

CircuPool® TOTALBalance

Swimming Pool pH Management - Installation and Operation Guide



pH Control System with CO₂ Infusion




Advanced Swimming Pool Sanitation

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SAFETY INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS. Read and follow all instructions. Ensure all owners / operators of this equipment have access to these instructions. Save all instructions. When installing and using this electrical equipment with pressurized components, basic safety precautions should always be followed, including the following.

-  **WARNING:** Follow all aspects of local and National Electrical Code(s) when installing the CircuPool **TOTAL Balance**. Disconnect all electrical power during installation & service.
 -  **WARNING:** To reduce the risk of injury, do not permit children to access this device. Service should only be attempted by a qualified professional.
 -  **WARNING:** Using and transporting compressed gases can be dangerous if mishandled. Although carbon dioxide (CO₂) is non-flammable, it is stored at very high pressures. Damage to the top of the cylinder may result in high-pressure gas being released under tremendous energy. To prevent injury or damage caused by accidental toppling, cylinders must be secured to a wall or other stable object. When refilling or replacing CO₂ tank(s), ensure regular safety checks and follow all safety instructions for transport.
- Heavy pool (and/or spa) usage and environmental conditions may impact the amount of CO₂ infusion needed to maintain proper pH. The actual amount of CO₂ infusion required by your pool can change and varies according to factors not limited to bather load, pool surface, water features, pool cover, rain, temperature, dirt, debris, and chemical balance.
 - Ensure that the Controller operates only when the circulation pump is operating.
 - Check the expiration date of any test kits as test results may be inaccurate if used after that date.

IMPORTANT - PLEASE READ BEFORE INSTALLATION

- The small flow settings chart that is included in your kit has an adhesive back. Be sure to apply it to the inside of the system's control box cover for later reference.
- Don't discard your pump's drain plugs. Keep them in a safe place so they can be used in the future if needed.
- If you are using a variable speed pump, ensure the TOTALBalance system's pressure sensor gets triggered when setting low pump speeds. It is recommended to make sure there is at least 4-5 lbs. of pressure in the filter and 1700 rpm on the pump.
- Winterizing your system:
 - If you drain your pool during the winter months, then switch system to OFF and close the cylinder valves. Remove the CO₂ Infusion injector and pressure sensor from the circulation pump (keep them in a safe place to reinstall later), then reinstall the original pump drain plugs.
 - If you cover your pool during the winter months and still run the filtering system, then turn down your Infusion settings. With a cover, the CO₂ will not gas off and the pH will drop below 6.8

INTRODUCTION

The **TOTAL Balance** pH management system is revolutionary because of its simplicity, safety, and effectiveness. It uses a patented CO2 infusion process to naturally lower the pH of the swimming pool and eliminate the need to store and handle caustic and dangerous acids.

Important Notice: The CO2 Infusion Injector and the Pressure Sensor fitting are both designed to fit most swimming pool pumps with industry-standard ¼-18 NPSM Straight pipe drain plugs. This includes pumps manufactured by:

CircuPool® SmartFlo

Pentair®

Sta-Rite®

Hayward®

PacFab®

System Package Contents:

- 1 - Low-voltage system Controller
- 1 - 24V DC low-voltage power supply AC Adapter
- 2 - Carbon Dioxide InpHusion™ Charts (small and large) and Instructions
- 1 - CO2 Infusion Injector with spare "O" ring
- 1 - Pressure-sensor fitting
- 1 - Pressure regulator assembly with cylinder pressure gauge
- 1 - Package containing cylinder restraint chain and plastic washers for regulator assembly
- 1 - Package containing 30' of Poly-urethane tubing
- 1 - Package containing colored slip-on bands for tubing identification
- 1 - Bottle leak detector

Tools Required:

- Screwdriver
- Drill
- 1 1/8" Adjustable Wrench

System Overview:

