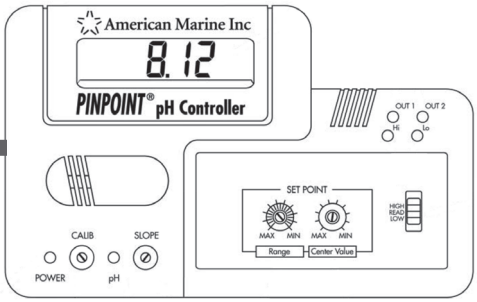
PINPOINT®
pH Controller
120VAC



User's Manual

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PINPOINT® pH Controller User's Manual

I. Overview

This device consists of a pH Monitor and electronics, which will control external device(s) based on the pH reading. There are two adjustments to be made before putting the controller into service. Calibration and controller set points. After the controller is in service, it will be necessary to re-confirm and occasionally re-calibrate the pH controller. Always keep fresh calibration fluid on hand.

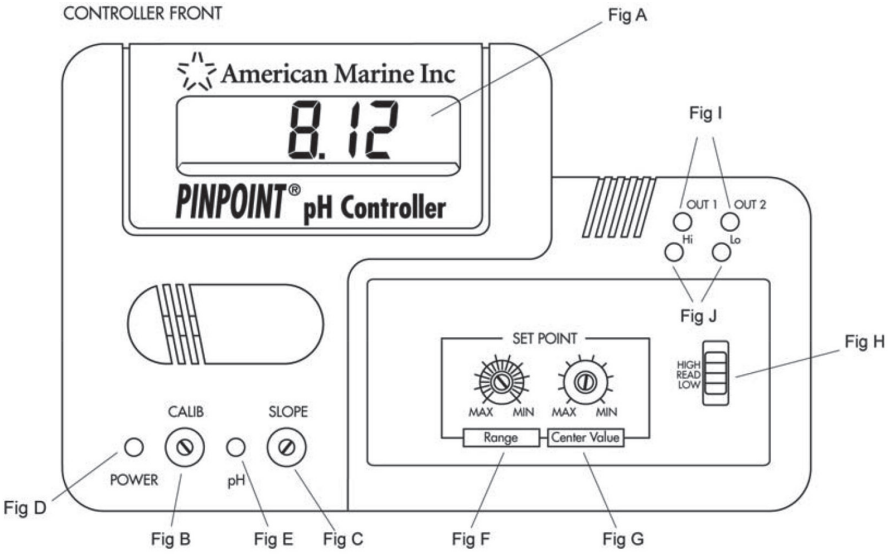
Many users will be controlling the addition of CO_2 or pH UP and/or pH DOWN fluids into their system with this instrument. It is important to pay special attention to the placement of the pH probe in the system and insure reasonable fluid circulation. Needle valves, pumps, and similar devices, should be designed to slow down flow into the system to a reasonable rate. If a base or acid is being added, the maximum rate of addition should be slow enough so that there are not large pH changes over a short period of time. Control electronics are not human, they are not intelligent and they cannot "know" when something has happened to make their input or output invalid. Non-stick solenoids are highly recommended.

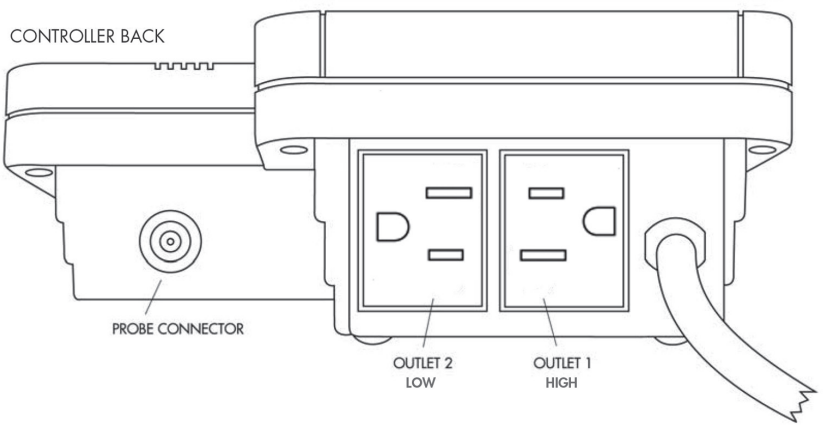
II. General Specifications

pH Measurement Range 0.00 – 14.00
pH Set Point Range 4.00 – 10.00
3 1/2 Digit LCD Display
Resolution 00.00 pH Unit
2 Independent 5 Amp 120 VAC Relay Outputs

