

**ZODIAC® ACADEMY**  
**TECHNICAL TRAINING**

# AquaPure®, Nature2®, & Fusion

## Workbook





## **IMPORTANT SAFETY INSTRUCTIONS**

The information contained in this technical guide is intended for Zodiac trained service personnel only. Electrical installation and repairs should only be performed by a certified electrician or Zodiac trained professional. and must comply with all national electric codes (NEC, Canadian, etc.). state and local law, ordinances, codes and regulations.

If you have not received training, **do not attempt any of the electrical repairs presented in this document.** Contact Zodiac Pool Systems, Inc. at 1-800-822-7933 for assistance.

### **Read and follow all instructions carefully.**

When servicing equipment, basic safety precautions should always be followed including those listed below.



### **WARNING**

Failure to heed the following warnings could result in property damage, permanent injury or death.

#### **TO REDUCE THE RISK OF ELECTRICAL SHOCK:**

- Disconnect main power to pool equipment area prior to any service or repairs.
- Keep all electrical equipment at least 10 feet (3m) from inside wall of pool or spa.
- Connect equipment only to a receptacle (cord models) or circuit (hardwired) protected by a ground fault circuit interrupter (GFCI).
- Use only copper conductors and supply wires suitable for the specific device.
- Replace damaged power cord(s) immediately and use only identical replacement parts.
- Do not bury power cord(s). Position cord(s) to minimize abuse from lawn mowers, hedge trimmers and other equipment.
- Do not install or service equipment if precipitation is present or imminent.

#### **TO REDUCE EQUIPMENT WATER PRESSURE HAZARD:**

- Always turn pump off to release pressure prior to removing or installing in-line equipment.
- To avoid equipment damage, do not exceed water pressure (psi) specifications for the device.

To reduce the risk of injury, do not permit children to operate, handle or play on equipment.

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**Zodiac® Pool Systems, Inc.**  
1-800-822-7933  
Regional Extension \_\_\_\_\_  
[www.ZodiacPoolSystems.com](http://www.ZodiacPoolSystems.com)

**Zodiac Academy**  
[zodiac.academy@zodiac.com](mailto:zodiac.academy@zodiac.com)  
[www.trainyu.com/zodiac](http://www.trainyu.com/zodiac)

Instructor: \_\_\_\_\_ ext. \_\_\_\_\_  
Sales person: \_\_\_\_\_ ext. \_\_\_\_\_  
Service Manager: \_\_\_\_\_ ext. \_\_\_\_\_

Notes:

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#### Finish Goods Part Numbers

**6613AP**

Power Pack Model:  
6613AP = PureLink - Standard Power Center  
6614AP = PureLink - Sub Panel Power Center  
APUREM = Stand alone AquaPure®/Fusion Soft

Cell Model:  
PLC = Cell Kit  
FSOFT = Cell Kit with Nature2® Vessel

Size:  
1400 = 14 Plate Cell  
700 = 7 Plate Cell

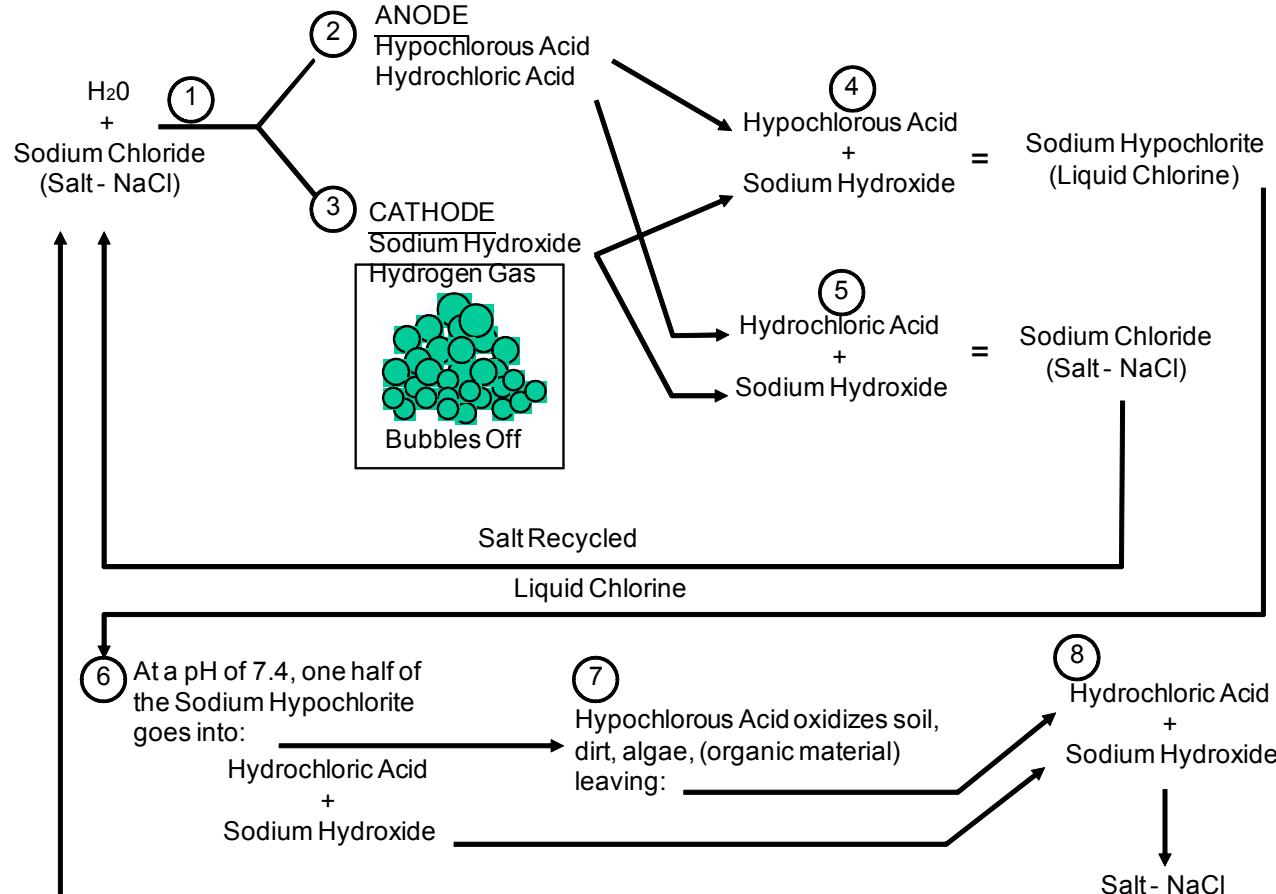
**PLC1400**

#### Sizing and Chlorine Production

700 Cell for up to = 12,000 Gallons  
1400 Cell for up to = 40,000 Gallons  
Use common sense when sizing!

	Gas Chlorine	Liquid Chlorine (12.5%)	90% Tri-Chlor Tabs	Calcium Hypochlorite
700	.625 lbs.	.625 gallons	.69 lbs.	0.95 lbs.
1400	1.25 lbs	1.25 gallons	1.38 lbs	1.9 lbs.

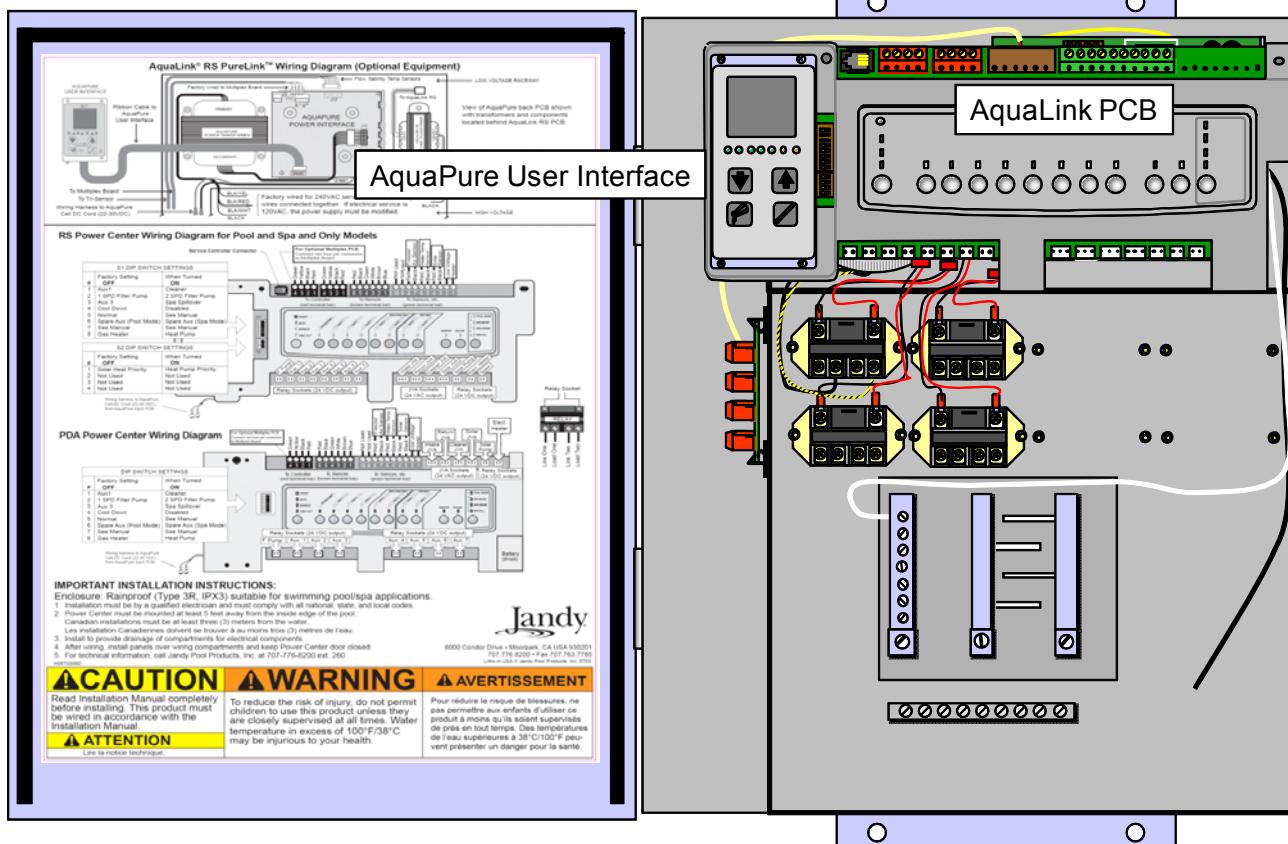
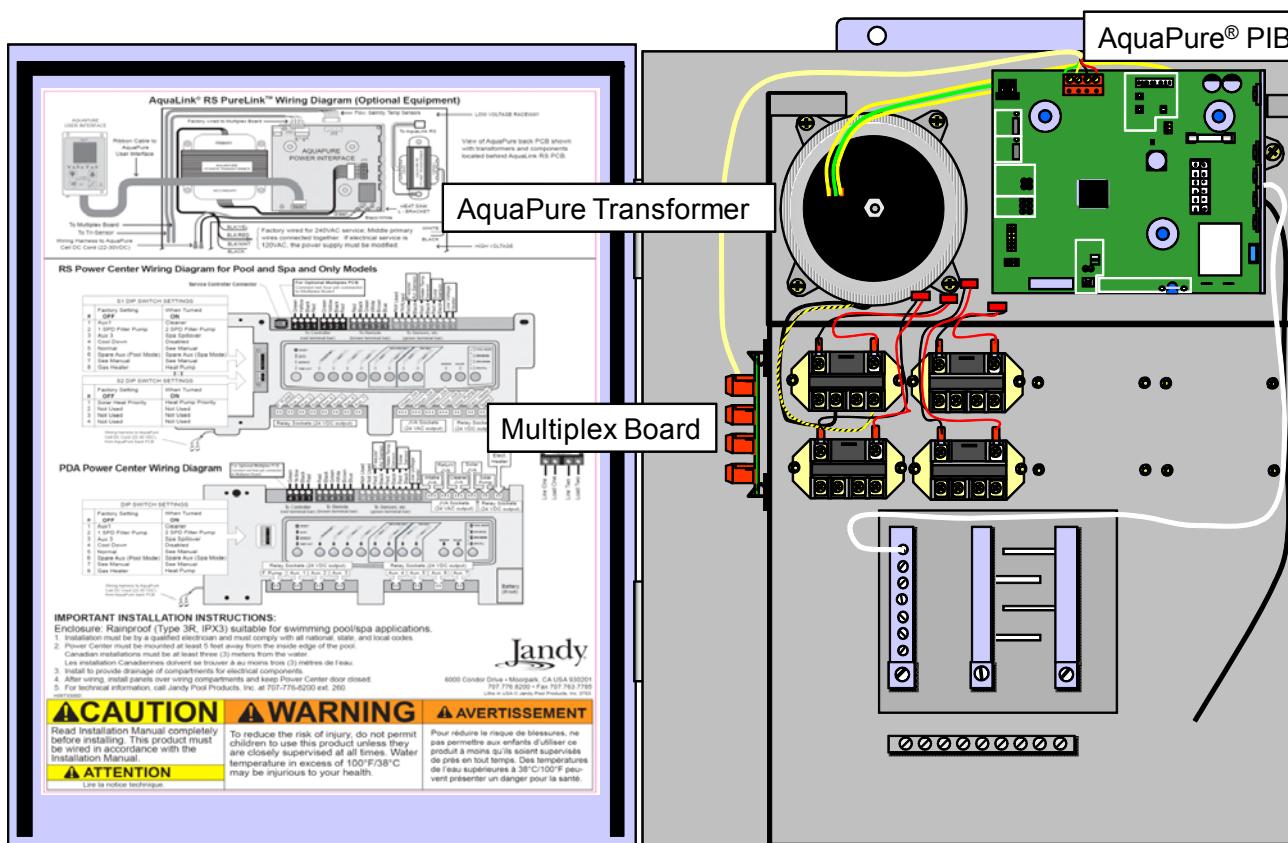
#### Chemical Process

