

**RATIO:GUARD®**  
**MODEL E-1**  
**EC INDICATOR/CONTROLLER**  
**WITH IN-LINE SENSORS**

Price \$4.00

**NOTICE!**

The first time the is turned on it will display **OFF** until a high set point has been entered.

**GETTING TECHNICAL ASSISTANCE**

The **H.E. Anderson Company** is anxious to assist our customers with installation and use of our products. Our technical people are available each weekday from 8:30 a.m. to 4:30 p.m. central time. You may call us toll free at **1-800-331-9620** from anywhere in the U.S.A. and Canada. If no one is available, we will promptly return your call.

Before you call, we suggest that you review this manual. You may find the answer to your question there. But even if you do not, reviewing the manual will help us to help you.

You may also email us at [info@heanderson.com](mailto:info@heanderson.com)

There is some information you should have available when you contact us. You should know the model and serial number of your controller. Also, you should note the program version number (see p. 5). We may not need all this information, but having it available at the start can sometimes save a lot of time and trouble for you.

SERIAL \_\_\_\_\_ PROGRAM VERSION \_\_\_\_\_

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# NOTICE

Improper handling or installation easily and instantaneously damages electronic circuits. If you are not knowledgeable in the proper handling and use of electronic parts, please retain the services of a qualified professional. Damage by improper handling or installation is ***not covered by warranty***. All electronic parts are fully tested before shipment.

Disconnect electrical power before making any changes or connections. ***Do not work on any unit with power applied.***

Here are some general guidelines.

1. Do not touch the pins of integrated circuits or other solid state devices. Always discharge any static electricity from your person by touching a known electrical ground before handling any solid state device or printed circuit board.
2. All devices and cables must be installed properly. Usually there is only one correct orientation and there may not be a physical attribute preventing a reverse connection. Look at the old part or cable and mark it if necessary before removing it. Hold the new part up next to the old part and verify the proper orientation and that the markings on the new part match the old. There is usually a dimple or some other mark indicating pin number one on solid state devices. Ribbon cables have a color line on one side. Other cables usually have wires with different colors. Note with your own markings how the old and new parts are to be installed before removing the old part.
3. Be sure that all pins on integrated circuits engage their corresponding socket before pushing the part into the socket. It is a common occurrence for one or more pins to fold or bend under the part while it is pushed into its socket. It will look like the part is properly installed even though it is not.
4. Make sure that wiring connections do not touch the terminal or connection next to it. If wire or cable must be extended, solder and seal the connection. Do not use wire nuts for data type cables. Separate data and power cables. Do not run them in the same conduit. If they must cross, do so at 90 degrees.

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## 1 INTRODUCTION

The Model E-1 controller is very easy to install and operate. It requires very little maintenance. The only maintenance required is periodic cleaning of the electrode.

This manual covers all aspects of installing and operating this controller. Once your controller is installed and operating, you should not have to refer to the manual unless you have a problem.

This section gives the specifications and describes the features available in your controller. You should also read Section 2 INSTALLATION, Section 3 PROGRAMMING, and Section 4 MAINTENANCE.

It is a good idea to familiarize yourself with Section 5 TESTING AND TROUBLESHOOTING. This will show you how to determine that your controller is operating properly and alert you to possible problems.

Appendix A. provides useful information for checking injectors using common fertilizers. Appendix B. gives examples of typical control wiring.

### 1.1 FEATURES

This section describes the features of your controller. Some of them will be covered in greater detail under other headings.

#### 1.1.1 Numeric Display

The controller has a large four digit LCD display. This display is used to display EC readings setpoints. It can also indicate alarm and error conditions.

#### 1.1.2 Sealed Enclosure

The only openings in the enclosure are where wires enter. The panel is totally sealed and the front cover is gasketed.

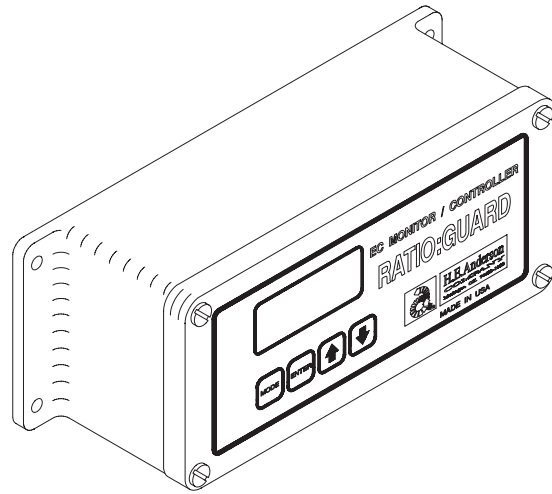


Figure 1  
The E-1 Controller

## SPECIFICATIONS Model E-1

### Range \*\*

0.01–5.00 millisiemens/cm

### Accuracy\*

Within 0.01 millisiemen @ 77°F

### Temperature Compensation

Automatic 32-100°F  
(2% per °C slope)

### Display

0.7 in. LCD numeric

### Control Outputs

10 amp. SPDT contact outputs for both high and low alarms.

