evaporator the water is converted into steam which passes up through the vapor pipe to the condenser tube where it is cooled to form distilled water.

By reducing the flow of water so that a little steam escapes through the condenser vent, high efficiency is assured, entrance of air becomes impossible, and any trace gases cannot redissolve in the hot distillate but leave with the wisp of steam. The vent also makes the system an open system so that no pressure can build up within the still.

The low water cutoff is designed to prevent damage caused by low water conditions in the evaporator. In use, the cutoff probe is in contact with the water in the still evaporator. The water completes an electrical circuit when the water is at a safe level (above the heating elements). When the water level drops below the probe, the circuit opens and de-energizes the heating elements.

Note
A properly regulated water supply is important for optimum distillate quality and maximum distillate output. Ensure that your feedwater supply meets the requirements at right.

Distillate capacity	1.8 liters/hour (1/2 GPH)
Maximum water pressure	90 psig
Minimum water pressure	40 psig
Plumbing connections	
Water inlet	1/4 NPT [1]
Waste	1/2” hose
Electrical requirements	The still is rated at 1300 watts and operates on 120 volts AC. The still will draw 12 amperes of currrent at 120 volts.
Overall dimensions	
Width	19-7/8 in.
Depth	9-1/2 in.
Height	20-1/2 in.
Shipping weight	65 lbs.

[1] *A hose nipple is provided for a* 1/2*" hose connection if a permanent connection is not desired.*

Installation

Unpacking

Unpack the still carefully to prevent damage. Ensure that all parts are removed from the container before discarding the packing materials.

Warning
Do not mount this portable still directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electical shock hazard if improperly located.

Note
Ensure that the service piping is adequately supported. The still is not designed to support the service piping.

Choosing a Site

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

Plumbing Connections

Connect the water and waste service lines to the still. Ensure that the waste service line at the still is atmospherically vented and gravity flow. A shut-off valve and throttling valve should be installed in the water supply line, just before the still, if the still is to be permanently piped. If the still is not to be permanently piped, a hose may be connected between the inlet hose nipple connection and a water faucet. The water faucet may be used as a water throttling valve. The distillate delivery tubing should be connected to the point of distribution or storage.

Warning
Use a properly grounded electrical outlet of correct voltage and current handling capacity.

Ensure that the equipment is connected to electrical service according to local and national standards. Failure to properly connect may create a fire or shock hazard.

Electrical Connection

The still is connected electrically by connecting the cord to a dedicated 120 volt AC grounded electrical circuit. See the specifications plate on the still evaporator for the electrical requirements.

Note
The still should be connected to a dedicated electrical line.

Caution
The heaters are immersion-type heaters, and will burn out if operated in air when the low water cutoff is disconnected. Read the Operation section before connecting the still to electrical service. Water supply must not be interrupted before power is turned off.

Note
During the Initial Startup procedures, check all connections for leaks and tighten as required.

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 Thermolyne PM20700 Digital Pyrometer, inserted into the vent.

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 water shut-off valve.
3. Open the water throttling valve about 1/2 turn.
4. When the water level in the evaporator reaches a sufficient level, as indicated by a steady overflow to waste, connect the still to the electrical service, and turn on power switch. Check to see that the heater light is on. (Heater light will only turn on when water is above low water cutoff probe.)
5. When the still begins to produce distilled water, adjust the water throttling valve until just a puff of steam issues from the condenser vent. Discard the first 2 hours of distillate production to allow the still to clean itself out.

Operation

Warning
Do not use in the presence of flammable or combustible materials; fire or explosion may result. This device contains components which may ignite such materials.

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

"Caution-Hot Surface. Avoid Contact." The exterior of the still becomes hot during operation and will remain hot for some time after the still has been turned off.

Note
If the still is operated continuously, it should be stopped and drained once every four hours. Draining the still at frequent intervals will help to inhibit the formation of scale in the evaporator.

Do not change the setting of the water throttling valve.

Caution
Always turn main power switch off before shutting off the water supply.

Startup

Start the still as follows:

1. Close the drain valve.
2. Open the water shut-off valve.
3. Turn on main power switch. When water level is above low water cutoff probe, heaters will turn on.
4. Check the cooling water flow and the vent temperature.

Stopping

Stop the still as follows:

1. Turn main power switch off.
2. Close the water shut-off valve.
3. Open the drain valve to allow the still evaporator to drain completely while its contents are hot.

Maintenance and Servicing

Warning
To avoid electrical shock, always disconnect from power supply before maintenance and servicing.

Refer servicing to qualified personnel.

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

Warning
Ventilate the room during this operation.

