



# LS SERIES

SOLVENT RECYCLING SYSTEM

## LS-15E, LS-15IIE, LS-55E, LS-55IIE, and LS-JVE Instruction Manual



*Version 5.0*  
*APRIL 2005*

# LS Series “Little Still” Instruction Manual

## Introduction

This LS Series solvent distillation system provides safe, on-site reclamation of contaminated solvents. Use of the Little Still can save money and conserve the environment by reducing or eliminating the disposal of these solvents.

Quality engineered and manufactured, the Little Still requires minimal operator involvement. When properly installed, operated, and maintained, this equipment can provide years of trouble-free service.

## Table of Contents

Safety Precautions	2
Installation Requirements and Instructions	3
Assembly	3-4
Electrical Requirements	5
Grounding Requirements	5
Electrical Connections	6
Condenser Cooling Water Requirements	7
Quick Cool Requirements	8
Conventional Tap Water Supply	9
Instrumentation and Controls	10
Start-up and Operation	14
Maintenance Schedule	18
Service and Troubleshooting	20
Appendix	27
Common Spare Parts	27
Electrical Schematics	29
Warranty	31

**For technical assistance call:  
800-888-3743 or 814-455-4478**

## Safety Precautions

### **▲WARNING:**

**READ THIS MANUAL COMPLETELY BEFORE INSTALLING AND OPERATING THIS EQUIPMENT. FAILURE TO FOLLOW THESE PRECAUTIONS CAN RESULT IN SERIOUS INJURY OR DEATH.**

- Installation location and area must conform to requirements set by National Electric Code Class 1, Division 1, Group D for hazardous locations.
- Follow National Fire Protection Association guidelines for control of static electricity (NFPA 77, *Recommended Practice on Static Electricity*). This applies to the installation area, equipment, personnel, and all transfer and receiving containers.
- Ventilate all vapors from the processing area and distillation equipment according to National Fire Protection Association guidelines (NFPA 91, *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying*).
- Follow the National Fire Protection Association recommendations for safe storage and use of flammable and combustible liquids (NFPA 30, *Flammable and Combustible Liquids Code*).
- Electrical wiring should be performed by a qualified electrician and must conform to National Electric Code Class 1, Division 1, Group D requirements for explosionproof equipment. Use only electricals labeled explosionproof (boxes, receptacles, hard conduit, etc.) for the installation and in the area.
- Obtain approval of the installation from your insurance and/or fire inspector.
- Remove any ignition sources from the area such as flames (cigarettes, torches, furnace), or sparks (grinders, non-explosionproof electrical switches and outlets, etc.).
- Verify proper water flow before operation to prevent accumulation of hazardous vapors.
- Wear proper eye and skin protection and an approved respirator when handling solvents and working with this equipment.
- Never process reactive solvents or materials such as gasoline, ethers, nitrocellulose, etc.
- Never work on or with this equipment while it is hot. Never open a hot Still. Allow a minimum of two hours or more cool-down time.

## Installation Requirements and Instructions

### PHYSICAL SPACE REQUIREMENTS:

- See *Safety Precautions* for important information regarding the installation area.
- The unit must be installed on a level concrete pad/floor and protected from the weather and freezing temperatures.
- Approximate overall dimensions/space requirements are listed below. Additional space is required around and above the equipment for loading and unloading, storage drums, access for maintenance, etc.

Equipment model(s)	Width	Depth	Height
LS-15E/15IIE	51 in. (1.3 m.)	27 in. (0.7 m.)	42 in. (1.1 m.)
LS-15E/15IIE + JetVac	108 in. (2.7 m.)	27 in. (0.7 m.)	48 in. (1.2 m.)
LS-55E/55IIE	75 in. (1.9 m.)	40 in. (1.0 m.)	60 in. (1.5 m.)
LS-55E/55IIE + JetVac	131 in. (3.3 m.)	40 in. (1.0 m.)	60 in. (1.5 m.)

**IMPORTANT:** If using a Little Cooler closed-loop cooling system with the Little Still, the Little Cooler must be located outside of the hazardous area. Refer to the *Little Cooler Instruction Manual* for further details.

**ASSEMBLY:** See *Parts Location Diagram* for additional information.

- Remove the unit from the shipping containers and inspect for damage. If damage is detected, save all packaging and immediately report any exterior or interior damage to the freight carrier.
- Remove all accessories from the inside of the Still (and the JetVac's cabinet, if applicable).
- Install the pressure relief valve assembly into the top of the Still's lid. Face the elbow towards the rear of the unit (away from the occupied area).
- Attach the supplied grounding cables/clamps to the ground block on the right side of the Still.
- Thread the discharge hose into the discharge pipe on the right side of the Still. Omit this step if installing a JetVac (see below).

**SPECIAL ASSEMBLY FOR LS-15IIE AND LS-55IIE:** "System II" Stills have additional features for automatic operation. Explanations of these features are discussed in the *Instrumentation and Controls* section.

- Install the vapor temperature gage into the control panel on the front of the Still (this gage is a delicate instrument and is packed separately to prevent damage). Attach the white wire to the positive (+) terminal and the red wire to the negative (-) terminal. Mount the gage using the two nuts provided.

**SPECIAL ASSEMBLY FOR INSTALLATIONS WITH A JETVAC:** When installing a JetVac attachment to a Little Still, the system is installed and assembled in a way that allows the system to operate either with or without the JetVac. Use Teflon pipe tape on all threaded connections to prevent vacuum leaks.

- Set the JetVac to the right of the Still, with approximately 24 inches of space between the units.
- Thread the discharge hose with sightglass into the JetVac's distillate port (on the left side, towards the front of the cabinet). Also thread the Y-strainer into the JetVac's vacuum port (on the left side, centered).
- Thread a male quick-connect onto the JetVac's metal braided hose female side. Thread a female quick-connect into the discharge of the Still (on the right side, centered in the cabinet). Thread the metal braided hose into the previously installed .
- Adjust the distance between the Still and JetVac until the metal braided hose quick-connects to the Still. Secure the Still and JetVac to the floor once positioned.
- Attach the other male quick-connect to the Still's discharge hose. This allows this discharge hose to attach directly to the Still (after disconnecting the metal braided hose) for processing without the JetVac.

### **INSTALLATION OF THE FLAME ARRESTER TO JETVAC:**

- The flame arrester is designed to prevent flame from entering the distillation system through the vent pipe.
- Proper installation and location of the flame arrester is essential to effective operation.
- Installation must be inspected and approved by your insurance and/or fire inspector.
- Connection is made at the vent on the backside of the JetVac unit (see pg. 8 for location).
- The flame arrester must be piped so the arrow on the flame arrester body points away from the distillation system and must be connected to the end of the vent pipe.
- Using FTI supplied piping, screw the ½" nipple into the coupling on the back of the JetVac, attached a 90° elbow to the nipple and a customer supplied connect a length of pipe to allow venting to a safe area (to the outside or other safe area as determined by your insurance or other qualified inspector). Make sure that the piping is properly supported and the flame arrester is attached to the end of the vent pipe. Do not use pipe larger than ½" diameter.
- If venting unit to the outside, a gooseneck can be installed on the end of the flame arrester to prevent rain from entering the vent piping through the flame arrester. The gooseneck must be ½" pipe, be installed at the end of the flame arrester and be no more that 5" long.

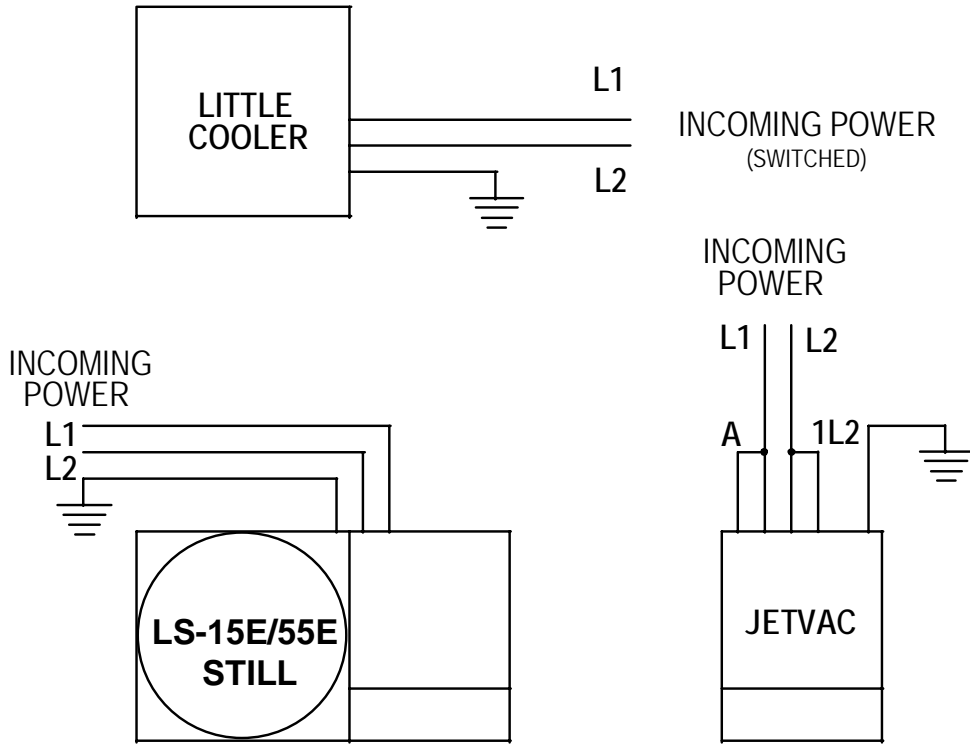
## ELECTRICAL REQUIREMENTS:

### ⚠CAUTION:

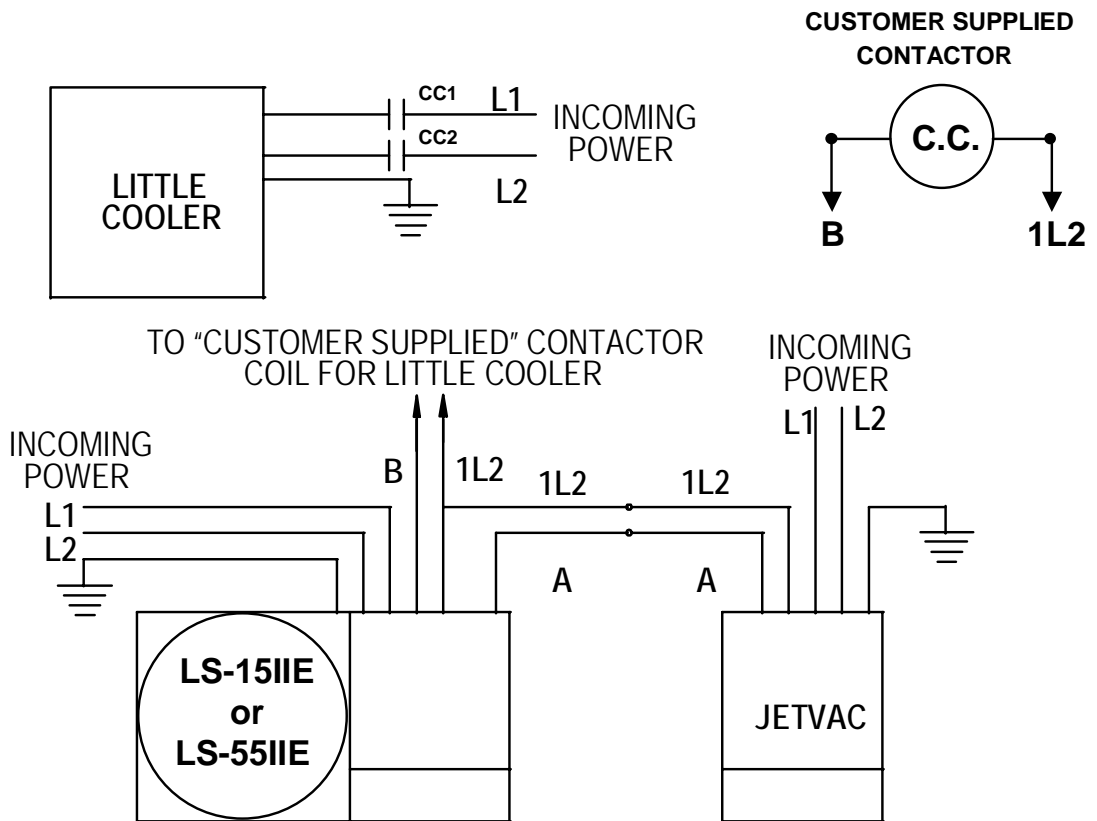
- A qualified electrician should perform electrical connections. Improper electrical wiring can result in damage to components.
- See *Safety Precautions* for important information regarding the electrical connections.
- Electrical power requirements to the control panel are 240 volts, 1 phase, 50/60 hertz from a protected circuit and earth ground. If the incoming voltage is 208 volts, processing time will increase. The equipment will not operate with incoming voltages (under load) less than 208 volts.
- Electrical connections are made on the rear of the Still. Attach a customer supplied explosionproof circuit box to the Still's electrical conduit.
- If a JetVac and/or Little Cooler are used with an LS-15E/55E still, they must be wired independent of the still and manually started/stopped.  
Note: Customer must supply a switch to control a Little Cooler in this case. See the Little Cooler Instruction Manual for more details.
- System II stills can be electrically connected for automatic operation of a JetVac and/or a Little Cooler, if using a Little Cooler, a 10-amp contactor (customer supplied) must be used. *See electrical connections below!*
- Make the connections per the diagrams following:

## GROUNDING REQUIREMENTS:

- See *Safety Precautions* for important information on static grounding.
- A positive earth ground must be provided to help avoid static ignition and must be attached to all equipment, filling and receiving containers, tanks, personnel, etc. All transfer devices such as piping, hoses, and pumps must also be grounded.
- Several ground lugs are provided on the right side of the Still and several grounding clamps are provided. USE THEM.



**Electrical connections for an LS-15E/55E**



**Electrical connections for a "System II"**

## CONDENSER COOLING WATER REQUIREMENTS:

### **▲WARNING:**

**Improper cooling water supply can result in the accumulation of hazardous vapors (refer to *Safety Precautions* for ventilation information).**

### **▲CAUTION:**

**Do not allow the cooling water supply to freeze. Damage to components can occur. Do not exceed 85 psi inlet water pressure.**

- Cooling water can be supplied via “tap water” or from a closed-loop cooling system (e.g., a Little Cooler or cooling tower).
- Cooling water supply and return connections are ½” NPT female pipe and are located on the rear of the Still and JetVac.
- Minimum cooling water flow required for the condenser is ½ gallon per minute for the LS-15E/15IIE, and 1 ½ gallons per minute for the LS-55E/55IIE. Minimum requirements increase by a ½ gallon a minute when using any still in conjunction with a JetVac.
- Cooling water temperature must be less than 80° F or 50° F below the lowest boiling point of the solvent being processed—whichever is lower (determine solvent boiling point under vacuum, if applicable).
- If using a “hard” water supply, treatment is required to prevent mineral deposit or scale accumulation within the vapor condensers and cooling coils of the cooling system. If water contains particulate, install an appropriate filter before the Still.

**IMPORTANT:** Follow these guidelines when using a Little Cooler closed-loop cooling system. Refer to the *Little Cooler Instruction Manual* for further information.

- The Little Cooler is designed only for condenser cooling. **Do not attach it to the quick-cool coil (use tap water for the quick-cool).**
- Depending on the physical distance, height, and type of plumbing used between the Still and the Little Cooler, it may be necessary to bypass the condenser water solenoid valve. Simply remove the hose from the inlet of the solenoid valve and connect it to the water inlet of the condenser (lower connection on the condenser).
- There will be a slight delay before the Still will turn on when using a Little Cooler (until the cooling water begins to circulate).

## QUICK COOL REQUIREMENTS

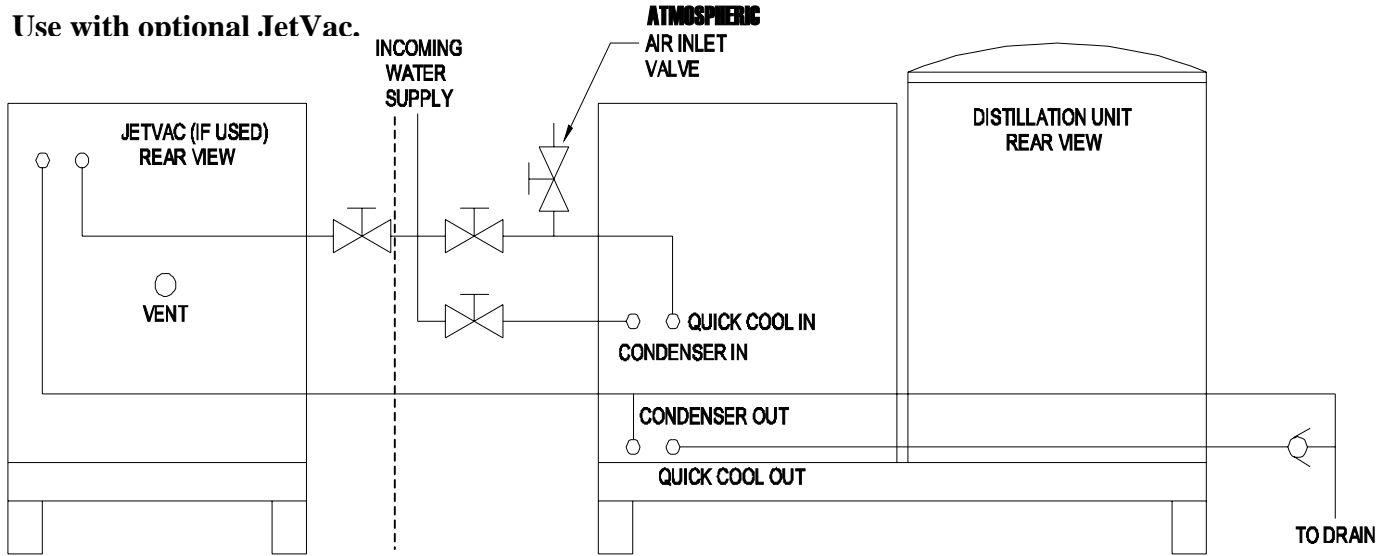
### **▲ NOTE:**

The Quick Cool is standard in the LS-15E/15IIE units. The main purpose of the quick cool coil is to rapidly cool down the distillation tank after a cycle is complete, which allows the user to run multiple shifts each day. **If the user does not intend to run multiple shifts, FTI recommends not plumbing the quick cool coil.**

- The Little Cooler is designed only for condenser cooling. **Do not attach it to the quick-cool coil (use tap water for the quick cool).**
- Plumb the quick cool coil with hard piping only.
- An air inlet valve must be installed to properly vent the system. This allows the line to be adequately drained after each use (see cooling diagram). Always completely drain the quick cool coil after each use or the next cycle will be prolonged and/or possible damage to the unit may occur.
- A check valve should be installed on the outlet side of the quick cool to prevent backpressure or back flow into the system from down steam (see cooling diagram), which will hinder the cycle time of the next cycle.
- Minimum cooling water flow required for the quick cool is 1-3 gallons per minute for the LS-15E/15IIE and 2-5 gallons per minute for the LS-55E/55IIE.