### Enclosure

Water resistant with gasketed cover;  
Sealed front panel

### Power Requirements

120 VAC  
240 VAC (With **A** suffix on model no.)

### Setpoint Memory Retention

Greater than seven days with zero power.

\* If properly calibrated using a standard solution.

\*\* 1 millisiemen (millimho) =  
1000 microsiemens (micromhos)

## Model E-1 EC Control

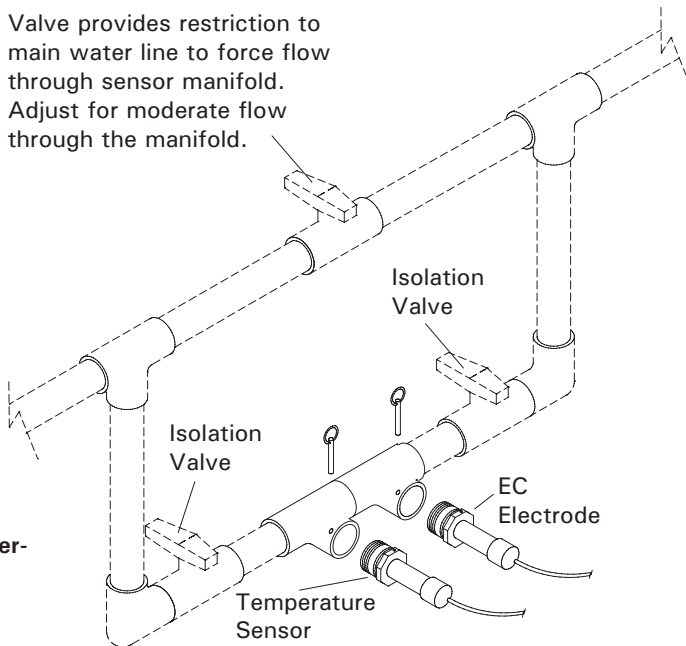
Parts shown with dashed lines are not included with manifold.

Install so sensors insert from side.

Manifold accepts 2" schedule 80 PVC pipe.

Main water line may be any size.

Valve provides restriction to main water line to force flow through sensor manifold. Adjust for moderate flow through the manifold.



**NOTE: Be certain both isolation valves are open during normal operation. Otherwise the unit will not operate properly.**

Figure 2

Installing the Sensor Manifold

### 1.1.3 Keypad

The four key pad allows easy viewing and setting of setpoints.

### 1.1.4 Memory Backup

The controller memory is backed up by a special supercap device. If power is lost, controller operation will stop, but setpoints will be retained. When power is restored the unit will resume functioning normally.

### 1.1.5 Easy Insertion Sensors

The sensor fitting is design for easy maintenance. Sensors are easily removed for cleaning.

### 1.1.6 Sensor Mounted Signal Conditioners

The EC electrode and temperature sensor both have signal conditioners mounted inside the sensor. This means that high level digital signals are sent to the controller. This greatly reduces cable related problems and increases accuracy. Sensors come with twenty-five feet of cable. Cables may be extended if necessary, with no effect on performance.

### 1.1.7 Circuit Protection

The controller includes some protection against external voltage spikes and other problems. However we cannot guarantee that it will be protected from all the strange things that happen in the real world. You should follow the recommendations given in Section 2.3.4 to provide maximum protection.

---

## 2 INSTALLATION

You will be installing the sensors and the control box, as well as any external alarm circuits.

Each sensor is prewired with twenty-five feet of cable. Select a convenient location which is within reach of sensor location. The location should also be close to a power source.

It should be out of direct sunlight, protected from extreme heat, and be free of vibration. The enclosure is water resistant and the unit is well sealed against water spray. However, you should choose a location where it will not be subjected to constant water spray or spray from the bottom.