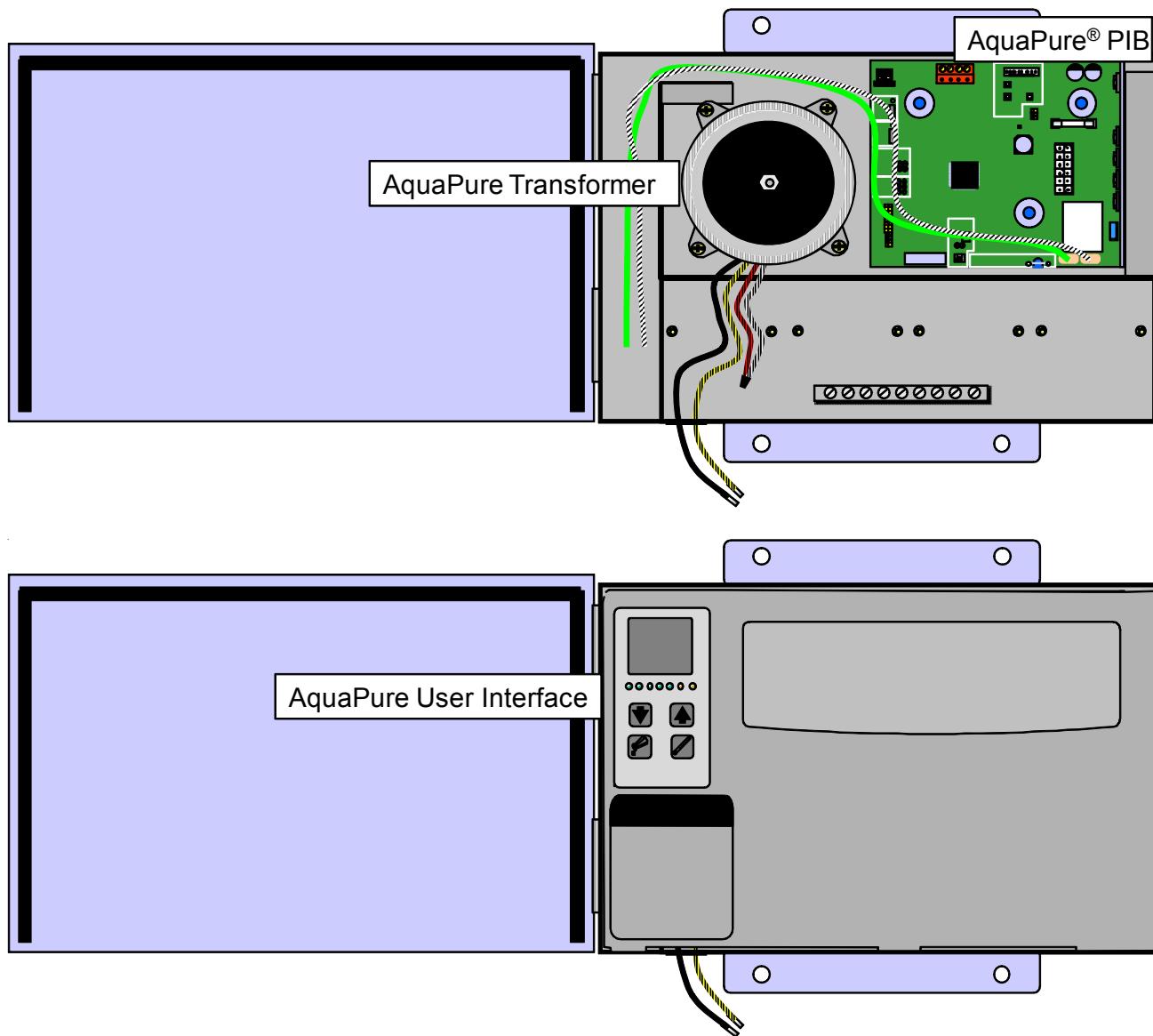


# ZODIAC® ACADEMY

## TECHNICAL TRAINING

PureLink





Notes:

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# ZODIAC® ACADEMY

## TECHNICAL TRAINING

CELL KITS

### Cell Kits

PLC 700  
PLC 700-25  
PLC 1400  
PLC 1400-25  
(Maximum length 25 feet)



Low Voltage Cable



AquaPure®  
Power Pack



Cell - 3 Port



Flow/Temp/Salinity Sensor



PureLink

### Fusion Soft Cell Kits

FSOFT700  
FSOFT1400

No 25 foot kits



Low Voltage Cable



Fusion  
(Cell and Start Up Cartridge Included)



Flow/Temp/  
Salinity Sensor



AquaPure®  
Power Pack



Nature2® Cartridge



PureLink

### Nature2 Benefit

- The bactericidal qualities of silver reduce the amount of chlorine required to maintain the pool. The copper inhibits algae growth.
- By lowering the output of the Fusion Soft, the pool water quality dramatically improves and the life of the electrolytic cell is extended

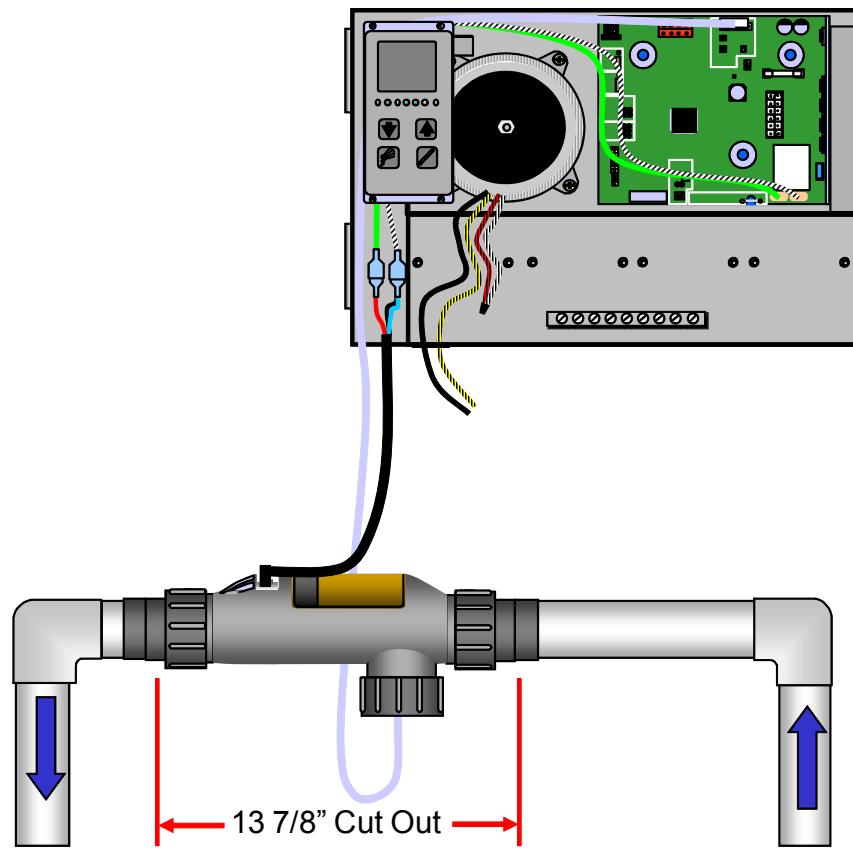
### Nature2 Minerals

- Copper – inhibits algae growth – regularly sold as algaecides.
- Silver – known bactericide – used for thousands of years to control bacteria in water, milk and on skin.
- Porous Alumina – releases silver & copper – assists in trapping nuisance metals, algae & bacteria.

