

## Installation, Operation, and Maintenance Manual

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# Lync BOLT

## Electric Water Heater



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Engineered Solutions

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## TABLE OF CONTENTS

<b>1. SAFETY CONSIDERATIONS .....</b>	<b>3</b>
<b>2. PRODUCT DESCRIPTION .....</b>	<b>5</b>
<b>3. PIPING DIAGRAMS .....</b>	<b>6</b>
<b>4. WATER HEATER INSTALLATION .....</b>	<b>8</b>
4.1. Checking Equipment Before You Install .....	8
4.2. Codes 8 .....	
4.3. Electrical Requirements .....	8
4.4. Location .....	9
4.5. Installation .....	9
4.6. Service Clearances .....	10
4.7. Clearances to Combustible Surfaces .....	10
4.8. Electronic Low Water Cutoff .....	10
4.9. Shunt Trip Circuit Interrupter .....	10
<b>5. TEMPTRAC™ ELECTRONIC CONTROLLER PANEL .....</b>	<b>11</b>
5.1. Principle of Operation .....	11
5.2. Upper LED Readout .....	11
5.3. Lower LED Readout .....	11
5.4. Control Buttons .....	11
5.5. Key Combinations .....	12
5.6. LED Icon Legend .....	12
5.7. To View the Setpoint .....	12
5.8. To Change the Setpoint .....	12
5.9. To Set the Current Time and Day (Military Time) .....	13
5.10. To Set the Energy Saving Time (Nighttime Setback) .....	13
5.11. To Set Modulation Parameters .....	13
5.12. To Change Other Parameters .....	13
5.13. LED Display Alarm Messages .....	14
5.14. Audible Alarm .....	14
5.15. Alarm Recovery .....	15
<b>6. START-UP PROCEDURES AND OPERATION .....</b>	<b>16</b>
<b>7. ELEMENT CONTINUITY CHECKS .....</b>	<b>18</b>
<b>8. MAINTENANCE .....</b>	<b>23</b>
8.1. Flushing .....	23
8.2. Draining the Tank .....	23
8.3. Sediment / Lime Scale Removal .....	23
8.4. Temperature and Pressure Relief Valve .....	23
8.5. Low Water Cutoff .....	24
8.6. Electrical Connections .....	24
8.7. Cleaning Electric Elements .....	24
<b>9. TROUBLESHOOTING .....</b>	<b>25</b>
<b>10. WIRING DIAGRAM .....</b>	<b>26</b>
<b>11. Replacement Parts .....</b>	<b>27</b>
11.1. Drain Valve, T&P Relief Valve, and Control Face Panel .....	27
11.2. Elements, Control Flanges, and Box-Mounted Components .....	28
11.3. Control Panel Components .....	29

**IMPORTANT: Read this Manual BEFORE using equipment. Failure to read and follow this information can result in death, serious personal injury, property damage, or damage to the equipment.**

**Keep this Manual for future reference.**

## 1. SAFETY CONSIDERATIONS

### **⚠ WARNING!**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, significant personal injury, exposure to hazardous materials, or death.

### **FOR YOUR SAFETY:**

Do not store or use gasoline or other flammable liquids near this unit, or any other appliance.

### **WHAT TO DO IF YOU SMELL GAS**

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a location away from your building and the smell of gas. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

### **⚠ WARNING!**

Installation and service must be performed by a qualified installer, service agency or electrical contractor who must read and follow all instructions before installing, servicing or removing unit. Refer to the information contained in this manual.

You must consult local building and plumbing codes prior to installation. If the information in this manual is not consistent with local codes, the local codes should be followed. Inquire with governing authorities for additional local requirements.

### **⚠ WARNING!**

Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect unit and replace any parts or items affecting safe operation that have been under water.


### **⚠ WARNING!**

In an emergency disconnect all electrical power to the unit from a location safely away from the emergency. Failure to follow these instructions can cause property damage, personal injury, exposure to hazardous materials or death.

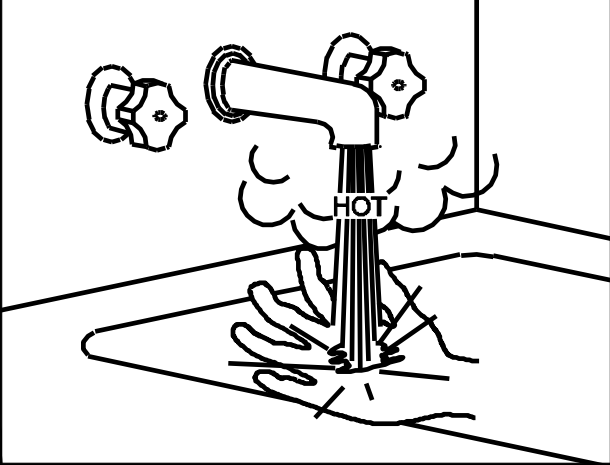
### **⚠ WARNING**

It takes only 5 seconds of skin contact with 140°F water to cause a second degree burn. You must protect against high water temperatures in all lavatories, tubs, showers and other points of hot water contact.

Accidental scalding from hot water is a greater risk in facilities for the young, old, or otherwise impaired. Any location where response to contact with hot water may be slower or where the danger of hot water contact is greater.



# DANGER

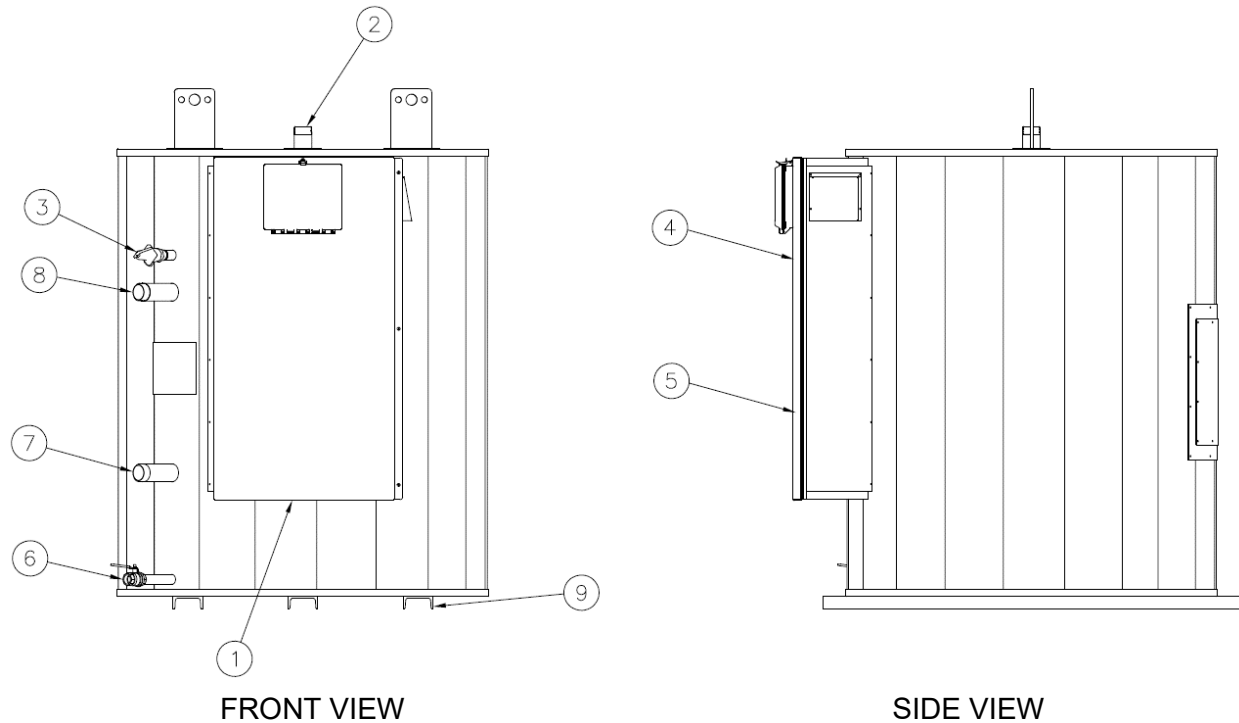


- Water temperature over 125°F can cause severe burns instantly or death from scalds.
- Children, disabled and elderly are at highest risk of being scalded.
- See instruction manual before setting temperature at water heater.
- Feel water before bathing or showering.
- If this appliance is used to produce water that could scald if too hot, such as domestic hot water use, adjust the outlet control (limit) or use temperature limiting valves to obtain a maximum water temperature of 120°F.

**IMPORTANT!**

- Thermostatically controlled mixing valves must be used in the design of the potable hot water system.
- Potable hot water should be tempered to no more than 110°F when used for bathing or other personal uses.
- Thermostatically controlled mixing valves set at 120°F or less to keep the delivered water temperature below scalding temperatures.