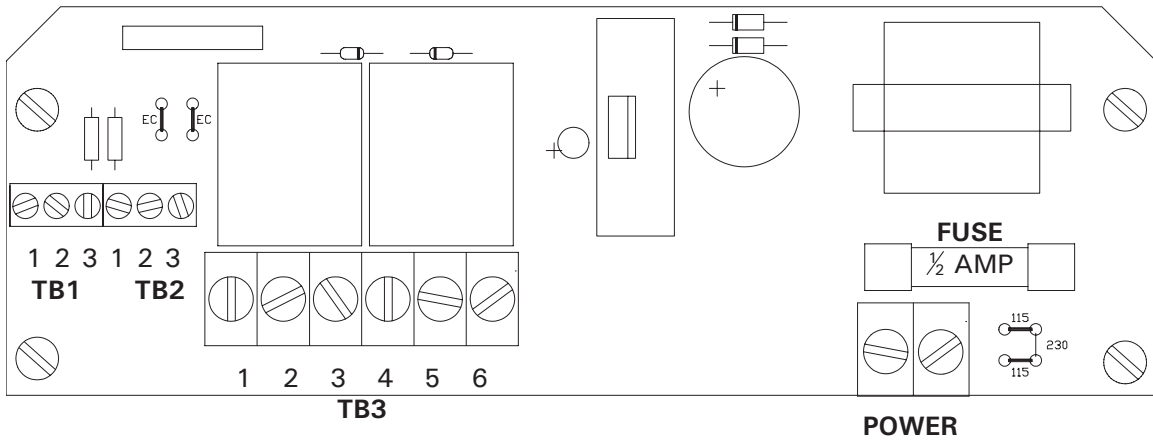


Figure 3  
The Terminal Board

| Sensor Connections |              |           |              |                |           | Relay Connections |      |        |                 |      |        |
|--------------------|--------------|-----------|--------------|----------------|-----------|-------------------|------|--------|-----------------|------|--------|
| TB1 – EC           |              |           | TB2 – Temp.  |                |           | TB3               |      |        |                 |      |        |
| 1                  | 2            | 3         | 1            | 2              | 3         | 1                 | 2    | 3      | 4               | 5    | 6      |
| Gnd<br>(5 V)       | EC<br>Signal | +5<br>VDC | Gnd<br>(5 V) | Temp<br>Signal | +5<br>VDC | High Alarm Relay  |      |        | Low Alarm Relay |      |        |
| Shield             | Black        | Red       | Shield       | Black          | Red       | N.C.              | N.O. | Common | N.C.            | N.O. | Common |

## 2.1 SENSOR INSTALLATION

A recommended installation of the sensor manifold is shown in Figure 2. You can vary the installation to suit your needs, but you should remember the following points:

1. The sensors should be installed downstream from the injector and blending tank (if present) so the treated water will be thoroughly mixed.
2. You should have isolation valves to allow the electrode to be easily removed while leaving the water on.
3. The sensors should be installed in a bypass for maximum convenience.
4. If installed in a bypass, you must have some restriction in the main water line to insure water flow past the sensors.

5. The fittings should be installed so the EC electrode and temperature sensor will insert horizontally.

## 2.2 MOUNTING THE ENCLOSURE

Mount the unit securely, using the four holes located in the flanges.

## 2.3 ELECTRICAL CONNECTIONS

Your controller comes prewired with all sensor connections already made. Normally the only wiring you will do will be to external control or alarm circuits.

You may wish to use conduit for the sensor and power cables. The entrance assemblies may be removed and replaced by conduit connectors if desired. If you do this, you will need to disconnect the cables and reconnect them later.

## Model E-1 EC Control

### 2.3.1 Sensor Connections

The EC and temperature sensors are prewired. Connection information is given in case you should ever need to replace or rewire the sensors. Figure 3. shows the terminal circuit board and sensor terminal blocks. Table 1. details the sensor connections.

### 2.3.2 Control Relay Connections

The control relays are clearly labeled as to alarm function and with common (**C**), normally open (**NO**) and normally closed (**NC**) contacts brought out to the terminal block. Contacts are rated at ten amperes. For ease of wiring, use the smallest wire suitable to the current required by the external circuit. Appendix B. shows the connections and some typical control applications.

**WARNING: Be certain all power is off when working with the external circuit connections.**

### 2.3.3 Power Connections

The controller comes with a power cord attached. If you wish to use conduit, remove the power cord and entrance assembly. Refer to Figure 2-2 when reconnecting power connections.