III. Displays and Adjustments

pH Display
pH Monitor Adjustment & Instrument Status
Controller Set Point Block
Display Mode
Controller Status LED's
120 VAC Outlets (#1 & 2)
PINPOINT® pH Probe


CONTROLLER FRONT
Fig A
American Marine Inc
8.12
PINPOINT® pH Controller
Fig I
OUT 1
OUT 2
Hi
Lo
Fig J
SET POINT
Fig H
HIGH
READ
LOW
MAX
MIN
MAX
MIN
Range
Center Value
CALIB
SLOPE
POWER
pH
Fig D
Fig B
Fig E
Fig C
Fig F
Fig G


CONTROLLER BACK
PROBE CONNECTOR
OUTLET 2
LOW
OUTLET 1
HIGH

UPPER LEFT (pH Display)

The 3 1/2-digit LCD (Fig. A) at the top left of the controller displays a value corresponding either to the pH as measured through the probe, or the HIGH or LOW controller set points.

LOWER LEFT (pH Monitor Power & Instrument Status)

Below the display are two adjustment screws, which are used to calibrate the electronics to the attached ***PINPOINT*® pH Probe,** and two LED's which report the status of the instrument.

The adjustment screw marked "CALIB" (Fig. B) is used with 7.00 pH Calibration Fluid and the adjustment screw marked "SLOPE" (Fig. C) is used with either 10.00 or 4.00 pH Calibration Fluid. Detailed information on how to make these adjustments is given later.

The red POWER LED (Fig. D) is illuminated when the power is turned on to the controller. The pH LED (Fig. E) is illuminated when the display is indicating the pH as measured through the probe with the slide switch in the middle "READ" position. The pH LED is off when the display is indicating either the HIGH or LOW controller set points.

CENTER (Controller Set Point Block)

There are two adjustment screws that are used to create the controller set points. They control the RANGE (Fig. F) and CENTER VALUE (Fig. G) of the controller, respectively. Detailed information regarding their adjustment is given later in the ADJUSTING THE CONTROLLER section.

LOWER RIGHT (Display Mode)

The position of the SLIDE SWITCH (Fig. H) determines what the LED display will show. In the center position, the display indicates the pH that the probe is measuring, and the RED pH LED (Fig. E) at the lower left of the instrument will be illuminated. Sliding the switch up or down will cause the display to show the HIGH or LOW controller set points.

UPPER RIGHT (Controller Status LED's)

There are a total of 4 LED's here. The upper row (Fig. I) shows the status of the 120 VAC outlets, which you will find on the back of the controller. The lower LED lights (Fig. J) are activated when the slide switch is in either the HIGH or LOW position.

120 VAC OUTLETS

There are two outlets, which will be energized when the pH is above (outlet #1) or below (outlet #2) the controller set points. A common application for the controller will be to control the addition of CO_2 to the system. Since the addition of carbon dioxide lowers the pH, the solenoid valve controlling the flow of CO_2 would be plugged into the HIGH control outlet (Outlet #1). If a pH raising substance is being dispensed into the system, the device controlling the flow would be attached to the LOW control outlet # 2.

A Laboratory Grade ***PINPOINT*®** **pH Electrode** is supplied with the controller. A fluid-filled bottle will protect the end of the electrode. The fluid inside the bottle is commonly known as storage fluid. There is a suction cup attached to the electrode, which may be used to secure it, or a user-devised scheme of holding the electrode may be employed.

IV. CALIBRATING THE pH METER SUBSYSTEM

This is a two-point calibration instrument therefore TWO different calibrations must always be used. A pH 7.00 fluid must be used to set the CALIB adjustment screw and a pH 10.00 or 4.00 fluid is used to set the slope.

Before you begin the calibration process, you should disconnect any devices attached to the pH Controller outlets.

You must have a #7.00 calibration solution, and another solution with either a higher or lower pH (typically 4 or 10).

1. Set the display mode switch (far right) to the central position (READ). The pH LED (lower left, Fig. E) should be illuminated.

2. Unscrew and remove the plastic bottle protecting the end of the electrode if you are doing this for the first time. If the electrode has already been in service, you should note the condition of the electrode and clean it if required.

3. Rinse the electrode with room temperature tap water. Gently shake the electrode to remove any clinging drops of water.

4. Immerse the tip (bottom 1 inch) of the electrode into the pH 7.00 calibration fluid. The display should show a steady reading fairly close to 7.00.

