

# **GREEN SCORPION**

## **Control System**

### Users Guide v5.0

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## **Foreword**

Thank you for purchasing a WERECON water treatment system featuring the Green Scorpion™ control package. This system currently represents many generations of software refinements and feature enhancements. It is the most advanced control system for fertigation and pH control systems available today.

After familiarizing yourself with this guide, you should appreciate the many steps that have been taken to make this software very straightforward to use. You will find that doing water treatment properly can be a complex task. We have done as much as possible to insulate the user from some of these complexities and provide a package that is very sophisticated, yet very intuitive in its use.

## **Purpose**

The Green Scorpion™ control system is designed to control WERECON fertigation and pH control systems consisting of up to three fertilizer pumps, plus one optional pH control agent pump. It is designed to inject proportionally on variable output irrigation systems. This is accomplished by monitoring various factors, such as water flow, pH (optional), time and date information, as well as various safety factors. In response to these inputs, the system outputs signals which tell the attached pumps when, and how much to inject at any one time.

## **A Word about Proportional Injection**

Many people have heard the word “Proportional” thrown around in the water treatment industry for years, yet some don’t understand what it means. Simply stated, a proportional system varies the fertilizer output in sync with the water output from the pump station. This means that when you are irrigating at 1000 GPM, you will be injecting more fertilizer than when you are irrigating at 100 GPM. This makes sense if you think about it. If you were mixing a batch of foliar fertilizer in a 1000-gallon spray rig, you would mix in more concentrate than if you were making the same batch in a 100-gallon spray rig. There are currently a few systems that are using non-proportional technology that are being sold for use on variable output fertigation systems. These are totally inappropriate. Many

pump stations in use today can deliver up to 4000 GPM. If you think about it, in this case, you need to inject 40 times as much fertilizer at maximum flow than you do at 100 GPM in order to keep a consistent rate.

## **Proportional Rates**

Due to the way proportional fertigation systems work, rates are expressed differently than in conventional sprayer or spreader based applications. Most professionals in the agronomic business are used to specifying rates on a product-per-area basis. For example: Pounds per 1000 sq. ft., Gallons per Acre, Liters per Hectare, etc. In proportional fertigation, the ultimate amount of fertilizer applied corresponds to the amount of water applied to an area. Because of this, proportional rates are specified on a product-per-water basis. These are expressed in parts-per-million or PPM. This sounds more difficult than it is. Using this method, one PPM is simply one gallon of product per million gallons of water. Once you understand how this works, it becomes relatively easy to predict product usage if you know your water usage. For instance, if you are set to deliver 100PPM, and you put out 500,000 gallons of water in a night, you will get 50 gallons of fertilizer. (100 gallons per million, 50 gallons per half-million) Several tools within the Green Scorpion™ allow you to specify your rates in various methods.

## **The Power Switch**

In the lower right corner of the control panel is a rocker switch to turn the system on and off. This switch is a software power switch. When it is in the “off” position, the system will go to sleep, and cannot inject, however, a part of the program is alive so that it can track water usage information when it is asleep. If an authorized technician needs to work on the inside of the panel, the system should be disconnected from main power to prevent electric shock. When you turn on the front panel switch, the system should show you the Green Scorpion™ title screen while it does its self-checks, and then you should see the system status screen (explained below).

## **The User Interface**

The user interface consists of a four-line LCD display, and a six key keypad. The display shows you system information, and the keypad allows you to navigate through the various programming and status displays. The use of these keys and displays will be illustrated in later sections.

## **The Display Screens**

Once the unit is first powered up, you should see the “Status” screen. This is one of several display screens that you will have depending on your system configuration. Each display screen will have a title bar on the top showing the screen name. This bar looks like this: -----STATUS----->. All of the displays are laid out right to left like channels on an old TV set. If the title bar, as above has an arrow pointing right, it means there are more screens to the right. If it has an arrow pointing left, there are more screens to the left. You can use the right and left arrow keys to navigate through the display screens. Your system has been programmed at the factory to only support the display screens that are applicable to your particular system. The full set of screens are as follows:

```
--STATUS-- > < --WATER-- > < --PRODUCT 1A-- > < --PRODUCT  
1B -- > < --PRODUCT 2A-- > < --PRODUCT 2B-- > < --PRODUCT  
3A-- > < --PRODUCT 3B-- > < --PRODUCT 4A-- > < --PRODUCT 4B-  
-> < --CURRENT PH-- > < --PH STATS—
```

Note that the two display screens at the ends do not have arrows pointing both directions, indicating that there are no more screens in that direction. The descriptions of the various display screens are shown in the following sections.