**WARNING: Be certain power is off when working with the power connections.**

### 2.3.4 Circuit Protection

We have done our best to design this product to stand up to adverse electrical supplies. The circuit is fused and we have included MOV devices to suppress voltage spikes coming in over the AC line. However, MOV's cannot protect under all conditions and do not last forever. Each time the MOV takes a really big spike it is damaged a little. After enough spikes it will fail.

If you really want to provide the best protection for your controller you should buy a spike (surge) suppressor (you can get them

at Radio Shack). This is a device that goes between the line cord and wall socket.

This will help. However, if you have a big storm that damages any of your other equipment, you probably should replace your spike suppressor; it may have been damaged by the storm even though it may appear to be okay.

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## 3 PROGRAMMING & OPERATION

The controller is designed for easy operation. The first time the controller is plugged in the control function will be off. This section tells how to turn control on by entering high and low setpoints and how to display them.

---

### 3.1 DISPLAY FUNCTIONS

The normal display is the EC value. If there is a high alarm condition the reading will also show a blinking **H** in the left most position. Conversely, if there is a low alarm it will show a blinking **L**.

#### 3.1.1 Setpoint Display

Pressing the **↑** key will show the high setpoint, which is designated by an **H** in the first position, followed by the value. Like wise, pressing the **↓** key will show the low setpoint which is designated by **L**.

#### 3.1.2 Program Version

Pressing both the **↑** and **↓** keys will display the controller program software version. This information is only needed when requesting technical help.

---

### 3.2 THE CONTROL FUNCTION

If the control function is not turned on, the controller will serve as an indicator only. Control is turned on by entering a high setpoint and may be turned off by setting the high setpoint to 0.

### 3.2.1 Setting the High Alarm Setpoint

To set the high alarm setpoint you must first display it by pressing the **↑** key. The setpoint will remain on the display for a short time after releasing the key. While the setpoint is still on the display press both the **MODE** and **ENTER** keys. Hold them until the setpoint display starts to blink. This means you are in the change mode and the value can be changed using the **↑** and **↓** keys. Press either key to move the setpoint to the desired value. If a key is held depressed, the setpoint will change slowly at first, then will speed up. Releasing the key will cause it to revert to slow changing. You may set it to any value between 0.01 and 5.00.

When the setpoint is at the right value, you may press **ENTER** to go back to the regular EC display, or you may simply let the display blink until it automatically goes back to the normal display.

### 3.2.2 Setting the Low Alarm Setpoint

The low setpoint is set exactly as the high setpoint by pressing the **↓** key and then the **MODE** and **ENTER** keys to enter the change mode. You will notice that there is a limit as to how high the setpoint will go. The low setpoint is limited to at least 3% below the high setpoint. This is to insure a minimum differential between high and low setpoints.

If the high setpoint is subsequently lowered, the low setpoint will automatically be lowered as necessary to keep this minimum percentage differential.

---

## 4 MAINTENANCE

The only maintenance required is periodic cleaning of the EC electrode. The EC electrode is calibrated at the factory. It should not need to be recalibrated. It does however need to be kept clean to provide accurate readings. You may find it helpful to turn off EC control during the following cleaning procedure to eliminate EC alarms:

1. Close the bypass isolation valves.
2. Remove the retaining pin and carefully remove the electrode from the sensor fitting.
3. Clean the electrode. Use a Scotch Brite® pad or something equivalent to clean scale and dirt from the electrodes. Do not use coarse sandpaper or other coarse abrasives. This can change the surface area of the electrodes and can alter the cell constant. This will result in inaccurate readings. If one or both of the electrode elements is pitted or has otherwise degenerated, the electrode should be replaced.
4. Reinstall the electrode and open the isolation valves.

---

## 5 TESTING & TROUBLESHOOTING

We have designed your controller to be as trouble free as possible. When your controller is shipped from the factory all sensor cables are wired and the sensors are checked for proper operation. Although this section refers to sensor wiring problems, you should not have to consider these as possible problems unless you have rewired or replaced your sensors.

This section will help you pinpoint problem areas. Once you have located the source of a problem you will be able to easily replace the faulty assembly.

---

### 5.1 THE PROGRAM VERSION

The program version tells which software is installed in your controller. If you should need to call the factory for assistance, we will need to know your program version. Press the **↑** and **↓** keys together to display the program version. You may record this information in the very front of this manual on the title page.

## 5.2 THE DISPLAY

You can determine some problems from observing the display. In normal operation there should always be something showing on display. If there isn't, you can be certain something is wrong.