## 2. PRODUCT DESCRIPTION



**Figure 2-1: Bolt Electric Water Heater**

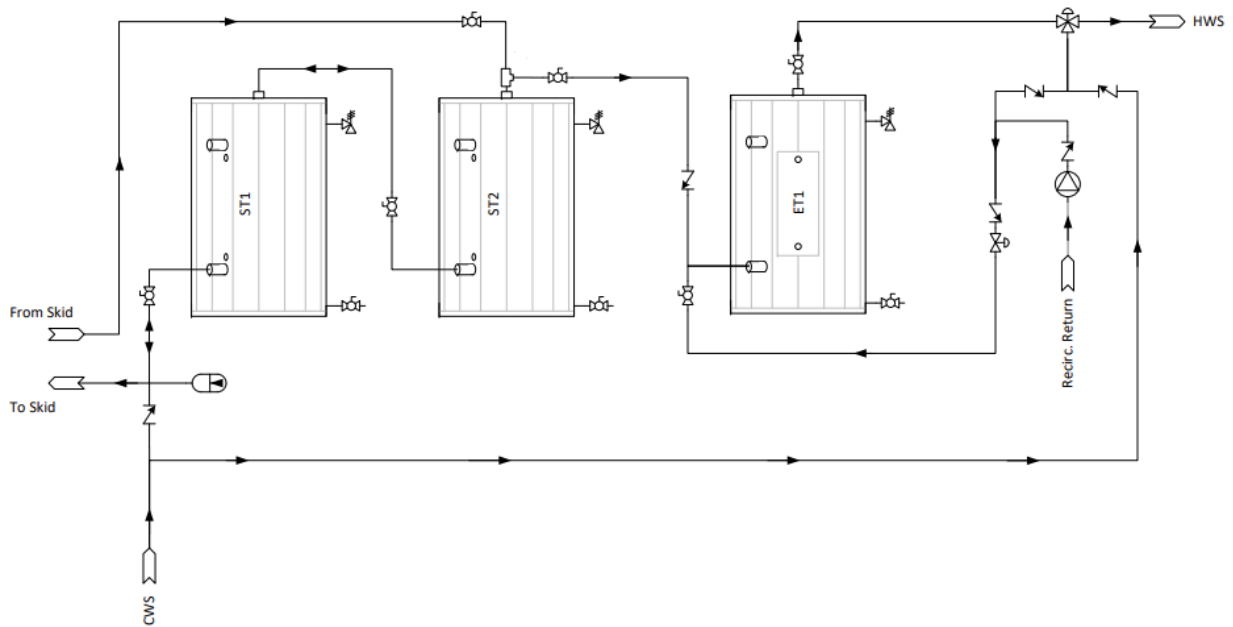
1. Electrical Entry
2. 2-1/2" NPT Hot Outlet
3. 1" NPT T&P Valve
4. Control Enclosure
5. Electric Element Enclosure
6. Drain Valve (250gal = 1" NPT; 500gal = 1-1/2" NPT)
7. 2-1/2" NPT Cold Inlet
8. Optional Service Connection
9. Channel Skids

**NOTE:** The Lync Bolt includes an integral inlet diffuser connected from the interior to the inlet connection to encourage proper stratification of hot water. This component is critical for heat pump water heater systems, where stratified storage reduces heater cycling and improves performance.

**NOTE:** The Lync Bolt may be used as a primary heating source, back-up to a heat pump or other heater, or as a trim tank for a heat pump system.

**This product is not intended for space heating applications.**

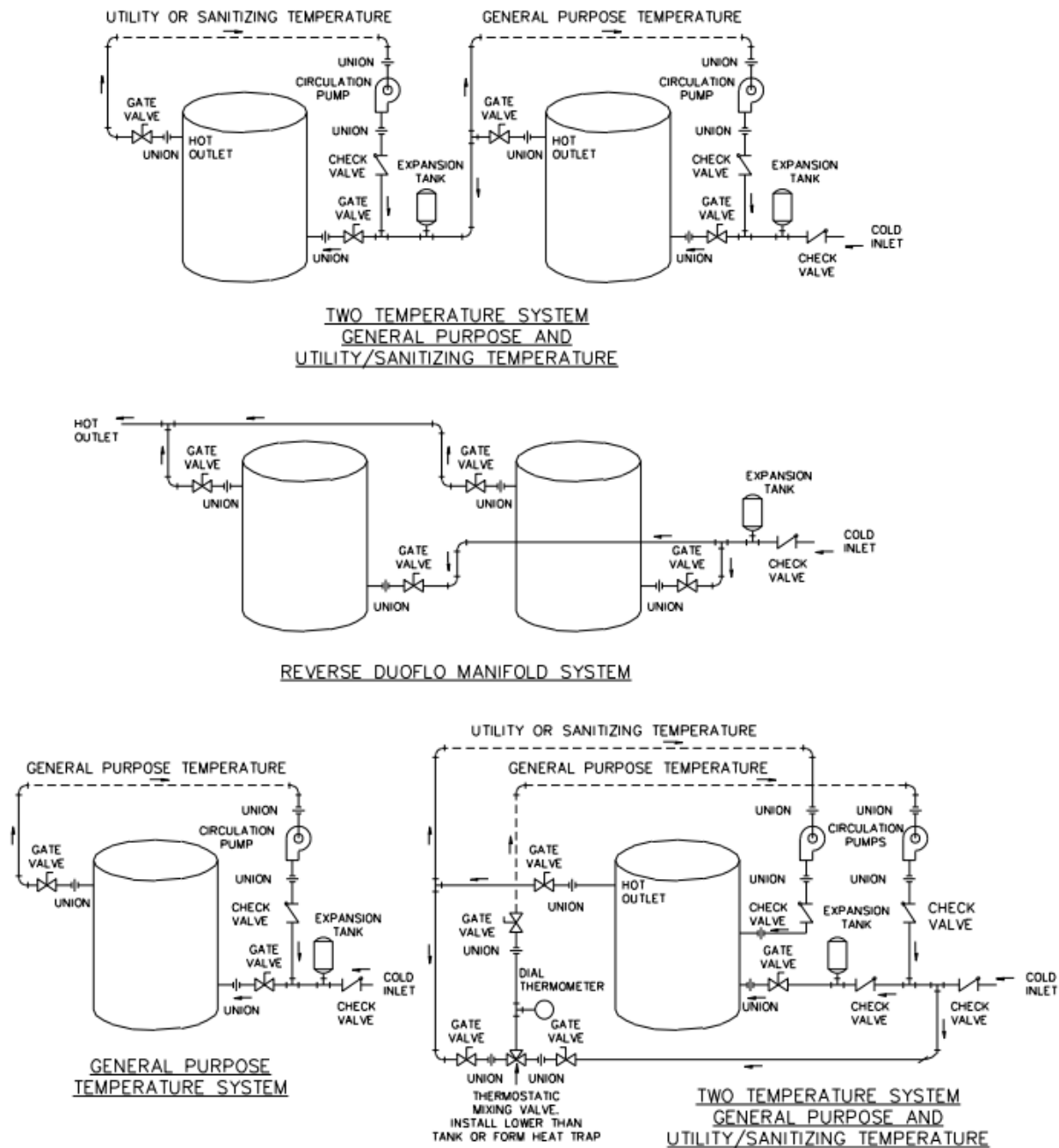
### 3. PIPING DIAGRAMS



(ST = Lync Storage Tank, ET = Lync Bolt)

[Not For Use as Instructions for Construction]

**Figure 3-1: Sample Piping Diagram for Heat Pump Storage and Recirculation**



**Figure 3.2: Two-Temperature and Reverse Duoflo Manifold Systems**

## 4. WATER HEATER INSTALLATION

### 4.1. Checking Equipment Before You Install

Inspect the unit completely upon receipt from the freight carrier before signing the bill of lading. Inspect the unit and all accompanying parts for signs of impact or mishandling. Verify the total number of pieces shown on packing slips with those received. Contact the freight carrier immediately if any damage or shortage is detected.

### 4.2. Codes

The equipment must be installed in accordance with the local installation regulations. Authorities having jurisdiction must be consulted before installation is made. In the absence of such requirements, the installation shall be in accordance with the instructions in this manual, unit markings, and supplemental instructions. Installation must also be in compliance with the latest edition of the National Electrical Code, NFPA-70. In Canada, the equipment must be installed in accordance with the latest edition of the Canadian Electrical Code, C22.1 and any applicable provincial regulations. All units conform to the current edition of the ASME Boiler and Pressure Vessel Code, Section IV, Part HLW or Section VIII.

### 4.3. Water Quality Requirements

To keep your water heater operating efficiently over its lifetime, it is critical to ensure that the chemical composition of incoming water is not harmful to the heater. To prevent corrosion, fouling, and other harmful effects on the heater, Lync requires feedwater to be within the EPA defined limits for potable water. Potable water is defined as complying with the U.S. EPA primary drinking water regulations and secondary drinking water standards.

### 4.4. Electrical Requirements

1. Check the rating plate on the front of the unit for correct voltage, phase, and amperage. Refer to the wiring diagram for the control components mounted on the heater.
2. Use proper wire size and branch circuit protection as required by the latest edition of either the National Electrical Code, NFPA-70, Canadian Electrical Code, C22.1, and any additional local codes. The electric water heater specification sheets show the number and size of power connectors furnished with the heater for minimum 90°C (194°F) copper connecting wire.
3. Use proper wire size for the ground connection. Attach to the ground lug connection marked with decal "GR".
4. Connect supply feeders to distribution block inside the electrical enclosure on the heater.

#### IMPORTANT

Check all wiring connections to ensure tightness prior to use.

**NOTE:** Only use copper wire that is the correct size, as indicated. Damage resulting from use of aluminum wiring is excluded from coverage under the warranty for this unit.



#### 4.5. Location

1. For indoor-rated units, install in a clean and dry area, and as near to electrical power as is practical. It should be located as close as possible to where the most hot water is used.
2. For outdoor-rated Bolt units, install the unit in a clean area away from any standing water, and as near to electrical power as is practical. It should be located as close as possible to where the most hot water is used.
3. Install the foundation of the unit on a pitched floor near a suitable drain. If that is not possible, install the unit as far away as possible from areas of the building subject to water damage, in case the water heater or a water connection leaks. The drain must be sufficient to withstand water in excess of 210°F.

Floor mounting tools and tie-down anchor points are provided with the unit. Code requirements vary by geographical location, and additional strapping or braces may be required. Please refer to your local codes for requirements for additional equipment.

#### ⚠ WARNING!

As with any electrical product, care should be taken to guard against the potential risk of fire, electric shock, and injury to persons.

#### 4.6. Installation

#### ⚠ WARNING!

Use industry standard safe rigging methods when lifting or moving. Failure to follow these instructions could result in property damage, serious injury or death. One common method uses straps and spreader bars to lift unit from the water heater base skid assembly.

1. Check the data decal on the heater. Be sure that the electrical supply is adequate for installation.
2. Carefully remove all shipping supports and bracing. Float type devices have shipping plugs blocking the float.
3. Install shut-off valves and unions on inlet and outlet piping for servicing. Use caution when threading pipe nipples into tank connections to prevent cross threading or over-tightening. Always use a back-up wrench on tank nipples when tightening unions, valves, etc.
4. Insulate the hot water and return circulation lines. Additionally, if the area is subject to freezing, insulate all water piping and take the necessary steps to keep the unit, and all water containing pipes and components, from freezing. Do not use plumbing connected to the unit as a ground for welding or any other purpose.
5. The water heater is equipped with temperature and pressure relief valves rated for the input. Pipe the relief valve discharge to a suitable open drain. The drainpipe may not be smaller than the relief valve opening and must be secured to prevent it from lifting out of the drain under discharge pressure. Do not install valves or restrictions in the discharge line.
6. Pipe the drain valve to a suitable open drain.
7. Inspect, maintain and service the temperature and pressure relief valve as provided on the instructions attached to the valve.