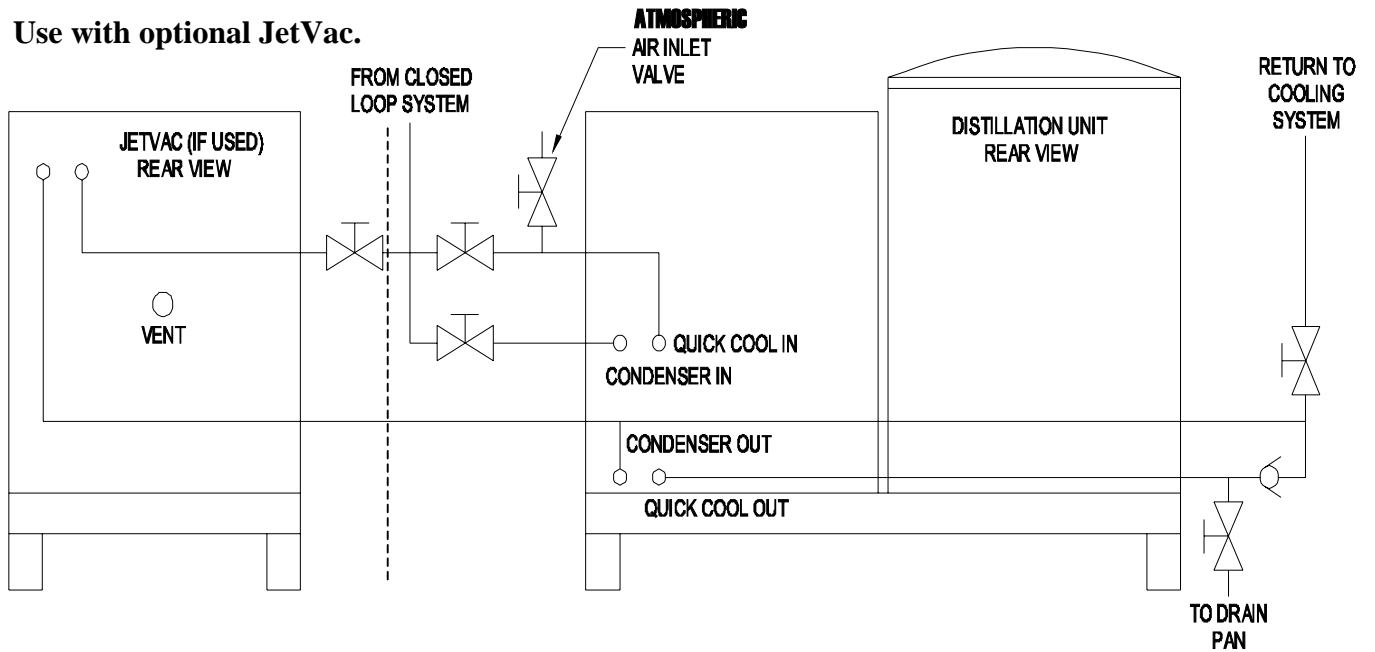
**CONVENTIONAL “TAP” WATER SUPPLY:**

Use with optional JetVac.





**CLOSED-LOOP COOLING WATER SUPPLY:** Refer to Little Cooler Instruction Manual when connecting a Little Cooler.

Use with optional JetVac.



**IMPORTANT:**

Quick cool must be drained completely before each run.  
An air inlet valve is required to drain quick-cool coil.

	MANUAL VALVE
	CHECK VALVE

## Instrumentation and Controls

### LS SERIES STILLS (ALL MODELS):

**STOP/START** - An illuminated push-button switch. Pull to activate the Still, push to terminate all functions. A green light indicates that the Still is operating within the processing cycle.

**IMPORTANT:** The STOP/START push-button switch must be left pushed in the STOP position for a minimum of five (5) seconds before pulling on. This allows the controls to electrically reset themselves. Failure to do so will prevent the heater from operating.

**CYCLE TEMP** - Controls the temperature that will be maintained in the area of the heater. Turn the dial to set the temperature at least 50° to 100°F above the boiling point of the solvent being processed.

**IMPORTANT:** Determine the solvent boiling point under vacuum, if applicable. See *Solvent Boiling Points Under Vacuum* for additional information.

### LS SERIES “SYSTEM II” STILLS:

**CYCLE TIMER** - This setting determines the total duration of the cycle. Turn the dial to the desired amount of time, depending on your particular solvent. If unsure as to the time required for your solvent, start at 8 hours, then observe the results. Adjust up or down, as necessary until the optimum time is determined.

**IMPORTANT:** The minimum setting (full counter-clockwise) allows the still to process for 10 minutes, then activates the cool-down mode for 1 hour. The maximum setting (full clockwise) allows the still to process for 16 hours, then activates the cool-down mode for 1 hour. The accuracy of the timer is approximately  $\pm 15\%$ .

**COOLING WATER** - White indicator light. When illuminated, this light indicates that the cooling water supply to the condenser is flowing at or above the proper rate. Adjust your incoming water flow until the light stays on without flickering. If the white light does not illuminate, this may indicate that the water flow to the unit is inadequate, or the condenser cooling system or flow switch requires maintenance.

**HEAT** - Amber indicator light. This light indicates the heater element is ON. During normal operation, this light will remain illuminated for approximately the first hour of the process, then will cycle ON and OFF to indicate that the heating system is cycling to maintain the temperature set on the Cycle Temp dial.

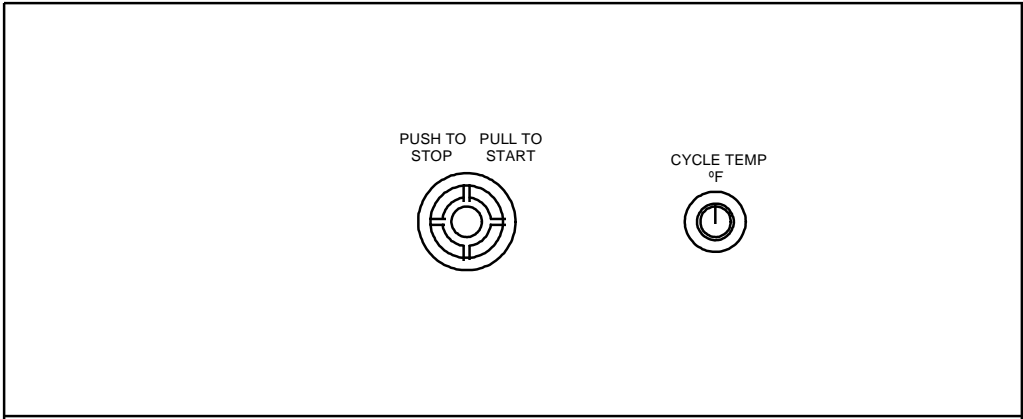
**VAPOR TEMP** - Indicates the temperature of the solvent vapor before being condensed into liquid. This gage is for informational purposes only, and controls no functions.

## **JETVAC ATTACHMENT:**

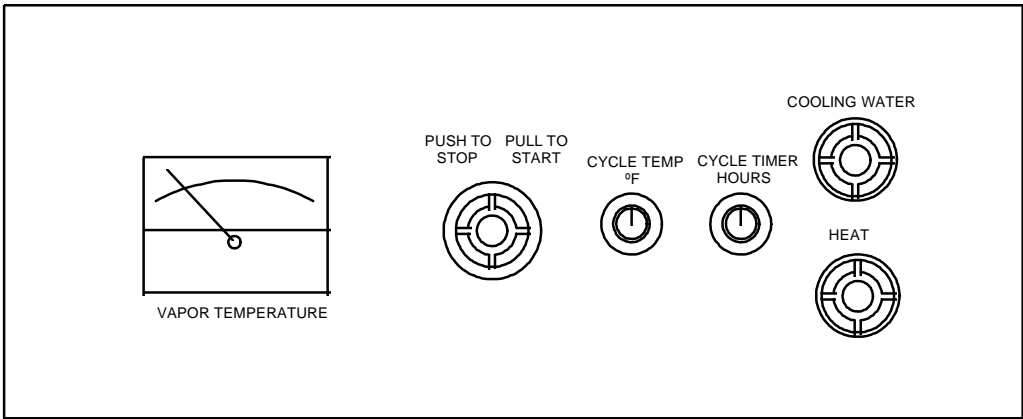
**STOP/START** - An illuminated push-button switch. Pull to ready the JetVac's operation, push to terminate all JetVac functions. A green light indicates that the JetVac is operating within the processing cycle.

**IMPORTANT:** The STOP/START push-button switch should remain ON (pulled) when wired for automatic operation. In this mode, the Still will automatically turn on and off the JetVac depending on the status of the Still's operation. If vacuum operation is not required for a particular process, simply push STOP/START to the STOP position.

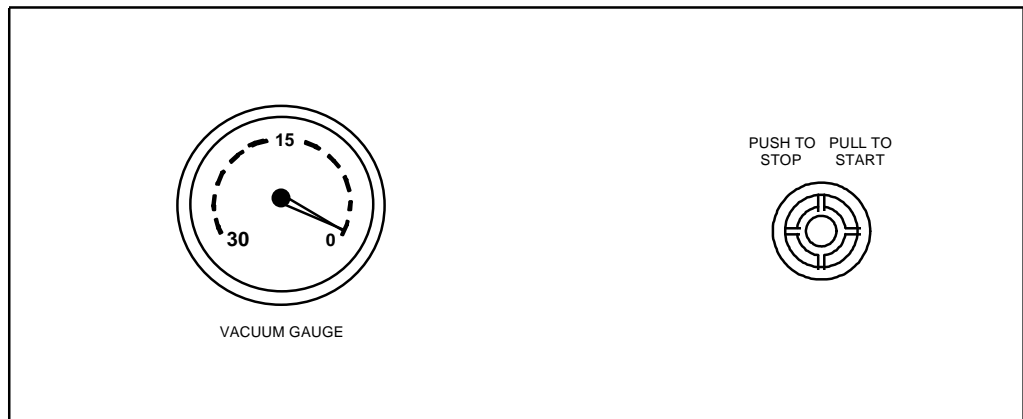
**VACUUM GAGE** - A gage that indicates the level of vacuum, measured in inches of mercury being generated by the JetVac measured in inches of mercury (0" to -30" Hg.). An increase in vacuum level decreases the boiling point of the solvent being processed. The vacuum level can be adjusted turning the nuts on the vac adjust valve located inside of the JetVac's cabinet (see parts location diagram).