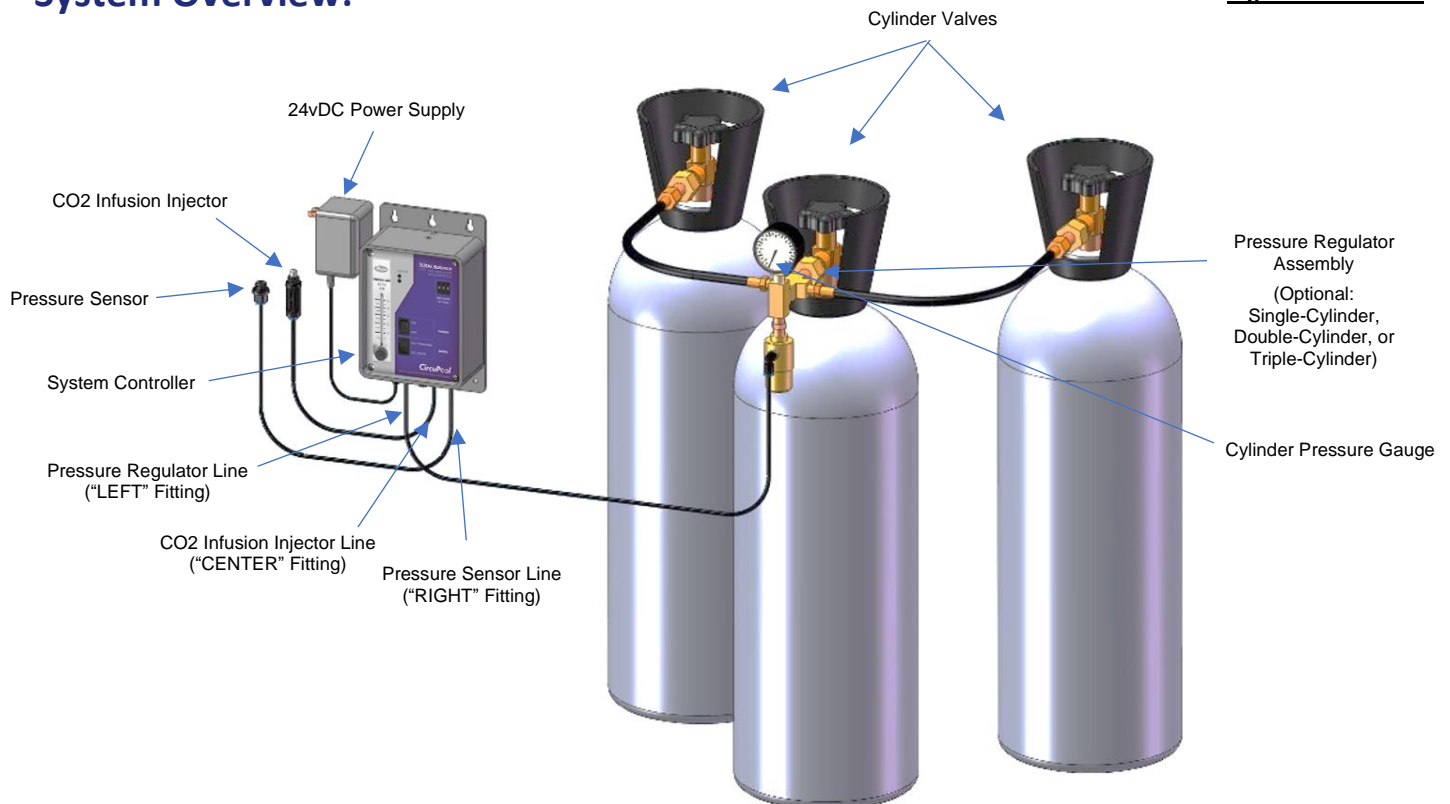
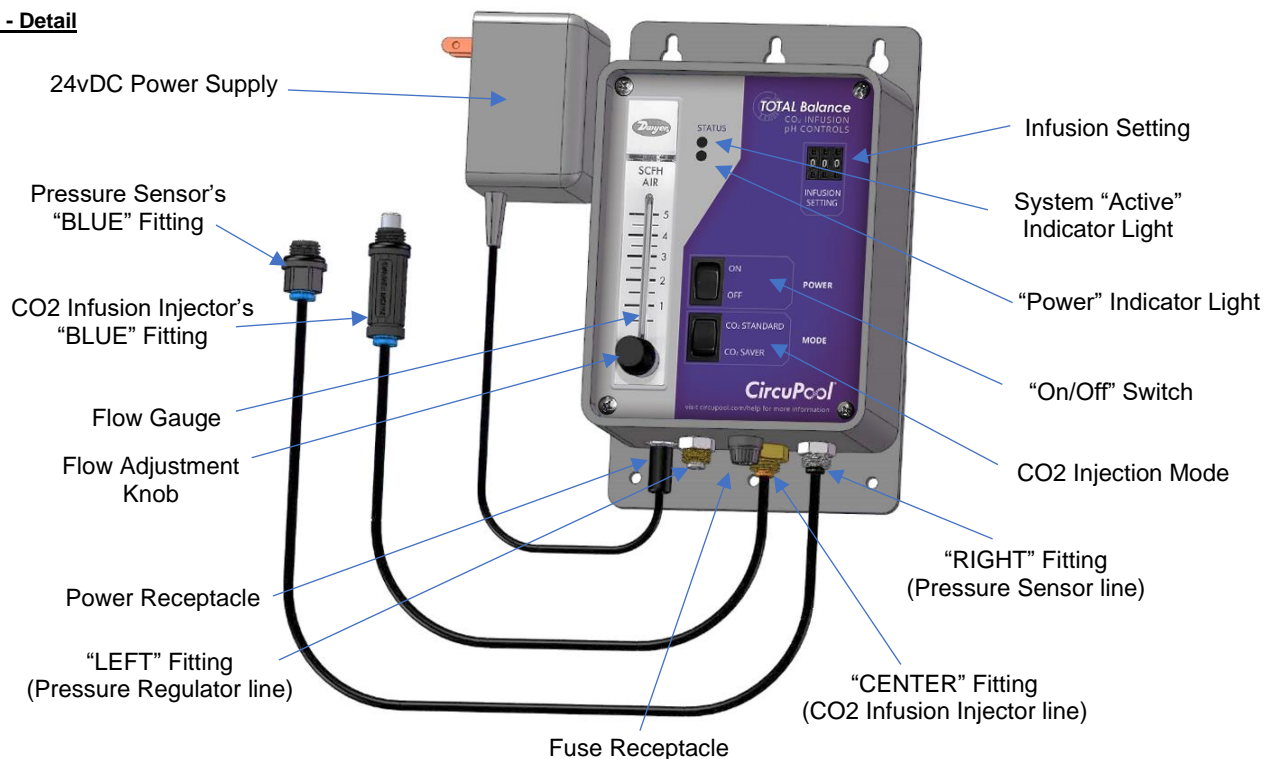


