

# GEO CALIBRATION

## Model 4000

---

### User operational guide

2/20/2017

Copyright ©2017 All Rights Reserved  
<http://www.geocalibration.com/>  
1(631)471-6157

GEO Calibration  
2190 Smithtown Ave  
Ronkonkoma NY 11779  
USA

## Using The Model 4000

- **Filling with Water**
  - Only use Distilled Water
  - Water Fill Accessories
    - Syringe
    - Volume of Distilled Water
      - \*\* 1000 mL
      - \*\* First time, 1000 mL. Then after, as required basis. No more than 50mL at a time.
  - Fill Level Monitoring
    - While filling the water, monitor the LED. If the low level LED comes on, the unit will stop working until the water is filled to a sufficient level. The overflow LED should not be off. It should be on all the time. That shows that the unit is functioning.
  - Estimated Time to Refill
    - Fill the reservoir with distilled water to the minimum required level at least once a day. Overall water usage depends on how much humidity is generated and how many times the unit cycles RH up and down.
  - Procedure in case of Overflow
    - Drain the water through both back ports. There is an overflow tube in the back of the unit called “Overflow B” It must be kept open while filling the water, so that if overfilled, the excess water will be automatically drained, levelling the reservoir. Once the water level is within operational range, close the Overflow B tube with the provided cap. “Drain A” is provided in case the ultrasonic water level goes above the recommended level. It must be kept open at all times while operating the unit. There should not be any cap provided for that. There is a drain tube provided. The user should take the drain tube and dispose of it into a receptacle correctly.
  - Temporary Performance Effects from Water Temperature
    - The temperature of the water can reach up to 70°C internally. It does not affect the performance of the Model 4000.
  - Post Fill - Closing of Fill Ports
    - The “Fill Tube” is provided to fill the water. Distilled water must be used in this unit. There are LED indicators above the Fill Tube port vertically stacked . The bottom LED should **NEVER** come on. The bottom LED indicates low water. If the LED above is on, that means it didn’t overflow.
  - Storage of Water Fill Accessories
    - Please keep all water fill accessories separate from any possible hazardous chemicals. The unit is very sensitive and only accepts distilled water. Keep it in a safe place

- Warmup time
    - Please allow 45 minutes for the unit to properly warm up. If the red OVERRIDE WARMUP button is shown on the GEO Software, then the unit is not ready for high humidity. As soon as the red button disappears, the unit is marked as ready. User can still operate the Model 4000 in low humidity applications.
  
- **Desiccant Instructions**
  - Explanation of Desiccant Type
    - Drierite Anhydrous CaSO<sub>4</sub> GAS DRYING UNIT. Made by HAMMOND. It usually comes in blue color dye. As the desiccant is used, it turns pink color. Note: it is highly recommended to throw away the cartridge and refrain from using the desiccant material.
  - Expected Life of Desiccant
    - User can setup a outside humidity level as a configuration parameter. The Model 4000 will automatically use outside humidity to save the desiccant beyond that point. And it will use the internal desiccant below that set point. If you want to have higher performance, the Model 4000 will use the desiccant at a much faster rate.
    - Model 4000 has 3 desiccants and it automatically switches with the good desiccant. And indicates good desiccant vs the bad desiccants. Note: to learn how the desiccant indicators work, please review the operations manual.
  - Reordering of Desiccant Including Part Numbers
    - To reorder desiccant, submit a purchase order with the part number to GEO Calibration. Part number DEC02
  - Detailing Unit Desiccant Features / Operation // Detailing Desiccant “End-Of-Life” Indicators
    - There are 4 LEDs indicating how the Model 4000 is utilizing the desiccants. If the indicator on the top left of DRYER 1 is flashing green, that means it is using outside humidity **only**.
    - DRYER 1, DRYER 2, and DRYER 3 LEDs indicating solid green means the desiccants life may be good. We don’t know until the unit starts switching and using the desiccants. If any one of those 3 flashing, then the desiccant is being used.
    - If DRYER 1, DRYER 2, and DRYER 3 is off, that indicates the desiccant may not be good. User can open that door and take the desiccant out and see if it’s pink. If it isn’t pink, that means the desiccant did not sit properly. There is a possibility of an air leakage if the desiccant is bleed
    - As desiccant is being used, the color of it changes from blue to light purple. When the desiccant is completely light-purple, it must be replaced.