### LS-15E/55E CONTROLS

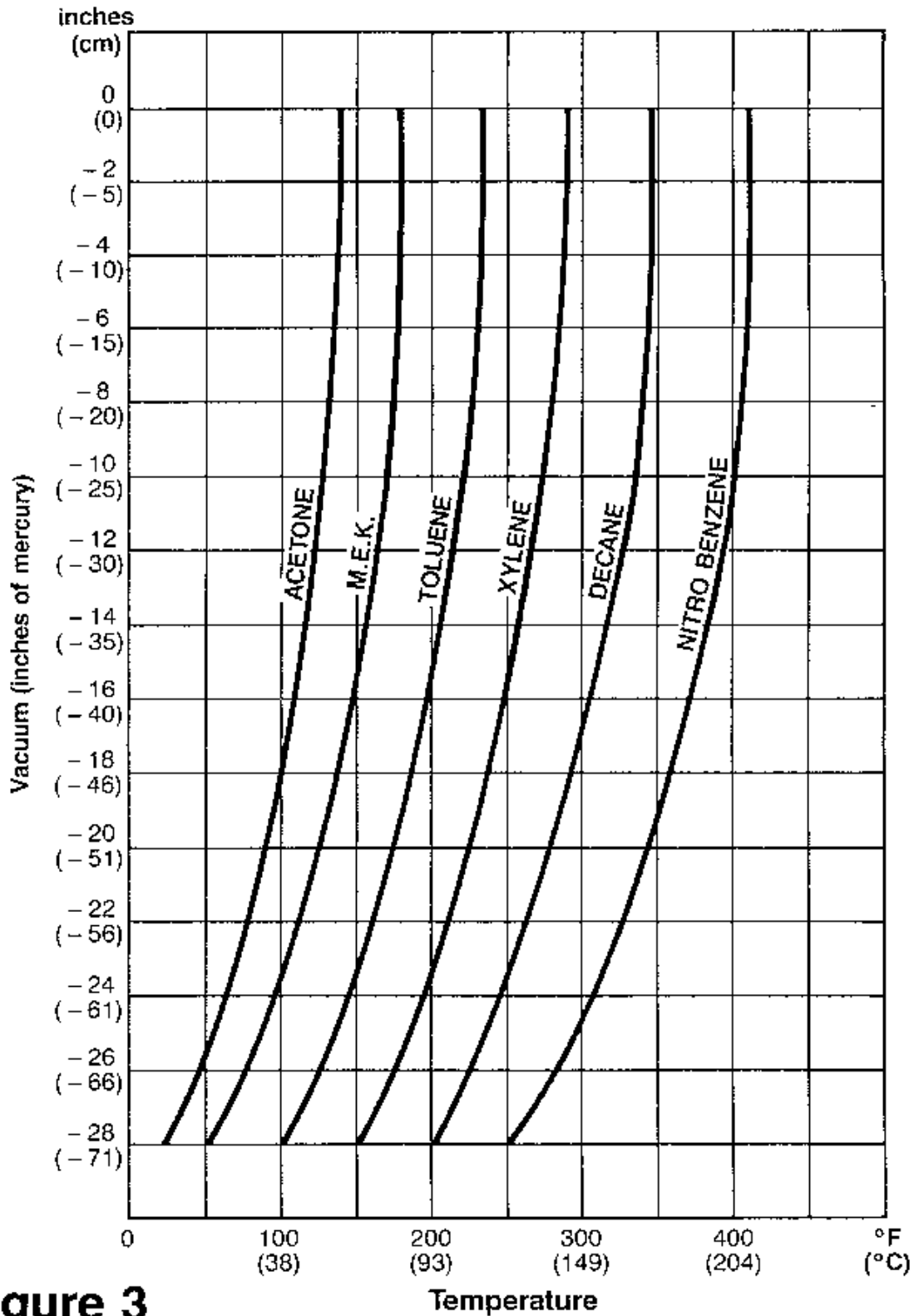


### LS-15IIE/55IIE CONTROLS



### JETVAC CONTROLS

# Solvent boiling points under vacuum



**Figure 3**

## Start-up and Operation

The LS Series equipment requires minimal operator involvement. Once set up and started, the unit can operate virtually unattended until the process is complete. See *Safety Precautions* before operating this unit. Explanation of each control and setting can be found in *Instrumentation and Controls*.

### ▲CAUTION:

**Only process neutral waste solvents with a pH between 6 and 9. Solvents outside of this safe pH range can cause damage to your LS Series equipment that is not covered under its warranty. Some solvents can become acidic or basic once heated. Periodically test the dirty solvent as well as the distillate and residue to verify a safe pH. If your pH is not in the “safe zone,” it must be neutralized. Consult your solvent supplier for recommendations on testing the pH and pH correction.**

### LS-15E/55E MODELS:

1. Open the lid and remove any residues from a previous run. Make sure that the inside of the boiling chamber is clean and free of debris.

### ▲CAUTION:

**When cleaning, use only plastic or other non-metallic utensils to avoid scratching the boiling chamber when scraping out residues. Scratching the Teflon® coating results in permanent damage and voids the warranty.**

2. Install a Stilbag or a Stilpan (if used, see *Installing a Stilbag*). If using a JetVac attachment, prepare the JetVac for operation (see *Start-up and Operation: JetVac*).
3. Fill the boiling chamber (ground all transfer equipment, containers, and personnel, see *Safety Precautions*). Do not overfill. Close the lid, make sure the lid is centered on the gasket, and secure the lid clamps. Place a clean, grounded receiving drum under the discharge hose of the Still (or JetVac, if applicable).
4. Verify that the quick-cool water supply is off and that all cooling water is drained from the quick-cool coil by opening the drain valve and breather valve.
5. Turn on the condenser's water supply. If using a Little Cooler, prepare the Little Cooler for operation (refer to the *Little Cooler Instruction Manual*).
6. Set the CYCLE TEMP dial to the desired temperature.
7. Pull the Still's STOP/START switch to the START position.
8. Adjust the condenser's water supply until the safety flow switch is satisfied (until the green light on the STOP/START button stays on).
9. Allow system to operate until solvent is no longer processing or until desired time has elapsed. Push the STOP/START switch to the STOP position. Allow the condenser cooling water to run for an additional hour (to condense any remaining vapors) before turning the condenser water off.
10. If using the quick-cool feature, turn on the quick-cool water supply for one hour, or until the Still has reached the desired temperature (100°F or less), turn water supply off and drain quick-cool before starting next cycle.

## LS-15IIE/55IIE MODELS:

1. Open the lid and remove any residues from a previous run. Make sure that the inside of the boiling chamber is clean and free of debris.

### **▲ CAUTION:**

**When cleaning, use only plastic or other non-metallic utensils to avoid scratching the boiling chamber when scraping out residues. Scratching the Teflon<sup>®</sup> coating results in permanent damage and voids the warranty.**

2. Install a Stilbag or a Stilpan (if used, see *Installing a Stilbag*). If using a JetVac attachment, prepare the JetVac for operation (see *Start-up and Operation: JetVac*).
3. Fill the boiling chamber (ground all transfer equipment, containers, and personnel, see *Safety Precautions*). Do not overfill. Close the lid, make sure the lid is centered on the gasket, and secure the lid clamps. Place a clean, grounded receiving drum under the discharge hose of the Still (or JetVac, if applicable).
4. Verify that the quick-cool water supply is off, and that all cooling water is drained from the quick-cool coil by opening the drain valve and breather valve.
5. Verify that the condenser water supply is on to the Still. If using a Little Cooler, prepare the Little Cooler for operation (refer to the *Little Cooler Instruction Manual*).
6. Set the CYCLE TEMP dial to the desired temperature.
7. Set the CYCLE TIME dial to the desired length of time.
8. Pull the Still's STOP/START switch to the START position. If the switch is pulled out from a previous run, push the switch in, wait 5 seconds, then pull the switch to the START position.
9. Adjust the condenser's water supply until the safety flow switch is satisfied (until the white light stays on).
10. Allow system to operate until the desired time has elapsed, or the solvent has finished processing (a drop in temperature on the VAPOR TEMP gage indicates near completion of the process). The green light on the STOP/START switch and the amber light will go out indicating the system is in cool-down mode (this allows the condenser cooling water to run for an additional hour (to condense any remaining vapors) before automatically turning the condenser water off).

### **▲ WARNING:**

**Never push the STOP/START switch to the STOP position to terminate a process early. Instead, set the CYCLE TIMER to the 10 MIN position (full counter-clockwise). This will automatically terminate the cycle in ten minutes, and allows the cool-down mode to engage to help prevent the release of hazardous vapors.**

11. If using the quick-cool feature, turn on the quick-cool water supply for one hour, or until the Still has reached the desired temperature (100°F or less), turn water supply off and drain quick-cool before starting next cycle.
12. Once all lights have gone out, push the STOP/START switch to the STOP position.

## JETVAC ATTACHMENT:

### **▲CAUTION:**

**Do not process solvents with boiling points below 200° F with the JetVac. Release of hazardous vapors and damage to the equipment may result.**

1. Lift the top panel of the JetVac's cabinet and prop it open with the supplied prop bar (attached under the top panel). If changing the solvent or cleaning the reservoir, the "old" solvent can be drained through a ball-valve located on the right side of the JetVac's cabinet.
2. Locate the pump reservoir, unscrew the two wing-nuts, lift the reservoir lid, and set the lid to the side.
3. Fill the pump reservoir with clean solvent (the same type of solvent that is being processed). Ground all transfer equipment, containers, and personnel (see *Safety Precautions*). Replace and secure the pump reservoir's lid.
4. Start the system by turning on the Still (and pulling the STOP/START switch of the JetVac to the START position). Allow the JetVac to generate vacuum (as indicated on the vacuum gage). When the vacuum level no longer rises, use the vacuum adjust valve to adjust to desired vacuum level, then close the top panel.
5. **IMPORTANT:** On new installations, it may be necessary to tape the Still's lid with the supplied Teflon<sup>®</sup> tape for the first few runs, or until the Still's lid gasket compresses and seals properly.
6. At the end of the process, the JetVac will shut down automatically (when wired in the automatic mode). In automatic mode, the STOP/START switch can remain in the START position, and operation will be controlled by the Still. When the JetVac stops, the vacuum will be relieved through a vacuum relief solenoid (atmospheric vent).

