



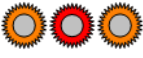


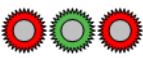


AQUA
RESEARCH

STREAM™

**DISINFECTANT GENERATOR
TECHNICIAN'S MANUAL
Revision B, July 2025**

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1.INTRODUCTION

1.1 Purpose of This Manual

This manual is intended as a companion to the STREAM™ Disinfectant Generator Operation and Maintenance Manual, which is included with every STREAM™ system. The information and procedures described in this manual are intended for use **only** by technicians trained by Aqua Research or its partners. Troubleshooting and repair procedures described herein have the potential to damage STREAM™ systems or present risk of injury if carried out by untrained personnel.

1.2 The Electrolytic Process

The STREAM™ system uses electrochlorination, which is the process of adding energy to sodium chloride (salt) to produce sodium hypochlorite. A basic chemical representation is:



In the case of the STREAM™ system, other oxidant species are produced by adding more energy to the reaction. The reaction is accomplished in the electrolytic cell. Salt water (brine) is pumped into the bottom of the cell. A voltage of 12 VDC is applied across the primary electrodes of the cell. This causes an electrical current to pass through the brine, which produces an aqueous chlorine-based mixed oxidant solution and hydrogen gas. The basics of this process are illustrated in Figure 1-1.

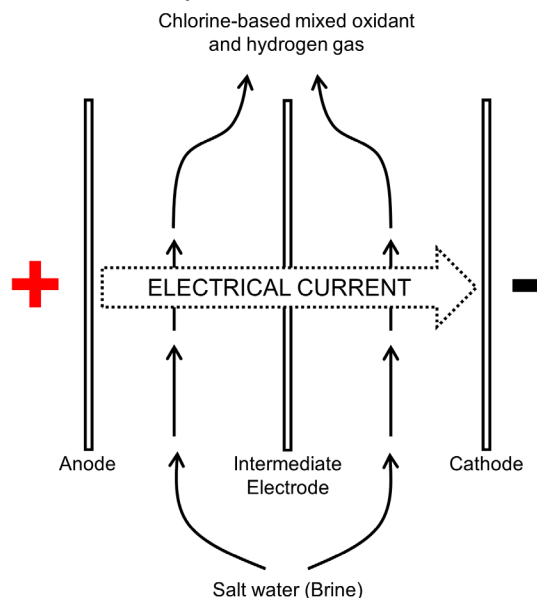


Figure 1-1. Basics of Electrochlorination

1.3 Required Tools

Aqua Research recommends that technicians carry at least the following tools and instruments for servicing STREAM™ systems:

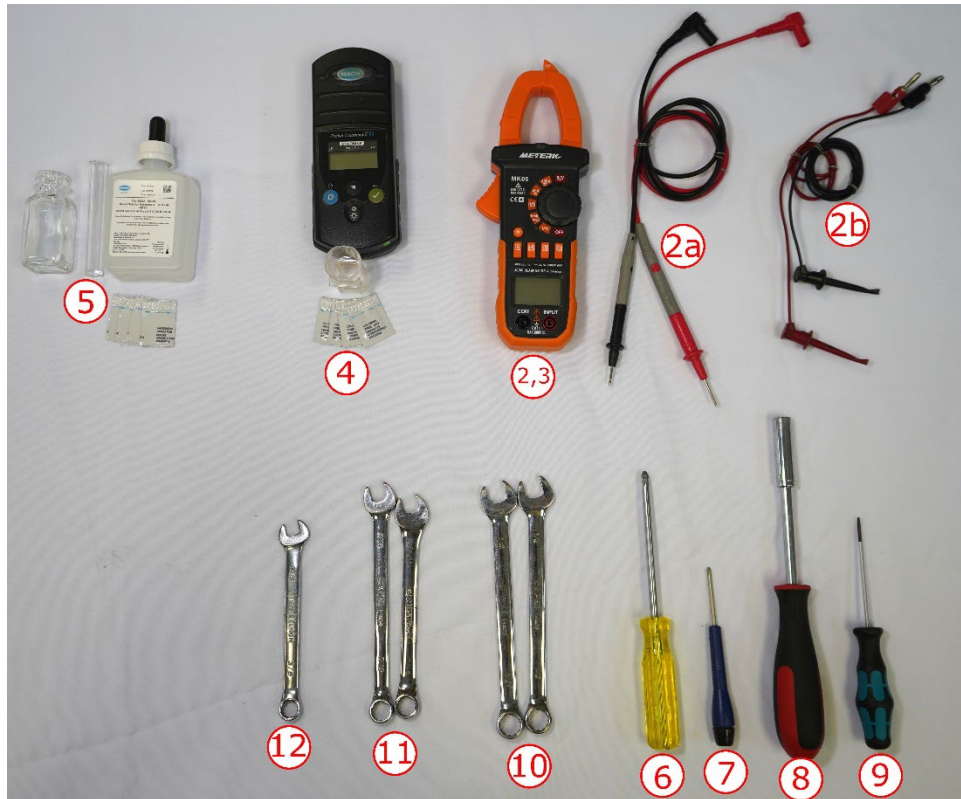


Figure 1-2. Required Tools for STREAM Maintenance

1. STREAM™ Disinfectant Generator Technician's Manual (not pictured)
2. AC/DC Voltmeter with:
 - a. Probe Leads
 - b. Mini Hook Leads
3. DC Current Clamp Meter
4. Free Chlorine Measurement Device
5. Water Hardness Measurement Device
6. #2 Phillips Screwdriver
7. #0 Phillips Screwdriver
8. 9mm Nut Driver
9. 2.5mm Flathead Screwdriver
10. (2) ½" or 13mm Wrench
11. (2) 7/16" or 11mm Wrench
12. 3/8" or 10mm Wrench

2.STREAM™ SYSTEM COMPONENTS

The STREAM™ System consists of three primary component groups:

1. The electrolytic cell
2. The system control box
3. The power supply



Figure 2-1. STREAM™ System Main Component Groups

The following sections discuss the specifics of each of these component groups.

2.1 Electrolytic Cell

The STREAM™ cell is where the electrolytic reaction takes place. The components of the cell are illustrated in Figure 2-2.

