DEHUMIDIFIER CONTROLLER
MODEL 5112

Operating Instructions

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1.0 INTRODUCTION

Many applications require the accurate measurement and control of relative humidity at a defined set point below ambient for long-term applications in a seal environment. The Model 5112 Dehumidifier Controller is specifically designed to meet these requirements and can be used to control dehumidification in virtually any type of sealed chamber. The controlled 115/230 VAC, 3 Amp output is able to control dehumidification systems that operate within the limits of the controller's power handling capacity.

The Model 5112 is capable of is capable of measuring relative humidity over the entire 0 to 100% range. The standard sensor supplied with the Controller has a response time satisfactory for maintaining long-term humidity stability. For applications requiring a fast recovery time the optional ETS Model 554 Humidity Sensor should be used.

The Controller is designed to work in conjunction with ETS Desiccant/Pump Dehumidification Systems (Models 5461, 5471 & 5478) and the Model 5465 Dry Gas Dehumidification System (AC Solenoid valve controls the flow of dry gas). It may also be used with other dehumidification systems that operate within the Model 5112 operating parameters (2 Amps).

Any drying system can be used to control the humidity in virtually any sealed environment. However, it should be noted that the larger the chamber, the greater the variation in relative humidity throughout the chamber from the sensor reading. Good air circulation in the chamber is critical to maintaining a uniform humidity level throughout the controlled environment.

2.0 DESCRIPTION

The Model 5112 Dehumidifier Controller consists of two (2) basic components: a Humidity Sensor and a Control Unit.

2.1 Humidity Sensor

The standard Humidity Sensor is an integrated unit measuring approximately 1”lx.438”wx.375”d that plugs into a 18” multi-conductor cable that is hard-wired to the Control unit. Longer cable lengths are available as an option. A temperature compensated capacitive sensing element where capacitance is proportional to humidity is used to detect the relative humidity level. This type of sensor can measure over the entire range of 0 to 100% R.H. with accuracy better than ±2% R.H at a temperature of 20-40°C. The sensor has a slew rate (response time) of 0.35% R.H./sec.

The sensor can be mounted to the wall of the chamber using an adhesive backed clamp or Velcro or through a ½” NPT compression fitting inserted in the chamber wall. Other mounting configurations can also be used to meet the user’s specific requirement.

2.2 Control unit

The Control unit provides the necessary indicators and controls to set the desired humidity level and to measure the actual humidity level in the chamber.

The front panel of the Control unit contains a 0.375", 3½-digit LCD readout for both setting the desired set point and for reading the relative humidity with a resolution of ±0.1% R.H. A black momentary RH LEVEL, SET PT/READ switch selects the information to be displayed. In the normal position the readout displays the measured relative humidity level. In the depressed position, the readout displays the desired humidity set point. When released, this switch automatically returns to the READ position. A 10-turn screwdriver adjustable potentiometer is used to adjust the set point from 0 to 100% R.H.

A separate pushbutton switch controls the Dehumidify function. When the DEHUMIDIFIER switch is in the OFF position, the Model 5112 operates as a precision electronic hygrometer.

The system Power switch and the controlled North American 3-prong grounded outlet are located on the rear panel.

The Control unit is housed in a flame resistant Noryl,SE1 GFN1 housing that conforms to the dimensional standard DIN 43700. The case measures 3.78"Wx3.78"Hx3.35"D (96x96x85mm). To install the control module into a panel a 3.62"x3.62" (92x92mm) cutout and the optional panel mount kit are required.

2.3 System Operation

Figure 2.3.1 is a block diagram illustrating the Dehumidifier Controller used with any dehumidification system installed in an ETS 5500 Series Humidity Control Chamber.

