

This troubleshooting guide is provided to help you diagnose some of the more common issues that can occur when using the ACE system. Keep in mind, the keys to successful operation are:

1. Following all the proper steps at start-up (per the Owner's Manual and Quick Reference)
2. Properly training the spa owner at time of delivery

The troubleshooting guide is designed to help you walk your customer through the steps they can do at the spa first. Note that the steps specified as **Dealer Only** are steps that will require a service call to the hot tub, and that these are not steps that a customer should perform. If you have any questions about the troubleshooting guide please contact Technical Support.

### **Product Overview:**

The ACE salt water sanitizing system (chlorine generator system) will convert salt water into chlorine and other oxidizers. There are two main components to the system: Cell and Controller. The Cell consists of a plastic housing containing titanium and diamond electrodes, with an attached cable for electrical connection. The cell is placed down the circulation filter pipe and the supply wires are run into the equipment compartment via the pass-through fitting. The Controller houses the micro control circuits. Line voltage is brought in from the IQ 2020 spa controller and converted to 12 V DC by external power supply and fed to the controller. The Controller is interfaced and operated through the spa's main control panel. The system is open loop and relies on the consumer to monitor the water and make adjustments to chlorine output level as needed. The **ACE system does not have a chlorine sensor. Salinity (salt level) is measured at the beginning of each run cycle by monitoring the current through the cell.**

### **Operation:**

Operation is based on a user specified daily run time. Four (6) hour cycles are performed daily. The run time of each cycle is determined based on USE and SIZE settings that are entered through the spa's control panel. A setting of USE 1 and SIZE 1 results in zero chlorine output (system off – on Rev D controller)

**Boost:** Allows for chemical generation on demand by initiating a 24-hour continuous run cycle on all spa sizes.

**Use Level:** 1 – 5 (low – high) that represents anticipated spa use. Translates into the run time per cycle/ per day.

**Spa Size:** User specified spa size. Enter 1 – 8. Translates into run time per cycle/per day.

**Salt level/Salt test** Salt level status indicator displays the following salt levels:

Limelight - low/1-2, ok/3-6, high/7-9 salt levels. Hot Spring – low/yellow, ok/green, high/red.

User can request salt check on demand. The controller monitors the voltage/current across the electrodes. To verify current, do not use a clamp-on current meter. Current must be measured in line with the cell.

11.0 - 12VDC: low 500 mA DC < ok < 1200 mA DC high ▶ see page 11

**30 day timer** – Requires Use Level input/confirmation every 30 days. Any Use Level input resets timer.

**System Status Messages**

As displayed in the water care menu of the Hot Spring Spas main control panel:

Operation Status	Display Message	Icon Status	Action
Operating normally	Water Care System Functioning	Solid	N/A
Salt test initiated/in progress	Water Care System Testing Water	Solid	N/A
Increasing Chlorine level	Water Care System Boosting	Solid	N/A
30-day user input required	Water Care System Monthly Maintenance (Check Water/Confirm Use Level)	Flashing	Confirm Use Level
Service Error	Display Message	Icon Status	Action
Non-operational (Summer Timer on/Circ Pump is off)	Water Care System Offline - Circ Pump	Flashing	Verify summer timer is off/ Clean Filters
Non-operational High salt level detected, short circuit may exist	Water Care System Offline - High Salt	Flashing	Check/confirm salt level. Dilute if necessary
Low salt level detected, cell may be dirty or open circuit	Water Care System Low Salt/Clean Cell (Offline-Inspect Cell/Check Salt)	Flashing	Check/confirm salt level. Inspect and clean cell if necessary. Add salt if necessary.
Non-operational Controller/cell failure	Water Care System Contact Dealer For Service	Flashing	Continue Troubleshooting

As displayed on the Limelight Hot Tub's main control panel:

Operation Status	Display	Icon Status	Action
Operating normally	Normal	Solid	N/A
Salt test initiated/in progress	SALT# flashing	Solid	N/A
Increasing Chlorine level	BOOST flashing	Solid	N/A
30-day user input required	USE# flashing	Flashing	Confirm Use Level
Service Error	Display	Icon Status	Action
Non-operational (Summer Timer on/Circ Pump is off)	Normal display	Flashing	Verify summer timer is off/ Clean Filters
Non-operational; High salt level detected, short circuit may exist	SALT 7-9 flashing	Flashing	Check/confirm salt level. Dilute if necessary
Low salt level detected, cell may be dirty or open circuit	SALT 1-2 flashing	Flashing	Check/confirm salt level. Inspect and clean cell if necessary. Add salt if necessary.
Non-operational Controller/cell failure	SALT - flashing	Flashing 4x per second	Continue Troubleshooting

**Dealer Only Troubleshooting:**

**Controller Light definitions:**

- |   |                                   |
|---|-----------------------------------|
| Power – Indicates controller is powered | Off – Safety circuit              |
| Online – Indicates system status        | Flash 1/s – Fatal error           |
| Element - Indicates cell is powered     | Flash 16/s – System offline error |
| U1 – Error indicator 1                  |                                   |
| U2 – Error indicator 2                  |                                   |
| TX – Transmitting data to spa           |                                   |
| RX – Receiving data from spa            |                                   |

**Controller Light Indications:**

- |          |     |           |            |         |
|----------|-----|-----------|------------|---------|
| No light | Lit | Flash 1/s | Flash 16/s | Flicker |
| ○        | ●   | ⊗         | ⊙          | ⊖       |

**System Error Conditions:**

Condition 1: Normal Operation

- |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| ● | ● | ○ | ○ | ○ | ⊖ | ⊖ | <b>Display: Functioning</b>   |
| P | O | E | U | U | T | R | - Element light will be lit when voltage is being applied to the electrodes |
| O | N | L | 1 | 2 | X | X |   |
| W | L | E |   |   |   |   |   |
| E | I | N |   |   |   |   |   |
| R | E | E |   |   |   |   |   |
|   |   | N |   |   |   |   |   |
|   |   | T |   |   |   |   |   |

Condition 2: No power

- |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | <b>Display: Water Care menu not available</b>   |
| P | O | E | U | U | T | R | - Verify that 12V power supply is properly connected to spa controller and has output voltage (minimum 11.5Vdc) |
| O | N | L | 1 | 2 | X | X | - <span style="color: red;">▶ see page 11</span>  |
| W | L | E |   |   |   |   |   |
| E | I | N |   |   |   |   |   |
| R | E | E |   |   |   |   |   |
|   |   | N |   |   |   |   |   |
|   |   | T |   |   |   |   |   |

Condition 3: Safety Circuit Error

- |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| ● | ○ | ○ | ● | ● | ⊖ | ⊖ | <b>Display: Contact Dealer for Service</b>  |
| P | O | E | U | U | T | R | - System is sensing current to cell when there should be none. Verify cell and controller function. Replace components as needed. |
| O | N | L | 1 | 2 | X | X |   |
| W | L | E |   |   |   |   |   |
| E | I | N |   |   |   |   |   |
| R | E | E |   |   |   |   |   |
|   |   | N |   |   |   |   |   |
|   |   | T |   |   |   |   |   |

Condition 4: No communication with spa

- |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| ● | ⊗ | ○ | ○ | ○ | ○ | ○ | <b>Display: Water Care menu not available</b> |
| P | O | E | U | U | T | R | - Check communication line to IQ box          |
| O | N | L | 1 | 2 | X | X |   |
| W | L | E |   |   |   |   |   |
| E | I | N |   |   |   |   |   |
| R | E | E |   |   |   |   |   |
|   |   | N |   |   |   |   |   |
|   |   | T |   |   |   |   |   |

Condition 5: Cell not connected to controller or open cell circuit

● ○ ● ● ⊖ ⊖  
 P O E U U T R  
 O N L 1 2 X X  
 W L E  
 E I N M  
 R E E  
 N  
 T

**Display: Contact Dealer for Service**

- Ensure that the cell is properly connected. Place cell in salted water (1000-1750ppm). Measure the amperage (500mA DC – 1200mA DC.)
- If low or no amperage replace cell. ▶ see page 11
- **NOTE:** Online will initially flash 1/s. Then the controller will enter into recovery mode where the element light will dimly flash and online will pulse once per 20 seconds until the condition is corrected.

