

L i g h t h o u s e<sup>TM</sup>

Aquarium Controller

# Owner's Manual

Model AQS-4

## System Status Codes

The System Status codes are reported on the Lighthouse main web page and in the *System Status?* menu of the Lighthouse console.

Code	Description
<b>1</b>	<b>Power Failure.</b> This occurs whenever power is lost.. This warning is cleared at midnight.
<b>2</b>	<b>Web Change.</b> This indicates that some settings have been successfully changed via the Configuration Web page. If you did not make the changes, it may indicate that an unauthorized person made changes without your knowledge. This warning is cleared at midnight.
<b>3</b>	<b>Temperature Probe Disconnected.</b> This indicates an invalid reading from the temperature sensor. The sensor may be unplugged, not seated properly in the connector, or damaged in some way. This warning is cleared when the condition is corrected.
<b>4</b>	<b>PH Probe Disconnected.</b> This indicates an invalid reading from the PH Probe. The probe may be unplugged, not seated properly in the connector, or defective. This warning is cleared when the condition is corrected. If you use the BNC Terminator instead of a PH probe, this warning will not occur.
<b>5</b>	<b>ORP Probe Disconnected.</b> This indicates an invalid reading from the ORP Probe. The probe may be unplugged, not seated properly in the connector, or defective. This warning is cleared when the condition is corrected. Note that using the BNC Terminator will still generate this warning. This is normal.
<b>6</b>	<b>Heater/Chiller running more than 2 hours.</b> This indicates that the heater or chiller has been ON for more than 2 hours. It could indicate that the temperature sensor has fallen out of the tank or no longer in contact with the water. It may also indicate that the heater or chiller is too small for the tank capacity, or not running properly. This warning is cleared when the heater or chiller runs and turns off within 2 hours.
<b>7</b>	<b>Heater/Chiller is Disabled.</b> The heater/chiller outlet has been manually disabled. This is a reminder to turn the equipment back on after maintenance. This warning is cleared when the heater/chiller is enabled again.
<b>8</b>	<b>Invalid Password Attempt.</b> This indicates that someone used the Web Configuration page and entered an invalid password. No changes were made. This warning is cleared everyday at midnight.
<b>20</b>	<b>LAN Communication Failure.</b> This indicates a communication failure between the LAN interface and the Lighthouse. Contact technical support if this error happens frequently.
<b>21-99</b>	<b>Internal Error.</b> One or more internal errors, warnings, or diagnostics failed. If these errors are seen multiple times,. please contact technical support.

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## **Introduction**

Thank you for purchasing the Lighthouse™ Controller. The Lighthouse Controller is designed to be used on any size marine, reef, or freshwater aquarium. It will allow you do any of the following:

- Maintain a constant temperature to a high degree of accuracy using any standard aquarium heater or chiller.
- Control up to three sets of lighting or other equipment with independent on and off times.
- Monitor and Control PH.
- Monitor and Control ORP.
- View data, graphs, and configure the unit via any Java enabled web browser, either on a local network or on the world wide web.

## **Installation**

The Lighthouse™ Controller contains the following components:

1. Display Console
2. AC Plug-in Transformer
3. Temperature Probe
4. AC Power Strip
5. 25 ft. Ethernet LAN Cable
6. BNC Terminator

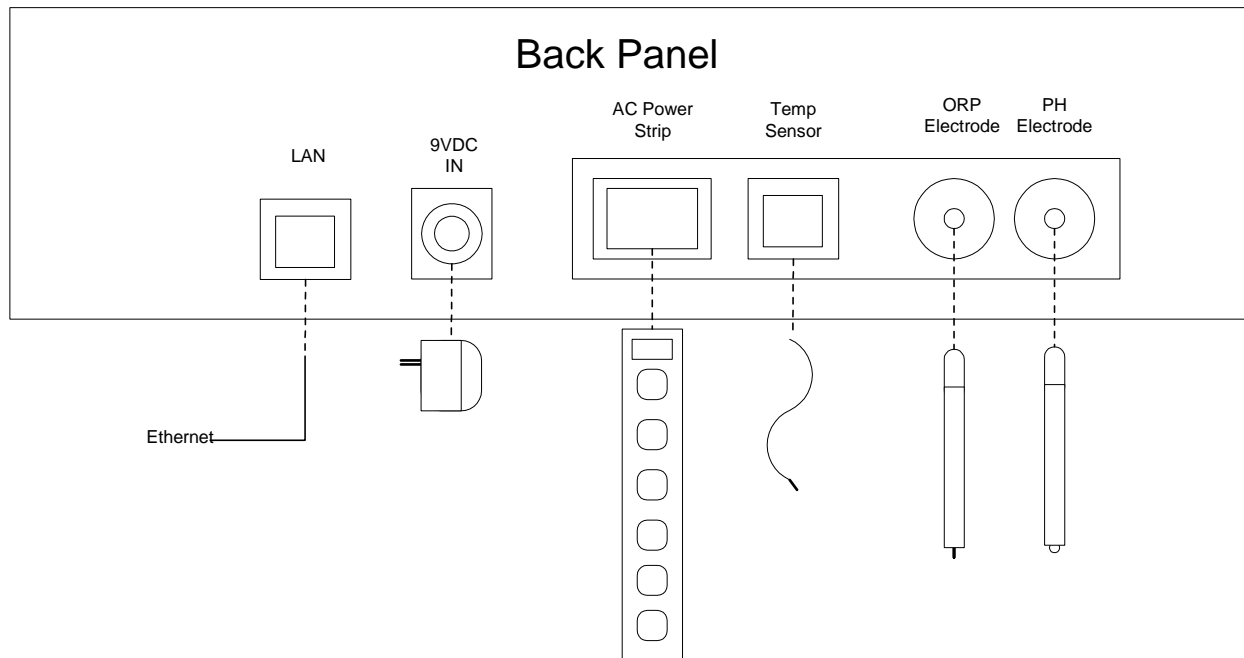
In order to use the Lighthouse controller to its fullest capabilities, you will also need the following items that are *not included*:

1. A PH Electrode with BNC connector.
2. An ORP Electrode with BNC connector.
3. PH 4 and PH 10 calibration fluids.

The console can be placed underneath, next to, or above the aquarium. Make sure that the console is not in a location where water may splash on or near the unit.

Below is an illustration of how the various components must be connected to the device.

**NOTE:** Never connect or disconnect the AC Power Strip connector or Temperature Sensor while power is applied. This could cause damage to the console. You can safely connect/disconnect the PH/ORP electrodes and LAN cable with or without power applied



We recommend that you use a grounding probe in the aquarium. Not only is this a good safety measure, it will improve the accuracy and stability of the electrodes, especially the ORP readings.

For the initial setup and test, connect the temperature sensor and AC power strip connectors to the back of the console. Note that the AC power connector and temperature sensor connectors look the same, but are different widths. The AC power strip connector is wider than the temperature connector. While the AC power strip connector cannot be plugged into the temperature sensor jack, the reverse is not true. Be careful not to plug the temperature sensor connector into the AC power strip jack, or damage to the console will result. Next, connect your PH and ORP electrodes. If you do not have an ORP probe, insert the BNC Terminator (provided) into the ORP connector.

**Note:** The LAN connector and the AC Power Strip connector on the back of the console use the same type of connector. **DO NOT** plug the AC Power strip cable into the LAN connector or visa-versa. Doing so may damage the console and/or your networking equipment.

Insert the AC wall transformer connector into the back of the console, and plug the transformer into a wall socket. You should see the display light up for several seconds, followed by a display of temperature, PH, ORP.

## **AC Power Strip**

The AC power strip contains six outlets. The top two outlets are not controlled by the console and are marked "Always On". You may use these outlets for any electrical device (including the AC plug-in transformer of the console).

The bottom six outlets are marked DAYLIGHT, ACTINIC, REFUGIUM, and HEATER.

DAYLIGHT - Use this outlet to plug in your primary set of lights.

ACTINIC - Use this outlet to plug in your secondary set of lights. Note the term *Actinic* is just for reference, and doesn't necessarily reflect the kinds of lighting you have or will use. Any type of lights or appliances may be plugged in here as well as the other lighting outlets.

REFUGIUM - Use this outlet to plug in your tertiary set of lights, such as those for a Refugium or moon light. This outlet is also shared for use by the PH and ORP controller feature (See the *PH/ORP Controller* setup section).

HEATER - The HEATER outlet is used to connect a heater or chiller. The Lighthouse will be switching the heater on and off at the AC power strip, based on the signals from the temperature sensor. Turn up the thermostat on the heater to its maximum (hottest) position. This will force the thermostat to be on all the time so the heater can be controlled by the Lighthouse. If you are using a chiller with its own thermostat, set the chiller to its lowest (coldest) setting so that the Lighthouse can override the thermostat and fully control the chiller.

**The power capacity of the AC power strip is rated at a maximum of 15 amps at 125VAC. Each of the four controlled outlets is capable of switching 10 Amps resistive, or 1/3HP inductive loads. Resistive loads (such as heaters) must not exceed 10 Amps or approximately 1100 Watts. Inductive loads (such as electronic and magnetic ballasts, water pumps, motors, and chillers) must not exceed 1/3 Horsepower. Using electrical appliances which exceed these limits will void all warranties. Exceeding the maximum power rating may cause erratic operation and generate excessive heat in the AC power strip, which can compromise electrical insulation and create a DANGEROUS fire hazard condition.**

**If the equipment connected to the AC power strip exceeds 15 amps for more than 30 seconds, the AC power strip will permanently shut down and require replacement. This condition is not covered by the warranty.**

## **Temperature Sensor**

The actual Temperature Sensor is located within the black end cap at the end of the temperature sensor cable. The tip of the temperature sensor must be fully submerged at all times. For best results, place the temperature sensor in a position that is away from the heater or chiller output, and where circulation is strong. A typical setup would be to place the temperature sensor in the sump and the heater in the tank, or visa-versa. If this is not possible, try to separate the heater and temperature sensor at opposite sides of the tank, or place the heater AFTER the temperature sensor with regard to water flow.. The further away the heater is physically to the temperature sensor, the more accurate and stable temperatures will be.

