

HC-9100 Series Surface Mount Humidity Controllers

General Description & Applications

The HC-9100 Series Humidity Controller offers a versatile solution for a wide variety of applications that may require 20 amp relays, short cycle delays and independent dual stages in one convenient, easy to use controller.

The HC-9100 controller can accommodate input voltages from 12VAC to 240VAC and offers a variety of humidity sensor options to choose from. Sensors are purchased separately.

The HC-9100 series Humidity Controllers feature bright red LED display of relative humidity as well as power and relay indication. Easy to use menus guide you through the set-up and lock-out features prevent tampering with settings.

Features

- Single or Dual stage models with independent relay control.
- Programmable set point, differential, short cycle delay time, and humidity sensor calibration mode.
- LED relay status indicator.
- NEMA 1, high-impact plastic enclosure.

Specifications

Power Requirements:

- Low Voltage (LV) models accept 12 to 24VAC & 24VDC.
- High Voltage (HV) models accept 120 to 240VAC.

Relay(s) Contact Rating:

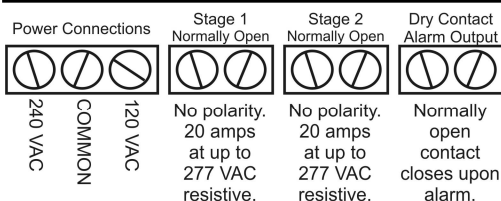
1 relay on single stage models, 2 relays on dual stage models.

- SPST, normally open – switch up to 20A at 277 VAC

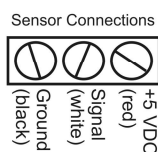
Ambient Operating Temp: 20 to 158°F (-6 to 70°C)

Ambient Operating Humidity: 90%RH at 95°F (35°C), non-condensing.

Wiring Connections



Sensor connections are on the smaller circuit board



- Tamper resistant features to lock out and limit set point adjustment and programming features.
- .56" high red LED display with three digit display in 1% RH increments.
- Displays current humidity.
- Durable touch-pad programming with LED display prompts.

Accuracy: ± 5% RH between 10-90% RH

Humidity Sensor (not included)

- Indoor Sensor Model - HS-50-S: 10-100% RH
- Duct Mount Sensor Model – HS-70-D: 10-100% RH

Relay Status Indicator: LED is on when relay is activated.

Dimensions: L 6.00" (15.24cm) x W 3.12" (7.92cm) x D 2.00" (5.08cm)

Agency Approvals: UL and CUL recognized.

Material Certification: RoHS compliant. 100% lead free.

Low Voltage Power: On low voltage (LV) models, the input voltage can be 12 to 24 VAC or 24 VDC. LV models will only have a two position terminal block marked "240" and "COM". There is no polarity with any of the low voltage inputs, so both power leads can go into either of these terminal positions.

Connecting the Humidity Sensor: Sensor connections are on the smaller display circuit board.



WARNING:

To avoid the risk of electrical shock, disconnect all power sources to the controller and the equipment before wiring any connections. More than one disconnect may be required to completely de-energize the control and the equipment.

IMPORTANT:

All wiring must conform to local, national and regional regulations. Use copper conductors only for all wire connections. Do not exceed the electrical ratings for the HC-9100 series control or the equipment it is wired to.

Connect the proper power supply to the power connections on the terminal block as shown in the Dimensions & Wiring section on page one. Note your model number indicates what input voltage is acceptable for this unit.

1. "HV" designates the unit can accept input voltage of between 110 and 240 VAC
2. "LV" designates the unit can accept input voltage of 12 or 24 VAC or 24 VDC. On low voltage versions, the HC-9100 will have only a 240VAC and Common terminal block. There is no polarity on this terminal block for low voltage inputs.

The input power is independent of the power that can run through the relays. On all models, regardless of the input voltage, the control relays can accept up to 240 VAC power at up to 30 AMPS. Connect the heating and cooling equipment to the normally open (NO) relay terminal block connectors as appropriate.

