

GEO CALIBRATION

Model 1000 SP

User operational guide

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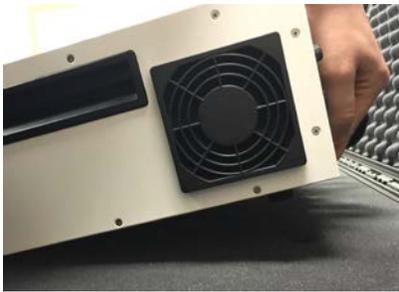
Quick Start Guide

Filling the Water Reservoir

	<p>Locate the Fill Port</p>
	<p>Locate the Fill Tube</p>
	<p>Remove Cover from Fill Port</p> <p>A fill tube is shipping standard with every purchase of a GEO Calibration calibrator.</p>



Gently Connect Tube to Fill Port



Tilt the Unit Forwards

Tilt forwards at a 10 degree angle while filling, to observe fill level.



Fill the Syringe Reservoir

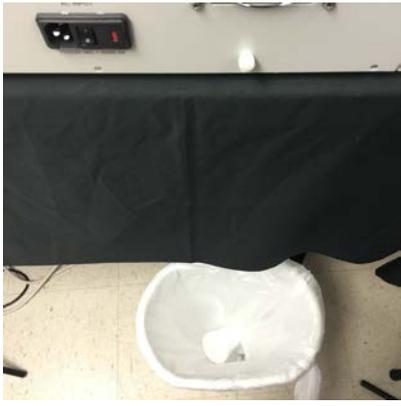
Only use standard distilled water. Fill one 10 mL syringe at a time while watching the fill level. The water will naturally flow into the internal chamber reservoir. Due to the reservoir's 50 mL capacity, do not fill more than four times in a row.



Un-tilt the Chamber

Once water is observed in the fill level indicator, un-tilt chamber and fill to slightly less than maximum.

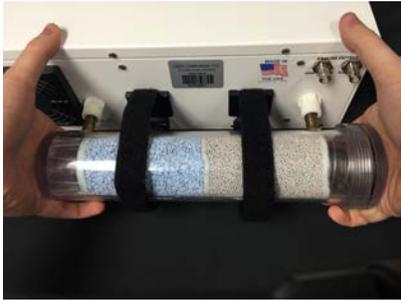
Draining Water for Transportation

	<p>Place Unit on Edge of Table</p> <p>Make sure the rear of the unit is over the edge of the table, with a bucket beneath.</p>
	<p>Tilt the Unit Towards Edge</p> <p>A book or other solid object may be placed under the front of the unit for stability.</p>
	<p>Locate & Remove Drain Cap</p> <p>The water will immediately begin flowing from the unit into the bucket below.</p> <p>**WARNING**</p> <p>Failure to replace drain cap will result in flooding of the table top upon refill.</p> <p>Overfilling of water will flood the chamber. In case of flooded chamber, you may wipe it out with a standard cloth.</p>

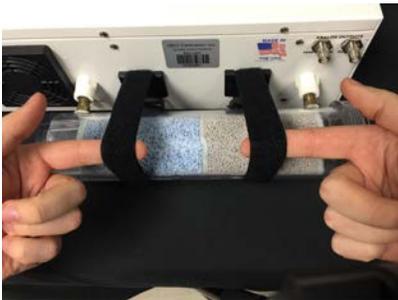
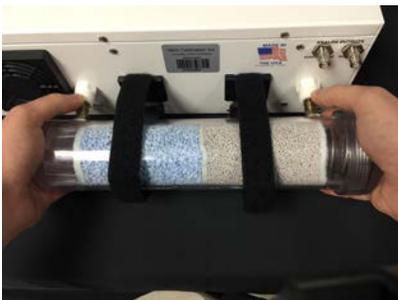
Cleaning Instructions

 A close-up photograph of a hand unscrewing a black cap from a circular chamber door. The door is white with a black ring around the opening. To the left of the door, there are two white knobs labeled 'FULL' and 'SAMPLE', and a small black switch.	<p>Open the Chamber Door</p> <p>Unscrew any visible fasteners and pull the door from the chamber with moderate force.</p>
 A close-up photograph of a hand using a white paper towel to clean the interior of the chamber door. The door is white with a black ring around the opening. The interior of the door is visible, showing a circular fan or vent.	<p>Clean With Paper Towel</p>
 A photograph showing a small, light blue bottle of disinfectant with a silver cap and a white paper towel. The bottle is on the left and the paper towel is on the right, both set against a black background.	<p>Disinfect with Alcohol Wipes</p>