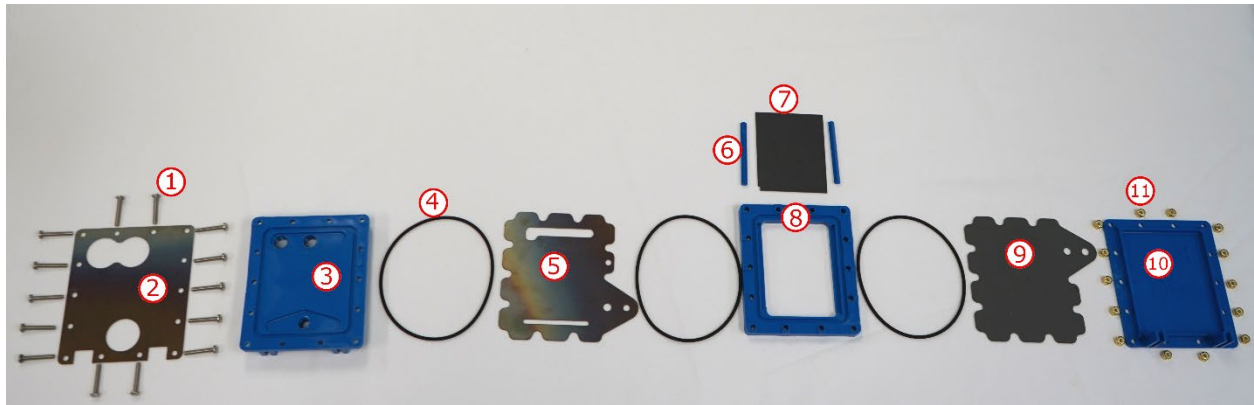


Figure 2-2. STREAM™ Cell Components

1. (14) Stainless steel 10-32 bolt
2. Titanium reinforcement plate
3. Cathode housing
4. (3) O-ring gasket
5. Cathode
6. (2) Intermediate electrode bracket
7. Intermediate electrode
8. Intermediate electrode housing
9. Anode
10. Anode housing
11. (14) Brass 10-32 nylon insert locknut

2.1.1 Removal and Installation

Removing the cell from the STREAM™ system may be necessary in the event that the cell has been damaged or reached the end of its life and needs replacing, or if the cell requires disassembly. To remove the cell, follow the steps below, referencing Figure 2-3.

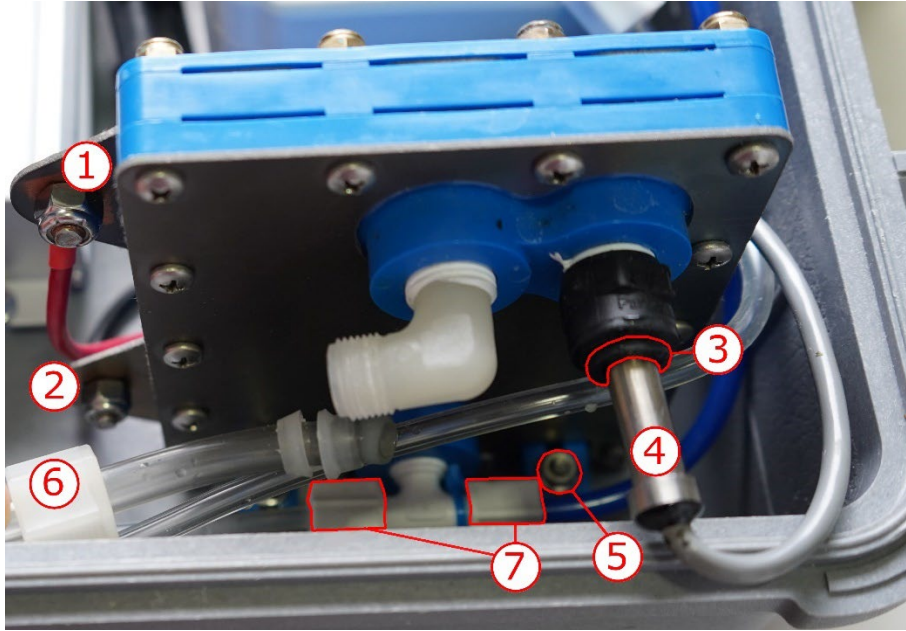


Figure 2-3. Electrolytic Cell in Place

1. Turn the system off and disconnect it from power.
2. To drain the cell, place the brine suction filter below the system and release the peristaltic tubing from the pump head (see Section 2.2.1).
3. Remove the positive lead (1) from the anode using two ½" or 13mm wrenches.
4. Remove the negative lead (2) from the cathode using two 7/16" or 11mm wrenches.
5. Remove the thermowell from its fitting:
 - a. Push the collet (3) against the fitting.
 - b. Pull the thermowell out, taking care to grip only the titanium thermowell (4), **do not** pull on the gray wire.
6. Remove the four mounting nuts (5) from the base of the cell using a 9mm nut driver.
7. Disconnect the 3/8" outlet tubing by unscrewing the nut (6) from the fitting. Leave the nut and ferrules on the outlet tubing.
8. Lift the cell out of the case and disconnect the blue 1/4" inlet tubing and the clear 1/4" rupture disc tubing from the bottom fitting by unscrewing the nuts (7) from the fitting. Leave the nuts and ferrules on the tubing.

Installation is the reverse of removal.

2.1.2 Disassembly and Assembly

The STREAM™ cell is designed to be able to be assembled and disassembled in the field with minimal tools once removed from the STREAM™ system case. The only tools required are a #2 Phillips screwdriver and a 3/8" or 10mm wrench. The steps for disassembly are discussed below.

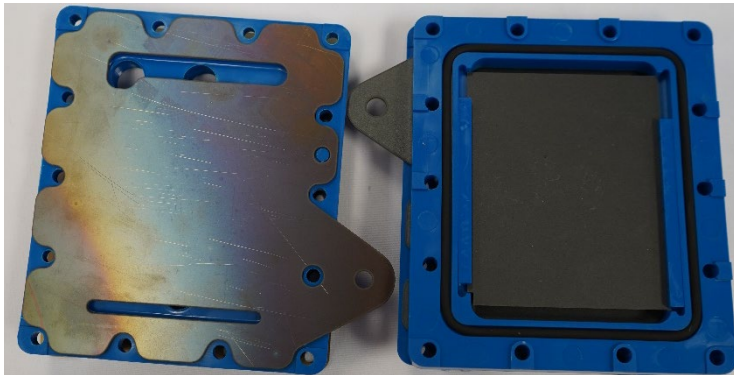


Figure 2-5. Cathode Housing Removed



Figure 2-4. Alignment Notch Detail

1. Remove all 14 assembly nuts and bolts.
2. Lay the cell flat with the cathode housing facing up.
3. Lift the cathode housing off (Figure 2-5). Note that the cathode electrode is sealed to the cathode housing in the factory; it is recommended to leave them together.
4. Note the orientation of the intermediate electrode and housing. The housing has four tabs in the corners, one of which is longer than the other three. This longer tab mates with a cutout notch in the intermediate electrode (Figure 2-4). This corner should be in the lower left when viewed from the cathode-facing side with the cell feet at bottom. **It is essential** that this orientation be correct because the intermediate electrode has different chemical coatings on either side, and reversing the polarity to these coatings will permanently damage the electrode. The intermediate electrode is held in place by two spacer brackets on either side which sit on top of the intermediate electrode, and a shoulder in the housing.
5. Lift the intermediate housing off. It is recommended to keep the electrode in place in the housing.

Assembly is the reverse of disassembly, with a few notes:

- Take special care to orient all electrodes correctly. Assembling the cell with any electrodes in the wrong orientation will permanently damage the cell.
- Once all electrodes and housings are placed, leave the cell laying down with the cathode housing facing up. Replace the assembly screws through the corners first; this will help clamp all components together. Once the corner assembly screws are

in place and tightened into their corresponding nuts, the cell can be placed upright for easier access to the remaining assembly screws.

2.1.3 Plumbing

Any repairs or maintenance on the system's plumbing should be very straightforward. Figure 2-6 shows a shortened representation of the system's plumbing components.