5. If the electrode does not easily stabilize or have the ability to reach 7.00 with the CALIB adjustment; this may be a sign that the electrode should be replaced.

6. Adjust the CALIB screw to bring the displayed pH to 7.00

7. Remove the electrode from the pH 7.0 calibration solution and briefly rinse it with room temperature tap water. Gently shake the electrode to remove clinging drops of water.

8. Immerse the end of the electrode into either the low or high calibration fluid. Usually pH 4 or pH 10. After you obtain a stable reading, adjust the SLOPE screw until the display shows the value of your calibration fluid (typically 4.00 or 10.00).

9. Again, briefly rinse the electrode with room temperature tap water and shake off any clinging drops.

10. Re-immerse the electrode in the pH 7 calibration solution and now repeat steps 6-7-8 until the display shows 7.00 in the pH 7 fluid and 4.00 or 10.00 in the other calibration fluid that you have selected.

11. Rinse the electrode and place it in your system. Remember that the electrode contains internal glass components and should be treated with care. Use the plastic storage bottle filled with storage fluid when not in use.

The pH calibration process is now complete.

The pH calibration should be checked every month or whenever a displayed reading looks unusual. Typical probe life is 18 months of continuous duty.

Replacement ***PINPOINT®*** **Electrodes, Calibration Fluid, Probe Extension Cables** and **Storage Fluid** are available from www.americanmarineusa.com.

V. PROPER PLACEMENT OF THE pH ELECTRODE

When the controller is in use, it is critical that the tip (bottom 1-inch) of the electrode be immersed in the system at all times. If the water level falls below the sensing tip of the electrode, the pH probe will not read properly and connected devices will not act accordingly. Adjust the position of the probe accordingly.

Consider the final placement of the probe and attach it securely so that it remains in position.

Be sure to check the probe position occasionally. Complacency usually sets in when you feel that “everything is running fine.”

VI. ADJUSTING THE CONTROLLER SET POINTS

The ***PINPOINT®*** **pH Controller** is capable of controlling pH within the range of pH 4.00 through pH 10.00. After the selection of the pH set points you will find that the controller can create a small or large span around the optimum pH, from about +/- 0.1 pH unit to +/- 1.0 pH unit.

Two adjustment screws on the front panel determine the controller pH set points. The right adjustment screw is labeled “Center Value” and the left adjustment screw is labeled “Range.”

First, determine the optimum pH value for your system. As an example, let's choose 6.80 as the most optimum value for the pH.

1. Adjust the RANGE screw to Minimum for ease of calculation.

2. Toggle the slide switch from HIGH to LOW and note the display readings.

As an example if the HIGH reading is 7.20 and the LOW reading is 7.00 then the current optimal value is the number that is exactly in between. (7.20 + 7.00 divided by 2 which would be 7.10).

3. Since we are looking for an optimum value of 6.80 and the optimum value is currently set at 7.10 (.30 too high) we should make the adjustment using the CENTER VALUE screw. Put the switch in the HIGH position and adjust the CENTER VALUE screw down by .30 pH units from 7.20 to 6.90

4. The HIGH value will now be set at 6.90 and the LOW value is automatically reset to 6.70. The optimum pH value (the number exactly in between the HIGH and LOW values) is now 6.90 + 6.70 divided by 2 which would be 6.80.

5. You may customize the pH range around your optimum pH value when your pH down or pH up device will become active. Currently the pH HIGH value is set to 6.90 which indicates at a system pH value slightly above 6.90, outlet #1 will energize and the resulting chemical reaction will drive the pH down to the optimal value of 6.80 at which time the controller will turn off the pH down device. If you wish to have a larger span of pH range between device ON/OFF simply adjust the RANGE screw more toward Maximum.

6. pH up control is done in the same fashion toward the optimal value with a pH up device attached to outlet #2.

As an illustration of how the two adjustments are related, consider the following:

When the measured pH moves from the center of the acceptable pH range (optimum value) to above the HIGH set point, the device attached to the HIGH outlet is activated and will remain ON until the pH is brought back to the center (optimum) value.

When the measured pH moves from the center of the acceptable pH range (optimum value) to below the LOW set point, the device attached to the LOW outlet is activated and will remain ON until the pH is brought to the center (optimum) value.

PINPOINT® pH Controller has control ability in *both* directions

In our example the set points are as follows:

HIGH	**6.90**
LOW	**6.70**
OPTIMUM	**6.80**

The controller is set up to control CO_2. There is a CO_2 solenoid attached to Outlet #1 on the back of the controller.