Figure 1 - Overview

INSTALLATION

Figure 2 - Detail



1. Select a site to mount the system Controller within 5' of a **covered, weather-protected**, standard house voltage (110vAC), GFCI electrical outlet.
2. Securely mount the Controller vertically with appropriate screws (wood, masonry, etc.).
3. Install the CO2 Infusion Injector and connect the poly-urethane tubing:

Important Notice: If the pump is located below the surface of the pool, assure that plumbing valves are positioned properly to prevent excess water pressure on pump before removing the drain plugs.

- a. Remove the drain plug from the pump strainer housing drain port. **Retain the plug for future use or for winterizing your pump at the end of the swimming season.**
- b. Securely install the CO2 Infusion Injector with "O" ring seal in the open drain port. Install by hand. Do NOT over-tighten. Do NOT use Teflon tape or caulk.
- c. Cut a length of 5/32" poly-urethane tubing sufficient to span the desired route from the CO2 Infusion Injector to the Controller.
- d. Slip the Orange colored band onto one end of the tubing, and insert tubing into the "BLUE" quick-connect fitting at the end of the CO2 Infusion Injector and route the tubing to the Controller. (See Figure 2, above)

NOTE: To **connect** the 5/32" poly-urethane tubing into any of the fittings, push the tubing firmly into the fitting then gently tug on the tubing to assure it is properly seated in the fitting.

To **disconnect** the tubing from any of the fittings, depress the outer plastic ring and pull firmly on the tubing until it releases.