### ***The Status Screen***

The “STATUS” screen is the farthest to the left in the chain of display screens. It gives you an overview of the system functions, and is the first screen you will see after the initial start-up. All Green Scorpion™ configurations have this screen. It displays the following information:

## **System Clock**

The line below the screen label shows the current system clock setting, time, day, and date respectively. This clock is used to control the on/off time functions for each injected product. It should be set accurately if you wish to use the product timing functions. It should be noted, that this clock display always changes days of the week at midnight. Internally, however, the day used in the injection timing functions will change at the day change time. (see Day Change in the programming section below)

## **Active Pumps**

The next line on the status screen shows the words “Active Pumps” followed by brackets “[ ]” each pump occupies a space within the brackets as follows: [123A]. Representing pumps 1, 2, 3, and Acid respectively. When a pumps symbol is visible in the brackets, it is ready to go whenever water is running. If it is not visible, it may be for the following reasons.

For fertilizer pumps:

- 1) The pump may be turned off by the Master On/Off function.
- 2) The pump may be programmed not to run in the time/date settings.
- 3) The pump may not be supported in your particular configuration.

For the Acid Pump: (there are more safeties for the acid pump)

- 1) The pump may be turned off by the Master On/Off function.
- 2) The pump may be programmed not to run in the time/date settings.
- 3) PH control may not be supported in your particular configuration.
- 4) There may not be enough water flow to activate the booster pump, so the acid pump is locked out.
- 5) There may not be any flow past the pH sensors, so the acid pump is locked out.
- 6) The pH may be higher than the high cutout, or lower than the low cutout (not within the safety range) so the acid pump is locked out.

## **The Water Screen**

The “WATER” screen gives you information about your pump station water usage. It shows current flow information, as well as statistical information about your water usage. Some of the readings are redundant with readings available on newer package pump stations, but these can be used in different ways from those on the pump station. These also add an element of convenience for those who do not have a modern pump station. Every Green Scorpion™ configuration will have this screen.

### **GPM**

The first line of your “WATER” screen, under the title bar, shows your current pump station water output in Gallons Per Minute. If you have GPM readout on your pump station, this display should read close to the one on your pump station. It may not be exact, due to the different timing algorithms used in the Green Scorpion™ versus the one in your pump station.

### **MTD Total**

The next line on the “WATER” screen shows total gallons of water used for the month. This line will automatically reset at midnight on the first of the month. NOTE: If you are using this reading as your sole method of tracking water usage, you should record it often to avoid losing it accidentally when it resets. This reading can be manually reset in the programming screens. (Explained later in this manual)

### **YTD Total**

The next line shows the total water usage for the year in gallons. This reading will automatically reset on midnight on January 1<sup>st</sup>. As above, if you are using this reading to track your water usage, you should record it often to avoid losing it at the first of the year. This reading can also be manually reset through the programming screens. (Explained later)

## **The Product Screens**

The next screens in the sequence are the “Product Screens”. Depending on your configuration, the number of these screens will vary. You will always have an “A” screen and a “B” screen for each pump on your system. They will correspond to your fertigation pumps 1, 2, and 3. The acid pump, if you have pH control, will always be pump 4. Even if you only have pH control, the acid pump will still be number four. This numbering is used because the Green Scorpion™ controls the acid pump differently than the fertigation pumps.

### **A Screens**

Each supported product will have an “A” screen, labeled 1A, 2A, 3A etc. The “A” screen contains information about rates, and product status. Its information is as follows:

#### **Name**

The first line under the “PRODUCT xA” screen displays the name of the product being injected by that pump. The default names are “PRODUCT 1”, “PRODUCT 2”, etc., but you can change these names in the programming functions to reflect the actual name of the product, such as “18-3-6”, or “UAN-32” etc. This function is provided so that it’s easier to keep track of which product is which when monitoring and setting the system.

