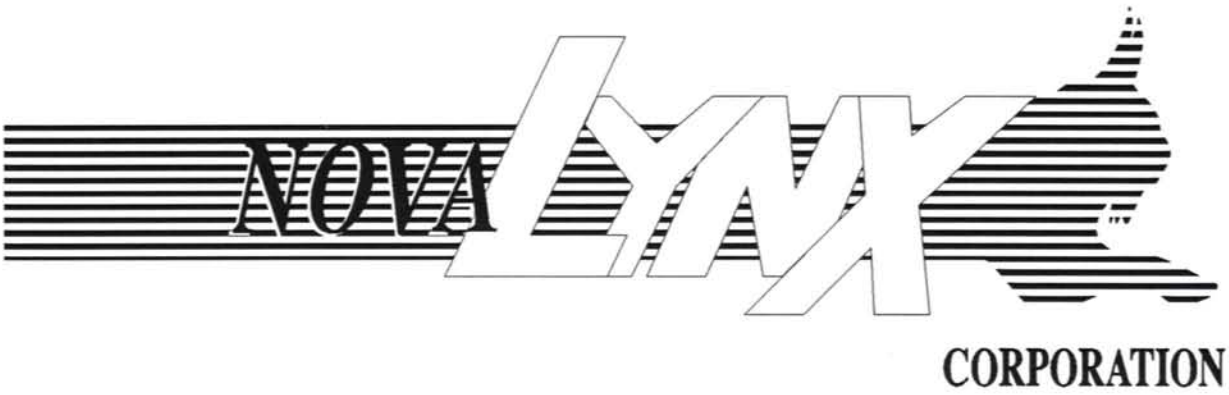
NOVALYNX CORPORATION
MODEL 220-050U
RELATIVE HUMIDITY SENSOR

INSTRUCTION MANUAL



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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1.0 INTRODUCTION

1.1 GENERAL DESCRIPTION

The Model 220-050U Relative Humidity Sensor is a solid state, fully electronic, instrument that provides measurement of relative humidity. The solid state sensing element and built-in signal conditioning circuitry produces a linear output signal that is compatible with a variety of electronic monitoring and recording instruments. The sensor is designed for use in industrial environments and may be installed into tower mounted shields for outdoor applications.

Relative humidity is measured by the Model 220-050U 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.

The electronic circuitry of the Model 220-050U is protected inside an IP 65 class housing. The end of the sensor assembly holds the RH sensing element. The humidity element is plugged onto mounting pins through the use of a plastic holder. The mounting pins are also electrical contacts. A protective membrane on a plastic shield encloses the sensing element 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 28 volts DC. For most NovaLynx system configurations, the power will be +12 volts, DC. A one foot length of cable is provided with the sensor whenever no additional cable is ordered from NovaLynx. For some systems, the one foot long cable may be replaced by or spliced onto a longer length of cable, depending upon the system's requirements.

For outdoor and tower mounted sensors, NovaLynx recommends using a solar radiation shield to housing and protect the sensor. The NovaLynx shields are used to provide correct exposure of the sensor to the atmosphere while at the same time preventing direct solar heating and precipitation contact of the sensing element. Several styles of shields are available from NovaLynx. Most of the shields use a clamping style u-bolt to attach the shield onto a tower leg or a vertical mast of 1.0 inches, outside diameter. For best results, a fan aspirated shield should be used. A separate manual is provided for the solar radiation shield when ordered from NovaLynx.