- e. Slip the Orange colored band onto the other end of the tubing, then insert that end of the tubing into the "CENTER" fitting on the bottom of the Controller. (See Figure 2, above)

4. Install the Pressure-Sensor and connect the poly-urethane tubing.
 - a. Remove the drain plug from the pump impeller housing drain port. **Retain the plug for future use or for winterizing your pump at the end of the swimming season.**
 - b. Install the pressure-sensor fitting with “O” ring seal in the open drain port. Using a small wrench, tighten the pressure-sensor firmly. Do NOT over-tighten. Do NOT use Teflon tape or caulk.
 - c. Cut a length of poly-urethane tubing sufficient to match the route of the tubing from the CO2 Infusion Injector to the Controller.
 - d. Slip the Green colored band onto one end of the poly-urethane tubing, and insert tubing into the “BLUE” quick-connect fitting of the pressure-sensor fitting.
 - e. Slip the Green colored band onto the other end of the tubing, then insert that end of the tubing into the “RIGHT” fitting on the bottom of the Controller. (See Figure 2, page 5)

IMPORTANT NOTE: *To reduce the risk of damage, do not allow the tubing to contact the ground. Route tubing from the pressure-sensor fitting and the CO2 Infusion Injector “upward” to any point above the pump using nylon wire ties to secure the tubing on its route to the Controller.*

5. Secure the carbon dioxide (CO2) cylinders.

WARNING: *Using and transporting compressed gases can be dangerous if mishandled. Although carbon dioxide is non-flammable, it is stored at very high pressures. Damage to the top of the cylinder may result in high-pressure gas being released under tremendous energy. To prevent injury or damage caused by accidental toppling, cylinders must be secured to a wall or other stable object.*

- a. Place the cylinders on a solid level base and against a wall or other stable object such as a wooden or metal post anchored securely in the ground.
 - b. Fasten each end of the cylinder restraint chain to the wall or post with appropriate screws (not included) so the chain drapes around the cylinders above the midline.
 - c. Open one link of the chain to create a hook to facilitate easy exchange of the cylinders.
6. Mount the pressure regulator assembly to the CO2 cylinder(s) and connect the tubing.
 - a. Insert a plastic “washer” (included) between each hexagonal nut fitting (CGA-320) on the regulator assembly and the threaded fitting on the cylinder valves.
 - b. While holding the pressure regulator with the gauge upright, firmly attach the nut collar to the cylinder valve with a 1 1/8” adjustable wrench. (DO NOT USE PLIERS.)
 - c. Firmly attach the regulator hose fitting to any additional cylinders with a 1 1/8” wrench.

NOTE: *The plastic “washer” is squeezed between the threaded fitting on the cylinder valve and the regulator (CGA320) fitting when the nut collar is tightened thereby creating a leak-proof seal. If the seal is not made properly, CO2 will escape at the faulty connection. DO NOT over tighten the nut. It should only be tight enough to prevent CO2 leakage. Plastic “washers” should be replaced every 2 or 3 cylinder exchanges.*

- d. Cut a length of tubing sufficient to connect the pressure regulator assembly to the Controller.
- e. Slip the Red band onto one end of the tubing, and insert tubing into the fitting located on the Pressure Regulator.
- f. Slip the Red band onto the other end of the tubing, then insert that end of the tubing into the “LEFT” fitting on the bottom of the Controller. (See Figure 2, page 5)

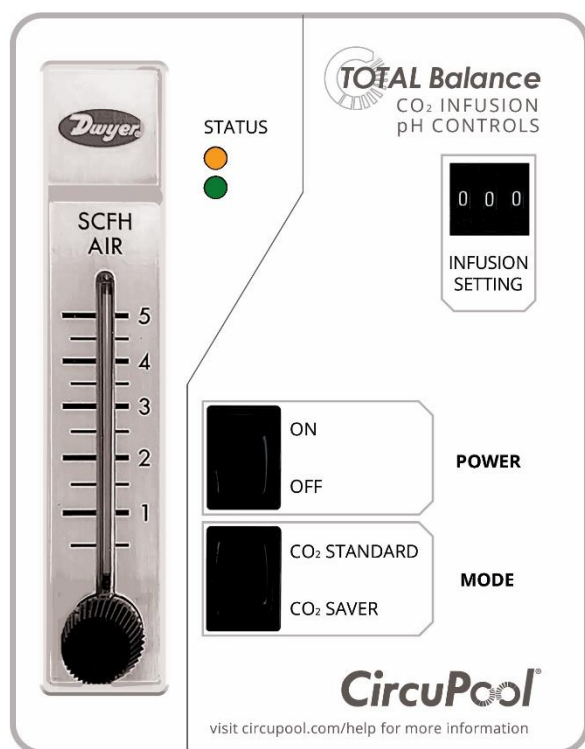
7. Leak test the pressure regulator assembly.
 - a. Ensure regulator fittings are securely attached to the cylinder valves.
 - b. Ensure the poly-urethane tubing from the regulator to the Controller is securely attached.
 - c. Open the main valves on the cylinders by turning the valves counter-clockwise until they are completely open then turn them clockwise ½ turn.
 - d. Use the “Leak Detector” or spray soapy water on all pressure regulator fittings including the tubing fitting on the regulator and the “LEFT” fitting on the controller. Leaks will appear as small but enlarging bubbles.
 - e. Using a cloth, wipe the leak detector residue from all surfaces.
8. Start the pump and check for water leaks at the pressure sensor fitting. If a water leak appears, gently tighten the fitting until the leak stops.