Desiccant Installation

	<p>Locate Desiccant Canister</p> <p>If indicating desiccant was included in your order, you should check to ensure the desiccant has blue color throughout, with no pink granules present.</p>
	<p>Locate the Two Bungs on Rear</p> <p>Make sure there are O-Rings inside of each bung.</p>
	<p>Push Desiccant into Bungs</p> <p>Make sure blue desiccant is on the left hand side.</p> <p>Using gentle force, press the desiccant into the bungs.</p>
	<p>Tighten and Attach Velcro Straps</p> <p>Tightening the Velcro straps will complete the seal.</p> <p>Make sure the desiccant is properly secured. It should feel and look "tight," as shown in the image provided.</p>

Desiccant Removal

	<p>Unjoin Velcro Straps</p>
	<p>Loosen Velcro Straps</p>
	<p>Gently Pull Desiccant</p> <p>Pull with two hands using even force on both sides of the desiccant canister.</p> <p>Use thumbs to push out from the chamber body, as shown in image provided.</p>

Refilling the Desiccant

	<p>Open Top Cover of Desiccant</p> <p>Save the spring, the sieve and the three white felt filters.</p> <p>Discard previous desiccant. Wipe the inside of the desiccant canister with a clean cloth. Beat filters clean of debris. Clean the sieve and the spring.</p>
	<p>Fill Canister with Desiccant</p> <p>(Assuming use of approved refill kit)</p> <p>Insert and push a white filter to the bottom. Empty the contents of the white desiccant bottle into the canister. Gently tap to pack. Insert a second white filter. Empty the contents of the blue desiccant bottle into the canister. Insert one more filter. Insert one more sieve, followed by the spring. Tighten the cover.</p>

Unit Maintenance

Daily	Annually
Keep Unit Clean	Control Probe Calibration
Use Proper Cleaning Materials	Ship unit back for preventative maintenance annually
Make Sure Water Level is Maintained	
	Watch YouTube videos for more information.

Introduction

The GEO Calibration Model 1000 SP is a precision controlled humidity and temperature generator. It provides the ability for an operator to create a precise controlled environment within a chamber for calibrating or testing temperature and humidity sensor equipment. The unit allows the operator to control the current temperature and humidity in the chamber from the front panel. The unit also allows access to probe offset settings from the front panel. Advanced operations require the use of the GEO Windows™ based application.

Operational Features

Temperature and Humidity Control

The GEO Calibration 1000 SP allows the user to generate a stable environment within its chamber. The unit can control and maintain the relative humidity and temperature in the chamber to within a resolution of 0.1% RH and 0.1°C respectively. The system accuracy is controlled via a NIST traceable internal probe.

Condensation prevention

The GEO Calibration 1000 SP control system has a condensation prevention feature which will not allow a rapid temperature drop when that drop will cause the internal chamber conditions to reach or come close to the current dew point. In such cases the unit will slow or halt the temperature drop while the excess humidity can be removed from the chamber. In such cases the temperature response time will be larger but the user will not experience condensation which is a significant cause of probe error.

Front Panel Operation

Main screen

During normal operation the unit's LCD screen shows the main menu which looks as below:

	S	e	t		A	c	t			
T	4	0	.	0	°	3	9	.	9	°
H	1	5	.	0	%	1	4	.	7	%
D P		6	.	1	°	C	W	A	R	M

Figure 1 Main menu

This screen indicates the current set point temperature and humidity and the current actual temperature and humidity inside the chamber. From this screen the user can change the set point.

The screen is organized as a grid. The grid has rows *T* and *H* which stand for Temperature and Relative Humidity and columns *Set* and *Act* representing the current set point and actual chamber for both temperature and humidity.

The DP value is the current Dew Point temperature within the chamber based on the actual temperature and humidity in the chamber.

Button Operation

The unit has 4 push buttons located below the LCD screen. The push buttons are labeled, 'NEXT', 'UP', 'DOWN' and 'EXIT'.