Condition 6: Low salt

● ● ○ ○ ○ ⊖ ⊖  
 P O E U U T R  
 O N L 1 2 X X  
 W L E  
 E I N M  
 R E E  
 N  
 T

**Display: Offline-Inspect Cell/Check Salt**

- Low salt condition. Measure salt level with a TDS meter or test strip to ensure it is in range (1000-1750ppm). Add salt as needed.
- Dirty cell. Clean cell. If continues to read low salt, remove cell caps with pliers and visually inspect for scale. Do not mechanically clean. Repeat clean process until clean.
- Worn cell. If salt is in range and cell is clean, cell maybe nearing end of life. Measure current in cell with meter. If under 500mA DC low salt is reported. Replace as needed.
- Verify hydraulics in the cell. Remove cell and place in the main tub. Ensure bubbles have cleared and perform a salt test. Measure the current to determine a baseline. If cell is within range, there are issues in the circulation line. Check, clean, or change the filter.

Condition 7: High salt

● ⊖ ○ ○ ● ⊖ ⊖  
 P O E U U T R  
 O N L 1 2 X X  
 W L E  
 E I N M  
 R E E  
 N  
 T

**Display: Offline High Salt**

- Salt level is too high in the spa. Review manual. Measure salt level in the spa with a TDS meter or test strip to ensure it is in range (1000-1750ppm). Dilute salt by draining water by 25 – 50% and filling with fresh water. Clear error with manual salt test.

Condition 8: High cell current (short/high salt)

● ⊖ ○ ○ ● ⊖ ⊖  
 P O E U U T R  
 O N L 1 2 X X  
 W L E  
 E I N M  
 R E E  
 N  
 T

**Display: Contact Dealer For Service or Offline High Salt**

- Cell is drawing too much current. Measure salt level with a meter or test strip to ensure it's in range (1000-1750ppm). Measure current at the cell (500mA DC – 1200mA DC). If salt is in range, high current replace cell. Clear error with manual salt test. ▶ see page 11
- **NOTE:** Online will initially flash 1/s. Then the controller will enter into recovery mode where the element light will dimly flash and online will pulse every 20 seconds until the condition is corrected.

Condition 9: Low input voltage

● ⊖ ○ ○ ● ⊖ ⊖  
 P O E U U T R  
 O N L 1 2 X X  
 W L E  
 E I N M  
 R E E  
 N  
 T

**Display: Contact Dealer for Service**

- Voltage supplied to the controller is less than 11.5V. Verify voltage output from the power supply and replace as needed. ▶ see page 11



**Troubleshooting step**

**How to Check**

**Action(s) Required**

1. Check/confirm proper water parameters

Parameter	Target	Min – “OK” Range – Max	
pH	7.4	7.2	7.6
Alkalinity	80ppm	40ppm	120ppm
Hardness	50ppm	25ppm	75ppm
Chlorine	3ppm	1ppm	5ppm
Salt	1500ppm	1000ppm	1750ppm

Hardness/calcium

PH level

Alkalinity

Other minerals

Spa water min. 100°F (37.5°C)

Test strips (5-way)

Test strips (5-way)

Test strips (5-way)

High: use Vanishing Act (may drift up)

High: add PH-;Low: add PH+ (will drift up)

Normally in spec (when others in spec)

Use Clean Screen or contact dealer

2. Check salt level (1000-1750 ppm)

Salt strips, or meter

Adjust salt as needed

3. Ensure ACE Cell is clean

Visually inspect

Clean as necessary; see Cleaning Sheet  
Scaled cell can reduce output & affect salt readings. ▶ see page 12

