

# INSTALLATION AND OPERATION MANUAL

# E3T

*Electric 3-Series Titanium*



## Electric Heater

### MODELS

**SPA ELS 0005 and ELS 0011**

**POOL ELS 0018 and ELS 0027**



**Intertek**  
4000856

Tested to UL Standard 1261

**FOR YOUR SAFETY:** Do not store or use gasoline or other flammable vapors and liquids or other combustible materials in the vicinity of this or any other appliance. To do so may result in an explosion or fire.

**NOTE:** The instructions in this manual are for the use of qualified individuals specially trained and experienced in the installation and maintenance of this type of equipment and related system components. Installation and service personnel are required by some states to be licensed. Persons not qualified shall not attempt to install, service, or maintain this equipment.

This manual should be maintained in legible condition and kept adjacent to the heat pump pool heater or in a safe place for future use.

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**Revision 2 reflects the following changes:**

Updated the "Breaker Amperage" on Tables B and C, page 7.

Updated Wiring Diagrams on page 11.

# 1. WARNINGS

## Pay Attention to These Terms

<b>DANGER</b>	Indicates the presence of immediate hazards which will cause severe personal injury, death or substantial property damage if ignored.
<b>WARNING</b>	Indicates the presence of hazards or unsafe practices which could cause severe personal injury, death or substantial property damage if ignored.
<b>CAUTION</b>	Indicates the presence of hazards or unsafe practices which could cause minor personal injury or product or property damage if ignored.
<b>NOTE</b>	Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

**WARNING:** Do not use this heater if any part has been under water. Immediately call a qualified service technician to inspect the heater and to replace any part of the control system which has been under water.

**WARNING:** To minimize the possibility of improper operation, serious personal injury, fire, or damage to the heater:

- Always keep the area around the heater free of combustible materials, gasoline, and other flammable liquids and vapors.
- Heater should never be covered or have any blockage to the flow of fresh air to the heater.

**EFFICIENCY TESTING NOTICE:** For purposes of verifying or testing efficiency ratings, the test procedure in Title 10 APPENDIX P to Subpart B of Part 430 (Uniform Test Method for Measuring the Energy Consumption of Pool Heaters).

**WARNING:** Risk of electrical shock. More than one disconnect switch may be required to de-energize the equipment before servicing.

## 2. WATER CHEMISTRY

**CAUTION: Corrosive water voids all warranties**

For your health and the protection of your pool equipment, it is essential that your water be chemically balanced. The levels shown in **Table A** must be used as a guide for balanced water.

### Pool/Spa Water Chemistry

Occasional chemical shock dosing of the pool or spa should not damage the heat exchanger providing the water is balanced. Automatic chemical dosing devices and salt chlorinators are usually more efficient in heated water. If not controlled, they can lead to high chemical levels which can damage the heat exchanger.

Further advice should be obtained from your pool or spa builder, accredited pool shop, or chemical supplier for the correct levels for your water.

### Automatic Chlorinators and Chemical Feeders

All chemicals must be introduced downstream of the heater and completely diluted into the water before being circulated through the heater.

Chlorinators must feed downstream of the heat exchanger and have an anti-siphoning device or check valve to prevent chemical back-up into the heat exchanger when the pool filtration pump is shut off.

**CAUTION: High chemical concentrations from feeders that are out of adjustment will cause rapid corrosion of the heat exchanger. Such damage is not covered under the warranty.**

**CAUTION: Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH, or other chemical imbalance is not covered under the warranty.**

Water Chemistry	Allowable Levels
Water Temperature	68-104°F (20-40°C)
pH	7.6-7.8
Total Alkalinity (ppm)	80-120
Calcium Hardness (ppm)	200-400
Salt (ppm)	4500 Maximum
Free Chlorine (ppm)*	2-3
Total Dissolved Solids (ppm)	3000 Maximum**

\*Free Chlorine **MUST NOT EXCEED 5 ppm!**

\*\*In saltwater chlorinated pools, the total TDS can be as high as 6000 ppm.

**Table A. Spa and Pool Water Chemistry**

## 3. SAFETY INFORMATION

Pool water temperatures typically range from 78°F (26°C) to 82°F (28°C). The American Red Cross recommends a temperature of 78°F (26°C) for competitive swimming. However, this may be too cool for young children and the elderly, who may require a temperature of 80°F (27°C) or higher.

## 4. OVERVIEW

Congratulations on the purchase of the most advanced spa/pool heater in the market. To get the best performance and savings from your new heater, it is important to install the heater in accordance with our instructions and the electrical, plumbing codes applicable to your area.

