UNPACKING

Please open and inspect your package upon receipt. Your package was packed with great care and all the necessary packing materials to arrive to you undamaged. If you do find an item that is broken or damaged, you must contact the delivering carrier to report the claim.

RATIO:GUARD®

Model E-1S

EC Monitor

GETTING TECHNICAL ASSISTANCE

The H.E. Anderson Company is dedicated to assisting our customers with installation and use of our products. Our technical staff are available each weekday from 8:30am to 4:30pm 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 here. But even if you do not, reviewing the manual will help us to help you.

There is some information you should have available when you call. You should know the model and serial number of your monitor. You should also have the program version number (See page 2.) 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.

If you need an additional owners manual for any H.E. Anderson Company product, please visit our website at http://heanderson.com/manuals.php

If for any reason you should need to return an item to us, please complete and include the Return Information Form, on our website at http://www.heanderson.com/RMAform-web.pdf

SERIAL _____ PROGRAM VERSION _____

H.E.Anderson
COMPANY
2100 Anderson Drive
Muskogee, OK 74402-2440
1-800-331-9620

This manual is organized to put the most often referred to information in the front for easier access. Information on installation and servicing follows.

Note: “Electrode” and “sensor” are used interchangeably within these instructions.

Display Functions

Normal Display

The normal display is the EC value (millisiemens). 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**.

Setpoint Display

Pressing the ⬆ key will display the high alarm setpoint, which is designated by an **H** in the first position, followed by the value. Like wise, pressing the ⬇ key will display the low alarm setpoint which is designated by **L**.

Version Number Display

When power is applied to the unit it will briefly display the program version number, for example **E107**. You should note this number and write it down along with the serial number on the title page of this manual. We may ask you for your program version if you should you call us for assistance.

Alarm Functions

The monitor is designed for easy operation. The first time the monitor is plugged in the alarm function will be off.

If the alarm function is not turned on, the monitor will serve as an indicator only. *Alarm operation is turned on by entering a high setpoint and may be turned off by setting the high setpoint to 0*.

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 displayed, 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 normal EC display, or you may let the display blink until it automatically goes back to the normal display.

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 maximum low setpoint is limited to a minimum of 3% below the high setpoint.

Cleaning the EC Electrode (Sensor)

The monitor requires very little maintenance. The temperature sensor requires no maintenance.

The EC electrode is calibrated at the factory. It should not need to be re-calibrated. It does however need to be kept clean to provide accurate readings. In some installations the EC electrode will become coated or fouled more quickly than in others, depending on water quality. You should establish a regular cleaning schedule based on personal experience with your system.

You may find it helpful to turn off EC alarms during the following cleaning procedure to eliminate EC alarms.

WARNING! Removing a sensor from a pressurized water line is dangerous and can cause personal injury plus water damage.

WARNING! Removing a sensor from a closed water line can be difficult .

You should shut off the water (close the bypass valves) and open a valve to atmosphere or remove the seal-screw on the side of the sensor tee before <u>slowly</u> removing the electrode.

Electrode Cleaning Procedure

- Close the bypass isolation valves.
- Remove the retaining U-pin and carefully remove the electrode from the sensor fitting.
- 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.
- Reinstall the electrode, replace the seal-screw or close the drain valve, and open the isolation valves.

Installation

- The EC electrode and temperature sensors each have signal conditioners contained within the sensor. This means that high level digital signals are sent to the monitor. This greatly reduces cable related problems and increases accuracy. Sensors come with fifteen feet of cable. Cables may be extended if necessary, with no effect on performance.
- Both monitor and signal conditioner should be mounted out of direct sunlight and protected from direct spray. The monitor enclosure and front panel are not UV resistant.