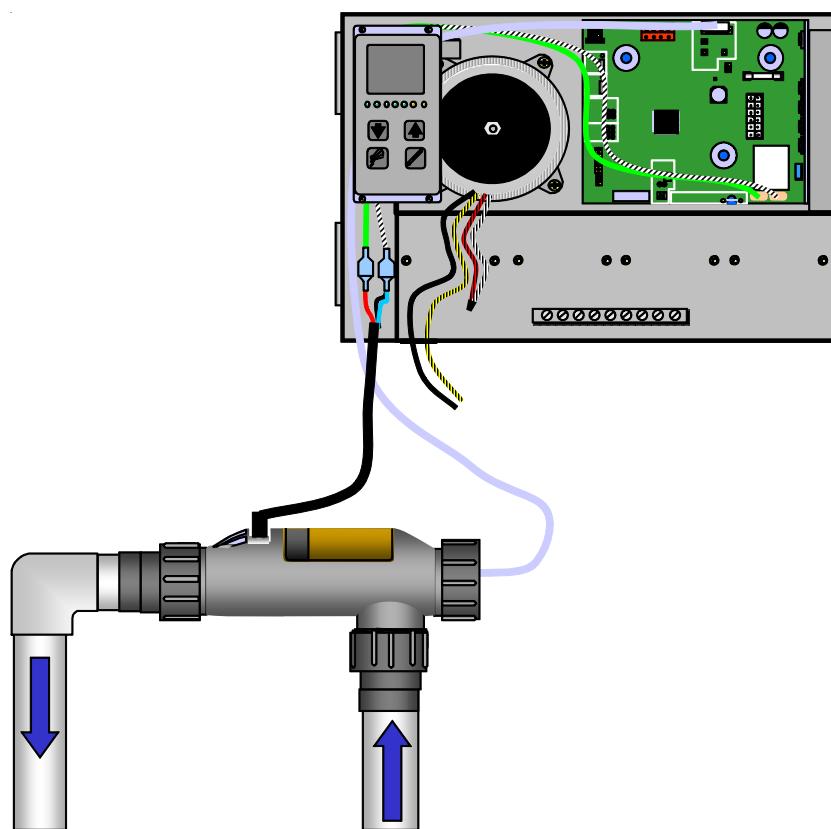
### Nature2 Facts

- Copper is released into the pool at low levels – .02 ppm - .06 ppm.
- Silver is maintained throughout the cartridge life (6 months) at .01 ppm - .05 ppm.
- Minimum pump run time – 6 hours – can be run 24 hours if needed.