#### **Rate**

This line reflects the current application rate, in PPM, for the selected product. This will reflect one of two things, depending on the product. In the case of fertilizer, or in fixed rate pH control, it will reflect the PPM that was set through the rate setting programming section (see below). In the case of Auto Adjust™ pH control, this rate will reflect the PPM that has been set on the acid pump by the Auto Adjust™ system. In the latter case, this is the rate that will best achieve your pH goal as determined by the Auto Adjust™ system.

## **Status Info**

The bottom line on the “A” screen displays information mainly used by technicians in troubleshooting. It shows the current stroke setting of the injection pump, the current count value for the flow sensor, and the current Hz setting of the variable frequency drives, if present. The typical user will probably not use this information, except possibly the stroke setting indicator. This reading should always match the stroke knob setting on the respective injection pump.

## **B Screens**

Each supported product will also have a “B” screen, labeled 1B, 2B, 3B etc. The “B” screen contains information about product usage for the respective pump. Its information is as follows:

### **Name**

As shown above in the “A” screen description, this shows the name of the product for the selected pump.

### **Tank**

This line represents the current level in the bulk storage tank for the selected product. This reading uses dead reckoning to determine the level. This means that the system knew how much was in the tank when it started, and it knows how much it has used since that time, therefore, it knows how much is left. This reading will only be accurate if you reset the level when you refill your tanks. (see below on how to do this) Additionally, if you have a pump mechanical failure, such as loss of prime, the system may not put out product, yet will think it did. In this case, your tank reading may be inaccurate. If this happens, you may simply reset the tank to the current level to re-establish your starting point.

### **Used**

The tank level reading above counts down as you use product. The “USED” reading counts up as you use product. This reading functions as an odometer for product used, and may be manually reset at any time. You can use this reading to tell you how much product you used in a month, for example. You could also use this to track the total amount of

a particular product used in a fertility program. See the programming section for an explanation of how to reset this.

## ***The Current pH Screen***

If your system supports pH control, you will have two pH sensors, and the “Current pH” screen. The two sensors in your system are continuously reading the pH of the water as it goes out to the irrigation system. This pH is read post-treatment, so it tells you what the actual pH of the water is going to the crop. The two sensors are right next to each other, and read the same water. This has been implemented as a redundant safety factor. The Auto Adjust™ system uses pH information to make changes to your acid application rate. If the two sensors do not read within .2 pH from one another, the system will not make changes to your application rate. As long as the sensors both average between the High and Low cutout values, the system will run normally at the last known good application rate.

## **pH 1 and pH 2**

These readings simply indicate the current pH read by the two sensors. If you see an up or a down arrow to the left of the pH reading, this indicates that the pH is above the high cutout, or below the low cutout. If this condition is present, you will see the “A” disappear on the “Active Pumps” line of the status display, and you will not inject any acid. Typically, if you see a down arrow, this may be a temporary condition, or your low cutout is set too high. If you see an up arrow, your high cutout may be set below the ambient pH in the lake or reservoir. If you see arrows, and your pH seems to be wrong, your sensors may need to be re-calibrated, or replaced. (see sensor calibration below)

## **The pH Stats Screen**

The pH stats screen displays statistics about your pH control performance. The system constantly monitors the pH sensors, and records the following information.

### **High**

This indicates the all-time high pH recorded for each of the sensors since it was last reset. See the programming functions section for resetting instructions. This reading will usually reflect your ambient pH because during periods of inactivity, your pH will usually drift back up to the ambient value.

### **Low**

This indicates the all-time low pH recorded for each of the sensors since it was last reset. See the programming functions section for resetting instructions. This reading may be shockingly low, but shouldn't be cause for alarm. There are two causes for this:

- 1) If the irrigation system was running at a high GPM, and was rapidly shut down, there may have been enough acid left in the system to pull the pH to a low level. This condition usually will only last for a minute or two, and is harmless.
- 2) If the system was powered down and back up, without resetting the stats, the low value will retain a value near 0.0. This is because on startup, during self-test, the pH sensors will count up from 0.0 to the current value. If the stats were not reset after the power cycle, the low pH will retain that low value of near 0.0.

### **Average**

The average pH reading records the average pH from each of the sensors. This average covers the last hour of operation. If during the last hour, you were running enough water for the system to actively inject, this number should read near your "Target" value. If the system was idle for the last hour, it will usually read near the ambient pH value. This reading can be manually reset in the programming functions, but this is not usually necessary because the average is for only one hour, and is constantly rolling over.

