NOVALYNX CORPORATION

MODEL 225- 500-A
TEMPERATURE & HUMIDITY SENSOR

INSTRUCTION MANUAL

Revision Date: August 2002

Receiving and Unpacking

Carefully unpack all components and compare to packing list. Notify NovaLynx Corporation immediately concerning any discrepancy. Inspect equipment to detect any damage that may have occurred during shipment. In the event of damage, any claim for loss must be filed immediately with the carrier by the consignee. Damages to equipment sent via Parcel Post or UPS require the consignee to contact NovaLynx Corporation for instructions.

Returns

If equipment is to be returned to the factory for any reason, call NovaLynx between 8:00 A.M. and 4:00 P.M. Pacific Time and request a Return Authorization Number (RA#). Include with the returned equipment a description of the problem, and the name, address, and daytime phone number of the sender. Carefully pack the equipment to prevent damage or additional damage in the return shipment. Call NovaLynx for packing instructions in the case of delicate or sensitive items. If packing facilities are not available take the equipment to the nearest Parcel Post, UPS, or freight service and obtain assistance with the packaging. Write the RA# on the outside of the box. Fill out a copy of the NovaLynx Repair Order form, if available, and return it with the equipment.

Warranty

NovaLynx Corporation warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from the date of shipment from the factory. NovaLynx Corporation's obligations under this warranty are limited to, at NovaLynx's option: (i) replacing; or (ii) repairing; any product determined to be defective. In no case shall NovaLynx Corporation's liability exceed product's original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by NovaLynx Corporation, or that has been subjected to misuse, negligence, or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

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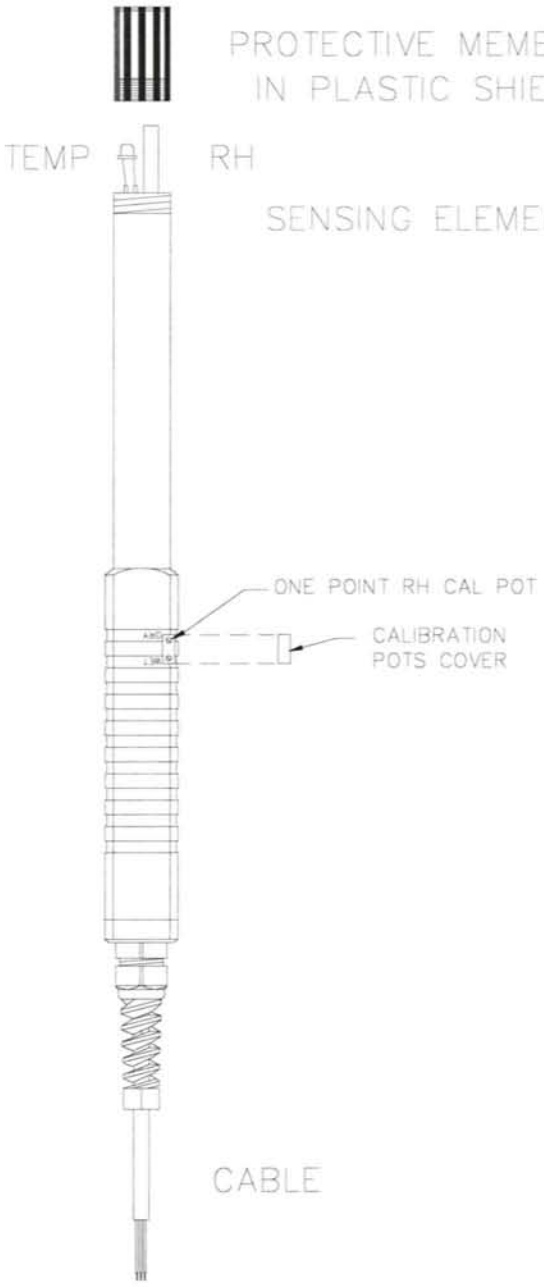
TABLE OF CONTENTS

MODEL 225-500A
EQUIPMENT CONFIGURATION AND IDENTIFICATION



PARTS IDENTIFICATION

SENSOR: MODEL 225-500-A RELATIVE HUMIDITY AND TEMPERATURE SENSOR

MODEL 225-500-A
COMBINATION RELATIVE HUMIDITY AND TEMPERATURE SENSOR

INSTRUCTION MANUAL

1.0 INTRODUCTION

1.1 GENERAL DESCRIPTION

The Model 225-500-A Combination Relative Humidity and Temperature Sensor Replaces the 225-500 Sensor; It has an improved RH Sensing Element.
The Output wire Colors have been made to be the as the Original 225-500.
This allows it to a 100% Direct replacement for the 225-500 Sensor