2.0 SPECIFICATIONS

2.1 PHYSICAL PROPERTIES

Size:	
Body Length	2.7" (69mm)
Head Diameter	0.46" (11.8mm)
Lower Body	0.47" (12 mm)
Cable Length:	12" (313mm)
Weight:	6oz (180g)
Case Type:	IP 65
Case Material:	ABS Plastic
Sensor Protection:	Membrane filter, 0.2 µm

2.2 POWER REQUIREMENTS

Supply Voltage:	7 to 28 VDC (+12 VDC Typical)
Current Consumption:	2 milliamps

2.3 OPERATING PARAMETERS

Temperature Range:	
Operating:	
Storage:	-40 to +140°F (-40 to +60°C)
External Output Load:	Greater than 100,000 ohms
Sensor Type:	INTERCAP®
Range:	10 to 90 % R.H. at Specified Accuracy
Output Signal Range:	0.0 to 1.000 VDC
Accuracy at +20°C:	±3% RH
Operating Range:	0 to 100% R.H.
Temperature Coefficient:	<±1.5 %RH from -10 to +60°C
Stability:	±2% R.H. over 2 years

3.0 INSTALLATION

3.1 UNPACKING

Carefully unpack all of the components of the instrument and inspect them for any 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 Parcel Post or UPS shipments, in which case you should contact NovaLynx 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.

3.2 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 element is located at the end of the probe with the smaller diameter and it is covered by a protective membrane. Place the sensing end of the probe into the shield first 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.

3.3 WIRING

The electrical connections of the Model 220-050U sensor are presented below. 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 SENSOR SIGNAL WIRE COLORS

+ POWER:	YELLOW
RH SIGNAL:	BROWN
GROUND:	GREEN
NOT USED:	WHITE
SHIELD:	CLEAR

NOVALYNX OUTPUT SIGNAL WIRE COLORS

POWER INPUT:	+12 VDC	RED
GROUND:	GND	BLACK
RH SIGNAL:	+ U	WHITE

4.0 OPERATION

4.1 RELATIVE HUMIDITY SENSOR

The Model 220-050U 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.

5.0 CALIBRATION

The following manual sections describe the calibration procedures recommended for testing and making corrections to the humidity sensor and electronic circuitry.

5.1 HUMIDITY SENSOR CALIBRATION

The Model 220-050U Humidity Sensor has no calibration adjustments available to the user. The calibration can be tested and compared to ensure that the sensor is working properly 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.

5.1.1 FIELD CHECKING

If the sensor to be checked is located in a remote area, NovaLynx recommends taking along a second sensor element to replace the original sensor element in case it is out of the specified accuracy range. Due to the stability of the sensor design it is not necessary to perform an acutal calibration adjustment to the sensor electronics. Replacement of the sensing element is recommended every two years for the best results.

If a second RH sensor is unavailable, the next 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 the sensor is good and does not need to be replaced. If the reading error is greater, then the decision must be made whether to replace the sensor or to use it for a longer period of time. 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 electronics require calibration after changing the sensing element, contact NovaLynx for instructions. For best results, the sensor should be tested in an accurate RH calibration chamber under controlled conditions.

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 is correctly calibrated.

NovaLynx provides the Model 220-HMK11 for testing and calibration of RH sensors by the user. The calibration chamber uses saturated salt solutions to check the %RH at 96% and at 12%. The calibration chamber demands extremely stable temperature conditions such as those found indoors or in laboratories. Multiple tests may be required before the sensor shows a repeatable operating point. The chamber humidity reading is corrected according to the temperature readings of the thermometer inside the calibration chamber; a situation requiring the chamber be in equilibrium with the room temperature.

6.0 MAINTENANCE

The Model 220-050U 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.

6.1 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 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 of two years and should be replaced after it has been in service for that time. Replacement of the element usually does not affect the probe electronics. However, the probe operation should always be checked after replacing the sensing element.

6.2 CAUTIONS

1. Do not insert any object into the sensor housing that 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.

7.0 TROUBLESHOOTING

The relative humidity 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; the output signal appears to be missing; the output signal 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.

7.1 POWER PROBLEMS

If the sensor's output signal appears to be in error or is absent, check the power connections. At the sensor cable, 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.

7.2 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. Changing the humidity can isolate a defective sensing element quickly. Breathing heavily onto the humidity sensor should produce an immediate increase in the humidity 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 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.

7.3 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.

7.3.1 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.

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.

7.3.2 HUMIDITY READS LOW

There may be an shorted cable connection that can be reconnected at the site, otherwise there will be a failed component in the sensor that requires or factory service.