When the pH of the water is above 6.90, Outlet #1 will energize the solenoid and CO_2 will bubble into the water until the pH of the water reaches the Optimum Value of 6.80. When the pH value reaches the Optimum Value of 6.80 the CO_2 will shut off.

After the CO_2 is shut down if the water still has a falling pH then the LOW setting is important. If the pH of the water falls below the LOW setting of 6.80 then outlet #2 will energize. Outlet #2 could have a regular air pump connected to it and the air should disperse in the water by an air stone. The air will drive off the extra CO_2 and return the water to the Optimum Value pH of 6.80 at which time the air pump will shut off.

NOTE: *The American Marine line of* ***PINPOINT*® pH, Temperature and ORP/REDOX Controllers*** *are unique because they can give control at both directions around the Optimum value. While attaching two devices that will control in both directions are not required it is a unique option.*

Calcium Reactor Theory and Setup

Calcium Reactors are excellent systems designed to add a steady amount of natural elemental calcium and minerals to a marine aquarium system.

This is achieved by the careful addition of CO_2 gas to the system seawater, thus lowering its pH to the acidic range and passing this seawater through aragonite coral chips housed inside a reactor <see diagram>.

Because the CO_2 treated seawater has a pH in the range of 6.6-6.8 (or lower); it will readily dissolve aragonite coral chips housed inside the calcium reactor. This enriched calcium seawater, also called effluent, should be sufficiently aerated as it exits the calcium reactor to drive off the CO_2 and return the pH to the normal range while still carrying the additional calcium.

You will be controlling the pH of the fluid inside the reactor. Generally a pH of 6.6-6.8 (or lower) will readily dissolve aragonite media. If the pH of the seawater surrounding the aragonite is too low, the aragonite will turn to “mush” and no longer have fluid flow through the chips. If the pH is too high there will not be a sufficient acid environment to dissolve the aragonite. Trial and error with your brand of aragonite should be performed.

NOTE: *Properly designed Calcium Reactor Systems will add natural elemental calcium and minerals to your system and will have* ***virtually no*** *effect on the pH of the aquarium.*

There are several equipment considerations:
- Calcium Reactor
- Aragonite Media
- CO_2 Tank
- *PINPOINT*® CO_2 Regulator Kit or *PINPOINT*® CO_2 Solenoid
- *PINPOINT*® pH Controller

CALCIUM REACTOR
Contains the aragonite chips and has a mechanism to infuse CO_2 gas inside the reactor. Some models have a built-in port to accommodate a pH probe. Many reactors do not have a port. Models without a port should have the output water (effluent) exit the reactor and collect in a container located in the sump area The probe of the pH Controller should be installed in the container so as to measure the pH of the seawater from the Calcium Reactor. As this container fills, it will overflow into sump where it should be properly aerated to drive off the CO_2 and return the pH back to normal seawater levels before it enters the aquarium. An air stone or aerating powerhead in the sump area will be beneficial.

CO_2 TANK OR BOTTLE
This will be your source of CO_2 gas. Obviously CO_2 gas when mixed with seawater will lower the pH of seawater. CO_2 bottles are easily, and inexpensively, refilled at any welding supply store or any outlet that will recharge fire extinguishers.

***PINPOINT*® CO_2 REGULATOR OR SOLENOID KIT**
An electrically activated valve that when energized by the outlet on the back of the ***PINPOINT*® pH Controller,** will allow CO_2 gas to exit the CO_2 bottle to be released to the aragonite of the Calcium Reactor. This CO_2 gas will quickly lower the pH of the seawater inside the reactor. The bubble counter will visually indicate the volume of CO_2 exiting the bottle. This gas volume can be adjusted via the needle valve on the solenoid.