Make sure the temperature sensor is secured so that it does not accidentally fall out of the tank. If this happens, disaster could result as the controller will be reading the room temperature instead of the water temperature, and will probably keep the heater or chiller running continuously.

Note: If the heater or chiller runs for more than 2 hours, the heater time display on the console will flash, alerting you to this condition. You will also get a warning in the System Status area on the web page. Normally, your heater or chiller shouldn't run for more than 2 hours at a time. If it does, it may indicate that the heater/chiller is too small for the volume of water.

## **Electrodes**

Two BNC jacks on the back of the console are provided for connecting PH and ORP electrodes. Just about any general-purpose electrodes can be used. If the electrode has a BNC connector, it will work with the Lighthouse Controller.

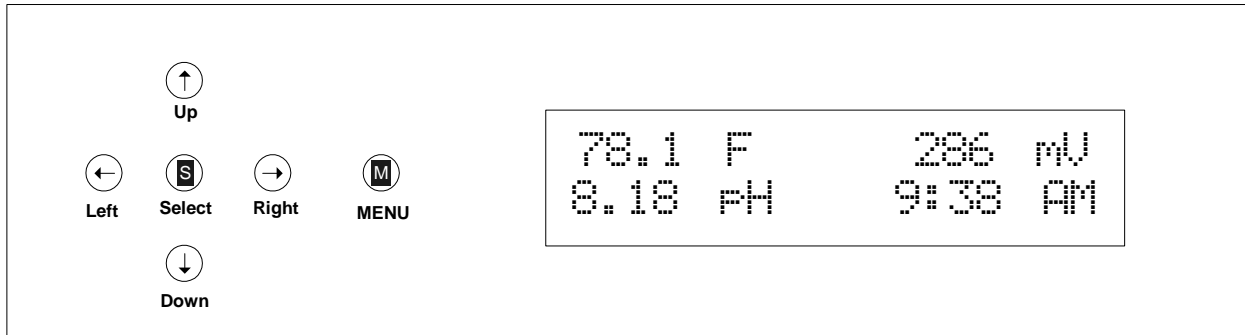
If the console is unplugged for long periods of time, you should disconnect your electrodes from the back of the unit. This will prevent unnecessary drain on the electrolytes within the electrodes. This will extend their life.

If you do *not* plan on using an ORP probe, a BNC Terminator plug is provided. Simply connect the BNC Terminator to the ORP probe input on the console and leave it connected at all times. The terminator improves accuracy and reduces electrical noise. If you plan to use only an ORP probe and no pH probe, use the BNC Terminator plug on the pH probe input.

Note: Do not run the Lighthouse with the ORP connector open. Doing so may introduce noise that can affect the accuracy of the PH and temperature readings. Use the supplied BNC Terminator plug or keep an ORP probe connected at all times.

# Programming

Programming the Lighthouse™ Controller is performed by using the 6 buttons on the front panel or by using your web browser. The button names and functions are as follows:



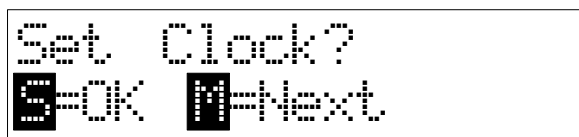
**MENU** The red MENU button is located on the far right, closest to the display. It's main function is to access the various menus of the controller. The MENU button is indicated in the various console displays as an inverse **M** character.

**SELECT** The red SELECT button is located in the center of the black buttons. It is used to select or choose various settings and options when prompted by the display. The SELECT button is indicated in the display as an inverse **S** character.

**UP DOWN LEFT RIGHT** The black directional buttons are used to navigate around within menu selections. These buttons are indicated in the display with the symbols ↑ → ↓ ←.

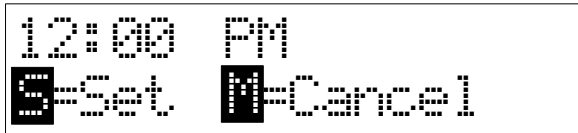
One of the first things to do on the Lighthouse Controller is to set the clock. Follow this procedure:

1) Press the MENU button (the red button closest to the display) repeatedly until the display shows the following:



If you accidentally went passed the clock menu display, press any of the black buttons to cancel, and then start over by pressing the MENU button again.

2) Press the SELECT button (center red button). You should see the following display:



3) Notice that the hour indicator is blinking. Press the UP and DOWN buttons and the hour will change. Do this until the current hour is displayed. Now press the RIGHT button to move to the minutes setting.

4) The minutes display should now be blinking. If not, press the LEFT or RIGHT black buttons until this occurs. Once again, press the UP and DOWN buttons to change minutes display.

Note: If you press and hold in the UP DOWN, LEFT, or RIGHT buttons, the display selection will begin to speed up, allowing you to get to the desired setting more quickly. This feature works in all menu selections.

5) Press the RIGHT button again, and use the UP and DOWN buttons to toggle between AM and PM.

6) The display should now show the current hour, minute, and AM/PM indicator. Press the SELECT button (the center red button) to set the new time.

Using all the other functions in the Lighthouse use this same sequence of button presses. The MENU button selects a function, the arrow buttons let you make changes, and the SELECT button saves those changes. You can always press the MENU button at any time to cancel the current operation. For example, if you pressed the MENU button instead of the SELECT button in Step 6, you would have cancelled the operation and the clock setting would not have changed.

If you do not press a key within 10 minutes, the unit will return to normal display.

## **Quick Setup**

If you want to get your Lighthouse up and running quickly without going through all the details, follow these steps:

1. With the power disconnected, connect the AC power strip connector (yellow cable) and the temperature sensor (silver cable) to the back of the controller.
2. Plug in your PH and ORP Probes. If you do not have both probes, attach the small metal BNC Terminator plug provided to the unused connector (either ORP or PH) on the back of the controller. If you don't have either probe, connect the terminator plug to the ORP connector and leave the PH open.
3. Plug the AC transformer into the wall outlet, then connect the power jack to the back of the Lighthouse. Follow the previous section on how to set the clock.

4. Attached the Lighthouse to your network by using the LAN cable provided or any CAT-5E Ethernet cable . Plug the other end into your hub, switch, or router. The default IP address is 192.168.0.250. If your network is not on the 192.168.0.xxx subnet, change the IP Address of the controller to an unused IP address on your network. To do this, press the MENU button until *Set Up Networking?* appears, then press SELECT followed by the UP button to change the IP address. Use the UP/DOWN/LEFT/RIGHT buttons to set the controller's IP address, then press SELECT. You should now be able to access your Lighthouse from your web browser by typing in `http://192.168.0.250` or whatever IP address you have chosen. Read the section *Networking the Lighthouse Controller* if you run into any problems.
5. In your web browser type in `http://192.168.0.250/cfg.htm`. The default password is "lhouse". Use the configuration menu to set up the rest of the Lighthouse, including lighting and other settings.
6. Place the temperature sensor in the tank Turn the heater's thermostat all the way up or at a higher setting than you normally use. For example, if you keep your heater at 79 degrees, set the thermostat to 85 or so. This will prevent the thermostat from turning off and interfering with the Lighthouse controlling the heater. Plug the heater (or chiller) into the outlet marked HEATER on the power strip. Use the Heater/Chiller section on the configuration web page to set up your heater or chiller temperatures.
7. Read the *Calibration Procedure* section and calibrate your PH probe.

## Setting Up The Lighthouse

The Lighthouse Controller can be set up using either the front panel buttons or your web browser. Many people find that using the web browser is easier. We recommend you at least do a partial setup through the front panel buttons to get familiar with the operation. In order to proceed with web browser setup, you will have to jump ahead to the section *Networking the Lighthouse Controller* and configure the network set up so you can access the Lighthouse from your computer. Once that is done, type `http://192.168.0.250/cfg.htm` into your web browser to get to the Lighthouse configuration web page.

<p><b>Lighthouse</b></p> <p>Reef Time: 7:51 AM</p> <hr/> <p><b>Authentication</b></p> <p>Password: <input type="password" value="••••"/></p> <p>Enter password, then use any of the <b>SUBMIT</b> buttons below.</p>
--

The web browser configuration page is protected by a password. You must enter a password before you can configure any settings. The default password is "lhouse". The password is case sensitive and must be entered as lower case characters. Enter this password into the

*Authentication* password edit box. Now any time you click a Submit button on the page, the Lighthouse will verify the password before making any permanent changes to the settings.

MENU FUNCTION	DESCRIPTION
<i>Disable Htr/Chiller?</i>	Temporarily turns off the heater or chiller.
<i>Enable Htr/Chiller?</i>	Resumes control of the heater/chiller after a <i>Disable Htr/Chiller?</i>
<i>Manual Lights?</i>	Lets you control the lights manually.
<i>Resume Lighting?</i>	Cancel manual lights- resumes lighting schedule.
<i>View Min/Max's?</i>	Allows you to view the minimum/maximum temperature, PH, and ORP values. This information also available in the web browser display.
<i>Display Options?</i>	Provides a way to modify the console display to your personal preference.
<i>View System Status?</i>	Lets you view information and warnings codes.
<i>Set Up Htr/Chiller?</i>	Use to set up the heater chiller on and off temperatures.
<i>Set Up Lighting?</i>	Use to set up the on/off times of the three lighting zones.
<i>Set Daylight Cutoff?</i>	Sets a temperature where the Daylight outlet will be turned off.
<i>Set Screensaver?</i>	Sets the time where the screen will go blank.
<i>Set Clock?</i>	Sets the time of day in the controller.
<i>PH/ORP Controller?</i>	Allows you to set up either the PH Controller or ORP Controller feature.
<i>Set Up Networking?</i>	Use to set up/change networking.
<i>Calibrate Probes?</i>	Use to calibrate the PH and ORP electrodes.