OPERATION

Synchronization

The **TOTAL Balance** system is meant to work in tandem with your circulation pump. After you install the system, power it on for the first time at the beginning of your pump’s daily circulation cycle. Subsequent daily operation of the **TOTAL Balance** Controller’s internal cycle is easily synchronized with circulation pump’s operation via the system’s Pressure Sensor, which allows it to operate only when it detects water flow. No further action is required unless your pool equipment must be turned off for an extended period of time (e.g. for pool repairs); in this case, it is recommended you turn off the **TOTAL Balance** Controller manually during this time until pool circulation can resume.

Controls (Quick-Reference) – **Important:** See next sections for more detail and **Initial Set-Up**.



Green “Power” LED Status Light

- A solid light confirms that the Controller has power.

Yellow “Active” LED Status Light

- A solid light confirms the Controller is actively infusing CO2. This light turns itself on and off every couple minutes, and does not require any monitoring or action on your part.

Infusion Setting

- Adjusts the Controller’s programming to increase or decrease the system’s infusion frequency. The higher the number, the harder the system works to lower pH, and the more CO2 is used.

Flow Gauge / Flow Adjustment Knob

- Controls and displays the flow rate of CO2 being supplied to the Controller. The higher the number, the harder the system works to lower pH, and the more CO2 is used.

Power Switch

- Turns the Controller ON/OFF.

CO2 Mode Switch

- Select CO2 STANDARD or CO2 SAVER mode. See CO2 SAVER section on Page 9 for more detail.
- **IMPORTANT:** Turn system OFF before changing modes.

Initial Set-Up

The **TOTAL Balance** pH system controller must now be set. Initial set-up will be based on the InpHusion® Chart. This small chart has an adhesive backing – be sure to peel attach the chart to the inside of the controller cover for future reference. For your records, a copy of this chart is located on page 10.

1. Using the InpHusion® Chart, locate your pool's "Volume (Gallons)" in the left column. Reading across to the right, identify the "Flow Rate" in column 2, the "Infusion Setting" in column 3, and the "Pump Run Time" on the far right.

Important Notice: The **TOTAL Balance** pH system controller is programmed with a proprietary injection formula. The formula is based on pool volume and pump run time. In most cases, setting the Controller according to the InpHusion® Chart will produce a pH range of 7.4 – 7.7. This result, however, may be dependent upon other factors, see next section for more information.

NOTE: "Minimum" Pump Run Time indicated on the Chart is the minimum time the pump must operate to assure the necessary amount of CO₂ will be injected. If the pump is scheduled to run for less than the minimum time indicated on the Chart, results may be adversely affected.

NOTE: If the volume of your pool falls between those on the Chart, round up to the next level.

2. Set your three-digit code based on the flow settings chart (make sure numbers on dials are centered) and set the mode switch to "CO2 Standard".
3. Turn pump on.
4. Turn on the **TOTAL Balance** system.
5. Now you can adjust the flow meter to flow rate according to flow settings chart.
6. Turn off pump. Turn off the **TOTAL Balance** system.
7. Once regular pool equipment operation is ready to begin, restore power to both pump and **TOTAL Balance** system (see "Synchronization" notes, page 7)

General Operation / Adjustments

After following the initial set-up instructions in the previous section, allow the pool system to run normally for a few days. Then, have the water tested in order to measure the resulting pH in the swimming pool.