Control Products offers a variety of Humidity Sensors compatible with the HC-9100 series humidity controllers. These sensor need to be purchased separately. The following sensors are currently available, but check with Customer Service or on-online at www.controlproductsonline.com for additional sensor information.

- HS-50-S Indoor, wall mounted humidity sensor in a white, vented, plastic enclosure.
- HS-70-D Duct mounted sensor for use in measuring humidity in a duct mounted space.
- HS-70-O Outdoor, weather-proof sensor (special order and minimum order quantity may be required).

Once the unit is powered up and the proper sensor is connected, the controller will display the current humidity. If the current humidity does not appear to match the actual current humidity, you will have an opportunity to calibrate the sensor. If the display is showing "Shrt" or "OPEn", it means the sensor connection has a problem. "Shrt" indicates there is a short in one of the wires of the sensor or in the sensor itself. "OPEn" indicates a cut wire or open connection on one of the sensor's wires.

How the Controller Works

When programming the HC-9100 humidity controller, it is important to determine how the HC-9100 controller should operate for your specific application. You will need to know if you are using the controller to add humidity or remove humidity, with a dual stage unit, it can even be used for both adding and removing humidity.

There are three different programming parameters that determine how the HC-9100 controller will operate for your specific application. Dual stage units have separate programming parameters for each stage.

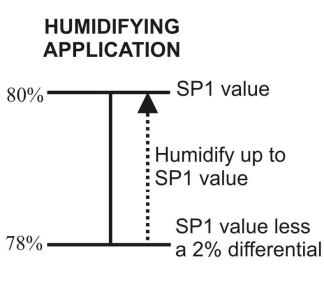
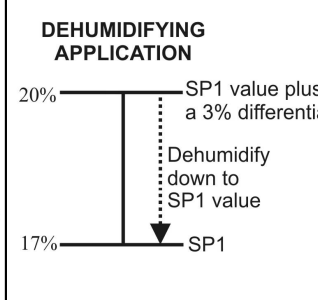
1. Humidity Set Point: The relays will always turn OFF or open when the humidity set point is reached.
2. Operating Mode (dEHU, HU or OFF): This setting determines the application the controller is being used for.
3. Differential Setting: This is the percentage above or below the humidity set point the humidity is allowed to rise or fall (depending upon the Operating Mode).

Humidity Set-Point Programming Functions:

Single Stage Applications:

On single stage models, the controller will either turn on or off the dehumidifying (dEHU) or humidifying (HU) application based on the *Humidity Set Point* set in the Set Point Programming function and the *Differential* set in Hidden Access Programming Function. The diagrams below show how a single stage model operates for either a dehumidifying or humidifying application.

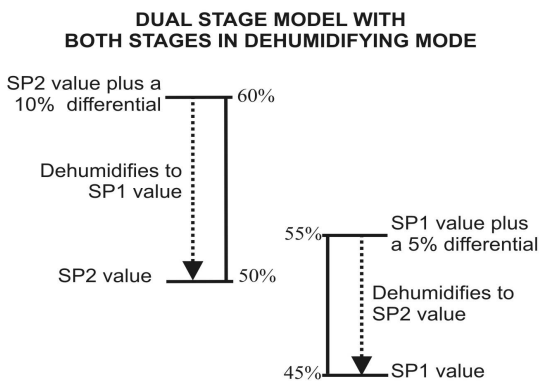
SINGLE STAGE MODEL SHOWING HUMIDIFY AND DEHUMIDIFY OPERATION

<p>HUMIDIFYING APPLICATION</p> 	<p>This shows the controller being used to humidify to a maximum of 80%RH. With a 2% differential, the controller will allow the humidity to drop to 78%RH and then turn on the humidify application until the humidity reaches 80%RH. Once the humidity reaches the set point, the relay will open again and allow it to come down to 78%RH before starting the cycle again.</p>	<p>DEHUMIDIFYING APPLICATION</p> 	<p>This shows the controller being used to dehumidify and keep humidity within a 17 to 20%RH. With a 3% differential, the controller will allow the humidity to rise to 20%RH and then turn on the dehumidifier equipment until the humidity reaches the set point, the relay will open and allow humidity to rise to 20%RH before starting the cycle again.</p>
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Dual Stage Applications:

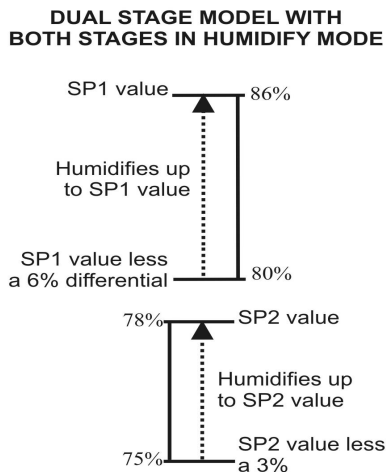
With dual stage models, each stage is independent, so one stage can be set as a dehumidifying (dEHU) and the other as a humidifying (HU) stage, or both can be dehumidifying or humidifying stages. When both stages are set to dehumidifying or humidifying mode, each stage can have any set point or differential value desired. If one stage is dehumidify and the other is humidify, however, there is a limitation on how you can set the humidity set points to prevent the controller from having both dehumidifying or humidifying applications running at the same time.

When both stages are in dEHU or HU modes, the humidity set points can overlap or be separated by any percentage RH. When using both dEHU and HU applications in a dual stage controller, the controller will not let the user set humidity set points that overlap. The HC-9100 controller automatically enforces a 2 second delay between one stage turning off and another stage starting. The following diagrams show examples of how the Dual Stage HC-9100 controller can be configured in different applications.



With both stages in the (dEHU) dehumidify mode, one can “stage” dehumidify phases. The example on the left shows stage one (SP1) keeping humidity within 45 to 55%RH. If the humidity rises to 60% for some reason, a second stage (SP2) kicks in to bring it back down to an acceptable level.

Alternately, each stage could be separated by any percentage.

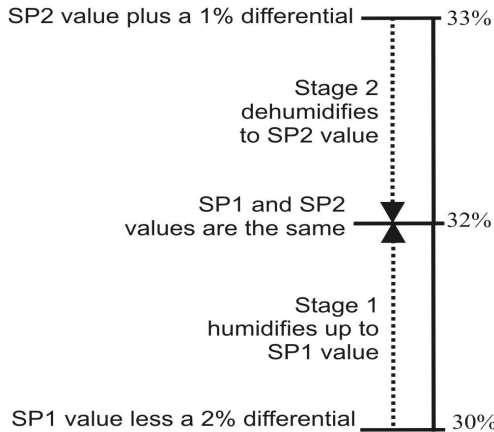


In this example, both stages are set to (HU) humidify, but the stages are separated by 2 degrees.

When both stages are set to either dEHU or HU modes, the stages can have the same humidity set-point, be separated by any percentage or they can overlap as shown above.

With dual stages, the HC-9100 can be used in a wide variety of applications.

DUAL STAGE MODEL WITH SEPARATE HUMIDIFY AND DEHUMIDIFY STAGES



It is possible to maintain a very tight humidity range by setting one stage as a humidify stage and one stage as a dehumidify stage.

In the example on the left, stage 1 will humidify up to 32%RH. At 32%RH, the humidify application will turn off and allow the application to rise to 33%RH at which time the dehumidify stage will turn on. The dehumidify stage will turn off when the humidity reaches 32%RH.

Although both humidity set points can be set at the same humidity, the HC-9100 requires a minimum differential of 1 percent or more. In addition, the controller enforces a 2 second delay between one stage turning off and the other stage turning on. This is designed to reduce the possibility of tripping circuit breakers should both the humidifying and dehumidifying elements be on at the same time.