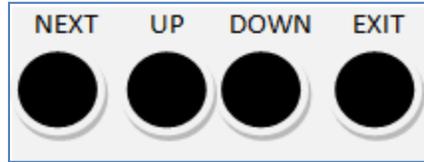


Figure 2 Pushbuttons

The 'NEXT' button advances the cursor to either the next user editable value or to the next menu. Depressing the button briefly activates a field into editing mode so that it may be modified. When a field is in edit mode it will flash. To edit the next field on the screen depressing the 'NEXT' button again and the next field will flash indicating it is in edit mode. To exit edit mode either press the 'EXIT' button or wait 30 seconds and the field will automatically exit edit mode.

Holding the 'NEXT' button depressed for more than 3 seconds will advance to the next menu.

The 'UP' button is active when a field is placed in edit mode. Pressing the 'UP' button increases the value of the field while pressing the 'DOWN' button decreases the value. Holding either the 'UP' or 'DOWN' button for more than one second will advance the value of the field at a high rate allowing the user to quickly change a field's value.

Depressing the 'EXIT' button will exit the editing mode. Depressing the 'EXIT' button for 3 seconds will advance to the previous menu.

Exit warming mode

The 'EXIT' button has one additional use when the GEO Calibration 1000 SP is first started it may not have sufficient water vapor to allow the setting of higher relative humidity values. In this case the front panel will flash the word 'WARMING'. During this time the unit will NOT control the chamber's temperature or humidity. To bypass this warm up time and go directly to controlling the chamber press the 'EXIT' button on the main screen. The word 'WARMING' will cease flashing and the unit will begin controlling the chamber.

Status Lights

The four status lights located to the right of the LCD screen indicate the following. The 'STATUS' light indicates the unit is active. The 'COMM' light indicates the unit is receiving commands from the GEO 1000 SP Windows application. The 'LOCAL' light indicates that the unit's environmental condition is being modified locally from the front panel. That is the current chamber environment has overridden the setting made by the GEO-DFB application. The 'FAULT' light indicates that the BIT (Built in Test) has detected a condition which will not allow control of the chamber. See appendix [Error code](#) for the possible fault conditions.

STATUS



COMM



LOCAL



FAULT



Setting the current temperature and humidity

From the Main Screen press the 'NEXT' Button. The current set point temperature will flash indicated by the color red in the figure below

	S	e	t		A	c	t			
T	4	0	.	0	°	3	9	.	9	°
H	1	5	.	0	%	1	4	.	7	%
D P	6	.	1	°	C	W	A	R	M	

Figure 3 Changing Temperature

Pressing the *UP* and *DOWN* button's will change the current set temperature. The unit will immediately begin controlling the chamber temperature to the set value. To set the humidity press 'NEXT' again and the relative humidity value will begin to flash indicated by the color red in the figure below.

	S	e	t		A	c	t			
T	4	0	.	0	°	3	9	.	9	°
H	1	5	.	0	%	1	4	.	7	%
D P	6	.	1	°	C					

Figure 4 Changing Relative Humidity

Internal Probe Calibration Configuration

The probe calibration screen allows the user to introduce a calibration offset to the internal probe used to control the GEO Calibration 1000 SP chamber. This allows the user to calibrate the internal probe to an external reference.

```
      P r o b e   C a l i b r a t e
T :    4 0 . 0 °           H :    4 9 . 8 %
T   O f f s e t :    0 . 1 °
H   O f f s e t :   - 0 . 1 %
```

Figure 5 Control Probe Calibration

In the image above the current probe offset is 0.1° C and the offset is -0.1% RH. The current chamber temperature and humidity are displayed for reference. Once the offsets are configured the values are permanently stored in the unit and do not need to be reset when the unit is subsequently powered on.

Built in Test Heat Exchanger configuration

The GEO Calibration 1000 SP Heat exchanger removes the heat generated when the peltier element is cooling the chamber. To prevent damage the unit monitors the temperature of the heat exchanger and will stop control if the temperature exceeds a configurable threshold. It is not recommended to change these values as they are pre-configured for the optimal operation of the unit. The thresholds are nevertheless configurable as shown in the figure below.

```
B I T   H e a t   E x c h a n g e r
C u r r e n t   1 5 ° C
M a x   4 3 ° C   M i n   1 8 ° C
H a l t   O f f   F a n   0 ° C
```

Figure 6 BIT Heat exchanger configuration

The screen displays the current temperature of the heat exchanger 15°C in the example above. The maximum and minimum allowed temperature are configured along with whether the control should be halted if the chamber conditions are exceeded. In addition the temperature threshold at which the chassis fan should start is configurable. Note: the unit may override the settings depending on the exact model.