1. Brine suction filter
2. Rupture disc union
3. Peristaltic pump head
4. Cell inlet tee
5. Cell outlet
6. Outlet and storage coupling
7. Thermowell fitting

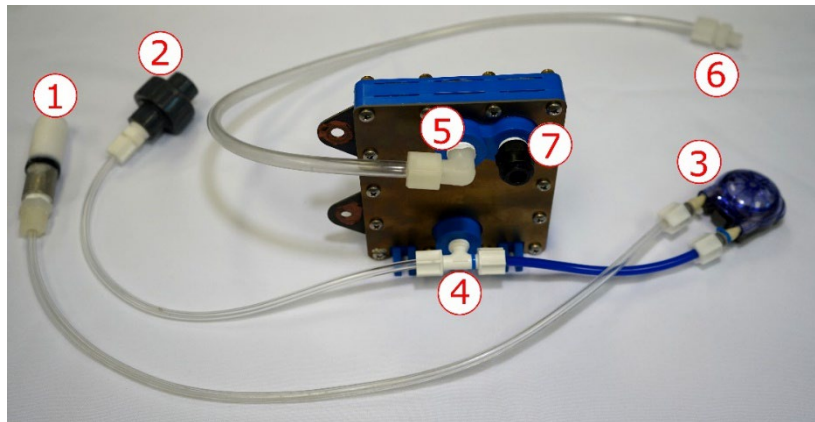


Figure 2-6. System Plumbing

Every tubing end connection (1,2,3,4,5,6) is made with a compression-type fitting. The connections into the cell housing are made with $\frac{1}{4}$ " (4) and $\frac{3}{8}$ " (5 & 7) pipe thread. One important consideration is that most compression fittings have three separate parts which must be kept in the correct order on the tubing end. Some compression nuts have an integrated sleeve instead of separated ferrules. See Figure 2-7.

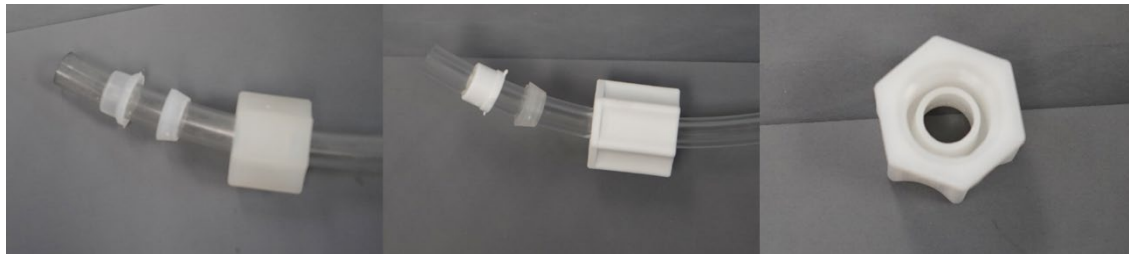


Figure 2-7. Compression Nuts with Separate (Left, Center) and Integrated (Right) Ferrules

2.2 Control Box

The control box houses the system control board and peristaltic pump. Connections into the box are made through a watertight cable gland. The control box can be opened if required for servicing internal components by removing the four Phillips head screws in the corners of the lid. The following sections describe the peristaltic pump, wiring harness, and control board in more detail.

2.2.1 Peristaltic Pump

The peristaltic pump controls the rate of flow of brine into and oxidant out of the cell. During normal operation, the pump speed will vary according to the electrical current through the cell to maintain a nominal concentration of 5,000 parts per million of free available chlorine in the oxidant. The components of the pump are illustrated in Figure 2-8:

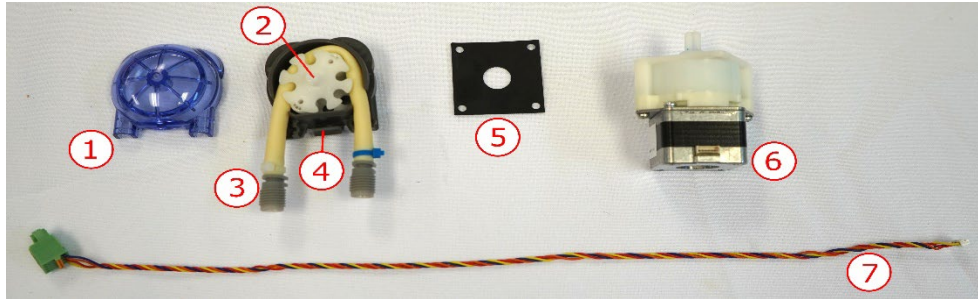


Figure 2-8. Pump Components

1. Cover
2. Cam wheel
3. Peristaltic tubing
4. Pump head
5. Pump gasket
6. Motor
7. Motor wiring connector

Removal and Installation

The steps to remove the peristaltic pump are described below:

1. Remove the peristaltic tubing from the pump head
2. Remove the lid from the control box
3. Disconnect the 4-wire connector from the pump motor
4. Remove the two screws from the underside of the control box lid
5. Separate the pump head and motor body
6. Keep the square gasket with the control box
7. For storage, re-assemble the pump head and motor body

Installation is the reverse of removal.

2.2.2 Wiring Harness

The wiring harness brings electrical power and sensing into the control box, and delivers electrical power to the cell through a watertight cable gland. The harness and cable gland are a complete assembly and should not be separated. Figure 2-9 shows the components of the wiring harness.

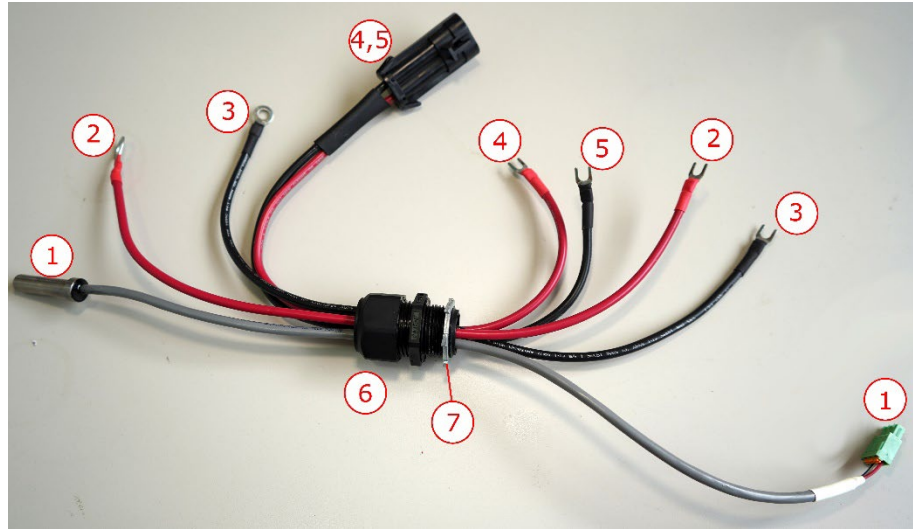


Figure 2-9. Wiring Harness Components

1. Thermowell – temperature sensor
2. Cell + Lead
3. Cell - Lead
4. Power Supply + Lead
5. Power Supply - Lead
6. Cable gland
7. Locking nut

Removal and Installation

If the harness and cable gland require replacement, it is recommended to first remove the control board to avoid any potential damage. See section 2.2.3 for control board removal and installation. Once the control board is removed, grip the cable gland by the wrench flats against the outside of the control box and turn counter-clockwise. The stainless steel locking nut is sealed against the interior wall of the control box with RTV silicone. Once the cable gland is loosened from the locking nut, the nut will need to be pried free and any remaining silicone cleaned from the control box wall.