The 225-500-A is a solid state, fully electronic, instrument that provides measurement of relative humidity and air temperature. The solid state sensing elements and built-in signal conditioning circuitry produces linear output signals compatible with a variety of electronic monitoring and recording instruments. The sensor is designed for hand-held use but it may also be installed into a tower mounted solar radiation shield for out of doors applications.

Relative humidity is measured by the Model 225-500-A through the use of a thin film capacitive sensing element. The sensor causes changes to occur in the electronic circuitry that is translated into a linear 0 to 1 volt DC output equivalent to 0 to 100 % R.H. Temperature is measured using a linear solid state device that produces an output signal without the use of signal conditioning. The temperature sensor signal is an electronic current with 1 µA equal to 1 °K of temperature. Using a selected resistor, the current output can be converted into a DC voltage.

The electronic circuitry of the Model 225-500-A is protected inside a NEMA 4 style case. the end of the sensor assembly holds the two sensing elements. The temperature sensing element is soldered onto the connecting pins while the humidity element is plugged onto the pins through the use of a plastic holder. A protective membrane on a plastic shield encloses the sensing elements in the end of the probe. The membrane allows moisture to pass through its walls to reach the humidity element while at the same time restricts particulate material from contaminating the sensor.

Power for the sensor assembly is provided externally by a DC source with a range of 7 to 35 volts DC. For most NovaLynx system configurations, the power will be +12 volts, DC. A five foot length of cable is provided with the sensor whenever no cable is ordered from

NovaLynx. For system applications, the five foot long cable may be replaced by a longer length of cable, depending upon the system requirements.

For out door and tower mounted applications, NovaLynx recommends using a solar radiation shield for housing the sensor. The standard NovaLynx solar radiation shield is the naturally aspirated shield, Model 380-281 The shield is a set of three wedge-shaped plates designed to allow air to pass over the sensor tip while preventing direct solar heating of the sensing elements. A clamping style u-bolt attaches the shield onto a tower leg or a vertical mast of 1.0 inches, outside diameter. For more precision, a shield with fan aspiration should be used. The fan aspirated shield provided by NovaLynx is Model 380-43408. Separate manuals for the solar radiation shield is provided with the equipment when ordered from NovaLynx.

1.2 SPECIFICATIONS

PHYSICAL PROPERTIES

Size:	
Body Length	9.45" (240mm)
Head Diameter	0.73" (18.5mm)
Lower Body	0.94 x 0.81" (24 x 21 mm)
Cable Length:	11 ft. (3.5m)
Weight:	6oz (180g)
Case Type:	NEMA 4, IP 65
Case Material:	ABS Plastic
Sensor Protection:	Membrane filter, 0.2 µm

POWER REQUIREMENTS

Supply Voltage:	7 to 35 VDC (+12 VDC Typical)
Current Consumption:	Less than 4 milliamps

OPERATING PARAMETERS

Temperature Dependance:	±0.05%RH/°C)
External Output Load:	Greater than 10,000 ohms

RELATIVE HUMIDITY SENSOR

Sensor Type:	HUMICAP 180
Range:	0 to 100 % R.H.
Output Signal Range:	0.0 to 1.00 VDC

Accuracy at +20°C:	
(including calibration inaccuracy,	
linearity, and repeatability)	
Against High-Quality Standards:	±1% RH
Against Salt Solutions:	±2% RH (0-90% RH)
	±3% RH (90-100% RH)
Long-Term Stability:	Better than 1% RH per year
Response Time:	15 seconds (with membrane)
(at 20°C, 90% response)	

TEMPERATURE SENSOR

Ambient Range:	-40 to +175 °F (-40 to + 80°C)
Sensor Output Range:	1 µA per Degree K, linear (supply voltage 9-30v)
Accuracy:	±0.8°C (at 25°C) 298.2 ua @ 25°C

1.3 MANUAL CONTENTS

This manual contains the following items:

Table of Contents	2 pages
Configuration Diagram	1 page
Text	12 pages
921107	RH/T Probe Outline Drawing

2.0 INSTALLATION

2.1 UNPACKING

Carefully unpack all of the components of the instrument and inspect them for damage that may have occurred during shipment. In the event of damage, all claims for loss must be filed against the carrier by the consignee. This does not apply to shipments via Parcel Post or UPS, in which case you should contact us for instructions on handling the claim.