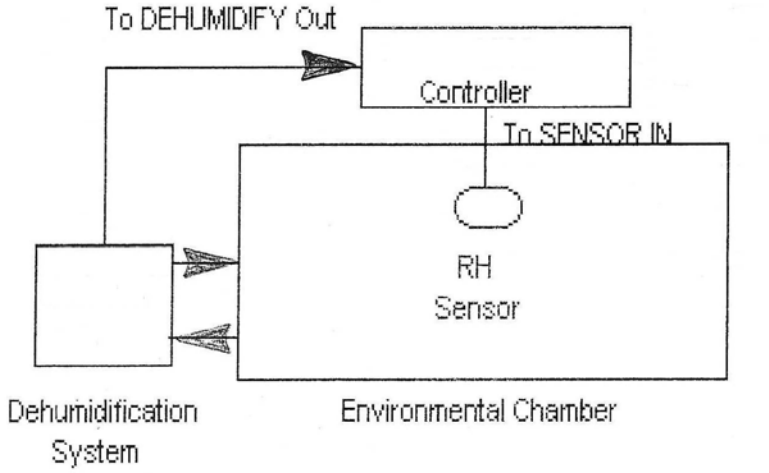

Figure 2.3-1 Controlled humidity chamber block diagram

The Humidity Sensor measures the relative humidity inside the chamber. The Sensor output signal is then compared to the set point. If the humidity measured in the chamber exceeds the set point by more than 0.5% R.H. the Controller turns on the

pump circulating the test chamber air through the desiccator or injecting dry gas through a solenoid valve. For the desiccator system the desiccant absorbs moisture, thereby lowering the humidity level inside the chamber. When the set point humidity level is reached, the Controller turns off the pump. The pump will then cycle on and off automatically as required by the Controller to maintain the desired humidity level.

Power to operate the Dehumidification System is controlled by a 3 amp solid-state relay. When the measured humidity deviates from the R.H. set point the Controller turns on the relay which then supplies the necessary 115/230 VAC power to the system.

3.0 SYSTEM DESCRIPTION

3.1 Controller Front Panel

Figure 3.1-1 shows the indicators and controls located on the front panel of the Control unit. The following is a description of each switch/indicator/display function.

Figure 3.1-1 Control Unit front panel

3.1.1 Indicators

3.1.1.1 % RH

This indicator is a 3½-digit LCD readout that is used to display both the measured humidity and the desired humidity level set point.

3.1.1.2 DEHUMIDIFIER ON

This indicator is a Green point source LED that shows power to the dehumidifier outlet has be turned on.

3.1.2 Controls

3.1.2.1 READ RH/SET RH

This is the black momentary pushbutton switch. In the normal (out) position, the measured humidity level is displayed on the LCD meter. When depressed to the SET RH position, the humidity level set point is displayed. Upon release, the switch returns to the READ RH position.

3.1.2.2 RH SET ADJ

This control is a screwdriver adjustable, 10-turn potentiometer used to select the desired humidity set point level. In the fully counterclockwise position, the readout will indicate 0R.H. and in the fully clockwise position the readout will indicate 100.% R.H.

3.1.2.3 DEHUMIDIFIER ON/OFF

This push on/push off switch, when in the ON position (in), places the system in the DEHUMIDIFY mode. When the measured humidity is above the set point level, a control signal activates the DEHUMIDIFY relay circuit and 115/230 VAC is applied to the DEHUMIDIFY AC outlet on the rear panel. This turns on the Dehumidification System. When this switch is in the OFF position (out) the Dehumidification System will remain off irrespective of the RH level measured.

3.2 Controller Rear Panel

Figure 3.2-1 shows the rear panel. The following is a description of each component function:

Figure 3.2-1 Control Unit rear panel

3.2.1 POWER

The Power switch, Fuse and AC line cord are separate components that control the power input to the Model 5112 Controller. The AC line cord is a standard North American 3-prong grounded type, 8” (2.5m). The Model 5112 contains a universal power supply that operates from 90-260VAC, 50/60Hz. Optional line cords are available to conform to the requirements of other countries when ordered with the Controller. Otherwise, the user must use either an adapter or cut off the plug and install the appropriate type.

The ON/OFF switch located on the rear panel, controls the ON/OFF status of the Controller. The AC line fuse is located internally on the PC board and protects both the controller electronics, and the solid-state relay. It is a 3AG Slo Blo type rated at 250 Volts, 3 Amps. The solid-state relay is not voltage dependent and is capable of switching a maximum of 3 Amps at either voltage, however, for extra protection a 2 Amp fuse is installed.