## Enable/Disable Heater or Chiller

Available at Front Panel:	YES
Available from Web:	NO

```
Disable Htr/Chiller?
S=OK  N=Quit
```

```
Enable Htr/Chiller?
S=OK  N=Quit
```

The Enable/Disable command allows you to temporarily stop (disable) or start (enable) the heater or chiller without messing with the temperature settings. This is useful during tank maintenance.

Let's say your aquarium heater is in the sump and the Temperature Sensor is in the tank. Turning off your sump pump would prevent the Temperature Sensor from reading the proper temperature, because the heater would be heating up just the water in the sump. By using the

Disable Heater function, you can temporarily do water changes or other maintenance without worrying about the heater staying on.

NOTE: When you first power up your controller, the default factory setting will have the heater turned off. Because of this, You will not get either the *Enable Htr/Chiller?* or *Disable Htr/Chiller?* menu items. See the **Set Up Htr/Chiller** section below to learn how to enable and set up the heater or chiller.

When you disable the heater or chiller, the lower right portion of the console will display a flashing "HTR OFF" message to remind you that the heater or chiller is disabled. To turn the heater or chiller back on, press the menu button once and the item *Enable Htr/Chiller?* will display. Press the SELECT button to return the heater or chiller back to normal operation.

Note that if the heater or chiller is already disabled, only the *Enable Htr/Chiller?* menu will be available. If the heater or chiller is running normally, only the *Disable Htr/Chiller?* menu selection will be available.

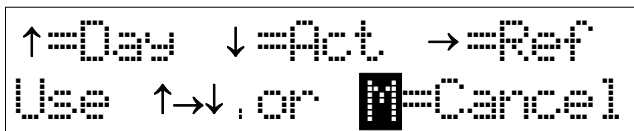
## Manual Lights

Available at Front Panel:	YES
Available from Web:	NO



Manual Lights?  
S=OK M=Next

The Manual Lights function allows you to temporarily override the preprogrammed lighting schedule. This is very useful during the initial set up and test of the controller, making sure that you have the right plugs in the right outlets. It is also handy any time you need to turn the lights on or off temporarily (i.e., introducing a new specimen to the tank). To select Manual Lights, press the MENU button until the display shown above appears. Then press the SELECT button.



↑=Day ↓=Act →=Ref  
Use ↑→↓, or M=Cancel

The three lighting zones are designated by the names Daylight (Day), Actinic (Act), or Refugium (Ref). Note that these names are used just to identify the three AC outlets. You can use any of

the three lighting zones for any type of lighting, or even other electrical appliances (such as power heads or pumps) if you so choose.

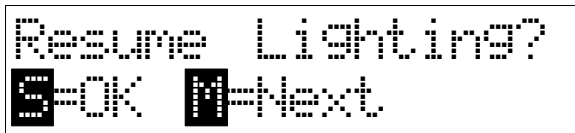
Press the UP button to control the Daylight lights, the DOWN button for Actinic, or the RIGHT button for Refugium. You will then see another menu that allows you to turn the selected light on or off. Press the UP button for ON, the DOWN button for OFF, or the LEFT button to go back to the previous menu. Press the MENU button at any time to cancel.

Manual light control does not change any of the on/off times that have been pre-programmed (See **Set Up Lighting**). If you turned off a light that is supposed to be on, the next programmed lighting time will set the light back on. If you want to resume the lighting schedule immediately for all lights, use the **Resume Lighting** menu.

If the Refugium lighting outlet is being used for the PH or ORP Controller (See the **PH/ORP Controller** section) you will still be able to manually control the outlet. However, when you exit the menu the on/off state of the outlet will return to its normal (determined by the PH/ORP controller setup) setting. Similarly, if you are using the *Daylight Cutoff Temperature* feature (See **Set Daylight Cutoff** Section) the manual light setting for the Daylight outlet will be overridden.

## Resume Lighting

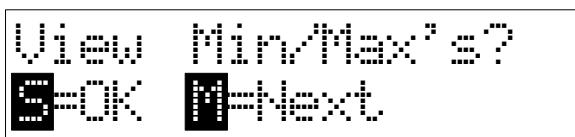
Available at Front Panel:	YES
Available from Web:	NO



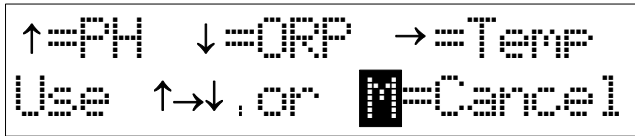
The Resume Lighting menu lets you resume the normal state of all three lighting zones after using the *Manual Lights?* menu. Press the SELECT button to resume the lighting schedule. This is a quick way to return to full automatic lighting after you have manually changed one or more lights.

## View Min/Max's

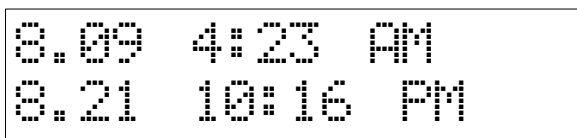
Available at Front Panel:	YES
Available from Web:	YES



The Lighthouse Controller continuously monitors the PH, ORP, and Temperature readings and saves the highest and lowest values to memory. The *View Min/Max's?* menu provides a way to look at these values. Press the SELECT button to choose which reading you want to see.



Press the UP, DOWN, or RIGHT button to view the PH, ORP, or temperature minimums and maximums along with their times. For example, pressing the UP button will display the PH min/max readings as shown below.



This example says that the minimum pH for today was 8.09 and occurred at 4:23 AM, while the maximum for the day was 8.21 recorded at 10:16 in the morning. Press the MENU button a second time to return to the normal display.

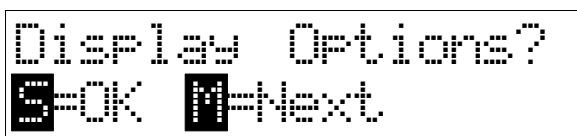
<i>Temperature</i> <b>73.7 °F</b>	High	Low
	73.7 °F 12:00 AM	73.7 °F 12:00 AM
<i>PH</i> <b>8.35 pH</b>	High	Low
	8.35 pH 12:00 AM	8.35 pH 12:00 AM
<i>ORP</i> <b>317 mV</b>	High	Low
	317 mV 7:43 AM	317 mV 12:00 AM

The min/max values are reset at midnight, so that the min/max values always show the extremes for the day.

All of the min/max values for PH, ORP, and temperature are displayed on the home page of Lighthouse. The values appear in the colored boxes just to the right of the current PH, ORP, and temperature readings.

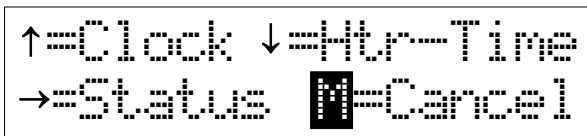
## Display Options

Available at Front Panel:	YES
Available from Web:	NO



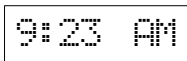
By default, the lower right corner of the console displays the on/off status of the AC outlets. You can optionally show the clock time or the heater/chiller run time. The *Display Options?* menu lets you choose which display you want to view. Press the SELECT button to choose between the three display modes.

NOTE: You can press the SELECT button at any time during normal display to cycle through the three display options. The *Display Options?* menu item just sets the default display option when power is applied or after a power failure.



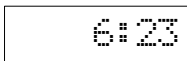
↑=Clock ↓=Htr-Time  
→=Status [X]=Cancel

Press the UP button to select Clock display, the DOWN button to select Heater run time, or the RIGHT button to display AC power outlet status. The three choices are as follows:



9:23 AM

**Clock** - The current time is continuously displayed in the lower right hand corner of the display.



6:23

**Htr-Time** - The length of time in minutes that the heater or chiller has been running is displayed. When the heater/chiller turns off, the last run time is continuously displayed until the heater/chiller turns on again, which resets to zero and then starts over. If the heater or chiller runs for more than two hours, the run time display will begin to flash. This is to alert you that something is wrong. For example, if the heater is not powerful enough for the tank size, it will run for extended periods of time or never turn off. Normally, the run time for the heater or chiller should be less than 2 hours, depending upon the size of the heater or chiller relative to the tank size, as well as the ambient temperature.



HDA-

**Status** - The Letters **H**, **D**, **A**, and **R** are displayed to indicate that the **H** Heater, **D** Daylight, **A** Actinic, or **R** Refugium outlets are ON at the AC power strip. If an outlet is OFF, a dash is displayed in that position. In the display shown above, the Heater, Daylight, and Actinic lights are ON and the Refugium outlet is OFF. In addition, a blinking dot at the end of the line pulses every second when all readings and status are updated.

If you have programmed the controller for PH or ORP control (See *PH/ORP Controller?* section), the "R" will be replaced with the letter "P" for PH control or "O" for ORP control, indicating that the ORP or PH controlling equipment is turned on.

If you have programmed the controller for Chiller control (See *Set Up Htr/Chiller?* section), the "H" for heater will be replaced with the letter "C" for chiller. If the heater/chiller is disabled (by

setting the on and off temperatures to the same value), an "X" will be displayed instead of the "H". This is the default factory setting.

## Set Up Heater or Chiller

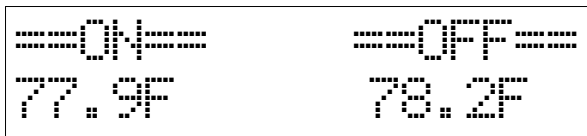
Available at Front Panel:	YES
Available from Web:	YES



Set Up Htr/Chiller?  
S=OK M=Next

This menu allows you to set the on and off temperatures of an aquarium heater or chiller. You can set the ON temperature and the OFF temperature independently. Press the SELECT button to begin the temperature setup process.