Installing the new wiring harness is the reverse of removal, with the added recommendation that fresh RTV silicone be applied around the threads of the cable gland on the control box interior wall before installing the new locking nut.

2.2.3 Control Board

The control board is the brain of the STREAM™ system. The primary components of the control circuitry are illustrated in Figure 2-10.

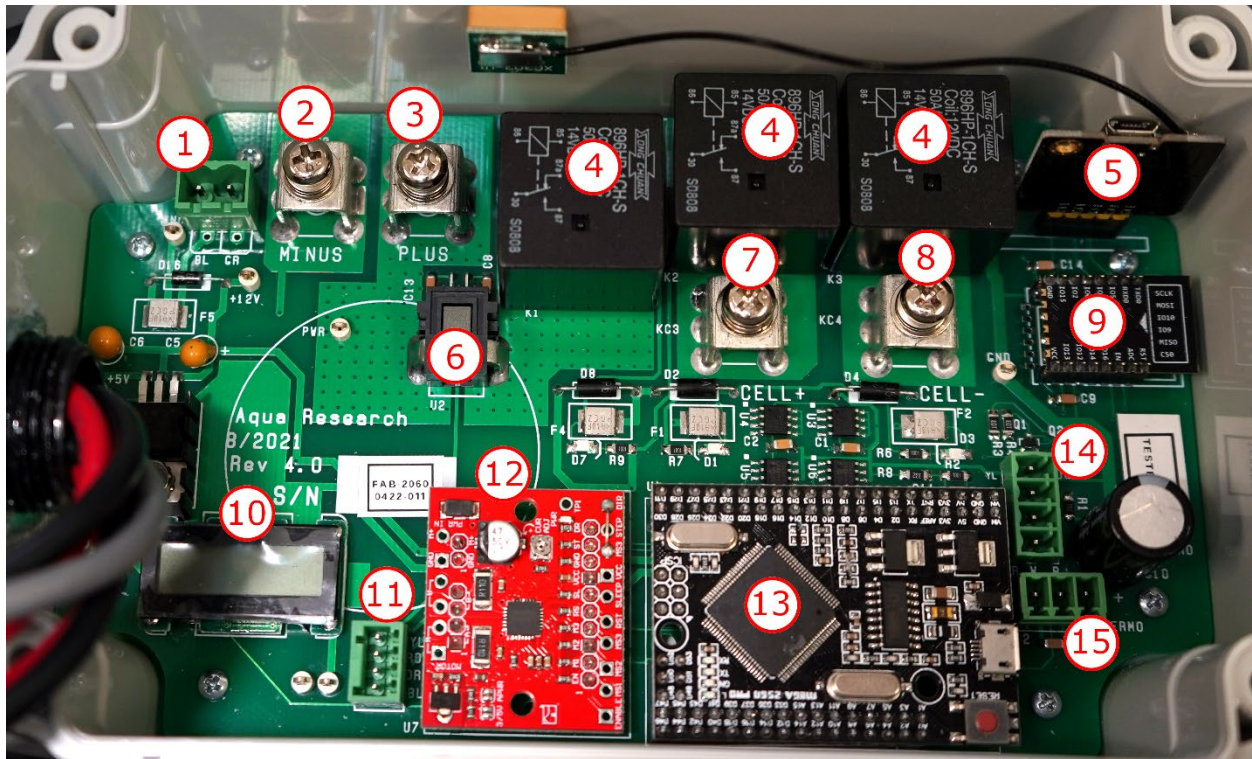


Figure 2-10. Control Circuitry

1. Power switch connector
2. Power supply - terminal
3. Power supply + terminal
4. (3) Cell power relays
5. GPS coprocessor
6. Current sensor
7. Cell + terminal
8. Cell - terminal
9. WiFi coprocessor
10. Runtime hour clock
11. Motor connector
12. Stepper motor driver
13. Processor
14. LED button connector
15. Thermowell connector

The connectors labeled 2,3,7,8, and 15 are connected to the wiring harness. Connectors labeled 1, 11, and 14 are connected internally to components mounted to the lid of the control box.

Removal and Installation

Removal of the control board may be necessary if the board becomes damaged. The steps for removal of the control board are described below.

1. Turn the system off and disconnect power.
2. Remove the peristaltic tubing from the pump head (see section 0)
3. Remove the control box lid.
4. Loosen the screws on the power supply +/- and cell +/- terminals (2,3,7,8 in Figure 2-10).
5. Remove the thermowell, LED button, motor, and power switch connectors by pulling the green connectors straight up (1,11,14,15 in Figure 2-10).
6. Remove the 8 small screws in the corners of the control board.
7. Carefully lift the control board out of the control box.

Installation is the reverse of removal.

Component Removal and Installation

The control board is assembled by Aqua Research and most components are permanently affixed. A few components can be removed or exchanged, if necessary. These are the processor, WiFi coprocessor, GPS coprocessor, and stepper motor driver (13,9,5, and 12 respectively in Figure 2-10).

To remove any of these socketed components, pull carefully **straight up** from the control board. If not pulled straight up, the pins on these components can be bent or broken.

To replace a socketed component, line the component's pins with its sockets, checking that the alignment is correct and no pins are misaligned such as in Figure 2-11. If the system is powered on with socketed components misaligned, it can cause electrical shorts and damage the system. Reference Figure 2-10 for the correct orientation of these components. Once the component is correctly aligned, push down firmly to seat the pins fully into their sockets.

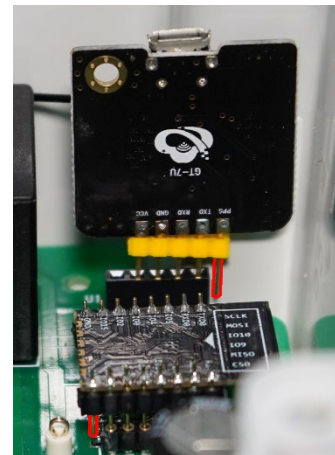


Figure 2-11. Misaligned Components

2.3 Power Supply

The power supply provides 12 VDC to the control box in order to power the control circuitry and the cell. It can be connected to a power outlet ranging from 100-277 VAC at 50-60 Hz. The power supply is outfitted with a surge protection device to protect against transient voltages (spikes). The surge protector has an LED indicator light that should be lit when connected to a power outlet. In Figure 2-12, note the green light on the surge protection device. If this light is not lit when connected to a working power outlet, it is possible that the surge protector has reached the end of its life.

1. Surge protection device
2. Power supply
3. Power supply-control box connector



Figure 2-12. Power Supply Components

2.3.1 Alternative Power Source

The STREAM™ system has the ability to be powered by any 12-15 VDC power source, such as a car battery or solar panels, by disconnecting the power supply-control box connector (3 in Figure 2-12) and connecting the included power cables to the control box and the appropriate power source. If an alternative power source is used, it is important to reference the manufacturer's documentation for correct operation and maintenance.