The Model 4000 only uses one desiccant at a time. If the desiccant is no longer useful, the unit will automatically change to another desiccant.

- Detailing Desiccant Color Change
  - Pink means the desiccant is used and needs to be replaced. Note if the color has changed to pink, the efficiency of the unit will slow down. It may not reach to a lower humidity than specified by the user.
- Detailing Desiccant Disposal
  - Depends on disposal rules and regulations of each country. Please review the MSDS provided with the Model 4000.
- **Door Operation**
  - Opening / Closing Extension Door
    - You can only open the Model 4000 door when it is powered. Please have the unit powered on when you need to open and close the door.
  - Extension Doors / Internal Accessory Door
    - Custom doors are available. Please contact GEO Calibration.
  - Bunges
    - Different sizes bunges are available for purchase. The sizes range from: 0.25, 0.5, 0.75,  $\frac{1}{8}$ ,  $\frac{3}{8}$ ,  $\frac{5}{8}$ ,  $\frac{7}{8}$ , and 1 inch. Please contact GEO Calibration for more information.
  - Probe Insertion Instructions
    - For multiple calibration, there are 10 probe USB Type-A connectors provided in the front panel on the bottom. From 1 through 10. (Note: the USB Type-A connectors are not regular USB type connectors. Customers should not charge their cell phones through these USB ports. This may damage their cell phones, USB devices, and the Model 4000 itself.
    - Port for reference probe at present, this port is provided for HC2-S3 type probe **only**. (Note: this probe is Hygro-Clip type probe)
  - Potential for Condensation
    - To prevent condensation inside the chamber, user must be aware of the physical principles behind condensation. For instance, the room temperature must not be below the internal temperature of the chamber. If such condition is present, there are very good chances of having condensation.
  - What to do in the event of condensation
    - In the event condensation has happened, to get rid of this condensation, the user has to increase the temperature and lower the humidity of the chamber.
    - In the event of condensation, the chamber must be removed of any excess water. To do this, open the chamber by pressing the DOOR RELEASE button. Take a clean cloth and carefully wipe down any excess water from inside the chamber.

- **Transportation**

- How to Move the Unit
    - This unit requires more than one person to move. Please ensure you have two people and use the black handles on the sides to lift the unit and keep the unit straight while lifting and transporting.
  - Is it necessary to empty the reservoir?
    - (Note: User doesn't have to empty the reservoir if the transportation is local. However, if the unit is transported for long distance, it is recommended that user drains the reservoir.)
    - If so, "Please refer to section **Filling Accessories and How-To's** of the Manual"
  - Photo or Rendering showing Handle Locations
  - Shipping Instructions
    - Unit Weight
      - 100 lbs (empty unit)
    - Unit Dimensions
      - Reference the spec sheet for the dimensions
    - GEO Requirements for Shipping to not void warranty
      - Container: If unit is shipped back to GEO, it must be shipped in a wooden crate with fully padded and protected from the damage while shipping.
      - Labelling
      - Etc.
-



# GEO 4000 Windows application

## Software capabilities

The GEO-DFB Desktop Software controls the GEO 4000 unit. It has the following features:

- Manually control current temperature and humidity of the GEO Calibration 4000 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

### Computer and Software Information

The GEO 4000 Windows application runs on Windows 10 32/64 personal computer. The computer have 3 free USB slots on the front access port. You may use these ports for peripherals like mouse, keyboard, and USB drives.

### Application installation

The application is already preloaded and configured for your machine. No installation is necessary.