## **Programming Functions**

For most of the readings in the display screens, there are programming functions to allow you to adjust the various settings. To enter programming mode, simply go to the display screen that shows the information you wish to set and press the “SET” key. Once you do this, you will go into a menu screen that allows you to select the item you wish to set.

### ***The Menu systems***

Once you have hit the “SET” key, you will go to one of the various menu screens depending on which display was active when you pressed the key. The menus show you a list of options with an arrow to the left of the top item. Simply use the up and down arrow keys to select the menu item you want, and press “SET”. This will either take you to another menu, or to a setting screen that will allow you to change the information you selected. To exit the menu system, simply select the “EXIT” line at the bottom of each menu, or hit the “ESC” key. If you are several menus deep into the menu system, you may have to select “EXIT” several times to return to the display screen. During programming, the system is idle and will not inject. If you forget to exit the programming mode, the system will automatically jump back to the operating mode after one minute of inactivity. The various menu items are described below, and are grouped by the display screen with which they are associated.

### ***The Status Screen***

By hitting “SET” while in the “STATUS” display, you will see a menu that will allow you to set the following items:

#### **Set System Clock**

The first menu item under the status screen allows you to set the system clock. This should be set accurately so that the product timing functions, and the water recording functions work properly. Once you enter this menu, you will see the following items:

- **Set Current Time**

This allows you to set the current time. Simply use the right and left arrow keys to move the cursor, and use the up and down arrow keys to change the digit value. The cursor will automatically skip over the “:” symbol between the hours and minutes.

NOTE: the time in the Green Scorpion is always entered in 24 hour format: i.e. 13:00 = 1:00pm. When the time has been set, hit the "SET" key to lock it in and return to the menu system. If you end with the "ESC" key, you will return to the menu, but the new setting will not be retained.

- **Set Current Date**

As with the time setting above, use the right and left arrows to move the cursor and use the up and down arrows to change the digit value. The cursor will skip over the "/" characters. Finish with the "SET" key to return to the menu. Not that it matters anymore, but the Green Scorpion™ is fully Y2K compliant, we think it may even be Y3K compliant, but that has yet to be proven.

- **Set Current Day**

This setting allows you to set the current day of the week on the system clock. Use the right and left arrow keys to move the "^^" pointer to the correct day of the week. Finish with the "SET" key to lock it in and return to the main menu.

## **Set Day Change Time**

The day-change setting requires a little explanation. In older models of Green Scorpion™, the system clock used to always roll over the weekday at midnight. When users used the day functions for injection, and had the system programmed to run on Tuesday, but not on Wednesday, for example, a problem arose. Many watering schedules take place at night; for instance, the schedule may start at 8:00pm and end at 3:00am. With the above programming, the system would begin injecting on Tuesday at 8:00pm, but at midnight, the system would stop injection because, it was now Wednesday, an off day. It was the intention of the user, however, to run fertilizer for Tuesday's entire schedule, and be off on Wednesday's schedule. This is not what happened. To remedy this, we have incorporated a programmable day-change time into the current Green Scorpion™. This makes the system change weekdays only at the set time. The default day-change time is 6:00am. This works well for night watering schedules, but can be changed to accommodate your particular needs. Once you enter the day change time menu item, use the right and left arrow keys to move the cursor, and use the up and down arrows to change the digit value. As with the system clock setting, this needs to be set in 24-hour format. Use the "SET" key to lock it in and return to the menu.

## ***The Water Screen***

By hitting “SET” while in the “WATER” display, you will see a menu that will allow you to set the following items:

### **Reset MTD Gals.**

This menu item allows you to reset the Month-to-Date water reading to zero. Caution, if you were recording this reading, and you accidentally reset this reading, there is no way to recover this data. As soon as you select this item, the value will be reset. Don’t go there if you don’t want to reset the value.

### **Reset YTD Gals.**

This menu item allows you to reset the Year-to-Date water reading to zero. Caution, if you were recording this reading, and you accidentally reset this reading, there is no way to recover this data. As soon as you select this item, the value will be reset. As with the MTD reset, don’t go there if you don’t want to reset the value.