Built in Test Humidity Generator configuration

The GEO Calibration 1000 SP has an internal humidity generator. This humidity generator is used as the source to the humidity within the chamber. To ensure that there is sufficient humidity generation capacity the unit humidity generator is kept in a warm standby state. To prevent damage from such conditions as insufficient water the generator temperature is not allowed to exceed a certain maximum threshold. This screen configures these thresholds. It is not recommended to change these values as they are pre-configured for the optimal operation of the unit. The thresholds are nevertheless configurable as shown in the figure below.

B	I	T	H	u	m	i	d	i	t	y	G	e	n
C	u	r	r	e	n	t	1	5	°	C			
S	e	t	3	1	°	C							
M	a	x	4	5	°	C	H	a	l	t	O	f	f

Figure 7 BIT Humidity generator

The screen displays the current temperature of the humidity generator module. The current set temperature and the maximum allowed temperature are configurable. Whether the unit stops control when the maximum temperature is exceeded is also configurable.

Error List

In the unlikely event that an error was detected during operation of the unit the error code and description will be displayed on the Error list screen. A list of the possible error codes is located here [Error code](#).

E	r	r	o	r	L	i	s	t				
N	o	E	r	r	o	r	s	F	o	u	n	d

Figure 8 Error list screen

GEO 1000 SP Windows application

Software capabilities

The GEO-DFB Desktop Software controls the GEO 1000 SP unit. It has the following features:

- Manually control current temperature and humidity of the GEO Calibration 1000 SP generator.
- Monitor the temperature and humidity values of the internal control probe channel.
- Configure DFB probe types using GEO supplied configuration or user defined custom probe types.
- Create multiple experiments each of which may have multiple phases where either temperature and/or humidity change or remain constant for configurable periods of time.
- User configurable logging of all captured data.
- Graphical plotting of internal chamber control probe and DFB probe measurements.
- Graphical plotting of internal chamber dew point.
- Report printing with user annotation.

Windows Application Installation Guide

Package Contents

The GEO 1000 SP Windows application runs on Microsoft windows XP SP2, Windows Vista 32/64 or Windows7 32/64 personal computer. The computer should have 2 free USB slots.

GEO 1000 SP USB to RS232 converter cable installation

The personal computer communicates to the GEO 1000 SP is via a USB-RS232 converter cable. This cable is supplied along with the windows software and USB key if you did not receive the cable you should contact GEO at the address listed in this document.

Plug in the USB converter to your PC. If this is the first time your computer has seen this device you may be prompted to download and install the drivers for the converter. These drivers are part of the windows operating system. If Windows is unable to find the driver please follow the instructions provided with converter or go directly to the converter manufacturer website or contact GEO technical support at the address listed in this document. Connect the RS232 side (DB-9) to the rear panel of the GEO 1000 SP.

GEO 1000 SP USB installation

The GEO 1000 SP has a built in USB to RS232 converter. Using the supplied USB cable connect the USB port of the PC to the directly to the USB input GEO-1000 SP. Windows should automatically detect the device and install the driver. If windows does not find the driver you can directly download it from <http://www.ftdichip.com/FTDrivers.htm>.

Application installation

Locate the GEO installation media this will have been supplied on a CD, DVD, flash drive or from the GEO Calibration website. Double click the setup.exe program and follow the on screen prompts. Once successfully installed the icon pictured below should appear on your desktop.



GEO Windows Application | Usage

The screenshot displays the GEO Windows Application interface, which is divided into several functional areas:

- Chamber Conditions (Left Panel):**
 - Humidity:** 33.8% (Target: 25.0%)
 - Temperature:** 54.2°C (Target: 23.0°C)
 - Dew Point:** 33.4°C
 - Device Feedback:** 46.9% Humidity, 31.3°C Temperature
 - Buttons:** Record Mode Start (green), Panel Mode (grey)
- Graph Control (Top Center):**
 - Buttons: Axis Scale, Reset Zoom, Pause Plot, Refresh Plot, Clear Plot, Print Report
- Humidity Graph (Top Graph):**
 - Y-axis: %RH (30 to 50)
 - X-axis: Time (0:11:35 to 0:11:55)
 - Legend: Chamber %RH (red line), DFB %RH (blue line)
 - Chamber %RH fluctuates between approximately 32% and 40%.
 - DFB %RH is constant at approximately 45%.
- Temperature Graph (Middle Graph):**
 - Y-axis: °C (30 to 50)
 - X-axis: Time (0:11:35 to 0:11:55)
 - Legend: Chamber °C (black line), DFB °C (magenta line)
 - Chamber °C fluctuates between approximately 45°C and 55°C.
 - DFB °C is constant at approximately 32°C.
- Dew Point Graph (Bottom Graph):**
 - Y-axis: °C (30 to 35)
 - X-axis: Time (0:11:35 to 0:11:55)
 - Legend: Dewpoint °C (yellow line)
 - Dewpoint °C fluctuates between approximately 31°C and 34°C.
- Experiment (Right Panel):**
 - Experiment Name: 5 Point Ramp Up Humidity
 - Log Output File: None Specified
 - Start Time: 11/27/2012 12:11 AM | Estimated End Time: | Run time: 00:00:23
 - Repeat: | Active Phase: Ramp Up Humidity
 - Buttons: Select Experiment, Stop, Start, Next Phase, Prev Phase
- Configuration (Right Panel):**
 - Buttons: ModBus Setup, Probes, Manage Experiments
- Activity Log (Bottom Right):**

Date	Event
12:11:33.9	Set %RH to 25.0
12:11:33.9	Set Temperature to 23.0°C
12:11:33.9	Entered phase[Ramp Up Humidity]
12:11:33.9	Started Experiment 5 Point Ramp Up Humidity
12:11:31.3	Error Opening COM31[The port 'COM31' does ...
12:11:20.3	Error Opening COM31[The port 'COM31' does ...

Main Screen

Figure 9 Main PC operational screen

The Main screen of the GEO application is pictured above.

The left hand area labeled **Chamber Conditions** shows the current environmental conditions in the chamber. The large display shows the current readings, while the smaller values indicate the current set points.

The left hand area labeled **Dew Point** indicates the current dew point within the chamber.

The left hand area labeled **Device Feedback** should be ignored for users of the Model 1000 SP, unless they have purchased the external DFB accessory.

In the center of the screen is a graphical representation of the environmental conditions over time. The top plot is the humidity graph it shows the chamber humidity channels over time. The center plot is shows the chamber temperature plots. The bottom plot shows the chamber dew point over time. The plot control is done via the 5 buttons above the plots.

In the right hand portion of the screen in the area labeled **Experiment** is a display of the current experiment being run and which phase of the experiment is currently active and controls which allow the experiment to be started/stopped. The user may also manually proceed to the next phase of the running experiment or rewind to the beginning of the previous phase of the current experiment.

In the center area of the right portion of the screen in the area labeled **Configuration** is where the user may perform initial configuration of the GEO-1000 SP, and manage the experiments database.

In bottom area of the right hand portion of the screen in the area labeled **Activity Log** is a textual representation of the current activity of the GEO software and informational messages.

Experiments

The GEO software allows the user to create experiments. An experiment is defined by a sequence of one or more phases each of which independently control the chamber conditions. The user may define any number of experiments and each may have any number of phases. Each experiment has a **Title** which is the displayed name of the experiment. Each experiment may be logged to a Comma Separated Values file (CSV) which is compatible with excel and numerous other 3rd party data analysis tools. The logging is optional and the rate at which logging is to be done is configurable by the user. The experiment may also be configured to **loop forever** which will cause the experiment to repeat once the final phase has completed.

Phase

A phase defines the environmental conditions of the chamber for a period of time. Each phase has a name multiple phases may have the same name. Optionally each phase may be logged independently to the experiment log into its own CSV file at its own data collection rate. Each phase has a total time to run. Once that time has completed the next phase in the experiment will be started. The user may define each phase to generate a report upon completion. For each phase the user may define the chamber temperature and humidity behavior independently. Each variable (temperature and humidity) behavior during the phase is defined by a starting point, end point, increment and an update rate. Once the phase is started the system will set the environmental conditions to the values in start, it will increment the value at a rate specified by increment. Note the increment may be negative for downward sloping behavior or may be set to zero to have the variable not change during the phase. The increment will continue until the end value is reached or the total time for the phase has been exceeded. This gives the user maximum flexibility. In the sample screen below the current phase 'Ramp Up Humidity' is defined to keep the temperature at a constant 23° C and ramp humidity from 25% RH to 35% RH in 2% RH increments every 2 minutes. This will happen for 20 minutes since the phase run time is set to 00:20:00.