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

To avoid electrical shock, always disconnect from power supply before maintenance and servicing.

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.

Disassembly for Cleaning

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

1. Stop the still. Turn the still off and allow the still to cool.

2. Remove the condenser from the still. Inspect the cooling water side of the condenser for scale and clean as required.

3. Disassemble the evaporator until the interior of the evaporator is visible. Inspect the interior of the evaporator for scale. Remove as much scale as possible manually.

4. Disassemble the drain line and clean as required. Ensure that the drain line is clear (including the drain opening in the evaporator) before using a cleaner. Reassemble the drain line.

5. 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 acid cleaner (see "Hard Scale Removal").

6. Inspect the constant level device and drain line and clean as required.

7. Reassemble the still. Assembly is essentially the reverse of disassembly.

8. Connect the water, waste and distillate lines.

9. Start the still as described under *Initial Startup*.

10. Lower the water flow rate with the water throttling valve until steam spouts out of the condenser vent at least 12 inches. Operate in this manner for 30 to 60 minutes to sterilize and clean out the still.

11. Readjust the still as described in *Initial Startup*.

Caution
When using the acid solution, do not allow the acid to remain in contact with the part for more than 20 minutes. Under no circumstances should any acid cleaner be allowed to come in contact with tinned surfaces (such as the distilled water side of the condenser or the distilled water transmission tubing).

Note
For best results, heat acid solutions and detergent solutions.

Note
If your still develops significant sludge and scale on an ongoing basis, you will probably benefit from pretreatment of your feedwater. Customer Service will help you ascertain the best pretreatment for your feedwater supply.

Warning
Do not add isopropyl alcohol to boiler. A fire may result.

Avoid splashing disinfecting solutions on clothing or skin.

Cleaning Methods

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

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 can be removed by using a 10 percent solution of inhibited hydrochloric acid. This acid solution is available commercially or can be prepared using 20 parts water and 6 parts 30 percent hydrochloric acid. Flush the part thoroughly after using the acid solution. A 5 percent Sodium Bicarbonate Solution can be used to remove any acid left on the part.

If inhibited hydrochloric acid is not available, a ten percent solution of sulfamic or acetic acid may be used as a substitute. Exposure time to this acid is 2 to 3 hours. Sulfamic and acetic acids have an advantage over hydrochloric acid ; they will not corrode the metal parts being cleaned.

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 feed water. 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 feed water by routing it through a mixed-bed deionizer less than 10 megohm/cm. 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 distilled water transmission tubing) to remove biological contamination from the affected part. Parts that come in contact with the steam vapors (such as distilled water transmission tubing) may be biologically cleaned by removing them from the still and immersing them in a one-percent solution by weight of isopropyl alcohol overnight. After the required amount of exposure to the isopropyl alcohol solution, reinstall the cleaned parts onto the still without rinsing them. Start the still and use the distillate output to rinse any remaining isopropyl alcohol solution to waste.

Testing for Condenser Leaks

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

1. Disconnect the still from the electrical service.
2. Let the 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, 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.

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

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

1. Remove the condenser from the still.
2. Remove the water discharge tubing. Plug the discharge connection on the condenser with a plug or stopper.
3. Attach a hose to the water inlet connection on the condenser and apply no more than 5-psi of air pressure to the condenser.
4. Submerge the entire condenser in a tank of water.
5. If any air bubbles come from the condenser, replacement is necessary.

Note
When conducting the condenser scale test, ensure that a minimum inlet water pressure of 40 psi is maintained. A drop in water pressure will also cause steam to blow from the condenser because of inadequate cooling.

Condenser Scale Test

Test the condenser for scale as follows:

1. Adjust the water throttling valve until just a puff of steam issues from the condenser vent. The volume of water required to cool the condenser to this point gives a general indication of the amount of scale that has built up inside the condenser's cooling water tubing; the greater the scaling, the greater the volume of water required. In extreme cases of scale, steam will always blow from the condenser vent, even when the water throttling valve is completely open.

Warning
Do not add the acid cleaning solution rapidly — if any bicarbonate scale is present, gas will be released in considerable amounts.

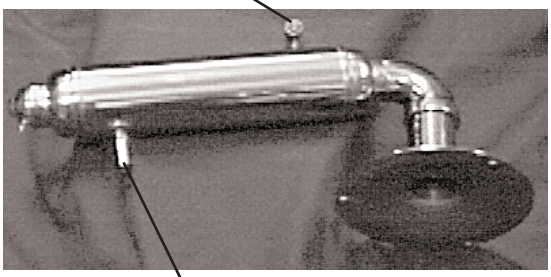
Caution
Do not pour any acid solution into the distillant side of the condenser — the acid will destroy the tin coating.

