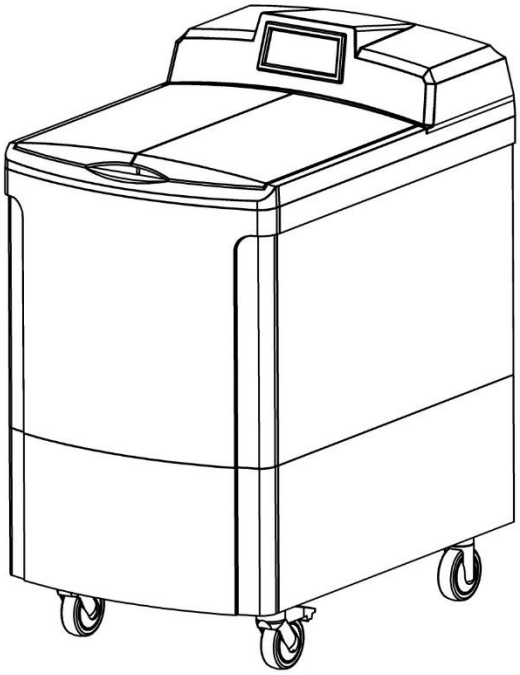
sca3600



Repair Manual

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Table of Contents

I. Preliminary Steps

Follow these steps before attempting to service the SCA

Power off and disconnect the SCA from the main power.

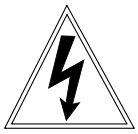
Allow the SCA to cool completely.

Attach a hose to the front valve and drain the tank completely.

Always disconnect the SCA from the main power and drain the tank completely before servicing.

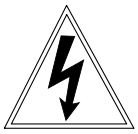
II. Quick Troubleshooting

The SCA has been designed to allow the end user to resolve most operating problems. When a problem is encountered, please read through this repair manual. If a resolution is not found in this manual, please contact technical support.



High Risk of Electrical Shock

Always disconnect the unit from power before removing any cover!



Problem	Probable Causes	What to Do
No Power to SCA	Power switch is not “On”	Press rocker switch on the back of the unit to the “On” position (LED lit).
	Power cord is not connected to unit or wall	If the power switch LED is not lit when the power rocker switch is turned on, check the power cord, and make sure it is pushed all the way into the receptacle on the system and is securely connected to a grounded wall socket. Check the power at the outlet. Check your building circuit breakers, and any power circuit that the unit is plugged into for a tripped circuit breaker or blown fuse. Reset or replace the breaker or fuse as required.
	Fuse is blown	With the power disconnected, check the continuity of F1, F2 (both mounted to the chassis) and FB1 and FB2 (both on the PCB).
	Thermal Cutoff Switch (TCO) is tripped or defective	A resettable Thermal Switch located on the back wall of the tank removes power from the SCA if the temperature of the bath exceeds 90ºC. Wait for the bath temperature to cool to < 80º C. Reset TCO, or ohm out TCO (**See Check the Continuity of the Thermal Cutoff Switch Section XII E pg. 44**).
	PEM Defective	(**See Check the Continuity of the PEM Section XII E pg. 45)**

Problem	Probable Causes	What to Do
Pump will not start, SCA is powered up, display panel is lit.	Timer has not been set and started	The system will only run when the timer is counting down. Check the timer display on the control panel. If it is not counting down, press the ⏻ button. If the time being displayed is 00:00, then add time and start the system as described in the User Manual.
	Pump is defective	(**See Measure the Pump Motor Resistance Section XII A-3 pg. 27**).
	Run Capcitor is defective	(**See Test the Pump Motor Run Capacitor Section XII A-5 pg. 30**).
	PCB is defective	(**See Test the Input Voltage to the Pump Motor Section XII A-4 pg. 28**).
	Control Panel is defective	(**See Check the Pump Motor Enable Signal Section XII A pg. 27**).

Problem	Probable Causes	What to Do
Warning Indicator  Flashing High Water  or Low Water  Indicator flashing	Liquid level is too high or too low, audible alarm sounding	Check if the indicator lights are flashing on the right side of the Display Control Panel. Press the Silence Alarm Button. If either level indicator is still flashing, add or remove water from the tank. If the indicator stops flashing, the level sensors are satisfied and normal operation can resume by pressing the Start Button ⏻. ALWAYS WEAR PROTECTIVE GLOVES AND EYEWEAR WHEN ADDING OR REMOVING LIQUID FROM THE TANK.
	Basket is raised or lowered too quickly	If the basket is lowered into or raised out of the cleaning solution too quickly, the solution does not fill or empty out fast enough to maintain even water level throughout the tank. This causes a temporary high or low water level condition. Press the Silence Alarm Button. If either level indicator is still flashing, add or remove water from the tank. If the indicator stops flashing, the level sensors are satisfied and normal operation can resume by pressing the Start Button ⏻.
	Float movement is impeded by buildup on shaft	Remove float (**See How to Remove the Sensor Assembly Section V-A pg. 13**) and inspect. If there is a buildup on the shaft that inhibits the free up and down motion of the float, clean off the shaft. A soft scrub pad can be used to remove any buildup on the shaft. Ensure the float moves freely from the bottom to the top of the shaft.
	Water level sensor is defective	(**See Water Level Sensor Troubleshooting Section XII D pg. 39**).

Problem	Probable Causes	What to Do
Warning Indicator  Flashing Error Code Displayed Audible Alarm	Internal Error	Sensor failure, power supply failure, or pump failure. (**See Error Codes Section XIII A pg. 50**). **Error Codes:** *EP = Pump motor current fault *EH = Heater current fault ES = 12VDC out of range, power supply error EO = Over temperature r1 = Temperature sensor failure r2 = High level sensor failure r3 = Low level sensor failure *Only displayed on the original controllers *without* the "No Heat" option
Not Heating, Over Heating, Not reaching set temperature.	Heater elements have failed	(**See Heating Element Troubleshooting Section XII B pg. 32**).
	Temperature sensor is defective	(**See Temperature Sensor Troubleshooting Section XII C pg. 36**).
Parts take longer than normal to dissolve support material. White deposits noticeable on dark-colored parts.	The cleaning solution is likely saturated with support material.	Drain the tank and add fresh water and cleaning solution as described in the User Manual. Generally, if using WaterWorks, when the PH balance of the bath reaches 11.5, the effectiveness of the dissolution drops dramatically.
	Type of cleaning agent.	If using Eco Works, try switching to Waterworks. Both are sold by Stratasys resellers. Waterworks is a more efficient cleaning concentrate.
The flow in the tank appears less than normal.	Nozzle not latched, angle is wrong, missing or broke O-Ring.	Remove the nozzle and inspect. The nozzle will not latch correctly if the O-Ring is not present or is damaged. Ensure the nozzle is rotated to the correct angle. (**See Figure 8, pg. 15**).

III. Removing Top Cover and Back Panel

A. How to Remove the Back Panel

1. **Remove the Back Panel**
    a. With the SCA unplugged from power, remove the two screws on the top center and bottom center of the panel.
    b. Loosen the remaining six M4 screws around the outside edges.
    c. Push up on the back panel and remove.

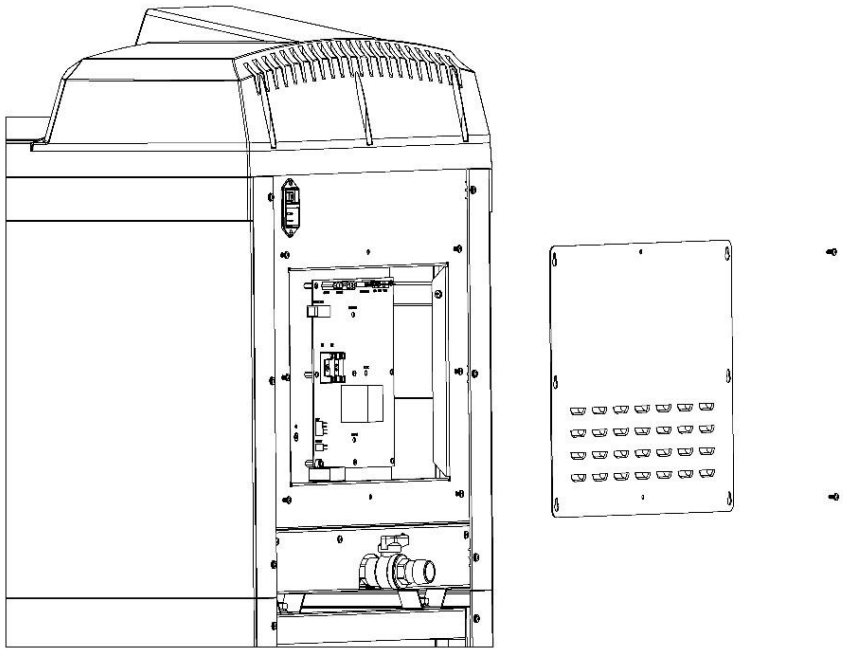


Figure 1 – Removing the Back Panel

B. How to Remove the Top Cover

1. **Remove the Top Cover**
    a. With the SCA unplugged from power, remove the J6 display ribbon cable from the PCB.
    b. Remove the three M5 screws holding the top cover to the SCA.
    c. Carefully remove the cover by pushing lightly on the back of the cover, ensure the J6 ribbon cable does not snag on any components.

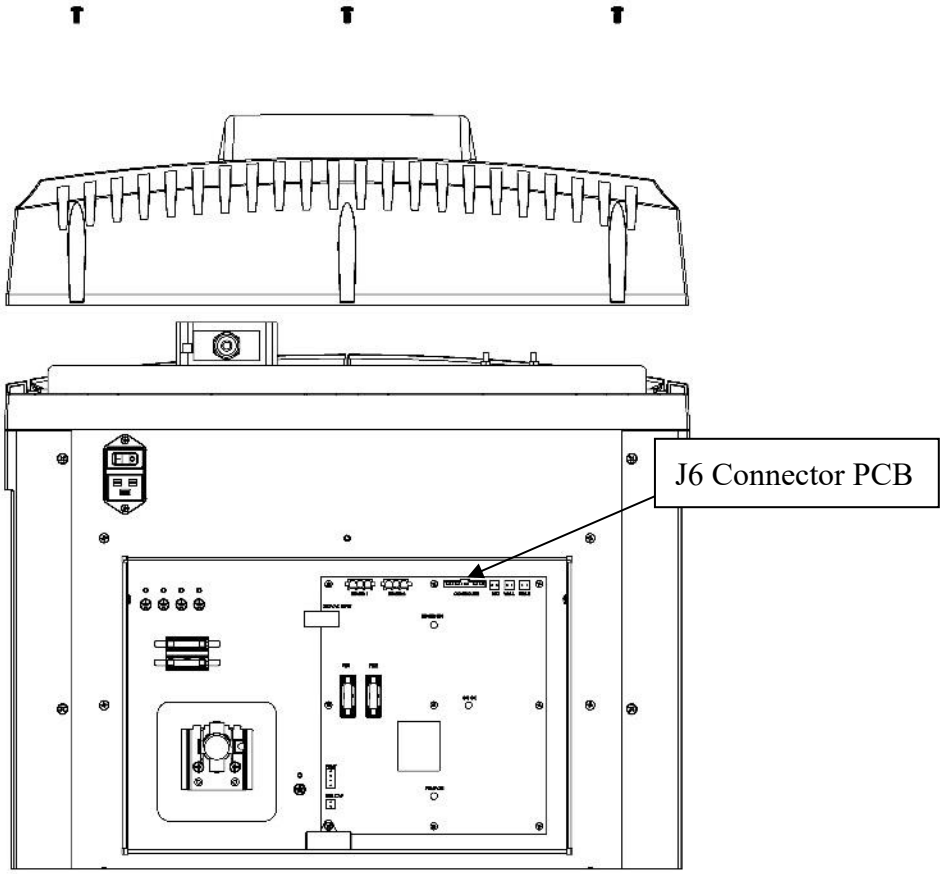


Figure 2 – Removing the Top Cover

IV. Pump Assembly Replacement

A. How to Remove the Pump Assembly

1. **Remove the Pump Assembly**
   a. Unplug the SCA from power and remove the back panel (**See How to Remove the Back Panel Section III A).**
   b. Remove the top cover (**See How to Remove the Top Cover Section III B**).
   c. Disconnect the pump motor connector from the PCB Assembly.

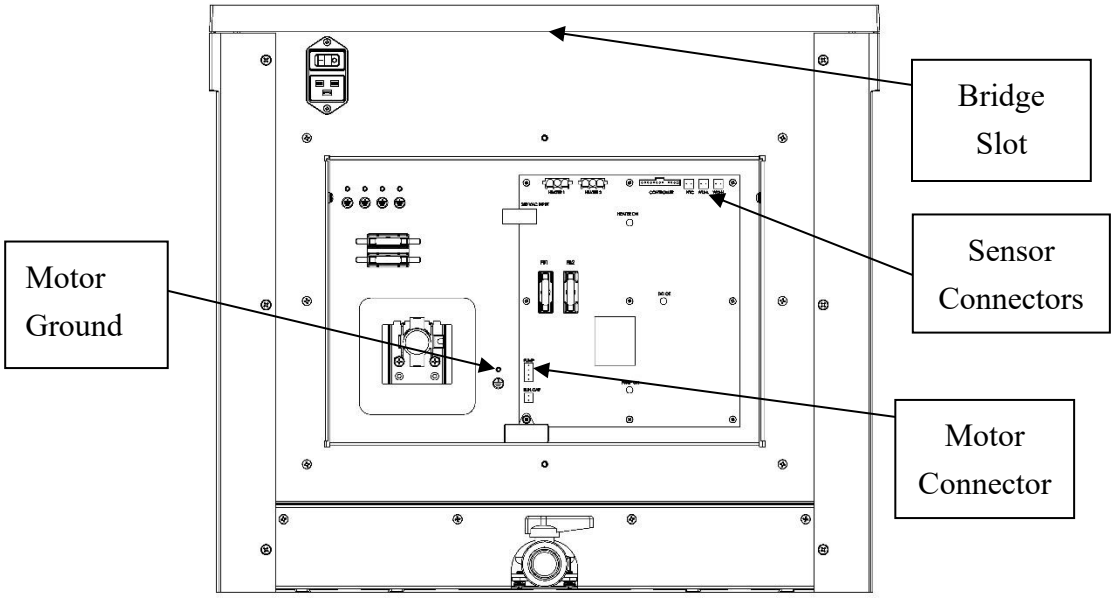


Figure 3 – PCB Assembly

   d. Remove the screw holding the motor ground wire.
   e. Gently pull the motor wires through the Bridge slot.
   f. Unplug the three connectors to the sensors from the PCB.
   g. Gently pull the sensor wires through the Bridge slot.
   h. Remove the four M5 screws holding the pump assembly and ground wire (***See Figure 4***).
   i. Grip the motor and carefully remove the pump assembly. The motor gasket may stick a little. Rocking the motor back and forth slightly will help loosen the gasket.

