CLEARWATER™

POOL SYSTEMS

The Healthy Alternative in Pool Maintenance

INSTALLATION & POOL CARE MANUAL

MODEL

PH-50

pH PURE™

CO_2 Injection for pH Control

A. Important Safety Instructions

When installing and using **pH PURE PH-50** electrical equipment, basic safety precautions should always be followed, including the following:

1. READ THIS MANUAL BEFORE INSTALLATION AND FOLLOW ALL INSTRUCTIONS. SAVE THE MANUAL FOR FUTURE REFERENCE

2. WARNING - To reduce the risk of injury, do not permit children to use these products unless they are always closely supervised. This is to prevent accidental injury.

3. Follow all applicable electrical codes

4. All permanent electrical connections should be performed by a qualified electrician.

5. Keep all cables visible and do not bury them. Also, position them so that they do not get damaged by lawn mowers, hedge trimmers and other like equipment.

6. WARNING - To prevent electrical shock, replace damaged cords immediately.

WARNING: Follow all aspects of local and National Electrical Codes when installing the pH PURE PH-50 unit. Disconnect all electrical power during installation and servicing.

WARNING: Using and transporting compressed gases can be dangerous if mishandled. Although carbon dioxide (CO_2) is non-flammable, it is stored at very high pressures. Damage to the top of the CO_2 cylinder tank may result in high pressure gas being released under tremendous energy. To prevent injury or damage caused by accidental toppling, the CO_2 cylinder tank(s) must be secured to a wall or other stable objects. When refilling or replacing the CO_2 cylinder tanks(s), ensure regular safety checks and follow all safety instructions for transporting.

CO_2 Safe Storage & Transport:

a. Care should be taken to prevent damage to the cylinder tank(s) valve and handle.
b. If cylinder tank is determined to be leaking or venting, do not attempt to stop leaking as it can cause frost bite and evacuates the CO_2.
c. Cylinder tank(s) installed location should be secured to prevent tipping as the cylinder is heavy and can injure if it falls.
d. Cylinder's installed location should be in cooler temperatures to prevent safety pressure release. A CO_2 cylinder tank will vent if the pressure is too high.
e. Cylinder tank(s) and the control box should be located in an open space.

Ensure injection only occurs when the circulation pump is running, and water is flowing through the pump and filter.

IMPORTANT TIPS:

1. The **pH PURE PH-50** has a safety switch so it will not inject CO_2 if the pump is not producing enough pressure. This switch will also sync the injection time to your pump's schedule.

2. Keep the manual in case you need to refer to it.

3. Make sure to follow all directions throughly including ensuring pump prime & filter air release.

Table of Contents

pH PURE™

CO_2 Injection for pH Control

Model PH-50

Thank you for purchasing the **PH-50** unit for your swimming pool!

After a quick and easy installation, balancing the pool water chemistry will finally become easy. No more fighting with keeping both pH and Total Alkalinity in balance.

Please follow all instructions and keep this manual handy for quick reference. All of our manuals are available for download at **www.clearwaterpoolsystems.com** as well.

pH PURE™

CO_2 Injection for pH Control

Manufactured by

CLEAR WATER ENVIRO TECHNOLOGIES

Sustainable Solutions for Our Future

CLEARWATER™ POOL SYSTEMS

The Healthy Alternative in Pool Maintenance

B.) Identifying the PH-50 Components

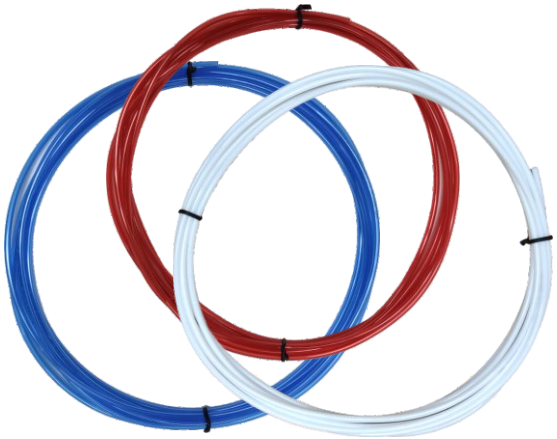
The **pH PURE PH-50** unit should contain all the components listed below. Before installation, identify components shown below to help ease installation.

Control Unit (1)

Injection Nozzle (1)

Pressure Sensor Fitting (1)

Quick connect in-line check valve (1)

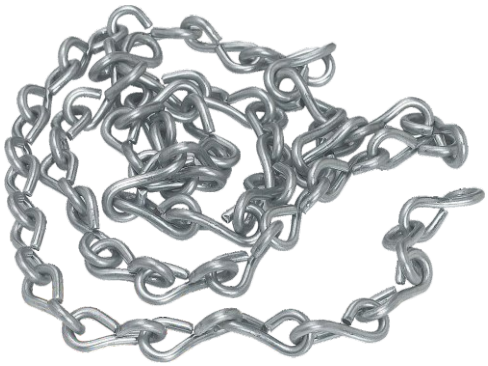


Blue, Red and White Tubing (1 of each color)

Control Unit Mounting Brackets (4)
Mounting Bracket Screws (4)

Regulator (1)

Mini Spray Bottle (1)



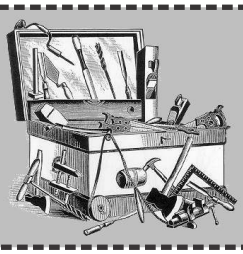
3 feet of chain (1)