For equipment shipped as a complete set with the sensor installed into the solar radiation shield, inspect the wiring to ensure none of the wires have been pulled from the terminal blocks or cable connectors. Remove any packing materials that may have become lodged in the sensor.

2.2 SENSOR

The sensor assembly is calibrated at the factory and is ready for immediate use. Power can be applied to the sensor and measurements can be made immediately. Make any necessary wiring connections to monitoring or recording instruments before applying the power. If it has been sent as a separate item, remove the probe from its shipping carton and install the probe into the solar radiation shield. A single set screw located on the side of the solar shield bracket clamps onto the probe to hold it in place. The sensing elements are located in the end of the probe with the small diameter and are covered by a protective membrane. Place the sensing end of the probe into the shield and slide it into the shield as far as possible before tightening the set screw. Do not over-tighten the set screw in order to avoid damaging the probe casing.

2.3 WIRING

The electrical connections of the Model 225-500-A sensor are presented on the outline drawing on the last page of the manual. For some system applications the sensor wiring may be provided by NovaLynx. Refer to the system wiring diagram for details about the exact connections.

Standard NOVALYNX OUTPUT SIGNAL WIRE COLORS

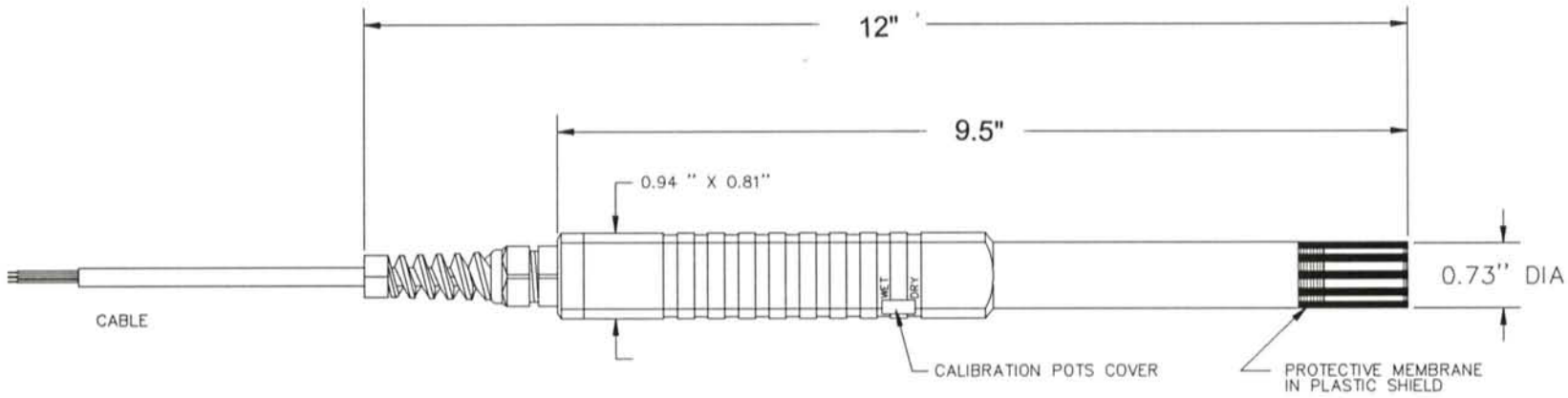
POWER INPUT:	**+12 VDC**	**RED**
GROUND:	**GND**	**BLACK**
TEMP SIGNAL:	**+ T**	**WHITE**
RH SIGNAL:	**0-1v**	**BROWN**
SHIELD	**~~~**	**GRAY, with Ring Lug**

Standard Cable Length is 11 feet

3.0 OPERATION

3.1 RELATIVE HUMIDITY SENSOR

The Model 225-500-A Relative Humidity sensor uses a solid state, thin film, device that senses relative humidity. The sensing element acts as a capacitor that changes with respect to the vapor pressure of the air and electrically changes the frequency of an electronic circuit. The sensor signal conditioning circuitry converts the capacitance change into an analog voltage. The output signal is a linear DC voltage with a range of 0 to 1 volt DC corresponding to 0 to 100 % R.H. The output signal may be directly used with some monitoring equipment while for other systems, the 0-1 volt signal may require amplification. The excitation to the RH sensor circuitry is +12 VDC. For use with data logging equipment, the sensor may be connected into a power control circuit where the +12 VDC power is switched on and off to conserve the battery. Rapid switching of the power may cause errors in the signal and will require adding a "warm-up" delay to allow the electronics to stabilize. Typically, 5 to 10 seconds of "warm-up" is adequate.