If you have any questions, please contact your Authorized Dealer, or visit our website at [www.raypak.com](http://www.raypak.com).

### READ AND FOLLOW ALL INSTRUCTIONS GIVEN IN THIS MANUAL.

The water in a spa or pool should never exceed 104°F (40°C). A water temperature in excess of 104°F (40°C) is considered unsafe for all persons. Lower water temperatures are recommended for extended use (exceeding 10-15 minutes) and for young children.

Excessive water temperatures have a high potential for causing fetal damage during the early months of pregnancy. Pregnant or possibly pregnant women should limit spa or pool water temperatures to 100°F (38°C).

Before entering a spa or pool, the user should measure the water temperature at several locations using an accurate thermometer since the tolerance of water temperature - regulating devices may vary as much as +/- 5°F (3°C)

Alcohol, drugs or medication should not be used before or during spa or pool use since their use may lead to unconsciousness with the possibility of drowning.

Persons suffering from obesity or with a medical history of heart disease, low or high blood pressure, circulatory system problems, or diabetes should consult a physician before using a spa or pool.

Persons using medication should consult a physician before using a spa or pool since some medication may induce drowsiness while other medication may affect heart rate, blood pressure and circulation.

Prolonged immersion in hot water may induce hyperthermia. Hyperthermia occurs when the internal temperature of the body reaches a level several degrees above normal body temperature of 98.6°F (37°C).

The symptoms include dizziness, fainting, drowsiness, lethargy and an increase in the internal temperature of the body. The effects of hyperthermia include: Unawareness of impending hazard, failure to perceive heat, failure to recognize the need to exit spa or pool, physical inability to exit spa or pool, fetal damage in pregnant women and unconsciousness resulting in a danger of drowning.

## 5. BEFORE INSTALLATION

Please read these instructions thoroughly and completely before installation and before use. Failure to do so could cause property damage or serious personal injury or death and void your warranty.

By installing this product, you acknowledge the terms of the manufacturer's warranty and your Authorized Dealer's return policies. The heaters that have been installed cannot be returned. If you have any questions regarding the warranty or product return policies, please consult your Authorized Dealer prior to installation.

Open the box and carefully unpack the heater. Inspect all components.

- Electrical Heater
- Installation and Operation Manual

## 6. INSTALLATION

The heaters are designed for indoor and outdoor use. All units must be mounted on a level base parallel to the ground. Secure the unit to the base with screws (not provided).

**CAUTION: Combustible materials should be kept at least 24" (610 mm) away from the heater.**

Recommended Clearances:

**TOP: 18" (457 mm)**

**SIDES: 6" (152 mm) away from your heater and the outlet hot water pipe.**

## 7. WATER CONNECTION

Please follow all plumbing instructions carefully. This product must be installed by a licensed and qualified plumber in accordance with all applicable national, state, provincial, and local plumbing codes.

**IMPORTANT: When preparing the connections going to unit, make sure you do not use glue or putty. Any glue or putty going into the unit will damage the flow sensor permanently. Prior to the final connections to the unit, flush all the lines to clear any debris.**

**NOTE: When using two-speed pumps, do not install a gate valve on the inlet. No shut-off valves are to be installed in the piping between the spa heater outlet and the spa. If using an in-line chlorinator, a check valve must be used. Any chlorinator valves that can cause return line blockage will VOID the warranty.**

- Spa/pool heater must be installed after installation of the filter.
- **Spa models** (ELS 0005 and 0011) are supplied with 1-1/2" NPT inlet and outlet plumbing connections.

- **Pool models** (ELS 0018 and 0028) are supplied with 2" NPT inlet and outlet plumbing connections.
- All models are rated 240V single phase.
- Units are flow activated.
- No Hartford loop is required.

After tightening both fittings at the water heater, start the pump to allow water to run through the spa/pool heater for at least 5-10 minutes. This process purges all the air from the water lines and must be performed prior to turning on the power at the unit.

**CAUTION: Failure to follow this step can cause permanent damage to the heating elements.**

When any maintenance is performed on the spa/pool that may introduce air into the plumbing pipes, it is important to turn the power off to the spa/pool heater and purge the air out of the lines before allowing the unit to power up.

## Dry-Firing of Elements

Dry-firing of elements is caused by water voids when power is on. All air must be purged from the system before any heat start-up. It is important to purge all air after cleaning or changing a cartridge filter. The filter casing acts as an air reservoir during this procedure, the circulation system must be on for at least two (2) minutes before you turn power on to this unit.