**NOTE:** For processing atmospherically (without vacuum) with a JetVac attached to the Still, simply push the JetVac's STOP/START switch to the STOP position, disconnect the metal braided hose at the Still with the quick-connector, connect the Still's red discharge hose to the discharge of the Still, and place the grounded receiving drum under the Still's discharge hose. Follow the operation instructions for the Still.

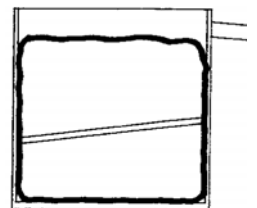
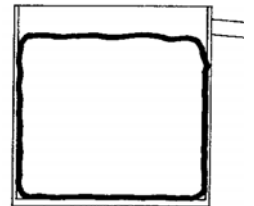
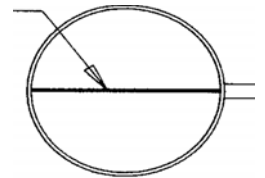
## INSTALLING A STILBAG:

### **▲WARNING**

Proper installation of a Stilbag is critical. Improper installation can result in dangerous pressurization of the boiling chamber. Never disable the Stilbag venting system.

1. Unroll the Stilbag and expand it open. Gather the top opening of the Stilbag, trapping air inside to form a “ball”.
2. Insert the Stilbag into the boiling chamber, taking care to line the bottom seam of the Stilbag from side to side and in line with the Stilbag vent (located on the inside right side of the boiling chamber). If using a Liftrack, place it into the boiling chamber before inserting the Stilbag.
3. Flatten the Stilbag along the bottom and sides to help prevent air pockets under the Stilbag.
4. Install the Stilbag retaining ring. Compress the ring by placing your thumb and finger into the loops and squeezing them together. Place the ring inside the Stilbag and allow it to expand into the groove on the inside of the boiling chamber, holding the Stilbag in place. Position the Stilbag retaining ring so that the Stilbag vent is between the opening of the retaining ring.
5. Re-adjust the Stilbag, if needed, in order to get a close fit to the boiling chamber and to further eliminate air pockets from under the Stilbag.

**IMPORTANT:** A Stilbag is designed for a single use only. The bag can become brittle and burst if used for more than one cycle. Some applications require the use of high temperature Stilbags. Other applications may be incompatible with the Stilbags material and require the use of a Stilpan.



## ~ Maintenance Schedule ~

### ▲ CAUTION:

Always wear eye protection, protective clothing, gloves and an approved respirator when working on or with this unit. Never work on or with this equipment while it is hot. Never open a hot Still. Allow a minimum of two hours or more cool-down time.

### EACH USE:

**CLEAN THE BOILING CHAMBER** - Remove any waste residues from the boiling chamber and Stilbag venting system. If necessary, gently scrape the sides with an approved scraper (see *Common Spare Parts*). Also keep the underside of the lid's lip clean for proper sealing, as well as clearing the opening to the pressure relief valve.

### ▲ CAUTION:

**When cleaning, use only plastic or other non-metallic utensils to avoid scratching the boiling chamber when scraping out residues. Scratching the Teflon® coating results in permanent damage and voids the warranty.**

### WEEKLY:

- **VERIFY FLOW SWITCH** - Test the operation of the cooling water flow switch. Start the system, and reduce the water flow to the condenser to verify that the indicator light goes out (the JetVac will also shut off, if used). If the flowswitch operates incorrectly, verify proper condenser water flow, and clean the flowswitch according to *Maintenance: Semi-annually*. If this does not solve the problem, replace the flow switch.

### ▲ WARNING:

**Do not attempt to operate the Still when the cooling water flow switch is not operating correctly. Doing so can result in the accumulation of hazardous vapors.**

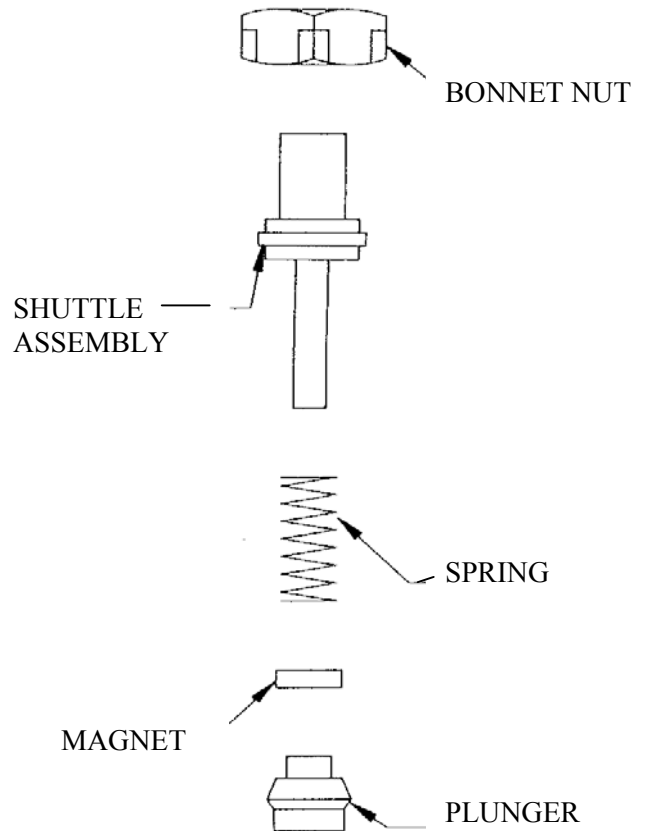
- **CHECK GROUNDING CABLES** - Inspect all grounding cables and clamps for deterioration or damage. Replace any suspect parts.
- **INSPECT GASKETS** - Check the lid gasket on the boiling chamber and the JetVac reservoir for debris, cracks, voids, etc. Replace any damaged gaskets.

**IMPORTANT** - Do not attempt to remove the Still gasket for inspection. A used gasket is compressed and will not easily re-install onto the boiling chamber.

## SEMI-ANNUALLY OR AS REQUIRED:

- **ADJUST LID CLAMPS** - Make sure that all of the Still's lid clamps hold tightly. Adjust any loose clamps, and replace clamps that appear weak.
- **CLEAN JETVAC PUMP RESERVOIR** - If using a JetVac attachment, drain the pump reservoir and clean and remove all dirt and debris. Inspect parts for corrosion, and replace any suspect parts.
- **CLEAN Y-STRAINERS** - The Still's Y-strainer is located inside of its cabinet. The JetVac's Y-strainer is located on its left side, in line with the metal braided hose. Remove the screen and clean out the debris. If mineral deposit or scale is detected, also remove and clean inside the condenser cooling water jacket as well.
- **CLEAN THE CONDENSER** - Remove the condenser and inspect it for scale or residue on both the water and solvent side. Clean or replace if necessary.
- **LID LIFT BAR** - On LS-55E/55IIE, units grease the lid's lift bar (located at the rear of the unit) using the two supplied grease fittings.
- **CLEAN THE FLOW SWITCH** - The flow switch is located inside of the Still's cabinet.

1. Disassemble the flow switch by loosening the large bonnet nut and pulling the body of the flow switch free.
2. Clean the shuttle assembly, spring, magnet, plunger, and body of the flow switch.
3. Place the spring, magnet, and plunger onto the shuttle assembly, then gently push the body onto the shuttle assembly. Take care not to damage the shuttle's O-ring.
4. Test the operation of the flow switch (see *Maintenance: Weekly*).



## Service and Troubleshooting

In the event the Little Still does not appear to operate correctly, use the following tips to diagnose common problems. If these suggestions do not pinpoint the cause of your problem, contact FTI's toll-free "Tech Service Hotline" between the hours of 8 a.m. to 5 p.m. EST.

### Tech Service Hotline - 800-888-3743

#### **▲WARNING:**

Never electrically trouble shoot or operate this equipment in the hazardous area when electrical components are exposed (e.g., the explosion-proof control box is opened). Doing so can provide an ignition source for hazardous vapors, resulting in serious injury or death. Any electrical tests should be performed by a qualified electrician.

#### **▲CAUTION:**

Always wear eye protection, protective clothing, gloves and an approved respirator when working on or with this unit. Never work on or with this equipment while it is hot. Never open a hot Still. Allow a minimum of two hours or more cool-down time.

### LS SERIES STILLS: BASIC TROUBLESHOOTING TIPS

**PROBLEM:** Still appears to be operating, but nothing is processing.

#### **POSSIBLE CAUSES:**

- Turn up the cycle temperature to a higher temperature.
- Solvent's boiling point is too high. Use a JetVac attachment for solvents with boiling points between 300°F and 500°F.
- Cooling water left in quick-cool coil. Verify that the water supply to the quick-cool coil is off, and all water has been evacuated from the coil.
- Residue build-up. Clean any accumulation of residues from the bottom of the boiling chamber. A build-up of material will act as an insulator and make it difficult to transfer heat into the solvent.
- Too high of solids in waste solvent. Process the solvent when it is less contaminated. Solids level should not exceed 20% for best results.