#### IMPORTANT!

Do not use standard or galvanized steel, or dielectric pipe nipples when making connections to the tank. Use only non-ferrous nipples.

8. A thermal expansion valve (or diaphragm-type expansion tank) should be installed in the cold water line between the water heater and any check valve.

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**4.7. Service Clearances**

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Allow sufficient space to provide adequate clearances on all sides for service and inspection. The recommended clearance is 24" at the top and in front of the unit, and 18" on each side of the unit. Optional equipment may increase the clearance requirements. Allow sufficient space for installing and servicing connections such as water, electrical, pump and other auxiliary equipment.

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**4.8. Clearances to Combustible Surfaces**

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The unit must not be installed on a combustible floor, or on a non-combustible floor covering combustible material. The minimum clearance to combustible material is 6" from the top, sides, and rear, and 24" from the front.

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**4.9. Electronic Low Water Cutoff**

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The device consists of a probe in the tank that acts as a switch, open when submerged in water and closed when the water level is below the probe, preventing heating elements from energizing. The probe should be kept free of scale buildup to ensure operation.

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**4.10. Shunt Trip Circuit Interrupter**

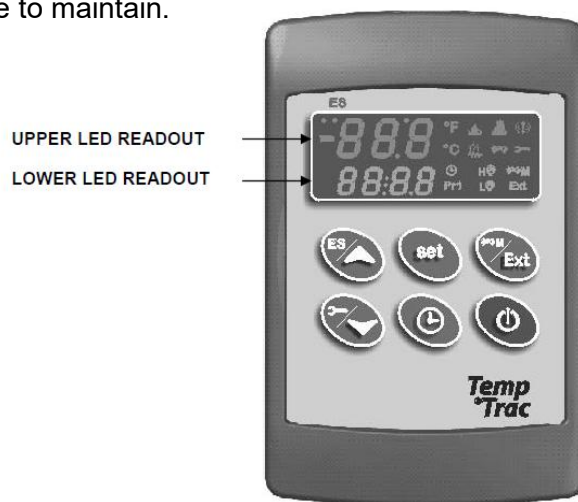
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The shunt trip, wired in the non-automatic circuit interrupter, is a safety device designed to open the circuit interrupter and prevent the elements from energizing if the control panel door is opened.

## 5. TEMPTRAC™ ELECTRONIC CONTROLLER PANEL

### 5.1. Principle of Operation

The water heater operates to satisfy the setpoint of the TempTrac digital control whose sensor is located near the energy source of the water heater tank. Demand (flow) will typically create a drop in temperature, thus activating the water heater to add heat to the stored water. This setpoint is the desired water temperature to maintain.



### 5.2. Upper LED Readout

The default display of the upper readout (Probe 2) is the water temperature near the hot water outlet. This readout can display the following additional information by pushing the EXT button:

- The modulation rate of the heater indicated by 0 to 100%.
- The temperature difference between Probe 1 and Probe 2.
- All of the display information described above is available for monitoring through the optional MODBUS RTU interface.

### 5.3. Lower LED Readout

The default display of the lower readout (Probe 1) is the water temperature sensed near the middle of the water heater tank, the primary control temperature for the TempTrac.

### 5.4. Control Buttons

**SET:** Displays and modifies the temperature set points. In programming mode, it selects a parameter or confirms an operation.

**UP:** Displays and modifies the energy saving (Night Time setback) settings. In programming mode, it browses the parameter codes or increases a displayed value.

**DOWN:** Displays the working hours of the load relays. In programming mode, it browses the parameter codes or decreases a displayed value.

**CLOCK:** Changes the lower display from the stored water temperature to current time and day.

**EXT:** Changes the upper display from Probe 1 temperature to Probe 3 temperature, and displays temperature difference of stored water temperature minus the Probe 2 temperature and firing rate of burner from 0 to 100%. In programming mode, set to 4-20mA output (password is required).
















**ON/OFF:** Switches the unit ON or OFF.

**NOTE:** See TempTrac User Manual PV500-41 for a full description.

### 5.5. Key Combinations

- Use the **UP + DOWN** key to lock and unlock the keyboard.
- Use the **SET + DOWN** arrow to enter the programming mode.
- Use the **SET + UP** arrow to exit the programming mode.

### 5.6. LED Icon Legend

LED	MODE	Function
°F	ON	Temperatures are displayed in degrees Fahrenheit
°C	ON	Temperatures are displayed in degrees Celsius
	Flashing	Call for heat time delay or remote enable/disable is in standby (disabled)
	ON	Call for heat is on
	Flashing	Second stage time delay ( <i>On 2-stage units only</i> )
	ON	Second stage on or the <b>AL2</b> alarm output is enabled.
	Flashing	Output 3 time delay
	ON	Output 3 relay on
	ON	Modulation output signal is in manual control mode or forced to the <b>i1S</b> setting by digital input 1
	ON	Modulation output signal is automatically controlled by temperature probe 1
	Flashing	Modulation output time delay is activated.
<b>Ext</b>	ON	Probe 3 is displayed
	Flashing	Digital input 2 (alarm) is activated
	Flashing	Digital input 3 (alarm) is activated
	ON	Lower display is displaying the time
	Flashing	Alarm signal
	Flashing	Programmed working hours limit is exceeded
	ON	Working hours are displayed in Lower LED readout
<b>ES</b>	ON	The energy saving function is running

### 5.7. To View the Setpoint

- Push and release the **SET** key to see the set point value.
- To return to normal display, press **SET + UP** or wait 15 seconds without pressing any key.

### 5.8. To Change the Setpoint

- Push the SET key. The upper display will show the “St1” parameter name, while the lower display will show its value.
- Use the UP or DOWN key to cycle through the parameter names.
- Push the SET key to modify a parameter value. The value in the lower display flashes.
- To change it, push the UP or DOWN keys. Push the SET key again to confirm the value and pass to the next set point.
- Repeat the operations described at points 3, 4, 5.
- To Exit: press SET + UP, or, wait 15 seconds without pressing any key.

**NOTE:** Each point has a time out of 15 seconds. If any key is pushed within 15 seconds, the controller exits the set points programming procedure.

The set value is stored even when after the time-out expires.

**5.9. To Set the Current Time and Day (Military Time)**

- Push and hold the **CLOCK** key for 4 seconds. The LED icon starts flashing and the “**Hur**” (hour) parameter name is displayed in the Upper LED readout. Its value is displayed in the Lower LED readout.
- Pushing the **UP** or **DOWN** key alternates the LED readouts between the following:
  - “**Hur**” (hour) in the Upper readout, and its value in the lower readout
  - “**Min**” (minute) in the Upper readout, **and** its value in the Lower readout
  - “**Day**” (day) in the Upper readout, its value in the Lower readout
- To adjust a value, press the **SET** key and the value in the Lower LED will start flashing. Change the value by pressing the **UP** or **DOWN** keys. When correct, press the **SET** key.
- To exit, press the **SET + UP** keys, or, wait 15 seconds without pressing any keys.

**NOTE:** This device recognizes Sunday as the first day of the week and Saturday as the last.

**5.10. To Set the Energy Saving Time (Nighttime Setback)**

- Push and hold the **UP** key for 4 seconds, and the first energy saving option will be displayed.
- Use the **UP** or **DOWN** keys to navigate to other options.
- To change a value, push **SET** key followed by **UP** or **DOWN** and then **SET** key again.
- To exit the menu, press **SET** and **UP** or wait for 15 seconds.

**5.11. To Set Modulation Parameters**

- Push and hold the **EXIT** key for 4 seconds and the LED will switch **ON** and a passkey will be required to view and manually change the modulation % value.




**NOTE:** The passkey is: 321

- Upon entering the password, the modulation % value will be displayed in the lower display.
- To manually adjust this value, push the **SET** key, and the value will start flashing. Adjust it by using the **UP** or **DOWN** keys and then the **SET** key again.
- To exit the menu, press **SET** and **UP** keys together or wait for 15 seconds.

**5.12. To Change Other Parameters**

- Push the **SET and DOWN** arrow simultaneously for 4 seconds.
- Select the required parameter. The name of the parameter is on the upper display; its value is on the lower display.
- Press the **SET** key, and the value of the parameter will start blinking.
- Use **UP** or **DOWN** to change the value.
- Press **SET** to store the new value and move to the following parameter.
- **To Exit:** Press **SET + UP** or wait 15s without pressing a key.

### 5.13. LED Display Alarm Messages

MESSAGE	CAUSE	RESULTS OF ALARM CONDITION	RECOMMENDED ACTION
"P1"	TP1 probe failure	Inlet temperature sensor is not connected or is reading incorrectly. Call for heat and burner modulation output signal will revert to low fire.	Check wiring and sensor Terminals 14 & 17
"P2"	TP2 probe failure	Temperature sensor is not connected or is reading incorrectly.	Check wiring and sensor Terminals 15 & 17
"P3"	TP3 probe failure	Temperature sensor is not connected or is reading incorrectly or flue gas temperature protection is disabled.	Check wiring and sensor Terminals 16 & 17
"HA"	High temperature limit setpoint exceeded	Audible alarm sounds, operation continues.	Manual reset required
"LA"	Low temperature alarm	Audible alarm sounds, operation continues.	
AL1	Digital input 1 is activated.	Unit de-energized after timer delay. Audible alarm sounds.	Manually reset required
AL2	Digital input 2 is activated. This alarm indication is dedicated to the Alarm On Any Failure feature of this product.	Unit de-energized after timer delay. Audible alarm sounds. Alarm contacts close for remote indication of alarm. Internal alarm register will communicate an alarm condition through the Modbus RTU communication link.	Manually reset required
AL3	Digital input 3 is activated.	Unit de-energized after timer delay. Audible alarm sounds.	
Mn1	Maintenance alarm for output 1	Buzzer sounds, operation continues	Check wiring and sensor
Mn2	Maintenance alarm for output 2	Buzzer sounds, operation continues	Check wiring and sensor
Mn3	Maintenance alarm for output 3	Buzzer sounds, operation continues	Check wiring and sensor
"rtc"	The real time clock has lost its setting	Energy saving function disabled	Reprogram clock
CONTROL MESSAGE	CAUSE	RESULTS OF CONTROL CONDITION	NOTES
 On	A call-for-heat condition	The burner operating sequence should begin.	If the burner does not operate, check safety devices or Remote Proving Interlock
 Flashing	The remote enable/disable has been triggered	The flame icon flashes indicating standby state	The <b>R1-R2</b> terminals have been opened by the remote master control. The heater will remain in standby.
	Integral circulation pump	The integral circulation pump will operate until the water temperature has equalized	Pump may operate before, during or after the call-for-heat

### 5.14. Audible Alarm

The TempTrac audible alarm is activated each time a connected alarm condition occurs. The following alarm conditions may trigger the alarm. Some alarms may be connected to, but may operate separately from the TempTrac on some products.