First check to be sure there is power to the controller.

If there is power, you will need to check the fuse. You will need to remove the front panel to check the fuse. The fuse is located behind the shield in the lower right side of the rear circuit board.

**WARNING: Before opening the enclosure and doing anything inside you should remove power from the unit and also remove power from any external control circuits.**

Inspect both the control circuit board (mounted to the cover) and terminal circuit board (mounted to the back of the enclosure) for burned or discolored spots. These are indications of component failures and indicate a serious problem. See sections 7.0 and 8.0 for information on repairs and service.

If the boards appear to be OK, remove the shield and check the fuse.

If it is bad replace it with the same type and rating ( $\frac{1}{2}$  amp.). Now follow the following procedure to locate the problem. Just let the front panel hang by the cable. Follow proper safety precautions during this procedure.

**WARNING: Use of larger than rated fuses will void the warranty.**

1. Disconnect both the EC and temperature sensors at the sensor terminal blocks.
2. If the problem still exists, disconnect both red wires from terminal blocks TB1 and TB2.
3. Apply power for a short time and then disconnect it. If the fuse blew then the problem is with the controller.

4. If the fuse did not blow, connect the first red wire back to terminal 3 of TB1 and again apply power for a short time. If the fuse blew, the EC sensor or its cable is faulty and needs to be replaced.
5. If the fuse still did not blow, connect the other red wire back to terminal 3 of TB2 and again apply power for a short time. If the fuse blew, the temperature sensor or its cable is faulty and needs to be replaced.

**NOTE: If the temperature sensor is faulty, you may disconnect it and operate your controller without it. It will still work, but without automatic temperature compensation.**

If you found a problem during this procedure, contact your distributor or call the factory for help. See section 8.

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## 5.3 ERROR CONDITIONS

You will get the **Err** indication when:

1. There is no EC electrode installed or the electrode is improperly wired.

*Check wiring carefully.*

2. The electrode is wired to the wrong terminals.

*Be sure the electrode is not connected to the temperature sensor terminals.*

3. The EC signal conditioner possibly has failed.

*The controller cannot detect problems with the electrode itself, but it can detect when the signal conditioner, which is mounted within the electrode housing, is not working properly.*

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## 5.4 OVERRANGE INDICATION WHICH WILL NOT CLEAR

A continuous overrange indication may be caused by a short in the electrode. Remove

the electrode from the water line. If the alarm does not clear, the problem is with the electrode. If the alarm does clear, then there is a true overrange condition.

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## 5.5 EXTERNAL ALARM CIRCUIT PROBLEMS

We cannot offer simple solutions for problems with the alarm circuits wired up to our product. You should contact an electrician or other qualified person for these problems.

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## 5.6 LOSS OF PROGRAMMING

Loss of programming is indicated by the display showing control is off. Control setpoints will need to be reentered.

Loss of programming can only occur if there is an extended period (many days) of no power to the unit or failure if the memory backup system during a no power condition.

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## 5.7 OTHER PROBLEMS

Our technical staff can help with other problems you may experience. We are also happy to answer any questions about our products.

Phone: 800-331-9620 (U.S.A. and Canada)  
918-687-4426.

Our hours are 8:30 a.m. to 4:30 p.m.  
central time, weekdays.

Email: [info@heanderson.com](mailto:info@heanderson.com)

FAX: 918-682-3342

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## 6 REPAIR

Repairs are made by replacement of complete circuit board assemblies or replacement of the complete front panel assembly. This should be done only by an authorized repair person or under the direction of our technical staff.

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## 7 FACTORY SERVICE

Should you require service for your Ratio:Guard® controller, the H.E. Anderson Co. Offers the following factory service options:

1. You may return your entire control or front panel assembly to us, prepaid, for repair. The charge will be a fixed labor charge plus parts and return postage. Charges for units under warranty will be for transportation only. Refer to our Limited Warranty in the back of this manual for details of the warranty. Turn around time in our plant is normally one day.
2. We may be able to speed repair by sending you a factory rebuilt exchange unit; after you receive it you can return the faulty unit. Contact us for details on this service. (This option requires established credit or a credit card number)

Should you need to return your unit to us our shipping address is:

**H.E. Anderson Company**  
**2100 Anderson Drive**  
**Muskogee, Oklahoma 74403 USA**



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## APPENDIX A.