### Setting for Heater Use



==ON==      ==OFF==  
77.9F      78.2F

If you are using a heater, the OFF temperature (the temperature the heater turns off) must be set *higher* than the ON temperature. The display shown above will appear, with the ON temperature blinking. Press the UP or DOWN button to raise or lower the temperature value. The ON temperature is the temperature that you want the heater to turn ON. To move the display more quickly, press and hold the button.

When the desired ON temperature is displayed, press the RIGHT button to set the OFF temperature. This is the temperature that you want the heater to turn OFF. Use the UP and DOWN buttons to set the temperature. You can also press either the LEFT or RIGHT buttons to switch between the two temperatures. Press the SELECT button to lock in the new temperatures. Press the MENU button to cancel the whole operation.

In the example shown above, the heater will turn on at 77.9 degrees, and turn off when the water temperature reaches 78.2 degrees.

**NOTE:** Setting the ON and OFF temperatures to the EXACT same values will disable heater/chiller control altogether. You may want to do this if you do not want to use the heater or chiller function in the Lighthouse Controller.

### Settings for Chiller Use

To use the temperature control for a chiller or sump fan, set the ON temperature to a *higher* value than the OFF temperature. For example, if the ON Temperature is 80.0 degrees and the

OFF temperature is 79.5 degrees, the chiller will turn ON at 80.0, and turn OFF when the temperature drops to 79.5 degrees.

Press the UP or DOWN button to raise or lower the temperature value. To move the display more quickly, press and hold in the button. When the desired temperature is displayed, press the RIGHT or LEFT button to switch to the other temperature. Again, use the UP and DOWN buttons to set the temperature. You can also press either the LEFT or RIGHT buttons to switch between the two temperatures. Press the SELECT button to lock in the new temperatures. Press the MENU button to cancel the whole operation.

NOTE: You can set the ON and OFF temperature differential to as little as 0.1 degrees. If the Temperature Sensor is located in close proximity to the heater, we recommend that the minimum difference be at least 0.2 degrees. A 0.1 degree difference may cause the heater relay to turn on and off excessively. We recommend a minimum of 0.4 degrees differential for a chiller, since cycling a chiller's compressor too often will cause excessive wear and tear of the chiller's compressor.

**Heater/Chiller Temperatures**

ON Temp:  °F    OFF Temp:  °F

Set ON **LOWER** than OFF for Heater.  
 Set ON **HIGHER** than OFF for Chiller.  
 Set ON and OFF to same value to disable.

To set up a heater or chiller on the configuration web page, enter the ON and OFF values into the text boxes. If you are using a heater, make sure the ON temperature is LOWER than the OFF temperature. Click the SUBMIT button to change the setting.

## Set Up Lighting

Available at Front Panel:	YES
Available from Web:	YES

Set Up Lighting?

**S**=OK    **N**=Next

The **Set Up Lighting** menu allows you to set the on and off times of the three lighting zones (Daylight, Actinic, and Refugium). Make sure that you have set the proper time (See **Set Clock**) before trying to set the lighting times.

↑=Day    ↓=Act    →=Ref

Use ↑→↓, or **N**=Cancel

Press the UP, DOWN, or RIGHT button to set the Daylight, Actinic, or Refugium lighting outlet. The following menu will appear.

```

ON   --Daylight--  OFF
01:00 AM   01:00 AM
  
```

The first set of digits will blink. Use the UP and DOWN buttons to set the hour of the ON time. Press the RIGHT and LEFT buttons to sequence through the hours, minutes, and AM/PM indicators of the two times. When the desired times are displayed, press the SELECT button to save the new setting. Press the MENU button at any time to cancel and keep the existing time setting. Press and hold to UP or DOWN buttons to advance the time more rapidly.

NOTE: Setting the ON and OFF times to the EXACT same value will disable lighting control for that outlet. It is a good idea to do this if you won't be using an outlet. This will prevent excessive wear and tear on the relays in the AC power strip. It doesn't matter what time you enter, as long as the on and off times are identical.

If the PH or ORP Controller feature is being used, you won't be able to set the lighting times for the Refugium outlet. To correct this, go to the *PH/ORP Controller?* menu and select the REF function.

<b>Daylight Settings</b>	
ON Time:	[7]:[25]AM
OFF Time:	[8]:[30]PM
<input type="button" value="Submit"/>	
<b>Actinic Settings</b>	
ON Time:	[7]:[00]AM
OFF Time:	[9]:[10]PM
<input type="button" value="Submit"/>	
<b>Refugium Settings</b>	
<input checked="" type="radio"/> Lighting	ON Time: [6]:[00]AM
	OFF Time: [11]:[00]PM
<input type="radio"/> PH Control	[3.00] pH <input type="radio"/> Outlet OFF <input type="radio"/> Outlet ON
<input type="radio"/> ORP Control	[300] mV <input type="radio"/> Outlet OFF <input type="radio"/> Outlet ON
<input type="button" value="Submit"/>	
<b>PH Control:</b> For Calcium Reactor/CO2 control, set <b>Outlet ON</b> .	
<b>ORP Control:</b> For Skimmer/ozone regulation, set <b>Outlet OFF</b> .	

To set up lighting using your web browser, use the Daylight, Actinic, and Refugium lighting sections. The pull-down boxes allow you to select the hour, minute, and AM/PM setting. There are individual SUBMIT buttons so you can set only the lighting outlet you need without affecting the others.

The Refugium settings are a special case. The web page combines both the lighting and ORP/PH Controller settings into one, while the front panel uses a separate menu. To use the Refugium outlet for lighting, click the LIGHTING radio button in the Refugium section and set your on and off times just like the other two lighting zones.

After setting the on/off times, click the SUBMIT button to save your changes.

## Daylight Cutoff Temp

Available at Front Panel:	YES
Available from Web:	YES

```
Daylight Cutoff Temp:
82.0F           Inactive
```

The Daylight Cutoff Temp feature allows you to turn OFF the Daylight outlet when the water temperature exceeds a certain point. This is useful during very hot days, where your chiller or sump fans cannot keep up, and turning off the Daylight lamps (i.e., Metal Halides) can help reduce the heat and lower water temperatures.

The Daylight Cutoff temperature should be set *higher* than the chiller ON temperature. If you are using a heater, set the temperature *higher* than the heater OFF temperature. For example, if the chiller turns on at 80 degrees, you might want the Daylight lamps to turn off when the temperature reaches 83 degrees. For use with a heater, if the heater OFF temperature is set to 79 degrees, you might want to set the Daylight Cutoff to 82 degrees. Make sure there is several degrees difference in the settings to prevent the Daylight lamps from turning on or off frequently when the heater or chiller reaches its temperature settings.

Use the UP and DOWN buttons to set the temperature where the Daylight outlet will turn off. Press the RIGHT button then the UP and DOWN buttons to select either *Active* or *Inactive* modes. In *Active* mode, the Daylight outlet will turn off at the set temperature, and turn back on (or resume normal timed mode) when the temperature drops 0.5 degrees below the setting. In the *Inactive* mode, the Daylight Cutoff feature is disabled and will have no effect on the Daylight outlet.

NOTE: When the Daylight Cutoff feature is Active, you lose the ability to control the Daylight outlet using the *Manual Lights?* setting.

<b>Daylight Cut-Off Temperature</b>	
Cutoff Temp: <input type="text" value="84.0"/> °F	<input checked="" type="radio"/> Active
	<input type="radio"/> Inactive
<input type="button" value="Submit"/>	
Temp MUST be set <b>HIGHER</b> than heater/chiller temperatures.	

To configure Daylight Cut-off temperature with your web browser, enter the temperature into the text box. To disable Daylight Cut-Off altogether, click the INACTIVE radio button.

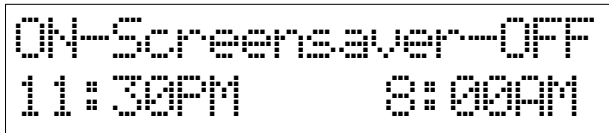
## Set Screensaver

Available at Front Panel:	YES
Available from Web:	YES



The Lighthouse controller display unit is subject to the same "pixel burning" as a computer monitor or a plasma TV. The Screensaver function allows you to turn off the display during the night hours or at times where you will not need to view the display. It is recommended that you turn off the display at least 6 hours a day to prolong its life. Note that all functions of the Lighthouse continue to run as normal while the display is turned off. The Screensaver settings have no effect on the web browser interface.

Press the SELECT button until the above menu is displayed. You should see the following:



the ON time is the time you want the Screensaver to turn off the display. The OFF time is the time you want the display to return to its normal condition. Use the UP and DOWN buttons to select the hour. Press the RIGHT or LEFT buttons to sequence through the minutes and AM/PM indicator. When the correct times are displayed, press the SELECT button to set the new times. Press the MENU button to cancel and return to the menus. If both the ON and OFF time is exactly same, the Screensaver function is disabled.

**NOTE:** While the screensaver is active (display is off), you can always push and hold the UP button to temporarily turn on the display and view the tank readings. When you release the UP button, the display will return to its Screensaver (display off) mode. Access to your Lighthouse via the web interface is always available regardless of the screensaver settings.

**Screensaver Settings**

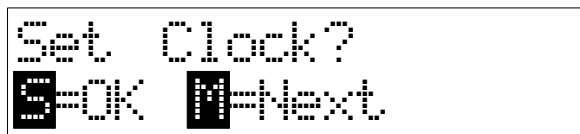
Display turns off at: :

Display turns on at: :

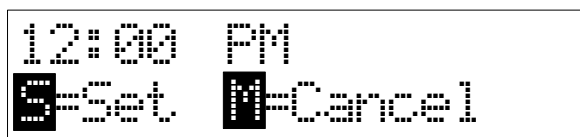
To set up the Screensaver from your browser, select the ON and OFF times from the pull-down combo boxes. Click the SUBMIT button to save the changes.