NOTE:

A 115 VAC pump or solenoid must be used when operating at 115 VAC and a 230 VAC pump or solenoid must be used when operating at 230 VAC.

3.2.2 DEHUMIDIFY AC Output

This fused, AC output receptacle accepts the standard 3-prong North American grounded plug. When the measured humidity exceeds the humidity level set point by about 0.5% R.H., 115/230 VAC power is applied to the receptacle. The maximum current that this circuit can continuously supply is fused at 2 Amps. However, under certain circumstances a 3 Amp fuse can be used.

3.2.3 SENSOR IN

This 18” (46cm) hard wired cable provides the input/output interconnect between the Controller and the Humidity Sensor. The sensor end is fitted with a flat, 4-pin female receptacle with the following pin-out configuration:

Pin-1	Temp Signal In (0-5V)
Pin-2	Power (2-5.5VDC)
Pin-3	RH Out (0-5V)
Pin-4	Ground

4.0 INSTALLATION AND OPERATION

4.1 Initial Check Out

Unpack the Control Unit and Sensor and inspect for visible damage. If no damage is observed then proceed to check out the system as follows:

NOTE

All equipment being used with the Controller must match the voltage selected.

1. The Humidity Sensor is already connected to the control unit when shipped.

2. Connect the line cord into the appropriate power outlet (MAINS). Be sure the POWER switch is in the OFF position and the DEHUMIDIIFIER switch is in the OFF (out) position. Plug the dehumidification system into the AC outlet.

NOTE

All ETS operating systems utilize the standard 3-prong North American plug. A 230V/50Hz system will be marked as 230V, but will still have the same 3-prong plug.

3. Turn on the Controller. The LCD readout should read some very low humidity level and the Green DEHUMIDIFIER indicator should be OFF.

4. The LCD reading should slowly start to increase until it reaches the ambient RH level. This may take as long as 5 minutes if the ambient humidity is very high.

6. Depress the READ RH/SET RH Switch to the SET PT position. The Display will read some level. While holding the switch down in the SET PT position, rotate the ADJUST Control to the desired RH level set point using a small (1/8”/3mm) screwdriver.

7. Release the switch so that it returns to the READ RH (out) position and note the humidity level reading on the display. Turn on the DEHUMIDIFIER switch (green button out). If the set point is below ambient the green DEHUMIDIFIER ON light will turn on and power will be applied to the Dehumidifier outlet, activating the dehumidification system. If the SET PT is above the ambient RH reading the Green LED indicator light will be off.

8. The dehumidification process will start. The dehumidification system will remain on until the set point is reached.

4.2 Installation

4.2.1 Sensor

The Humidity Sensor should be positioned in the test chamber to sense the best average humidity condition within the chamber. The sensor is normally installed using either the clamp or mounted in the bulkhead using the compression fitting. Both items are supplied with the Controller along with a ½" to 3/8" NPT reducer for installation in standard ETS Chambers.

CAUTION:

The sensing element is sealed within the sensor assembly, protected against mechanical damage by a slotted housing cover. Under no circumstances should the sensing element be touched. The sensor should never be cleaned using compressed air. Dust and dirt particles can be removed by blowing gently. There are no user serviceable parts in the Model 5112 sensor.

4.2.2 Control Unit

The Control Unit may be placed on any surface near the test chamber or installed into a panel (92x92mm cutout) using the optional mounting clips.

Plug the Dehumidifier into the AC Output receptacle. Plug the Controller line cord into the appropriate power outlet (115 or 230 VAC). The Model 5112 Dehumidifier Controller is now ready for operation.

4.3 Operation

4.3.1 Initial Turn On

Turn on the Controller. (The POWER switch is located on the rear panel.) Allow the Controller to warm up for approximately 5 minutes for the sensor to stabilize.

4.3.2 Setting R.H. SET POINT LEVEL

Depress the black momentary READ/SET PT pushbutton and adjust the ADJUST control for the desired R.H. set point as indicated on the LCD display. A small (1/8"/3mm wide blade) screwdriver is required. When the correct reading is obtained, release the switch. The display will then read the measured humidity level.