Programming Instructions

Programming the HC-9100 series humidity controller is completed through two separate programming sequences:

1. Humidity Set-Point Programming Functions
2. Hidden Access Programming Functions for operation mode, differential, high & low set point limits, calibration, short cycle delay time and lock-out functions.

The programming menus are set up to display a program function first, followed by the numeric value or feature value. You can change that value and then press the ENTER key to save the value, then press the MODE key to move to the next programming function. The program functions are displayed with shortened text to represent the function that is to be programmed. For a detailed explanation of all the program functions, see page 7.

WHAT HAPPENS DURING A POWER FAILURE?

All settings on the HC-9100 humidity controllers are saved in non-volatile memory which means they will stay programmed even if the power is cut to the unit. This is crucial during a power failure since the unit will return to normal operating function once the power is restored.

SAVING YOUR CHANGES:

To save your changes, you MUST press the ENTER value whenever you make a change to any program setting.

EXITING THE MENUS:

You can exit the menus in one of several ways. If you make changes, you will need to press the ENTER button after every change or your values will not be saved!

1. Pressing the **MODE** button will cycle through each programming function and then its value. At the end of the menu, the unit will go blank for several seconds and then return the current humidity to the display.
2. Pressing and holding the **MODE** button for five seconds will allow you to exit the menu without having to cycle through the menus.
3. When a programming function is displayed, you can press the down and up arrows to move through the various programming options to select the one you wish to change. If you get to the last menu and press the down arrow one more time, the unit's display will go blank for several seconds and then return with the current humidity displayed.



PROGRAMMING HUMIDITY SET POINT:

- It is assumed the unit is powered up and the current humidity is displayed.
- Shaded sections are only applicable to Dual Stage Units.

Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
1		SP1	SP1 represents Set Point #1 for the first stage. On single stage models, there will only be one set point value, but on dual stage models, there will also be a SP2 as shown below.
2		Flashing Humidity Value	Using the $\downarrow\uparrow$ keys, adjust the humidity set point value for stage 1.
3		SP1 value is displayed.	Pressing ENTER saves the value and displays it without flashing.
4		SP2	For DUAL STAGE models ONLY , SP2 will appear, giving you the ability to program the humidity set point for the second stage.
5		Flashing Humidity Value	DUAL STAGE MODELS ONLY: Using the $\downarrow\uparrow$ keys, adjust the humidity set point value for stage 2.
6		SP2's value is displayed	DUAL STAGE MODELS ONLY: Pressing ENTER saves the value and displays it without flashing.
Exit		Blank Screen	For a few seconds, the screen will go blank and then the current humidity will be displayed. This signifies the end of this programming menu.

PROGRAMMING THE HIDDEN ACCESS MENU FUNCTIONS:

- It is assumed the unit is powered up and the current humidity is displayed.
- Shaded sections are only applicable to Dual Stage Units.
- For detailed explanation of the individual programming options, go to the end of this programming guide.

Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
1	\downarrow +	OP1	Press and hold the DOWN ARROW key and then press the MODE button. OP1 will be displayed representing the Operating Mode for Stage 1.
2		Flashing OP1 value	Using the $\downarrow\uparrow$ keys, select between the dEHU, HU or OFF operating mode for stage 1.
3		OP1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
4		OP2	On DUAL STAGE UNITS only, the unit displays OP2, representing the operating mode for Stage 2.
5		Flashing OP2 value	Using the $\downarrow\uparrow$ keys, select between the dEHU, HU or OFF operating mode for stage 2.
6		OP2's value is displayed	Pressing ENTER saves the value and displays it without flashing.
7		dF1	dF1 will be displayed representing the differential for Stage 1.
8		Flashing dif1's value	Using the $\downarrow\uparrow$ keys, adjust the differential setting for stage 1.
9		dif1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
10		dF2	ON DUAL STAGE UNITS only, dF2 will be displayed representing the differential for Stage 2.
11		Flashing dif2's value	Using the $\downarrow\uparrow$ keys, adjust the differential setting for stage 2.



Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
12		dif2's value is displayed	Pressing ENTER saves the value and displays it without flashing.
13		HSL1	HSL1 will be displayed representing the High Set Point Limit for Stage 1.
14		Flashing HSL1's value	Using the $\downarrow\uparrow$ keys, adjust the high set point limit for stage 1.
15		HSL1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
16		LSL1	LSL1 is displayed representing the Low Set Point Limit programming parameter.
17		Flashing LSL1's value	Using the $\downarrow\uparrow$ keys, adjust the low set point limit for stage 1.
18		LSL1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
19		HSL2	On DUAL STAGE UNITS only, the unit displays HSL2, representing the High Set Point Limit for Stage 2.
20		Flashing HSL2's value	Using the $\downarrow\uparrow$ keys, adjust the high set point limit for stage 2.
21		HSL's value is displayed	Pressing ENTER saves the value and displays it without flashing.
22		LSL2	On DUAL STAGE UNITS only, the unit displays LSL2, representing the Low Set Point Limit for Stage 2.
23		Flashing LSL2's value	Using the $\downarrow\uparrow$ keys, adjust the low set point limit for stage 2.
24		LSL2's value is displayed	Pressing ENTER saves the value and displays it without flashing.
25		CAL	CAL is displayed, representing the humidity sensor calibration adjustment.
26		Flashing CAL value	Using the $\downarrow\uparrow$ keys, adjust the calibration value of the humidity sensor. This can be adjusted $\pm 30^\circ$ from the reading on the display.
27		CAL value is displayed.	Pressing ENTER saves the value and displays it without flashing.
28		SCYC	SCYC represents the Short Cycle Delay Time. You select a value in minutes anywhere from 0 to 15 minutes. Press MODE to change the selection.
29		Flashing SCYC value	Using the $\downarrow\uparrow$ keys, set your desired Short Cycle Delay time.
30		SCYC value is displayed	Pressing ENTER saves the value and displays it without flashing.
31		LOC	This is the Lock-Out feature that prevents users from changing the humidity alarm set point or the humidity alarm set point. Press MODE to turn this ON or OFF.
32		ALL or OFF flashes	Use the $\downarrow\uparrow$ keys to toggle between "ALL" or "OFF"
33		ALL or OFF is displayed	Pressing ENTER saves the value and displays it without flashing.
34		Display goes blank	Pressing MODE at the end of this menu results in the display going blank for several seconds followed by a display of the current humidity reading from the humidity sensor.



EXPLANATION OF PROGRAMMING PARAMETER SETTINGS:

- SP1 & SP2** **HUMIDITY SET POINT** This is the humidity you wish to maintain for each stage. The HC-9100D model has two independent relay stages. The HC-9100S is a single stage model. See page 2 for an explanation of how the HC-9100 uses these set points in conjunction with the differential setting.
- OP1 and OP2** **OPERATING MODE** Select the type of application this controller will be working with. Is it a humidifying(HU) application or a dehumidifying(dEHU) application. If you don't wish to use this relay at all, select the OFF mode. Only Dual stage units will have a "OP2" mode. Factory default is dEHU.
- dF1 and dF2** **DIFFERENTIAL** This represents the percentage points RH from the humidity set point the controller allows the humidity to rise or fall before closing the relay control. See diagrams above. This is always a positive number from 1 to 30. Zero is not allowed as a differential value. Only Dual Stage units will have a "dF2" option. The factory default setting is 3.
- HSL1 and HSL2**
LSL1 and LSL2 **HIGH SET POINT LIMIT and LOW SET POINT LIMIT** This is a tamper proof option that allows a user to set maximum and minimum humidity set point limits to which a user can adjust the humidity set point. If a user only wants people to be able to adjust humidity a few percentage points, they can set very tight High and Low Set Point Limits. Both High and Low set point limits can be set to the same humidity to prevent any change in humidity set point. Only dual stage units have HSL2 and LSL2 options. Factory default value is 100% for the High Set Point Limits and 0% for the Low Set Point Limits.
- CAL** **CALIBRATION** This option allows a user to field calibrate the humidity sensor. If the actual humidity is 2 percent higher than what the HC-9100 is displaying, the user can enter a value of 2 in the calibration option to make the HC-9100 controller display the correct humidity. You can enter a calibration value anywhere from -30 to +30. Factory set at zero.
- SCYC** **SHORT CYCLE DELAY TIME** The short cycle protection feature prevents the controller from short cycling a compressor. A short cycle condition is when a relay controlling a compressor or other equipment cycles on and off too quickly, possibly causing compressor or equipment damage. The minimum time between relay state change is determined by the value entered in the Short Cycle Delay Time option. Enter a value anywhere from 0 to 15 minutes. Factory default is 5 minutes.
- LOC** **LOCK OUT FEATURE** This feature allows the user to prevent anyone from adjusting the humidity set point(s). If a person attempts to change any value, the display will show LOC for a short period of time to show the user these adjustments are off-limits. Two options are available. Factory default is OFF.
1. ALL Locks out all functionality of the Humidity Set Point menus. No changes can be made.
 2. OFF This turns off all lock-out features and allows a user full access to the Humidity Set Point menu.

Normal Operation

During normal operation, the current humidity will be displayed. Relay indicator lights will be illuminated only if relays are in the closed position.

Relay Operation:

1. Relays will always open when the humidity set point is reached.
2. Relays will always close when the humidity set point, plus or minus the differential value is reached.
3. On a dual stage unit, if using one relay for dEHU and the other for HU, the HC-9100 will not allow the relays to be both on at the same time. There will a minimum of 2 seconds between turning one stage off and turning another stage on. This is designed to eliminate the possibility of a simultaneous switch between dehumidifying and humidifying that could cause a circuit breaker to trip.



FAILED HUMIDITY SENSOR ALARM:

The HC-9100 can determine when the humidity sensor is defective or damaged and will alarm when such a condition occurs. If the sensor has a cut wire or an open circuit, the display will flash "OPEn". If there is a short in the sensor wire or the sensor element, the display will flash "Shrt". All controller functions will cease to operate until the problem with the sensor is fixed.

Technical Support & Contact Info

If you have further questions about the operation of your HC-9100 Temperature Controller and Alarm, please contact our Customer Service department in one of the following methods:

- Phone: 952-448-2217
- Fax: 952-361-9420
- Email: customerservice@controlproductsinc.com
- Web: www.controlproductsonline.com

MODELS AVAILABLE (Made in USA)	
HC-9100S-LV	Single stage, power = 12 or 24 VAC, 24 VDC
HC-9100D-LV	Dual stage, power = 12 or 24 VAC, 24 VDC
HC-9100S-HV	Single stage, power = 120 or 240 VAC
HC-9100D-HV	Dual stage, power = 120 or 240 VAC