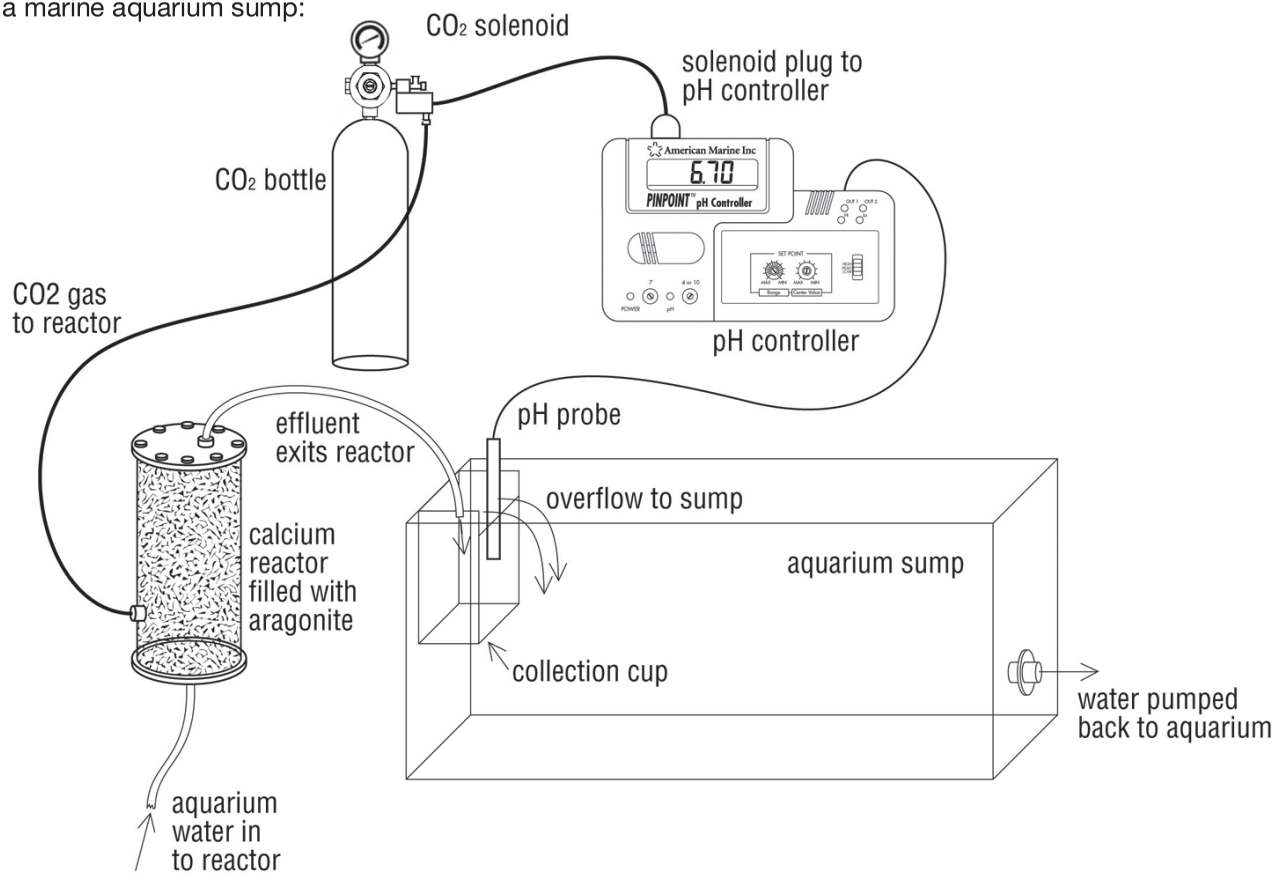
ARAGONITE
Basically coral fragment. You should experiment to find the pH levels that will dissolve the aragonite most efficiently. If the pH is too low the aragonite will turn to “mush” and no longer have flow through it. If the pH is too high then the aragonite will not be dissolved sufficiently. Also try different fluid flow rates through the reactor.

***PINPOINT*® pH CONTROLLER**
The electronic pH measurement and control device that will activate the CO_2 solenoid to start or stop the CO_2 gas flow to the reactor.

Not all pH Controllers can control devices that will influence pH in both an increasing and a decreasing pH direction as needed. The ***PINPOINT*® pH Controller** is perfectly suited for any calcium reactor or hydroponic application.

Continuous pH measurement of the aquarium water with the ***PINPOINT*® pH Monitor** is also recommended.

Consider the following setup into a marine aquarium sump:



WARRANTY

***PINPOINT*® pH Controller** by American Marine Inc. is warranted to be free of defects in material and workmanship for a period of 2 years from date of sale. Positive proof of purchase is required for warranty claim.

American Marine Inc. will not be liable for any costs of removal, installation, transportation charges, or any other charges, which may result in connection with a warranty claim.

American Marine Inc. will not be liable for any damage or wear to products or livestock caused by abnormal operating conditions, water damage, abuse, misuse, unauthorized alteration or repair or if the product was not installed in accordance with the printed operating instructions.

Any defective product must be sent freight prepaid with appropriate documentation supporting the warranty claim. Replacement or repair will be at the discretion of American Marine Inc. Typical turnaround time within 24 hours. Overnight delivery available.

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