4.3.3 Activating Dehumidify Function

If the desired humidity is lower than the ambient humidity measured, turn on the DEHUMIDIFY function by depressing the green push-on-push off switch to

the ON position. The Green DEHUMIDIFIER light will come on indicating that the Dehumidification System has been activated.

As the humidity level in the test chamber begins to drop it will be detected by the Humidity Sensor and displayed on the LCD meter. When the humidity level in the chamber has been reduced below the set point, the Green LED light will go out indicating the Dehumidification system has been turned off. As the humidity level in the chamber gradually begins to increase above the set-point level, the Dehumidification System will turn back on until the humidity level drops back to slightly below the set point. The System will continue to cycle to maintain the desired humidity within ±3% RH.

4.3.4 Using the Model 5112 as a Humidity Indicator Only

If the Model 5112 Controller is to be used as a humidity indicator only (no humidity control), place the DEHUMIDIFIER switch to OFF. The system now becomes a humidity level meter (hygrometer) only.

4.3.5 Dehumidification Systems

The Model 5112 Controller will control any dehumidification system that operates within its power handling capability (2 Amps). The ETS Models 5461, 5471 & 578 Desiccant Dehumidification Systems and the ETS Model 5463 Dry Gas Dehumidification System are described in detail in their appropriate Operating Manuals.

4.3.6 Excessive Controller Cycling

Frequent on/off cycling of the dehumidifier may be indicative of a poor test chamber seal or defective gloves. The chamber should be thoroughly inspected to determine where the leak(s) are occurring and the problem corrected.

5.0 CALIBRATION

The Model 5112 Controller is calibrated prior to leaving the factory. However, as with all temperature and humidity measuring instruments, they must be calibrated periodically to maintain specified performance levels. Calibration should be checked at least one or two times a year depending on the operating conditions and the required measurement accuracy.

NOTE:

If returned to the factory for recalibration or repair first obtain a RMA number from ETS by calling 215-887-2196 Ext. 220.

Calibration of the Model 5112 is performed as a complete unit.

Turn on the power and allow at least 5 minutes for the instrument to warm up. Place the DEHUMIDIFY switch in the OFF position, then follow the procedure described below.

Calibration of the Controller requires either a known calibrated reference sensor for comparison. As an alternative, certified calibration salt solution cells can also be used.

The Model 5112 is calibrated by comparing the relative humidity reading with the reading of a known calibrated reference. The reference sensor should be placed next to the Model 5112 sensor and allowed to stabilize for at least 30 minutes before making any adjustments to the sensor electronics.

Calibration can be performed either in the test chamber or in a separate calibration cell.

1. Remove the Sensor from its mounted position. If the Sensor is to be calibrated in the chamber place the reference sensor next to it. If the Sensor is to be calibrated outside the chamber, remove the Sensor from its installed position

2. Turn on the power. Allow at least 5 minutes for the system to warm up. The Sensor and reference unit must be in a constant temperature environment of 73°F/23°C ±5°F/3°C and humidity environment for at least 30 minutes to obtain humidity/temperature equilibrium prior to calibration.

3. Establish a required relative humidity level in the chamber such as 12%.

4. Read the temperature and relative humidity. Compare the reference unit reading with the level displayed on the Dehumidifier Controller display. They should be within ±2% R.H. of each other. If not, adjust the “1-point RH-calibration” control, located through an access hole on the right-hand side of the control unit as shown in Figure 5.1-2 until the correct reading is obtained. A small blade screwdriver is required to perform this adjustment.

Figure 5.1-2 Calibration adjust potentiometer

This completes calibration of the Model 5112 Dehumidifier Controller.

Other calibration techniques include the use of wet bulb/dry bulb and chilled plate measurement. Wet bulb/dry bulb instruments should not be used in the test chamber because the wet bulb adds humidity to the chamber making it extremely difficult to calibrate at low humidity levels. However, there are wet bulb/dry bulb calibrators with a small test cell for the sensor that can be used.

6.0 TROUBLESHOOTING

The Model 5112 is all solid state and should provide many years of trouble-free service. If a problem with the system is suspected, it is recommended that the fault be initially isolated to either the Sensor or the Control unit.