## ***The Product “A” Screens***

Hitting “SET” while in any of the product “A” screens, will give you the following menus that allow you to set rate, name, and timing information as follows:

### **Set Rates**

Selecting this menu item will send you to another menu that allows you to make changes to all settings that affect the application rate of the selected product. The menu is as follows:

- **Set Pump Stroke**

This item allows you to set the stroke in the Green Scorpion™ to match the actual setting of the stroke knob on the pump. In order for the Green Scorpion™ to resolve it’s internal math engine, these must match at all times. The pump stroke can be resolved in one of two ways. The first is Auto Stroke™ mode. In this mode, the system will calculate the ideal stroke knob

setting for a particular rate. After you set the rate, the system will tell you to set the knob for XX%. This is the mode that should always be used with our blue motor driven pumps. The second method is manual stroke mode. In this mode, you set the pump, and then set the controls to match your setting. When you set the rate, the controls will resolve the math for your stroke setting. This setting is sometimes useful for the smaller solenoid type pumps for pumping from drums. In addition, this setting MUST be used on the acid pump when Auto Adjust™ is engaged. When you select this menu item, you will see the stroke setting on the left, and the stroke mode on the right. Use the right and left arrows to change the stroke mode, and use the up and down arrows to change the stroke value. NOTE: when you have the stroke mode set to “AUTO”, you cannot change the stroke setting because it will automatically be set when you set the rate. Finish your settings by hitting the “SET” key to return to the menu.

- **Set Rate (Manual)**

This menu item allows you to set the rate directly in PPM by using the up and down arrows. While setting this value, if you hold down the arrow keys, the rate will rapidly roll up and down. Once you are done, hit “SET” to lock it in. If the selected pump is set to Auto Stroke™ mode, you will be instructed to set the pump stroke to a particular value. At this time, you should adjust the pump’s stroke knob to match, then hit “SET” to activate the new rate. You will notice that the rate displayed on the “A” screen after you change this setting. This is because of the way the internal math works out. It is not always possible to hit a selected rate exactly, but the system will set the closest possible rate to your selection.

- **Set Rate (Auto)**

This selection allows you to use our proprietary Rate Assist™ system to calculate your rate. If you are unsure as to the proper setting of a particular fertilizer pump, you can select this from the menu, and the Rate Assist™ system will help you. This method allows you to set your rate in the units of your choosing, for example: Pounds of N per 1000 square feet per year, quarts of liquid per acre per month, ounces of iron per acre per week, etc. To use this system, you will need to know your approximate water usage, your irrigated area measurement, and if you

intend to inject based on weight of nutrient per area, you will need to know the weight of your fertilizer product. Once armed with this information, simply answer the questions on the screen to navigate through the system. Once you have answered each of the questions, the system will calculate the appropriate PPM rate, and will set the selected product to that rate. It is important to understand that the only item that will affect your rate, is the final PPM value calculated by the system. For convenience, the Rate Assist™ system will retain all of the settings from the last time you used it, regardless of on which product it was last used. Think of the Rate Assist™ system, as a big calculator that is shared by all of the products, you answer the questions, it grinds the math, and then applies the rate to the appropriate pump.

### **Set Name/Timing**

These settings allow you to program the product name and set any desired time and date functions for the selected product as follows:

- **Set Product Name**

This item allows you to set the product name as displayed on the display screens. This convenience item helps you keep track of which product is which on the system. The product name can be up to 10 characters and can consist of letters, numbers, and/or symbols. Use the right and left arrow keys to move the cursor, and use the up and down arrow keys to change the character. Numbers and symbols are before the alphabet. If you hold the up and down keys, the characters will roll by quickly. The space character is the first one on the list, if you hold the down arrow key; the symbols will roll by quickly, but will stop on the space character. Once you are satisfied, hit the “SET” key to lock it in and return to the menu system.

- **Time Functions**

These items allow you to set times during which you wish to inject. You should consider your choices carefully however. Keep in mind that it takes a considerable amount of time to load your irrigation system with product, and an equally large amount of time to purge your system. It is generally recommended that you allow your system to inject proportionally all-the-time in

micro doses, unless you have a very specific reason to only inject at certain times. Keep in mind, there are a full set of separate time and date settings for each supported product. Therefore, you could set product 1 to only inject at certain times and days, while you could program product 2 to run whenever there is flow.