PH-50 User Manual (1)

PH-50 Warranty Card (1)

PH-50 Extended Warranty Card (1)

C.) Tools and Materials Required

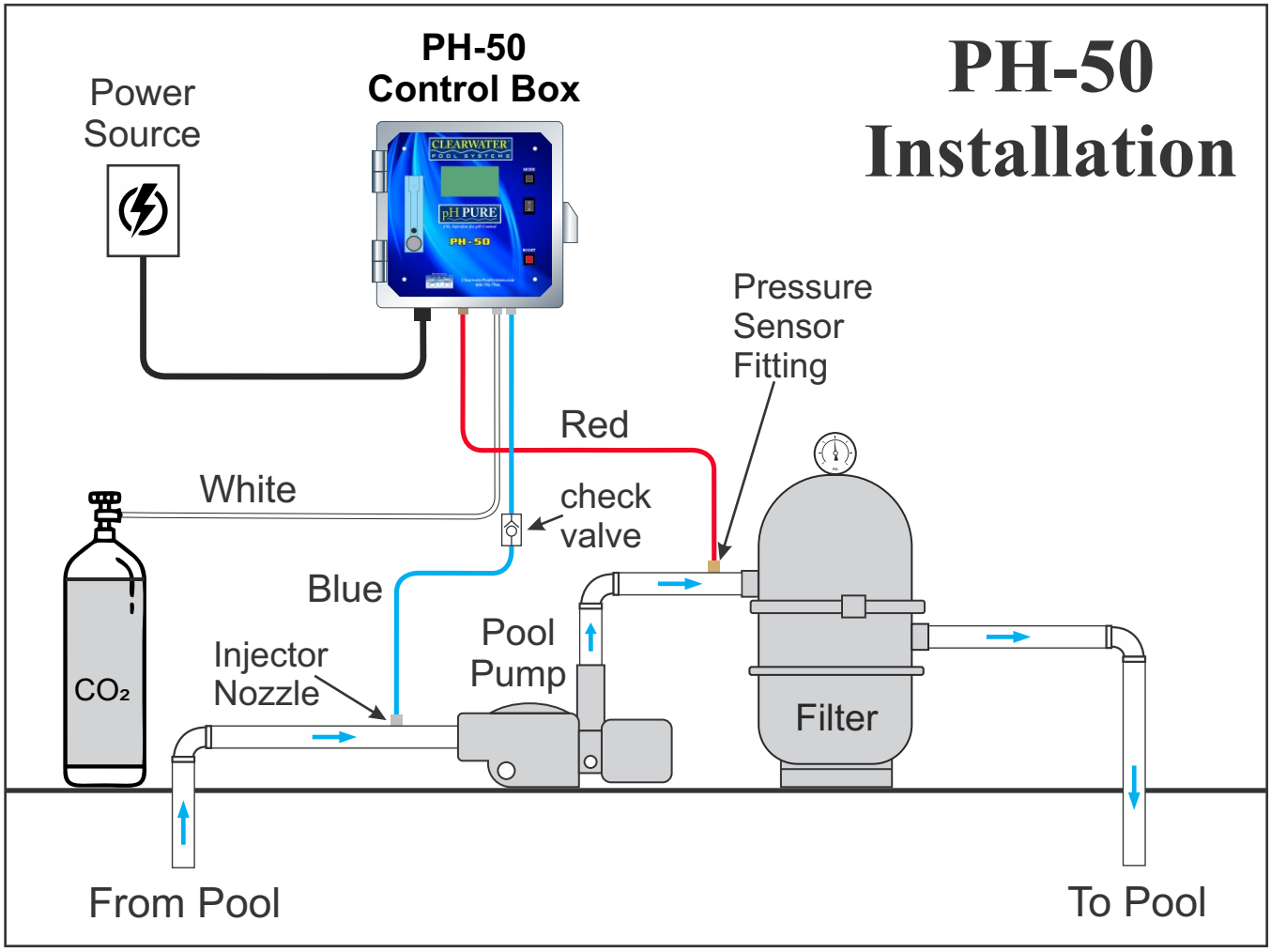


- Bullet Level
- Drill & Drill Bit(s) 3/8”
- Screws & Anchors
- Crescent/Adjustable Wrench
- Screwdrivers, Flat & Phillips
- Sharp Scissors &/or Utility Knife

- Other tools may be required

D.) Site Survey

The **PH-50** should be installed at the pool’s pump and filter area. You will need to locate a place to mount the **PH-50** control box on a wall or such. This location will need to be within 6 feet of an electrical source. The CO_2 cylinder tank(s) must be placed on a hard surface such as a concrete pad similar to the surface the pump & filter are located on. The CO_2 cylinder tank(s) must be secured to a vertical surface such as a wall, post or other object to prevent tipping of the cylinder.



E.) Installing the Unit

Mounting the Control Box

The **PH-50** should be installed at the pool's pump and filter area. You will need to locate a place to mount the **PH-50** control box on a wall or such. This location will need to be within 6 feet of an electrical source.

- Unit must be installed in the upright position and can not be rotated into another position.

Keep the protective clear plastic sheet on during installation to stay clear of scratching the unit. Remove it after installation is complete.

1.) Install the four mounting brackets using the enclosed screws to the back of the control box.