## Set Clock

Available at Front Panel:	YES
Available from Web:	NO



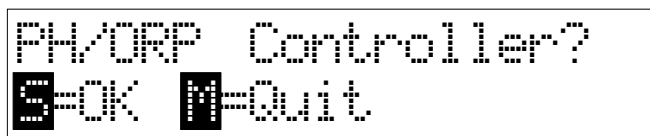
The Set Clock menu is used to set the current time of day. Press the SELECT button after getting to the above display. You should see the following:



the hour display will be blinking. Use the UP and DOWN buttons to select the hour. Press the RIGHT or LEFT buttons to sequence through the minutes and AM/PM indicator. When the correct time is displayed, press the SELECT button to set the new time. Press the MENU button to cancel and return to the menus.

## PH/ORP Controller

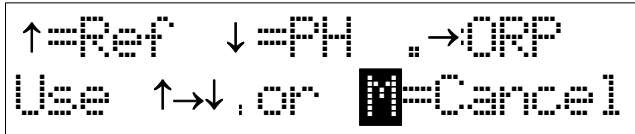
Available at Front Panel:	YES
Available from Web:	YES



The Refugium lighting outlet on the AC power strip can optionally be used as a PH controller or ORP controller. For example, you could plug an ozone generator into the Refugium outlet and use the ORP reading to turn the ozone generator on or off at a specific ORP value. Similarly, a CO2 regulator solenoid on a Calcium Reactor could be controlled by the PH reading. If you do not need the PH/ORP control feature, you do not need to use this menu and can skip this section.

The Refugium outlet is shared between Refugium lighting, the PH controller, and the ORP controller. Therefore, you can use this outlet for *either* ORP control, PH control, or Refugium lighting.

Press the SELECT button when the *PH/ORP Controller?* menu appears. Press the UP button to set normal Refugium lighting for this outlet. If you do not need the PH or ORP Controller feature, no further action is needed.



Press the DOWN button to use the outlet for PH control, or the RIGHT button for ORP control. Pressing the RIGHT button will display the following menu:



While the ORP value is blinking, use the UP and DOWN buttons to change the value. This will be the value that you want the ORP controller to turn on or off. Press the RIGHT button to set the State, to either ON or OFF. If set to ON, the outlet will be turned *on* when the ORP value is reached or exceeded. If set to OFF, the outlet will turn *off* when the ORP value is reached or exceeded.

Ozone Generator Example - Set the ORP value to 350mV and the state to OFF. The ozone generator will turn off when the ORP reading reaches or exceeds 350mV.

CO2 Regulator Solenoid Example- Set the PH value to 6.5 and the state to ON. If the ph rises to 6.5 or above, the solenoid will turn on, allowing CO2 to flow into your Calcium Reactor.

If you ever want to return to normal Refugium lighting control, just come back to this menu and select REF.

There is a built-in range of 5 mV for ORP, and 0.05 pH for PH Control. For example, if you set the ORP Controller to turn off at 400mV, the outlet will turn off at exactly 400 mV, but won't turn back on until the ORP drops to 395 mV (400 - 5 mV of range). Likewise, the pH must drop or rise 0.05 units before the equipment will turn on or off, respectively. This is done to prevent excessive wear and tear on your equipment. The table below illustrates the effects of the ranges with some sample values:

Controlling	Set State	Set Value	ON at:	OFF at:
PH	ON	7.50 pH	7.50 pH	7.45 pH
PH	OFF	7.50 pH	7.45 pH	7.50 pH
ORP	ON	350 mV	350 mV	345 mV
ORP	OFF	350 mV	345 mV	350 mV

**Refugium Settings**

☐ Lighting      ON Time: [6]:[00]AM  
OFF Time: [11]:[00]PM

---

☐ PH Control    [8.00] pH    ☐ Outlet OFF    ☐ Outlet ON

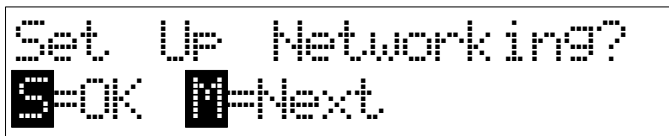
---

☐ ORP Control   [300] mV    ☐ Outlet OFF    ☐ Outlet ON

To set up either PH or ORP Controller from your browser, first select either the PH CONTROL or ORP CONTROL radio button. Next, enter the PH or ORP value, then select whether the outlet should be ON or OFF. Click the SUBMIT button to save your changes.

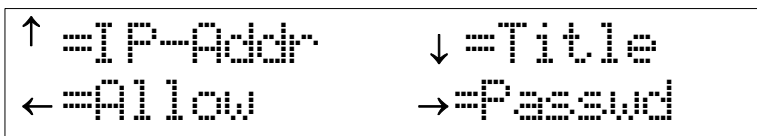
## Set Up Networking

Available at Front Panel:	YES
Available from Web:	NO



This menu provides a way to set up all the LAN network parameters. With the exception of the Tank Title, network setup cannot be done via the web browser. If you need to change your password, it can only be done via the front panel buttons.

Press the SELECT button when the above menu is displayed. You should see the following display.



Press the UP button to set the Lighthouse controller's IP address. The default IP address is 192.168.0.250. If your network is already on the 192.168.0.xxx subnet, you may not need to change the default IP address. Whatever numbers you enter here becomes the web browser URL. For the default setting, typing in `http://192.168.0.250` will get you to the

Lighthouse web pages. If you are unfamiliar with networking, please see the section *Networking The Lighthouse Controller* for more information before proceeding.

Press the DOWN button to set the Tank name or title. The tank name provides a way to customize the web pages with your own title for your tank. It is also useful if you have multiple Lighthouse Controllers as a way to identify them. By default, the tank name is set to "Lighthouse", but may be set to any 16 characters name you choose, (i.e., "Jim's Reef Tank").



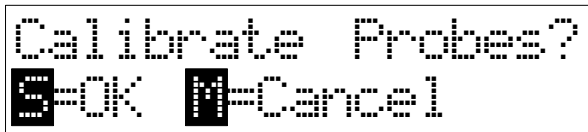
You can also set the Tank Name from your Web browser. Enter up to 16 characters then click the SUBMIT button.

The ALLOW selection provides a way to enable or disable ALL configuration from the web interface. If set to NO, the web configuration page is not accessible and changes cannot be made to the Lighthouse through the web interface, even with the correct password. This is a security feature that can be used if your Lighthouse is connected to the world wide web. See the section *Security Issues and Web Configuration* for more information.

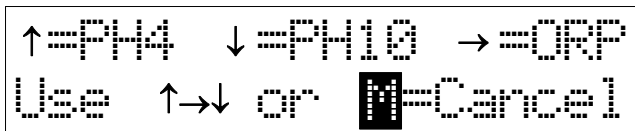
The PASSWD setting lets you choose a password for web configuration access. **We highly recommend that you change the password from the factory default setting.** The password is case sensitive and must be between 3 and 8 characters long. Use the UP, DOWN, LEFT, and RIGHT buttons to select characters for the new password.

## Calibrate Probes

Available at Front Panel:	YES
Available from Web:	NO



The Calibrate Probes menu allows you to calibrate the PH and ORP electrodes. Pressing the SELECT button displays the following menu.



Press UP to select PH 4 calibration, DOWN to select PH 10 calibration, or RIGHT to select ORP Calibration. Pressing the UP button will show the following display:



You will need PH 4.00 or 4.01 and PH 10.00 or 10.01 calibration solutions to calibrate your PH probe. You should always calibrate new probes before use, or old ones when you think the readings may be wrong.

In general, ORP electrodes do not need to be calibrated. Aquarium ORP readings are most useful in viewing the *changes* in ORP rather than an absolute ORP value. However, the Lighthouse Controller does allow you to calibrate your ORP electrode. You will need ORP calibration fluid to perform this, such as a 230mV solution.

## **PH Calibration Procedure**

### **Probe Preparation - New Probe**

If the Probe is brand new, unscrew the storage bottle or remove the rubber cap from the tip of the probe and discard it. Rinse the probe, brushing lightly with an old toothbrush. After cleaning, place the probe in the aquarium. Keep it there for at least one hour before attempting calibration.

### **Probe Preparation - Old Probe**

A probe that has been submerged in an aquarium for any length of time requires cleaning before calibration. Calcium deposits, algae, or other contaminants on the probe tip and body must be thoroughly cleaned away or else the calibration fluid will become contaminated. This will result in inaccurate calibration. Use an old toothbrush and a little baking soda or vinegar to clean the probe. Pay particular attention to cleaning the glass bulb at the tip of the probe. Be careful, as the thin glass bulb can easily be broken. Rinse thoroughly and place back in the aquarium for at least one hour before calibrating.

### **Calibration Fluids**

We recommend using disposable, sealed calibration packets. You can also use bulk calibration fluids with good results, provided that the bottles have been stored properly and the expiration dates haven't expired. Some PH packets are marked 4.00 or 4.01, and 10.00 or 10.01. There is no difference between these solutions. All of them will work fine with the Lighthouse. You will need at least one pH 4 and one pH 10 packet to perform calibration. Note that pH 7 packets CANNOT be used to calibrate the Lighthouse.

### **Calibration Preparation**

The easiest way to setup calibration is to use three small drinking glasses. Place the pH4 and PH10 packets in two of the glasses. Tear open the top of the packets and set the packets into the glasses to hold them upright. Do not pour out the solutions- leave the solution in the packets. Fill the third glass with clean fresh water. Place the probe tip in the pH 10 packet so the tip is fully submerged. Shake or jiggle the probe while submerged to release any trapped air bubbles.