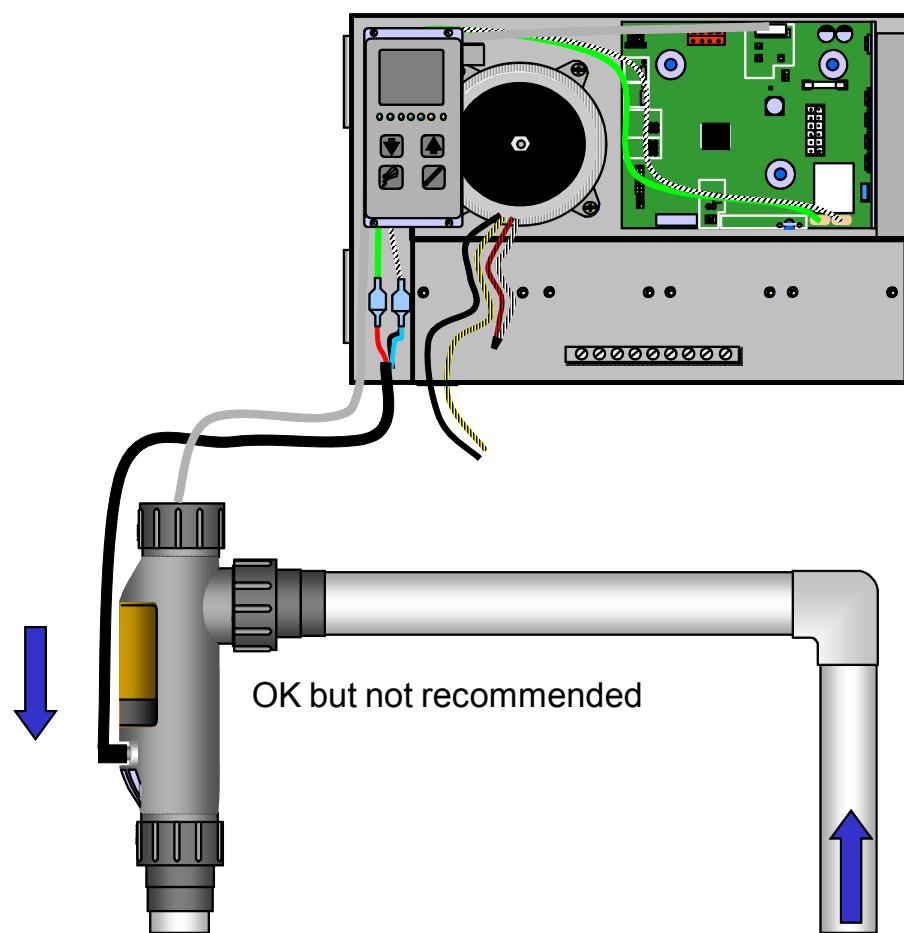
**Cell Location and Position**



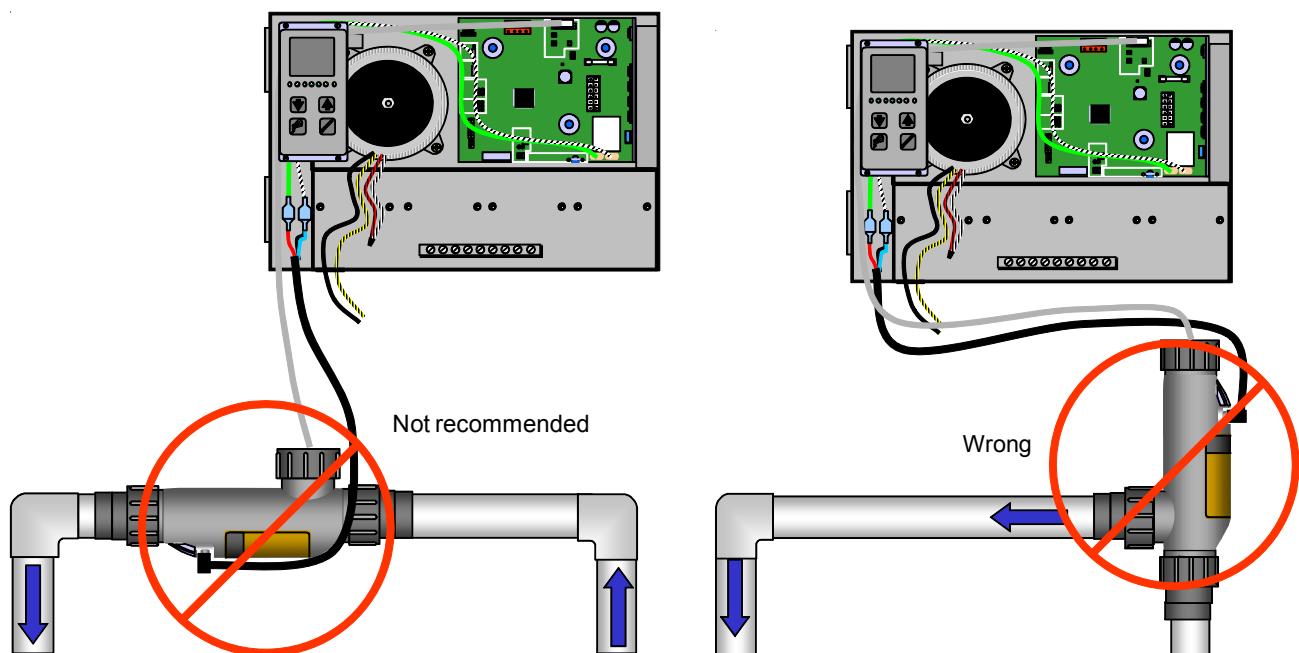
**Cell Location and Position**



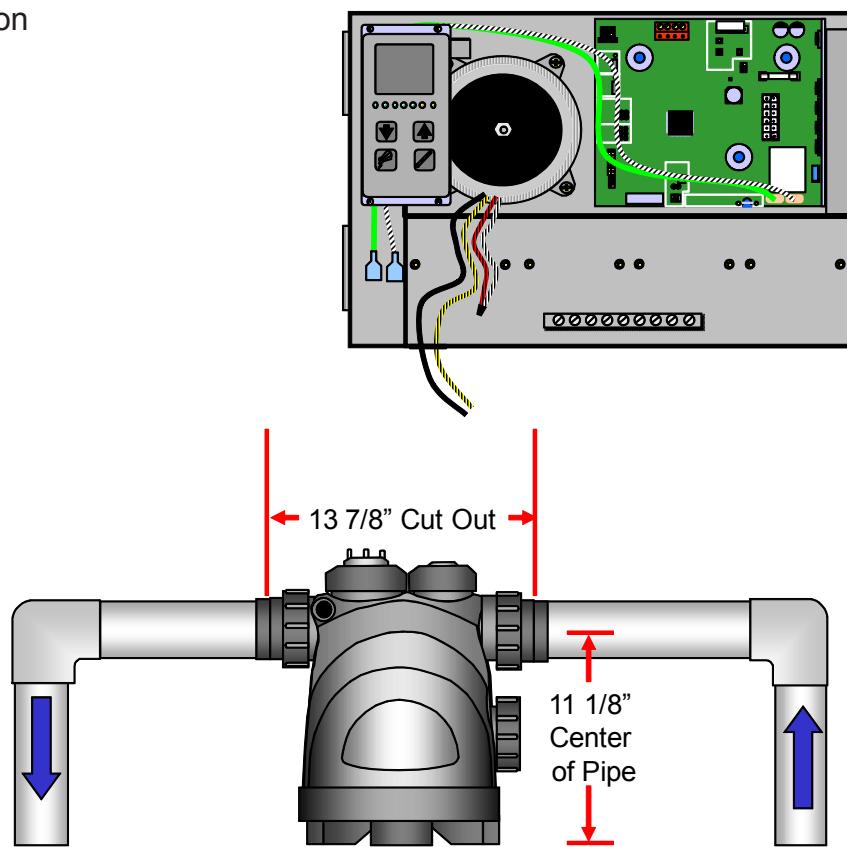
Cell Location and Position



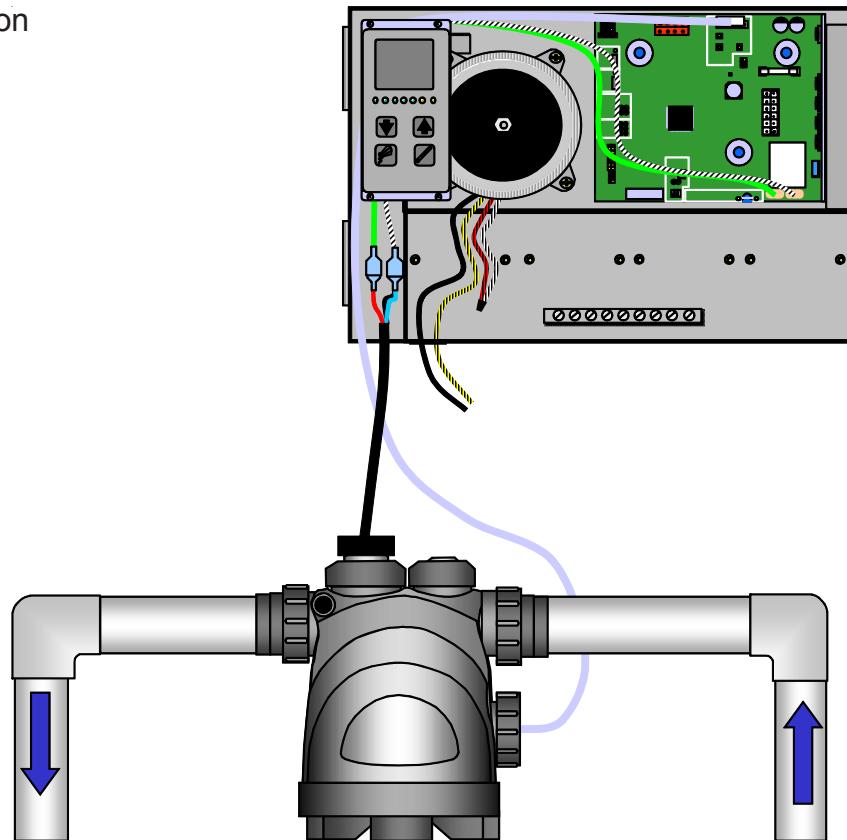
Cell Location and Position



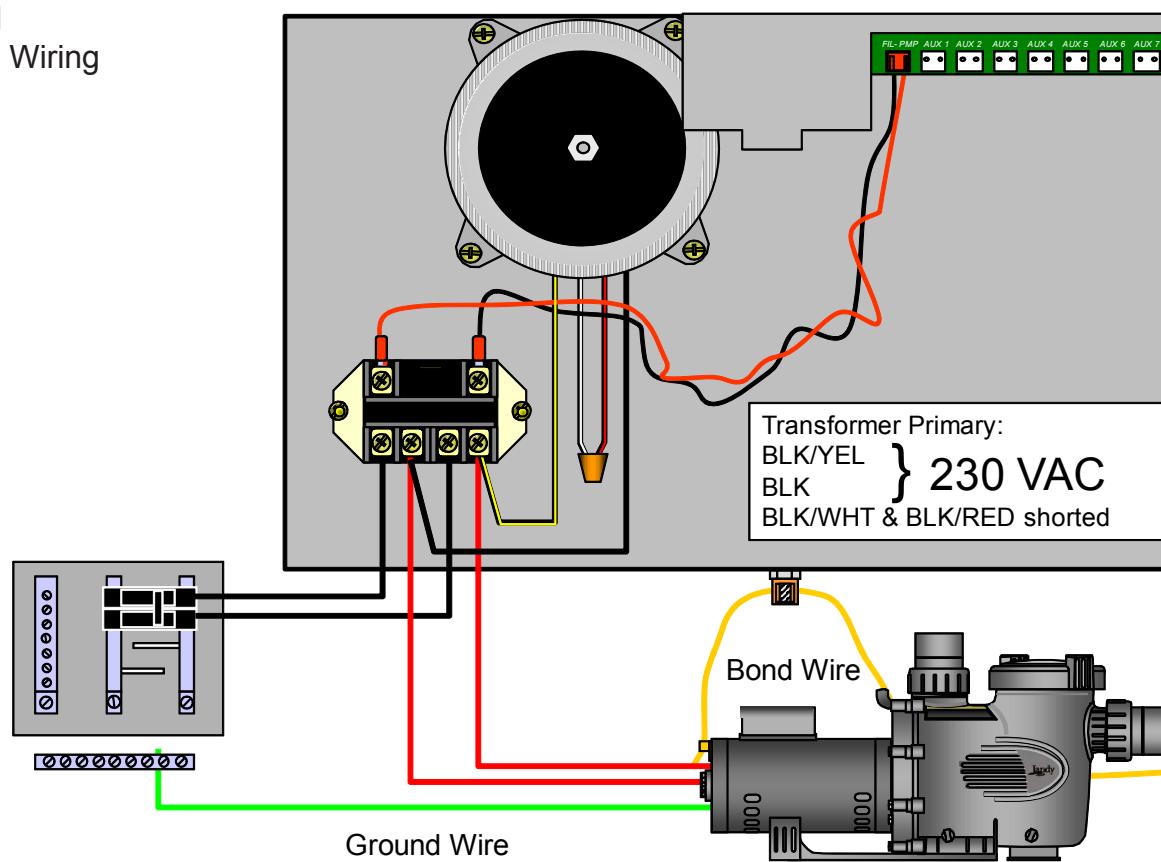
Fusion Soft Location and Position



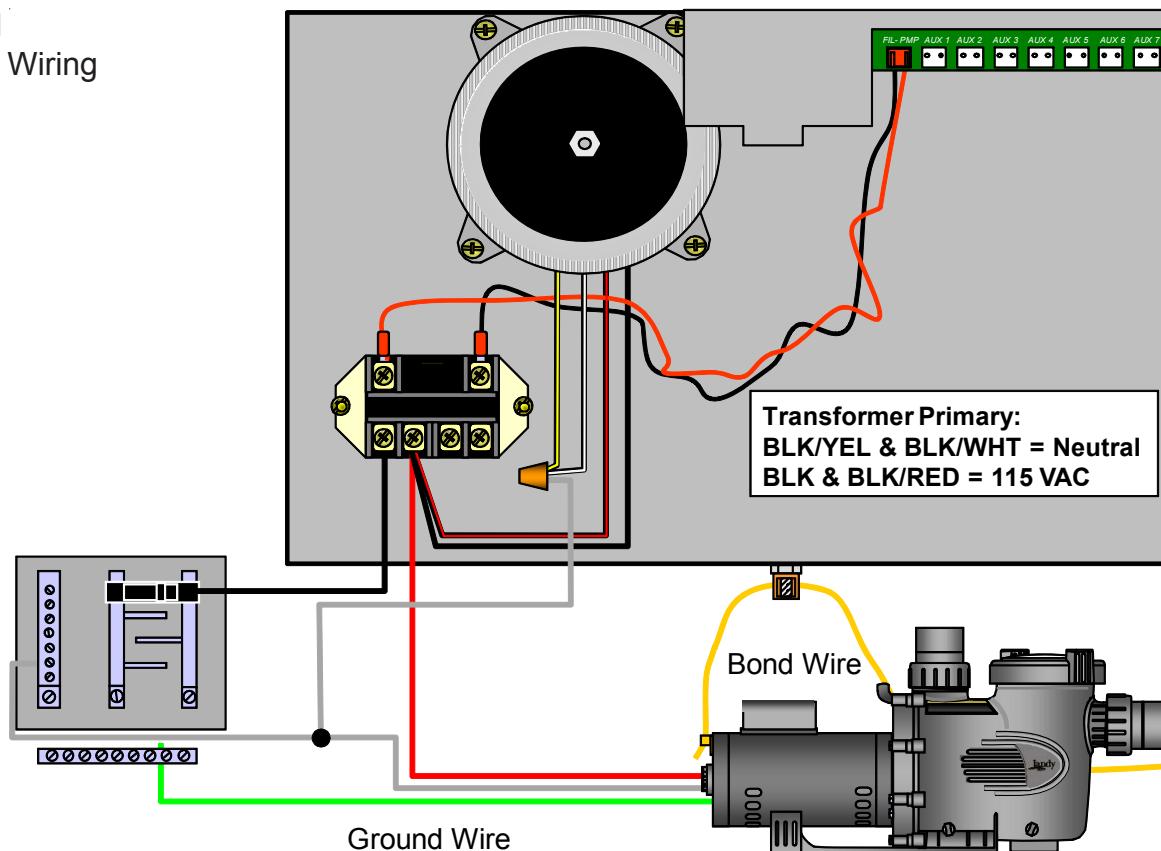
Fusion Soft Location and Position



Electrical  
230 VAC Wiring

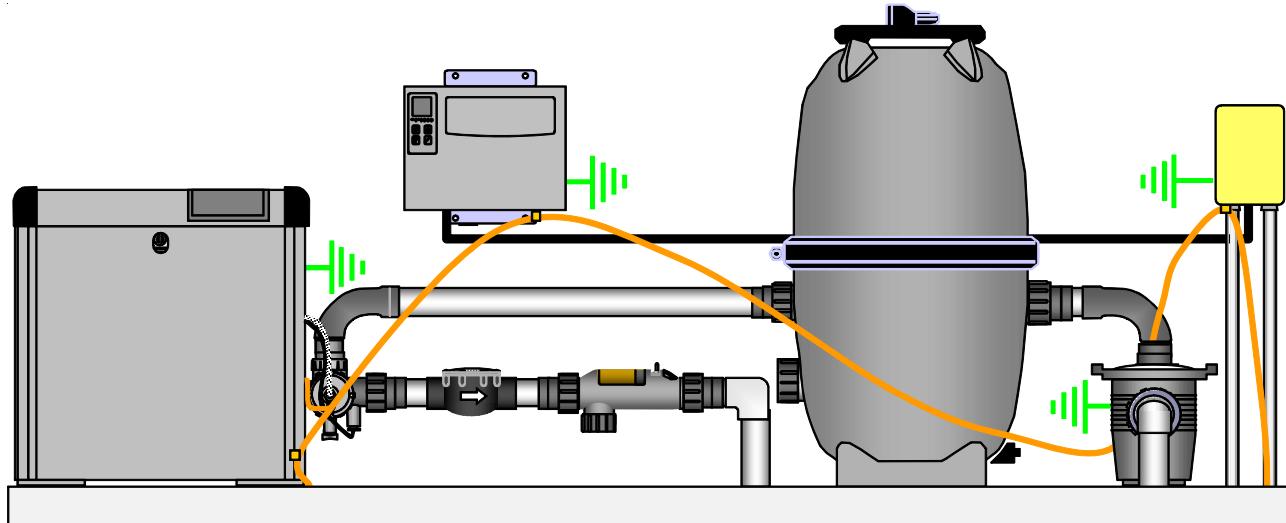


Electrical  
115 VAC Wiring

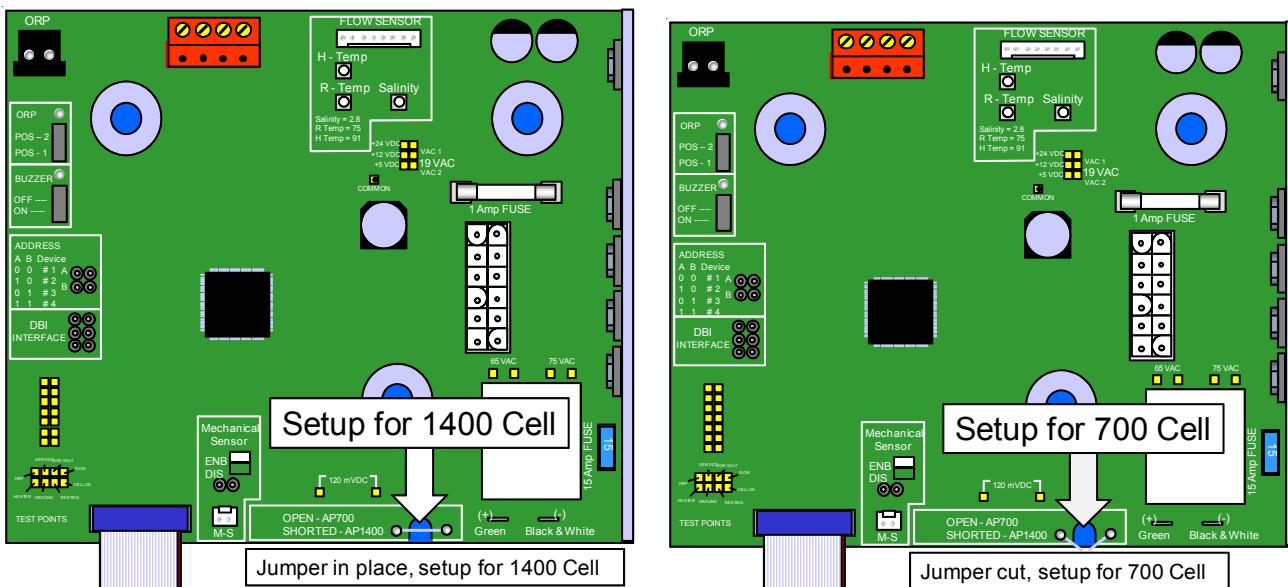


#### Electrical Connections

- Connect AquaPure® to load side of time clock or filter pump relay.
- Ground all electrical equipment.
- Bond all electrical equipment.