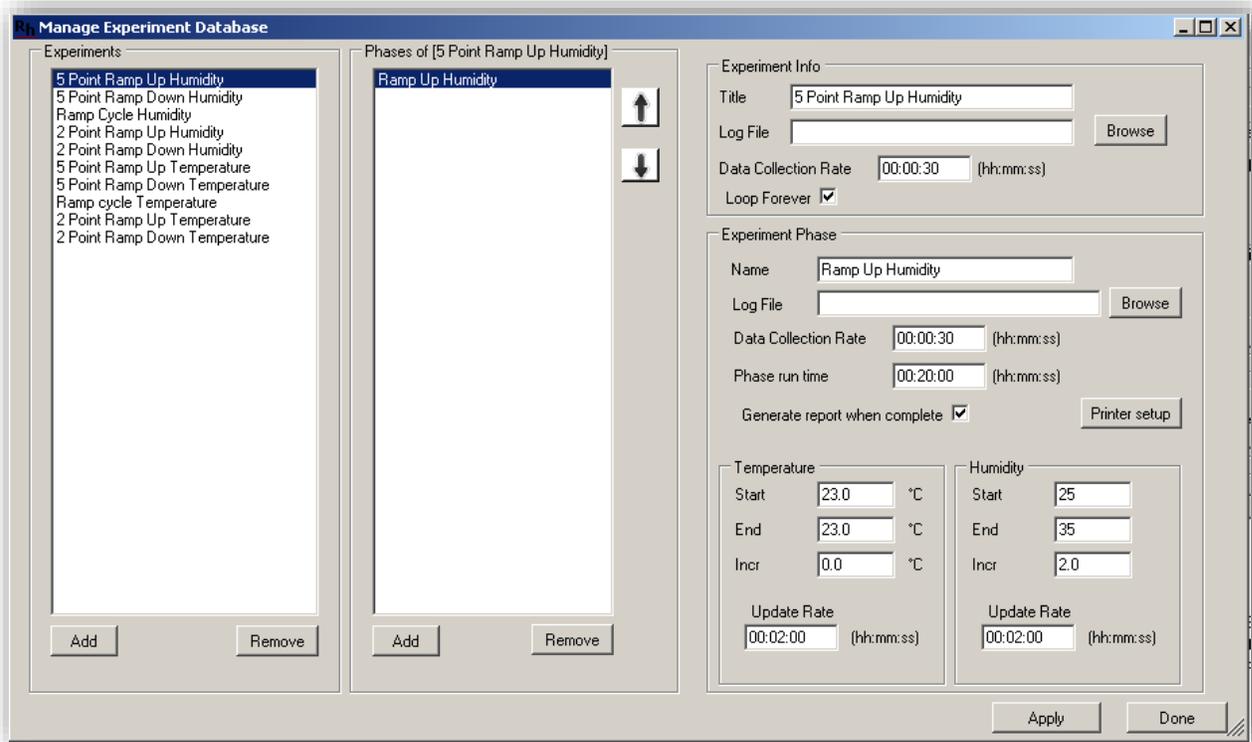


Figure 10 Experiment and phase definition

Modbus Initial setup

The GEO Calibration 1000 SP uses the modbus protocol over the USB/RS232 interface. First time the application is installed the communication port to which the unit is connected must be found. If the system is powered on pressing the 'Auto Configure' button will cause the GEO application to find the communication port that the unit is connected to. This needs to be done only once during installation or the device drivers are reinstalled or updated.