NOTE: Make sure that the ORP probe and Temperature Sensor are plugged in during calibration. If you do not have an ORP probe, connect the BNC Terminator plug to the ORP input. This will minimize any stray noise or electrical interference that may affect pH accuracy during calibration.

### **Calibration Procedure**

Select the calibration menu in the Lighthouse, then select PH10. You will see a four digit number on the top line of the display. This number will first rise very quickly, then slow down as it approaches pH 10. If the number is jumping around, It is sometimes helpful to swirl or shake the probe in the calibration fluid to dislodge any air bubbles on the tip. You need to wait for this number to stop changing. It might take up to a minute for this to happen, but the number should stabilize. Once the number has stopped changing, press the SELECT button to lock in the PH10 calibration.

Now remove the probe from the pH 10 calibration fluid and place in the glass containing fresh water. Swish it around a bit, then remove the probe and shake it dry. Place the probe tip in the pH 4 calibration fluid and select the PH4 setting on the Lighthouse. Again, it will take some time for the probe to adjust downward to PH 4. Leave it in there until the number stops changing. Press the SELECT button to lock in the value.

### **Probe Maintenance**

You need to clean the glass bulb of your pH probe every 3-4 months. Use RO or tap water and an old toothbrush. If there are visible signs of calcium buildup or debris on the glass bulb, use baking soda or vinegar to scrub the probe tip clean. Typically, calibration will last for a year. However, if after cleaning you believe the readings are inaccurate, the probe may require recalibration. You should replace the probe when calibration is required very frequently or you cannot get stable readings during the calibration procedure. A pH probe will typically last 2-3 years in saltwater.

NOTE: After calibration, the PH Controller setting will change. If you are using the PH Controller feature, go to the *PH/ORP Controller Menu* and check your settings.

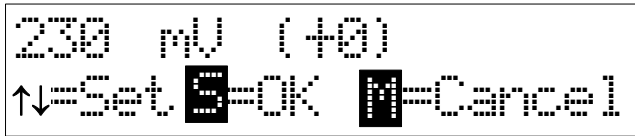
## **ORP Calibration**

Normally, you do need to calibrate your ORP probe. When used in an aquarium, the changes in ORP readings are far more important than any absolute value. ORP probes need to be cleaned frequently, as they develop a slime coating on the platinum tip which causes a slow rise in ORP readings over time. It is a good idea to clean the tip of your ORP probe every 1-2 months using an old toothbrush.

To calibrate your ORP probe, follow this procedure.

New ORP probes or probes that have been immersed in their storage solutions for a long time can take up to 48 hours before stabilizing. For this reason, we do not recommend calibrating a

new ORP probe within the first few days of use. An old trick is to place the probe in a glass of freshwater with a few drops of household bleach in it to sort of "kick start it" and get it stabilized faster.



ORP calibration does not require two points of reference, so a single calibration fluid is all that is required. Immerse the probe in the calibration fluid and wait for the mV reading to stabilize. It may take up to a minute or so for some electrodes to settle down. Use the UP and DOWN buttons to set the mV reading to that of the calibration fluid. Press the SELECT button to lock in the new value.

NOTE: If you are using the ORP Controller feature, you will have to go back and set up the ORP Controller settings after calibration.

## **Temperature Calibration**

The Temperature sensor is calibrated at the factory and normally requires no further calibration. It is recommended that you follow this procedure only if you believe that the temperature readings are in error, or if you need to synchronize the Lighthouse temperature with another temperature device.

### **Sources Of Calibration**

To calibrate the Temperature Sensor, you will need an accurate meter or thermometer. We recommend using a thermocouple-based electronic meter with submersible probe. They typically have +/- 0.10 Deg F calibration. These meters are expensive. You might be able to borrow one from a school or laboratory in your area.

As an alternative, you can use a photographic darkroom thermometer. There are the mercury-based "pencil" style glass thermometers, and the dial type with a stainless steel stem. The better quality ones are accurate to within +/- .25 Deg F.

Do not use aquarium or cooking thermometers for calibration. The accuracy of these devices are extremely poor.

### **Temperature Calibration Procedure**

Place the Temperature Sensor and the temperature probe of the calibrating equipment in a glass of water. For the most accurate results, you should calibrate with the temperature of the liquid

close to that of your tank. Calibrating at 78 Deg F is ideal. Follow this procedure to calibrate the Lighthouse Temperature Sensor:

- 1) Remove the power jack from the back of the Lighthouse console.
- 2) Press and hold the MENU button while reapplying power. Continue to hold down the button until the display shows "Calibrate Temp?". Release the MENU button and press the SELECT button. To cancel, press any other key.
- 3) The display will show the temperature in one-hundredths of a degree increment. Use the UP and DOWN buttons to adjust the temperature to match that of the calibration source.
- 4) Press the SELECT button to lock in the new calibration value. After several seconds, the Lighthouse Controller will restart.
- 5) You will have to go to the *Set Up Htr/Chiller?* menu and set the heater/chiller temperature as well as the Daylight Cutoff temperature (if used). After calibration, the heater/chiller will be set to disabled.

## **Networking The Lighthouse Controller**

The Lighthouse Controller is equipped with a built-in web server and LAN connection that can be used to connect the unit to any private or public network. This allows monitoring and configuration through a Web Browser, and provides ways for external applications to take full advantage of the Lighthouse. Connecting to the Lighthouse depends upon the type of networking equipment you have.

### **Dial-up PC Users**

If your only means to connect to the internet is a dial-up phone modem and you do not have any sort of home network, you will have to purchase a **Network Interface Card** in order to connect the Lighthouse Controller directly to your PC. You will also need to purchase an **Ethernet Cross-Over Cable** to connect the controller directly to your computer. The included Ethernet cable WILL NOT WORK for direct connection to your PC.

After installing your network card, go to your computer's network setup options and choose an IP address of 192 . 168 . 0 . 1 for the computer, with a subnet setting of 255 . 255 . 255 . 0. You can leave any information regarding gateways or DNS servers blank. Now plug one end of the cross-over cable into the network card and the other in the LAN connector on the back of the Lighthouse Controller. Open your web browser and type `http://192.168.0.250`. You should now be able to view the controller's web pages.

## **Connecting to an Existing Network**

The Lighthouse Controller can be connected to any computer network capable of dealing with 10-BaseT Ethernet. If your router, hub, or modem supports auto-sensing 10/100 Ethernet, use the supplied cable or any CAT-5 cable to connect the controller to any available Ethernet port on your network. If your equipment only supports 100-BaseT Ethernet, it will not work. You will need to purchase a hub or switch capable of auto-sensing 10/100 Ethernet connections in order to use the LAN feature of the Lighthouse.

The Lighthouse Controller supports Static IP address only. It does NOT support DHCP (Dynamic Host Control Protocol). Most likely, your server or router is set up for DHCP on some addresses. This means that devices connecting to your equipment automatically get assigned IP addresses. Normally, your equipment has a range of IP addresses that it gives out under DHCP. For example, the address range may be 192.168.1.100 through 192.168.1.200. In this case, you can set the IP address of the Lighthouse Controller to any number outside that range of numbers. In this case, any number below xxx.xxx.xxx.100 or above xxx.xxx.xxx.200 will work. For example, setting the IP address of the Lighthouse to 192.168.1.1 or 192.168.1.201 would both work, since it is outside the 100-200 range. Check your equipment's setup pages or control panel to find this information.

The IP address set in the controller must be on the same subnet as your network. Basically, this boils down to the first three sets of numbers in the IP address being identical to those on your network, with only the last number being unique. For example, if devices on your network have IP addresses 192.168.2.4, 192.168.2.78, and 192.168.2.90, the first three sets of numbers are all identical (192.168.2.xxx) and only the last one is unique for each attached device. If you chose an IP Address for the controller such as 192.168.2.150, you would be on the same subnet (the same first three sets of numbers) and everything should work. However, make sure you do not choose an address within the range of the DHCP server, because the server may use that address when assigning a newly connected network device later on.

## **Connecting to the World Wide Web**

Setting up the Lighthouse Controller so it can be accessed remotely from the world wide web requires a high-speed "always on" connection from a DSL, cable modem, or other similar equipment. It is not feasible for Dial-up users to connect their Lighthouse to the public internet.

There are hundreds of brands and models of networking equipment in use and therefore, it is impossible to provide specific instructions on how to configure a system to allow world wide web access to a Lighthouse. Here are some general guidelines on what needs to be done.

You probably have a static IP assigned to you by your ISP. In addition, your routing equipment provides multiple IP's in one of the local intranet ranges, such as 192.168.x.x. This is called NAT

(Network Address Translation). It allows you to hookup several computers and any other Ethernet devices to the internet, even though you have only one IP address.

What you need to do is provide a data path through your modem/router from the outside world directly to the Lighthouse. To do this, you will need to open a port (sometimes called a *pinhole* or *Forwarding* in your equipment's "advanced" setup menu). The Lighthouse only needs one port, so if your equipment allows you to enter a range of ports, the starting and ending port should be the same. For example, if your static IP to the outside world is 1.2.3.4, you need to pick a port number (say, 8000) and route any incoming data traffic on port 8000 to the Lighthouse. This setup would look like this:

`http://1.2.3.4:8000 → 192.168.0.250:80`

This setup will allow anyone who types in `http://1.2.3.4:8000` or `http://myserver.com:8000` anywhere in the world to connect directly to your Lighthouse at 192.168.0.250 (the ":80" means port 80 which is the standard http web port). The Lighthouse will also accept http connections on ANY port (except ports 26481 and 26482), so you don't even have to do port translation if you don't want to. So you can change the configuration to:

`http://1.2.3.4:8000 → 192.168.0.250:8000`

which would also work. If your server or your modem/router has a built-in Firewall, you may have to modify the Firewall rules so that TCP data arriving on port 8000 is allowed to pass unrestricted to your local intranet.