3. TROUBLESHOOTING

If the STREAM™ system presents a fault condition, the steps outlined in the subsequent sections can be followed to address the fault. If the fault is unable to be fixed by using these steps, contact Aqua Research for further support.

3.1 Common Issues

Some of the most common causes for the STREAM™ system to be out of service are:

- Scale formation
- Blockage in the tubing, or
- Other obstruction of flow
- Incorrect salt concentration in the brine
- Incorrect power source
- Poor electrical connections within the system

3.1.1 Scale Formation

Accumulation of calcium carbonate scale is the most common issue that has affected STREAM™ systems in the field. The STREAM™ system is best run on water with a total hardness less than 1 grain per gallon (17.1 ppm). When operated on water with total hardness greater than this, the electrolytic cell **will** become fouled with calcium carbonate scale. Figure 3-1 shows the STREAM intermediate electrode after 40 hours of operation on water with 10 grains per gallon total hardness. This buildup of scale reduces the usable surface area of the electrodes. If enough scale is allowed to accumulate, it can bridge between the electrodes, effectively creating an electrical short through the cell. In order to maintain the system and keep the manufacturer's warranty valid, it is required to clean the cell every 40 hours of operation when water with total hardness greater than 1 grain per gallon is used, see Section 7.1.6 in the STREAM™ Operations and Maintenance Manual. It is strongly advised that the operator of the system use a soft water source such as rainwater runoff, or water from a lake, river, stream, or other soft water source.



Figure 3-1. Scale Formation

3.2 First Steps

The first steps before undertaking any repairs on the STREAM™ System, regardless of the symptom, are outlined below. The troubleshooting steps discussed in the following sections assume that these first steps have already been done.

1. Check the brine

The STREAM™ is designed to run best on a salt concentration of 15 g/L. That is, 15 grams of salt dissolved in 1 liter of water. If uncertain, make new brine that is known to have the correct concentration.

2. Check all tubing

Look over all tubing, starting from the brine suction filter and rupture disc housing and continuing to the pump, the cell, and along the length of the outlet tubing. Look for any places the tubing may be pinched or kinked. Look for any blockage or accumulation of solids in the tubing, such as pictured in Figure 3-2. Look at the coupling at the end of the outlet tubing for obstructions in the fitting.



Figure 3-2. Scale Accumulation in Tubing

3. Check the power source

Confirm that the light on the surge protection device is lit, if plugged into an outlet. If the light is dark, unplug the unit from its current outlet and try connecting it to another outlet.

4. Check the rupture disc

If the rupture disc is blown (see Figure 3-3), it is an indication that something has blocked flow through the system. The cell will likely need to be cleaned with acid and the tubing re-checked for obstructions.

5. Check the pump

On startup, the pump should turn clockwise at a speed of about 150 revolutions per minute. If the pump is turning slower than this during the first 45 seconds, it could indicate a poor electrical connection to the pump motor, obstructions in the tubing, or both.

6. Check for flow

Turn the system on and confirm that the pump is turning clockwise. Watch the inlet tubing from the brine suction filter for flow and watch the outlet at the top of the cell for flow.



Figure 3-3. Blown Rupture Disc

3.3 **Blinking Yellow - Low Voltage Warning**

The flashing yellow error code indicates that the voltage supplied to the system control box has fallen below 11 VDC. The speed of the flashing light indicates how far below this threshold the voltage has fallen. The faster the light blinks, the lower the voltage is. Normally, the system will continue to run as long as the voltage into the control box is above 10 VDC.

Although the system should continue to run with this indicator present, it is likely that there is an issue that will cause system shutdown and should be addressed. The steps for troubleshooting a low voltage warning are described below.

- ❖ If green light on surge protection device is off:
 - Plug STREAM into a different outlet. If light comes on, try to run system.
 - If the light stays off, the surge protector and/or power supply may be damaged.
- ❖ If green light on surge protection device is on, check the output from the power supply:
 - If < 12 VDC:
 - Plug STREAM into a different outlet
 - Check voltage again
 - Try to run the system
 - If error persists:
 - Unplug the system from power
 - Turn the ON/OFF switch ON

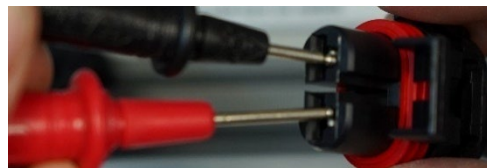


Figure 3-4. Measuring Voltage at Power Connector

- Wait 10 minutes
- Turn the ON/OFF switch OFF
- Plug the system back in and try to restart
- If error persists:
 - Turn the ON/OFF switch OFF
 - Disconnect the positive (red) lead from the cell
 - Turn the ON/OFF switch ON, allow the system to run until it faults out with a solid red (low amps) error
 - Repeat steps above three times
 - Reconnect the positive lead to the cell and try to run the system
- If ≥ 12 VDC:
 - Open the control box and check:
 - All connections are secure (points 1,2,3,7,8,11,14,15 in Figure 2-10)
 - All socketed components are fully seated (5,9,12,13 in Figure 2-10)
 - Look over the entire control board for any visible signs of damage. Figure 3-5 shows an example of corrosion on a circuit board.



Figure 3-5. Corrosion on Circuit Board

3.4 Solid Yellow - Low Voltage Shutdown

The solid yellow error code indicates that the voltage supplied to the system control box has fallen below 10 VDC. At this level, the voltage is insufficient to power the reaction in the electrolytic cell and so the system will shut down. The steps for troubleshooting a low voltage shutdown are the same as in Section 3.3.

3.5 Blinking Yellow/Red - Voltage Out of Range Shutdown

The blinking yellow/red error code indicates that the voltage to the system control box is outside of the range required to operate the control circuitry, either too high (above 15.5 VDC) or too low (below 6.5 VDC). The system will indicate which condition is present by the speed of the blinking. A faster blink rate of four times per second indicates the voltage is above the upper threshold. A slow blink rate of twice per second indicates the voltage is below the lower threshold.

If the error code indicates that the voltage is below the lower threshold (slow blinking twice per second), follow the troubleshooting steps outlined in section 3.3.

If the error code indicates that the voltage is above the upper threshold (fast blinking four times per second), the steps for troubleshooting are described below.

- ❖ Check the voltage from the power supply
 - If > 15.5 VDC:
 - Unplug the STREAM from the power outlet
 - Let the system sit without power for 30 minutes
 - Plug the system in and check voltage again
 - If still > 15.5 VDC:
 - Try plugging the system into a different power outlet
 - The power supply may have been damaged and need replacing – see Section 2.3
 - If < 15.5 VDC:
 - Open the control box
 - Check that all socketed components are properly aligned and fully seated
 - Look over the control board for damage, especially in the area of R8 & R2 (see Figure 3-6)

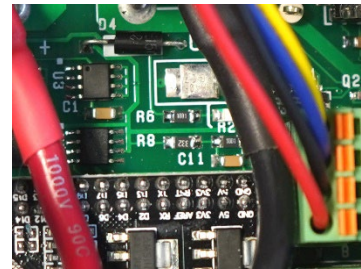


Figure 3-6. R8 and R2

3.6 Blinking Red - High Amps Shutdown

The blinking red error code indicates that the electrical current through the cell is too high. The most common cause of this error is too much salt in the brine solution. The steps for troubleshooting a high amps shutdown are described below.