**Set On Time**

This menu item sets the time at which injection will start. Like all Green Scorpion™ time settings, it must be set in 24-hour format. Use the left and right arrow keys to move the cursor, and the up and down arrows to change the digit value. Lock it in with “SET”.

**Set Off Time**

This sets the time at which injection will stop. It is set exactly like “Set On Time” above.

**Set Mode**

This setting tells the system whether to abide by the time settings. It has two modes; “ACTIVE” and “IGNORE”. In “ACTIVE” mode, it will obey the time settings, and will only inject at the prescribed times. In “IGNORE” mode, the system will disregard the time settings and will inject whenever there is water flow. Use the up and down arrow keys to change the setting, and use “SET” to lock it in.

- **Date Functions**

Like the time functions above, these settings are used to tell the system on which days of the week to inject. As with the time functions, there are separate settings for each product.

**Set Active Days**

This setting sets on which days injection will take place. Simply move the “^” pointer to the desired day with the right and left arrow keys, and move the day letter into either the “ON” or “OFF” row using the up and down arrow keys. When you are done, hit “SET” to confirm the new settings and return to the menu.

### **Set Mode**

This setting tells the system whether to abide by the day settings. It has two modes; “ACTIVE” and “IGNORE”. In “ACTIVE” mode, it will obey the day settings, and will only inject on the prescribed active days. In “IGNORE” mode, the system will disregard the day settings and will inject whenever there is water flow. Use the up and down arrow keys to change the setting, and use “SET” to lock it in.

### **Jog Pump**

The “Jog Pump” feature allows you to manually run the motor driven pumps that do not have any on board controls. In the case of wall mount solenoid pumps, or acid pumps, this feature will not be available because these pumps have their own manual controls on the units. For motor driven pumps, simply enter this mode, use the up, and down arrows to adjust the motor speed. The speed is represented as a percent value where 100% equals full speed. This feature is useful for priming or testing the larger fertigation pumps. To prevent accidental over-injection, this mode will terminate and return to the menu system after one minute of inactivity. If you want to run the pump longer than one minute, you should periodically hit the up or down arrow key to reset the safety timer. Once you are done, simply hit “SET” or “ESC” to return to the menu system.

## ***The Product “B” Screens***

The product “B” screen programming menus primarily control usage information, as well as the master ON/OFF function. Hit the “SET” key while in this screen to get to the following menus.

### **Master ON/OFF**

The “Master ON/OFF” function allows you to manually control whether a pump will inject. When it is in the “OFF” mode, it will never inject regardless of time, date, or flow conditions. This is the proper way to deactivate pumps when you do not want to use them. To adjust this setting, simply select it from the menu, and use the up and down arrows to change from “ON” to “OFF” or vice versa, then hit “SET”. When a is in the “OFF” mode, you should see it’s number disappear from the “Active Pumps” brackets in the “Status” screen.

### **Reset Tank Level**

The “Reset Tank Level” function allows you to adjust the tank level reading on the “B” screen to match the actual product level in the bulk storage tank. To adjust, simply select this menu item, use the arrow keys to adjust the value to match the tank level, and hit “SET”. Once you return to the “B” screen for the selected product, you should see the “TANK” reading reflect this new value. The system will then count down from there as injection takes place.

### **Reset Used**

This menu item resets the “USED” item on the “B” screen back to zero. This reset takes place as soon as you enter this menu item. If you want to keep this number, record it before making this selection, as there is no going back once this is selected. Once the value is reset, you will get a confirmation message, simply hit any key to return to the menu system.

## ***The Current pH Screen***

The settings below the “Current pH” screen control the various functions of the Auto Adjust™ system, as well as calibration functions for the pH sensors. Simply hit “SET” while this screen is visible to get to the following menu items.