**PROBLEM:** Odor of solvent vapors around the LS units.

#### **POSSIBLE CAUSES:**

- Normal occurrence. During the process, very small amounts of vapors can escape from the lid and from the receiving drum. Proper ventilation in the area should evacuate these vapors.
- Lid ajar. Verify that the gasket for the lid of the Still and/or JetVac pump reservoir is not damaged and the lid is properly seated.
- Condenser is plugged with mineral deposits or scale. Replace the condenser; treat the cooling water supply to prevent re-occurrence.
- Cooling water temperature too high. Cooling water temperature must be less than 80° F or 50° F below the lowest boiling point of the solvent being processed—whichever is lower (determine solvent boiling point under vacuum, if applicable).
- Faulty flow switch not detecting low water flow. Test the operation of the flow switch and service if necessary.
- Pressure relief valve is activating. Check for obstructions.

## **LS SERIES STILLS: BASIC TROUBLESHOOTING TIPS CONTINUED...**

**PROBLEM:** Stilbags break or melt during a cycle or while lifting out residue.

**POSSIBLE CAUSES:**

- Temperature too hot. The standard temp Stilbags will become brittle if overheated. Try the hi-temp Stilbags.
- Stilbag used too long. The Stilbag is designed for a maximum of up to 16 hours and for a single use only.
- Chemical incompatibility. The Stilbags are made of “Nylon 6” and “Nylon 66.” Check compatibility with your solvent supplier.
- Acid or caustic attack. The Stilbags are designed for use with solvents/residues with a pH between 6 and 9.
- Residue too heavy. The dirty/waste solvent should contain no more than 20% solids.

**PROBLEM:** Unit(s) will not turn on (no lights come on).

**POSSIBLE CAUSES:**

- No power to the Still. Verify the electrical power/connections to the Still.
- Blown fuse inside the Still’s control box (System II units only). Replace fuse. This would indicate an electrical power surge or other problem with the circuitry (consult factory).
- Flow switch not engaged (LS-15E and LS-55E only). Verify proper condenser water supply. Clean or service the flow switch.
- Controls have not reset (LS-15E and LS-55E only). Push the STOP/START switch to the STOP position for at least five (5) seconds before pulling the switch back out.

**PROBLEM:** Only the green light comes on (System II only). Still not heating.

**POSSIBLE CAUSES:**

- Flowswitch not engaged. Verify proper condenser water supply. Clean or service the flowswitch.

**PROBLEM:** Only the white light comes on when the STOP/START switch is pulled (System II only).

**POSSIBLE CAUSES:**

- Controls have not reset. Push the STOP/START switch to the STOP position for at least five (5) seconds before pulling the switch back out.

## **JETVAC ATTACHMENT TROUBLESHOOTING TIPS:**

**PROBLEM:** JetVac will not turn on.

### **POSSIBLE CAUSES:**

- JetVac is improperly wired. Verify the electrical power and connections to the JetVac and Still. When wired for automatic mode, the Still must be operating for the JetVac to operate.
- Improper cooling water flow to the condenser. If the flow switch in the Still is not engaged, the JetVac will not operate (when wired in automatic mode).

**PROBLEM:** Low vacuum readings.

### **POSSIBLE CAUSES:**

1. Air Leak – Disconnect the vacuum from the still. Place a hand over the end of the stainless steel hose and turn on the vacuum. If you get good vacuum, check for:
  - Leaks around the lid of the Still. Check the Still's lid gasket, and/or tape the lid to seal.
  - Leaks at the quick-connector. Inspect the gasket inside of the female quick-connector on the metal braided hose. Replace the gasket if damaged.
  - Loose fitting on the unit.
2. If vacuum is still low, check:
  - The pumps reservoir for low liquid level. Top off the liquid level in the JetVac's pump reservoir with clean solvent.
3. Debris carried over during the distillation cycle can block:
  - The Y-strainer, check valve, aspirator, or pump causing a loss of vacuum. Look for signs of debris in the pump reservoir. If debris is found, the aspirator may be clogged. Suction 4 - 5 gallons of clean solvent through the stainless steel hose.
4. An O-ring failure on the vacuum adjustment valve.
5. Chemical attack of the internals in the vacuum relief solenoid.
6. Loose compression fittings in the system.

## Advanced Troubleshooting Tips: LS-15E / LS-55E

### **⚠ WARNING:**

Qualified electrical personnel must perform all electrical tests and work. There is a potential for sparks when the electrical control box is open. The unit must be removed to a location outside the hazardous area before any electrical work can be done on live circuits.

### **PROBLEM: No heat. Green light not on.**

1. Verify that cooling water is properly supplied to the condenser. The unit requires at least 1-1/2 gallons per minute for the LS-55 and 1/2 gallon per minute for the LS-15. Make sure this volume of water is passing through the unit. If the water supply is not adequate the unit will not turn on.
2. Verify that the flow switch (FLS) is performing properly. Check for voltage between wire 1L2 (on the on/off switch) and wire 5 on pin 15 on the temp board. If no voltage exists, turn off your water supply and service the flow switch (see pg. 17). It is located down low inside the front panel of the still (it is brass colored and labeled "Gems" on it).
3. If after cleaning the flow switch (and turning the water supply back on) the voltage still is not present between wire 1L2 and wire 5, temporarily bypass the flow switch by connecting a jumper wire between pin 21 and pin 15 (on the temp board) to see if the heater contactor engages. If the heater contactor engages with the flow switch bypassed, replace the flow switch.

### **PROBLEM: No heat. Green light is on.**

The thermisters are metal rods that are inserted into the heater casting and wired to the temp board. Their job is to tell the heater when to cycle on and off, using a temperature / resistance relationship. Follow these instructions to test the thermisters (1 TC and 2TC) to verify proper specs.

#### **1. Disconnect the power to the unit.**

2. Check each thermister individually by disconnecting their wires (22 gauge black and white twisted pairs) from the temp board. One set is on pins 1 and 3, and the other set is on pins 2 and 4. Measure the resistance between the black and white wires. The following values should be obtained;

Ambient Temperatures (Degrees)	Resistance (kilo - ohms)
<u>60°F (16°C).</u>	<u>13.6 kΩ</u>
<u>77°F (25 °C).</u>	<u>90 kΩ</u>
<u>100°F (38° C)</u>	<u>52.5 kΩ</u>
<u>240°F (115°C)</u>	<u>3.9 kΩ</u>

If one or both of the readings do not fall within this range, the thermister(s) should be replaced. If they both fall within acceptable ranges, continue with the troubleshooting tips.

### **Advanced Troubleshooting Tips: LS-15E / LS-55E continued...**

3. Verify that the K2 relay on the temp board is closing (when unit is turned on) by measuring for voltage between wire IL2 (on the on/off switch) and wire 6 on pin 14 (on temp board). If no voltage is present, K2 may be faulty and the temp board must be replaced. If 240V is present, K2 has closed and it is alright to continue with troubleshooting tips.
4. Verify that KI relay on the temp board is closing (when the unit is turned on) by measuring for voltage between wire IL2 (on the on/off switch) and wire 7 on pin 11 (on temp board). If no voltage is present, and all previous tests check out, K I may be faulty and the temp board must be replaced. If 240V is present, KI is closed and the temp board is alright. If the temp board checks out, call the factory for further information.
5. This set of troubleshooting tips will verify a faulty temp board. Most heating problems lie within the water supply or the flow switch. It is common for scale and other debris to build up in this switch causing the symptoms you are experiencing. A Y-strainer should be used on the incoming water supply to help prevent problems.

**If you have any questions, please contact our Technical Service Hotline at 800-888-3743.**

## Advanced Troubleshooting Tips: LS15IIE / LS55IIE

**▲ Warning:** Qualified electrical personnel must perform all electrical tests/work. There is a potential for sparks when the electrical control box is open. The unit must be removed to a location outside the hazardous area before any electrical work can be done on live circuits.

### **PROBLEM:** Only green light comes on / still

1. With the on/off switch in the ON position (pulled out), opening the solenoid valve (sol-1) controls the water flow. If 240 V.A.C. is present at the solenoid valve and the water is still not flowing, the solenoid valve is defective and should be cleaned or replaced. If voltage is not present, check fuses FUI and FU2. If the fuses are good, verify power from the power supply. There should be 24 V.D.C. between wires #7 (pos.) and #11 (neg.). If there is not, then replace the power supply. If the power supply checks out alright and the solenoid valve still does not power up, timer 2 (TIM-2) is probably defective and should be replaced.
2. Verify that the cooling water is properly supplied to the condenser. The units require at least 1/2 gallon per minute for the LS-15IIE and 1-1/2 gallons per minute for the LS-55IIE. Make sure this amount of water is passing through the unit. If the water supply is inadequate, the unit will not turn on.
3. Verify that the flow switch IFLS is performing properly. Check for 24 V.D.C. between wire # 11 and wire # 8 on pin 15 on the temp board. If no voltage exists, turn off your water supply and service the flow switch (see pg. 7). It is located down low inside the front panel of the still (it is brass colored and labeled "Gems" on it).
4. If after cleaning the flow switch (and turning the water supply back on) the voltage is still not present between wire #11 and wire #8, temporarily bypass the flow switch by connecting a jumper wire between pin 21 and pin 15 (on the temp board) to see if the heater contactor engages. If the heater contactor engages with the flow switch bypassed, replace the flow switch.

### **PROBLEM:** Green light on / White light on / Amber light is **not** on

#### **5. Disconnect the power to the unit.**

Check each thermister individually by disconnecting their wires (22 gauge black and white twisted pairs) from the temp board. One set is on pins 1 and 3, and the other set is on pins 2 and 4. Measure the resistance between the black and white wires. The following values should be obtained:

Ambient Temperature ( <u>degrees</u> )	Resistance ( <u>kilo-ohms</u> )
<u>60°F (16° C)</u>	<u>136 kΩ</u>
<u>77°F (25°C)</u>	<u>90 kΩ</u>
<u>100°F (38°C)</u>	<u>52.5 kΩ</u>
<u>240°F (115°C)</u>	<u>3.9kΩ</u>

If one or both of the readings do not fall within this range, the thermister(s) should be replaced.