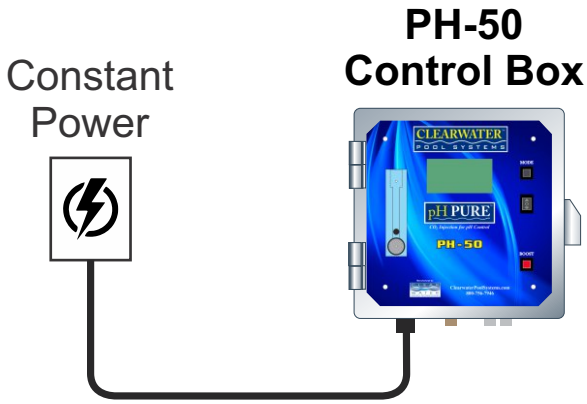
2.) Mount the control box to the wall using the mounting brackets installed. Hold the control box up to the wall or surface to where it will be mounted and mark the four screw holes. Using a level will ensure the control box is straight, so the flow meter functions correctly. Attach the control box to the wall according to the wall material using appropriate mounting hardware for that material, i.e. wood screws, mollies, concrete screws, or anchors.

E.) Installing the Unit (Continued)

Choosing a Power Source

The PH-50 unit is supplied with a plug that may be used with a 115 AC outlet that supplies constant power. If the installation location is outdoors, it is necessary to correctly use the outdoor in-use cover that prevents water from entering the outlet.

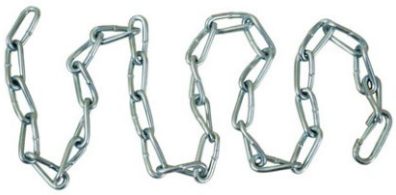
The plug for the **PH-50** may be plugged into a proper GFCI outlet with outdoor in-use cover. The power source should remain powered 24/7 and MUST be grounded per NEC standards. The power to the **PH-50** can be either 115 VAC or 230 VAC.



Line Diagram for Electricians
L1 = Black
L2 = White
Ground = Green

Cylinder Tank (s) Location

The CO_2 cylinder tank(s) should be mounted and secured so they can not tip over. ***ONLY*** locate the cylinder tanks(s) on a hard surface such as concrete, pavement, etc & with a suitable wall or structure safety chains can be attached to prevent tipping. Use the included safety chain with appropriate screws or anchors to mount, Example, wood screws for mounting to wood surface, or concrete anchors for mounting to concrete or block wall. The location should be partially or fully shaded to prevent the cylinder(s) from venting due to overheating.



Cutting the tubing:
Use a new utility knife or scissors to cut tubing. Ensure the cut is straight across & smooth. Examples below:

GOOD - Straight across and smooth

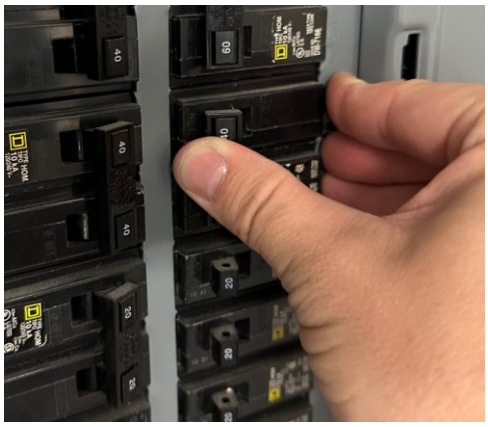
BAD - Rough edges will not seal properly

BAD - Not straight across and will not seal properly

E.) Installing the Unit (Continued)

Installation

1.)



Shut off power to the pump with breaker or disconnect.

2.)

If applicable, close valves that are before and after installation locations as needed to minimize water draining from piping. Example, valves before pump, backwash valve & return to pool valves.

3.)

Set cordless drill to the drill setting, not a torque number setting or hammer function.

4.)

Drill straight into the pipe & do not use the drill to remove any burrs. Only install pressure sensor & injection nozzle in rigid PVC pipe. Flexible PVC, fittings, filters are not approved installation locations.

5.)

With a utility knife remove any burrs from the outside edge of the pipe.

E.) Installing the Unit (Continued)

Pressure Sensor Fitting Install

Ensure power is shut off & valves are closed to isolate the pump and filter area if applicable

Identify location of pressure switch installation: Between the pump outlet and filter inlet

1.)

Use a 3/8” standard drill bit & drill straight down into the pipe. Some water may drain from the hole and is expected.

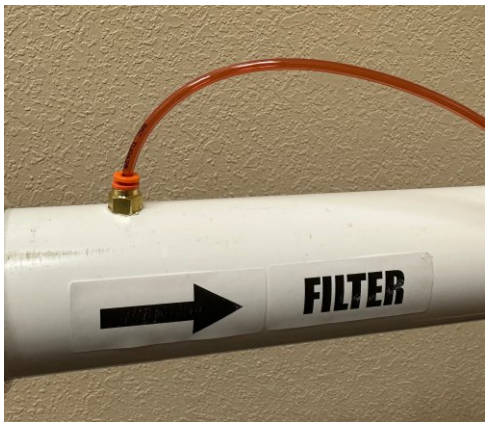
2.)

Start installation of pressure sensor by hand turning clockwise and applying light pressure. Pressure sensor will make its own threads as installed.

3.)

Using an adjustable wrench, continue turning clockwise until fully seated.

4.)



Push one end of the red tubing into this fitting.

5.)