NOTE:
The tray gasket may cause the pump assembly to stick to the bridge. If this happens, loosen the gasket by gently rocking the assembly back and forth.

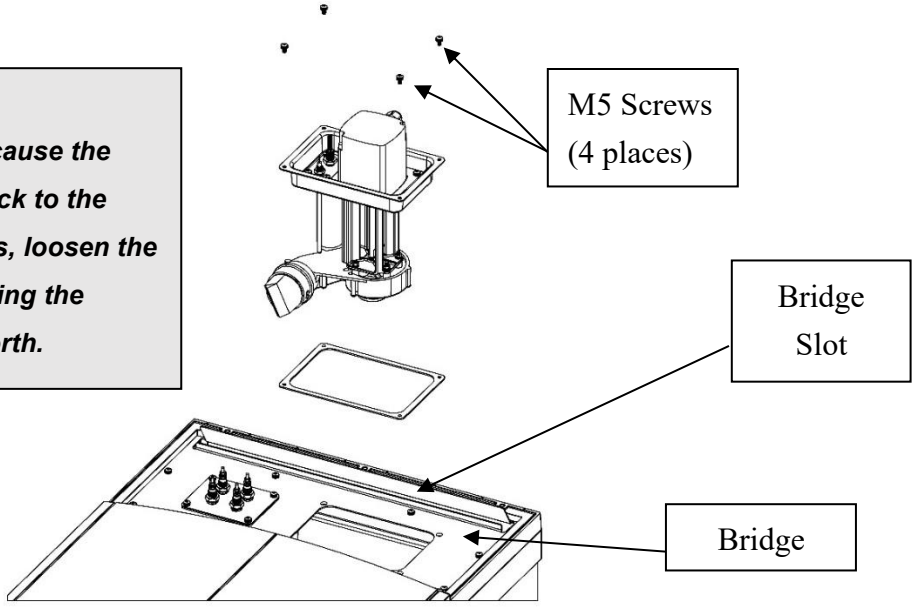


Figure 4 – Remove the Screws and Remove the Pump Assembly

j. Grip the pump assembly by the motor and carefully guide the pump assembly through the hole in the bridge.

B. How to install the Pump Assembly

1. Install the Pump Assembly

a. Grip the pump assembly by the motor and carefully guide the pump through the Bridge hole until the tray is seated on the gasket on top of the Bridge.

b. Mount the pump assembly to the Bridge using the four M5 mounting screws and washers. Ensure the gasket is aligned with the screw holes in the Bridge.

c. Thread the motor and sensor wires through the Bridge slot. Be careful not to rip off any wire labels.

d. Attach the ground wire from the motor cable to the ground connection on the frame.

e. Plug in the connector from the motor to the PCB.

f. Plug in the 3 sensor connectors to the appropriate slots on the PCB.

g. Slide the back panel on and secure (See **How to Remove the Back Panel Section III A).**

h. Plug the J6 ribbon cable from the display back into the PCB.

i. Place cover back on the SCA and secure (See **How to Remove the Top Cover Section III B**).

V. Sensor Assembly Replacement

A. How to Remove the Sensor Assembly

1. **Remove the Sensor Assembly**
   a. Remove the back panel (**See How to Remove the Back Panel Section III A**).
   b. Remove the top cover (**See How to Remove the Top Cover Section III B**).
   c. Unplug the three sensor connectors from the PCB (***See Figure 5***).
   d. Remove the four M5 screws holding the sensor assembly (***See Figure 6***).
   e. Carefully pull the sensor wires through the Bridge slot.

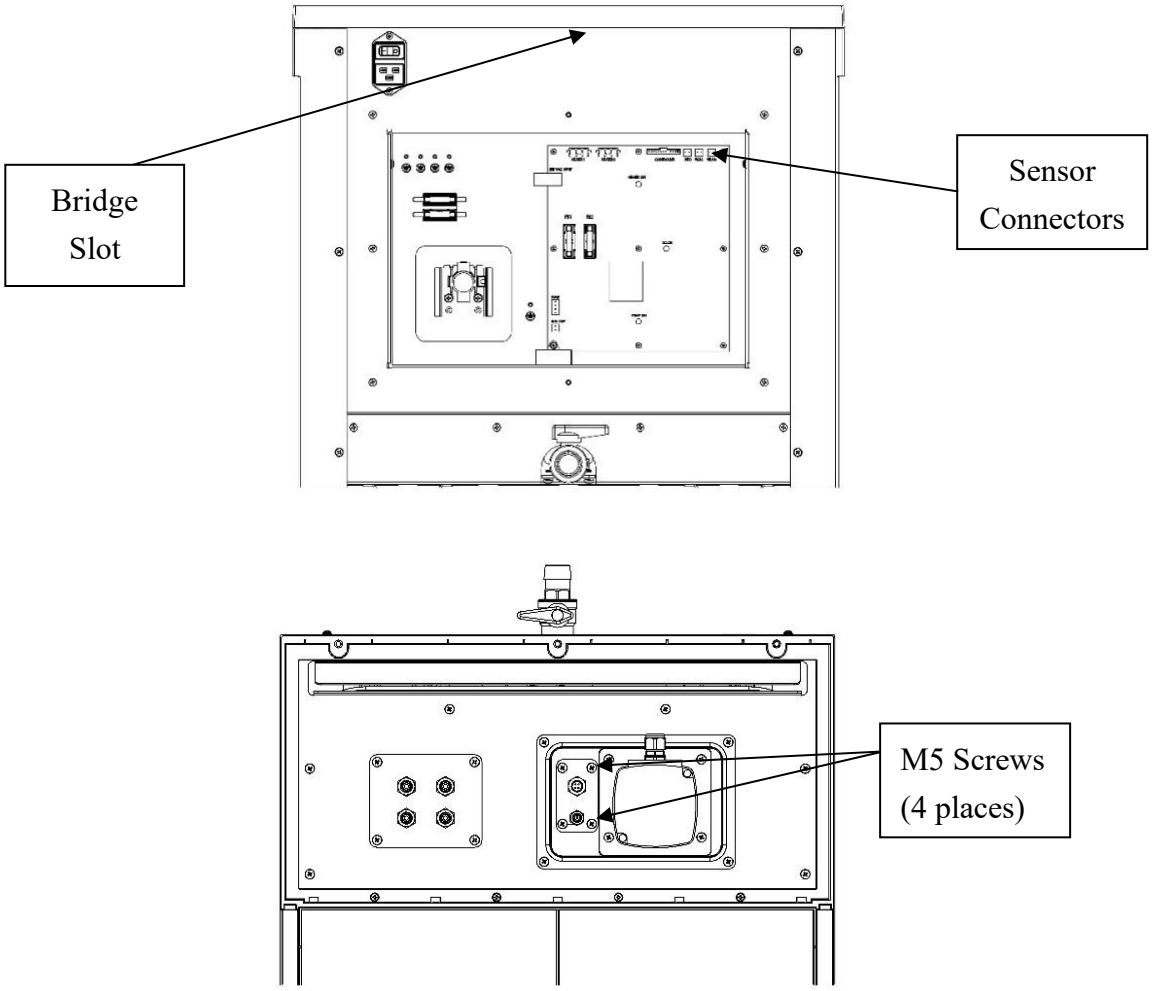


Figure 5 – Top View of SCA with Top Cover Removed

   f. Carefully remove the Sensor Assembly from SCA.

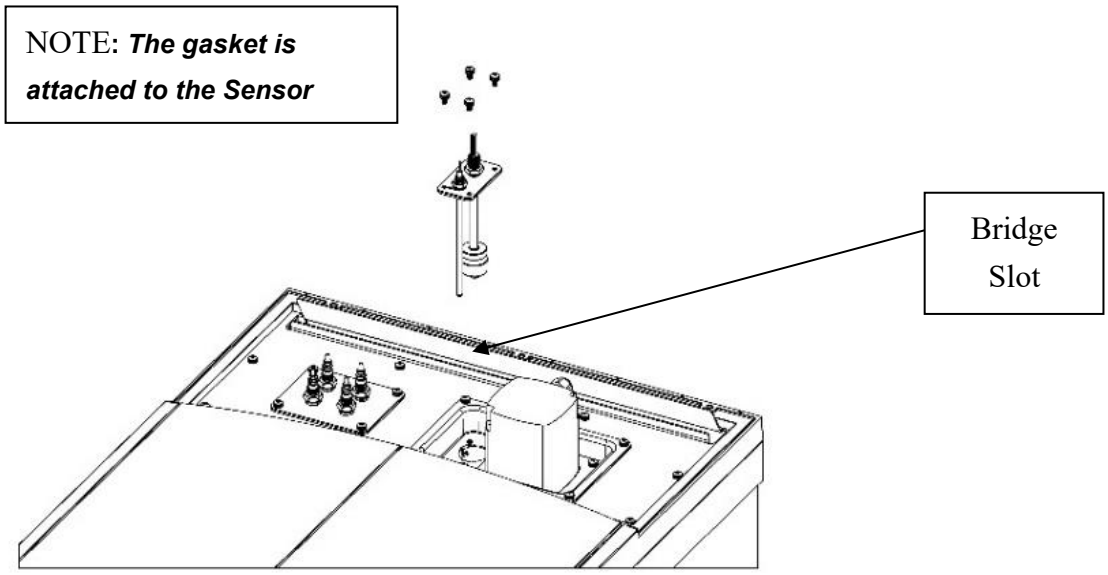


Figure 6 – Remove the Sensor Assembly

B. How to install the Sensor Assembly

1. **Install the Sensor Assembly**
   a. Insert the Sensor Assembly into the motor tray.
   b. Mount the Sensor Assembly using the four M5 screws.
   c. Carefully thread the sensor wires through the Bridge slot. Be careful not to rip off any wire labels.
   d. Plug in the 3 sensor connectors into the appropriate slots on the PCB.
   e. Plug in the J6 display ribbon cable back into the PCB.
   f. Slide the top cover panel and secure (**See How to Remove the Top Cover Section III B).**
   g. Slide the back panel on and secure (**See How to Remove the Back Panel Section III A**).

VI. Spray Nozzle Replacement

A. How to Replace the Nozzle

1. **Replace the Nozzle**
    a. The 3600 has a Bayonet style nozzle that latches on to the pump output opening. Twist the nozzle counterclockwise to unlatch and clockwise to latch. The nozzle O-ring must be in place to securely latch the nozzle to the pump manifold. Ensure the nozzle is correctly orientated (***See Figure 8***).

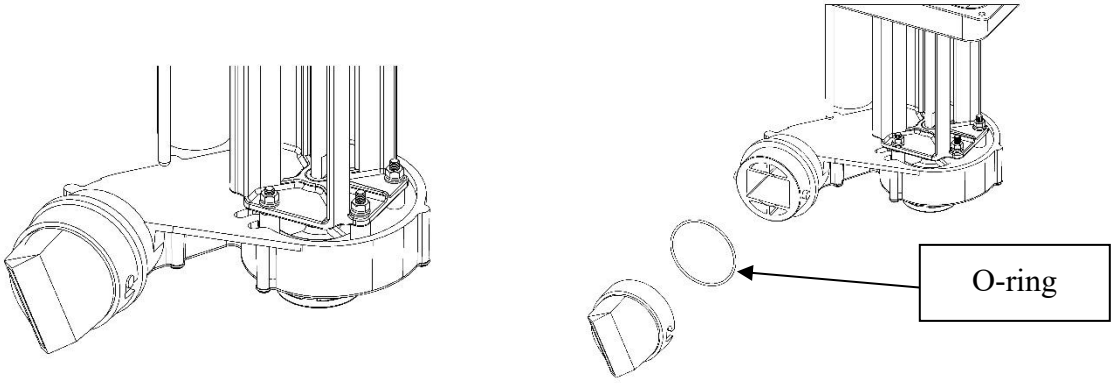


Figure 7 – Replacing the Spray Nozzle

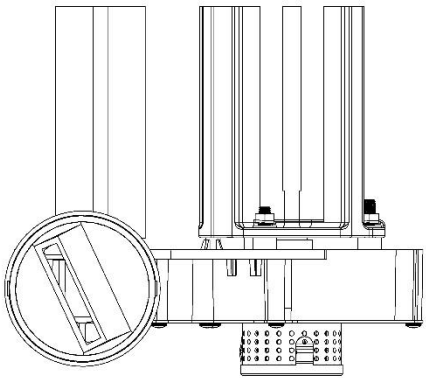
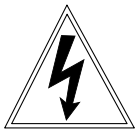


Figure 8 – Correct Rotation of the Spray Nozzle

VII. Heater Assembly Replacement

A. How to Remove the Heater Assembly

1. **Remove the Heater Assembly**
   a. Unplug the SCA from power and remove the back panel (**See How to Remove the Back Panel Section III A**).
   b. Remove the top cover (**See How to Remove the Top Cover Section III B**).



SHOCK HAZARD! PLEASE ENSURE POWER PLUG IS REMOVED FROM THE SCA.

   c. Unplug the heater's two connectors from the PCB Assembly.