CABLE COLORS

NOVALYNX CABLE	CABLE FUNCTION
BROWN	RH SIGNAL
BLACK	GROUND
RED	+12 VDC POWER
WHITE	TEMP SIGNAL
Gray	Shield

NOVALYNX CORPORATION

C

TITLE OUTLINE, RELATIVE HUMIDITY & TEMPERATURE PROBE

MOD. USAGE 230-500A			SHEET 1 OF 1
BY RGN	SCALE NONE	DWG. NO.	921107A
DATE 8-02			

3.2 TEMPERATURE SENSOR

The temperature sensing element is a current producing device that has an output a characteristic that is linear with changes in temperature. The element is a solid state device that, whenever it is excited by a +12 VDC power source, produces an output current with 1 µA of current equal to 1 degree Kelvin. By using a shunt resistor across the output of the sensor, a DC voltage proportional to the temperature can be produced. The temperature sensor is mounted onto pins adjacent to the relative humidity sensing element at the end of the Model 225-500 probe. For systems furnished by NovaLynx, the shunt resistor will be provided for the output range specified by the user.
Typically 10,000 ohmsinstalled on the signal Cond PCB..... 25°Cof 77°F = 2.982vdc

4.0 CALIBRATION

The following manual sections describe the calibration procedures recommended for testing and making corrections to the humidity and temperature sensors and electronic circuits.

4.1 HUMIDITY CALIBRATION

The relative humidity sensor should be checked on a regular basis to ensure that the output signal is accurate and that the sensing element has not changed. To maintain accurate readings the sensor calibration should be checked at least annually. For sensors located in areas where there is severe dust and atmospheric pollutants, it is recommended that the sensor be checked more often. For best results, a quarterly system audit is recommended.

4.1.1 FIELD CHECKING

If the sensor to be checked is located in a remote area, NovaLynx recommends taking along a second sensor to replace the original sensor in case it needs to be recalibrated or replaced, rather than taking calibration equipment into the field. Taking the second sensor will save time and will allow more time for other field work.

Relative humidity sensor calibration procedures are very sensitive to changes in

temperature and should be performed only under controlled conditions. Additionally, fine tuning of the humidity probe, using a portable calibration chamber requires repetition of the adjustment and retesting to obtain repeatable results. Performing such a procedure is generally not desirable at a remote, outdoor location.

If a second probe is unavailable, the easiest way to check the probe operation in the field is to compare the relative humidity sensor output against an accurate psychrometer. If the humidity readings are within +/- 4 % R.H. then fine tuning the probe to make the output read the exact value is not necessary. If the reading error is greater, then the decision must be made to replace or to adjust the sensor. Remember to include the accuracy of the test instrument (psychrometer) in the decision process. Most often the accuracy of the test instrument or psychrometer will be less than the accuracy of the humidity probe. For best results, the Assmann style psychrometer is recommended. The Assmann psychrometer uses a spring driven fan and has precision thermometers. Should the RH probe require recalibration, NovaLynx recommends using the Model 225-HMK Calibration Chamber with a design based on the known relative humidity of saturated salt solutions. Refer to the calibration chamber manual for the specific calibration method. Other methods of calibration involve using an environmental chamber.

4.1.2 HUMIDITY ADJUSTMENTS

Since stable high and low humidity conditions are both needed for calibration NovaLynx recommends that you do not adjust the sensor electronics without using the proper calibration equipment. If the sensor appears to be operating normally and is within the operating specifications, check the translator to ensure that it is adjusted correctly.

Any signal conditioning provided for use with the sensor has been adjusted at the factory by simulating the sensor with a precision DC voltage source. Verify that the signal conditioning or monitoring equipment is operating correctly and make any necessary adjustments before calibrating the sensor. Retest the sensor with the signal conditioning or monitoring equipment after making any adjustments to determine whether or not the sensor needs to be calibrated.