- High/low water temperature alarm
- External thermostat limit failure
- Probe failures
- Low water

The audible alarm is silenced by pressing any button, but the visual alert may remain.

**5.15. Alarm Recovery**

- The probe failure alarm automatically stops after normal operation is re-established. Check connections before replacing the probe.
- Temperature alarms “HA” and “LA” automatically stop as soon as probe 1 senses temperatures within normal operating parameters.
- Digital input 2 & 3 alarms stop when the condition(s) listed above are normalized and any button is pressed. Resetting the alarm condition may require resetting individual safety devices or cycling main power switch.
- RTC alarm stops after programming the real time clock.
- RTF alarm requires the replacement of the real time clock.

For additional information, contact the Lync Customer Service Dept at 800-433-5654.

## 6. START-UP PROCEDURES AND OPERATION

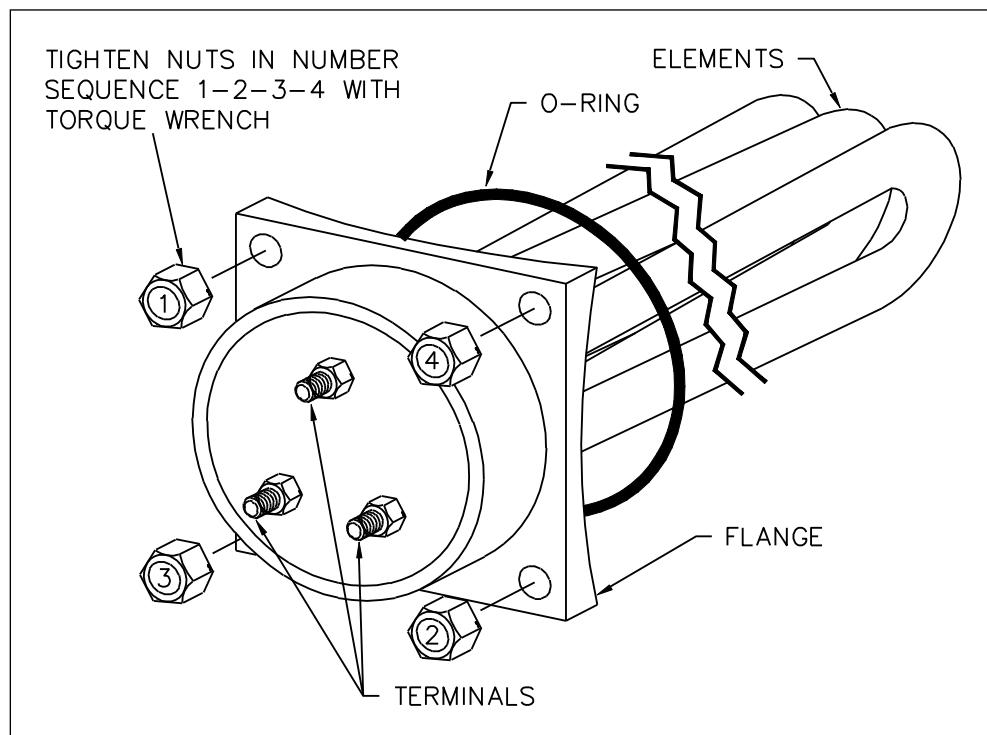
### ⚠ WARNING!

Always turn off all electrical service to the unit when accessing controls inside the cabinet. The cabinet contains high voltage wiring and terminals. If the electrical service is not turned off, and these wires or terminals are touched, a dangerous shock causing personal injury or death. Close the control cabinet before restoring electrical service to the unit.

1. Use a multimeter to check resistance to ground between all element terminals and the element mounting flange. **See Page 19.**
  - Fill the heater with water. Open the relief valve to allow air to escape. Be sure all connections into the tank are tight.
  - Check inside of electrical enclosure for leaks while the tank is full of water at water line pressure. Contact customer service if a leak is observed.
  - If leaks are present, tighten all four nuts uniformly on the element mounting flange in a crisscross pattern. Tighten one nut, then the nut diagonally across from the first nut. Next, tighten the nut next to the second nut, and then the nut diagonally across from the third nut. Repeat this sequence until all nuts are tight. Each nut should be tightened to 11 foot pounds of torque. To avoid warping the flange, do not over tighten.

### IMPORTANT!

All leaks must be corrected prior to turning on the electricity to avoid damage to electrical components within the enclosure.



**Figure 6-1: Electric element (design may vary)**

3 phase elements have 3 terminals.



2. The tank must be full of water before turning on the electricity. If elements are energized without water in the tank, they will burn out immediately.

**IMPORTANT**

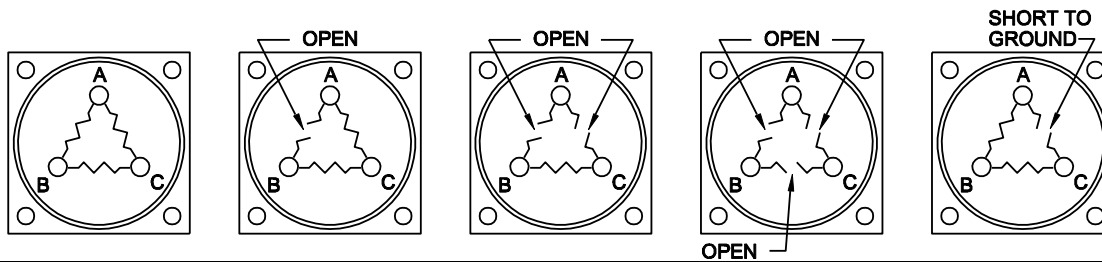
Dry-starting the unit will void all warranties.

3. Check the tightness on all electrical connections before turning the unit on.
4. Energize the manual disconnect switch. Check for proper voltage (with a voltmeter) on power circuit. Voltage should not vary more than 5% from voltage shown on data plate. If voltage exceeds these limits, immediately turn off main disconnect and contact utility company.
5. Energize control circuit switch. Check for proper voltage.
6. Check for proper amperage with ammeter on power circuit. Amperage should not vary more than 5%, when under full load, from amperage shown on data plate. *See Table 2.* If amperage exceeds these limits, immediately turn off main manual disconnect and refer to Electric Water Heater Trouble Shooting Guide.
7. Check magnetic contactors for noise. If noisy, i.e., buzzing or chattering, turn off main power disconnect, disassemble contactor and blow out foreign particles. Drill filings, dirt or other particles can cause pitting of points which will in turn burn out the contactor and/or wire. Extra care has been taken during fabrication and inspection for cleanliness, however, field installation is often responsible for debris collecting on the contactor points.
8. The top thermostat is a temperature limiting safety device set at 200°F. The upper operating thermostat is factory set at 130°F. The lower operating thermostat is set at 120°F. Adjust stored water temperature by turning the Operating thermostat dial to the desired temperature. The Upper Operating and Operating thermostats should be set minimum 10°F higher.
9. After startup and with the water heater operating, allow the water in the tank to reach the desired temperature and de-energize the heating elements. Draw hot water from a nearby faucet or outlet until the heating elements come back on. This will check for proper operation of the thermostats and other operating controls.

**IMPORTANT**

After approximately 30 minutes of operation, turn off all power to the unit. With main disconnect off, check each wire connection and fuse clip for elevated temperature. If an elevated temperature is noted, there is a loose connection at the point of greatest heat. All connections must be tight for proper performance.