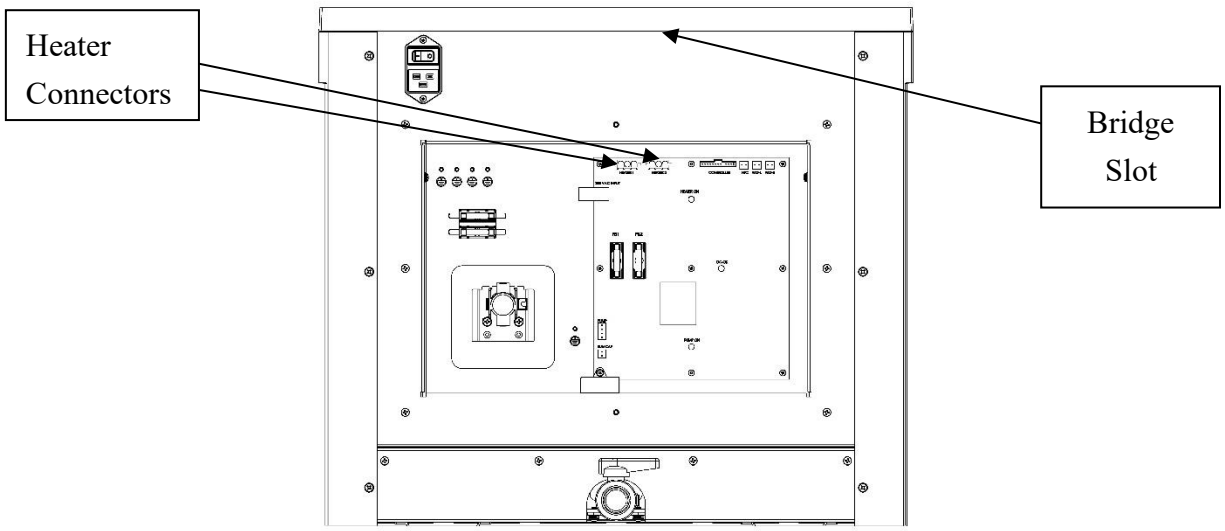


Figure 9 – Heater Connectors

   d. Gently pull the heater wires through the Bridge slot.
   e. Remove the four M5 screws holding the Heater Assembly and ground wire (***See Figure 10***).

ALLOW THE HEATING ELEMENT FOR COMPLETELY COOL BEFORE REMOVING.

f. Carefully remove the Heater Assembly from SCA

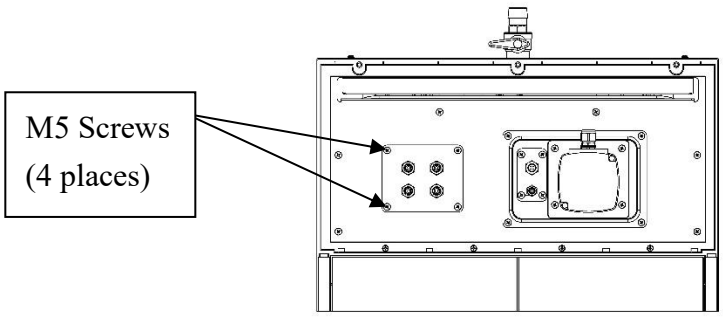


Figure 10 – Top View of the SCA with the Top Cover Removed

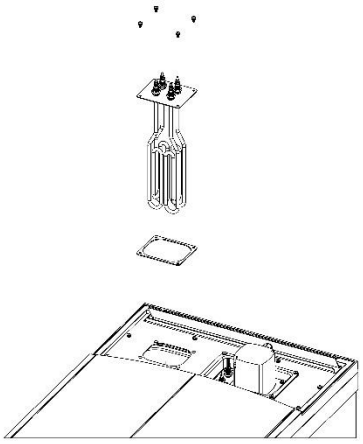


Figure 11 – Remove the Heater Assembly

B. How to Install the Heater Assembly

1. **Install the Heater Assembly**
   a. Carefully guide the Heater Assembly through the hole in the Bridge until the plate is seated on the gasket on top of the bridge.
   b. Mount the Heater Assembly to the Bridge using the four M5 mounting screws and attach the ground wire to the tray.
   c. Carefully pull the heater wires through the Bridge slot.
   d. Plug the two heater wire connectors back into the PCB.
   e. Plug the J6 ribbon cable from the display back into the PCB.
   f. Place the top cover back on and secure (**See How to Remove the Top Cover Section III B**).
   g. Place the back panel on to the SCA (**See How to Remove the Back Panel Section III A**).

VIII. Display Control Panel Replacement

A. How to Remove the Display Control Panel

1. **Remove the Display Control Panel**
    a. Unplug the SCA from power and remove the back panel (**See How to Remove the Back Panel Section III A**).
    b. Remove the J6 ribbon cable from the PCB.
    c. Remove the top cover (**See How to Remove the Top Cover Section III B**).
    d. Turn the cover over and remove the six M4 screws that attach the display to the bezel from the inside.

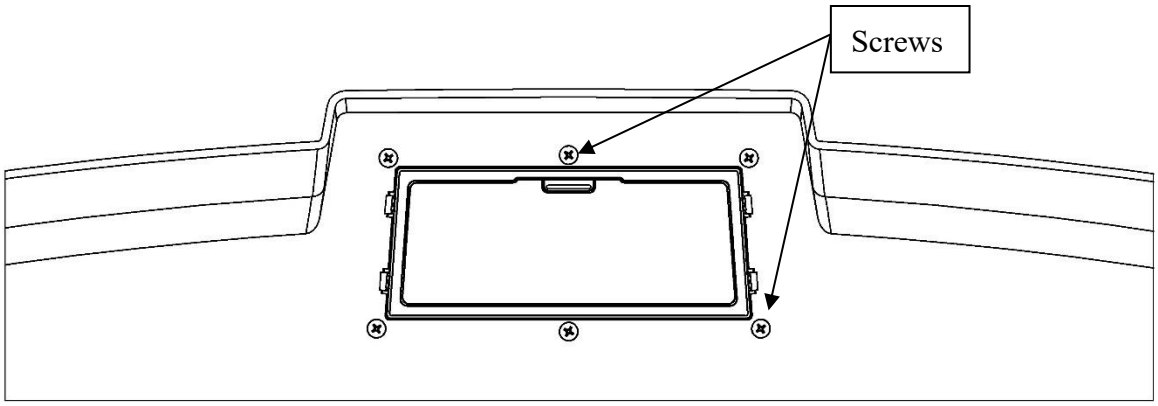
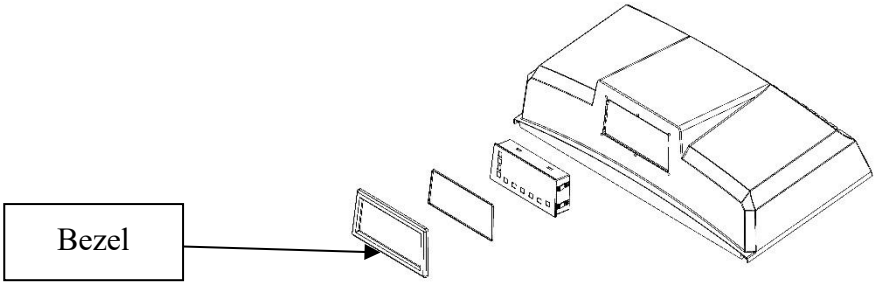


Figure 12 – Remove Screws

    e. Pull off the bezel and slide the display out of the cover.



B. How to Install the Display Control Panel

1. **Install the Display Control Panel**
    a. Thread the J6 ribbon cable through the hole in the front of the top cover where the display will be mounted.
    b. Check the orientation of the display and place the bezel over the display, ensuring the bezel screw holes align with the holes in the top cover.
    c. Turn the cover over and secure the display to the bezel with the six M4 screws from the inside.
    d. Thread the display ribbon cable through the Bridge slot and plug the J6 ribbon cable from display into the PCB.
    h. Place the top cover back on and secure (**See How to Remove the Top Cover Section III B**).
    f. Place the back panel on SCA and secure (**See How to Remove the Back Panel Section III A**).

VIIII. PCB Assembly Replacement

A. How to Remove the PCB Assembly

1. **Remove the PCB Assembly**
    a. Remove back panel (**See How to Remove the Back Panel Section III A**).
    b. Check the wires to make sure the labels are on the wires connected to the PCB.
    c. Remove all the wire connectors from the PCB, be careful not to rip off a wire label.
    d. Remove the screw that holds on the run capacitor to the PCB (***See Figure 13***). This screw is longer than the other screws.
    e. Remove the remaining eight screws that hold the PCB to the back plate standoffs (remove the center screw last).

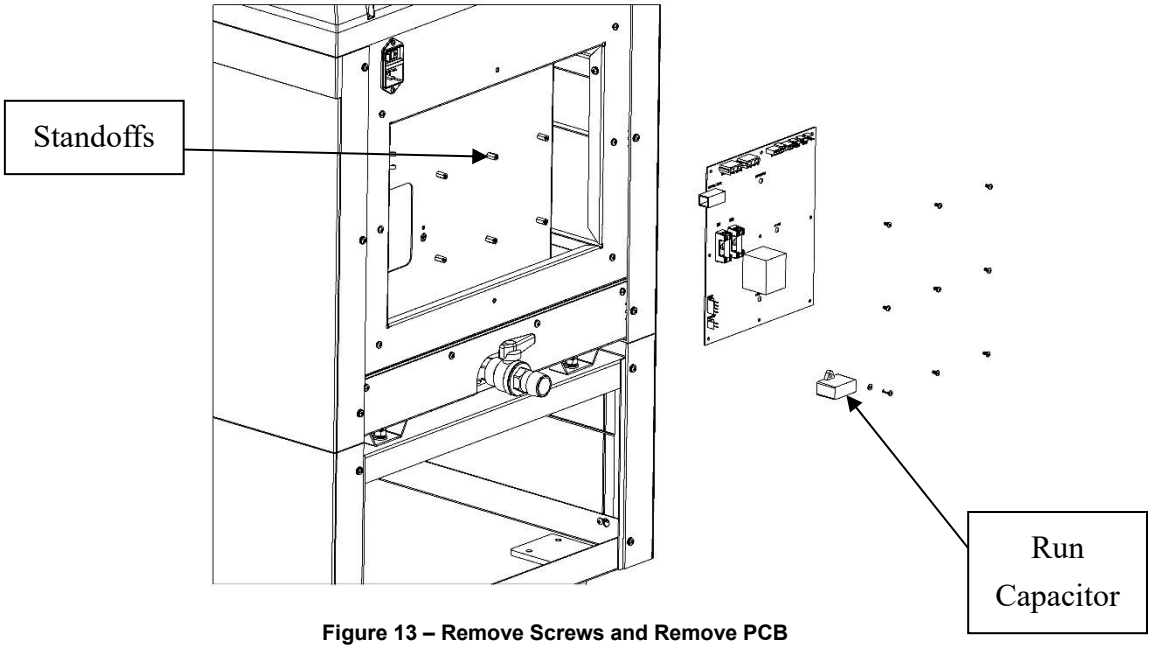


Figure 13 – Remove Screws and Remove PCB

    f. Grip the edge of the circuit board and pull the board out. Make sure not to damage any wires as the board is removed.

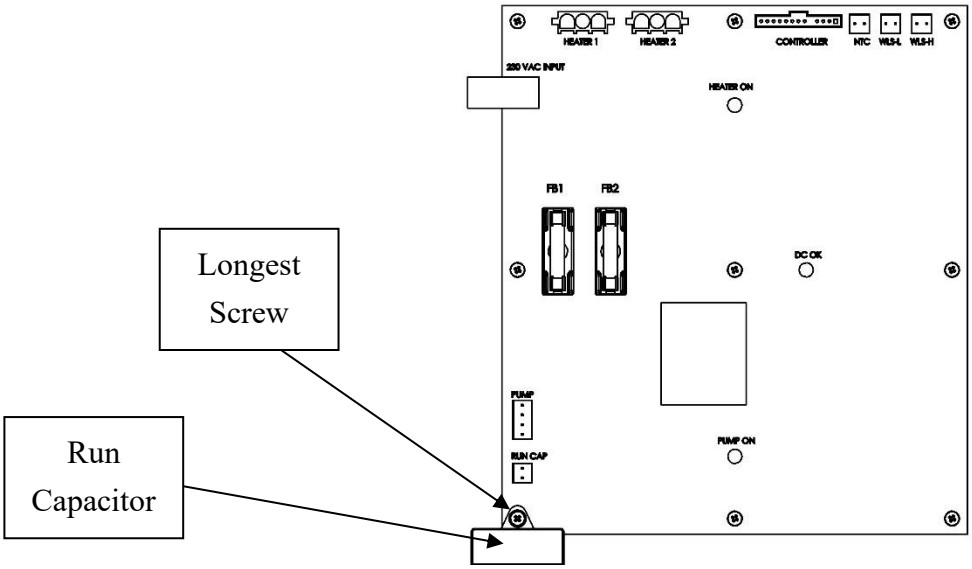


Figure 14 – PCB

B. How to Install the PCB Assembly

1. **Install the PCB Assembly**
    a. Place the PCB onto the back plate and align the screw holes to the standoffs on the back plate. Make sure no wires get behind the board as you place it.
    b. Mount the circuit board with nine screws (the longest screw secures the Run Capacitor to the PCB).
    c. Connect the wires to their proper locations by referencing the labels on the wires and the circuit board.
    d. Place the back panel on SCA and secure (**See How to Remove the Back Panel Section III A**).

X. Power Switch Replacement

A. How to Remove the Power Entry Module (PEM) Switch

1. **Remove the PEM**
    a. Remove the back panel (**See How to Remove the Back Panel Section III A**).
    b. Disconnect the PEM wire connectors from the fuses.
    c. Remove the PEM ground wire from the frame.