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 as follows:

   Connect funnel to top (Water outlet) of condenser. Connect tubing with clamp to bottom connection (water inlet) of condenser. Pour acid solution into funnel and let sit in condenser for 10-15 minutes. Open drain clamp and let acid solution flow to drain. Rinse condenser with distilled water after acid cleaning.

3. Reinstall the condenser on the still.

Top Connector



Bottom Connector

Warning
To avoid electrical shock, always disconnect from power supply before maintenance and servicing. Refer servicing to qualified personnel.

Heating Element Testing and Replacement

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

1. Drain and cool the still.

2. Remove the bottom cover from the still evaporator. This may be done by removing the 2 screws from the bottom. Disconnect the electrical leads and bus bars from the heating element terminals. Tag the leads to facilitate reassembly.

3. To test each heating element for an open circuit, apply a current across the terminals. Use a test light in series with the applied current. If the test light does not light, the heating element is burned out. Mark the damaged heating elements.

4. To test each element for a short circuit, take an ohm reading on each element while bus bars are disconnected. The proper reading should be approximately 21 ohms.

5. 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.

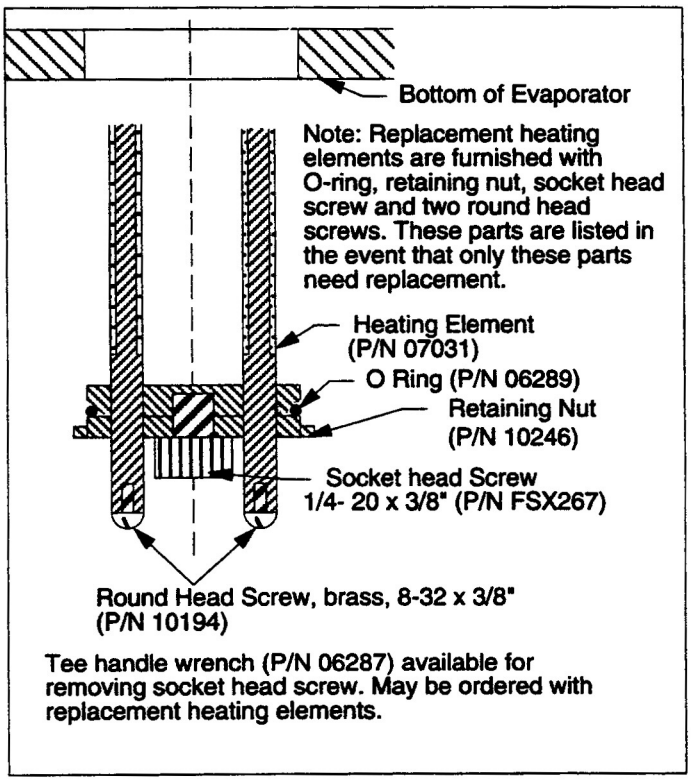
6. To remove an inoperative or damaged heater, loosen the screw under the heater and push out the heater. If the heater is badly scaled, remove the retaining nut and rock the heater back and forth (from inside the evaporator) to break the scale.

7. 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.

8. Install the bus bars and wiring between heater terminals. Retighten the heater retaining screws to eliminate the possibility of leakage.

9. Add water to the evaporator and ensure that none of the heating elements are leaking. Allow to sit for 30 minutes. If no leaking occurs, reattach bottom cover to still.