## **Set pH Limits**

The “Set pH Limits” item allows you to change the various pH values that affect the operation of the pH control system in both Auto Adjust™ mode as well as manual mode. They are as follows:

- **Set High Cutout**  
This sets the pH above which injection will be locked out. If your pH ever goes above this value, you will see the up arrow next to the pH on the “Current pH” screen, and injection will be locked out. Since it takes acid to lower the pH, if this lockout is ever engaged, the system will not recover automatically. Therefore, this value should always be set to 1.0 pH above your ambient pH. (the highest your pH will ever be) For example: if your irrigation lake naturally is pH 9.0, this value should be set to 10.0. Once this item is selected, use the up and down arrows to adjust, and hit “SET” to enter the value and return to the menu. This safety is engaged whether or not the Auto Adjust™ system is turned on.
- **Set Low Cutout**  
This sets the pH below which injection will be locked out. If your pH goes below this value, you will see the down arrow next to the pH on the “Current pH” screen, and injection will be locked out. This safety prevents injecting too much acid and bringing your pH to dangerously low values. Once the system hits this lockout, acid will stop injecting, and the pH will rise back up. For optimum operation, this value should be set 0.5 pH points below your desired pH. For instance: if you want your water to be pH 6.5, you should set this to 6.0. Once you have selected this item, use the up and down arrow keys to adjust the value, and hit “SET” to enter and return to the menu system. This safety is engaged whether or not the Auto Adjust™ system is turned on.

- **Set Target Value**

This item sets the pH you want your water to be. This is used as the goal that the Auto Adjust™ system strives to reach. If the Auto Adjust™ system is disengaged, this value will be ignored. Once you are in this menu item, as with the High/Low Cutout settings above, simply use the up and down arrows to adjust the value, and lock it in with “SET”.

## **A.A. ON/OFF**

This menu item turns the Auto Adjust™ system on and off. Once you select this item, use the up and down arrows to change the setting, and hit the “SET” key to enter the value and return to the menu. For more information about the Auto Adjust™ system, see below.

## **A Word about the Auto Adjust™ System**

The Auto Adjust™ system is a WERECON innovation that combines the best of proportional and pH driven pH control systems. It uses a rules based algorithm to ensure that you always get the output pH level you want regardless of your ambient water pH. Whether or not the Auto Adjust™ system is engaged, your pH control system works in a similar fashion to your fertigation; acid is injected at a PPM rate and its output varies with water flow. Using this method ensures that your output pH will be stable at all flow ranges, and the reliability of the flow sensor ensures safe injection. The ultimate output pH is always dictated by your rate setting. High rates produce lower pHs and low rates produce higher pHs. Without the Auto Adjust™ system, to achieve a certain pH, you will have to experiment with various rate settings until you get it right. Then, if your ambient pH changes, you will have to go back through the fine-tuning process again to get the desired pH. When the Auto Adjust™ system is turned on; the system analyzes your statistical output pH every two minutes. Then, if certain safety criteria are met, the Auto Adjust™ system will make changes to your acid PPM in order to find the right setting to achieve the target pH. If the system is engaged, it is pointless to manually set the PPM for product 4 (the acid), because the Auto Adjust™ will just re-set it as it sees fit. While it is engaged, you will see messages every two minutes showing the activities of the Auto Adjust™ system.

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You will see either a message indicating that the rate was changed, or a message indicating why the rate was not changed. Here are some of the messages you may see:

```
***AUTO ADJUST PH***  
Average pH           7.16  
Target pH            6.50  
Adjusted to          34.25ppm
```

This is a standard message that the Auto Adjust system made a change to your rate setting for product 4.

```
***NO AUTO ADJUST***  
Because...  
PH Sensor Deviation
```

This indicates that the rate will not be changed because the two-pH sensors deviate by more than .2 pH. It considers one of the sensors to be incorrect, but it doesn't know which one. You should re-calibrate your sensors if you see this message.

```
***NO AUTO ADJUST***  
Because...  
Insufficient Flow
```

This message is normal. The Auto Adjust™ system will only make changes to the rate if the pump station is operating at least at 25% of maximum flow. Acid will be injected below this flow rate, but changes to the PPM rate will not occur.

```
***NO AUTO ADJUST***  
Because...  
Target Achieved
```

This simply indicates that the rate will not be adjusted, because the Auto Adjust™ system has found the correct rate to produce the desired target pH.

```
***NO AUTO ADJUST***  
Because...  
No pH Change
```

This message indicates that the Auto Adjust™ system attempted to change the rate, but read no pH change from the last rate adjustment, so it will not attempt to adjust the rate again. You may get this message if you run out of acid, or if your acid pump lost prime.