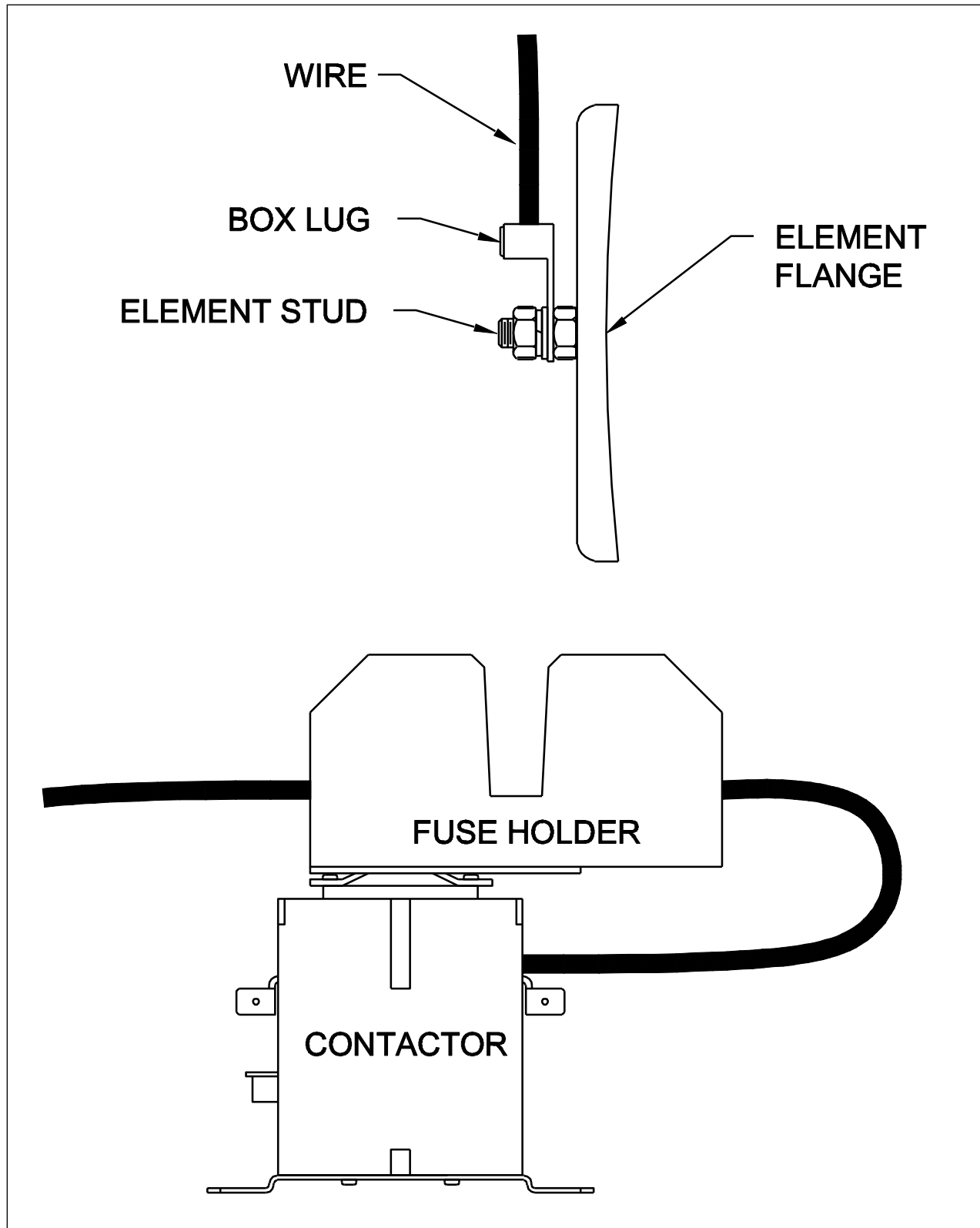
## 7. ELEMENT CONTINUITY CHECKS



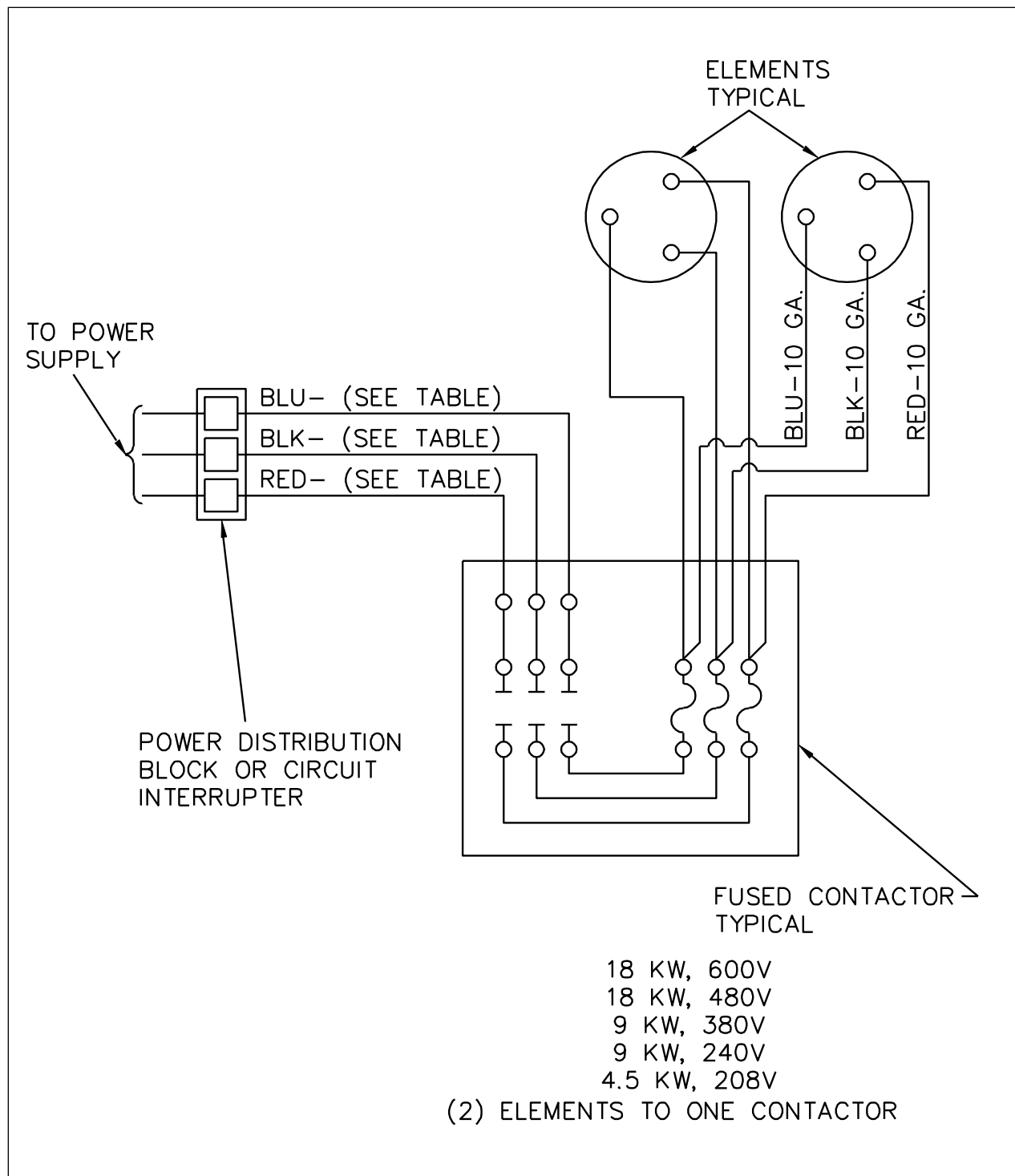
**NOTE:** Element wire leads must be disconnected to prevent false OHM readings.

ELEMENT RATING		CHECK OPEN	I. OHM READING NORMAL	II. OHM READING 1 LEG OPEN	III. OHM READING 2 LEGS OPEN	IV. OHM READING 3 LEGS OPEN	V. OHM Reading Terminal To Flange
kW	VOLT	COILS					
18	480	A-B	26	78	∞	∞	Depending on the severity of the short, the OHM reading may vary from zero, (direct short) to several hundred ohms (partial short). In any case where the OHM reading is not infinity, the element should be replaced.
		B-C	26	39	39	∞	
		C-A	26	39	∞	∞	
9	480	A-B	52	154	∞	∞	
		B-C	52	77	77	∞	
		C-A	52	77	∞	∞	
4.5	480	A-B	103	308	∞	∞	
		B-C	103	154	154	∞	
		C-A	103	154	∞	∞	

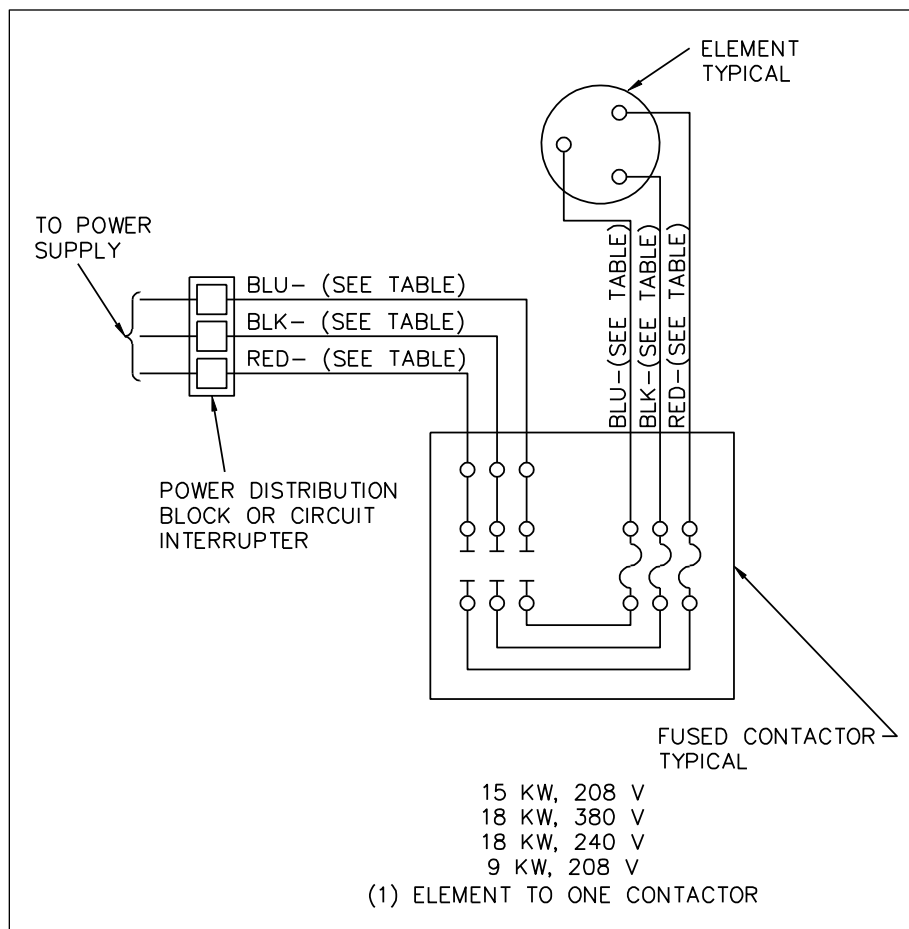
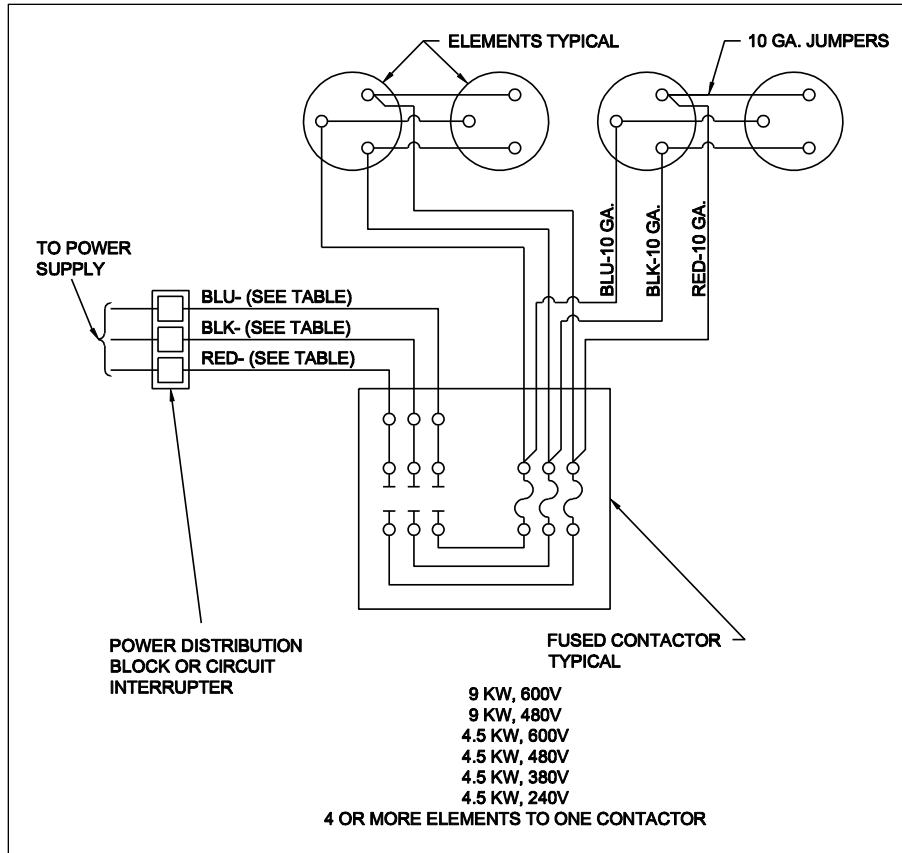
### Typical Current Measurements