4. Check/confirm system settings

Control panel

- Confirm bather load (how many, how often)
- Adjust Spa Size & Use settings down if chlorine readings are consistently high

5. Check any control panel error messages

6. Run salt test with cell in main body of water

Control panel

- Record salt level

Reading should be in

acceptable range:

50% - 75% in green(HSS)

or SALT4-6 (LL)

7. Check for Modified standpipe

Glued in ring at bottom

Replace stand pipe with modified unit

8. Re-run salt check with ACE cell in standpipe

Control panel

- Compare reading/position to above, If same/similar dilute salt with partial drain and top-off to lower generation rate, If different: confirm flow; clean filter and/or replace w/ paper filter if using Tri-X

9. Remove excess chlorine from the water

Verify with test strip

Add hydrogen peroxide to remove chlorine

Dealer only:

Verify above steps were performed.

Lower Spa Size & Usage; check for component damage.

**ACE RETRO**

The ACE Retro System is the next generation of ACE systems. It has the same features as the integrated ACE system but is accessed through an independent user interface mounted to the spa skirt. The unit operates just as the integrated unit and can be tested in a similar manner.

**Compatibility:**

The ACE retro system is designed for HotSpring Spas built between 2004 and 2009. The key compatibility requirement is that the spa be equipped with a pass-thru connection between the equipment compartment and filter bucket. The Ace retro is also compatible with currently released HotSpring and Limelight spas. Both brands are equipped with pass-thru connection.

The **Use level indicator** displays current Use level setting from Off – 10. This light will flash when it is time for the 30-day check-up.

**30-day check-up:** Test and balance water. Adjust Use level based on chlorine reading. If Use level is unchanged, press SET to scroll back to current setting to confirm that the check-up was done.

The **Set button** adjusts Use level from Off – 10. Smaller spas tend to require lower use levels.

Test water with a test strip weekly to confirm chlorine level and adjust up if chlorine is below 1 ppm and down if chlorine is above 5 ppm.

The **Boost button** activates the Boost function to increase chlorine generation for 24 hours.

Use this function before, during, or after events where the spa will be used more frequently than normal. Light will indicate Boost is in process.



The **Salt Level indicator** displays the current salt level.

- Red flashing – High salt error - offline
  - Red/green – OK (upper end)
  - Green/green – OK
  - Yellow/green – OK (lower end)
  - Yellow flashing – Low salt error - offline\*
- \*Low salt level reading may indicate the cell is dirty. Inspect cell before adding salt.

The **Boost light** will be illuminated when Boost is in process.

The **Salt button** activates an automatic Salt Test.

The Salt indicator light will scroll while the system is testing. Ensure all jet pumps are off when running an automatic salt test.

The ACE retro uses the same components as the integrated ACE system. The only difference is the controller/interface. NOTE: an I2C hub is not required for the ACE retro because it does not communicate with the spa.

**Connections:**

**Power supply:** The power supply connects to the same terminal as the circulation pump with the use of flag splitters. This is done as a means to shut off the ACE when the circulation is stopped, for example during summer timer.

**Controller:** The Controller connects to the power supply. It also connects to the pressure switch port in the IQ2020 controller. The spa pressure switch then plugs into the ACE pressure switch jump board. The ACE retro monitors the pressure switch and shuts off generation when no flow is sensed. For spas not equipped with a pressure switch, plug the pressure switch bypass jumper into the ACE.

**Cell:** The chlorinator cell connects to the ACE via the standard bullets.

**Operation:**

The ACE retro operates in a similar manner to the integrated ACE system. The ACE retro system operates on a user programmed sequence. The user sets the USE level and the system chlorinates on the set program. Chlorination happens during a portion of (4) six hour cycles depending on the level set. The higher the USE setting, the longer the unit will energize the electrodes and more chlorine will be produced. The system does not have a chlorine sensor therefore it is the user’s responsibility to adjust the output to meet their needs.