10. Reassemble the still and connect the still to the electrical service.

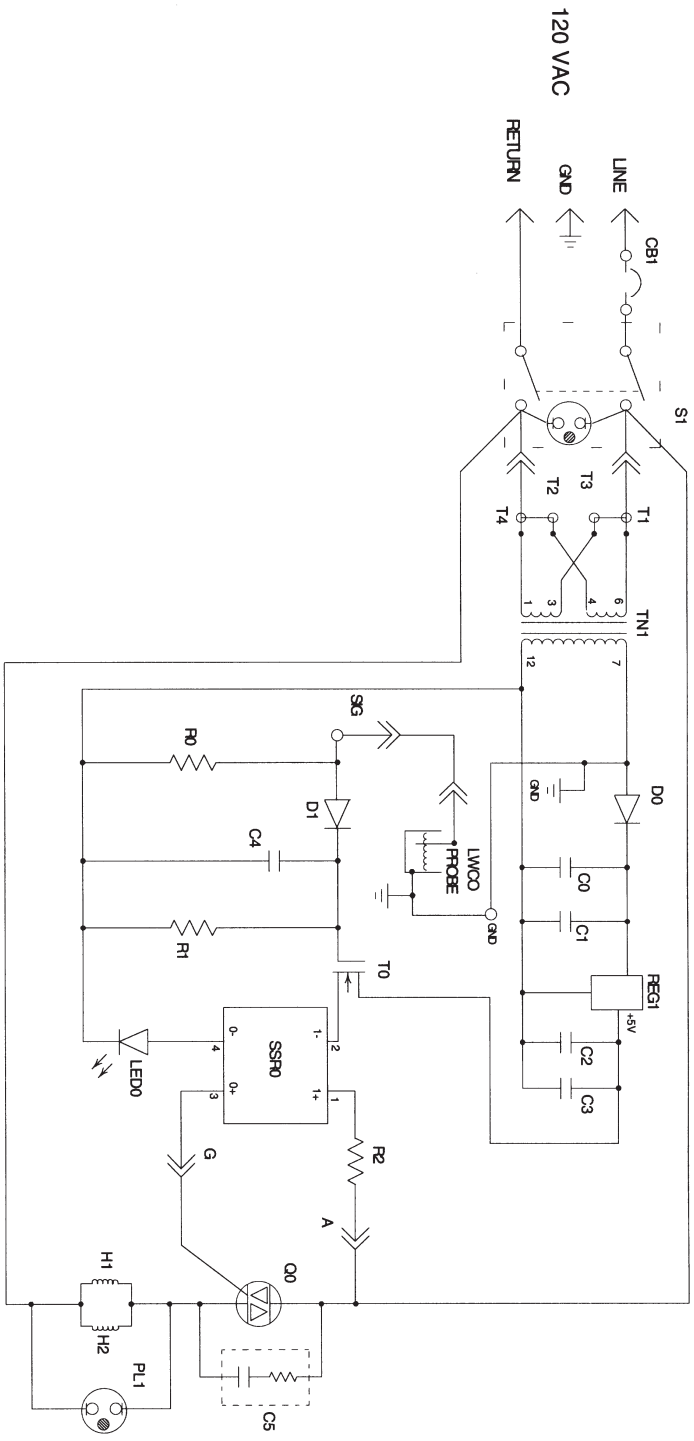


Heating Element Replacement

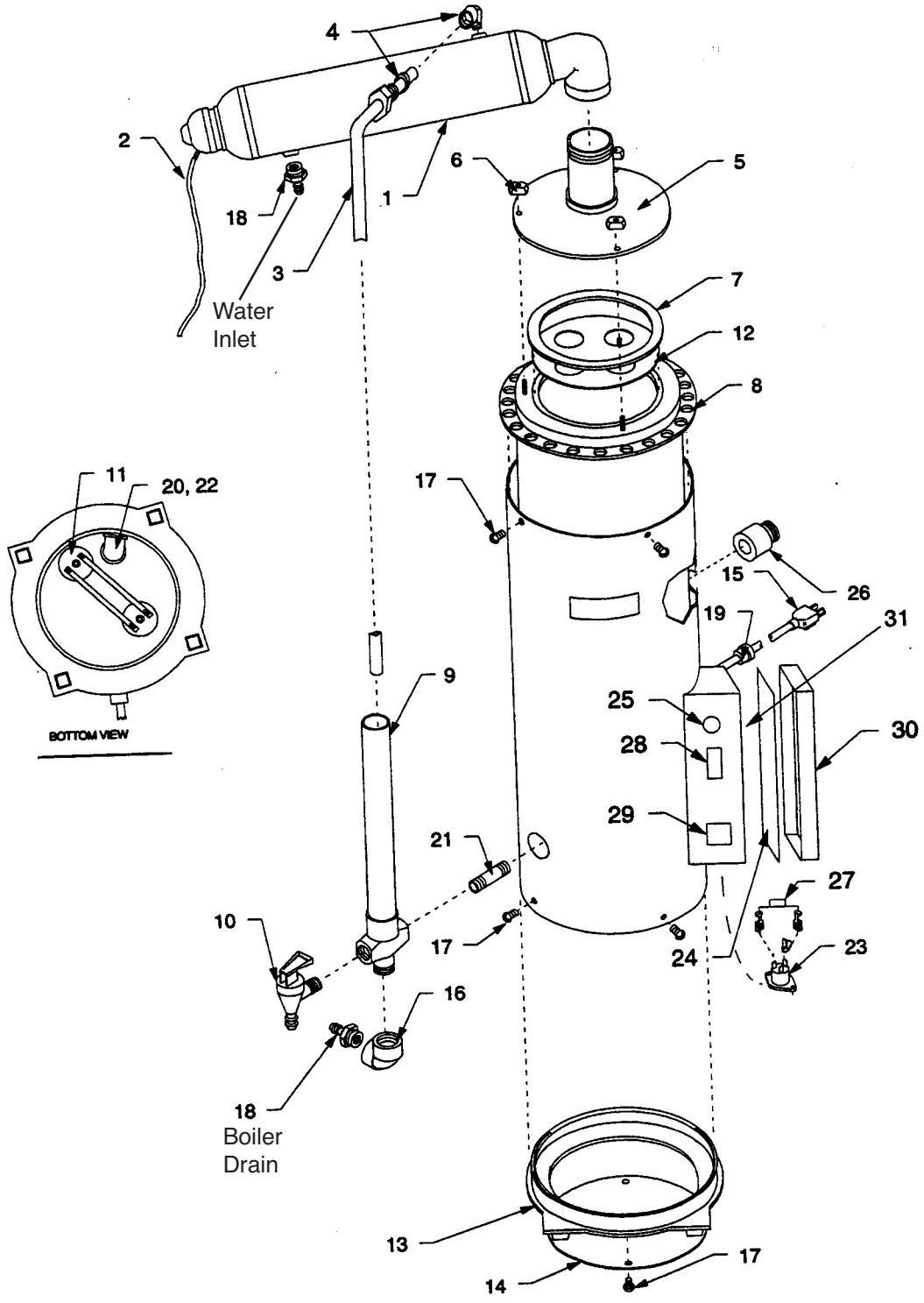
Troubleshooting Guide

Drop in purity.	Dirty still. Volatile impurities in feedwater.	Inspect evaporator for excess scale and clean as required. Test distillate CO_2, NH_3, etc. Reduce water flow rate to help eliminate volatiles from condensor.
Pyrogenic or organic contamination or disillate.	Dirty still. Leak in condensor. Bacteriological growth in distilled water.	Inspect evaporator for excess scale and clean as required. Test condensor for leaks and replace if required. Inspect the suspected parts. Clean with an Isopropyl alcohol solution if required (see “Biological Cleaning” under *Cleaning Methods*)
Drop in disillate capacity.	Excess scale on heating unit. Low voltage. Leak in drain valve. Damaged or inoperative heaters.	Inspect and clean as required. Check voltage. If less than 5% of the rated voltage, 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 water flowrate. Low water pressure. Excess scale in condenser.	Readjust throttling valve. Check water pressure. It should be at least 40 psi. Inspect condensor for scale.
Water blowing from condenser.	Condenser leak. Trapped distillate line.	Test condensor for leaks; replace or repair as required. Inspect distillate line for any restrictions or trapping.

Wiring Diagram



Exploded View



Replacement Parts Listing