Unless you want to ensure that your acid usage always stays constant regardless of the resultant output pH, you should always leave the Auto Adjust™ feature turned on.

## **Calib. Sensors**

PH sensors, being a laboratory grade instrument, require periodic re-calibration. Unless you have been instructed to do otherwise by WERECON, you should clean and calibrate your sensors at least once per month. The sensors are located in the white capsule behind the Green Scorpion™ panel.

After selecting “Calib. Sensors”, you must select which sensor to calibrate from the next menu. To ensure you are calibrating the correct sensor, trace the sensor cable back to the Green Scorpion™ cabinet. The cable entering the cabinet on the left (facing the keypad) is sensor #1, and the one on the right is Sensor #2. To calibrate the sensors, perform the following steps:

Read all steps carefully before you start.

- 1) You will need Buffer solution of pH 4 and pH 7 (provided with the system)
- 2) Close the ball valve on the main line sample tubing.
- 3) Pour pH 4 buffer solution into a marked, clean disposable cup approximately ½” deep. (you can use the buffer bottle cap for this)
- 4) Prepare pH 7 buffer as in step 3.
- 5) Loosen the nut holding the sensor # 1 in its capsule and remove.
- 6) Clean and rinse the glass surface on the bottom of the sensor with water.
- 7) Pre Rinse the sensor in a stream of pH 7 buffer solution. Do not use the solution in the cup (If you contaminate the buffer solution you will not get a true reading and the system will not function properly.)
- 8) On the control panel, select the Cal Sensor #1 menu item.

- 9) Place sensor in the pH 7 buffer solution in the cup, holding it at an angle.
- 10) Wait for 20-30 seconds, then hit “SET” and wait for next prompt.
- 11) Pre Rinse the same sensor in pH 4 buffer solution as in step 7.
- 12) Place the sensor in the pH 4 buffer solution in the cup, Hit “SET” and wait for the next prompt. The system will give you a span % reading. Sensors reading >75% are acceptable. If you get a reading below 75%, try calibrating it again. If you still are below 75%, the sensor should probably be replaced.
- 13) Replace Sensor #1, and tighten the retainer nut by hand.
- 14) Return to the Calib. menu and Repeat Steps 5 through 13 on sensor #2
- 15) Open the ball valve on the sample tubing from the main line.

## ***The pH Stats Screen***

Hitting “SET” while viewing the pH stats screen will produce the following menu selections:

### **Reset High/Low**

Use this menu item to reset your high and low pH statistics. Both the high and low readings will be reset to the current pH. This will occur immediately upon entering the menu item. If you need these values, record them before going here. Once you select the item, you will get a screen confirming the reset. Simply hit any key to return to the menu system.

### **Reset Average**

Selecting this will reset your average pH statistics. It will clear out all rolling average values, and start averaging the pH at the current time. Resetting this value is not usually necessary due to the fact that the average rolls in a new value every minute for the last hour. As with above, the reset is immediate. Once selected, you will see a confirmation screen. Just hit any key to return to the menus.

## **Troubleshooting**

<b>Problem</b>	<b>Cause</b>	<b>Possible Solution</b>
Blank Display	No Power	Check power switch Check power supply
Garbage on Display	Power Spike	Cycle front panel switch
PH Sensor Reading Stars	Bad Calibration Bad Sensor	Re-calibrate Sensor Replace Sensor
No product usage	Loss of Prime Pump set to be off	Re-Prime Fertilizer Pump Check Master On/Off Check Time/Date Settings
No Acid Usage	Loss of Prime Pump Locked out	Re-Prime Acid Pump Check for “A” on Status display If no “A”, check manual for possible reasons.

## **System Maintenance**

The Green Scorpion™ requires very little in the way of system maintenance. The clear plastic cover should remain closed whenever you are not accessing the front panel to ensure water-tightness. The outer cabinet can be cleaned with a mild cleaner. If it begins to oxidize due to UV exposure, you may apply a plastic dressing such as Armor-All® to help protect the fiberglass.

## **Technical Support**

Should you need technical support, please feel free to contact us at any time as follows:

WERECON Inc.

Inside AZ.	1-623-582-5332
Toll Free	1-888-WERECON (937-3266)
Email	techsupport@werecon.com

We also post technical bulletins on our web site at: [www.werecon.com](http://www.werecon.com)