Important Notice: The **TOTAL Balance** pH system controller is programmed with a proprietary injection formula. The formula is based on pool volume and pump run time. In most cases, setting the Controller according to the InpHusion® Chart will produce a pH range of 7.4 – 7.7. This result, however, may be dependent upon a Total Alkalinity (TA) level of <160, as well as other environmental factors not limited to bather load, pool surface, water features, pool cover, rain, temperature, dirt, debris, and chemical balance.

If ever the pH in the swimming pool is not measured to be within optimal levels, follow the instructions below to adjust the system.

Settings Adjustments – If situations arise where you may need to make an adjustment on the Controller, the Controller is designed to be extremely adjustable. If the settings listed on the Chart for your pool volume do not achieve your objectives, we recommend changing the "Infusion Setting" first. Subsequent adjustment can be achieved by changing the "Flow Rate", and lastly run time. Unless otherwise instructed by the manufacturer, **the "Flow Rate" should not exceed 5CFH.**

After making any adjustments, allow the pool system to run normally for a few days. Measure the resulting pH in the swimming pool to confirm system settings are sufficient, and make any subsequent adjustments as needed.

CO2 Saver Mode

The system mode switch should initially be set to CO2 Standard for a minimum of 14 days. After the pool's pH has been successfully stabilized over that time and the pool water has become "saturated", you can switch to CO2 Saver mode. In most cases, the CO2 Saver Mode can maintain the pH while using up to 50% less CO2. If at some point greater pH reduction is needed, try slightly raising Infusion settings first before returning to CO2 Standard.

IMPORTANT: Turn the **TOTAL Balance** controller **OFF** before changing the injection mode.

Pool Features that affect Adjustment setting and CO2 Usage

Pool features that cause aeration of the water can cause more CO2 to be required than normal as it encourages greater amounts of evaporation. Water features such as negative-edge/infinity-edge walls, waterfalls, or fountains may cause the system to need to run on a higher setting than normal and use slightly more CO2. Conversely, covering the pool can reduce evaporation and cause CO2 to be retained and drop the water's pH below normal levels.

Cylinder Exchange Instructions:

1. Turn the Controller to the OFF position.
2. Close the cylinder valves (turn the knob clockwise until completely closed).
3. Disconnect the regulator assembly from the cylinders using the 1 1/8" adjustable wrench. **DO NOT** misplace the plastic washers.
4. Exchange the cylinders.
5. Connect the regulator assembly to the cylinders. Make sure the plastic "washers" are in place. **NOTE:** the plastic "washers" should be replaced every 2 or 3 cylinder exchanges.
6. Tighten the hexagonal nut collar to the cylinder valves using the adjustable wrench.
7. Open the cylinder valves.
8. Use the leak detector to check for leaks.
9. Turn the Controller to the ON position.

Troubleshooting:

- **CO2 tanks runs out quickly**
 - ✓ Check for gas leaks at CO2 tank valves, regulator, and tubing connections.
 - ✓ CO2 tank gauge may be inaccurate if pressure fell quickly then stayed at a low number. Operation will be consistent as long as CO2 tank pressures are above than zero.
 - ✓ Confirm Infusion and airflow settings, these may be accidentally set higher than needed.
- **CO2 tanks have not needed to be refilled after prolonged use.**
 - ✓ Verify system is on, confirm that settings are correct and that yellow blinking light occurs at system startup.
 - ✓ Verify CO2 tank valves are open.
- **Controller does not have power**
 - ✓ Confirm Controller is connected to power, and that no GFCI/circuit breakers are tripped.
 - ✓ Check fuse on Controller, located on underside of Controller. Replace with F2AL 250V glass fuse.

Infusion Chart

This copy of the infusion chart has been added here for future reference. Be sure to adhere the included physical copy of the chart to the unit's cover or in a protected location near the equipment for convenient access during use.