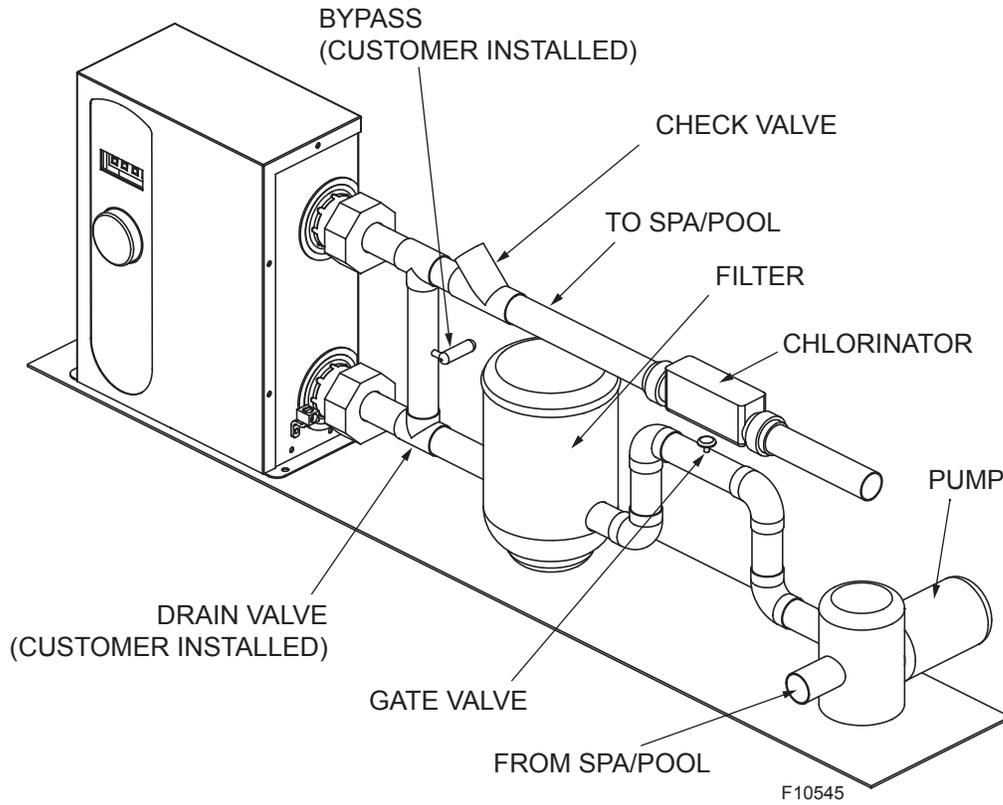
The heater must have an adequate flow of water for proper operation. Adequate water flow removes the heat produced by the heater and transfers the heat to the spa/pool and prevents overheating. Low water flow usually results from dirty filter or improperly adjusted manual bypass.

The heater is designed to run at a minimum flow rate of 15 gpm and maximum of 60 gpm. A manual bypass valve is needed when the flow rate exceeds 60 gpm.

Unit will not energize elements if the water flow is under 15 gpm. Once 15 gpm has been established, the heating elements will energize 1 minute after flow is configured. This is to make sure the tank is completely filled with water and any air in the tank has had time to escape.

**CAUTION: The unit's supporting base must be high enough to keep completely free of standing water at all times.**

**RAIN WATER RUN OFFS.** The unit is designed to operate outdoors and can be exposed to rain. However, rain water run-off falling directly onto the unit from a roof can cause damage and/or shorten the life of your unit. This may also void your warranty. Install rain gutters or rain diverters on your roof if the unit is installed in a position where contact with rain run-off may occur.



**Figure 1. Spa/Pool Installation Diagram**

## 8. ELECTRICAL CONNECTIONS

**WARNING:** Please read these instructions thoroughly and completely before installation and before use. Failure to do so could cause property damage or serious personal injury, or death and void your warranty.

**WARNING:** Risk of electrical shock. More than one disconnect switch may be required to de-energize the equipment before servicing.

This product must be installed by a licensed and qualified electrician in accordance with Article 680 of the National Electrical Code, NFPA 70 and with the requirements of the authority having jurisdiction and all applicable national, state, provincial, and local electrical codes. As with all electrical appliances, under no circumstances should you attempt to install, repair or disassemble this pool/spa heater without first shutting off all power to the unit directly at the fuse or breaker box.