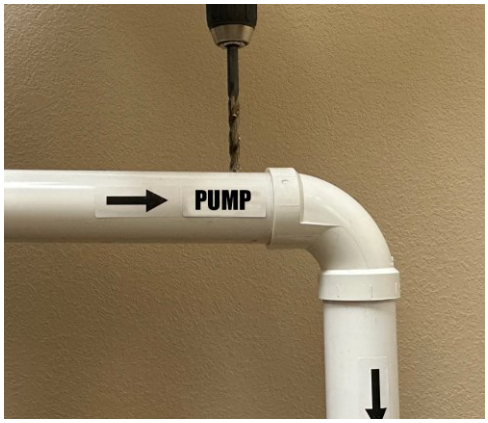
Route the red tubing back to the left most connection on the **PH-50** unit.

E.) Installing the Unit (Continued)

Injection Nozzle Install

Identify location of injection nozzle installation: At the pipe before pump strainer basket housing

1.)



Use a 3/8” standard drill bit & drill straight down into the pipe. Some water may drain from the hole and is expected.

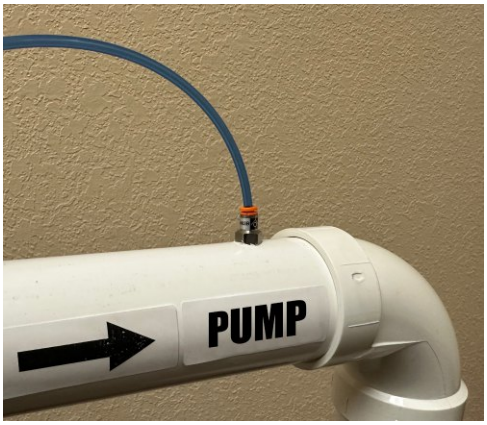
2.)

Start installation of injection nozzle by hand turning clockwise and applying light pressure. Injection nozzle will make its own threads as installed.

3.)

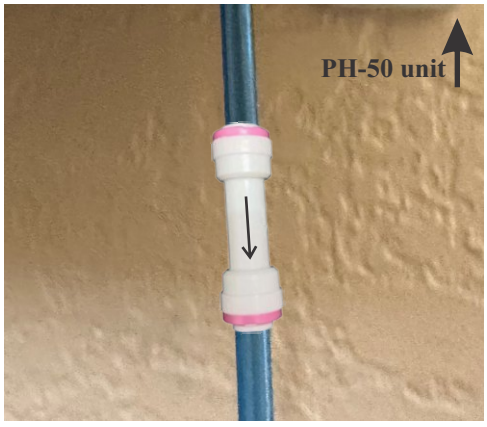
Using an adjustable wrench, continue turning clockwise until fully seated.

4.)



Push one end of the blue tubing into this fitting.

5.)



Install quick connect “in-line” check valve on blue tubing midway to the controller. Make sure the arrow on the quick connect is pointing down.

6.)

Route the blue tubing back to the right most connection on the **PH-50** unit.

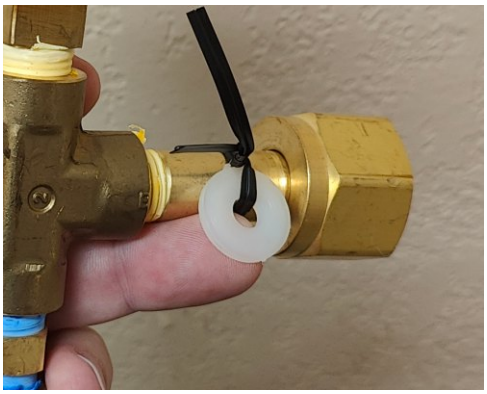
E.) Installing the Unit (Continued)

Attach Regulator & Connect to PH-50 unit

Important Notes:

- Ensure plastic sealing washer is in place to prevent slow leaks of CO_2. Plastic sealing washer should be used for each cylinder & replaced every other cylinder tank(s) change. These are available from your CO_2 supplier, Amazon & other sources.
- The number of cylinders connected must match the number of regulator connections you have. Example, you cannot connect a two-cylinder regulator to only one cylinder.

1.)



Plastic sealing washer is attached to each cylinder stem with a zip tie.

2.)

Install the plastic sealing washer inside the CO_2 connection

3.)

Turning clockwise tighten until fully seated by hand.

4.)

Using an adjustable wrench, tighten fully.

5.)

Insert one end of the white tubing into the regulator connection. Your regulator may look different if it is for 2-3 cylinders.

6.)

Route the white tubing back to the **PH-50** unit and insert into the remaining connection.

E.) Installing the Unit (Continued)

Pressure Test Connections

Ensure CO_2 is not leaking by using soapy water. A few drops of household dish soap and water will suffice.

1.) Open CO_2 cylinder valves fully. If CO_2 is heard leaking or CO_2 is felt, immediately shut valves completely by turning the valve clockwise.

2.) Fill the mini small spray bottle (included with unit) with the soapy water mix of water and 1 or 2 drops of dish soap and spray on the CO_2 connections. If bubbles appear and grow in size, tighten fitting until it stops.

NO LEAK

Mini Spray Bottle

LEAK

IMPORTANT NOTES

1.) Ensure all valves previously closed have been opened. Depending on your filter type and pipe routing, the setting of valves will be different from pool to pool. **DO NOT** start pump before reopening valves closed previously!