The recommended installation is shown in *Figure 1*. It can be varied to suit your needs, but remember the following:

- The sensor tees should be installed in a bypass with isolation valves so they can be removed without shutting off the water flow.
- The bypass for the tees should always be below the main water line, especially if a pH electrode is also installed in the bypass.
- You must have some restriction in the main water line to insure water flow past the electrode.
- It is recommended that the EC sensors be installed horizontally as shown in *Figure 1.*
- A sample valve (a hose bib will do) installed as shown in Figure 1. is a great convenience. It can also make electrode removal much easier by opening it to allow air to enter the line when removing the electrode.
- The bypass should be flushed before inserting the sensors.

Alarm Relay Connections

Caution! Disconnect power to the monitor and alarm circuits before removing the front panel of the monitor.

The alarm relays are labeled in Table 1 as to alarm function, with Common, normally open (N.O.) and normally closed (N.C.) 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.

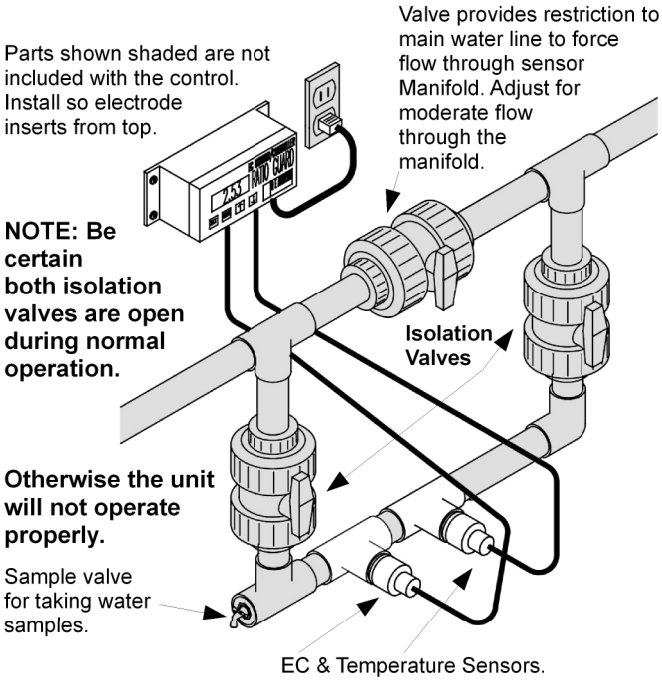

Figure 1. Installing the Controller

Table 1 – Terminal Board Connections											
Caution! Disconnect power before removing front panel.											
TB1 – EC Sensor			**TB2 – Temp. Sensor**			**TB3 – Alarm Relay Connections**					
1	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**4**	**5**	**6**
Ground (5 v)	EC Signal	+5 VDC	Ground (5 v)	Temp. Signal	+5 VDC	High Alarm Relay			Low Alarm Relay		
Black	White	Red	Black	White	Red	N.C.	N.O.	Common	N.C.	N.O.	Common