#### Power Interface Board (PIB) Conversion



#### Water Chemistry

Balance the pool water.

Super chlorinate if needed.

- Do not use a metal base algaecide.
- Metals in the water increases the conductivity of the water.
- Increased conductivity can damage the cell.

#### Test Numbers

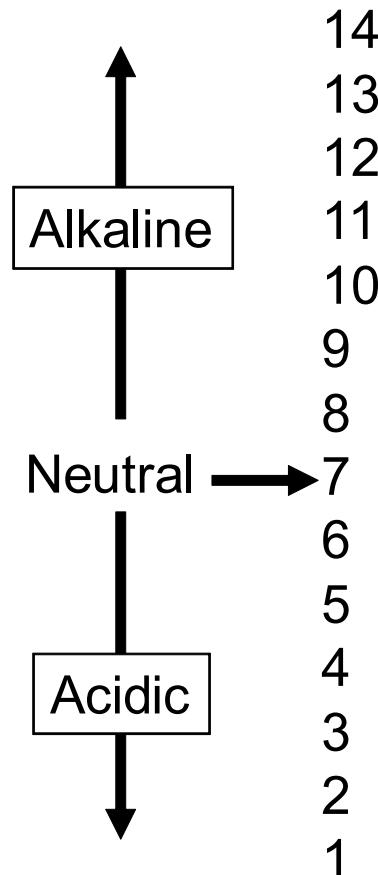
- Free chlorine - 1.0 to 3.0 ppm (0.5 possible with Nature<sup>2</sup>)
- pH - 7.4 to 7.6
- Total Alkalinity 80 to 120 ppm
- Cyanuric Acid (Stabilizer) - 10 to 50 ppm
- Total Dissolved Solids (TDS) – Less than 2000 ppm. (Subtract salinity level to arrive at corrected level).

#### Affect of pH on Chlorine

- At a pH of 6.0, 96%\* of the chlorine is in the active killing form, but too corrosive for pools and humans.
- At a pH of 7.0, 73%\* of the chlorine is in the active killing form.
- At a pH of 7.5, 50%\* of the chlorine is in the active killing form. Ideal for pools.
- At a pH of 8.0, only 21%\* of the chlorine is in the active killing form.

\*Chlorine in the molecular structure of hypochlorous acid, the active, killing form. The remaining percentage is in the form of a hypochlorite ion, which is also an active form of chlorine, but very weak and slow to kill.

#### pH Scale



#### Salt (NaCl)

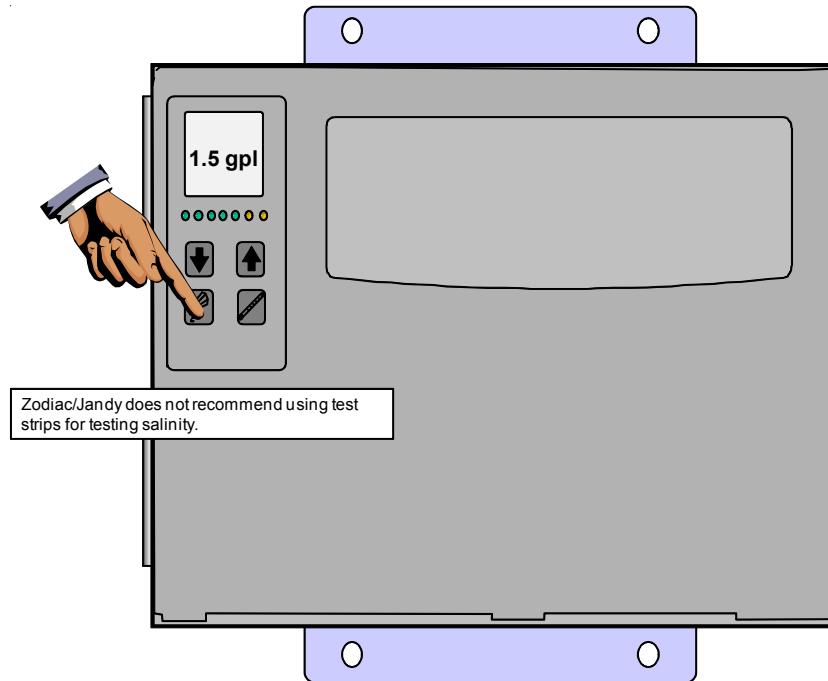
- Ocean water – 35,000 to 36,000 ppm.
- Tear drop – 7,200 ppm.
- AquaPure – 3,000 to 3,500 ppm.

The purer the salt the better. Calcium & Magnesium are enemies of the cell.

- Minimum 98% pure food grade NaCl
- No added anti-caking agents.
- No sodium ferrocyanides (aka yellow prussiate of soda)
- Non-iodized

**Convert GPL to PPM  
Times by 1000 Example:**

$$2.5 \text{ GPL} \times 1000 = 2500 \text{ ppm}$$



**Salt Adjustment Chart to Achieve 3.0 gpl  
(food grade salt only)**

Current Salinity	Pool Size in Gallons						
	10,000	14,000	18,000	20,000	24,000	28,000	30,000
0.0 gpl	250 lbs	350 lbs	450 lbs	500 lbs	600 lbs	700 lbs	750 lbs
1.0 gpl	165 lbs	230 lbs	300 lbs	330 lbs	400 lbs	460 lbs	495 lbs
1.5 gpl	125 lbs	175 lbs	225 lbs	250 lbs	300 lbs	350 lbs	375 lbs
2.0 gpl	85 lbs	120 lbs	150 lbs	170 lbs	205 lbs	240 lbs	255 lbs
2.5 gpl	40 lbs	60 lbs	70 lbs	80 lbs	100 lbs	110 lbs	120 lbs
3.0 gpl	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs

# ZODIAC® ACADEMY

## TECHNICAL TRAINING

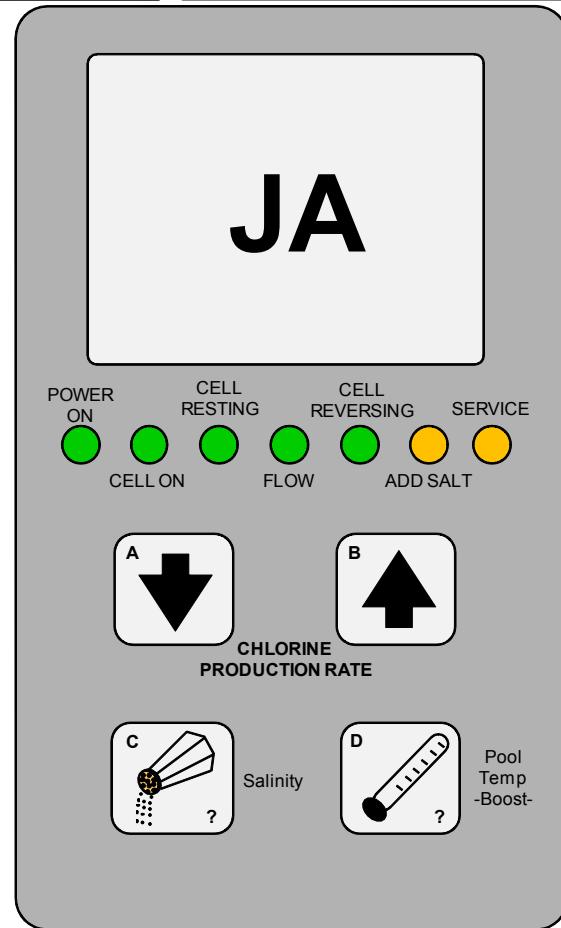
### LCD & Factors

#### What the LCD Display Means

- 'LO' – indicates chlorine production has shut down because the water temperature is less than 51 deg. F
- 'BO' – indicates system is in Boost Cycle. Boost Cycle sets the production rate to 100% for 24 hours. To activate Boost Cycle press and hold down the 'Pool Temperature' key for 10 seconds; it can be cancelled by holding the same key for 10 seconds.
- 'EC' - indicates the unit is being controlled by an external controller or ORP device.
- 'JA' – Indicates operation is controlled by a Jandy control and the control is in AUTO MODE.
- 'JO' – Indicates operation is controlled by a Jandy control and the control is in SERVICE or TIME MODE.
- 'JB' – Indicates operation is controlled by a Jandy control and BOOST MODE has been activated at the control.