## Advanced Troubleshooting Tips: LS 15IIE / LS55IIE CONTINUED...

6. Verify that power is getting to the temp board. There should be 24 V.D.C. between wires # 3 (pos.) pin 21 on the temp board and wire # 11 (neg.) pin 23 on the temp board. If this is not the case, than the cycle timer could be defective. The timer can be bypassed by jumping a wire between wire #7 pin 2 on TIM-I and wire #3 pin 1 on TIM-I. If this works, then replace the cycle timer.
7. Verify that K2 contactor on the temp board is closing (when the unit is turned on) by measuring for voltage between wire #11 and wire #9 on pin 14 (temp board). If no voltage is present, K2 may be faulty and the temp board must be replaced. If 24 V.D.C. is present, K2 is closed and alright.
8. Verify that K1 contactor on the temp board is closing (when the unit is turned on) by measuring for voltage between wire #11 and wire #10 on pin 11 on the temp board. If no voltage is present, and all previous tests check out, than K1 may be faulty and the temp board must be replaced. If 24 V.D.C. is present and K1 is closed, then the temp board is alright. If the temp board checks out, call the factory for further information.
9. This set of troubleshooting tips will help verify a faulty temp board. Most problems lie within the water supply system or the flow switch. It is common for scale and other debris to build up in this switch, causing the symptoms you are experiencing. A Y-strainer should be used on the incoming water supply to help prevent these problems.

## Appendix

### SPARE PARTS - MECHANICAL:

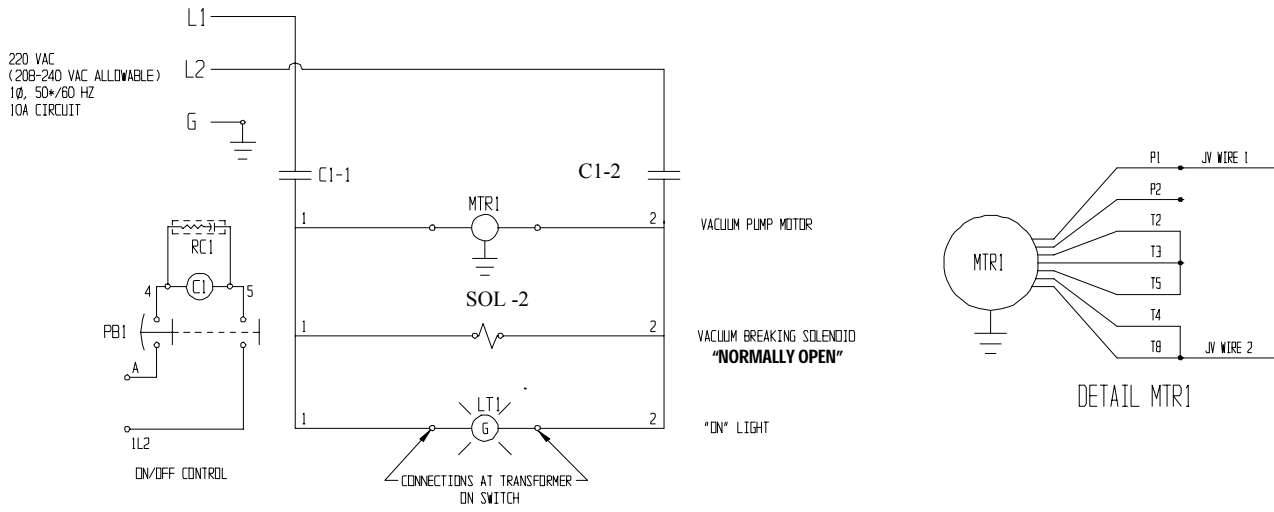
Part #	Description	Notes
A100619	Aspirator, brass, JetVac	Attaches to discharge of pump. Standard brass material.
A101047	Aspirator, stainless steel, JetVac	Optional aspirator material. 316 SS construction.
J100634	Condenser, LS-15	Standard CuNi construction.
A100413	Condenser, LS-15 stainless steel	Condenser with 316 SS construction.
J102937	Condenser, LS-55	Standard CuNi construction.
A100431	Condenser, LS-55 stainless steel	Condenser with 316 SS construction.
A101126	Discharge hose	Red Nycoil tubing with brass fitting.
A100416	Discharge hose with sightglass	Nycoil hose, brass sightglass and swivel fitting.
J100205	Flame check-valve, JetVac	Attached to rear of JetVac for venting of solvent vapors.
J100216	Heat resistant tape	Teflon tape used to help seal Still's lid for better vacuum.
M100182	Lid Gasket, LS-15	Gortex rope for lid seal.
M100188	Lid Gasket, LS-55	Gortex rope for lid seal.
A100423	Lid toggle clamp	Holds down lid.
A100439	Liftrack, LS-55	SS rack with handles used to help remove Stilbags.
J100221	Plastic Stilscraper	For scraping the residues from vessel walls.
A100628	Pressure relief valve assy. - LS-15	Mounts in lid, rated for 1/2 psi.
A100587	Pressure relief valve assy. - LS-55	Mounts in lid, rated for 1/2 psi.
A100444	Pump reservoir, JetVac	Stainless steel reservoir - tank only.
J100211	Quick connector, female	Attach to Still for easy connection of braided hose.
J100210	Quick connector, male	Attach to braided hose for easy connection to Still.
A101436	Quick-cool tube assy.	Internal Teflon tubing and fittings for Q-cool. 2 req'd.
M100184	Reservoir lid gasket, JetVac	Gortex gasket for sealing pump reservoir cover.
J100231	Seal, JetVac motor shaft	Lip seal used on pump motor to protect bearings.
A100445	SS cooling coil, JetVac	Includes mounting plate, and gasket. Three required.
A100576	Static ground clamp (6')	Braided wire with alligator-type clip and ring connector.
M101055	Stilbag ring, LS-15	Holds Stilbag in place.
A100438	Stilbag ring, LS-55	Holds Stilbag in place.
M101831	Stilbags, LS-15 hi temp, per doz.	Rated for temperatures up to 430°F (blue).
M101830	Stilbags, LS-15 reg. temp, per doz.	Rated for temperatures up to 400°F (clear).
M101833	Stilbags, LS-55 hi temp, per doz.	Rated for temperatures up to 430°F (blue).
M101832	Stilbags, LS-55, reg. temp, per doz.	Rated for temperatures up to 400°F (orange).
A100427	Stilpan, LS-15	Teflon coated pan for residue removal without bags.
A100440	Stilpan, LS-55	Teflon coated pan for residue removal without bags.
A100414	Thermowell for standard condenser.	Threads into condenser for vapor temperature gage.
J100212	Vacuum gage	Measures vacuum level in inches of Hg.
J100209	Vacuum hose, metal braid, JetVac	Hose between JetVac and discharge of still.
A100442	Vacuum pump assembly	Includes housing, impeller assy., and center bearing.
M100176	Vapor temperature gage	Measures vapor temp at condenser.