**Figure 7-1: Typical Wire Terminations**



**Figure 7-2: Typical Three Phase Wiring**

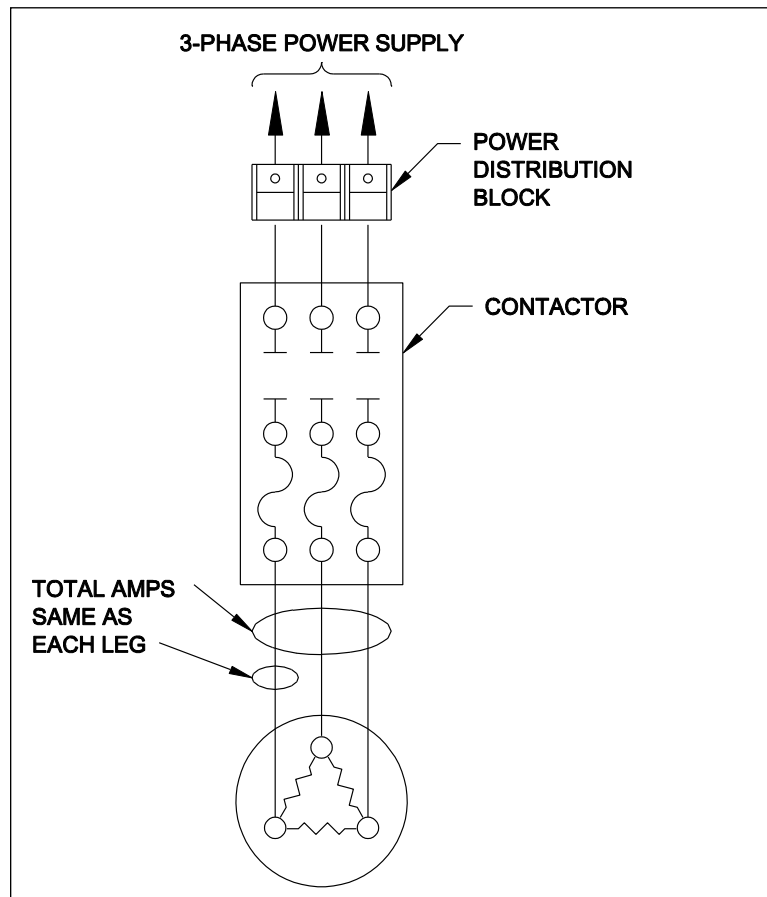


REQUIRED WIRE SIZE	
Contactor Fuseholder Rating	Wire Size
600V – 30A	10 AWG
300V – 60A	6 AWG
600V – 60A	6 AWG

TORQUEING REQUIREMENTS		
Wire Size	Terminal Type	In-lbs
10 AWG	RING	25
8 AWG	BOX	40
6 AWG	BOX	45

KW-VOLTAGE	3 Ø AMPS PER ELEMENT	
	AMPS PER LEG	AMPS TOTAL
*14 kW-600V	13-1/2	13-1/2
*7 kW-600V	7	7
18 kW-600V	18	18
9 kW-600V	9	9
4.5 kW-600V	4-1/2	4-1/2
18 kW-480V	22	22
9 kW-480V	11	11
4.5 kW-480V	5-1/2	5-1/2
18 kW-380V	28	28
9 kW-380V	14	14
4.5 kW-380V	7	7
18 kW-240V	44	44
9 kW-240V	22	22
4.5 kW-240V	11	11
15 kW-208V	41-2/3	41-2/3
9 kW-208V	25	25
4.5 kW-208V	12-1/2	12-1/2

TABLE 2



**NOTE:** Elements are usually wired to contactors in groups, in order to maintain an amperage draw of close to, but not more than, 50 amps per contactor.

## 8. MAINTENANCE

A preventative maintenance program helps ensure a long trouble-free life of the water heater.

COMPONENT	OPERATION	INTERVAL	REQUIRED
Tank	Sediment Removal	Every 3 Months	Flushing
Relief Valve	Inspect	Every 6 Months	Test
Electrical Connections	Inspect	Monthly	Inspect for wire discoloration
Electric Elements	Check	Every 6 Months	Amp Draw
Electric Elements	Remove & Clean	See Section 4.4 Electrical Requirements	

### 8.1. Flushing

1. Turn off the heater electrical disconnect switch.
2. Open the drain valve and allow water to flow until it runs clean.
3. Close the drain valve when finished flushing.
4. Turn the heater electrical disconnect switch to the ON position.

### 8.2. Draining the Tank

The heater must be drained if it is to be shut down and exposed to freezing temperature. Maintenance and service procedures may also require draining the heater.

1. Turn off the heater electrical disconnect switch.
2. Close the cold water inlet and hot water outlet valve to heater.
3. Open a relief valve to vent the tank pressure.
4. Open the heater drain valve.
5. If the heater is being drained for an extended shutdown, it is suggested the drain valve be left open during this period.

### 8.3. Sediment / Lime Scale Removal

Waterborne impurities consist of the particles of soil and sand which settle out and form a layer of sediment on the bottom of the tank and adhere to heat exchange surfaces. The amount of calcium carbonate (lime) released from water is in direct proportion to water temperature and usage. The higher the water temperature or water usage, the more lime deposits are dropped out of the water. Lime accumulation not only reduces the life of the equipment but also reduces efficiency of the heater.

### 8.4. Temperature and Pressure Relief Valve

The temperature and pressure relief valve is a safety device. The relief valve should be checked at regular intervals by manually opening the valve but no less than as directed on the instructions attached to the valve. The openings inside the valve may become blocked by a buildup of scale and could become inoperable. If the valve does not open and close properly, and does not blow off internal pressure when tested, **it must be replaced**. Shut down the heater, relieve the internal pressure and replace the relief valve with one meeting the requirements stated on the rating decal located adjacent to the relief valve mounting location.

### 8.5. Low Water Cutoff

The standard low water control is electronic. Inspection should be made of the electrode on water heaters equipped with electronic low water devices.

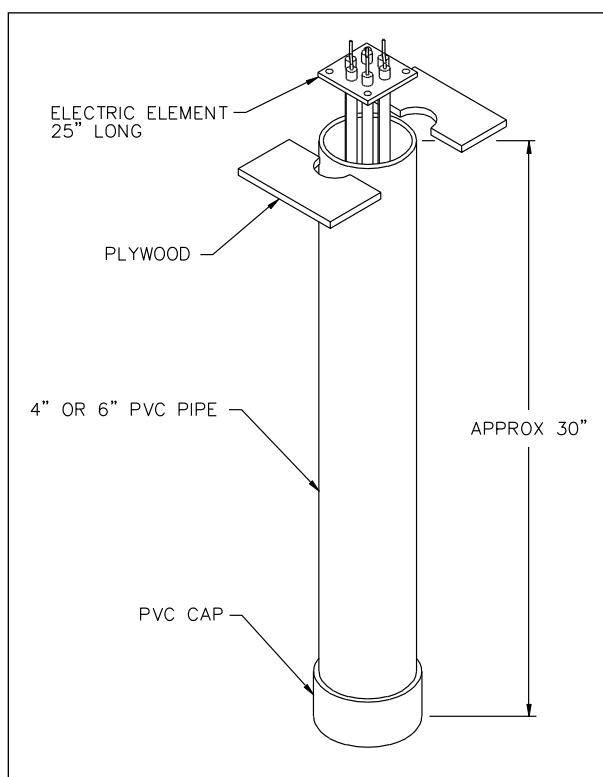
### 8.6. Electrical Connections

Check all electrical connections approximately one to two weeks after the initial start-up to ensure tightness. Heating and cooling occurring during use can loosen connections. Visually inspect wire terminal points for any discoloration on a monthly basis. Discoloration is likely due to a loose connection at the point nearest the discoloration. Check contactors periodically and clean if necessary and repair or replace pitted points caused by foreign particles. Check fuses periodically for continuity and replace if necessary with the same type and rating.

### 8.7. Cleaning Electric Elements

Electric immersion INCOLOY® sheath elements are wound at high wattage ratings and must be completely covered by water while in operation. Otherwise, these parts will overheat and burn out. Scale from the water will collect on the sheathing of the element over a period of time and must be removed periodically to extend the life of the element. Water in some areas will produce the scale buildup more rapidly than other areas. The speed of the scale buildup is also determined by the watt density of the element.