**WARNING:** Serious bodily injury or death could occur if you ignore shutting off all power to the unit at the fuse or breaker box.

All wiring (wire gauge) and circuit protection (breakers) must comply with the U.S. National Electrical Code (NEC) in the U.S.A., or the Canadian Electrical Code (CEC) in Canada.

Failure to do so could result in property damage and/or personal injury, and void your warranty.

**NOTE:** The Canadian Electrical Code generally requires that all supply wires and corresponding circuit protection (breakers) used for hot water heating applications be sized to a minimum of 125% of the maximum current rating of the heater (see model specifications below for details).

Before installing this product, ensure that the home has sufficient electrical power available to handle the maximum amperage load of the applicable model. **All units have one (1) minute time delay on start.** The unit will not energize the elements until 15 gpm is established.

A separate ground conductor for each incoming circuit is required.

**CAUTION:** Make sure that the electrical connections are correct and all wire connections are tight and secure. Make sure that the correct breaker size and wire gauge has been used. Make sure that the unit has been connected to a ground in accordance with applicable codes.

Properties	Models			
	SPA 0005	SPA 0011	POOL 0018	POOL 0027
Elements	1	2	2	3
Voltage	240 V	240 V	240 V	240 V
Frequency (HZ)	60	60	60	60
Power (kW)	5.5	11	18	27
Each Supply (kW)	5.5	5.5 (Qty 2)	9 (Qty 2)	9 (Qty 3)
Required Breaker (min/max)	30/30 AMPS	60/60 AMPS	40/50 AMPS (Qty 2)	40/50 AMPS (Qty 3)
Electrical Service	100 AMPS	150 AMPS	150 AMPS	200 AMPS

Table B. Electrical Specification

Properties	Models			
	SPA 0005	SPA 0011	POOL 0018	POOL 0027
Wire Gauge	#10	#6	#8	#8
Wire Set	1	1	2	3
Breaker Amperage	30	60	40/50	40/50
Breaker Type	Double Pole	Double Pole	Double Pole	Double Pole
Breaker Quantity	1	1	2	3

Table C. Circuit Breaker Specification

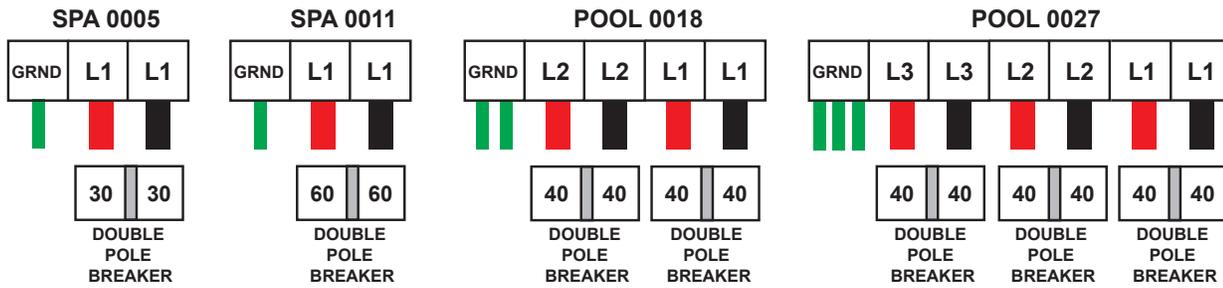


Figure 2. Wire Connection to Circuit Breakers

## 9. OPERATION

Once the spa/pool heater is installed, it can be used year round. The user **MUST** make sure the pump is not disengaged to allow it to run until the desired temperature setting is reached.

The unit will function only when there is sufficient flow through it (15 gpm minimum). On the digital control panel shown in Figure 3, press and hold the knob for five (5) seconds to check the flow rate in the unit.

The unit also has a one (1) minute built-in TIME DELAY to protect it from air in the lines and to avoid burning out the elements as a result of it. When the unit senses sufficient water flow it will automatically activate.

## 10. CONTROL

Turn the control knob to set your desired spa/pool temperature. When the set temperature is reached the heater will go to idle and consume no energy.

### Digital Control Temperature Setting

The heater comes with a digital temperature control located in the front panel that can be easily set from 40°-104°F (4°C-40°C) in one (1) degree increments by a simple turn of the knob.

The heater can be turned OFF by pushing the control knob once.

Hold the knob for three (3) seconds to switch from Fahrenheit to Centigrade.