## SPARE PARTS - ELECTRICAL:

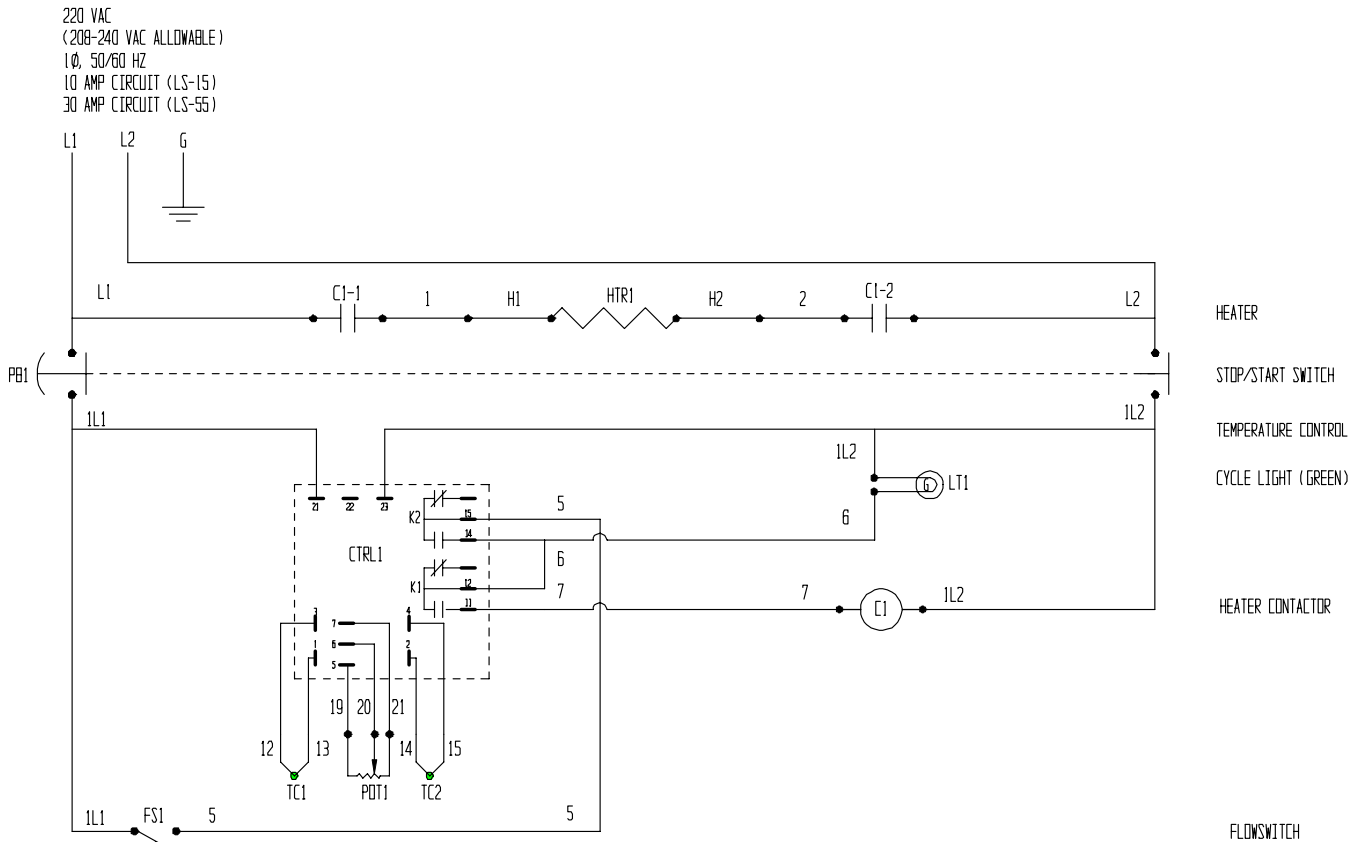
Item #	Part #	Description	Notes
C1	J101486	Contactator	Controls heater in Still or pump in JetVac
CTRL1	J102795	Temp control board, LS-15E/55E	Controls cycle temperature from 100°F to 392°F.
CTRL1	J102734	Temp control board, LS-15IIE/55IIE	Controls cycle temperature from 100°F to 392°F.
FS1	J100914	Flowswitch, LS-55E/55IIE	Rated for 1½ gallons per minute.
FS2	J100913	Flowswitch, LS-15E/15IIE	Rated for ½ gallons per minute.
FUSE1	J102735	Fuse, System II	Protection for controls. Type 3AG 2A.
FUSE2	J102919	Fuse, System II (600 mA)	Protection for Power Supply. 250 volt 5 x 20mm
LT2	J102736	Indicator light, white, System II	Cooling water indicator.
LT3	J102737	Indicator light, amber, System II	Heat on indicator.
MOV1	J102738	MOV, System II	For surge protection.
MTR1	J103298	Motor, JetVac pump	X-proof, 3450 rpm, 56C, 208-230V/1 Ph, 60 Hz.
PB1/LT1	J100323	STOP/START switch, LS-15E/55E/JV	Pull on, push off switch with green light.
PB1/LT1	J102739	STOP/START switch, LS15IIE/55IIE	Pull on, push off switch with green light.
POT1	J102139	Potentiometer, System II cycle temp	For adjusting the cycle temperature, 450Ω.
POT2	J102740	Potentiometer, System II cycle time	For adjusting the cycle time, 1 MΩ.
PS1	J102741	Power supply, System II	Power supply converts 240 VAC to 24 VDC.
RC1/RC2	J101699	RC network assembly	RC network, crimp connectors.
SOL1	J100889	Solenoid valve, System II water	Controls the cooling water supply to the condenser.
SOL2	J102249	Solenoid Valve, JetVac relief	Vacuum relief valve. Opens when JV is off.
SSR1/SSR2	J102742	Relay, solid state, System II	For heater control and JetVac control.
TC1	J101157	Thermistor	Temperature sensing probe for Still (Controlled by POT 1 - 100°F to 392°F ) K1 is its contact.
TC2	J101157	Thermistor	Overtemp sensing probe for still (412°F) K2 is its contact.
TIM1	J102743	Timer relay, System II cycle time	16 hour timer for cycle time
TIM2	J102744	Timer relay, System II cool-down	1-hour timer for condenser water.

Note: Heater for LS-15E/15IIE is 1650 watts. Heater for LS-55E/55IIE is 6200 watts

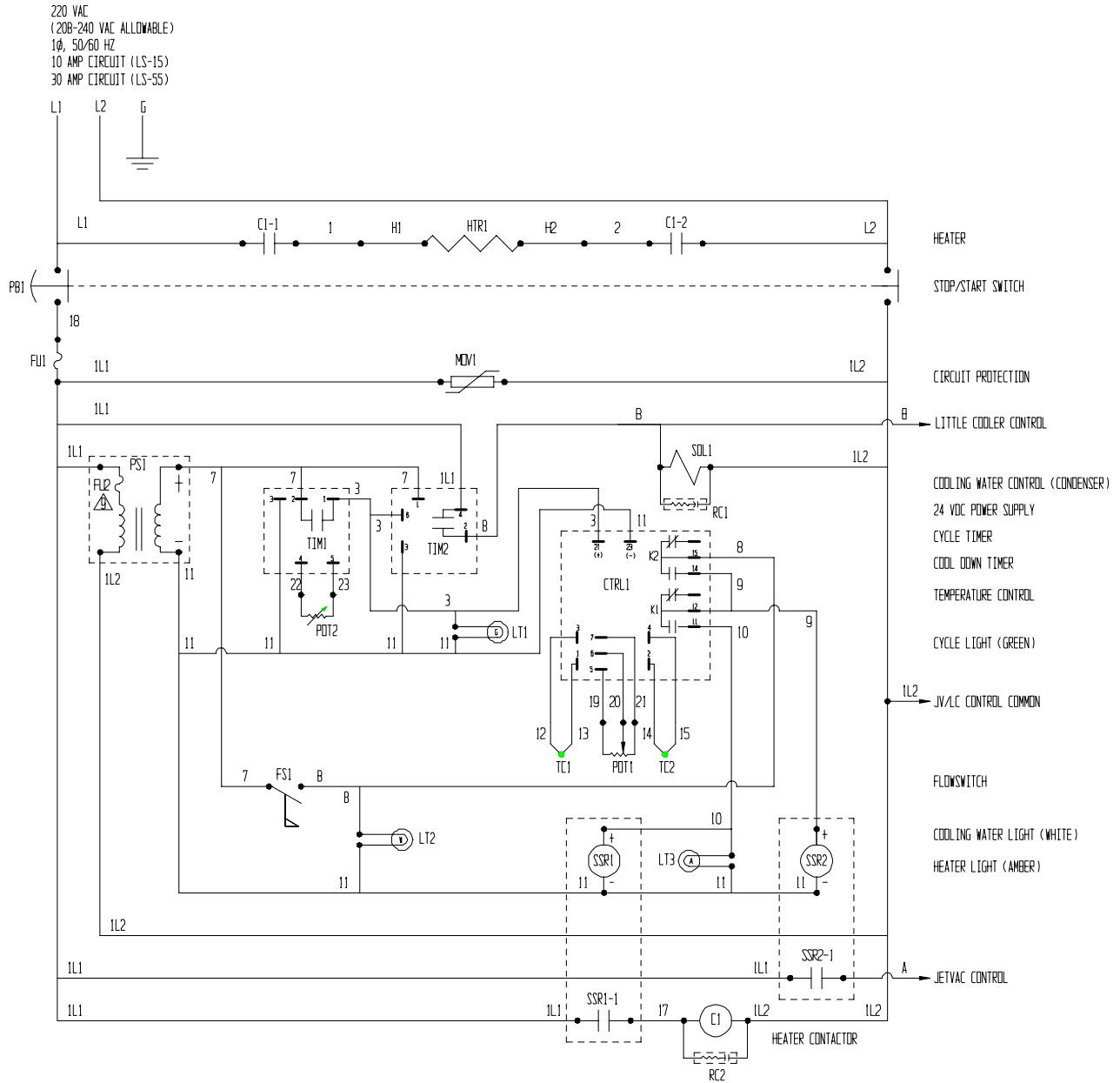
# ELECTRICAL SCHEMATIC - LS-JETVAC:



# ELECTRICAL SCHEMATIC - LS-15E/55E:



# ELECTRICAL SCHEMATIC - LS-15IIE/55IIE:



**Note:** When start button is pulled on, both timers are energized, but timer # 2 does not start timing until timer # 1 times out.

**Note:** If using a Little Cooler, connect control wires to the coil of the customer supplied contactor. (refer to the Little Cooler manual).

## **CHEMICAL REACTION DISCLAIMER**

The user must exercise primary responsibility in selecting the product's material of construction, which are compatible with the fluid(s) that come(s) in contact with the product. The user may consult Finish Thompson, Inc. (manufacturer) and a manufacturer's representative/distributor agent to seek a recommendation of the product's material of construction that offers the optimum available chemical compatibility.

However neither Manufacturer nor agent shall be liable for product damage or failure, injuries, nor any other damage or loss arising out of a reaction, interaction or any chemical effect that occurs between the materials of the products construction and fluids that come into contact with the product's internals.

## **WARRANTY**

Finish Thompson, Inc (manufacturer) warrants this product to be free of defects in materials and workmanship for a period of 3 years plus a lifetime warranty on the LS Heater, from date of purchase by original purchaser. If a warranted defect, which is determined by manufacturer's inspection, occurs within this period, it will be repaired or replaced at the manufacturer's option, provided (1) the product is submitted with proof of purchase date and (2) transportation charges are prepaid to the manufacturer. Liability under this warranty is expressly limited to repairing or replacing the product or parts thereof and is in lieu of any other warranties, either expressed or implied. This warranty does apply only to normal wear of the product or components. This warranty does not apply to products or parts broken due to, in whole or in part, accident, overload, abuse, chemical attack, tampering, or alteration. The manufacturer accepts no responsibility for product damage or personal injuries sustained when the product is modified in any way. If this warranty does not apply, the purchaser shall bear all cost for labor, material and transportation.

Manufacturer shall not be liable for incidental or consequential damages including, but not limited to process down time, transportation costs, costs associated with replacement or substitution products, labor costs, product installation or removal costs, or loss of profit. In any and all events, manufacturer's liability shall not exceed the purchase price of the product and/or accessories.



### **FINISH THOMPSON INC.**

921 Greengarden Road • Erie, PA 16501-1591 U.S.A.  
Ph 814-455-4478 • Fax 814-455-8518  
Email [fti@finishthompson.com](mailto:fti@finishthompson.com) • [www.finishthompson.com](http://www.finishthompson.com)



Tech Service Hotline 800-888-3743  
Part Number J102856-4, Rev 10  
Lit ID No. FT01-829C