Calibration of the relative humidity sensor can be achieved using either the calibration chamber, Model HMK, or the one point electronic calibrator, Model 220-HMK-20. Use of the calibration chamber is recommended whenever the sensor is out of tolerance or precision adjustments are necessary. The one point electronic calibrator is convenient for making field adjustments of the sensor electronics whenever the sensor is only slightly out of tolerance and exact adjustment is not needed.

The calibration chamber involves using saturated salt solutions and demands extremely stable temperature conditions such as those found indoors or in laboratories. Multiple adjustments may be required before the sensor reaches a repeatable operating point and

further adjustments are not needed. For saturated operation of the sensor, an over-night stabilization of the sensor in the high humidity salt chamber is recommended. The humidity adjustments are made according to the temperature readings of the thermometer inside the calibration chamber, a situation requiring the chamber be in equilibrium with the room temperature.

4.2 TEMPERATURE CALIBRATION

As with the relative humidity sensor, the temperature sensor operation must also be checked to ensure accurate data. It is convenient to test the temperature at the same time the humidity sensor is being tested.

4.2.1 FIELD CHECKING

The recommended method for checking the temperature sensor operation is to compare the output signal of the translator with readings taken using a precision glass thermometer. A portable electronic thermometer with a digital display may also be used, if available. The thermometer should be readable to 1 degree F and should have an accuracy equal to the 225-500-A temperature probe, +/- 1°C.

The field test should be performed by placing the end of the thermometer as close to the end of the 225-500 probe as possible. Protect the thermometer from direct sunlight to avoid solar heating. If possible, best results can be obtained by placing both the 225-500 sensor and the thermometer into an enclosed chamber such as a portable styrofoam ice chest. By closing off the chamber to circulating air, the two probes can approach the same temperature reading. A styrofoam chamber also offers insulation against the changing outdoor air temperature, allowing an easier check of the temperature probe.

An ice bath is recommended for testing the accuracy and low end operation of the probe, however, this method may not always be practical for field testing. Should an ice bath be used, place a plastic bag over the end of the 225-500-A sensor to prevent damage to the humidity sensor. Avoid letting the sensing elements sit in water whenever the power is applied.

4.2.2 TEMPERATURE ADJUSTMENTS

The temperature sensor has no user accessible adjustments.

Any signal conditioning used with the sensor has been adjusted at the factory by simulating the sensor with an accurately adjusted current source (+/- 0.1 μA). For example, 210.9 microamps equals -80 degrees F and 352.6 microamps equals +175 degrees F. The

current which corresponds to a given temp is found by: (degrees F-32)/1.8+273.2. Test the signal conditioning circuitry and make any necessary adjustments to obtain correct operation. Retest the signal conditioning with the sensor to verify operation of the sensing element.

5.0 MAINTENANCE

The Model 225-500 sensor assembly requires little or no maintenance, in general, other than general cleaning of the outer case and routine testing of the system operation. Regular inspections of the sensor should be made to detect problems with the cable and build-up of dirt, dust and atmospheric pollutants. Care and maintenance of the exteriors of the instruments, housings, and shields will increase the life of the equipment. Inspections of the fasteners and mounting hardware should also be made regularly to avoid loosening of the nuts and bolts that may occur during high winds due to movement of the tower.

5.1 CLEANING THE RH SENSOR

The humidity sensor element is a thin film polymer plastic that is very sensitive to oils from human skin. **Do not touch the sensor element with your fingers**. There is no method for cleaning the element, however it may be rinsed using clean de-ionized water should the surface become dusty or dirty. Power should always be removed from the sensor before rinsing the element. The plastic protective guard with the protective membrane located on the end of the sensor must be removed to expose the sensing elements. The plastic guard is threaded and must be carefully unscrewed for removal. The element may be left attached to the end of the sensor or it may be removed. To remove the element grasp the green plastic protective housing along the edges and slide the element upward, away from the body of the probe. Allow the element to thoroughly dry before reapplying power to the probe. Replace the membrane filter cap if it appears to be dirty. Do not attempt to clean the filter.

WARNING: Never attempt to clean the sensor assembly by mechanical means such as brushing or wiping. The sensing element will become permanently destroyed by attempting such a procedure.