## GEO Windows Application | Usage

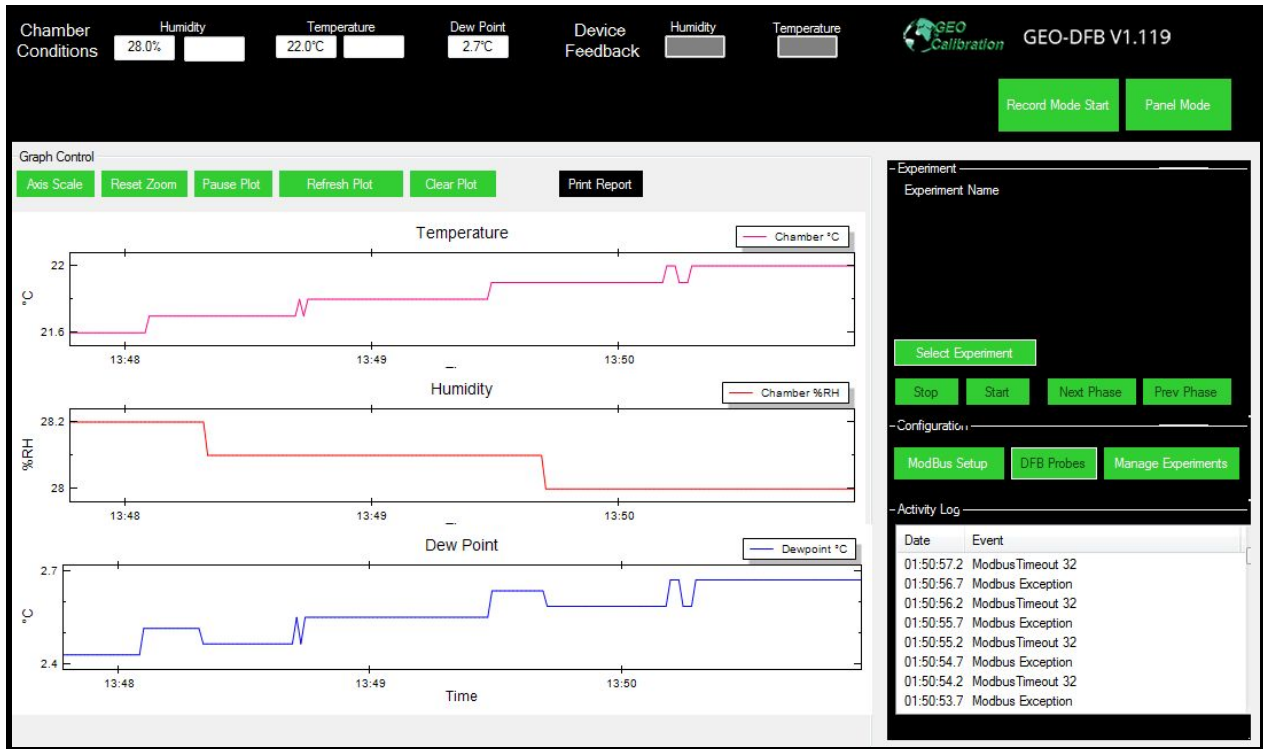


Figure 9 Main PC operational screen

### Main 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 top area labeled **Dew Point** indicates the current dew point within the chamber.

The top-right hand area labeled **Device Feedback** should be ignored for users of the Model 4000, 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.