- ❖ Check the cell current with the clamp meter (see Section 4.3)
 - If current reaches >20 amps before shutdown or shutdown is very rapid after the initial 45-second purge:
 - Check cell lead connections are tight
 - Clean the cell with acid following appendix C in the STREAM™ Operations and Maintenance Manual
 - Mix new brine and restart the system
 - If the issue persists:
 - Disconnect the red lead from the cell anode
 - Start the system and allow it to run until fault with the red lead disconnected. The fault condition in this case should be a solid red (low amps error). If the system faults out with a flashing red error with the red lead disconnected, the control board may be damaged. Contact Aqua Research.
 - Open the control box
 - With the system powered off, check the voltage between the power supply + and - terminals. If using the system's integrated power supply, this

voltage should not exceed 12.5 V. If the voltage is above this limit, the power supply may be damaged. Contact Aqua Research.

- If using an alternate power source such as a car battery, this voltage should not exceed 15.5V. A voltage higher than 12V will cause more current through the cell. If the voltage between power supply + and - terminals on the board is 12-15.5V on an alternate power source, it may be necessary to dilute the brine to reduce its conductivity.
- If the current is between 14-20 amps:
 - Check cell lead connections are tight
 - Open the control box and check:
 - All connections are fully seated
 - All socketed components are properly aligned and fully seated
 - Look over the board for any signs of damage
 - Confirm the voltage between 5V test point and GND is between 4.8 - 5.2 VDC

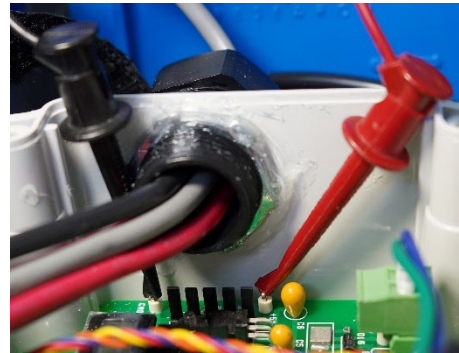


Figure 3-7. Checking Voltage at 5V Test Point

3.7 Solid Red - Low Amps Shutdown

The solid red error code indicates that the electrical current through the cell is too low. The most common cause of this error is not enough salt in the brine solution. The steps for troubleshooting a low amps shutdown are described below.

- ❖ If cell current is < 14 amps:
 - Ensure the cell lead connections are tight at the cell
 - If brine is < 50°F (10°C):
 - Make a new brine solution (15g/L) with water at least 70°F (21°C)
 - Try to run the system on the new brine solution
 - Kickstart the cell with high salt:
 - Make a small amount of brine at 30g/L concentration
 - Place the brine suction filter in this stronger solution, turn the system on, and let the pump run for 30 seconds
 - Turn the system off
 - Move the brine suction filter back to the normal 15 g/L brine
 - Turn the system on and let it run
 - Clean the cell with acid (see Section 7.1.6 in the STREAM™ Operations and Maintenance Manual)
 - Open the control box and check connections are tight at:
 - Cell +
 - Cell -

- Power supply +
- Power supply -
- ❖ If cell current is > 14 amps:
 - Using the STREAM™ WiFi, check the cell amps
 - If the cell amps from the WiFi is < 14 amps, there may be an error in the measurement circuitry. Open the control box.
 - Confirm that voltage from GND to 5V test point (see Figure 3-7) is 4.8 VDC - 5.2 VDC
 - Confirm that all socketed components are aligned correctly and properly seated

3.8 Blinking Red/Green - Overheating Warning/Shutdown

The blinking red/green error code indicates that the temperature inside the electrolytic cell is too high. The speed of the blinking indicates how hot the temperature in the cell is. A faster blink rate indicates higher temperature. If the system is still running with this indicator present, the temperature has not exceeded the maximum threshold to prevent damaging the cell but is above a warning threshold. If the temperature in the cell exceeds the safe operating limit of the cell, the system will shut down. The steps for troubleshooting an overheating warning/shutdown are listed below.

- ❖ Clean the cell with acid
 - See Section 7.1.6 in the STREAM™ Operations and Maintenance Manual
- ❖ Feel the cell
 - If the cell is warm to the touch, the cell likely needs cleaning. See above.
 - If the cell is not warm to the touch, there may be an electrical issue.
- ❖ Check the thermowell electrical connections
 - Open the control box and check the 3-wire connection (15 in Figure 2-10)
 - The connector should be fully seated, all three wires firmly fixed in the connector
 - Check continuity (see Section 4.4) between the thermowell housing and the cell electrodes while the system is running (see Figure 3-8).
 - If there is continuity between the housing and either electrode:
 - Remove power from the system
 - Remove the thermowell from the cell
 - Open the control box

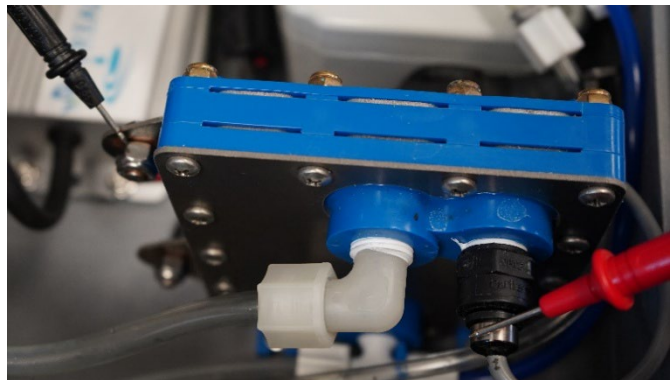


Figure 3-8. Continuity Thermowell Housing to Electrode

- Check continuity between the thermowell housing and:
 - ◆ Power supply +
 - ◆ Power supply -
 - ◆ CELL +
 - ◆ CELL -
 - ◆ +12V Test Point
- If there is continuity between the housing and any of these points with the thermowell removed from the cell, the thermowell is likely damaged and will need replacing. See section 2.2.2.

3.9 Pump Not Turning or Turning slow

When the system is first powered on, there may be a delay of several seconds before the pump starts to turn. During this time the controls of the STREAM are booting up. The pump then starts to turn at a speed of roughly 150 rpm for 45 seconds. If the system is turned on and the pump does not start to turn within 30 seconds, or if the speed is below 150 rpm, it is an indication of a problem. The steps for troubleshooting a pump that does not turn are described below.