### Conductivity Tables

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**TABLE I - Conductivities given in millisiemens  
Peters Single Element Fertilizer Components**

| ppm<br>Nitroen | Ammonium<br>Nitrate<br>NH <sub>4</sub> NO <sub>3</sub><br>34%N | Ammonium<br>Sulfate<br>NH <sub>4</sub> SO <sub>4</sub><br>21%N | Sodium<br>Nitrate<br>NaNO <sub>3</sub><br>16%N | Potassium<br>Nitrate<br>KNO <sub>3</sub><br>14%N | Calcium<br>Nitrate<br>CaNO <sub>3</sub><br>15.5%N | Epom<br>Salts<br>MgSO <sub>4</sub><br>10%Mg |
|----------------|--|--|--|--|---|---|
| 50             | .23  | .45  | .43  | .48  | .37   | .38   |
| 75             | .35  | .68  | .65  | .71  | .55   | .56   |
| 100            | .46  | .90  | .86  | .95  | .74   | .75   |
| 125            | .58  | 1.13   | 1.08   | 1.18   | .92   | .94   |
| 150            | .69  | 1.35   | 1.29   | 1.42   | 1.11  | 1.13  |
| 175            | .81  | 1.58   | 1.51   | 1.66   | 1.30  | 1.31  |
| 200            | .92  | 1.80   | 1.72   | 1.90   | 1.48  | 1.50  |
| 225            | 1.04   | 2.03   | 1.94   | 2.14   | 1.66  | 1.69  |
| 250            | 1.15   | 2.25   | 2.15   | 2.37   | 1.85  | 1.88  |
| 275            | 1.27   | 2.48   | 2.37   | 2.61   | 2.04  | 2.06  |
| 300            | 1.38   | 2.70   | 2.58   | 2.85   | 2.22  | 2.25  |
| 350            | 1.61   | 3.15   | 3.01   | 3.32   | 2.59  | 2.63  |
| 400            | 1.84   | 3.60   | 3.44   | 3.80   | 2.96  | 3.00  |
| 450            | 2.07   | 4.05   | 3.87   | 4.27   | 3.33  | 3.38  |
| 500            | 2.30   | 4.50   | 4.30   | 4.75   | 3.70  | 3.75  |
| 550            | 2.53   | 4.95   | 4.73   | 5.22   | 4.07  | 4.13  |
| 600            | 2.76   | 5.40   | 5.16   | 5.70   | 4.44  | 4.50  |
| 650            | 2.99   | 5.85   | 5.59   | 6.17   | 4.81  | 4.88  |
| 700            | 3.22   | 6.30   | 6.02   | 6.65   | 5.18  | 5.25  |
| 750            | 3.45   | 6.75   | 6.45   | 7.12   | 5.50  | 5.63  |
| 800            | 3.68   | 7.20   | 6.88   | 7.60   | 5.92  | 6.00  |
| 850            | 3.91   | 7.65   | 7.31   | 8.07   | 6.29  | 6.38  |
| 900            | 4.14   | 8.10   | 7.74   | 8.55   | 6.66  | 6.75  |
| 950            | 4.37   | 8.55   | 8.17   | 9.02   | 7.03  | 7.13  |
| 1000           | 4.60   | 9.00   | 8.60   | 9.50   | 7.40  | 7.50  |

The information given here is provided courtesy of Peters Fertilizers. We hope it will be helpful. It is based on our best knowledge, and we believe it to be true and accurate. Neither H.E. Anderson Co. nor Peters Fertilizers assumes any responsibility for the use of these statements, nor do we intend them as a recommendation which would infringe on any patent or copyright. Inclusion of these data does not constitute an endorsement by H.E. Anderson Co. of Peters brand products over competing brands.