Remove and clean 80 W/in<sup>2</sup> (18kW) density elements on a monthly basis. The interval between removal and cleaning can usually be extended to six months when 40 W/in<sup>2</sup> (9kW) density elements are installed. Most installations where 20 W/in<sup>2</sup> (4 1/2kW) density elements are used require only an annual cleaning. Elements are cleaned by soaking them in a scale dissolving solution. A 30" piece of four or six inch PVC pipe with a cap on one end makes an ideal container for element cleaning. (See *Figure 8-1*) Contact a chemical supply house for guidance on the proper cleaning solution for your area.



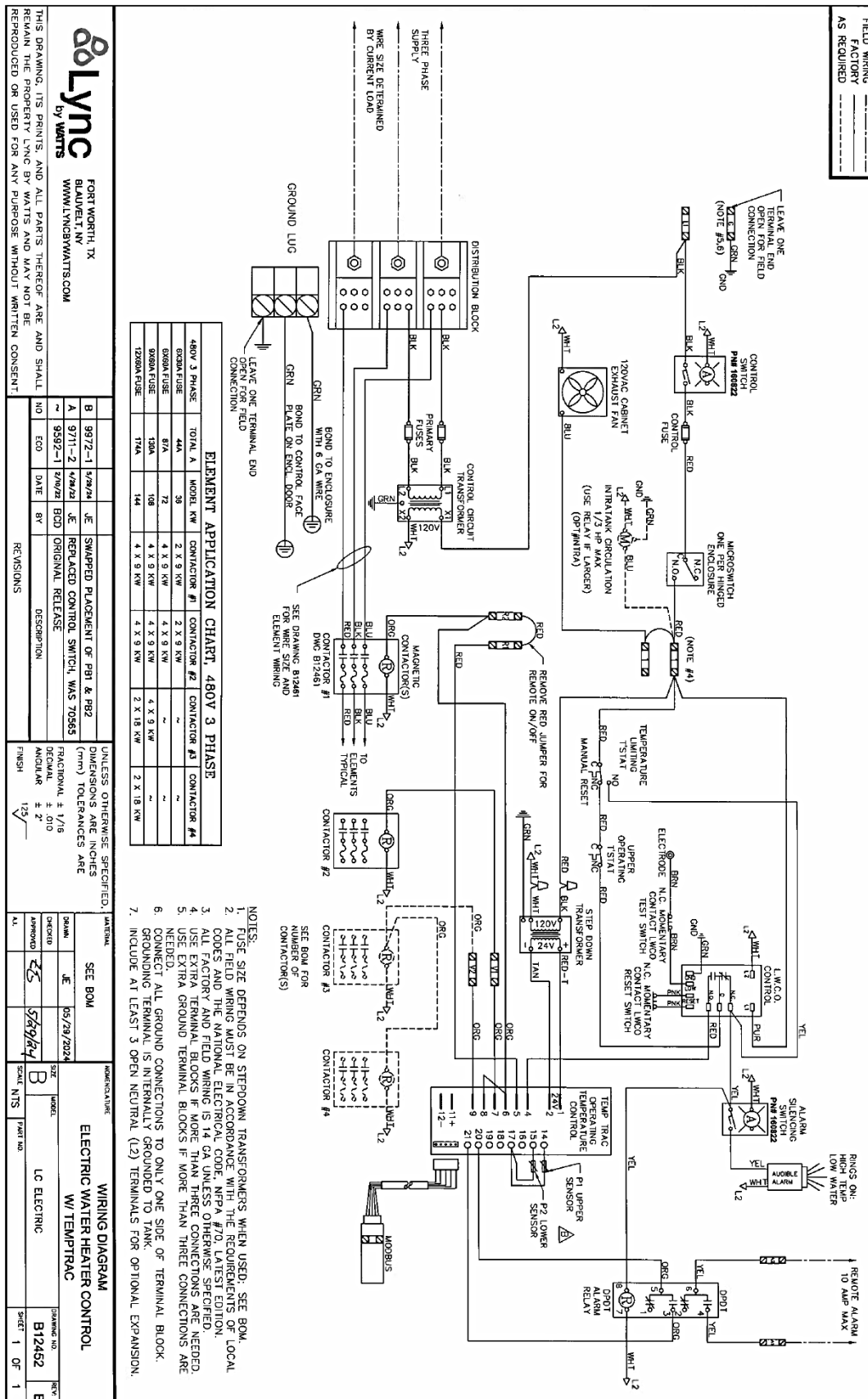
**Figure 8-1: Element Cleaner**



## 9. TROUBLESHOOTING

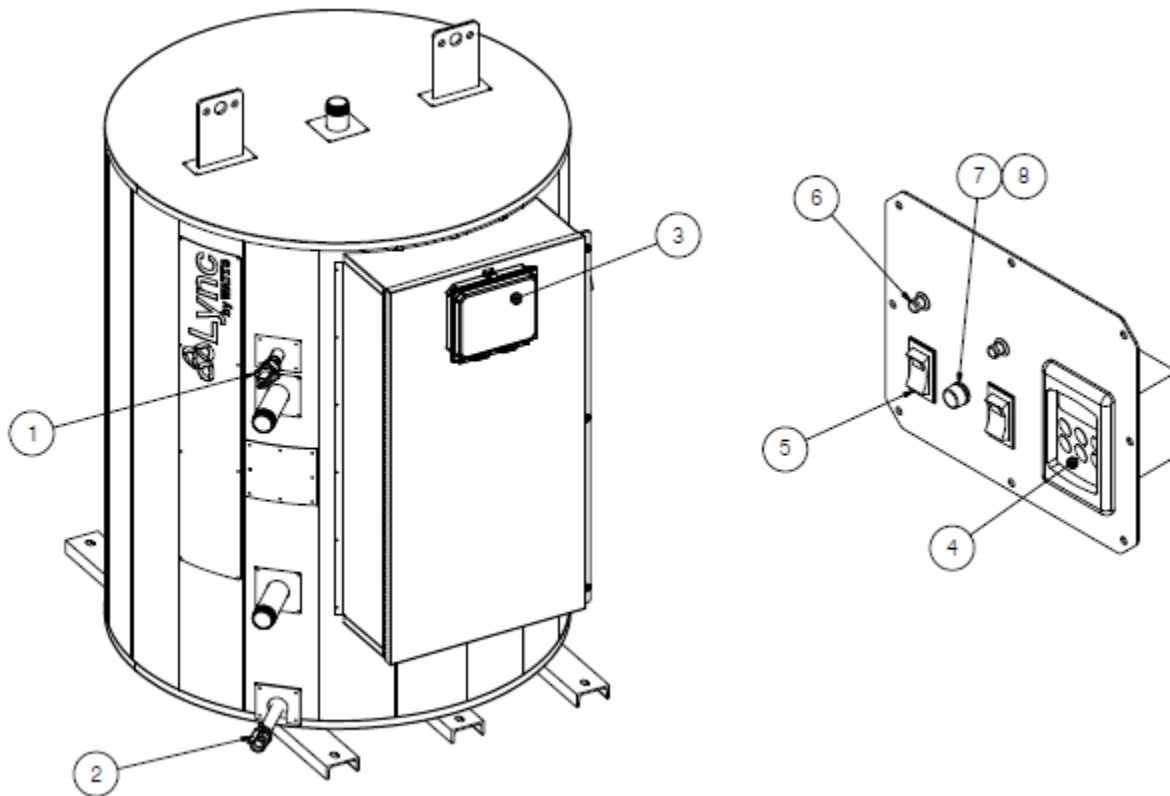
PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
<b>No hot water</b>	Thermostat(s)	Check to assure proper thermostat setting.
	Contactors will not pull in	Check continuity between all three thermostats or pressure controls. Complete circuit. If one is open, it must be replaced.
	Control circuit switch is in OFF position	Turn switch to ON position.
	Control circuit fuse blown	Isolate cause for failure and replace fuse.
	Contactor(s) coil open	Check continuity. Replace coil if not a complete circuit.
	Time delay sequencer not operating	Check for 120 volts to coil on first sequencer step. Allow ample time for additional steps to energize. If steps do not energize in reasonable time, replace only the defective relay step. See wiring diagram.
	Proportional sequencer not operating	Check for 120 volts to line connection (L) on sequencer. Check fuse for continuity. See wiring diagram. Consult factory.
	Low water cutoff closed	Check for open circuit. Check water level in tank. Replace low water cutoff if defective.
	Heating elements	Check for open legs. (See table 2).
<b>Insufficient hot water</b>	Heater not large enough to satisfy peak demands	Add booster or additional kw input. Consult local Lync representative.
	Hot water lines not insulated	Add insulation; it will protect against heat loss and save on cost of operation.
	Power fuse(s) blown	Check fuses for continuity. Replace if blown. If blown, determine cause of break before replacing with same type fuse.
	Contactor(s) not closing	Check coil for continuity. If defective, replace.
	Thermostat(s) not correctly set	Check to assure proper thermostat control setting.
	Element(s) not heating	Check for proper amperage draw. Check for proper ohm resistance. Replace if defective. Consult factory. (See pages 19 and 23)
<b>Burned or discolored wires</b>	Loose connections	Tighten all connections. If charred, replace wire with wire of same type and size.
	Dirty or pitted contactor points	Remove contactor points and inspect. If dirty, clean with emery paper. <b>CAUTION:</b> Point must remain flat. If pitted or burned, contactor points must be replaced.
<b>Blown fuses</b>	Loose connection. Defective element	Check all connections for tightness. Check ohm resistance in electric elements. Replace.
<b>High or low voltage</b>	Local utility	Check with local utility.
<b>High or low amperage</b>	High or low voltage. Defective element	Check with local utility. Low amperage, check fuses, tighten connections. Check ohm resistance on elements.
<b>Wire burned or melted at element</b>	Loose connections. Water leaking on elements	Tighten connection and replace wire. Isolate leaking water and repair. Replace wire with same type and size.