- ❖ Check for obstructions
 - Look over the length of the tubing, starting from the brine suction filter all the way to the end of the discharge tubing.
- ❖ Stretch the peristaltic pump tubing
 - Remove the tubing from the pump head
 - Grip the tubing at both ends, just behind the gray fittings, and stretch it by a few inches (Figure 3-9)
 - Repeat the above step five times
 - Before replacing the tubing in the pump head:
 - Turn the system on
 - Watch the cam wheel in the pump head to see if it turns without the tubing in place
 - If the pump doesn't spin even without the tubing, an electrical issue is likely
- ❖ Check for electrical issues
 - Open the control box
 - Scan the control board for signs of damage
 - Look over the pump wires for signs of damage
 - Check that the connections at both ends of the pump wires are secure by tugging gently
 - Check that all socketed components are aligned and seated

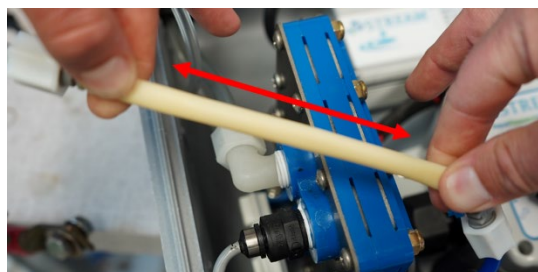


Figure 3-9. Stretching Peristaltic Tubing

- ❖ Replace stepper motor driver
 - Reference section 2.2.3
- ❖ Check stepper motor driver setting (see Figure 3-10):
 - With the system powered on, check the voltage from GND to the point TP1 (1) on the stepper motor driver.
 - If > 0.8 VDC or < 0.7 VDC:
 - Use a small screwdriver to rotate the CUR ADJ potentiometer (2) – note that the adjustment is very sensitive. Bring the voltage at TP1 to between 0.8 VDC and 0.7 VDC. Turning the CUR ADJ potentiometer clockwise decreases the voltage at TP1. Counterclockwise increases the voltage at TP1.

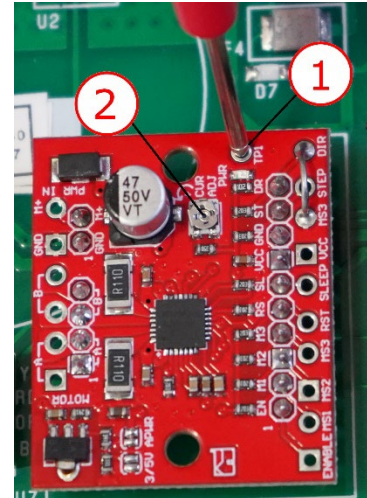


Figure 3-10. Stepper Driver Adjustment

3.10 Low Chlorine Production

It is advisable to periodically check the chlorine production of the STREAM™ system. The STREAM is designed to produce a chlorine-based mixed oxidant at a concentration of 0.5% free available chlorine (FAC) +/- 0.1%, or 4,000 ppm to 6,000 ppm with a nominal concentration of 5,000 ppm. Variations in this concentration will occur, but if the average production decreases over time, it may indicate an issue or that the electrolytic cell has reached the end of its useful life. In the event that the system's chlorine production falls, the following steps should be taken.

- ❖ Re-check the test results.
 - Ensure that the water used for diluting the sample is clean and free of oxidant demand. The STREAM™ Operations and Maintenance Manual describes procedures for producing oxidant-demand-free water.
 - Do not take a sample for testing immediately after starting the system. Allow the system to run for at least 30 minutes before taking a sample from the oxidant outlet.
 - Follow the correct instructions for the chlorine measurement device being used. Different methods measure different ranges, so be sure that the dilution of the sample is appropriate for the device in use. The formula below can be used to calculate the appropriate dilution, with Min being the low end of the measurable range, Max being the high end of the measurable range, S being the nominal sample concentration (5,000 ppm for STREAM), and D being the dilution ratio:

$$D = \frac{2 * S}{\text{Max} - \text{Min}}$$

Example 1: The method to be used is a colorimeter which uses DPD reagent combined with the sample to measure FAC. The range of the device is 0.1-8.0 mg/L (ppm). Then Max = 8.0, Min = 0.0, and S = 5000:

$$D = \frac{2 * 5000}{8 - 0} = 1250:1$$

Because this is a difficult dilution to accomplish, round it to an easily usable ratio such as 1000:1.

Example 2: The method to be used is a test strip with a range of 0-1000 ppm. So Max = 1000, Min = 0, and S = 5000:

$$D = \frac{2 * 5000}{1000 - 0} = 10:1$$

- ❖ The cell may be fouled. Clean the cell with acid, following the procedures in Appendix C of the STREAM™ Operations and Maintenance Manual.
- ❖ Check the temperature of the brine solution. The brine solution should be between 50°F - 100°F (10°C - 38°C). Brine that is too warm will flow faster through the cell, reducing exposure time in the cell and possibly resulting in lower FAC production. Brine that is too cold will cause damage to the electrodes, reducing their effectiveness.
- ❖ Run the system and allow it to stabilize for 5 minutes. Then measure and record the amperage through the cell and the volume of oxidant produced in 1 minute by directing the flow from the discharge tubing into a graduated cylinder for 1 minute. Compare the measured results against the table below.

Amps	Vol. in 1 minute (ml)
14	41
15	52
16	63
17	74
18	85
19	96
20	107
21	118

If the measured results differ from the above table by more than 20% it could indicate that there is a blockage in the system, or that the cell has reached the end of its usable life.

3.11 Leaking

If a leak occurs in the system, it is likely to accompany another issue. Most often, if the cell has not been properly maintained with cleaning cycles or by using soft water, leaking can occur due to pressure buildup within the system. After addressing the root cause of the leak, the following steps can be taken.

❖ Examine the system to find the source of the leak

➤ If the leak is at a connection point into the cell:

- Disconnect the tubing at this point
- Remove the fitting from the cell housing
- Wrap the threads of the fitting with Teflon thread seal tape
- Replace the fitting and tighten hand-tight, replace the tubing connections

➤ If the leak is along the length of the tubing:

- Examine the tubing for holes or damage
- If there is damage close enough to either end of the tubing, the damage can be cut out and the tubing reattached
- If there is not enough tubing either side of the leak to allow cutting it out, the tubing may need replacing

➤ If the leak is from the cell housing:

- The cell can be removed and disassembled (see Section 2.1)
- Clean the gaskets and gasket mating surfaces of the cell housings (Figure 3-11)
- Examine the gaskets for damage
- Reassemble the cell

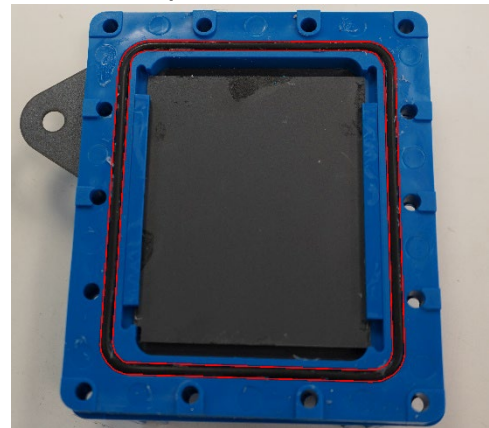


Figure 3-11. Cell Housing Gasket

- ❖ To prevent permanent damage from a leak, a drain hole can be added in the bottom of the system's Pelican case (Figure 3-12). On more recent versions of the STREAM™ system, this hole is added in the factory. When drilling a drain hole, be careful not to drill farther than the thickness of the Pelican case and puncture internal components.