Model Type: **A1007**
Product Name: **Electrically Heated Portable Still**
Series Number: **919**

Key	Part # (Qty)	Description
1	21058	Condenser
2	21100	Distillate delivery tube
3	21880	Water discharge tube, 10-5/8”
4	03702	Water discharge elbow
5	21195	Steam cover
6	03719	Wiring nut, brass, #10-24 UNC
7	06271	Gasket, evaporator steam cover
8	CS670X1A	Evaporator
9	21319	Constant Level Device
10	02096	Drain faucet
11	07031*	Heating element
12	21414	Dish baffle
13	20251	Ring, stand base
14	21894	Bottom plate
15	CR919X1	Cord set, 120 volt
16	03775	Elbow, brass, 1/2 NPT x 1/4 NPT
17	FSX191	Screw, phillips head, thread cutter, stainless steel, #8-32 x 3/8
18	03717	Hose nipple, brass, 1/2” x 1/4 NPT
19	SRX16	Strain relief, plastic
20	03411	Elbow, brass 3/8 NPT x 90°
21	03436	Nipple, brass, 3/8 NPT x 2”
22	03535	Nipple, close, brass, 3/8 NPT
23	SCX58	Triac
24	PC670X1A	Low Water Control Board
25	PLX97	Indicator Light
26	BR670X1A	Low Water Cut-off Probe Assembly
27	CA919X1A	Capacitor Assembly
28	SWX137	ON/OFF Switch
29	SWX129	Circuit Breaker
30	CV919X2A	Electrical Box Cover
31	CV919X1A	Heat Sink

**See the Heating Element Replacement illustration in the Maintenance and Servicing section.*

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 563-556-2241 or 800-553-0039.

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:

2555 Kerper Blvd., Dubuque, Iowa, 52004-0797
Phone: 563-556-2241 or 1-800-553-0039
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