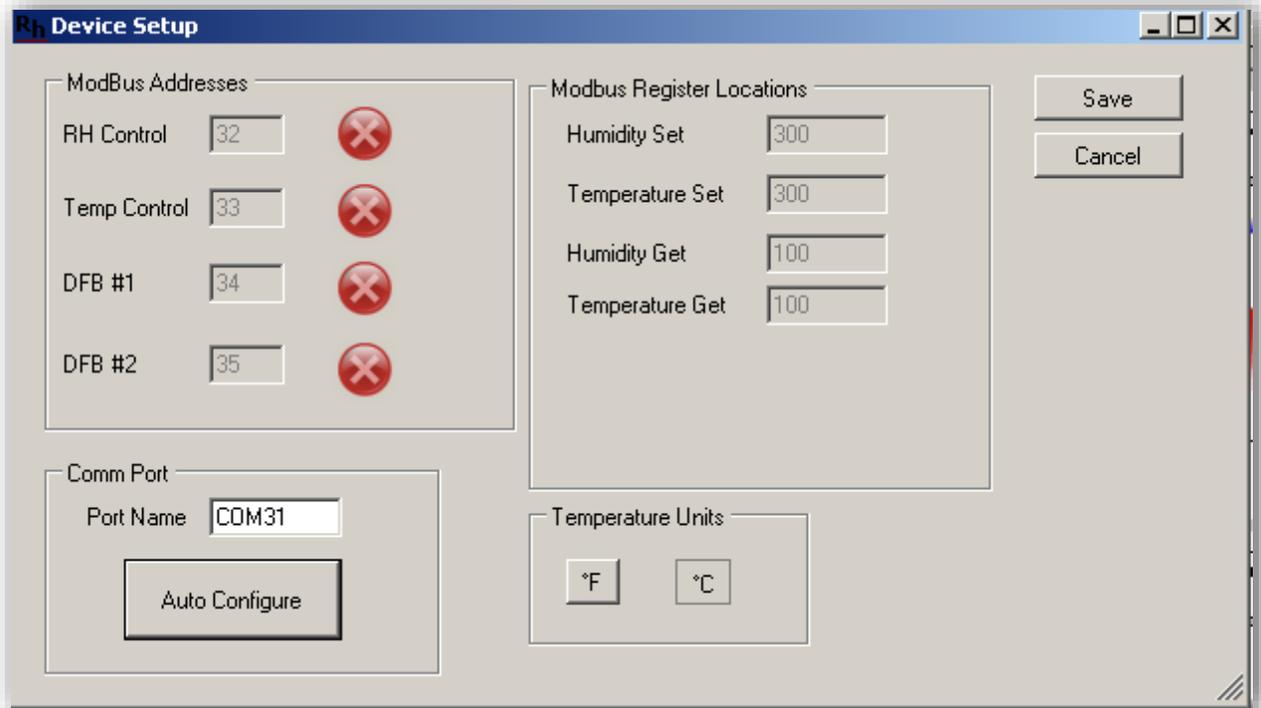


Figure 11 Modbus device setup

Panel Mode

Panel mode is accessed from the main screen button labeled 'Panel Mode'. Panel mode is only available if an experiment is not currently running. In Panel mode the user may manually control the environmental conditions with the chamber.

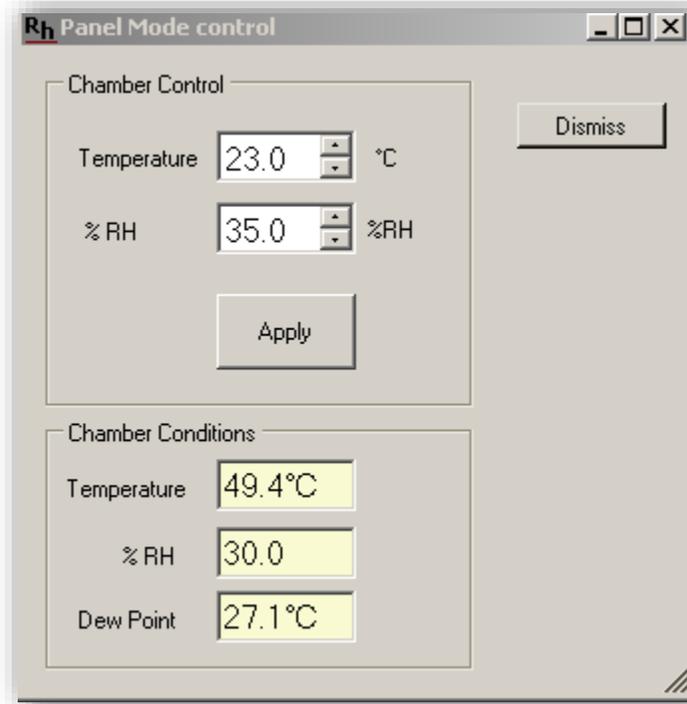


Figure 12 Panel mode control

Plot control

The plot area allows the user to control the scale range, line plot color and to zoom in and out of particular areas of interest. The screen that sets auto scaling and plot line color is shown below. To zoom the display to a particular area of interest the user should pause the plot updates by pressing the 'Pause Plot' button and then drag the cursors on either the temperature or humidity plot to the area of interest. The user may zoom in multiple times. To return to the total time views press the 'Reset Zoom' button.