CO2 Infusion Chart						
Patent US 7,537,707 B2						
Volume (Gallons)	Flow Rate Setting	Infusion Setting	Minimum Pump Run Time (Hours)			
			(Variable Speed Pumps: ensure sufficient flow during this time. Usually > 1700 rpm on the pump, > 4-5 lbs. of pressure in the filter)			
			4	6	8	10
5,000	2	60	♦			
10,000	2	120	♦			
15,000	2	180		♦		
20,000	2.5	188		♦		
25,000	3	200		♦		
30,000	3	240			♦	
35,000	3	280			♦	
40,000	3	330				♦
45,000	3	380				♦
Ideal pH range: 7.4 – 7.6*			Acceptable pH range: 7.2 – 7.8			
Ideal Total Alkalinity (TA): <160ppm						
*Maximum swimmer comfort and sanitizer effectiveness.						

LIMITED WARRANTY

CircuPool **TOTAL Balance** pH management systems carry the following Limited Warranty should failure occur due to faulty manufacture or materials, during normal use and service. For residential use, the manufacturer warrants to the original purchaser that the equipment shall be free of manufacturer's defects at the time of sale, and upon examination shall provide replacement parts in accordance with the following schedule:

Year One: No charge for parts.

For Commercial use (any pool that is not for private single-family use, or the use of which is subject to regulation), parts are warranted against defect for a period of one year.

This limited warranty is subject to the following terms, conditions, and exclusions:

1. To obtain the benefits of this warranty, contact the warranty department for troubleshooting. You may obtain current contact information at www.circupool.com/help. Warranty claims must be initiated in a timely manner. Upon discovery of a defect, the warranty department will issue a Return Merchandise Authorization (RMA) and defective items and parts are to be shipped by customer to an authorized service representative, freight prepaid.

Upon examination, the determination of the cause of failure shall be made solely by CircuPool Products. The date upon which the claim is submitted and an RMA is issued shall solely serve to determine at what point the claim falls within the schedule of warranty proration, in comparison with the original purchase date. No packages will be accepted without a RMA number.

2. Should a defect in any item or part covered by the warranty become evident during the warranty's term, CircuPool Products will at its sole discretion repair or replace such item or part. CircuPool Products reserves the right to replace defective parts with new or refurbished parts. This warranty does not include the cost of labor or transportation charges for equipment or component parts to or from CircuPool Products, or the removal, reinstallation, or any such costs incurred in obtaining warranty replacements or repair.

3. This warranty extends to the original retail purchaser and original installation site only, beginning at the original date of purchase, and is non-transferrable.

4. The warranty contains the following exclusions. CO2 Tanks, O-Rings, rubber gaskets, washers, electrical fuses, and circuit-breaker components are normal replacement items subject to wear and are excluded from the warranty. Product discoloration, or any other cosmetic or superficial damage or deterioration, regardless of its cause, is not covered by this warranty. The warranty is not applicable to problems arising from circumstances outside the control of CircuPool Products, including, but not limited to the following:

- A. Damage or premature wear due to improper pool chemistry, and failure to maintain pool water chemistry in accordance with the recommendations contained in the owner's manual.
- B. Damage due to improper installation or connection to improper voltages, including materials and workmanship supplied by others.
- C. Damage due to negligence or failure to properly maintain equipment, including the maintenance of clean and tight electrical connections.
- D. Damage due to improper service, as well as unauthorized equipment modifications and use of non-genuine replacement parts.
- E. Damage due to misapplication, misuse, abuse, or failure to operate equipment as specified in the owner's manual.
- F. Problems resulting from tampering, accident, fire, flood, freezing, lightning, insects, or other natural elements, or other circumstances beyond the control of CircuPool Products.
- G. Damage due to over-tightening of threaded components or excessive pressure or stress.

The liability of CircuPool Products shall not exceed the repair or replacement of defective items or parts under the referenced limited warranty terms. There are no implied warranties of merchantability or fitness for a particular purpose that apply to this equipment. Under no circumstances shall CircuPool Products, its agents, employees, and affiliates be liable for any loss, damage, injury, inconvenience or loss of time, incidental expenses such as labor and material charges, or any other incidental, or consequential damages, which may result from the use, installation, removal, or reinstallation of its equipment and parts.

This warranty is valid only in the United States of America. This warranty gives you specific legal rights and you may also have other rights, which vary from state to state. This warranty supersedes all previous publications. Any dispute between the original purchaser and CircuPool Products will be settled by binding arbitration, conducted in Harris County, Texas, under the rules of the American Arbitration Association.

CircuPool Products

(888)-206-9938. www.circupool.com/help