**USE level:** The SET button scrolls through positions 0 – 10 as shown on the level indicator on the left side of the controller. Red indicates the system is off.

- 0 – system off
- 1 – low use mode
- 2 – 10 increasing levels of chlorination

**Salt level:** The center of the controller has the salt chart and salt button. The chart displays the most recent salt test value. Although the water is constantly monitored, the salt value is only updated at the beginning of each cycle or when a manual test is requested by pressing the SALT button. The lights will scroll while a test is being performed ~ 15 seconds.

- Red (flashing) - High salt/system off-line: **NO chlorination current over 1200 mA**
- Red/green - Salt level ok: upper green level
- Green - Salt level ok: mid green level
- Green/Yellow - Salt level ok: lower green level
- Yellow (flashing) - Low salt/system off-line: **NO chlorination current under 500 mA**

Note: The ACE will not produce chlorine with the salt level is flashing. (high or low)



**Boost:** A manual boost feature is provided for times when the extra chlorine is needed beyond the current setting. Ideal for intermittent bather load increases. If a consistent increase in bather load is seen, increase the USE level rather than boost.

The boost runs the cell for a full 24 hours and then reverts back to the programmed use level. A boost is equivalent to USE 10. It is possible to start and stop the boost by pressing the boost button.

The boost feature is also good for troubleshooting the system. Activating the boost will power the electrodes and allow for measurement of voltage and current.



**Maintenance Timer:**

The ACE is equipped with a maintenance timer designed to remind the user to inspect the spa and perform regular maintenance. 30 days after the last USE setting input the USE indicator light will begin to flash. After 33 days, the Use level will drop to 1. To reset the timer and stop the flashing light, a USE level needs to be input.

**Summer timer:**

When the spa shuts off the circulation pump due to summer timer, the pressure switch will open and the ACE will go offline as indicated by the flashing red use level light. Because not all spas are equipped with a pressure switch, it is recommended to connect the ACE to the circ pump power terminals. When the circulation pump is off, the ACE interface will shut down and no lights will be visible.

**Troubleshooting:**

The ACE retro has a number system checks, safety features, and trouble shooting light sequences that are similar to those in use in the integrated ACE. The table below lists all of the light sequences, what they mean, and what to inspect.

Light Sequence	Condition	Action
----------------	-----------	--------

All lights solid/boost off	Operating normally	--
Boost light solid	boosting	--
USE level indicator "OFF"	System is off	<ul style="list-style-type: none"> <li>• Check to see if summer timer is active.</li> <li>• Verify power source</li> </ul>
Scrolling Salt meter lights	Salt test active	--
Salt lights solid	Ok salt	--
Flashing red salt meter	High salt – system off line and not generating	<ul style="list-style-type: none"> <li>• Verify cell current is &gt; 1200mA during a salt test</li> <li>• Use a salt test strip and verify salt is over 2000 ppm</li> <li>• Drain a portion of the water and fill with clean water.</li> </ul>
Flashing yellow salt meter	Inspect cell/check salt – system offline and not generating	<ul style="list-style-type: none"> <li>• Verify cell current is &lt; 500mA during a salt test</li> <li>• Use a salt test strip and verify salt is under 1000 ppm</li> <li>• If salt is low, add salt</li> <li>• If salt is ok, clean the cell and filter (or replace with paper filter)</li> <li>• Retest with cell in main tub and if salt reading is still low the cell may need to be replaced.</li> </ul>
Flashing Use light	30-day timer	<ul style="list-style-type: none"> <li>• Change the use level</li> </ul>
OFF flashing 1/sec	Summer timer active/pressure switch – system not generating	<ul style="list-style-type: none"> <li>• Verify pressure switch is working and replace if necessary.</li> <li>• Bypass pressure switch with PS bypass jumper PN 72768</li> </ul>
OFF & USE 3 flashing 2/sec	Low input voltage	<ul style="list-style-type: none"> <li>• Inspect 12V power supply for 11.5 minimum output to Ace controller</li> </ul>
OFF & USE 7 flashing 2/sec	Cell open circuit	<ul style="list-style-type: none"> <li>• Verify cell is connected to the controller.</li> <li>• Inspect cell for blockage and replace or clean</li> </ul>
OFF & USE 10 flashing 2/sec	Cell short circuit	<ul style="list-style-type: none"> <li>• Verify cell is connected to the controller and no exposed metal is touching.</li> <li>• Inspect the cell for reason of short.</li> <li>• Replace if needed</li> </ul>