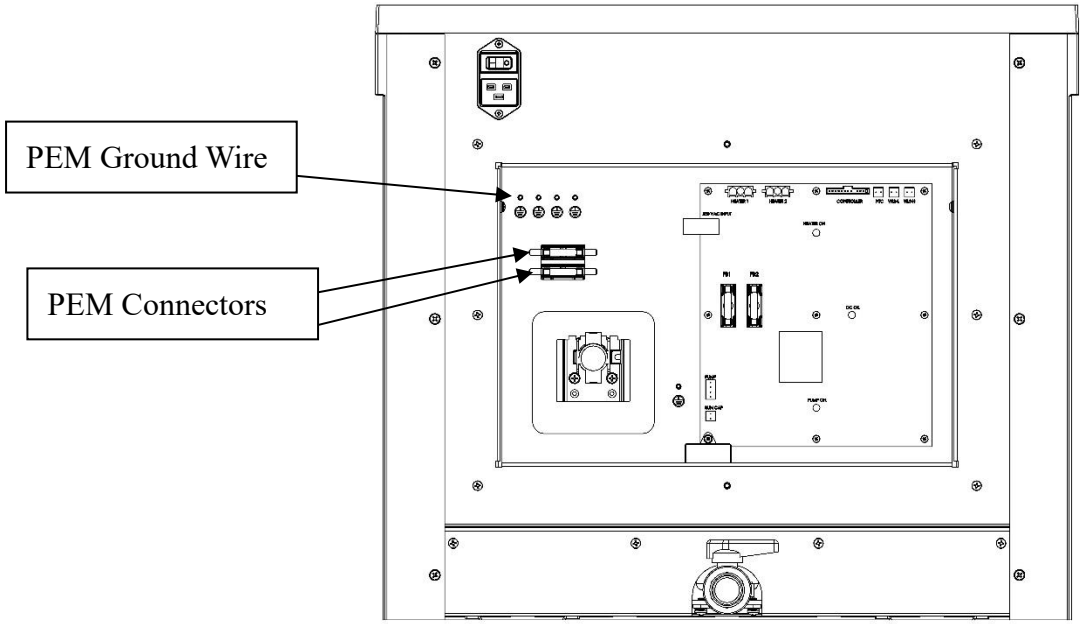


Figure 15 – Location of switch wires

    d. Remove the two M3 screws on the securing the switch to the frame and pull out the switch and wiring.

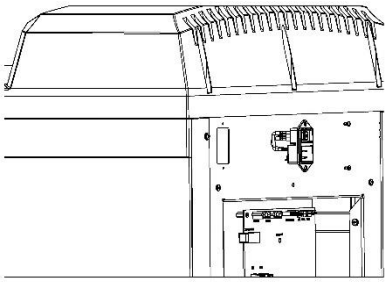


Figure 16 – Remove Switch

B. How to Install the Power Entry Module (PEM) Switch

1. **Install the PEM**
    a. Thread the wiring through the switch hole in the frame.
    b. Press the switch back into the case and secure with the two M3 screws.
    c. Connect the wires from the switch to the fuse tabs (brown wire on top) and secure the ground wire with the M3 screw.
    d. Place the back panel on SCA and secure (**See How to Remove the Back Panel Section III A**).

XI. Fuse Replacement

A. How to Replace the Fuses

1. **Replace the F1/F2 Fuse (25A 250V)**
    a. Remove the back panel (**See How to Remove the Back Panel Section III A**).
    b. Carefully pry the fuse out of the clips with a flat head screwdriver.
    c. Replace the damaged fuse with a new fuse of the same rating.
    d. Place the back panel on (**See How to Remove the Back Panel Section III A**).

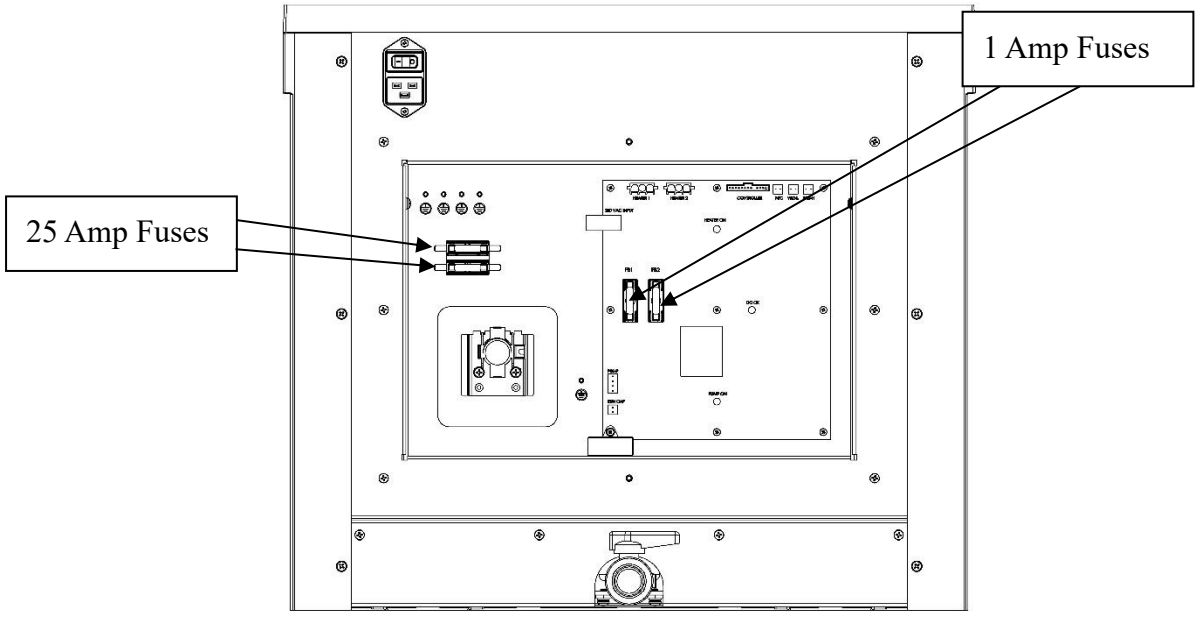


Figure 17 – Fuse Location

2. **Replace the FB1/FB2 Fuse (1A 250V)**
    a. Remove the back panel (**See How to Remove the Back Panel Section III A**).
    b. Carefully pry the fuse out of the clips with a flat head screwdriver.
    c. Press the new fuse into the clips and securely snap into place.
    d. Place the back panel on (**See How to Remove the Back Panel Section III A**).

XII. Troubleshooting Steps

NOTE:
*The symbol "~" prefixing the measured value denotes "**approximate**". Most measurements will not be completely accurate with the values represented in this manual, but the SCA will function normally. Usually, measurements that are extremely different from the indicated measurements will represent a possible failure in the component. All measurements should be verified several times to ensure the test probes are contacting the connector pins properly.*

Before troubleshooting individual components, it is recommended that all connectors on PCB be reseated (unplugged and plugged back in) to eliminate the possibility of a loose connection.

Recommended Tools

Digital Multimeter with Capacitance Selection

.7mm Test Probes

Test Hooks

Digital Multimeter with Capacitance Selection

Test Hooks

.7 mm Test Probes

A. Pump Troubleshooting

Tools Needed:

Multimeter

Test Hooks

.7mm Test Probes

Phillips Screwdriver

Symptom: **Pump Does Not Appear to Start or Does Not Run at Normal Speed.**

Theory: The pump is a 230 VAC motor that circulates the water from the intake at the bottom of the pump out the nozzle using an impeller attached to the motor shaft.

Steps:

1. **Check the "Pump On" Green LED**
    a. The "Pump On" LED is illuminated when the Control Panel sends a signal to enable the Pump Relay. Power on the SCA and press the Start Button ⏻ to enable the pump.
        i. If the "Pump On" LED is illuminated, skip to the next section (Section 2).
        ii. If the "Pump On" LED is not illuminated, remove power from the SCA. Re-seat (unplug and plug back in) the J6 Display Controller ribbon cable (***See Figure 18***) from the PCB. The latch must be released to remove the connector by pressing a thumb nail on the latch lever and wiggle the connector out of the socket**.** Ensure the J6 connector snaps in securely when plugging back in. Skip to the next step (Step b).

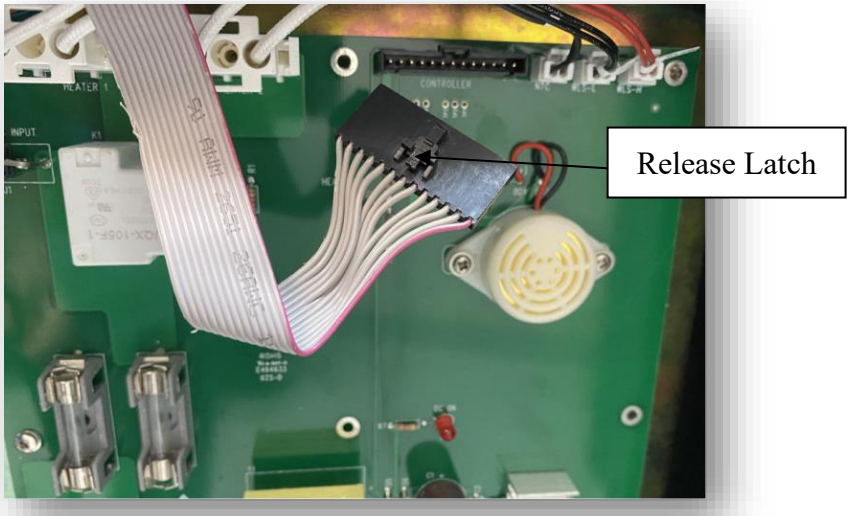


Figure 18 – Re-seat J6 Ribbon Connector

b. Power on the SCA and press the Start Button ⏻ to enable the pump.

i. If the “Pump On" LED illuminates, there was probably a loose connection on J6.

ii. If the “Pump On" LED does *not* illuminate, skip to the next section (Section 2).

2. **Check the Pump Motor Enable Signal**

a. Set the multimeter to DC voltage ⩛. Power on the SCA. Press the Start Button ⏻ (pump motor enabled). Check the voltage between TP10 (DC Ground) and resistor R5 (***See Figure 19***).

Figure 19 – Pump Motor Enable Signal

i. If the multimeter reads ~12.0 VDC, and the “Pump On” LED is *not* lit, the Display Control Panel is operating correctly. Replace the PCB.

ii. If the multimeter reads ~0 VDC, replace the Control Panel. Ensure connector J6 is seated securely and verify initial measurements.

3. **Measure the Pump Motor Resistance**

a. Remove power from the SCA. Remove the connector for the pump from the J4 “PUMP” connector on the PCB and measure the resistance of the pump using the .7mm Test Probes. If these probes are not available, the contact pins can be reached from the back side of the connector, or some small staples may be used by inserting them into the connector. Choose the Resistance Setting **Ω** on the Multimeter. Check the resistance of the pump between the wires on pins 1 & 3 on the *cable connector* (***See Figure 20***).

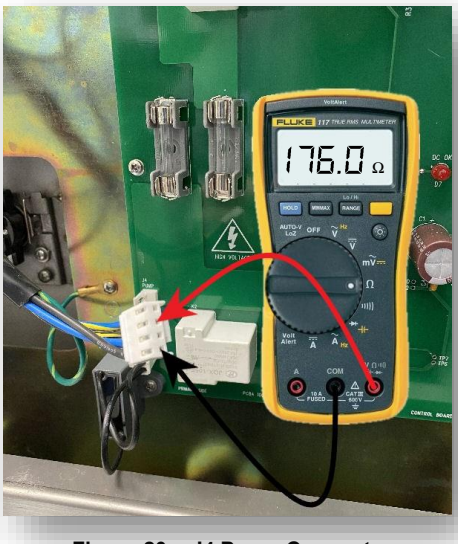


Figure 20 – J4 Pump Connector

i. If the multimeter reads ~176.0 Ω, continue to the next step (Step b).

ii. If the multimeter reads 0.0 Ω or OL, replace the pump. Verify initial measurement.

b. Check the resistance of the pump between the wires on pins 2 & 4 on the *cable connector (**See Figure 21**)*.

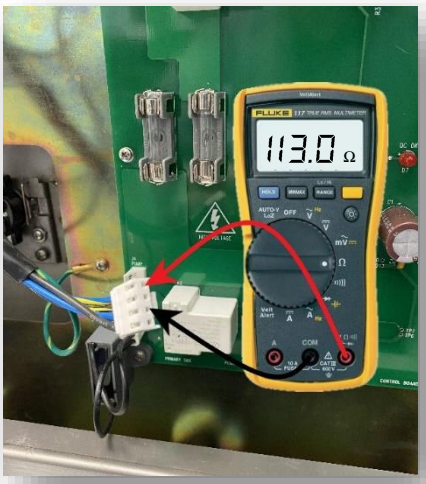


Figure 21 - J4 Pump Connector

i. If the multimeter reads ~113.0 Ω, continue to the next section (Section 4).

ii. If the multimeter reads 0.0 Ω or OL, replace the pump. Verify initial measurement.

4. **Test the Input Voltage to the Pump Motor**

a. Ensure the power is disconnected and attach the test hook leads between pins 1 and 3 (***See Figure 22***). Set the multimeter to AC Voltage $\tilde{V}$.

Ensure they do not touch each other.
WARNING: High Voltage May Be Present on These Pins!

Turn the power on and press the Start Button ⏻ on the control panel to enable the pump. Measure the AC voltage at the J4 “PUMP” pins on the PCB.

Figure 22 – Pump Output Voltage (pins 1 and 3)

i. If the multimeter reads ~208 → 240 VAC (~230 VAC EU), continue to the next step (Step b).
ii. If the multimeter reads ~0 VAC, this is an indication that the PCB or Control Panel is defective or a loose connection at J6.

b. Power off the SCA. Attach the test hooks leads between pins 2 and 4 (***See Figure 23***). Turn the power on and press the Start Button ⏻ on the control panel to enable the pump. Measure the AC voltage at the J4 “PUMP” pins on the PCB.

Figure 23 – Pump Output Voltage (pins 2 and 4)

i. If the multimeter reads ~208 → 240 VAC (~230 VAC EU), continue to the next step (Step c).

ii. If the multimeter reads ~0 VAC, this is an indication that the Run Capacitor is defective or unplugged, there is a loose connection on J5, the PCB is defective, the Control Panel is defective or there is a loose connection on J6.

c. If ~208VAC(US) / ~230VAC(EU) is present between pins 1 and 3, but not present between pins 2 and 4, test the run capacitor (**See Test the Pump Motor Run Capacitor Section XII A**).

d. If both voltages are *not* present when the Start Button is pressed, check to ensure the Display Controller is sending the signal to turn on the pump (See **Check the Motor Enable Signal Section XII A**).

5. **Test the Pump Motor Run Capacitor**

a. The 1.5 µF (micro-Farad) run capacitor gives the pump an extra punch to get the pump motor rotating correctly and in the right direction, as well as supplies half the voltage to keep the pump rotating at the proper speed. Visually inspect the run capacitor. As capacitors age, they make leak electrolyte. If any evidence is found of leaking electrolyte, replace the run capacitor.

b. To test the start capacitor, the capacitance can be measured with a multimeter that has a capacitance measurement setting ⊣|⊢. The Selection button on the multimeter may need to be pressed to enable the Capacitance setting (***See Figure 24***). The capacitor should read ~1.5 µF.