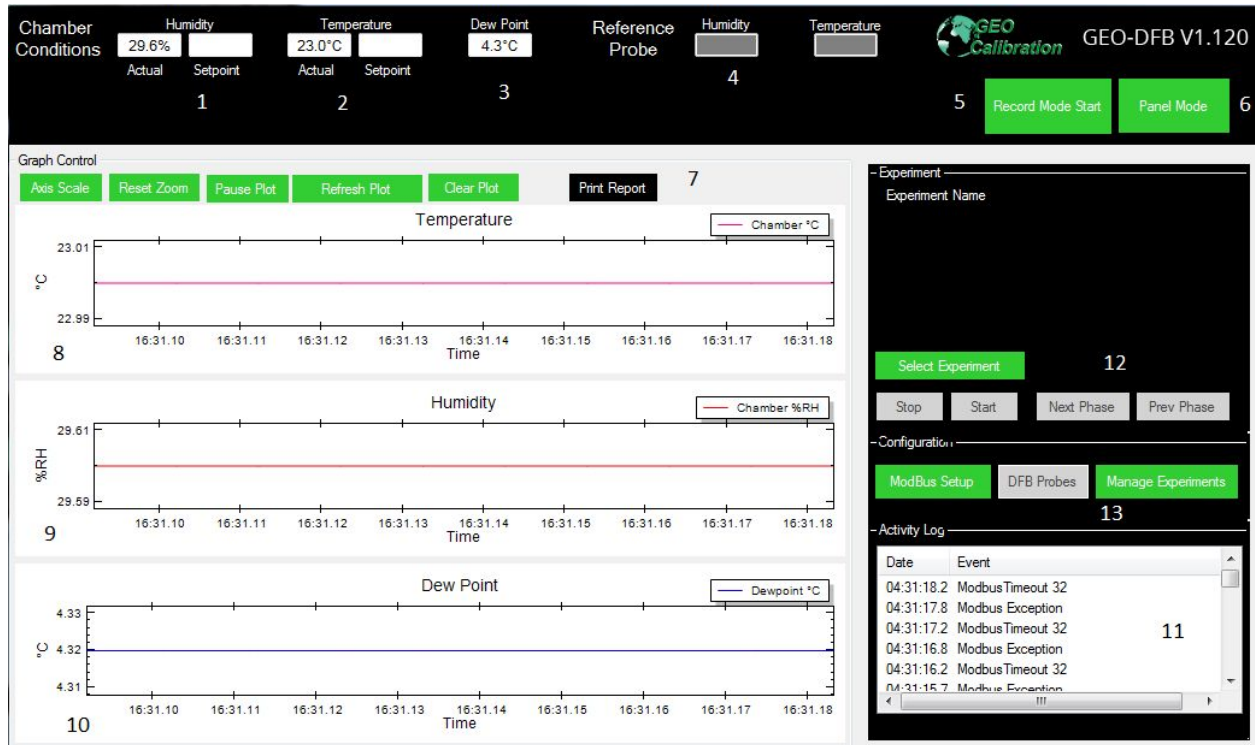
In the right hand portion of the screen in the area labeled **Experiment** is a display of the current experiment being run and which phase of the experiment is currently active and controls which allow



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-4000 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.



**1: Chamber's Actual Humidity**

**2: Chamber's Actual Temperature**

**3: Chamber's Actual Dew Point**

**4: Reference Probe Readings**

**5: Record Mode Start - Save a file and begin recording**

**6: Panel Mode - Allows manual setpoint declaration**

**7: Graph Control**

**Axis Scale - Opens Chart Scale Selection to customize colors of each graph**

**Reset Zoom - restore zoom back to default settings**

**Pause Plot - Pauses the plot and stops it from scrolling**

**Refresh Plot - Reloads the plots on the current screen**

**Clear Plot - erases the onscreen plots for temperature, humidity, and dew point**

**8: Temperature Graph Readout**

**9: Humidity Graph Readout**

**10: Dewpoint Graph Readout**

**11: Activity log and messages**

**12: Experiment phase controller - Start and stop experiments, as well as skip phases**

**13: Configuration**

**Modbus Setup - Connects the chamber to Modbus.**

## 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 3<sup>rd</sup> 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.