The following troubleshooting guide should assist the user in locating the more obvious problems:

1. No Power - Check power at the wall outlet.

2. No indication on LCD display but green Dehumidifier LED is on. - LCD display defective. Return unit to factory.

3. Obviously incorrect humidity reading – If sensor was removed from its connector, check to see that it has been replaced properly. The arrow (▲) should line up with the left hand side of the sensor with the sensing grill facing up. If it was reversed reinstall properly. The sensor will not be damaged if plugged in backwards.

   Next, check sensor operation by blowing gently onto sensor for several seconds and observe the reading. If the humidity increases the humidity sensor is at least working. Depress the READ/SET PT switch and adjust the ADJUST control fully CCW and then rotate it fully CW. The display should show readings approximately 0 to 100% RH. If not, return the unit to the factory.

4. Incorrect RH set point readings – Return the unit to the factory.

5. No DEHUMIDIFY AC control voltage – Turn on the DEHUMIDIFIER switch. Read the humidity level on the LCD display. Adjust the set point to that level. Rotate the control at least ±2% R.H. about this point. The Green DEHUMIDIFIER indicator should come on when the set point is below the measured humidity. When the set point is above the measured humidity the Green indicator should be off. If the light cycles, but the dehumidifier still fails to operate either the 2 Amp internal fuse or the solid state relay may be blown, or the Dehumidification System may have failed. Both fuse and relay can be replaced by the user. The relay is rated at 3 Amps, but is protected by a 2 Amp fuse. If the dehumidification system used occasionally blows the fuse try replacing it with a 3 Amp Slo-Blo type. **DO NOT REPLACE WITH A FUSE RATED GREATER THAN 3 AMPS.**

To gain access to the PC board it will be necessary to first remove the front panel. Snap off the front bezel as shown in Figure 6.0-1 and remove the 4 screws. It may also be necessary to remove the rear panel to provide enough slack in the internal wiring to reach the fuse or U1. Reverse the procedure to reassemble.

Figure 6.0-1 Front panel removal

If the fuse/relay procedure does not fix the problem then replace U1 (MC1458) and recheck the system. If the system still fails to operate, return the unit to the factory for repair.

6. Unit reads either 0 or over 100% with sensor installed. - Sensor defective. Replace sensor.

If any components are replaced the system should be recalibrated as set forth in Section 5.

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7.0 WARRANTY

Electro-Tech Systems, Inc. warrants its equipment, accessories and parts of its manufacture to be and remain free from defects in material and workmanship for a period of one (1) year from date of invoice and will, at the discretion of Seller, either replace or repair without charge, F.O.B. Glenside, similar equipment or a similar part to replace any equipment or part of its manufacture which, within the above stated time, is proved to have been defective at the time it was sold. All equipment claimed defective must be returned properly identified to the Seller (or presented to one of its agents for inspection). This warranty only applies to equipment operated in accordance with Seller's operating instructions.

Seller's warranty with respect to those parts of the equipment which are purchased from other manufacturers shall be subject only to that manufacturer's warranty.

The Seller's liability hereunder is expressly limited to repairing or replacing any parts of the equipment manufactured by the manufacturer and found to have been defective. The Seller shall not be liable for damage resulting or claimed to result from any cause whatsoever.

This warranty becomes null and void should the equipment, or any part thereof, be abused or modified by the customer of if used in any application other than that for which it was intended. This warranty to replace or repair is the only warranty, either expressed or implied or provided by law, and is in lieu of all other warranties and the Seller denies any other promise, guarantee, or warranty with respect to the equipment or accessories and, in particular, as to its or their suitability for the purposes of the buyer or its or their performance, either quantitatively or qualitatively or as to the products which it may produce and the buyer is expected to expressly waive rights to any warranty other than that stated herein.

ETS must be notified before any equipment is returned for repair. ETS will issue an RMA (Return Material Authorization) number for return of equipment.

Equipment should be shipped prepaid and insured in the original packaging. If the original packaging is not available, the equipment must be packed in a sufficiently large box (or boxes if applicable) of double wall construction with substantial packing around all sides. The RMA number, description of the problem along with the contact name and telephone number must be included in formal paperwork and enclosed with the instrument. Round trip freight and related charges are the owner’s responsibility.