Figure 24 – Run Capacitor Test

c. If a capacitance option is not available on the multimeter, the resistance can be tested.

i. Short the leads of the run cap initially (***See Figure 25***).

ii. After shorting the capacitor leads, measure between both wires at the highest resistance setting of the multimeter. The resistance of the capacitor will increase from low resistance to infinity in a few seconds on a normally operating capacitor. If the capacitor ohms out at 0 ohms (shorted) or is initially at infinite ohms (open) *after* shorting the leads, the capacitor is probably defective. Replace the run capacitor.

Figure 25 – Short Capacitor Leads Initially

6. **Inspect Pump Motor and Components**

a. Disconnect Power

i. If the SCA is full of water/caustic chemicals, it may be easier to remove the pump from the SCA and inspect (**See How to Remove the Pump Assembly Section IV A**). If the SCA is empty, the pump does not need to be removed. Remove and inspect the nozzle and the pump input strainer for any kind of buildup (***See Figure 26***). The input strainer is found at the bottom of the pump intake. It is a round screen and simply pulls off. If either has a lot of buildup, remove the buildup. Rotate the shaft of the pump. It should rotate extremely easily by rolling a finger across the shaft. It should not have any dead spots in the rotation and the rotation should not feel rough.

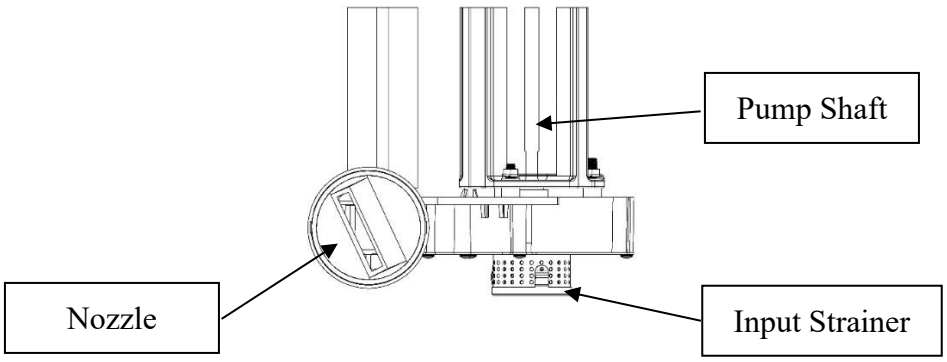


Figure 26 – Nozzle and Input Screen

B. Heating Element Troubleshooting

Tools Needed:

Multimeter

Phillips Screwdriver

Symptom: **Not Heating or Not Heating Normally**

Theory: The heating element has an internal resistance that creates heat when current flows through. When submerged in water, the heat is transferred to the water. It should take approximately 3 minutes per degree to heat up the bath. Voltage is applied to the heater elements upon starting the initial ramp up to the set temperature. When the temperature of the bath exceeds the set temperature by 1°C, voltage is removed from the heating elements, the “Heater On” LED will turn off and the bath is allowed to cool. When the temperature of the bath drops 2°C below the set temperature, voltage is then applied to the heating elements to increase the bath temperature and the “Heater On” LED will turn on. This process continuously cycles back and forth. An audible click can be heard as the heater relay energizes and de-energizes during the normal operation of the SCA. The Display will not show the set temperature constantly because of the heating and cooling effect of the system. It is normal to see various temperatures within 3 degrees of the set temperature.

Steps:

1. **Check the “Heater On” Yellow LED**
    a. The “Heater On” LED is illuminated when the Control Panel sends a signal to enable the Heater Relay. Power on the SCA, select a temperature and press the Start Button ⏻ to enable the heaters.
        i. If the “Heater On” LED is illuminated, skip to the next section (Section 2).
        ii. If the “Heater On" LED is *not* illuminated, remove power from the SCA. Re-seat (unplug and plug back in) the J6 Display Controller ribbon cable (***See Figure 27***) from the PCB. The latch must be released to remove the connector by pressing a thumb nail on the latch lever and wiggle the connector out of the socket**.** Skip to the next step (Step b).
    b. Power on the SCA and press the Start Button ⏻ to enable the heaters.
        i. If the “Heater On" LED illuminates, there was probably a loose connection on J6.
        ii. If the “Heater On" LED does *not* illuminate, skip to the next section (Section 2).

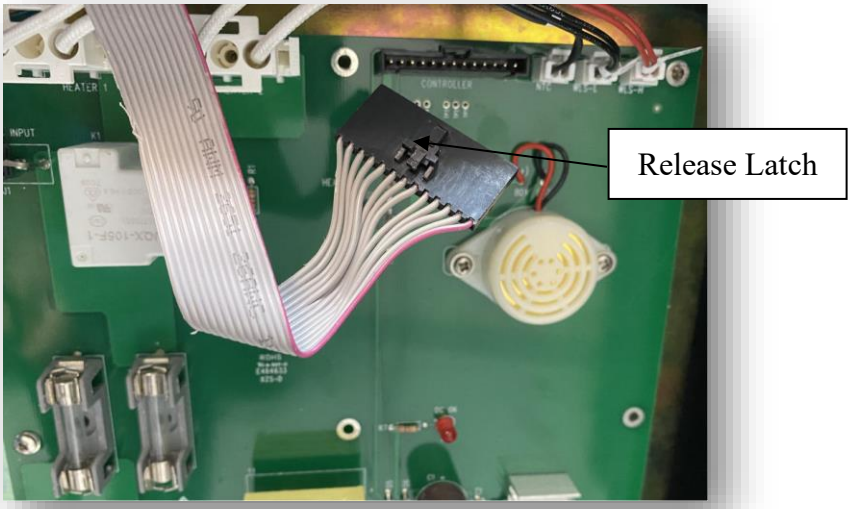


Figure 27 – Re-seat J6 Ribbon Connector

2. **Check the Heater Enable Signal**

   a. Set the multimeter to DC Voltage ⎓. Check the voltage between resistor R2 (Heater Enable Signal) and R3 (DC Ground) (***See Figure 28***).

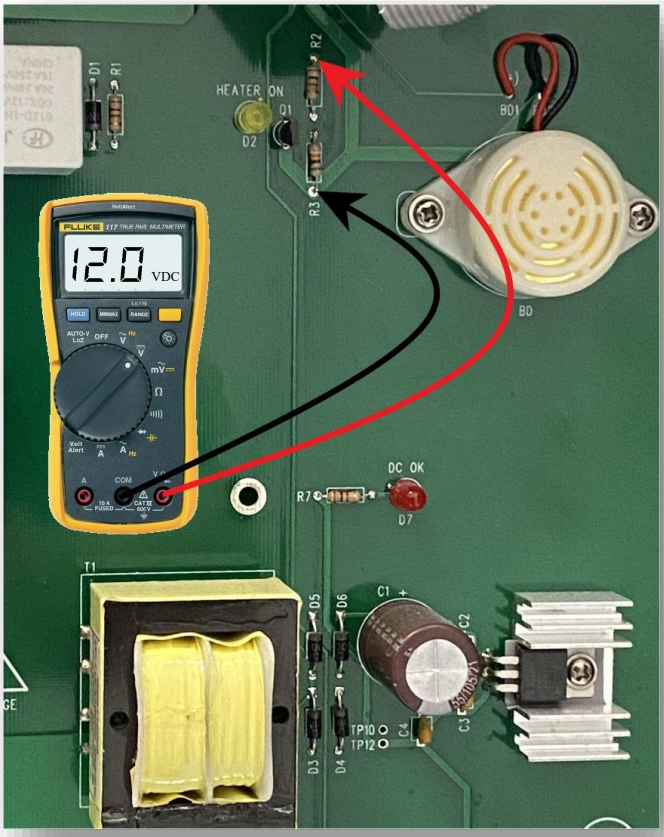


Figure 28 – Heater Control Signal

i. If the multimeter reads ~12.0 VDC and the “Heater On” LED is illuminated, the Display Control Panel is operating correctly, skip to the next section (Section 3).

ii. If the Start Button is pressed, a temperature setting has been selected, the “Heater On” LED is *not* illuminated and multimeter reads ~0 VDC between R2 and R3, check the Temperature Sensor (**See Temperature Sensor Troubleshooting Section XII C**).

3. **Heater Element Resistance Test**

a. Remove power from the SCA.

b. Remove the back panel (**See How to Remove the Back Panel Section III A**).

c. Set the multimeter to resistance **Ω**. Remove the Heater 1 connector and measure the resistance of Heater 1 between the outside pins of the wire connector (***See Figure 29***).

i. If the multimeter reads ~34.0 Ω continue to the next step (Step d).

ii. If the multimeter reads 0.0 Ω or OL, replace the Heater Assembly. Verify initial measurement.

d. Remove the Heater 2 connector and measure the resistance of the Heater 2 between the outside pins of the wire connector.

i. If the multimeter reads ~34.0 Ω continue to the next section (Section 4).

ii. If the multimeter reads 0.0 Ω or OL, replace the Heater Assembly. Verify initial measurement.

Figure 29 – Heater Resistance

4. **Heater Element Voltage Test**
   a. Remove power from the SCA and unplug the Heater 1 and Heater 2 connectors from the PCB.
   b. Power on the SCA. Ensure a heat setting is selected and press the Start Button ⏻ to turn on the heaters.
   c. Set the multimeter to AC Voltage Ṽ and measure the voltage of the Heater 1 between the outside pins of the PCB connector (***See Figure 30***).

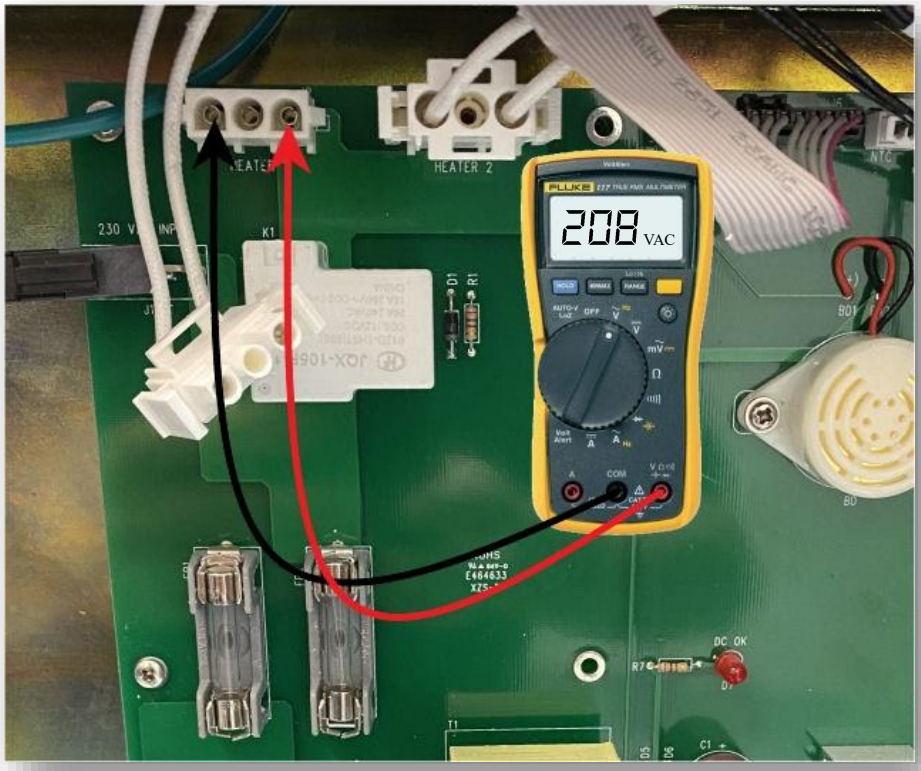
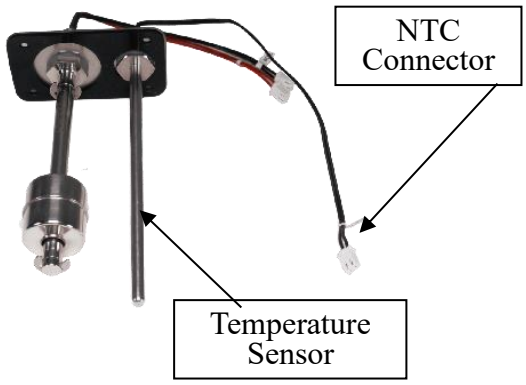


Figure 30 – Heater Voltage

   i. If the multimeter reads ~208 → 240 VAC (~230 VAC EU), continue to the next step (Step d).
   ii. If the multimeter reads ~0 VAC, ensure a heat setting (50, 60, 70 or 85) is selected on the Control Panel. If a heat setting is selected, the Start Button has been pressed, and the multimeter still reads ~0 VAC, this is an indication that the PCB, Control Panel or Temperature Sensor is defective or there is a loose connection at J6. If the Heater "Heater On" LED is lit, and there is ~0 VAC at the Heater 1 connector, replace the PCB.
   iii. Repeat the previous steps with the Heater 2 connector.

   d. If both connectors do not have power when the heat option is enabled, the Start Button is pressed and the "Heater On" LED is *not* illuminated, check the temperature sensor (**See Temperature Sensor Troubleshooting Section XII C**).

C. Temperature Sensor Troubleshooting



Tools Needed:

Multimeter

Philips Screwdriver

.7mm Test Probes

Symptom: **Not heating at all, overheating, underheating.**

Theory: The temperature sensor changes resistance according to the temperature of the water. As the temperature increases, the resistance of the sensor decreases (***See Figure 31***).