2.) If water in strainer basket has drained out, ensure proper pump priming is complete by filling the strainer basket. Please follow your pool pump's manufacturer directions.

3.) Once water is flowing, release any air from your filter using the air release valve located at the top of the filter. Open until all air is released.

F.) Balancing the Pool's Water

Before starting up the **PH-50**, the pools water must be clear and clean. Any algae bloom in the water will prevent the pH from being lowered in a proper manner with our system.

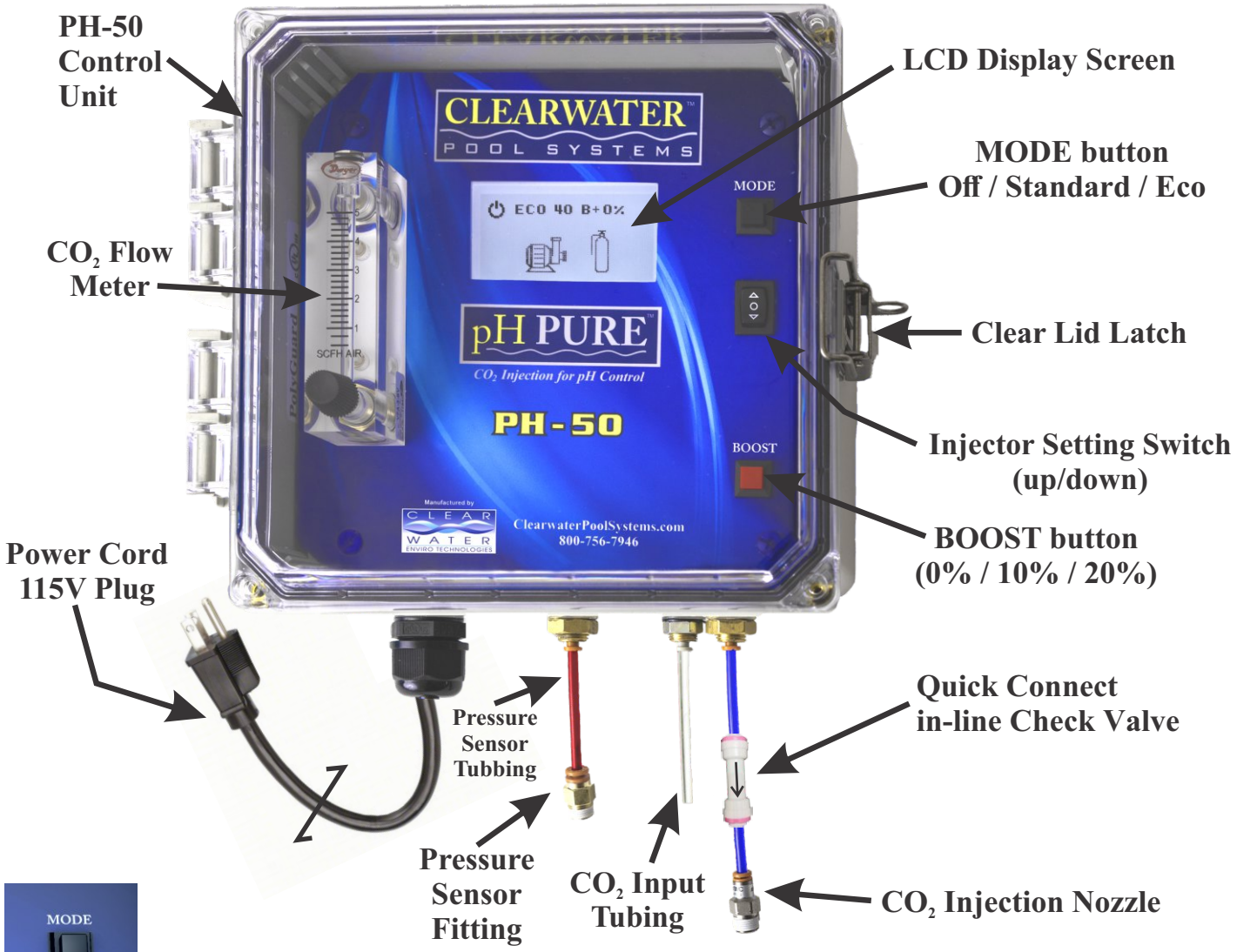
The **pH PURE PH-50** unit will work with all sanitizer options including traditional chlorine of all types – liquid, tablets, and granular. It is ideal to work with saltwater chlorinators, ionization and ozone systems. If you are using one of our ionization systems, it is not good to use granular chlorine with it.

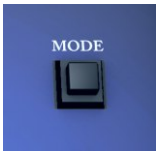
pH - The starting pH must be at least 7.2 and no higher than 7.8. Our goal is to get it between 7.2-7.8, preferably in the middle of those numbers – like 7.4 to 7.6. The human eye's pH is about 7.5. Aways keep it below 7.8 and above 7.2 no matter what.

Total Alkalinity - Maintain the total alkalinity between 80 and 140ppm**.** This should be tested a couple of times a week or more during the first month or so of installing **pH PURE.**

A higher total alkalinity will cause an increase in CO_2 required to the keep the pH in the 7.2-7.8 range. So, for cost savings, it is very important to keep an eye on the total alkalinity and keep it 100 or lower, if possible. The total alkalinity will remain fairly steady once **pH PURE** is used but may trend upwards over a long period of time and this would be the only time muriatic acid would be needed.