If the humidity element is suspected of being defective, replace the element with a fixed capacitor of 70 pF. Clip or solder the capacitor onto the pins of the probe where the RH element normally sits. The capacitor should produce a 100% R.H. output for the probe. If the element is defective it must be replaced with a new one. The humidity element will deteriorate over a period of two years and should be replaced if it has been in service for two years. Replacement of the element usually does not affect the probe electronics. However, the probe operation should always be checked after replacing the sensing element.

5.2 CAUTIONS

1. Do not insert any object into the sensor housing which could physically damage the sensing elements.

2. Do not expose the sensor probe to temperatures lower than -40 degrees C or higher than 125 degrees C.

3. Do not expose the sensor probe to strong acids or bases.

4. Do not operate the probe with the sensing elements in contact with water.

5. Do not expose the probe to high levels of sulphur dioxide.

6. Do not let the RH sensing element come into contact with human skin.

7. Do not operate the humidity probe for long periods with the protective membrane removed.

8. Do not attempt to clean the RH sensing element.

6.0 TROUBLESHOOTING

The relative humidity and temperature sensor is a simple instrument to use and, except for possible contamination of the humidity sensing element, it is virtually trouble-free. Always disconnect the input power and begin to troubleshoot immediately whenever any of the following conditions occur: the instrument does not produce an output signal; one of the two output signals appears to be missing; one of the two or both of the output signals exhibits a marked change in performance; the instrument has been dropped or damaged; lightning has struck near the sensor; moisture has invaded the electronic circuitry housing.

The Upper End (5" long Cylinder) of the RH/Temp Probe Can be Removed by pulling on it. Make sure that during installation that there is no stress pulling on the cable, because it may cause the two halfs to seperate.

6.1 POWER PROBLEMS

If the sensor's two output signals appear to be in error or are missing, first check the power connections. At the sensor circuit board terminals, measure the battery or the input power source voltage with a voltmeter. Be sure that the instrument has been powered up correctly or wait for the next power ON cycle to occur. Check any batteries to be sure that they have sufficient charge and an adequate voltage level to power the instrument and that

all connections are secure. Inspect the battery terminals to ensure that they are clean and solidly connected to the battery. Generally, if the temperature signal is missing, the power connection may be open.

6.2 DETERMINING THE SOURCE OF A FAILURE

To determine whether the trouble is in the sensor or the electronics, try to manually operate the sensor, by increasing the relative humidity near the sensor or by changing the air temperature. Changing the humidity and temperature can isolate a defective sensing element quickly. Breathing heavily onto the humidity sensor should produce an immediate increase in the humidity output signal. Directly touching the temperature element should also produce an increased temperature output signal. If it is impossible to locate the problem, contact NovaLynx to return the unit to the factory. If the translator electronics respond properly to the simulated inputs then the trouble will be somewhere in the sensor. If there is no temperature sensor signal, replace the temperature sensing element. If there is no humidity sensor signal or if the humidity signal does not change with a change in humidity, the sensing element may be defective. Replace the element with a spare element or with a fixed capacitor to determine if the sensing element has failed. For additional assistance contact NovaLynx.

6.3 TROUBLE SYMPTOMS

The following sections offer some assistance in locating possible sources of trouble. These suggestions are for cases that occur most often and are most easily identified. There may be situations where the problem is not easy to identify. NovaLynx can provide assistance over the phone to help locate problems with the equipment. Please try the suggestions below before contacting NovaLynx for help.

6.3.1 HUMIDITY READS HIGH

If the relative humidity sensor output signal reads much higher than can reasonably be expected, the sensor may have become saturated by being immersed in water and has failed to recover. Remove the protective plastic guard with the membrane filter and check for water intrusion around the sensing element. Rinse off the sensing element using de-ionized water and allow it to dry, thoroughly. Replace the sensor and recheck the output signal. If the signal remains at a level greater than 100% R.H., the sensing element has failed and must be replaced.

Other causes of high readings may include an open ground lead in the sensor. Loose or missing wires can be fixed at the site. Defective sensor elements may require replacement or factory repair.

If the humidity sensing element appears scratched or broken then constant high humidity readings will result; this condition requires replacement of the sensing element. Other problems involving the sensing element may produce readings that appear to be valid but that do not respond to changes in the humidity. These second types of problems can be detected by simply blowing onto the sensing element and observing the output signal for a corresponding change.

6.3.2 HUMIDITY READS LOW

There may be an shorted cable connection that can be reconnected at the site, or a failed component in the sensor that would require replacement or factory repair.