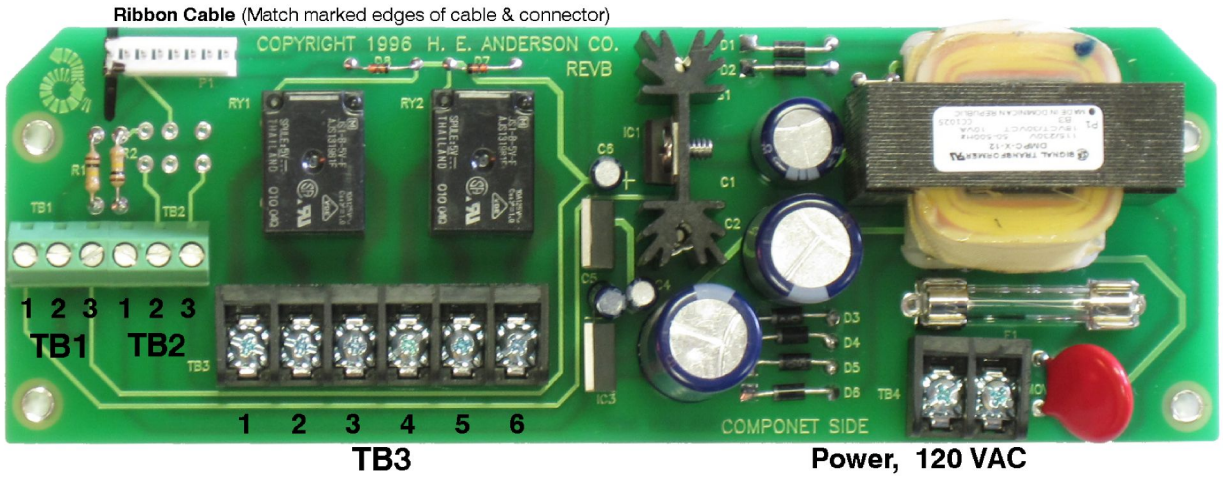

Photo 1. Back Board for Model E-1S, 120 VAC. See Table 1.

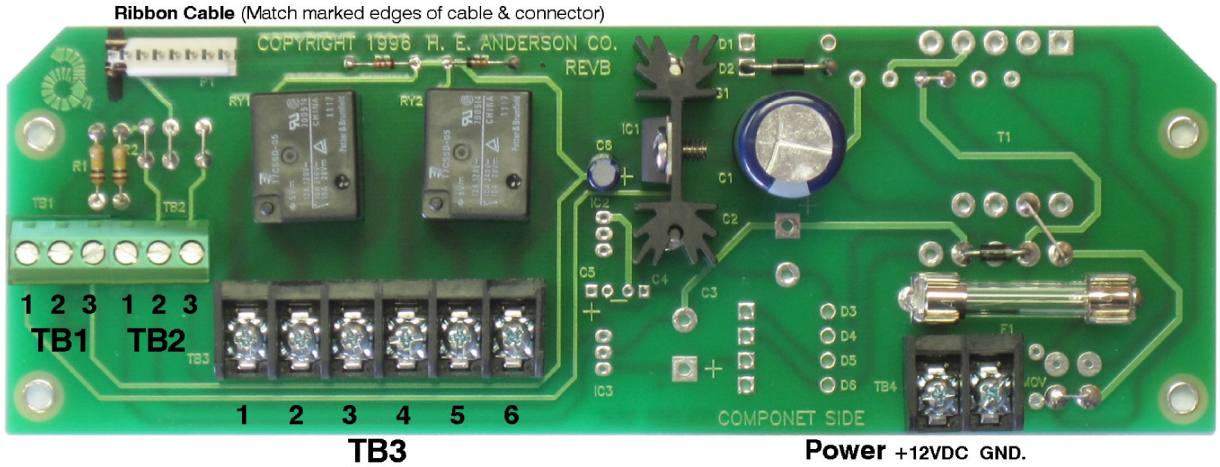

Photo 2. Back Board for Model E-1D, 12 VDC. See Table 1.

Power Connections

Model E-1S (120 VAC)

The monitor comes with a power cord. If you wish to use conduit, remove the power cord and entrance assembly. Refer to *Photo 1.* when reconnecting power connections. The power connections are not polarized.

Circuit Protection

The circuit is fused and includes MOV devices to suppress voltage spikes on the AC line. However,

MOVs cannot protect against all possibilities and do not last forever. Each time the MOV absorbs an unusually large spike it is suffers some damage. Eventually it will fail.

To provide the best protection for your monitor use a spike (surge) suppressor which goes between the line cord and power outlet. This will help. However, if you have a storm or power surge that damages any of your other equipment, you should replace your spike suppressor. it may be damaged even though it appears to be okay.

NOTE: Damage from power line spikes or lightning strikes is not covered by our warranty.

Model E-1D (12 VDC)

This model is designed for a 12 VDC power supply (not included). Refer to *Photo 2.* for the wiring polarity. Operating with a 12 VDC power supply may provide some isolation and protection from power surges and lightning strikes.