G.) Control Box Features





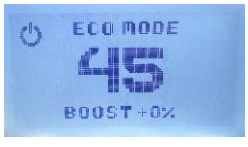
MODE Button Setting

There are three settings for the **"MODE"** button.

OFF - This will stop the system from releasing any CO_2 into the water.

STND - Standard setting for the first two weeks of use.

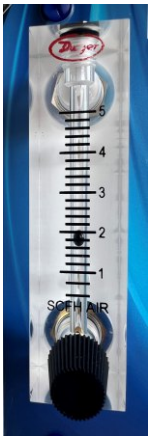
ECO - Economy mode to save on CO_2 use after stabilizing the system.



Injection Settings

This is one of the two features that need setting to control the CO_2 levels for your pool. This up and down button, adjusts the controller's programming to increase or decrease the system's CO_2 injection duration and frequency.

CO_2 Flow Meter



This is the other feature that needs setting to control the proper amount of CO_2 into your pool. This can range from 1 to 5 CFH (cubic feet per hour). This controls the flow rate of the CO_2 being fed to the unit. A black float ball will appear on the gauge when CO_2 is being injected and is visible when in the range just under 1 CFH and up to 5 CFH.

H.) Determining the Number of Gallons in Your Pool

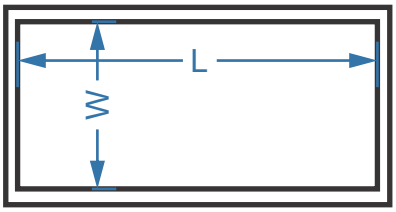
First, you must know the number of gallons in your pool.

CALCULATION OF POOL CAPACITY:
Before a pool can be properly treated, the pool capacity needs to be determined. The formulas below will give you a guideline to follow. The results of these calculations will be approximate.

CALCULATION OF AVERAGE DEPTH:
Take the depth at the deep and the depth at the shallow end, divide by two, and this will equal your average depth.

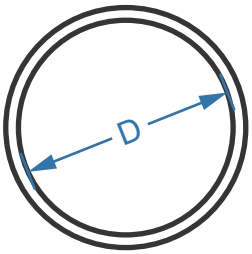
CAPACITY FORMULAS:

Rectangular Swimming Pools:



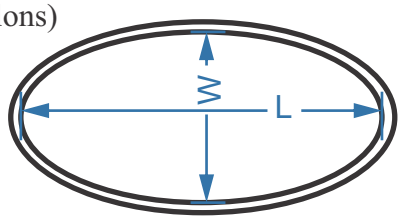
Length x Width x Average Depth x 7.5 = Capacity (Total Gallons)
Example: 32'x 16'x 8'x 7.5 = 30,720 gallons

Circular Swimming Pools:



Long Diameter x Short Diameter x Average Depth x 5.9 = Capacity (Total Gallons)
Example: (where Diameter= 20') 400 x 8 x 5.9 = 18,880

Oval Swimming Pools:



Long Diameter x Short Diameter x Average Depth x 5.9 = Capacity (Total Gallons)
Example: 30 x 20 x 8 x 5.9 = 28,320 gallons

Irregular Swimming Pools:

You can either ask your pool installer or estimate based on what shape your pool most resembles.

I.) Starting Up the System / Operation Instructions

Once the system has been completely installed and the CO_2 cylinder tank(s) in place, it is time to start up the system.

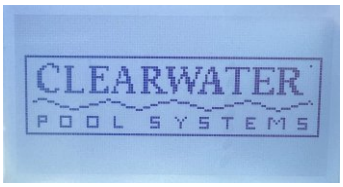
MAKE SURE THE pH IS AT THE PROPER READING OF 7.2 to 7.8 WHEN STARTING THE SYSTEM TO LIMIT THE AMOUNT OF ADJUSTMENTS YOU NEED TO MAKE TO GET IT LEVELED OFF.

The settings are based on the overall size of the pool. However, these settings are subject to several factors – like overall surface area of the water, spa or infinity edge spillover, fountains, or waterfalls**,** etc. A higher reading may be required under those circumstances.

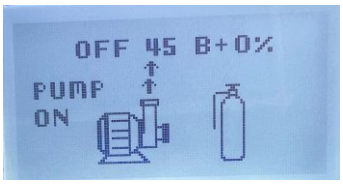
I.) Starting Up the System / Operation Instructions (Continued)

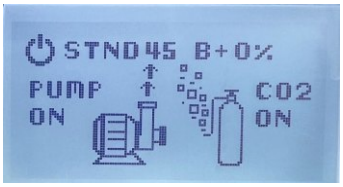
Once the pool size has been determined, and the pool pump is running (in high speed if you have a variable speed pump), plug in the **pH PURE PH-50** unit's cord into a 115V outlet.

Initially, the **pH PURE** logo and **Clearwater Pool Systems** logos will appear.



Then the screen will show one of the following images depending if the CO_2 Injection is ON or OFF.





Determining the Settings

To set the unit to the proper settings, first push the "**Injection Setting Switch**" in the up or down button to obtain the desired setting as per the chart.