In summary, you will need to modify the configuration of your modem/router equipment and possibly change your Firewall if you are using one. Read your equipment's manual thoroughly before attempting these changes.

## **Wireless Connections**

If you want to use a wireless connection for your Lighthouse, you will have to purchase a wireless adapter. There are low-cost wireless adapters and wireless access point (WAP) equipment available that will allow you to place the Lighthouse Controller on your wireless network. Check computer stores and online computer and equipment retailers for wireless and WAP networking devices.

## **Web Interface**

The Lighthouse controller has five web pages containing all the various status and monitoring information. You can get to the main web page by entering `http://192.168.0.250` into your web browser or whatever IP address you have chosen..

NOTE: The Lighthouse does not use any OS-dependent code or controls in its web pages. It is therefore compatible with virtually all operating systems (Windows, Mac, Linux, etc.).

You MUST however, enable Java, Javascript, and cookies in your browser for the Lighthouse to work properly. You may need to configure your browser's settings if pages do not display properly.

## Index.htm

This is the default or main page containing real time data, status, and 24-hour statistics. You do not have to specify the full html name to access this page. Both <http://192.168.0.250> and <http://192.168.0.250/index.htm> will get you here. The page will automatically update every 60 seconds displaying the latest data. The index.htm page contains the following information:

The screenshot shows the Lighthouse web page with the following content:

- Lighthouse**  
Reef Time: 7:45 AM
- Temperature**: 73.7 °F. High: 73.7 °F (12:00 AM), Low: 73.7 °F (12:00 AM).
- PH**: 8.35 pH. High: 8.35 pH (12:00 AM), Low: 8.35 pH (12:00 AM).
- ORP**: 317 mV. High: 317 mV (7:43 AM), Low: 317 mV (12:00 AM).
- System Status**: Clean
- AC Power Status**: Four outlets labeled Daylight, Actinic, Refugium, and Heater, each with a small black dot indicating it is turned on.

*This page automatically updates every 60 seconds.*

[Home](#)   [Graphs](#)   [Settings](#)

**Title** - The default title is "Lighthouse" but can be customized. (i.e., "Joe's Reef" or "180G FOWLR").

**Reef Time** - The current time set in the Lighthouse.

**Temperature** - The current temperature, plus the highest and lowest recorded temperatures for today. The High and Low values are cleared at midnight every day.

**PH** - The current PH reading, plus the highest and lowest recorded PH values for today. The High and Low values are cleared at midnight every day.

**ORP** - The current ORP reading, plus the highest and lowest recorded ORP values for today. The High and Low values are cleared at midnight every day.

**System Status** - This section lists any warnings or errors that have occurred. For a detailed explanation of warnings and errors, see the "System Status Codes" section on the inside front cover of this manual. If there are no errors or warnings, the word "Clean" will be displayed here.

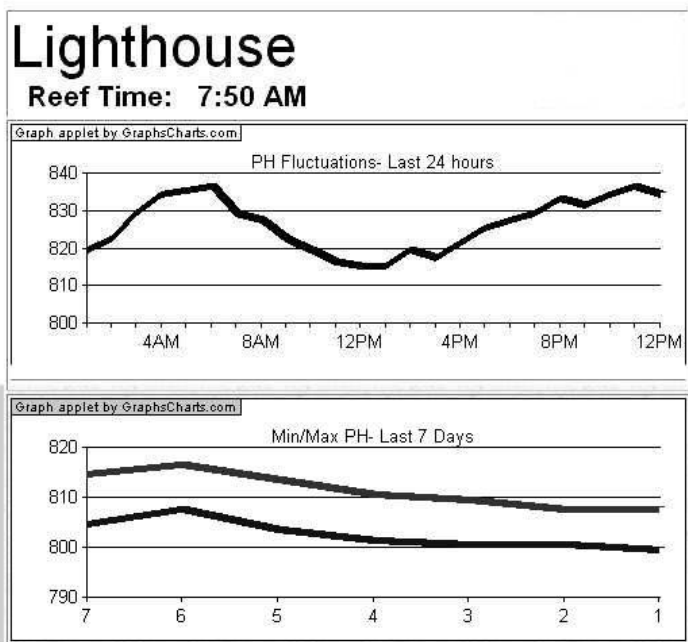
**AC Power Status** - A series of small graphics that displays the status of the four AC outlets. If the red or green "light" is on, that AC outlet is turned on.

## Graphs.htm

The graphs page shows a rolling view of the temperature, PH, and ORP readings recorded for the last 24 hours and last 7 Days. This page makes extensive use of Java and downloads large amounts of data in order to build the graphs. It is normal for this page to take some time to download and fully render the graphs.

**24-Hour** The three 24-hour graphs record the temperature, PH, and ORP values for each hour. The values are recorded at the top of the hour. They are NOT averages or min/max values. The right-most reading in the graph represents one hour ago. The left-most reading is the graph is the reading yesterday , or 24 hours ago.

**7-Day** The 7-Day graphs represent the minimum and maximum values recorded over the last 7 days. Every 24 hours, the min/max values are transferred to the 7-day graphs. On the x-axis, Day 7 represents the min/max 7 days ago. Day 1 is yesterday's values.



## Lighthouse

**Reef Time: 7:48 AM**

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*Lighting Schedule*

LIGHT	ON TIME	OFF TIME
Daylight	1:00 AM	1:00 AM
Actinic	1:00 AM	1:00 AM
Refugium	1:00 AM	1:00 AM

---

*Heater/Chiller Temperature Settings*

Turns ON at: **78.0 °F**

Turns OFF at: **78.0 °F**

Daylight Cut-off Temp: **Inactive**

0/td>

---

*PH Controller*

**Disabled**

---

*ORP Controller*

**Disabled**

---

*Web Configuration*

**Export Button** The graphs page also contains an EXPORT button that dumps all of the graph data to a new window. The first line contains the 24-hour time data, followed by the graph data from the three 24-hour graphs, followed by the three 7-day graphs. Each value is separated by a comma. In many programs (such as Microsoft's Excel), the comma separators tell the program to import the data into separate cells of the spreadsheet. By using cut-and-paste, you can manually copy graph data into a spreadsheet.

## Settings.htm

The settings web page contains a quick summary of all the settings and configuration of the Lighthouse.

**Lighting Schedule** Shows the three lighting zones and their on/off times settings.

**Heater/Chiller** Shows the heater/chiller temperatures and the status of the Daylight Cutoff settings.

**PH/ORP Controller** Shows if the Refugium outlet is programmed for PH or ORP Control, and the settings for the controller.

**Web Configuration** Displays whether or not the web configuration (cfg.htm) web page is accessible. Show either "Allowed" or "Not Allowed".

**ScreenSaver** Shows the on/off times of the screensaver.

## Cfg.htm

This is the web page where configuration and settings may be changed via your web browser. In many cases, it is far easier to use the web page than the front panel buttons to set up your Lighthouse. However, the Clock and Network Settings **MUST** be configured using the front panel.

NOTE: For security reasons, there is no link to the configuration page from any of the other web pages. You must type in `http://192.168.0.250/cfg.htm` to get to this page.

**Authentication** At the top of the page is the password setting. You must enter your password before using any of the *Submit* buttons on the rest of the page. The default password is "lhouse". You can change the password from the *Networking Setup?* menu of the Lighthouse.

The three lighting zones are designated by the names Daylight (Day), Actinic (Act), or Refugium (Ref). Note that these names are used just to identify the three AC outlets. You can use any of the three lighting zones for any type of lighting, or even other electrical appliances (such as power heads or pumps) if you so choose.

**Daylight Settings** Select the On/Off times for the Daylight outlet, then click the Submit button.

**Actinic Settings** Select the On/Off times for the Actinic outlet, then click the *Submit* button.

<b>Daylight Settings</b>	
ON Time:	<input type="text" value="7"/> : <input type="text" value="25"/> AM
OFF Time:	<input type="text" value="8"/> : <input type="text" value="30"/> PM
<input type="button" value="Submit"/>	
<hr/>	
<b>Actinic Settings</b>	
ON Time:	<input type="text" value="7"/> : <input type="text" value="00"/> AM
OFF Time:	<input type="text" value="9"/> : <input type="text" value="10"/> PM
<input type="button" value="Submit"/>	
<hr/>	
<b>Refugium Settings</b>	
<input type="radio"/> Lighting	ON Time: <input type="text" value="6"/> : <input type="text" value="00"/> AM
	OFF Time: <input type="text" value="11"/> : <input type="text" value="00"/> PM
<hr/>	
<input type="radio"/> PH Control	<input type="text" value="8.00"/> pH
	<input type="radio"/> Outlet OFF <input type="radio"/> Outlet ON
<hr/>	
<input type="radio"/> ORP Control	<input type="text" value="300"/> mV
	<input type="radio"/> Outlet OFF <input type="radio"/> Outlet ON
<hr/>	
<input type="button" value="Submit"/>	
<b>PH Control:</b> For Calcium Reactor/CO2 control, set <b>Outlet ON</b> .	
<b>ORP Control:</b> For Skimmer/ozone regulation, set <b>Outlet OFF</b> .	



NOTE: Please check the website [www.mcuresearch.com/downloads.html](http://www.mcuresearch.com/downloads.html) for free UDP-enabled applications and utilities that can enhance the capabilities of your Lighthouse Controller. The downloads page is updated frequently, so please check back periodically for new additions.

## **Data.htm**

This web page is not meant for viewing, though you can by typing in <http://192.168.0.250/data.htm> into your browser. The purpose of this page is for server application to "scrape" or gather information periodically and use that data to build long term historicals and similar functionality. Please visit [www.mcuresearch.com/downloads.html](http://www.mcuresearch.com/downloads.html) to get the full specification on the data.htm file. You will also find tutorials on how to create your own web pages using PHP scripts. These scripts use the data.htm page to gather real time readings..