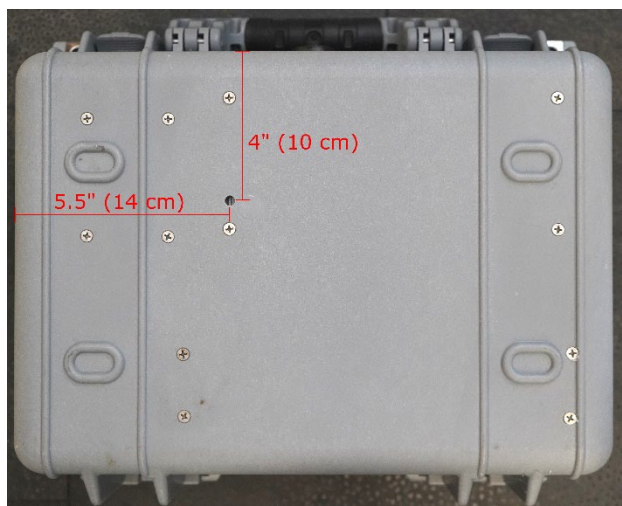


Figure 3-12. Drain Hole Location

4.PROCEDURES

4.1 WiFi Communications

The STREAM™ system is equipped with a WiFi communications coprocessor. This can be used to collect valuable information about the operation and condition of the system.

4.1.1 Connecting to the STREAM™ WiFi

- ❖ From any WiFi-enabled device (smartphone, tablet, laptop, etc.), open the list of available WiFi networks.
- ❖ Connect to the network named STREAMWiFi_XXXX-XXX (replace the X's with the last 7 digits of the STREAM serial number, e.g. STREAMWiFi-1022-006).
Note: If on a smartphone, it may be necessary to disable the cellular data connection. Keep the WiFi connection active.
- ❖ Open any web browser and enter "10.10.10.10" into the address bar to get the STREAM™ system's home instruction page.

4.1.2 Getting Data Through the WiFi

Once connected, enter "10.10.10.10/getStatus" into the address bar. Note that the 'S' is capitalized. The system will return a string in this format:

```
5|0.00|11.52|8000|74.78|0|0|0%7|113|12%23|251021|17034300|35|143965167|N  
|106|603625833|W|4
```

Note: The WiFi coprocessor updates every 30 seconds by default. If it has been less than 30 seconds since the WiFi connection was made, the system will return:

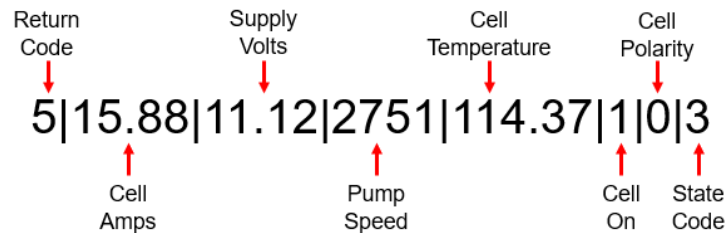
```
null%null%null
```

Wait 30 seconds and enter "10.10.10.10/getStatus" into the address bar again.

This string of information is divided into three substrings, each separated by the "%" character. The three substrings and their fields are discussed below.

Status Substring

The status substring contains information about the operation of the STREAM. The fields contained in the status substring are:



Return Code: Used by the system firmware.

Cell Amps: The amperage through the cell measured by the current sensor. In a shutdown state, this field retains the last value measured during normal operation.

Supply Volts: The voltage from the power supply measured at the processor. The value displayed in this field will typically be 0.6 VDC lower than the actual power supply voltage.

Pump Speed: The speed of the pump in steps/s. To approximately convert this value to a volume/time measurement, divide by 45.

Cell Temperature: The temperature measured by the thermowell in degrees Fahrenheit.

Cell On: The state of the cell power relay. A “1” indicates that the cell is powered. A “0” indicates that the cell is not powered.

Cell Polarity: The polarity across the cell. A 0 indicates normal polarity.

State Code: Used by the system firmware.

Time Substring

The time substring contains information about the system’s internal runtime counter. This substring has only three fields:



Return Code: Used by the system firmware.

On Time: The time (in seconds) that the cell has been powered since the system was manufactured. This value only counts when the system is on, and the cell is powered.

Restarts: The number of times that the system has been powered on since it was manufactured.

GPS Substring

The GPS substring contains information from the GPS coprocessor. It should be noted that these fields will often contain “0” when the STREAM is indoors and unable to locate a GPS satellite. The fields are:

23|251021|17034300|35|143965167|N|106|603625833|W|4

Return Code Date Time Lat. Deg Lat. Billionths North South Long. Deg Long. Billionths Satellites
East West

Return Code: Used by the system firmware.

Date: The current UTC date in format ddmmyy

Time: The current UTC time in format hhmmssss

Lat. Deg: The whole number value of the present location’s latitude

Lat. Billionths: The decimal value of the present location’s latitude to nine places

North South: The device’s position north or south of the equator

Long. Deg: The whole number value of the present location’s longitude

Long. Billionths: The decimal value of the present location’s longitude to nine places

East West: The device’s position east or west of the Greenwich meridian line

Satellites: The number of GPS satellites in view

4.2 Measuring Voltage

Every component in the STREAM™ system control box operates on DC power, meaning that the voltage from the system ground to any point has a fixed polarity. The system ground and the power outlet ground or earth may not be at the same potential, so it is important to select the correct reference point when measuring voltage.

To measure a voltage relative to the system ground, attach the common or negative lead of a voltmeter to any of: the GND test points, the Power Supply - terminal, or the Cell - terminal. The positive lead can then be attached to the point at which voltage is being measured, such as in Figure 4-1.

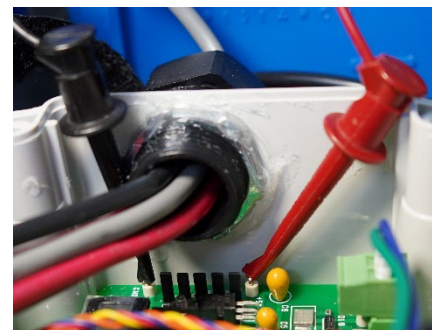


Figure 4-1. Checking Voltage Between Test Points

4.3 Measuring Current

To measure current with a clamp-around DC current meter, turn the meter on to the appropriate setting/range. In Figure 4-2, the meter is set to the 40A range because the current to be measured will be less than 40A. If the meter has a zero button, press it with the clamp closed and not affixed around any wires to set the zero amps measurement reference for the meter. Affix the clamp around only one lead to the cell. The clamp must be fully closed. Watch the current on the meter's display.



Figure 4-2. Current Clamp Meter

4.4 Checking Continuity

To check continuity between two points, attach the appropriate leads to the DC Voltmeter. Turn the meter to the continuity setting, usually indicated by a symbol like (1) in Figure 4-3. Many meters group this function with others. It may be necessary to press a FUN/SEL button until the screen shows a symbol like (2) in Figure 4-3. To check continuity between two points, touch the probes to the points in question. If the meter makes an audible beeping sound, this indicates that there **is** continuity between the points.



Figure 4-3. Continuity Meter