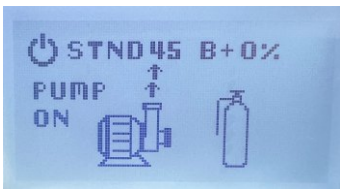
Determining the Settings Chart

Pool Gallons	CO_2 Injection Setting	CO_2 Flowmeter Setting	Minimum Pump Hours
5k	15	1.5	3.00
10k	30	1.5	6.00
15k	30	2.25	6.00
20k	40	2.25	6.00
25k	50	2.25	8.00
30k	45	3	8.00
35k	52	3	8.00
40k	60	3	10.00
45k	54	3.75	10.00
50k	60	3.75	10.00

Note: If your variable speed pump is running on low speed, it may not trigger injection cycle as the pressure is too low

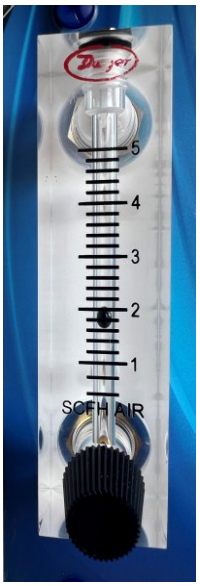
Setting the MODE Button

First, with the pump running, push the **MODE** button so it goes from "**OFF**" to "**STND MODE**" – short for "Standard". A factory preset number will appear in large numbers. Then a smaller version of it will show up in ten seconds with large drawing of pool pump and cylinder tank with arrows going up from the pump. This will show that the pump is on and the **MODE** is "Standard".



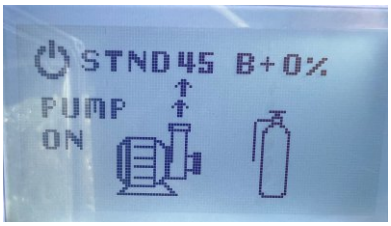
I.) Starting Up the System / Operation Instructions (Continued)

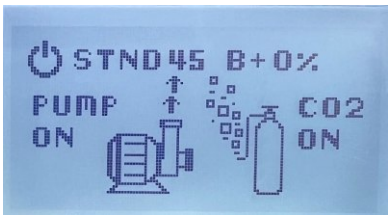
Setting the CO_2 Flow Meter



The next step, set the **CO_2 Flow Meter** to the proper setting as seen in the yellow chart on page 15. This can be adjusted by turning the control knob clockwise or counterclockwise. Please note that is will come on and off in various time increments, usually every few minutes. If you want to bypass that waiting time to further adjust this setting, you can press and hold the "**MODE**" button a couple of seconds till the system reboots itself and starts all over again.

If everything is operating properly, these images below will appear on and off periodically – depending on if the CO_2 is injecting or not. If it is injecting, the bubbles images and **CO_2 ON** wording will show up next to the cylinder tank drawing. This is assuming the pump is on and in high pressure mode. The unit does not inject CO_2 all the time. It is on a sophisticated timer programed by the **Injection Setting** and **CO_2 Flow Meter** based on the size of the pool. When CO_2 is not being injected into the pool, the image will show **PUMP ON**, the mode and the setting number and arrows going up from the pump drawing. When CO_2 is being injected, the "bubbles" image will appear along with the readout **CO_2 ON** and **PUMP ON**. The Flow Meter black float ball should be in the proper range per the yellow chart on page 15.





Low Pump Pressure

The next day, check the unit for any error messages. This is only for those with a variable speed pump. If the pump pressure is not high enough to allow a full injection cycle, the unit will display an error of "Last injection cycle not completed". This error resets after 24 hours of run time or once a full CO_2 injection cycle has completed. If the error remains, a faster injection cycle would need to take place.

Monitoring the pH/CO_2 Injection

It is important to monitor the pH daily as you go through the process of stabilizing the system. You may have to raise or lower the Injection Setting or CO_2 Flow Meter readings until it is stabilized in the 7.2-7.8 range. The ideal number is between 7.4-7.6 if possible.

YOUR MINIMUM PUMP HOURS AS NOTED IN THE CHART MUST BE MAINTAINED. If you normally run your pump longer than recommended or even 24 hours a day, you can continue that. (We are only concerned about the minimum hours it runs.) Settings need to be prorated for higher number of hours for the unit to inject the proper amount of CO_2.

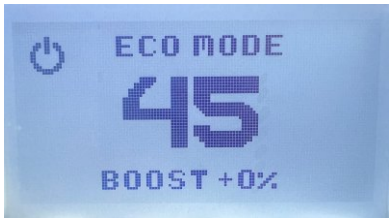
If your variable speed pump is running on low speed, it may not trigger the injection cycle as the pressure is too low.

I.) Starting Up the System / Operation Instructions (Continued)

Optional Settings

Changing to ECO MODE

After two weeks of having your water fully "saturated" and the pH stabilized, you can change your setting to go into **ECO MODE**.



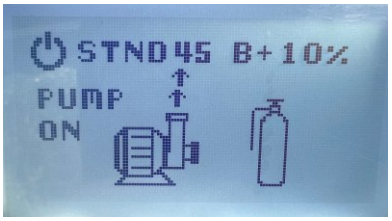
This can very easily be done by pressing the black **MODE** button once to **ECO**. "**ECO**" stands for "economy" and this feature will allow you to continue your settings as they are, but cut back on CO_2 usage, and saving you even more money vs. using muriatic acid to balance your pH. Your CO_2 usage may be decreased by as much as 50%.

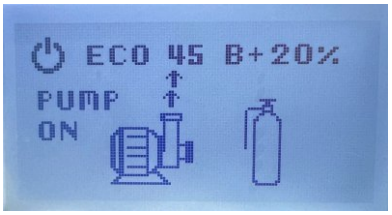
When changing to this feature, make sure you test the pH frequently to make sure it is in range and not going over 7.8.