*Note: The audible beeping alarm can be turned off by pressing salinity key for 5 seconds.*

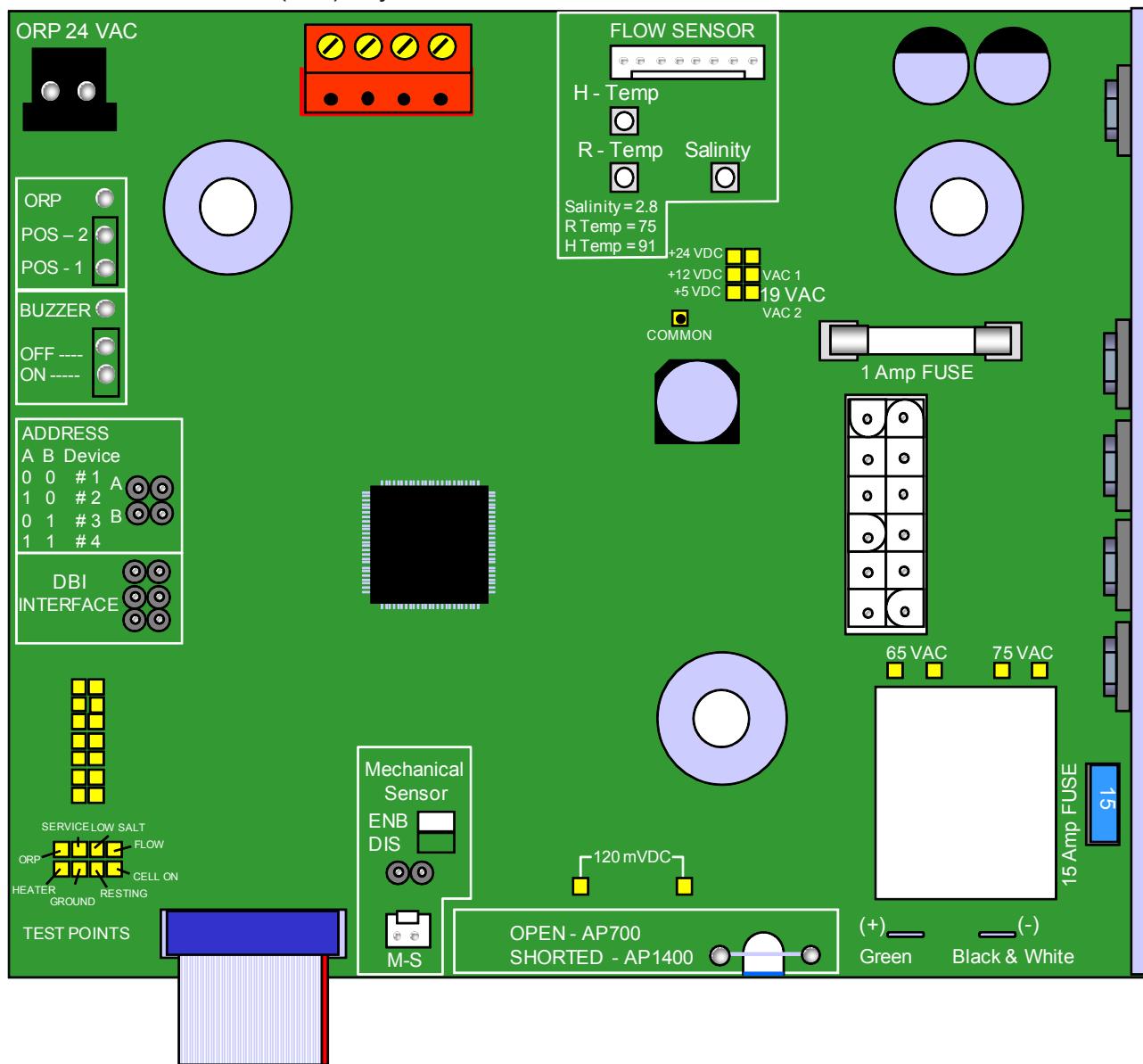
**This will only clear the alarm for 24 hrs.**



#### Factors Which Determine Chlorine Residual

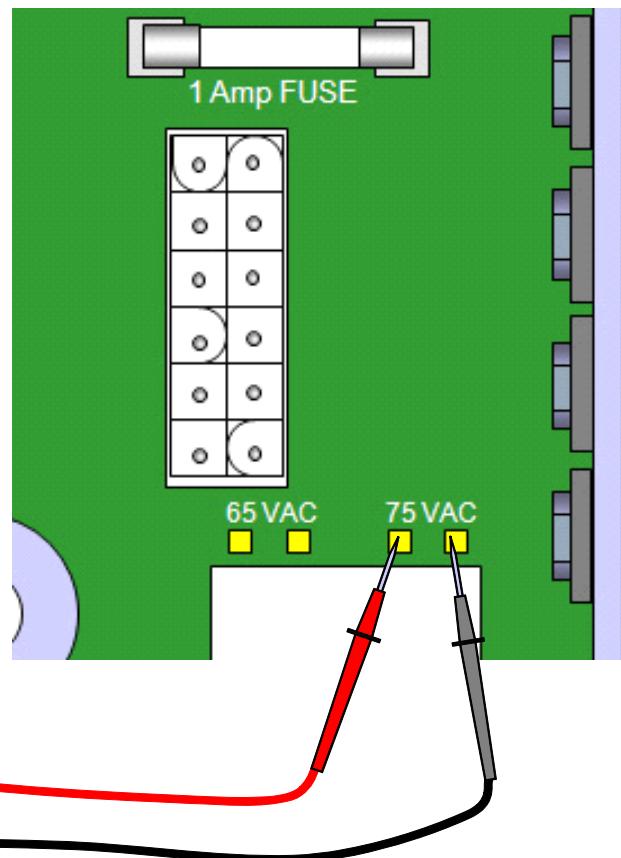
- Model/Size of chlorine generator (salt chlorinator).
- How long the chlorine generator is ON (filtration cycle).
- Setting of Production Percentage of the chlorine generator.
- Salt level.
- Water chemistry (pH, Total Alkalinity, Stabilizer, etc.).
- Water temperature.
- Covered or uncovered.
- Water features.
- Bathing load (one dog is equivalent to between 5 and 50 adults)
- Other organic matter (e.g. Phosphates & Nitrates).

Power Interface Board (PIB) Layout



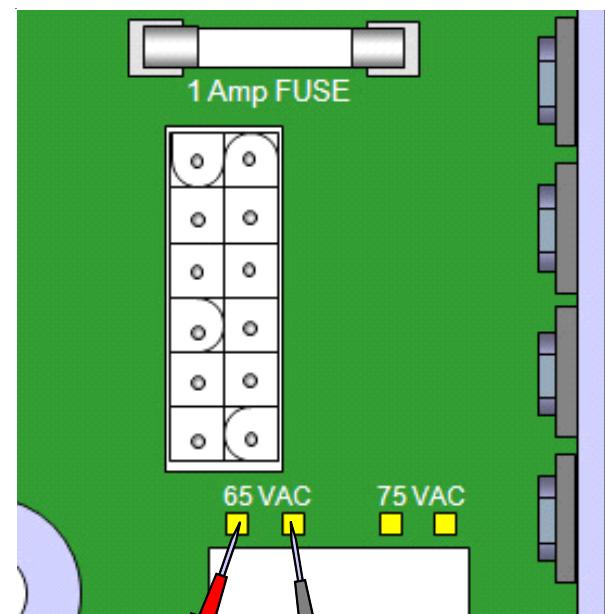
Voltage Test - Transformer  
Wires at connector = Blue to Blue/White

**67 - 88 Acceptable**



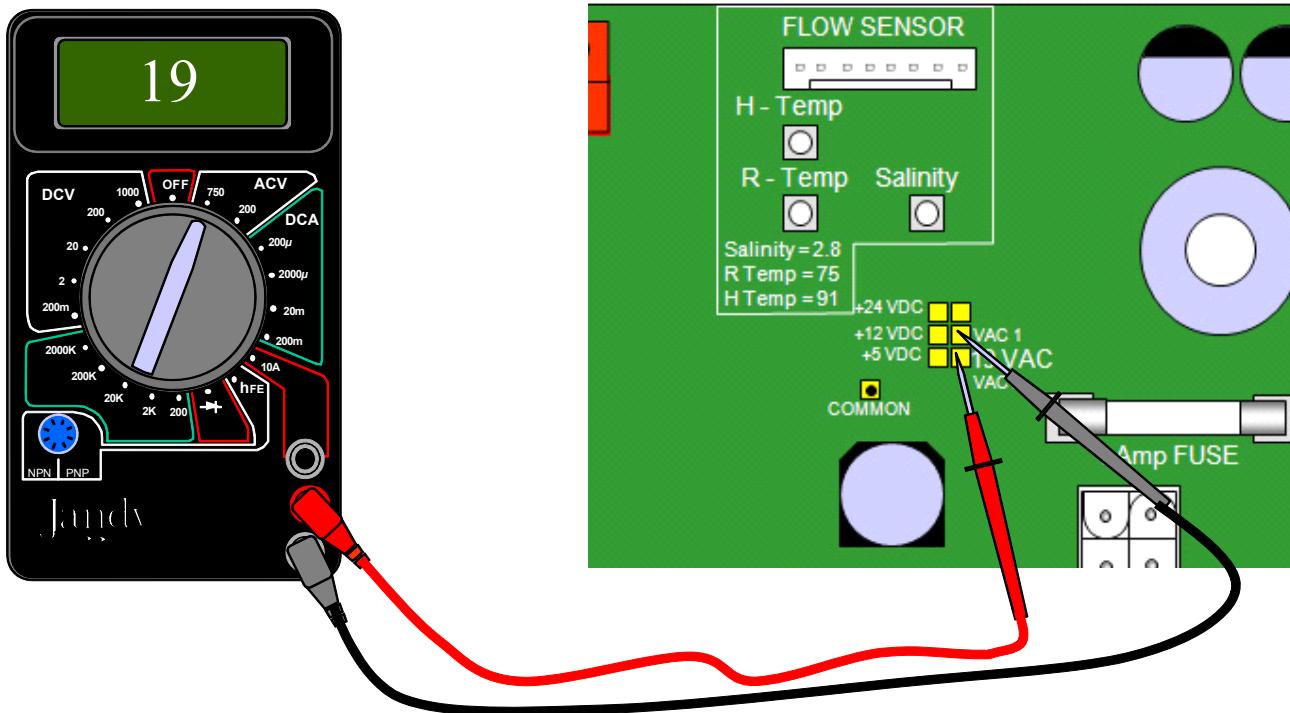
Voltage Test - Transformer  
Wires at connector = Orange to Orange/White