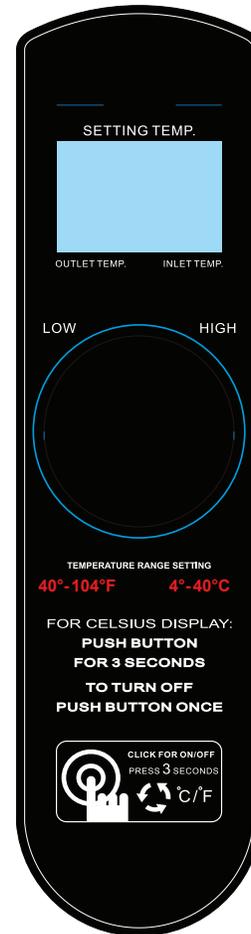


Figure 3. Digital Control

Code	Description	Action
E1	Inlet sensor has a short	No functions from all buttons, no heat. Need to replace sensor.
E2	Outlet sensor has a short	No functions from all buttons, no heat. Need to replace sensor.
E3 for 27 kW units only	Chamber #1 sensor short.	The heater will continue to operate, continues to heat.
E4 for 27 kW units only	Chamber #2 sensor short.	The heater will continue to operate, continues to heat.
E5	Remote wiring is in use. The master external controller is not calling for heat.	The heater will not heat until the master control has a call for heat.

Table D. Fault Codes

150K Inlet/Outlet Sensor	
Temp °F/°C	ResistanceΩ
32 (0)	491399.3
41 (5)	384009.2
50 (10)	303720
59 (15)	242375.9
68 (20)	191172
77 (25)	150000
86 (30)	122049
95 (35)	97403.8
104 (40)	77394
113 (45)	61780.2
122 (50)	49539.7

10K Sensor for POOL 0027 Models only	
Temp °F/°C	ResistanceΩ
32 (0)	31537
41 (5)	24783
50 (10)	19587
59 (15)	15568
68 (20)	12443
77 (25)	10000
86 (30)	8080
95 (35)	6563
104 (40)	5359
113 (45)	4398
122 (50)	3628

SPA 0005, SPA 0011, and POOL 0018 - Use 2 sets 150K sensor for Inlet/Outlet  
 POOL 0027 - Use 2 sets 150K sensor for Inlet/Outlet with additional 2 10K Sensors

**Table E. Spa/Pool Sensor Resistance**

## 11. TROUBLESHOOTING

Problem	Cause	Solution
Nothing happens when the thermostat is turned on	Low flow.....	1. Check filter, skimmer basket, pump. 2. If a 2-speed pump is used, turn to high speed. 3. Press and hold the knob for 5 seconds. Make sure the flow rate displayed on screen is at least 15 gpm.
	High limit.....	Push the reset button.
	Thermostat not calling for heat.....	Turn thermostat to higher temperature.
It takes a long time to heat the spa	Low input voltage.....	Call the electric company.
	Undersized heater.....	Calculate temperature in Heat rise °/hr.= Heater input (kw) x 410 divided by spa gallonage (This does not take into account heat loss due to weather).
	Heat loss from poor weather conditions (cold, high winds).....	Use spa cover.
	Defective heating element.....	Call an electrician.
Spa does not reach temperature	Low flow.....	Check filter, skimmer basket, pump.
Heating element continuously burning out	High input voltage.....	Call the electric company.
	Poor water chemistry.....	See Water Chemistry on page 4.
	Heating element split open.....	Over-acid condition. Watch pH, add acid slowly.
Fuses blow or circuit breaker opens	Shorted heating elements.....	Replace element.
	Undersized wire.....	Replace field wiring.