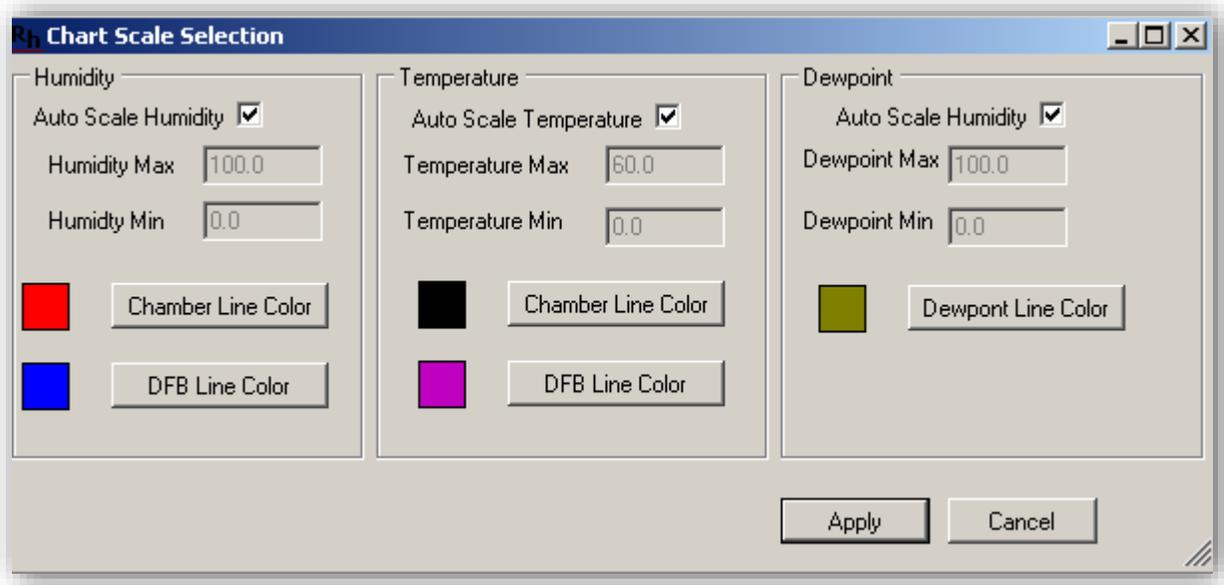


Figure 13 Axis range and color selection

Reports

At any time the user may request a report to be printed on the currently collected information. To print a report press the 'Print Report' button from the main screen. The user will be prompted for their name, title, employee ID and any additional notes. The user must select a printer to which to send the report and select print when ready.

Record Mode

The 'Record Mode' button on the main screen allows the user to record the chamber control probe channel behavior without defining an experiment. During record mode the system will log the raw collected data to the CSV file entered by the user. The Record Mode is meant for diagnostic or free form data collection. Note that record mode will generate a large amount of data as the environmental conditions are logged at a fast rate. So ensure that there is sufficient disk space where the log file is to be stored.

Error codes

The following table describes the possible error codes displayed on the Error List of GEO 1000 SP

Error String	Control behavior	
"No Analog Detected"	Control is turned off	Internal Hardware fault
"No Peltier"	Control is turned off	Internal over temp probe fault fans will run continuously.
"NO HumGen Temp"	Control is turned off	Internal temperature probe failure.
"Peliter High Limit"	Control is turned off if halt on errors is enabled	Internal cooling sensor is above limit
"HumGen Low Limit"	Control is turned off if halt on errors is enabled	Ambient temperature of humidity generator is below operating temperature
"HumGen High Limit"	Control is turned off if halt on errors is enabled	Humidity generator is above allowed limit. Check water supply or ambient conditions
"EEPROM Cfg Reset"	Control not affected	Unit has reset its configuration to factory default review settings.
"EEPROM Cal Reset"	Control not affected	Factory calibration has been reset to default. Please contact GEO instruments.

Contact Information

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