**60 - 79 Acceptable**



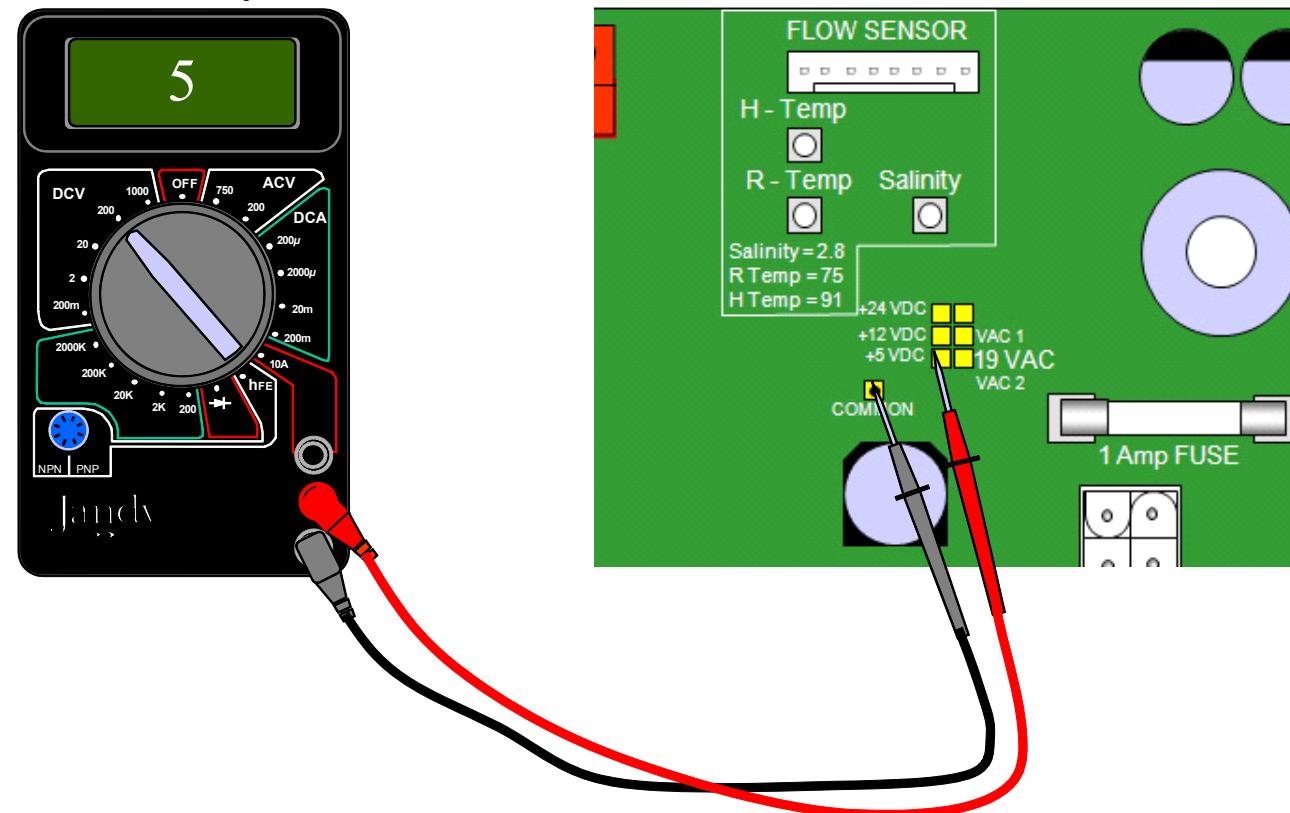
Voltage Test - Transformer to PIB  
Wires at connector = Brown to Brown/White

**17 - 24 Acceptable**



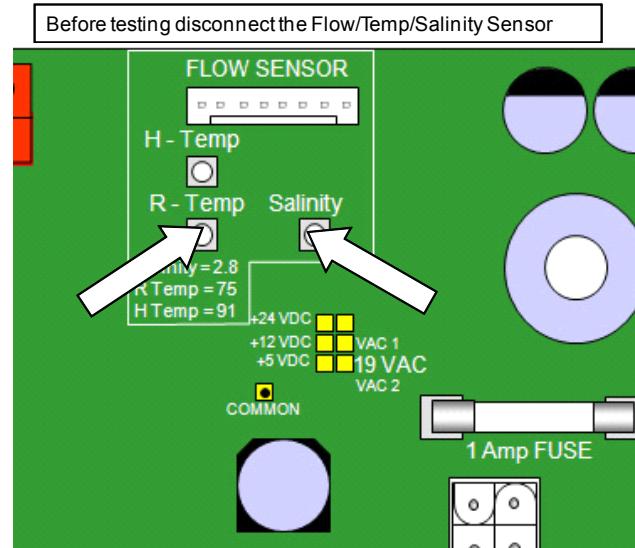
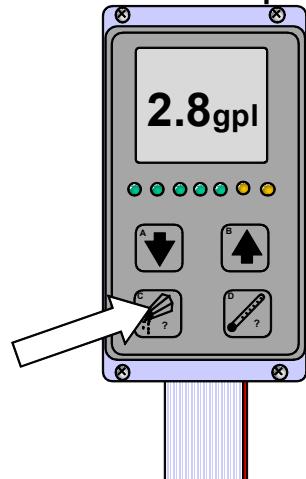
Voltage Test - Voltage Regulator

**4.8 – 5.2 Acceptable**



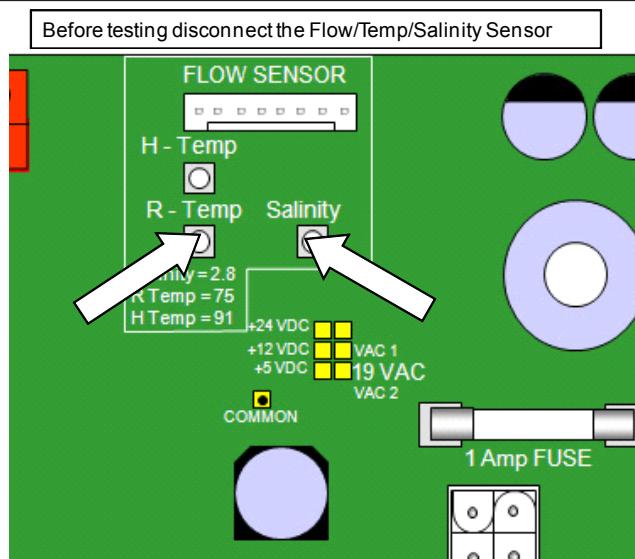
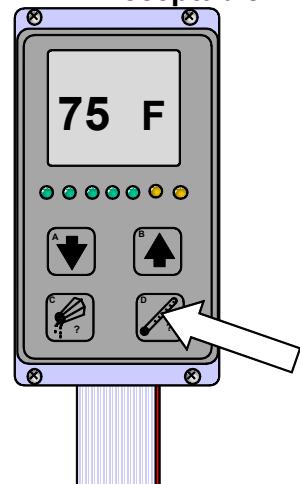
Test PIB Salinity Sensing

**2.7 – 3.1 Acceptable**



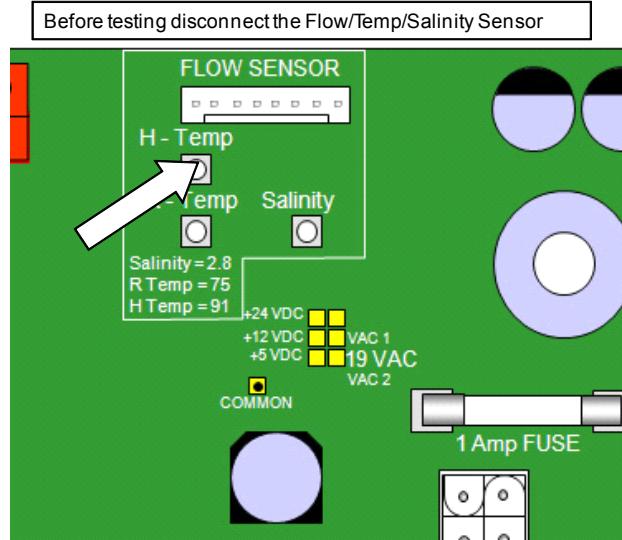
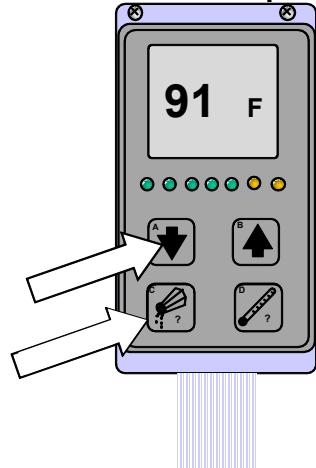
Test PIB Temperature Sensing

**73° - 77° Acceptable**

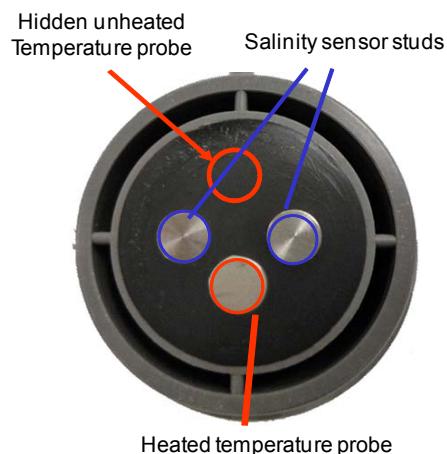


Test PIB Flow Sensing

**89° - 93° Acceptable**



### Flow/Temperature/Salinity Sensor - TriSensor



New Sensor Released Nov 2014

Clean sensor before proceeding. Use green scrub pad to clean

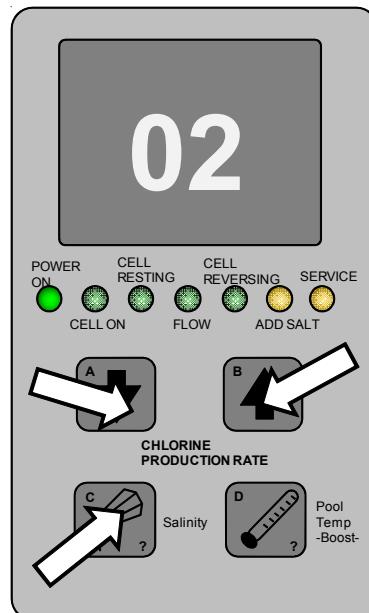
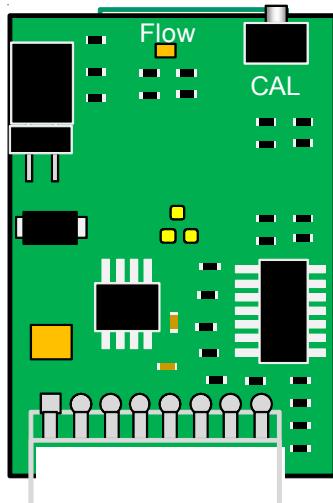
### Flow Calibration – Adapter Card

Verify the firmware by holding down the following buttons at the User Interface:

“C” Salinity, “A” Down, “B” UP at the same time.

The first four sets of digits will be the firmware revision.

If the Firmware is 02110A10, remove the jumper on the Adapter Card. Any other revision leave the jumper in place.



Press "D" to resume normal operation.

## Tri-Sensor Improvements



In-line interface module



## Simple Installation & Service

PGM "A" Firmware 02110A10 and later  
PGM "B" ALL firmware prior to 02110A10  
Hold "Sel" for 5 sec's to select PGM Wait 5 minutes to allow for calibration

## New "Pig Snout" Design



Changed from three to two studs. The heated and reference temp sensors are now utilizing the salinity studs to transfer heat to the water

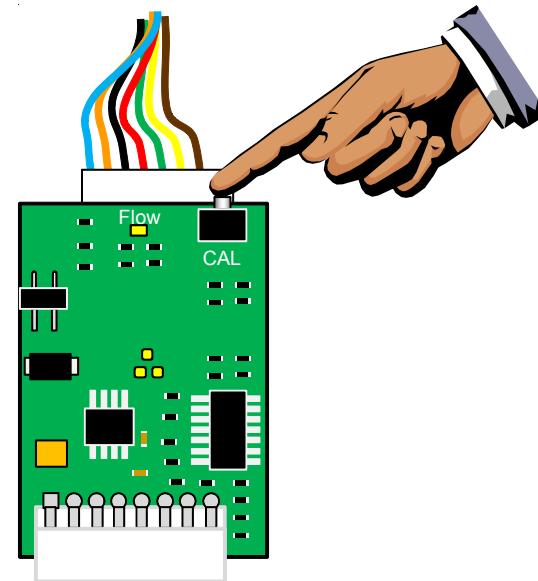
### Flow Calibration – Adapter Card

For all installations do the following:

- Turn on power
- Wait at least 10 minutes\*.
- Hold down the calibration button until the Flow indicator is illuminated.