## **Security Issues and Web Configuration**

If your Lighthouse is configured for Web access from your local network, security is not much of a concern. However, if you intend to set up your Lighthouse so it is available on the World Wide Web, there are several issues regarding security that you need to know.

Any equipment or computer that is connected to the public internet is vulnerable to attack by hackers and malicious persons. The Lighthouse is no exception. The Web Configuration page allows anyone with the right password to change the settings in your Lighthouse. It is this page that must be protected from unauthorized access.

What are the consequences if someone hacks into your Lighthouse and changes things? Obviously, items like lighting schedule and Tank Name would be inconvenient but would not cause any real damage. But changing heater settings (perhaps setting the tank temperature to 95 degrees) or messing with the ORP or PH controller can cause havoc and/or a loss of livestock. This is why it is important to protect your Lighthouse. Here is a list of security recommendations:

1. The Lighthouse uses a password protection scheme in order to limit configuration changes to authorized persons. It is recommended that the password be the full 8 characters, and not be a common or dictionary word. Adding one or more numbers to the password is a good idea. Using passwords that can be easily figured out (dog's name, birthday, the name of your tank or home page, etc.) should be avoided. Use a unique

password for every web site- many people get into trouble because they use the same password over and over again for all web sites they visit.

2. Exit and close your browser completely when you're finished using the Configuration Page. Your Lighthouse password is saved in a temporary cookie on your computer while using the page. Closing your browser will erase the cookie, eliminating the only copy of your password outside of the console.
3. For best protection, use the *Set Up Network?* menu to set the Web Configuration access setting to "Not Allowed" for times that you won't be needing to configure via the web. In this mode, it is impossible for anyone to change Lighthouse settings from the web, even if they have the correct password. A typical situation might be if you're traveling, you can turn on web access during the trip, then turn it off when you arrive back at home.
4. Use the System Status Information to monitor web configuration access. You can view System Status from the main page on the Lighthouse or from the front panel under the *System Status* menu. You will get a Code #2 when configuration has changed via the web interface. If you get a Code #8, someone has entered the wrong password and (unsuccessfully) tried to change your configuration. Both these system status messages are cleared at midnight every day, so be sure and check the System Status on a daily basis.

## **UDP Packet Transmissions**

The Lighthouse controller has the ability to send UDP (User Datagram Protocol) messages to servers and networked computers. This allows the Lighthouse to be expanded so that things like email alerts, cell phone text messaging, long-term historical data gathering, and other applications can add new functionality to the Lighthouse.

If you are not familiar with UDP, it is an internet protocol that works like a Telegram. Whenever anything changes in the Lighthouse such as PH, temperature, or lighting schedule, a telegram is sent to inform the receiver of the message about the change. The receiving computer needs to be "listening" for the telegram, which is done within an application program. If the receiving computer is not listening, the message is discarded.

To set up UDP, you will need the MAC address (Media Access Control address- this has nothing to do with Macintosh computers), IP address, and Port number of the computer where the UDP Packets should be sent. You don't need to set up UDP unless you are running a program that uses it. In this case, you should leave the UDP setting 'Disabled'.

Under Windows, you can get all the information needed to set up UDP from the command prompt. On a Windows machine, perform the following steps:

1. Select Start->Run from the start menu and type in 'cmd ' as the program name to run. Click the OK button.
2. A DOS box will open. At the command prompt type `ipconfig /all`.
3. You will see a dump of all your machine's network settings. The "Physical Address" is the MAC address that needs to be entered into the Lighthouse Configuration page.
4. The "IP Address" of your computer should be entered into the "Receiving IP" text box.
5. The port number can be any number from 1 to 65535. Both the receiving application and the Lighthouse must use the same port number. It is best to enter a number greater than 2000 to avoid conflicts with pre-assigned ports. The Lighthouse defaults to Port 2552.
6. Click the *Submit* button. The Lighthouse will begin to send UDP Packets to the designated computer on a periodic basis.
- 7.

The Lighthouse normally sends a new packet every 60 seconds. If there is a lot of Ethernet traffic at the Lighthouse, the packet may be delayed by a few milliseconds. You will also get a new packet when configuration changes occur, either at the front panel or via the web page.

The details and contents of the packet data are covered in the document "UDP Packet Data Format" that can be downloaded from [www.mcuresearch.com/downloads.html](http://www.mcuresearch.com/downloads.html).

The Lighthouse is capable of broadcasting packets to multiple computers, and can also send packets directly to a remote computer over the internet. To send packets to multiple computers on your local network, set the MAC Address to FF-FF-FF-FF-FF-FF and the Receiving IP address to xxx.xxx.xxx.255, where the xxx's are the first three numbers of your local network. If you have multiple local networks (multiple subnets), set the Receiving IP address to 255.255.255.255 which will broadcast the message to all computers on all local networks.

To send UDP packets over the internet to a remote computer or server, use the MAC address of the NIC card, router, or modem as the MAC address (i.e., your gateway IP). Then, set the Receiving IP to the public IP address of the remote computer or server.

## **Power Failures**

The Lighthouse stores all its settings in a combination of flash memory and battery backup RAM. All settings can survive a power outage up to 4 weeks. Certain settings, such as PH calibration and lighting schedule are stored in flash memory and will never be lost. The graphs data is the only information that is lost during a power failure.

## Troubleshooting

<b>Problem</b>	<b>Solution</b>
The console display is blacked out. I can get to the menus, but the display goes out again when I'm done setting things up.	The ScreenSaver is active. The ScreenSaver ON time is the time you want the display to turn OFF (go black). Also, check the clock for the correct time, which will cause the ScreenSaver to activate unexpectedly.
The Daylight outlet lights keep turning turn on or off randomly.	Check Daylight Cutoff settings. Make sure the cutoff temperature is greater than the heater/chiller ON and OFF temperatures by at least 3 degrees. If you don't need the Daylight Cutoff feature, set it to "Inactive" to turn it off.
The console menu won't let me set the Refugium on and off times.	Go to the PH/ORP Controller menu and set the outlet to the 'REF' setting.
I forgot my password for the configuration web page. How do I retrieve it?	Just go to the console and select the <i>Set Up Networking?</i> menu. Select PASSWD and you can view your existing password.
I type in the cfg.htm URL to get to the web configuration, but my browser just hangs with a blank page.	Go to the console and select the <i>Set Up Networking?</i> menu. Select "Allow" then set <i>Web Configuration</i> to "YES".
The "Power Failure" system status on the home page won't go away.	Many system status messages, including 'Power Failure', are cleared at midnight.
My ORP reading is displaying "?????" and my PH reading is very low or displaying "?????" as well. Both my probes are plugged in.	Your probes are reversed. Swap the PH and ORP connections.
The lower right side of the display is showing some kind of clock or timer that is changing every second.	You've accidentally switched to Heater Run Time display. While the display is normal (not in a menu), Press the SELECT button several times to toggle through the display options.
The Graphs web page shows blanks where the graphs should be. The other web pages seem to display okay.	The Graphs page uses JAVA. Chances are that you have JAVA disabled in your web browser. Go to your browser options and enable it. If you do not have JAVA installed, go to <a href="http://www.java.com">www.java.com</a> and install it.
I'm not using an ORP probe and I plugged in the BNC Terminator into the ORP jack. The main web page keeps displaying "ORP Probe Disconnected".	This is normal. The only way to get rid of the message is to plug in a real ORP probe.
I have to keep entering my password every time I use one of the SUBMIT buttons on the configuration web page.	You need to allow cookies in your web browser. Enable cookies for your Lighthouse IP Address.
I click the EXPORT button on the Web configuration page and nothing happens.	You need to allow pop-up windows in your browser. Go to your browser's options and allow pop-ups for the IP Address of your Lighthouse.
The unit keeps resetting, and the light in the switch of the AC power strip keeps going out.	You are overloading the AC power strip. The equipment plugged in is exceeding the maximum power ratings.

## **Warranty**

The Lighthouse controller is warranted to be free of defects in material and workmanship for a period of one year from the date of original purchase.

For warranty repair, send email to [support@mcuresearch.com](mailto:support@mcuresearch.com) to receive a return authorization. We will provide you with a return number. When returning the unit, you must include the Return Authorization Number, proof of purchase, and a written explanation of the trouble. During the warranty period, we will, at our option, either repair or replace the product free of charge.

This warranty does not cover damage due to improper installation or use, negligence, damage caused by water, fire, lightning, or other acts of nature, and unauthorized product modification or repair, or failure to follow instructions supplied with the product (including exceeding the power rating of the AC Power Strip), or to incidental or consequential damages beyond the Lighthouse Controller product itself. Implied warranties are limited in duration to the life of this limited warranty.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to you. This warranty gives you specific legal rights. You may have other rights, which vary from state to state.

## **Service and Support**

Service and support may be obtained at <http://www.mcuresearch.com> or by sending email to [support@mcuresearch.com](mailto:support@mcuresearch.com).

## Specifications

### Temperature Sensor:

Range +20 to +120 Degrees F  
Accuracy  $\pm 0.4$  Degrees F @ 25°C

### PH:

Range 3.00 pH to 14.00 pH  
Accuracy  $\pm 0.02$  pH @ 25°C  
Interface BNC male

### ORP:

Range 75 to 999 mV  
Accuracy  $\pm 4.0$  mV @ 25°C  
Interface BNC male

### Power Strip:

Maximum(all outlets) 15Amps at 125VAC 60Hz  
Controlled outlets(ea): Resistive (heaters): 10A @125VAC MAX.  
Inductive (ballasts,chillers): 1/3HP @ 125VAC MAX.

### Console:

Dimensions 7.9 x 6.3 x 2.5 inches  
Input +9VDC 500 mA  
Power Consumption 6 Watts max.

Manufactured by:  
MCU Research Company  
276 Jones Cove Road  
Asheville, North Carolina 28805  
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