Using the BOOST Feature

If you need to quickly get more CO_2 released into the pool because the pH got too high, you can push the red **BOOST** button on the panel. If you push it once, the CO_2 output will be increased 10%. If you push it a second time, it will be increase 20%. This will continue for a 24-hour period, before going back to normal. A display will show the **BOOST** at either 10% or 20% in two phases as noted in the images. A high amount of rain or bather load in the pool might bring on a slight need for more CO_2 in rare circumstances because the pH got too high.

Always check the pH more frequently to make sure the pH has gone down – and stays in that range. If this feature did not bring the pH back into the recommended settings of 7.2-7.8, you might want to increase the injection setting switch or the CO_2 flow meter to a higher setting.





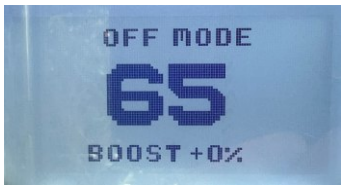
J.) Changing the Cylinder Tank(s)

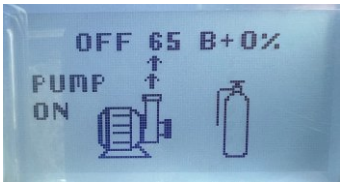
Whether you have 1, 2, or 3 cylinder tanks in use for the **pH PURE**, they will all extinguish evenly. The amount of time they last is dependent on the settings, and how well the pH and total alkalinity have been monitored.

How do you tell if they are empty?

The best way is to keep an eye on the pressure gauge included with the system. Over a period, the gauge reading will get lower and lower till it reaches zero. At that point it is time to change the cylinder(s) with filled ones.

1.)





Press the **MODE** button till the unit shows "**OFF MODE**".

2.)

Close the cylinder valves tightly.

3.)

Loosen and remove the brass nut(s) with an adjustable wrench.

4.)

Remove the safety chains and exchange the cylinder(s).

5.)

Re-install the safety chains with new tanks in place.

6.)

Re-install or replace the **plastic sealing washer** included with our system. It is very **IMPORTANT** this step is done or leaks will occur.

7.)

Re-install the regulator connecter(s) to the cylinder tank(s).

8.)

Open the cylinder valves fully.

9.)

NO LEAK

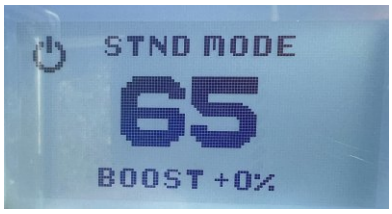
LEAK

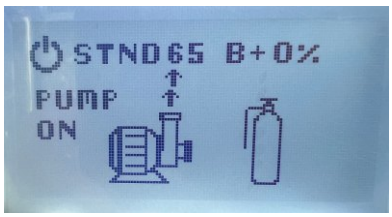
Mini Spray Bottle

Check for leaks with soapy water. Use a soapy water mix (fill small spray bottle with water and add 1 or 2 drops of dish soap) applied to the CO_2 connections. If bubbles appear and grow, tighten fitting until it stops.

J.) Changing the Cylinder Tank(s) (Continued)

10.) Turn the system back on by pushing the **MODE** button to either **STD** or **ECO**.





If the previous setting was in ECO MODE

If the cylinder tank(s) were replaced quickly (within a few hours) and the pool water is still in the acceptable pH range, you can keep it in the **ECO MODE**. This is assuming the cylinder tank(s) had not been empty for a long period of time when the cylinder tank(s) were exchanged. If the pH is still right where it needs to be, you can continue the **ECO MODE**.

We recommend testing the pH everyday at this point regardless of what **MODE** you set it at.

When exchanging the cylinder tank(s), the settings on the CO_2 Flow Meter may have changed due to the pressure in the tank being much different with a full tank(s) now in use. You will need to adjust accordingly.

Helpful Hints

Make a note of how long your cylinder tank(s) last each time you exchange with a refill. This will give you an idea how long you can expect to go between exchanging them.

Always keep an eye on the pressure gauge on the regulator every time you check on the pool equipment. You will want to make sure there have been no leaks causing you to run out of CO_2 prematurely.

Monitoring your Total Alkalinity

In addition to monitoring your pH, you should keep an eye on the total alkalinity. This is standard pool chemistry and not just because of the **pH PURE**. We like it in the 80-140 ppm range. The Total Alkalinity in the pool with **pH PURE** will rarely, if ever, go down again, so the dumping of muriatic acid to control the pH allows you to eliminate the need for sodium bicarbonate (baking soda) to raise it. You may have to use a little bit of muriatic acid to lower the total alkalinity if it gets too high, but that may take a long time to occur as the total alkalinity basically is stabilized too.

Keeping the total alkalinity on the lower side (80-100ppm) will reduce the amount of CO_2 that is used daily. You can also reduce the CO_2 usage by changing the **MODE** button to **ECO**, as long as all precautions on page 17 “Changing to **ECO MODE**” are followed.

Winterizing

If your pool is closed for the winter months, make sure you turn the control **MODE** to **OFF,** and turn the cylinder valves to the **CLOSED** position.

CLEARWATER™ POOL SYSTEMS

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CO_2 Injection for pH Control

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