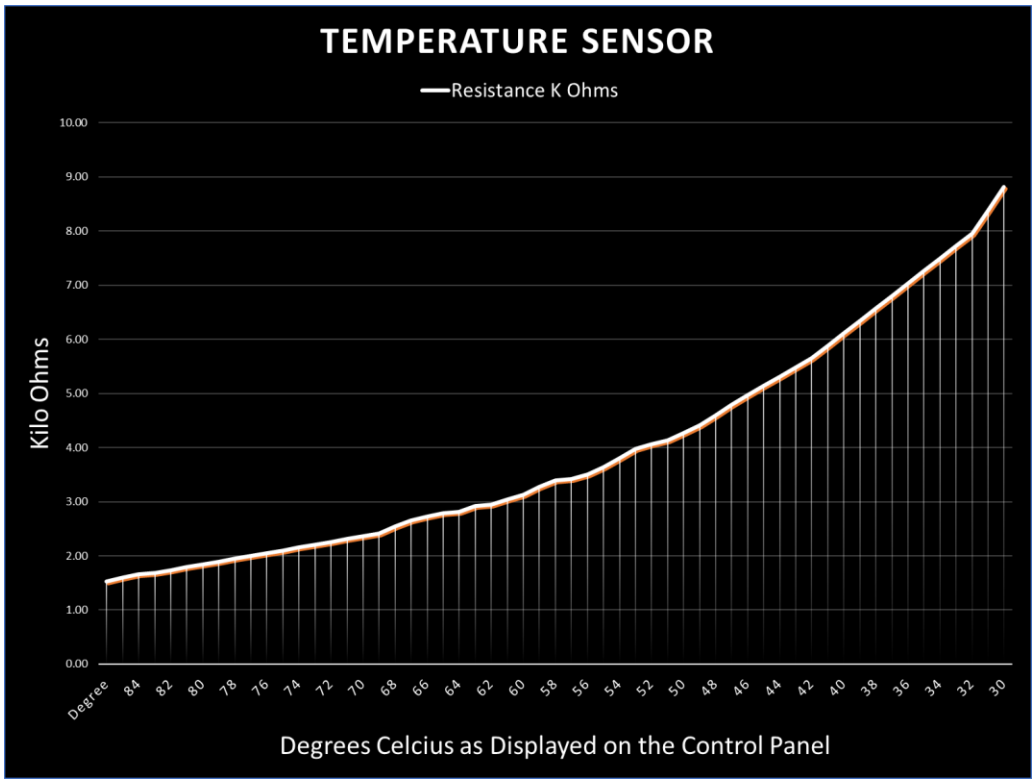


Figure 31 – Temperature/Resistance Correlation

If the temperature sensor is defective (giving inaccurate resistance measurements):

- The bath may not heat at all or may not reach the set temperature (+/- 3°C).
- The bath may overheat, possibly tripping the Thermal Cutoff switch (TCO).
- There will be an r1 error (infinite resistance or open).

Steps:

1. **Check the resistance of the Temperature Sensor**
   a. With the SCA at room temperature, remove the NTC connector from the PCB (***See Figure 32***).

Figure 32 – Temperature Sensor Resistance at 50°C

   b. Set the multimeter to resistance **Ω**. Check the resistance between the two wires of the NTC connector with the two .7mm probes. At room temperature (~19°C → 30°C). The resistance should read between11.5 kΩ and 8 kΩ (depending on what the actual room temperature is). Plug the NTC connector back in and power on the SCA.
   c. Set the temperature of the SCA to 50°C and press the Start Button ⏻ .
   d. When the temperature reads 50°C on the display, power off the SCA, unplug the NTC connector and check the resistance. The resistance should read ~4.14 kΩ. Compare different heat settings with the table below. The temperature in the table corresponds to the displayed temperature on the control panel.

NOTE: A Water Temperature Thermometer can be used to determine if the actual water temperature corresponds to the displayed temperature.

Temperature	Resistance
85°C	~ 1.53 kΩ
70°C	~ 2.31 kΩ
60°C	~ 3.04 kΩ
50°C	~ 4.14 kΩ
Room Temp ~ 19°C → 30°C	~ 11.5 kΩ → 8.82KΩ

Table 1- Temperature Resistances

e. If the sensor is shorted, open, or the sensor resistance does not correspond to the table above, the sensor will need to be replaced.

D. Water Level Sensor Troubleshooting

Tools Needed:

Multimeter

Philips Screwdriver

.7mm Test Probes

Symptom: **SCA beeping, high or low water LED flashing on control panel**.

Theory: The float sensor uses two internal switches within a hollow rod straddled by a watertight stainless-steel float that slides along the rod as the water level changes. If the water level is at the minimum or maximum level, the magnetic property of the float closes an internal switch, which generates an error.

Steps:

1. **Check the resistance of the Water Sensor**
   a. Remove the sensor from the mounting plate (**See Sensor Assembly Replacement Section V)**.
   b. Visually inspect the float assembly. If there is a buildup on the shaft that inhibits the free up and down motion of the float, clean off the buildup. A soft scrub pad can be used to remove any buildup on the shaft. Ensure the float moves freely from the bottom to the top of the shaft. Very rarely, the float can be permeated with water. Ensure the integrity of the float.
   c. Set the multimeter to resistance **Ω** and check the resistance across both wires of the **WLS-H** connector (***See Figure 33***).
      i. Move the float to the middle of the shaft.
         - Multimeter should read ~22.0 kΩ
      ii. Move the float to the top of the shaft.
         - Multimeter should read 0.0 Ω (continuous)
   d. Check the resistance across the **WLS-L** connector.
      i. Move the float to the middle of the shaft.
         - Multimeter should read ~22.0 kΩ
      ii. Move the float to the bottom of the shaft.
         - Measure 0.0 Ω (continuous).
   e. If the measured resistance values do not correspond to the values above, replace the Water Level Sensor.

Figure 33 – WLS-H Resistance

E. No Power to SCA Troubleshooting

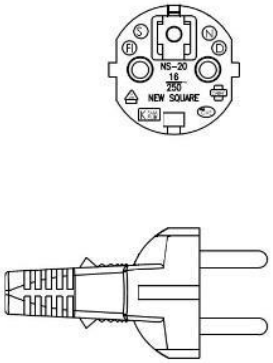
Tools Needed:

Multimeter

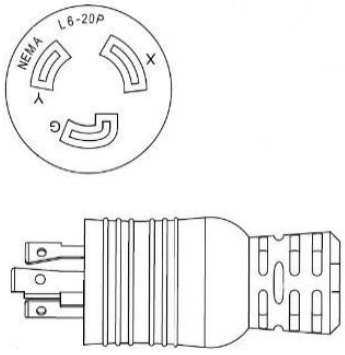
Phillips Screwdriver

Symptom: SCA Appears to Have No Power

Theory: The SCA requires 230 VAC +/- 10%. For US power, it is possible to have 208 VAC, 220 VAC or 240 VAC. The most common industrial voltage in the US is 208 VAC, but these other voltages will work fine with the SCA 3600. Europe uses 230 VAC. US voltage requirements are single phase, 60 Hz., 2 -110/120 VAC lines and a ground.
For EU, the SCA requires single phase, 50 Hz., 230VAC, neutral and ground.



Europe - (CEE 7) 230VAC, 50Hz, 16A, Single phase



US – (L6-P20) 208VAC, 60Hz, 20A, single phase

Steps:

1. **Check the LED on the PEM**
   a. The PEM (Power Entry Module or Power Switch) contains a red LED that illuminates when the power switch is toggled on (***See Figure 34***). Toggle on the Power Switch.

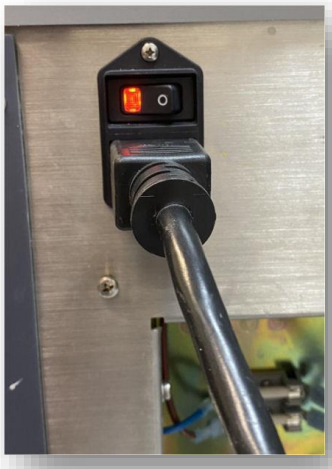


Figure 34 – PEM LED

i. If the PEM LED illuminates, skip to the next step (Step b).

ii. If the PEM LED does not illuminate, skip to the next section (Section 2).

b. Remove the back panel (**See <u>How to Remove the Back Panel</u> Section III A**) and check the “DC OK” LED on the PCB (***See Figure 35***).

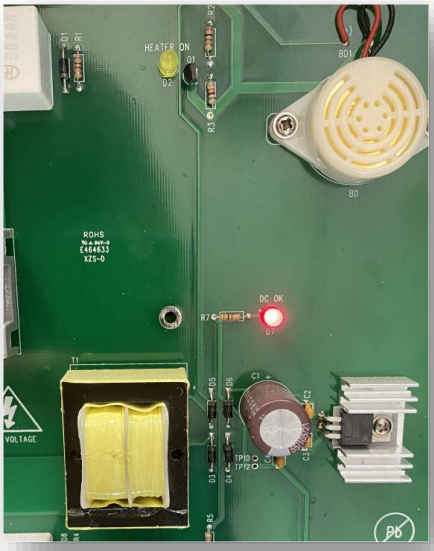


Figure 35 – PEM LED

i. If the “DC OK” LED is illuminated, the PCB has input power. If the Control Panel does not appear to have power, skip to the Display Troubleshooting Section (**See <u>No Power to Display Troubleshooting or ES Error</u> Section XII F**).

ii. If the “DC OK” LED does not illuminate, skip to the next step (Step c).

c. Set the multimeter to AC Voltage $\widetilde{V}$. Power off the SCA and disconnect the J1 connector from the PCB. Power on the SCA and check the voltage at J1(***See Figure 36***).

Figure 36 – J1 PCB Input Power

i. If the multimeter reads ~208 → 240 VAC (~230 VAC EU) across both wires of the J1 connector, skip to the next step (Step d).

ii. If the multimeter reads ~0 VAC across the J1 connector, skip to the section (Section 2).

d. Unplug power from the SCA. Set the multimeter to the Diode Test Mode ⊣▶⊢. Check the continuity of FB1 and FB2 on the PCB (***See Figure 37***).

Figure 37 – FB1 and FB2 Fuses

i. If the multimeter displays continuous (0.00), the fuse is good.

ii. If the multimeter displays open (OL), the fuse is blown. Skip to the next step (Step e).

e. Replace the fuse with the same type and rating as the original (1 A / 250V). Power up the SCA. If the fuse blows again, unplug the heater and pump from the PCB and replace the fuse.

i. If the fuse blows with the heater and the pump unplugged from the PCB, replace the PCB.

ii. If the fuse does not blow with the heater and the pump unplugged from the PCB, troubleshoot the component that is causing the fuse to blow.

- FB1 Fuse: Troubleshoot the Heater (**See <u>Heating Element Troubleshooting</u> Section XII B**).
- FB2 Fuse: Troubleshoot the Pump (**See <u>Pump Troubleshooting</u> Section XII A**).

2. **Measure the Power Cord Output Power**

   a. Unplug the power cord from the SCA. Set the multimeter to AC Voltage $\tilde{V}$. Ensure the power cord is still connected at the outlet. Measure the output voltage of the power cord at the female side (***See Figure 38)***.

Figure 38 – Female End of Power Cord

   i. If the multimeter reads ~208 → 240 VAC (~230 VAC EU) across contacts L and N, continue to the next section (Section 3).

   ii. If the multimeter reads ~0 VAC across L and N, skip to the next step (Step b).

   b. Check the power at the outlet.

      i. For the L6-P20 Socket (US), there should be ~208 VAC → 240 VAC across the X and Y slots at the wall socket (***See Figure 39***).

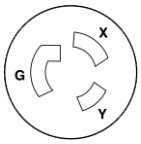


Figure 39 – L6-P20 Socket (US)

      ii. For the CE 7 Socket (EU), there should be ~230 VAC across the L and N sockets at the wall outlet (***See Figure 40***).

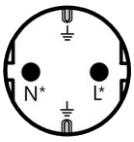


Figure 40 – CE 7 Socket (EU)

   iii. If there is no power at the outlet, check the building's circuit breakers. Please ensure there is proper voltage at the outlet. The 3600 will not function with 110 VAC input across L and N of the Power Cord (will probably get an ES error). If there is voltage at the outlet and no voltage at the output of the power cord, check the continuity of the power cord and replace if needed.

3. **Check the Continuity of Fuse F1 and F2**
    a. If there is no voltage at connector J1 with power applied and the power switch toggled on, but there is power at the female end of the power cord, check the continuity of the F1 and F2 fuses Unplug power from the SCA. Set the multimeter to the Diode Test Mode ⊣▶⊢ and measure across fuse F1 (***See Figure 41***).

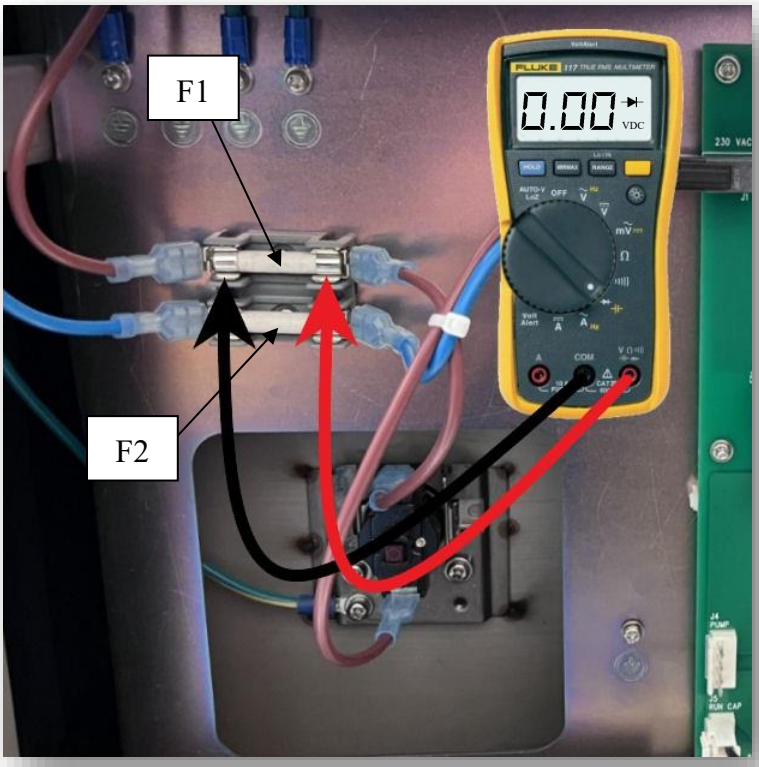


Figure 41 – Fuse F1 and F2

        i. If the multimeter displays continuous (0.00), the fuse is good. Skip to the next step (Step b).
        ii. If the multimeter displays open (OL), the fuse is blown. Replace the fuse with the same type and rating as the original (25A / 250VP).

    b. Check the continuity of F2.
        i. If the multimeter displays continuous (0.00), the fuse is good. Skip to the next section (Section 4).
        ii. If the multimeter displays open (OL), the fuse is blown. Replace the fuse with the same type and rating as the original (25A / 250VP).