Warranty

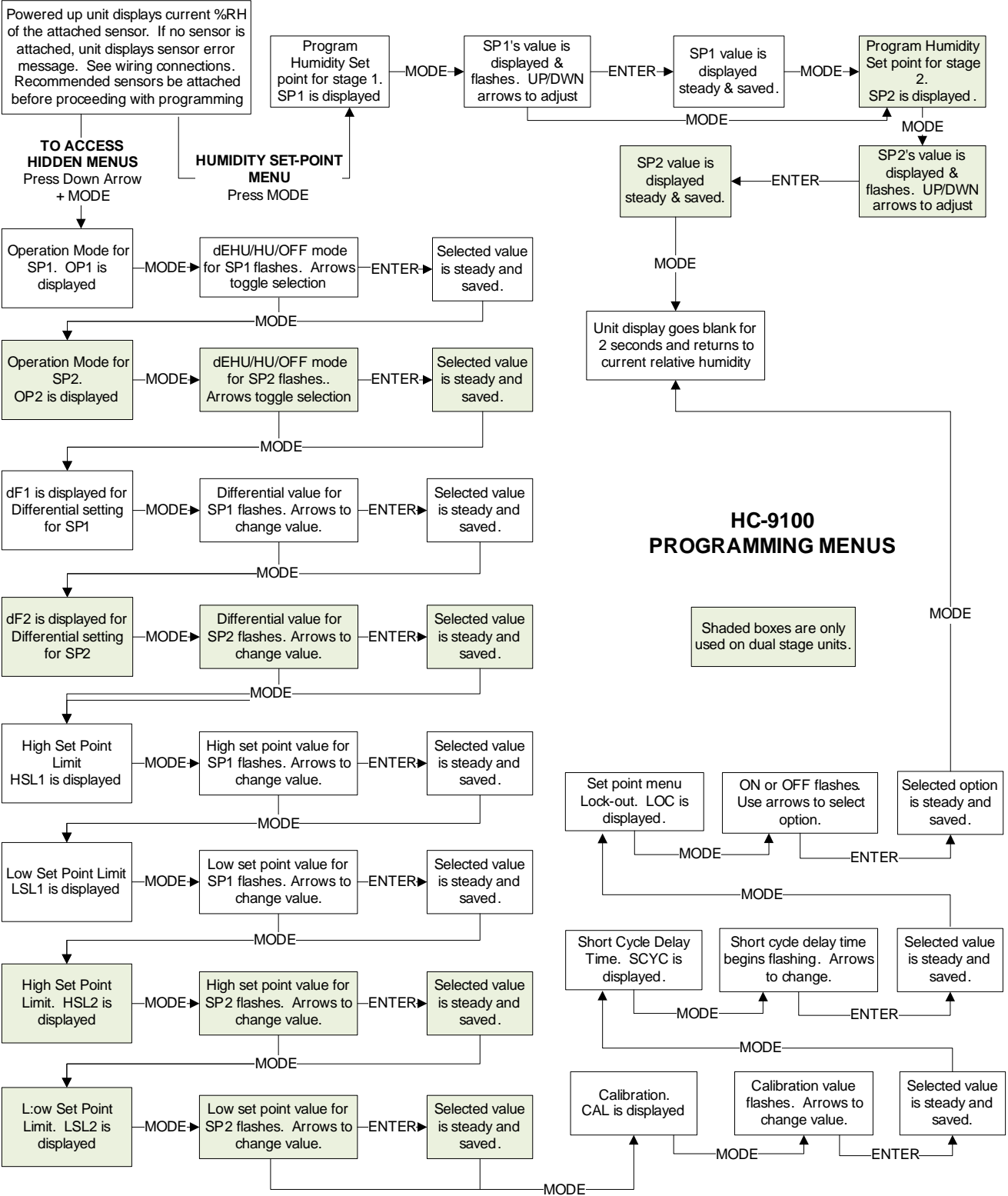
Control Products, Inc. warrants this product to be free from defects in material and workmanship under normal use for one year and is not responsible for consequential damages or installation costs of any nature. Exposure to contaminants and extreme environmental conditions such as moisture, temperature, chemicals, etc. may cause the unit to degrade or fail. Control Products accepts no liability for product applications or customer application testing.

Custom Design & Modifications

Control Products specializes in complete design and manufacture of electronic controls. In addition to making any desired modifications to this product, we can design a unique control specific to your application. Please consult our Customer Service Department for further information on these services.



Menu Flow Charts



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