## 10. WIRING DIAGRAM



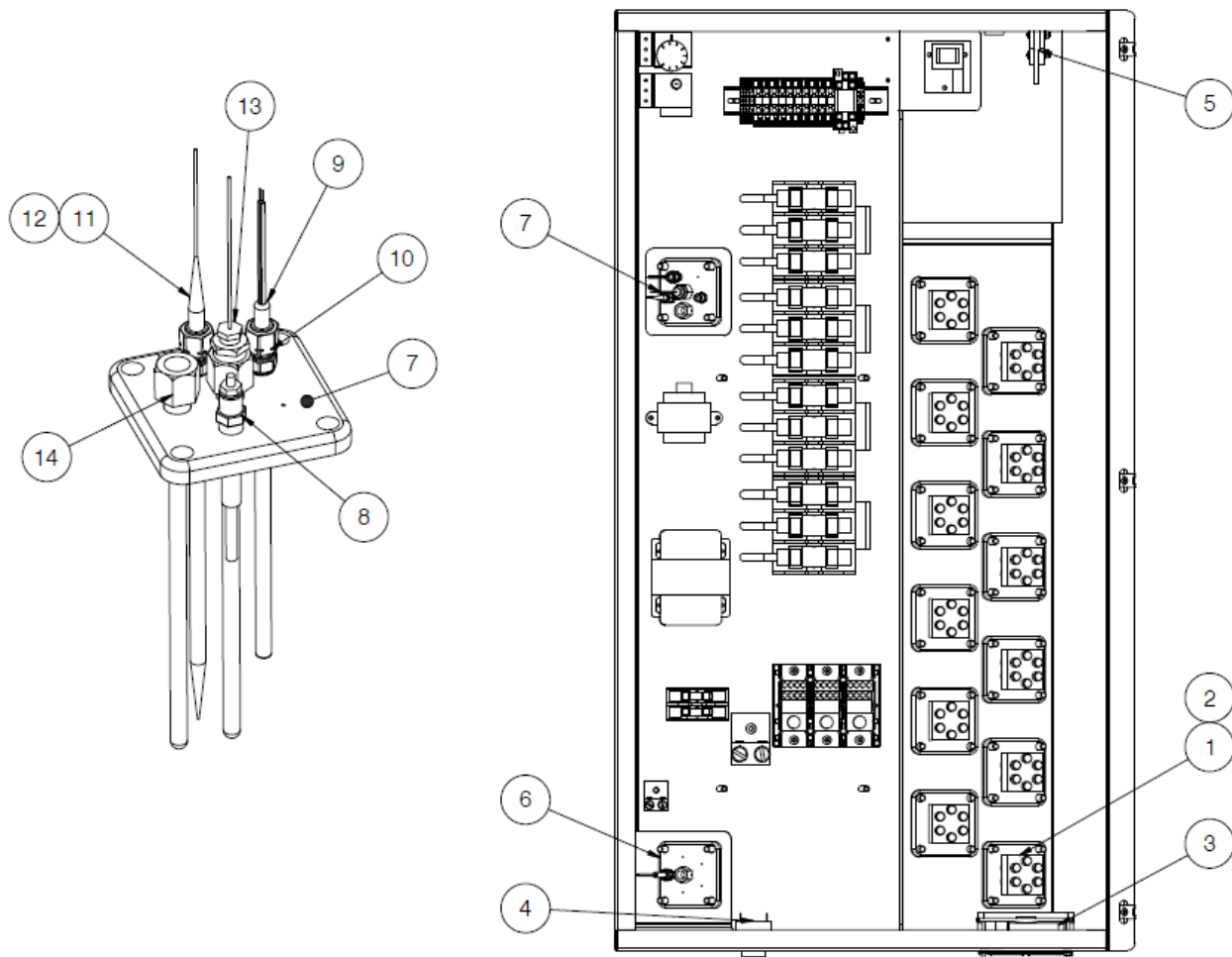
## 11. REPLACEMENT PARTS

### 11.1. Drain Valve, T&P Relief Valve, and Control Face Panel



ITEM	DESCRIPTION	250 GALLON	500 GALLON
1	VALVE,T&P RELIEF 1 WATTS LF140X9 150-210 1 150 PSI	155571	155571
2	VALVE,BALL WATTS BRASS THREADED	122394	122396
3	ENCLOSURE, HMI CLEAR COVER 10 X 8 X 2 ALLIED MOULDED	159468	159468
4	TEMP CONTROL PRG TTRAC LYNC ELECTRIC	157090	157090
5	SWITCH,CARLING #LTILA51-6S-BL-AM-NBL-125N/INDP BLACK	70565	70565
6	SWITCH,SPST N.C. 15A MOMENTARY CONTACT SELECTA	70573	70573
7	FUSEHOLDER,PANEL TYPE #HTB-28I	5613	5613
8	FUSE,MDA 15 AMP BUSS 250V	5742	5742

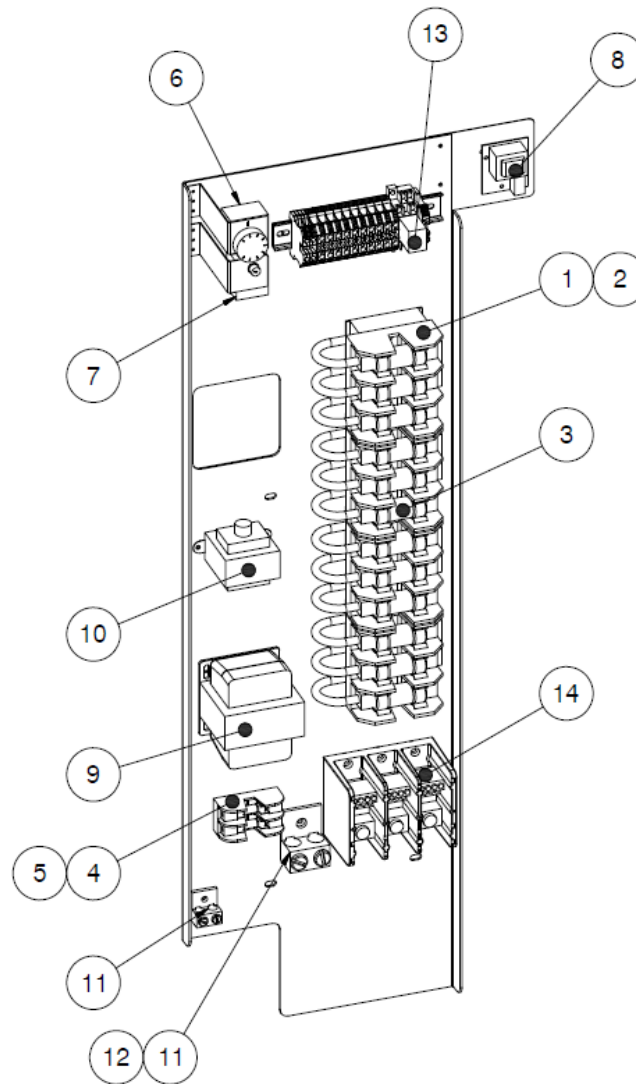
## 11.2. Elements, Control Flanges, and Box-Mounted Components



ITEM	DESCRIPTION	36 kW	72 kW	108 kW	144 kW
1	ELEMENT,9KW 480V 3 PHASE STUD UL1030 O-RING FLANGE	40350	40350	40350	40350
2	ELEMENT,18KW 480V 3 PHASE STUD UL1030 O-RING FLANGE				40347
3	FAN,COOLING DAYTON #2RTK6 BALL BEARING	160570	160570	160570	160570
4	ALARM,AUDIBLE INGRAM #PB120A BLACK NEMA 4X 120V	151343	151343	151343	151343
5	SWITCH,MICRO #BZ2RW80-A2	5765	5765	5765	5765
6	FLANGE,MTG BRONZE 1/4 X 1/8 NPT 2 HOLE TAPPED	126545	126545	126545	126545
7	FLANGE,MTG BRONZE 1/4 (2EA) & 1/8 (3EA) NPT 5H TAPPED	129256	129256	129256	129256
8	PROBE,LWCO WARRICK #3L1D002.75 W/1/8 MPT 316 SST	58154	58154	58154	58154
9	PROBE,THERMOSTAT DIXELL #7018110 12SS-NTC-4.5M	139779	139779	139779	139779
10	CONNECTOR, 1/8 MPT X 1/4 COMPRESSION BORED	73227	73227	73227	73227
11	THERMOSTAT,OPERATING 75-194F 3' CAPILLARY 7" LONG	151679	151679	151679	151679
12	FERRULE,6MM BRASS PER VENDOR DWG #001	73228	73228	73228	73228
13	THERMOSTAT,MANUAL RESET HIGH LIMIT WITH FAIL SAFE	151681	151681	151681	151681
14	THERMO-WELL,BRASS 1/4 NPT OD 1/4 NPT ID 175MM LENGTH	156471	156471	156471	156471

**NOTE:** Items 1 and 2 have the part number stamped on the bronze flange.

### 11.3. Control Panel Components



ITEM	DESCRIPTION	36 kW	72 kW	108 kW	144 kW
1	CONTACTOR,SQUARE D	156704	116601	116601	116601
2	FUSEHOLDER,SQUARE D	116603	116602	116602	116602
3	FUSE, FERRAZ SHAWMUT	51542	5743	5743	5743
4	BLOCK,FUSE FERRAZ SHAWMUT #30312 2 POLE 30A 600V	5529	5529	5529	5529
5	FUSE,ATQR2 2 AMP FERRAZ SHAWMUT	15737	15737	15737	15737
6	THERMOSTAT,OPERATING 75-194F 3' CAPILLARY 7" LONG	151679	151679	151679	151679
7	THERMOSTAT,MANUAL RESET HIGH LIMIT WITH FAIL SAFE	151681	151681	151681	151681
8	LWCO,PROTODESIGN #LW-3-C-1-A-03-C 120V REV12312015	129013	129013	129013	129013
9	TRANSFORMER,CONTROL GE #9T58K0045 .150KVA 230/460	63079	63079	63079	63079
10	TRANSFORMER,STEP DOWN DAYTON #4VZE5G 40 VA 120-4V	140177	140177	140177	140177
11	LUG,GROUND IHI #2S2/0 2/0-4AWG	107460	107460	107460	107460
12	LUG,GROUND IHI #2S250 4/0-6AWG				160196
13	RELAY,DPDT 10A 120V OMRON #LY2-AC110/120 SQUARE	76488	76488	76488	76488
14	BLOCK,DISTRIBUTION BUSSMAN	151055	151055	151055	151054