4. **Check the Continuity of the Thermal Cutoff Switch (TCO)**
    a. The TCO is a resettable temperature sensitive switch that will open the contacts when the temperature of the bath exceeds 90º C and will remove the input power to the system. The TCO has a red push button in the middle of the wire terminals that will reset (close the contacts) the switch when the bath temperature is below 80º C. Set the multimeter to the Diode Test Mode

and measure across the TCO (***See Figure 42***).

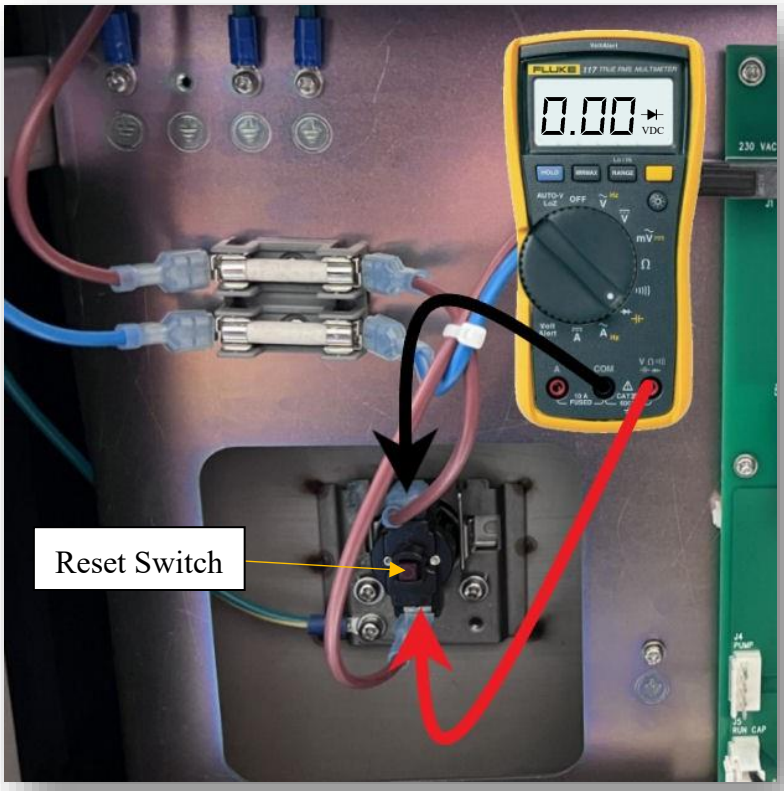


Figure 42 – TCO (Thermal Cutoff Switch)

i. If the multimeter displays continuous (0.00), the TCO is operating correctly. Skip to the next section (Section 5).

ii. If the multimeter displays open (OL), the TCO contacts are open (infinite resistance), wait until the bath temperature cools below 80º C. Press the red switch in the middle of the TCO to reset it. If resetting the TCO by depressing the button in the middle does not close the switch (continuity), replace the TCO.

5. **Check the Continuity of the PEM**

a. Unplug the power cord to the SCA. Set the multimeter to the Diode Test Mode ⊣▶⊢ and measure across the PEM (Power Entry Module).

b. With the PEM turned “On” (toggled to the left), touch one lead of the multimeter to the brown wire connected to fuse F1 and the other lead to the top right-hand prong of the PEM (***See Figure 43***).

i. If the multimeter displays continuous (0.00), this leg of the PEM is operating correctly. Skip to the next step (Step c).

c. With the PEM turned “Off” (toggled to the right), touch one lead of the multimeter to the blue wire connected to fuse F2 and the other lead to the top left-hand prong of the PEM (***See Figure 43***).

i. If the multimeter displays continuous (0.00), this leg of the PEM is operating correctly.

Figure 43 – PEM (Power Entry Module)

d. If the respective contacts do not show the proper resistance, replace the PEM.

F. No Power to Display Troubleshooting or ES Error

Tools Needed:

Multimeter

Phillips Screwdriver

Symptom: **SCA display appears to have no power upon plugging in to power and toggling on the power switch, or the display powers up but an ES error is displayed**

Theory: The display requires a voltage of between 9V DC – 13V DC from the PCB to operate. The further from 12V DC, the more likely the ES error will occur.

Steps:

1. **Check the 12V DC LED**
   a. Remove the back panel (**See <u>How to Remove the Back Panel</u> Section III A**).
   b. Check to see if the red "DC OK" LED is lit upon powering up SCA. This LED should always light up when the power switch is turned on.
      i. If the "DC OK" LED is *not* lit, check the incoming power to the PCB (**See <u>No Power To SCA</u> Section XII E**).
      ii. If the "DC OK" LED is lit, and the Control Panel display has no power or is giving an ES error, power off the SCA and reseat connector J6 (***See Figure 44***). The latch must be released to remove the connector by pressing a thumb nail on the latch lever and wiggle the connector out of the socket**.** Skip to the next step (Step c).

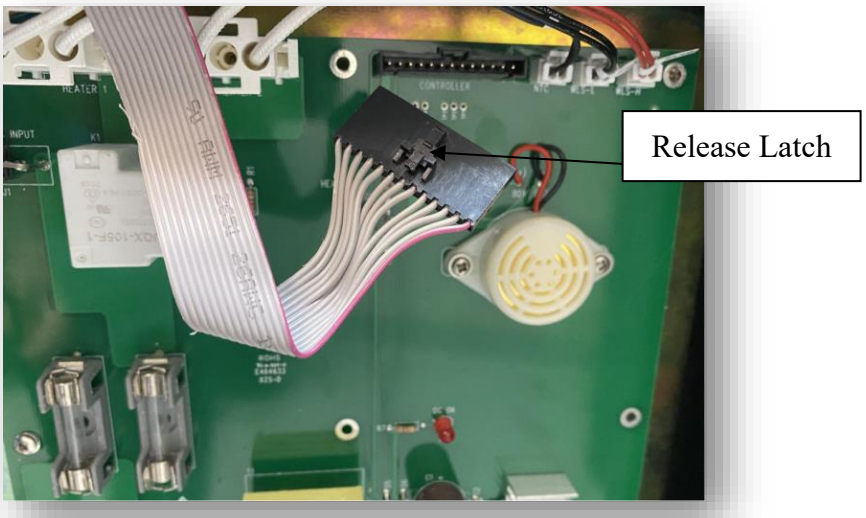


Figure 44 – Re-seat J6 Ribbon Connector

c. Select the DC Voltage ⩛ setting on the multimeter and check the voltage between TP10 (Ground) and TP12 (12 VDC). There should be ~9 VDC → ~13 VDC between TP 10 and TP 12 (***See Figure 45***).

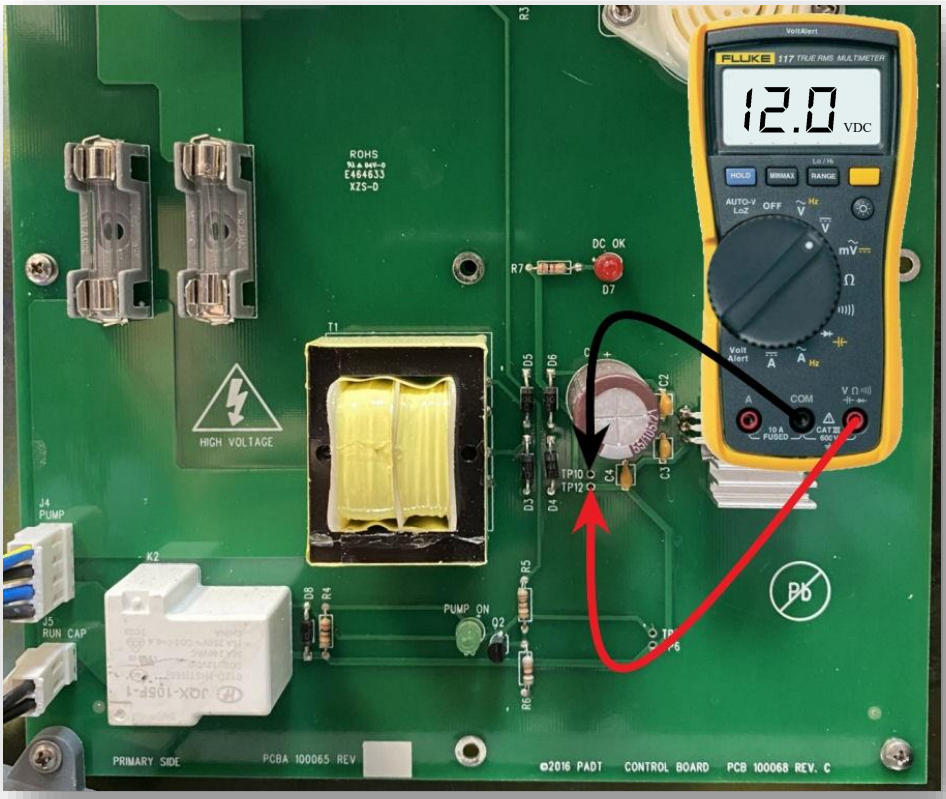


Figure 45 – DC Power Supply Voltage

i. If there is ~9 VDC → ~13 VDC, and the display does not power up, replace the display. Ensure J6 is seated correctly and snapped into place.

ii. If there is *not* ~9 VDC → ~13 VDC, check the incoming power at J1 (**See <u>No Power To SCA</u> Section XII E**). If there is ~208 VAC → ~240 VAC at J1 and there is *not* ~9 VDC → ~13 VDC between TP10 and TP12, replace the PCB.