**TABLE II - Conductivities are given in millisiemens  
Peters Mixed Soluble Fertilizer Analysis**

| ppm  | 20-20-20              |         | 20-5-30 | 25-5-20 | 25-10-10<br>30-10-10 | 15-16-17            |                      |
|------|-----------------------|---------|---------|---------|----------------------|---------------------|----------------------|
|      | Nitro-gen<br>20-19-18 | 20-2-20 |         |         |                      | 5-11-26<br>Hydrasol | 15-11-29<br>15-20-25 |
| 50   | .23                   | .31     | .22     | .12     | .09                  | 1.00                | .32                  |
| 75   | .34                   | .47     | .33     | .18     | .14                  | 1.50                | .48                  |
| 100  | .45                   | .62     | .44     | .24     | .18                  | 2.00                | .65                  |
| 125  | .56                   | .78     | .56     | .30     | .23                  | 2.50                | .82                  |
| 150  | .68                   | .93     | .69     | .36     | .27                  | 3.00                | 1.00                 |
| 175  | .79                   | 1.09    | .81     | .43     | .32                  | 3.50                | 1.20                 |
| 200  | .90                   | 1.24    | .94     | .51     | .36                  | 4.00                | 1.40                 |
| 225  | 1.01                  | 1.40    | 1.07    | .57     | .41                  | 4.50                | 1.56                 |
| 250  | 1.13                  | 1.55    | 1.20    | .62     | .47                  | 5.00                | 1.72                 |
| 275  | 1.24                  | 1.71    | 1.32    | .71     | .51                  | 5.50                | 1.91                 |
| 300  | 1.35                  | 1.86    | 1.43    | .80     | .54                  | 6.00                | 2.10                 |
| 350  | 1.58                  | 2.17    | 1.66    | .92     | .64                  | 6.50                | 2.45                 |
| 400  | 1.80                  | 2.48    | 1.90    | 1.04    | .74                  | 7.00                | 2.80                 |
| 450  | 2.03                  | 2.79    | 2.15    | 1.18    | .85                  | 7.50                | 3.15                 |
| 500  | 2.25                  | 3.10    | 2.40    | 1.32    | .96                  | 8.00                | 3.50                 |
| 550  | 2.48                  | 3.41    | 2.61    | 1.45    | 1.06                 | —                   | 3.84                 |
| 600  | 2.70                  | 3.72    | 2.82    | 1.58    | 1.16                 | —                   | 4.18                 |
| 650  | 2.93                  | 4.03    | 3.03    | 1.71    | 1.26                 | —                   | 4.52                 |
| 700  | 3.15                  | 4.34    | 3.24    | 1.84    | 1.36                 | —                   | 4.80                 |
| 750  | 3.38                  | 4.65    | 3.45    | 1.98    | 1.46                 | —                   | 5.20                 |
| 800  | 3.60                  | 4.96    | 3.66    | 2.11    | 1.56                 | —                   | 5.54                 |
| 850  | 3.83                  | 5.27    | 3.87    | 2.24    | 1.66                 | —                   | 5.88                 |
| 900  | 4.05                  | 5.58    | 4.08    | 2.37    | 1.76                 | —                   | 6.22                 |
| 950  | 4.28                  | 5.89    | 4.29    | 2.50    | 1.86                 | —                   | 6.56                 |
| 1000 | 4.50                  | 6.20    | 4.50    | 2.63    | 1.96                 | —                   | 6.90                 |

The information given here is provided courtesy of Peters Fertilizers. We hope it will be helpful. It is based on our best knowledge, and we believe it to be true and accurate. Neither H.E. Anderson Co. nor Peters Fertilizers assumes any responsibility for the use of these statements, nor do we intend them as a recommendation which would infringe on any patent or copyright. Inclusion of these data does not constitute an endorsement by H.E. Anderson Co. of Peters brand products over competing brands.