\*Note: If the Flow Indicator Light illuminates before the 10 minutes has elapsed, it indicates the Adapter Card is already calibrated.

**Do Not press the CAL button until at least 10 minutes has passes since power was turned on.**



### Cell Cleaning

- Add 1 part muriatic acid to 10 parts water.
- When bubbling quits the cell is clean.
- Rinse thoroughly after cleaning.
- Do not leave the cell in acid for more than 30 minutes.

*Note 1:*

*Do not use a metal knife or screw driver to dislodge debris.*

*Either could scratch the ruthenium coating.*

*Note 2: Cell Cleaning should only be done as needed. Each time the cell is cleaned it shortens the life of the cell.*



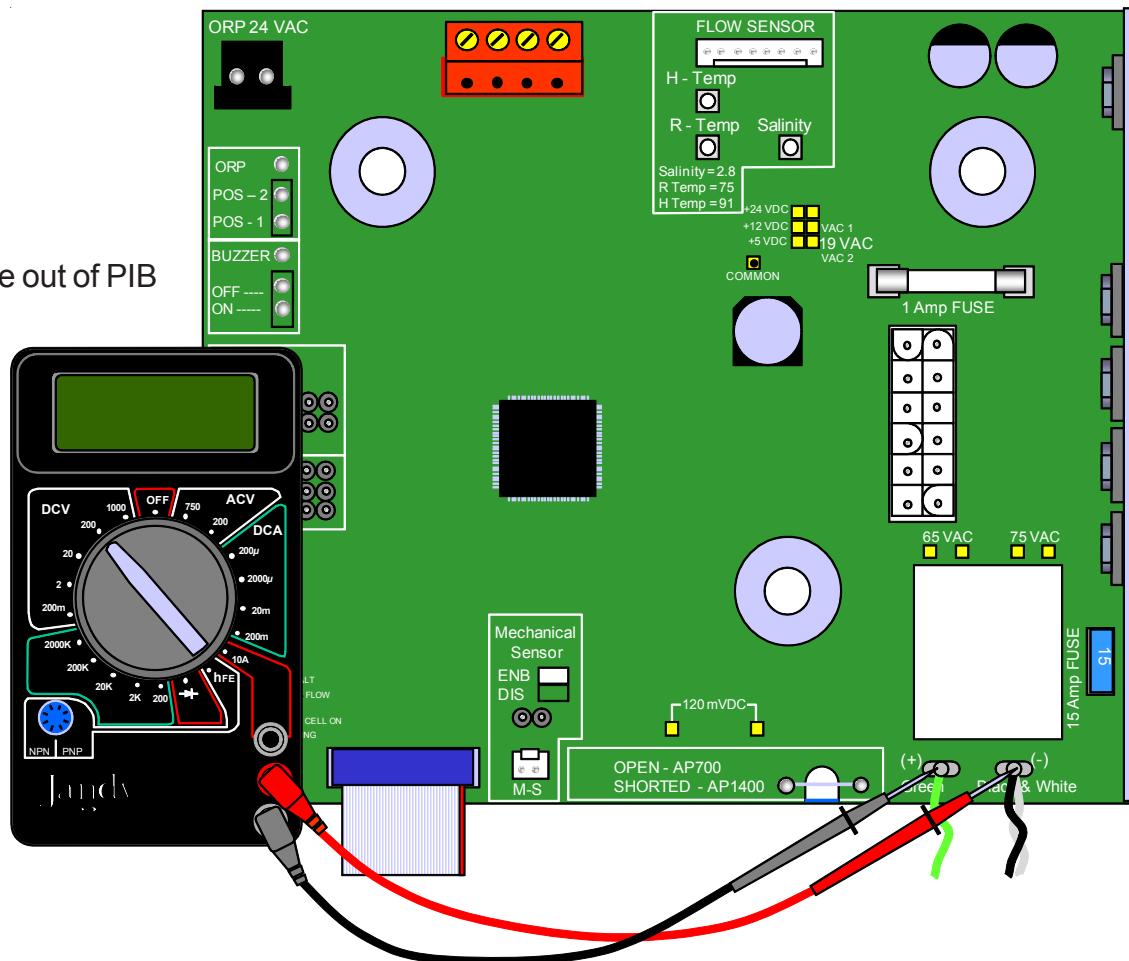
### Cell Voltage Testing

*Production must be at 100% and power on to cell for this test.*

Voltage to Cell - Rev A 22 to 28 VDC

Voltage to Cell - Rev B or newer 29 to 32 VDC

Test Voltage out of PIB



Test Voltage at Cell (center post to outside post).

*Production must be at 100% and power on to cell for this test.*

Voltage to Cell - Rev A 22 to 28 VDC

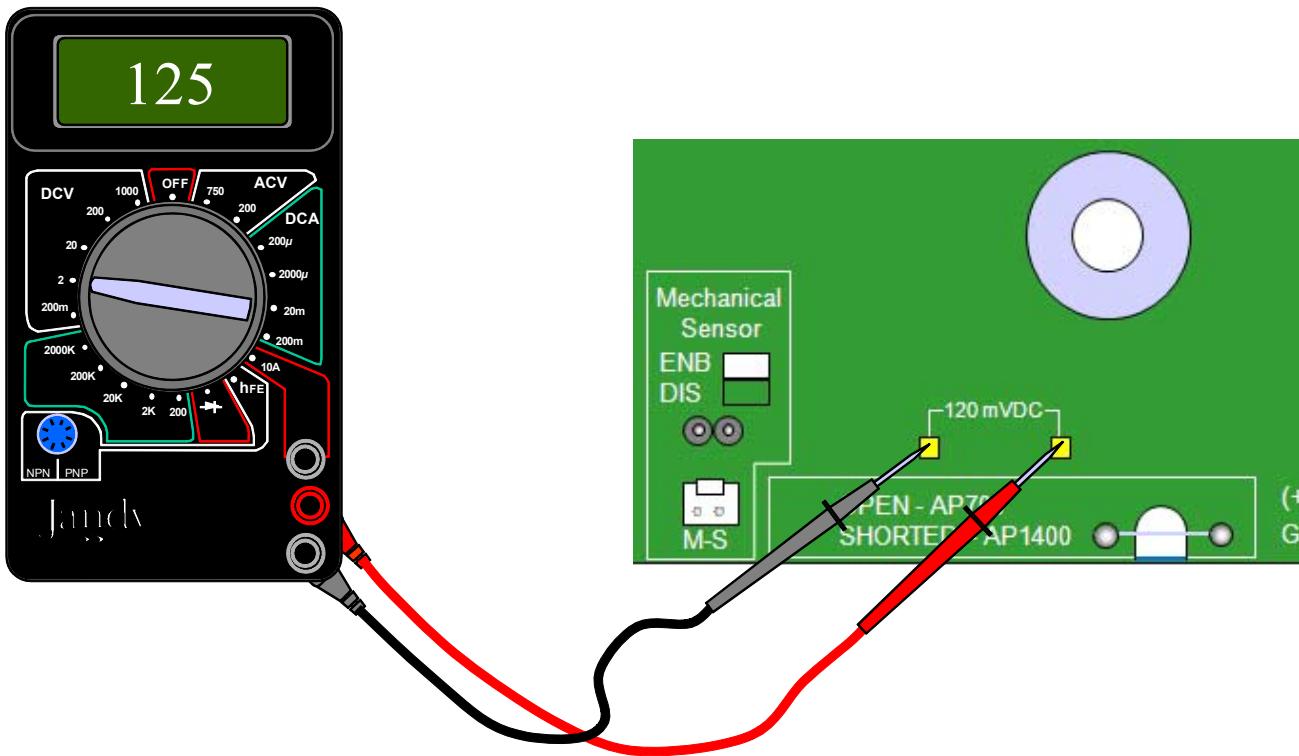
Voltage to Cell - Rev B or newer 29 to 32 VDC



Current to Cell Test

Production must be at 100% and power on to cell for this test.

**100 – 145 mV DC**



Service Codes

LEVEL 1

- 120 - Low cell current in forward direction - check DC cord, clean cell if necessary or replace cell.
- 121 - Low cell current in reverse direction, same as 120 above.
- 123 - Low to no current at cell - check DC cord, clean cell or replace if necessary.
- 124 - High current indicated at the cell - this usually means a bad PIB.
- 125 - Cell needs to be cleaned or replaced.
- 126 - Low current in forward direction and VAC input voltage below 100/200 VAC - check input voltage, transformer and PIB voltages.
- 127 - Low current in reverse direction and VAC input voltage below 100/200 VAC - check input voltage, transformer and PIB voltages.
- 144 - Low Salinity (below 2.0 gpl) - indicates the pool needs salt added.
- 145 - High Salinity (above 4.0 gpl) - indicates pool needs to be diluted.
- 170 - PIB service condition indicated and is usually caused by low incoming AC voltage -check transformer voltages. Can also be caused by faulty sensor.
- 171 - PIB service condition - indicates board needs to be replaced.
- 172 - Flow sensor service - clean sensor, check for damage and replace if necessary.
- 173 - Low VAC input voltage and on-board power supply is not regulated - make sure unit is wired with the proper voltage.
- 174 - Pool temperature is too high for operation of AquaPure (i.e. > 108°F).
- 175 - Flow sensor air lock condition or very low salinity.

LEVEL 2

- 180 - Heated sensor element not heating (generates 172 code)
- 181 - Flow sensor temperature sensor failure (generates 172 code – Flow sensor service)
- 182 - Salinity Sensor sees less than 0.2 gpl of salt, either no salt in pool or sensor air locked (generates 175 code – Flow sensor air lock)
- 183 to 186 - flow salinity sensor temperature probe error codes. They will all generate 172 codes which indicate flow sensor service is required.
- 187 - PIB power supply either too low or too high (generates 173 - Low input voltage code if Level II code 188 is present) (generates 170 code if 188 is not present).
- 188 - VAC input voltage is too low (generates 173 code if Level II code 187 is present)
- 189 - Relay not conducting in the forward direction (generates 171 code - PIB service)
- 190 - Relay not conducting in the reverse direction (generates 171 code - PIB service)
- 191 - High cell current (at upper limit of A/D converter) and cell voltage below 19V (generates 170 code PIB service)
- 192 - High cell current and cell voltage below 19V (generates 171 code – PIB service).
- 193 - Measured significant cell current when SCRs were turned off (generates 170 code – PIB service).
- 194 - Cell Current is 85% lower than desired and cell voltage above 19V (generates 125 code - Cell dirty or needs replacement).
- 195 - Salinity invalid due to out of range measurements caused by PIB error (generates 170 code – PIB service).

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## Notes:

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