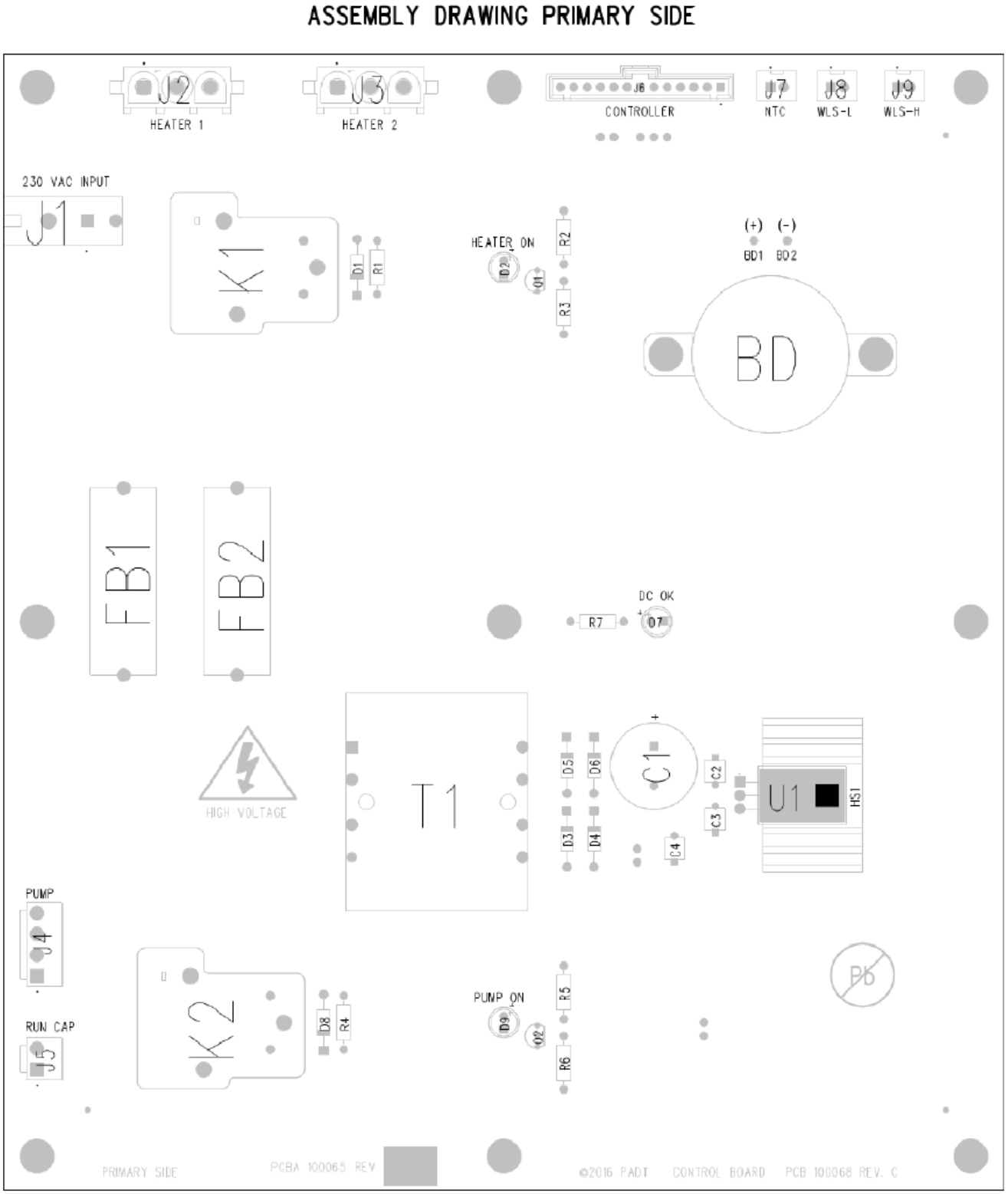
XIII. Documentation

A. Error Codes

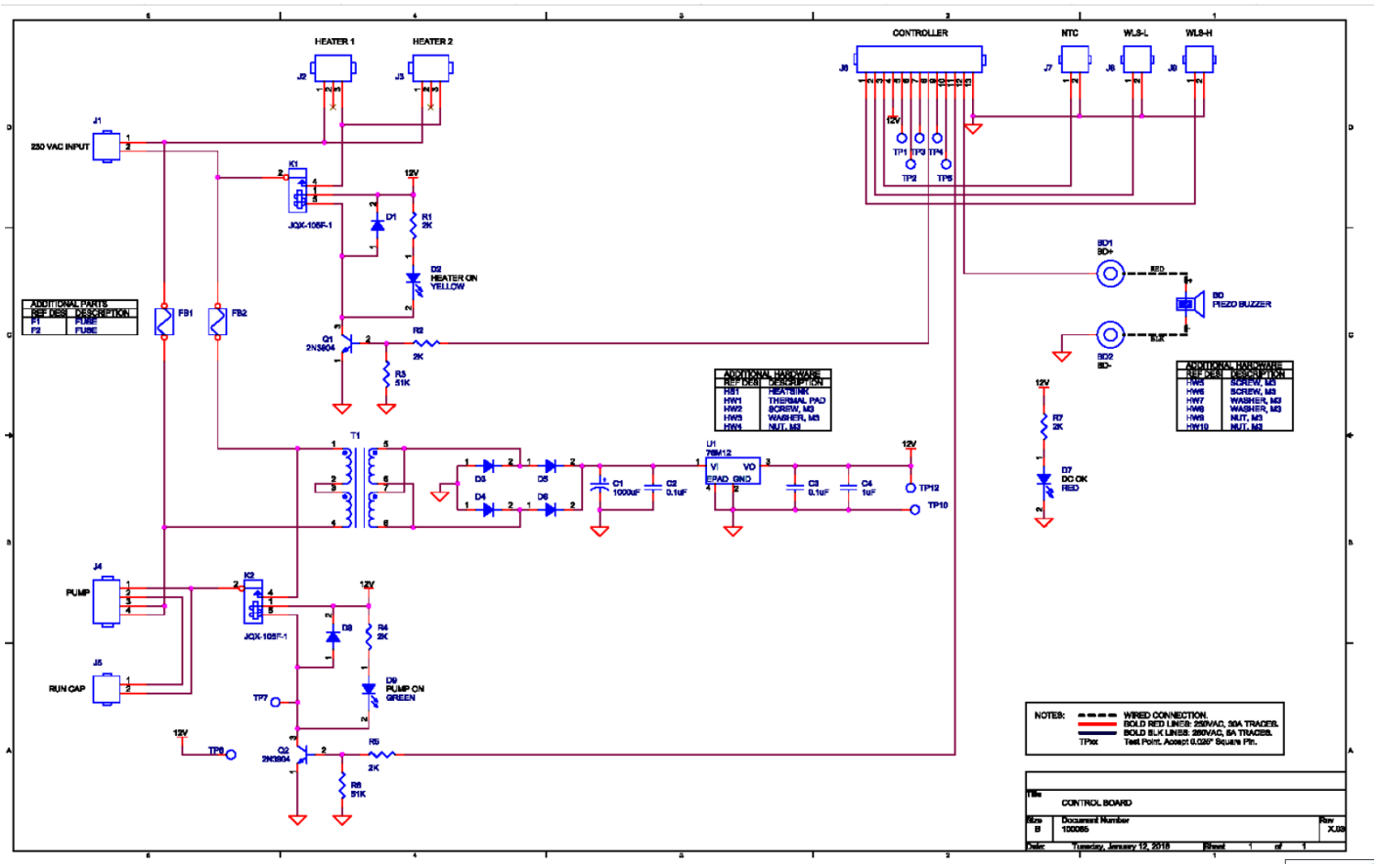
***EP**	Pump-motor malfunction/pump motor current fault.	(**See Pump Troubleshooting Section XII A**).
***EH**	Heater current fault	(**See Heating Element Troubleshooting Section XII B**).
ES	12VDC out of range, power supply error for display	(**See No Power to Display Troubleshooting Section XII F**).
EO	Over temperature	Temperature of water exceeds set temperature by more than 5ºC. Can be caused by an exothermic reaction to soluble cleaning solutions. Let tank return to set temperature. Error will not reset until SCA is powered down. (**See Temperature Sensor Troubleshooting Section XII C**).
r1	Temperature sensor failure	(**See Temperature Sensor Troubleshooting Section XII C**).
r2	High level sensor failure	(**See Water Level Sensor Troubleshooting Section XII D**).
r3	Low level sensor failure	(**See Water Level Sensor Troubleshooting Section XII D**).

***Only displayed on the original display controller *without* the "No Heat" option

B. Schematics

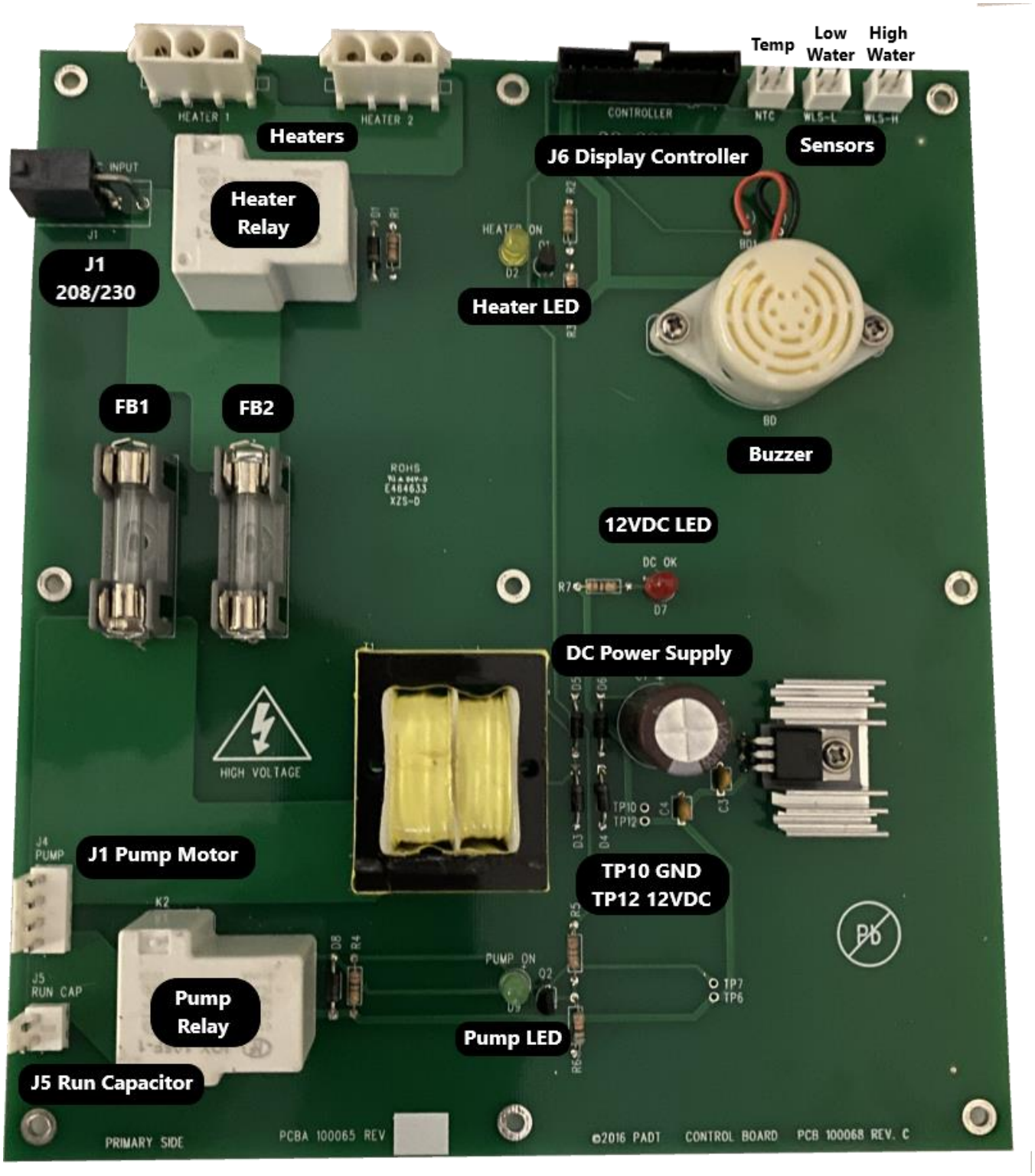


Physical Layout of PCB



Electronic Schematics

C. PCB Layout



PCB (Printed Circuit Board)

D. J6 Display Controller Pinout

- Low → ~0V DC
- High → ~12V DC

Pin	Description	Low	High
1	Water Level High Sensing	No Fault	Fault
2	Water Level Low Sensing	No Fault	Fault
3	Temperature Sensing	No Fault	Fault
4	Display VCC ~12V DC	Power Off	Power On
5	NA		
6	Heater Malfunction Sensing	No Fault	Fault
7	Heater Malfunction Sensing	No Fault	Fault
8	Heater Control	Heater Off	Heater On
9	Pump Motor Malfunction Sensing	No Fault	Fault
10	Pump Motor Malfunction Sensing	No Fault	Fault
11	Pump Motor Control	Start/Pause On	Start/Pause Off
12	Buzzer control signal output	Buzzer On	Buzzer Off
13	DC GND	NA	NA

E. Commonly Used Parts

Commonly Used Parts		
Part Description	**Part Number**	**Image**
Pump subassembly repair kit, SCA 3600	100006	
Power Entry Module (PEM)	100129	
Heater Assembly, SCA 3600,220VAC Heaters	100007	
Sensor Assembly for SCA 3600	100078	
Thermal Cutoff Switch (TCO)	100070	
Nozzle	100130	

Start Capacitor	100104	
Printed Circuit Board (PCB)	100065	
Display Controller	100128	
F1/F2 Fuse, Fast-acting, 25A, 6.3mm x 32mm, 250V	100123	
FB1/FB2 Fuse, slo-blow, 1A, 250V	100106	
Power cord, 250VAC, 16A NA SCA 3600	100108	
Power cord, 250VAC, 16A, EU for SCA 3600	100107	

XIV. Supplementary Information

A. Specifications

Physical specifications

Height	108.6 cm (42.8 in)
Width	57.8 cm (22.8 in)
Depth	92.7 cm (36.5 in)
Tank capacity	102 L (27 gal)
Weight (net / gross shipping)	73 kg (160.6 lbs) / 93 kg (204.6 lbs)
Large parts basket capacity	40.6 x 40.6 x 35.6 cm (16x16x14 in)
Small parts basket capacity	10 x 10 x 10 cm (4x4x4 in)
Shipping carton dimensions	105.0 X 70.0 x 129.5 cm (41.3 D x 27.6 W x 51.0 H in)

Power specifications

Source (nominal)	230VAC +/- 10%, 50/60 Hz, 15A, 3400W

Facility specifications

Installation location	Level floor able to support 204 kg (450 lbs)
Power requirements	A grounded electrical outlet (208-240VAC, 20A, 50/60Hz, single phase) within 2 m (6 ft) of the SCA

Environmental specifications

Temperature range	5°C - 40°C (41°F – 104°F)
Relative humidity	0% - 80% RH
Altitude	0 M – 2000 M

Safety and Regulatory specifications

Regulatory Compliance	CE, cTUVus, RCM, RoHS, WEEE
Pollution Degree	2
Installation Category	II
Equipment Class	Class I
IEC Marked Degree of Protection	For Indoor Use Only, IP20

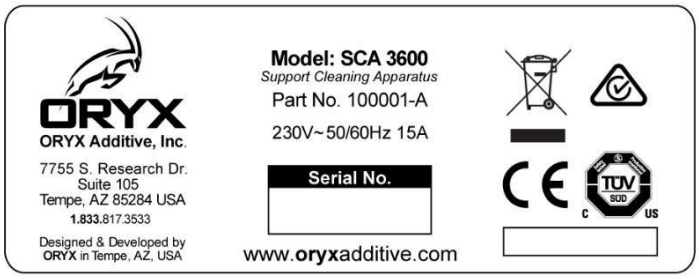
B. Customer Support

Contact Support

Technical support for this product is provided by **Oryx Additive, Inc**. Before contacting technical support, please try the Troubleshooting section of this Repair Manual.

If additional support is needed, contact Technical Support:

- Email Technical Support: **support@oryxadditive.com**
- Call Technical Support: **1.833.817.3533**
- Note the SCA model number, part number, and serial number (found on the back of the unit):



If the unit is covered by an extended warranty, contact the Authorized Reseller from whom the unit was purchased.

Otherwise, to receive technical support:

Send an e-mail to: **support@oryxadditive.com**.

Please include:

- full name
- company name
- phone number
- SCA serial number
- Detailed description of the problem with the SCA
- Pictures of the PCB (main board in the back)
- Other relevant pictures

Call 1-833-817-3533 and ask for SCA technical support.

For all documentation regarding the SCA 3600, please visit:
www.oryxadditive.com/products/sca3600

C. Warranty Information

SCA 3600 Support Cleaning Apparatus Limited Warranty

Product	Limited Warranty Period
SCA 3600 Support Cleaning Apparatus	1 year

All new Support Cleaning Apparatus (SCA) systems are warranted exclusively by Oryx Additive, Inc.'s ("Manufacturer") limited warranty as follows:

Each Support Cleaning Apparatus system ("System") and its components ("Components"), except those listed below under limits and exclusions, is warranted against defects in the materials and workmanship for a period of one (1) year from the date of installation at the end user's ("Customer") facility.

Repair or replacement only: manufacturer's liability under this agreement shall be limited to repairing or replacing, at the discretion of manufacturer, parts, or components sufficient to return the system to conform to the marketing specifications of the system.

Components subject to wear during normal use and over time such as paint, finish, light bulbs, seals, etc., are excluded from this warranty.

This warranty is void if the system is subjected to mishandling, misuse, neglect, accident, improper installation, improper maintenance, or improper operation or application, or if the machine was improperly repaired or serviced by the customer. This warranty is void if the system is not installed by a certified distributor and the proper installation documentation provided by the manufacturer has not been submitted.

Liability, whether based on warranty, negligence or other cause, arising out of and/or incidental to sale, use or operation of the system, or any part thereof, shall not in any case exceed the cost of repair or replacement of the defective equipment, and such repair or replacement shall be the exclusive remedy of the purchaser, and in no case will manufacturer be responsible for any and/or all consequential or incidental damages including without limitation, and/or all consequential damages arising out of commercial losses.

This warranty is transferrable from the original end user to another party if the machine is sold via private sale before the end of the warranty period.

The foregoing is a limited warranty, and it is the only warranty by manufacturer. MANUFACTURER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.