**TABLE III - Conductivities are given in millisiemens  
Peters Mixed Soluble Fertilizer Analysis**

| ppm<br>Nitrogen | 15-15-15 | 15-10-30 | 15-30-15 | 15-0-15 | 16-4-12 | 21-7-7<br>Acid | 21-7-7<br>Neutral |
|-----------------|----------|----------|----------|---------|---------|----------------|-------------------|
| 50              | .30      | .32      | .31      | .36     | .32     | .28            | .21               |
| 75              | .46      | .51      | .47      | .55     | .48     | .42            | .32               |
| 100             | .62      | .70      | .62      | .74     | .64     | .56            | .42               |
| 125             | .79      | .87      | .78      | .94     | .81     | .70            | .53               |
| 150             | .96      | 1.05     | .93      | 1.15    | .98     | .84            | .63               |
| 175             | 1.13     | 1.23     | 1.09     | 1.35    | 1.14    | .98            | .74               |
| 200             | 1.30     | 1.41     | 1.24     | 1.55    | 1.31    | 1.12           | .84               |
| 225             | 1.47     | 1.59     | 1.40     | 1.72    | 1.47    | 1.26           | .95               |
| 250             | 1.65     | 1.78     | 1.55     | 1.90    | 1.62    | 1.40           | 1.05              |
| 275             | 1.82     | 1.95     | 1.71     | 2.09    | 1.81    | 1.54           | 1.16              |
| 300             | 1.98     | 2.12     | 1.86     | 2.28    | 2.00    | 1.68           | 1.26              |
| 350             | 2.31     | 2.45     | 2.17     | 2.64    | 2.29    | 1.96           | 1.47              |
| 400             | 2.65     | 2.78     | 2.48     | 3.00    | 2.58    | 2.24           | 1.68              |
| 450             | 2.98     | 3.12     | 2.79     | 3.34    | 2.93    | 2.52           | 1.89              |
| 500             | 3.25     | 3.46     | 3.10     | 3.68    | 3.28    | 2.80           | 2.10              |
| 550             | 3.55     | 3.76     | 3.41     | 3.98    | 3.57    | 3.08           | 2.31              |
| 600             | 3.85     | 4.06     | 3.72     | 4.28    | 3.86    | 3.36           | 2.52              |
| 650             | 4.15     | 4.36     | 4.03     | 4.58    | 4.15    | 3.64           | 2.73              |
| 700             | 4.45     | 4.66     | 4.34     | 4.88    | 4.44    | 3.92           | 2.94              |
| 750             | 4.75     | 4.95     | 4.65     | 5.20    | 4.72    | 4.20           | 3.15              |
| 800             | 5.05     | 5.25     | 4.96     | 5.50    | 4.98    | 4.48           | 3.36              |
| 850             | 5.35     | 5.55     | 5.27     | 5.80    | 5.24    | 4.76           | 3.57              |
| 900             | 5.65     | 5.85     | 5.58     | 6.10    | 5.50    | 5.04           | 3.78              |
| 950             | 5.95     | 6.15     | 5.89     | 6.40    | 5.76    | 5.32           | 3.99              |
| 1000            | 6.25     | 6.45     | 6.20     | 6.70    | 6.00    | 5.60           | 4.20              |

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# **RATIO:GUARD® LIMITED WARRANTY**

## **WHAT IS COVERED**

The H.E. Anderson Company of Muskogee, Oklahoma, will make any necessary repairs and/or replace any parts of any Ratio:Guard® alarm/controller made necessary because of defects in materials or workmanship for the periods specified below. Warranty repairs and/or replacements will be performed without charge to the owner by H.E. Anderson Company within a reasonable time after prepaid delivery of the alarm/controller to the H.E. Anderson Company, 2100 Anderson Drive, Muskogee, Oklahoma 74403.

## **WARRANTY PERIODS**

|                                     |  |
|-------------------------------------|--|
| <b>CONTROL ELECTRONICS</b>          | Fifteen months from date of manufacture. |
| <b>EC &amp; TEMPERATURE SENSORS</b> | Fifteen months from date of manufacture. |
| <b>pH &amp; ORP SENSORS</b>         | Six months from date of manufacture.     |

## **WHAT IS NOT COVERED**

Repairs and/or replacements of parts caused by failure to follow prescribed installation instructions and limitations issued by H.E. Anderson Company. In addition, this warranty does not cover service adjustments, repairs, or replacements caused by misuse, negligence, alteration, accident, or lack of specified maintenance. Specifically, improper handling of pH sensors, including letting the electrode dry out, will void the warranty on the sensor. This warranty does not cover components used by, but not manufactured by H.E. Anderson Company, in the manufacture of said alarm/controller, except to the extent of said component manufacturer's warranty.

This warranty specifically excludes liability for consequential damages or for charges for labor or expense in making repairs or adjustments, or losses of time or inconvenience.

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This warranty gives you specific legal rights and you may also have other legal rights which may vary from state to state. H.E. Anderson Company does not authorize any person to create for it any other obligation or liability in connection with these products. ANY IMPLIED WARRANTY APPLICABLE TO THESE PRODUCTS IS LIMITED TO THE DURATION OF THIS WARRANTY. H.E. Anderson Company shall not be liable for consequential damages resulting from breach of this written warranty.

NOTE: Some states do not allow limitation on how long an implied warranty will last or the exclusion of limitations of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

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## **WHAT TO DO IF THERE IS A QUESTION REGARDING WARRANTY**

- 1) Promptly notify the consumer advisor at H.E. Anderson Company by telephone.
- 2) Confirm the report in writing to the H.E. Anderson Company, stating the circumstances surrounding the problem.

## **PURCHASER'S OBLIGATION**

- a) Purchaser must give H.E. Anderson Company immediate written notice on discovery of defect.
- b) Purchaser must pay for shipment of the defective product to the H.E. Anderson Company, 2100 Anderson Drive, Muskogee, Oklahoma 74403.