# 12. WIRING DIAGRAMS

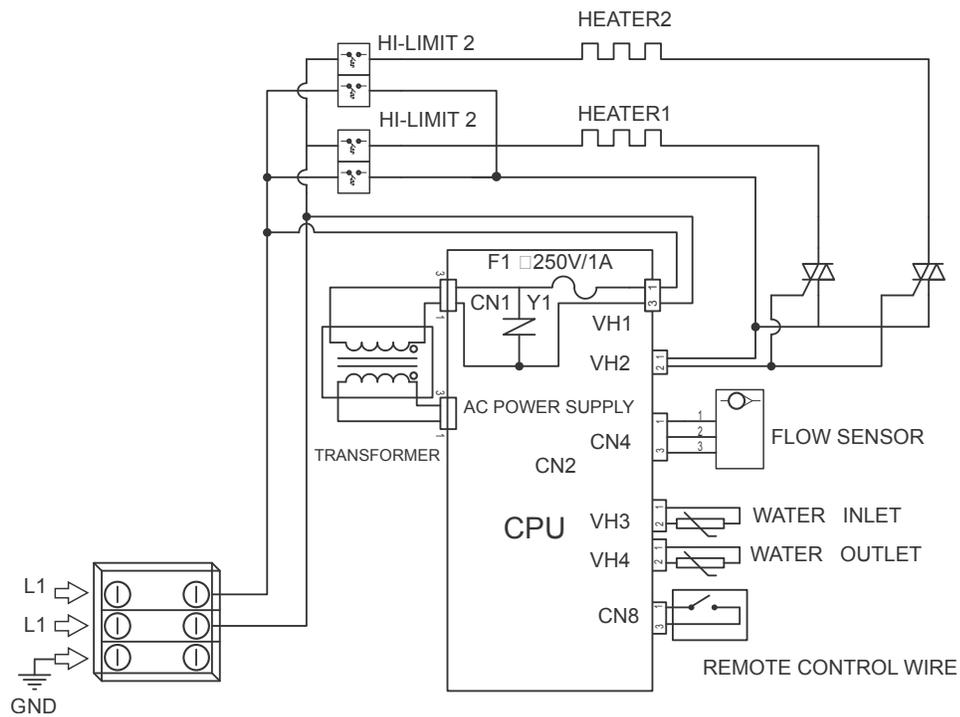


Figure 4. Spa Wiring Diagram

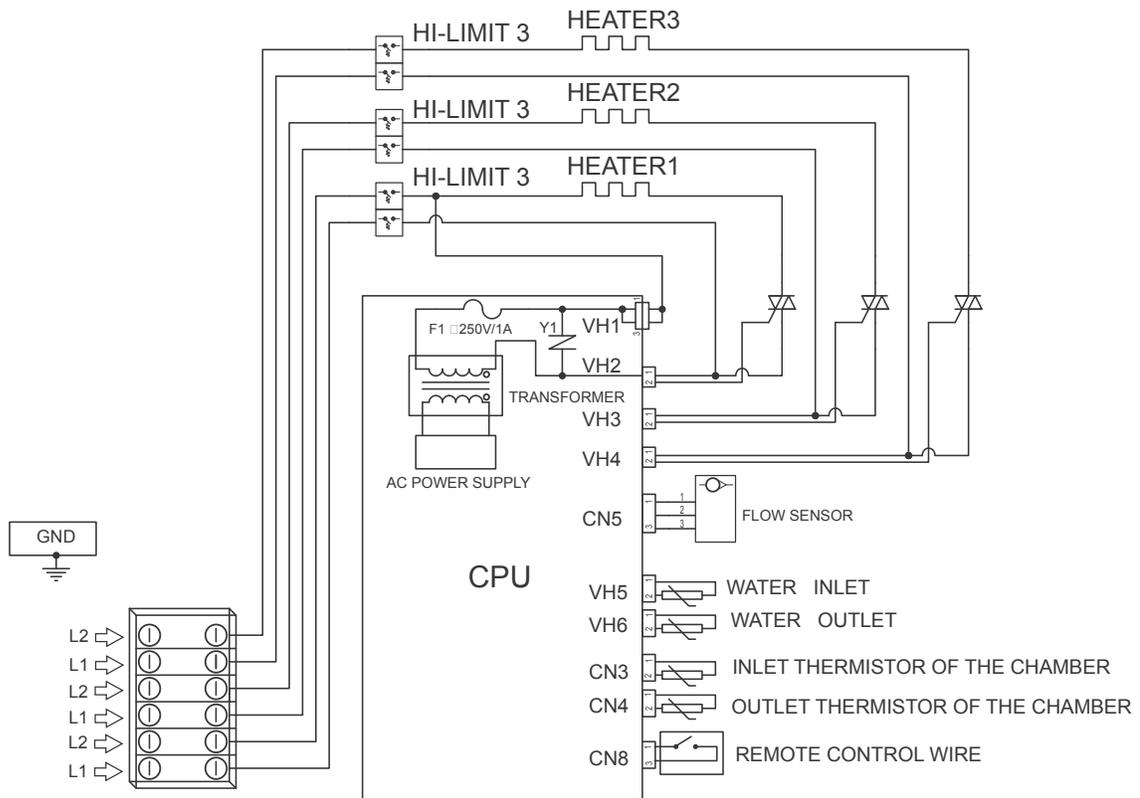


Figure 5. Pool Wiring Diagram



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