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 normally have to consider these as possible problems unless you have rewired or replaced your sensors.

Once you have located the source of a problem you will be able to easily replace the faulty assembly.

The Display

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

- 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! Use of larger than rated fuses will void the warranty.

SPECIFICATIONS
Model E-1S

Range
0.1–5.00 millisiemens

Accuracy*
Within 0.05 millisiemen @ 77ºF (25°C)

Display
0.7 in. LCD numeric

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 (Model E-1S)
12 VDC @ 500 ma (Model E-1D)

Setpoint Memory Retention
Greater than seven days with zero power.

* If properly calibrated using a standard solution.
** 1 millisiemen (millimho) = 1000 microsiemens (micromhos)

Caution! 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 (½ amp.).

Follow the following procedure to locate the problem. Just let the front panel hang by the cable. Follow proper safety precautions during this procedure.

- Disconnect both the EC and temperature sensors at the sensor terminal blocks.
- If the problem still exists, disconnect both red wires from terminal blocks TB1 and TB2.
- Apply power for a short time and then disconnect it. If the fuse blows then the problem is with the controller.
- 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 blows, the EC sensor or its cable is faulty and needs to be replaced.
- 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 still have a problem, contact your distributor or call the factory. (See page 1.)

Error Conditions

You will an **Err** indication when:

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

  Check wiring carefully.
- The electrode is dry.

  Immerse the electrode.
- The electrode is wired to the wrong terminals.

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

Over-range Indication

A continuous over-range 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 over-range condition.

External Alarm Circuit Problems

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

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.

Other Problems

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

See the front of this manual for contact information.

Factory Service

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

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. See our Limited Warranty in the rear of this manual for details. Turn around time in our plant is normally one day.

We may be able to speed repair by sending you a factory rebuilt exchange unit or sub-assembly; after you receive it you can return the faulty unit. Contact us for details on this service. (This option requires established credit or credit card.)

To return an item to us, please complete and include the Return Information Form, on our website at
http://www.heanderson.com/RMAform-web.pdf

TABLE I - Conductivities given in millisiemens

Peters Single Element Fertilizer Components

ppm Nitroen	Ammonium Nitrate NH_4NO_3 34%N	Ammonium Sulfate NH_4SO_4 21%N	Sodium Nitrate $NaNO_3$ 16%N	Potassium Nitrate KNO_3 14%N	Calcium Nitrate $CaNO_3$ 15.5%N	Epom Salts $MgSO_4$ 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 Nitro-gen	20-20-20 20-19-18	20-2-20	20-5-30	25-5-20	25-10-10 30-10-10	15-16-17 5-11-26 Hydrasol	15-11-29 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

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TABLE III - Conductivities are given in millisiemens

Peters Mixed Soluble Fertilizer Analysis

ppm Nitrogen	15-15-15	15-10-30	15-30-15	15-0-15	16-4-12	21-7-7 Acid	21-7-7 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® monitor/alarm 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 monitor/alarm to the H.E. Anderson Company, 2100 Anderson Drive, Muskogee, Oklahoma 74403.

WARRANTY PERIODS

MONITOR ELECTRONICS	Fifteen months from date of manufacture.
EC & TEMPERATURE SENSORS	Fifteen months from date of manufacture.
pH & ORP SENSORS	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 failure caused by misuse, negligence, alteration, accident, or lack of specified maintenance. Specifically, improper handling of pH sensors, including letting the pH electrode dry out, storage in distilled water, or damage to sensor caused by failure to open a valve to atmosphere or remove seal-screw when removing the sensor from the tee. will void the warranty on the sensor. This warranty dies not cover damage from power line spikes or lightning strikes. This warranty does not cover components used by, but not manufactured by H.E. Anderson Company, in the manufacture of said monitor/alarm, 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.

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.

WHAT TO DO IF THERE IS A QUESTION REGARDING WARRANTY

1) Promptly notify the consumer adviser 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.