**Milliamp Test:** Do not use a clamp-on current meter. Current must be measured in line with the cell, disconnect one leg of the cell to the controller, put meter in series, set meter to DC milliamp range. Must read between 500mA DC – 1200mA DC. See last page.

## ***Troubleshooting Images***



a) 11.5VDC minimum from the power supply to the controller.



b) 115 VAC at the APM terminals on the control box.



c) 500 mA DC – 1200 mA DC at the cell.  
(Element LED on the controller must be ON)



d) 11.0 VDC minimum on the output of the controller to the cell.  
(Element LED on the controller must be ON)

## ACE™ Salt Water Sanitizing System Hot Spring® Dealer – Cell Inspection and Cleaning Instructions

Periodic inspecting and cleaning of the ACE cell is recommended to maximize the life of the equipment. Use the Vanishing Act™ calcium remover to reduce the cleaning frequency. Clean cell when the status message on the screen indicates Low Salt and the water has not been changed or topped off recently; or every 3 months.

### ***Inspecting the Cell***

1. Turn off the power to the spa.
2. Remove cell from the filter bucket.
3. Look through end cap holes and check for white scale around the inner channel opening. (Both configurations shown in *Figure 1*)
4. Remove excess water.
5. Inspect the opening to the electrodes for scale and look down the channels. Light should be visible at the end of the channels.  
**DO NOT INSERT ANYTHING INTO THE CHANNELS.**
6. If there is any obstruction or scale in the cell, cleaning is required.
7. Clean the cell as outlined below.
8. Reinstall cell in filter and power the spa.



*Figure 1*

### ***Cell Cleaning with pH Down***

1. Add spa water to the cleaning bottle to the fill-line indicated on the bottle. Add 3 tablespoons of pH down to the cleaning bottle. Secure lid and shake bottle to create cleaning solution.
2. Remove the lid from the cleaning bottle. Place the cell in the bottle so the bottom of the cell is floating.
3. Soak the cell for 10 minutes or until bubbles stop coming from the cell. If bubbles are still releasing from the cell after 10 minutes, change the cleaning solution and repeat. Inspect cell to confirm completion.
4. Reinstall cell in filter and power up the spa.

### ***Cell Cleaning with Pool Salt Cell Cleaner or Pool Acid***

Pool cell cleaners can be used to clean the ACE cell by following the instructions on the cell cleaner bottle. Pool acid (muriatic acid) can also be used to clean the cell when properly diluted.

**Warning:** Prolonged soaking of the cell in pool acid will damage the cell. (15 min 4 times per year max.)

**Caution:** Acids will burn skin and eyes. Always follow safety instructions on the bottle/package.

- 1a. **Pool Cell Cleaner:** Unscrew the lid to the cleaning bottle included with the ACE system and fill it to the fill-line with pool cell cleaner per the instructions on the cell cleaner bottle.
- 1b. **Pool Acid:** Unscrew the lid to the cleaning bottle included with the ACE system and fill it to the fill-line with a solution of 1 part pool acid and 10 parts water.
2. Place the cell in the bottle so the bottom of the cell is floating.
3. Soak the cell for 10 minutes or until bubbles stop coming from the cell. If bubbles are still releasing from the cell after 10 minutes, change the cleaning solution and repeat. Inspect cell to confirm completion.
4. Reinstall cell in filter and power up the spa.

TIP: Raise and lower the cell in solution for more thorough cleaning.