The screenshot shows a software interface for defining experiments and phases. On the left, under the heading "Experiments", there is a list of experiment types: 5 Point Ramp Up Humidity, 5 Point Ramp Down Humidity, Ramp Cycle Humidity, 2 Point Ramp Up Humidity, 2 Point Ramp Down Humidity, 5 Point Ramp Up Temperature, 5 Point Ramp Down Temperature, Ramp cycle Temperature, 2 Point Ramp Up Temperature, and 2 Point Ramp Down Temperature. Below this list are two large empty rectangular boxes. On the right, the "Experiment Info" section includes fields for Title, Log File, and Data Collection Rate (with a unit of hh:mm:ss), and a "Loop Forever" checkbox. The "Experiment Phase" section includes fields for Name, Log File, Data Collection Rate, and Phase run time (all with hh:mm:ss units). It also features a green "Define Stability" button, a "Transition on Chamber Stability" checkbox, and a "Generate report when complete" checkbox with a green "Printer setup" button. At the bottom of the phase section, there are two columns of controls: "Temperature" and "Humidity". Each column has fields for Start, End, and Increment (all in °C), and an "Update Rate" field (in hh:mm:ss). At the very bottom right of the interface are "Cancel" and "Select" buttons.

Figure 10 Experiment and phase definition

## Modbus Initial setup

The GEO Calibration 4000 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.

The screenshot shows a software configuration window for Modbus settings. It contains the following elements:

- ModBus Addresses:** A list of four items, each with a text input field and a red 'X' icon to its right:
  - RH Control: 32
  - Temp Control: 33
  - DFB #1: 34
  - DFB #2: 35
- Modbus Register Locations:** A list of four items, each with a text input field:
  - Humidity Set: 300
  - Temperature Set: 300
  - Humidity Get: 100
  - Temperature Get: 100
- Comm Port:** A section with a 'Port Name' input field containing 'COM6' and a green 'Auto Configure' button below it.
- Temperature Units:** Two green buttons, one for '°F' and one for '°C'.
- Buttons:** Two green buttons, 'Save' and 'Cancel', are located on the right side of the window.

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.

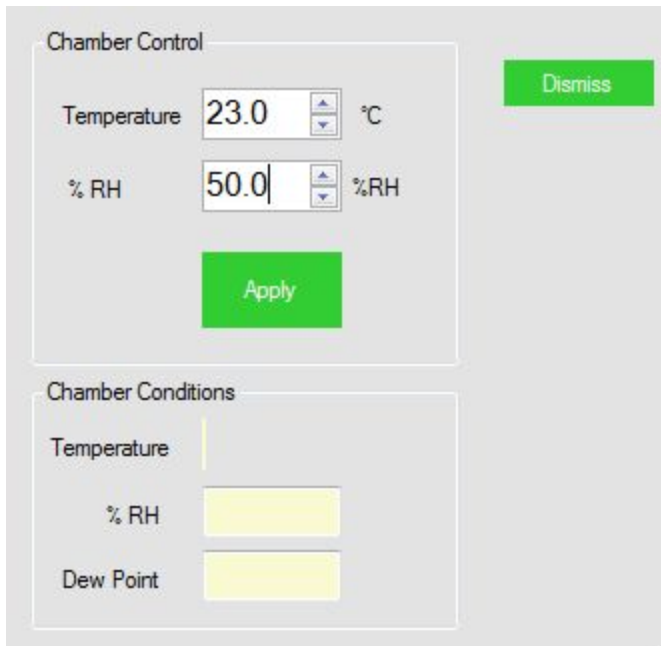


Figure 12 Panel mode control

## 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.

The screenshot displays a control panel for plot settings, organized into three columns: Humidity, Temperature, and Dewpoint. Each column has an 'Auto Scale' checkbox (all checked), 'Max' and 'Min' value input fields, and two color selection buttons labeled 'Chamber Line Color' and 'DFB Line Color'. The Humidity column shows Max: 100.0, Min: 0.0, Chamber Color: Red, and DFB Color: Blue. The Temperature column shows Max: 60.0, Min: 0.0, Chamber Color: Magenta, and DFB Color: Purple. The Dewpoint column shows Max: 100.0, Min: 0.0, and Chamber Color: Blue. At the bottom right, there are 'Apply' and 'Cancel' buttons.

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.

## App Launcher



When you start the Model 4000, this screen. You will have 2 options:

**GEO Software:** Launches the Chamber Conditions software

**Multiple Probe Calibrator:** Launches the automatic probe calibration software

Tap the software that you want with the touch screen to select the program desired.

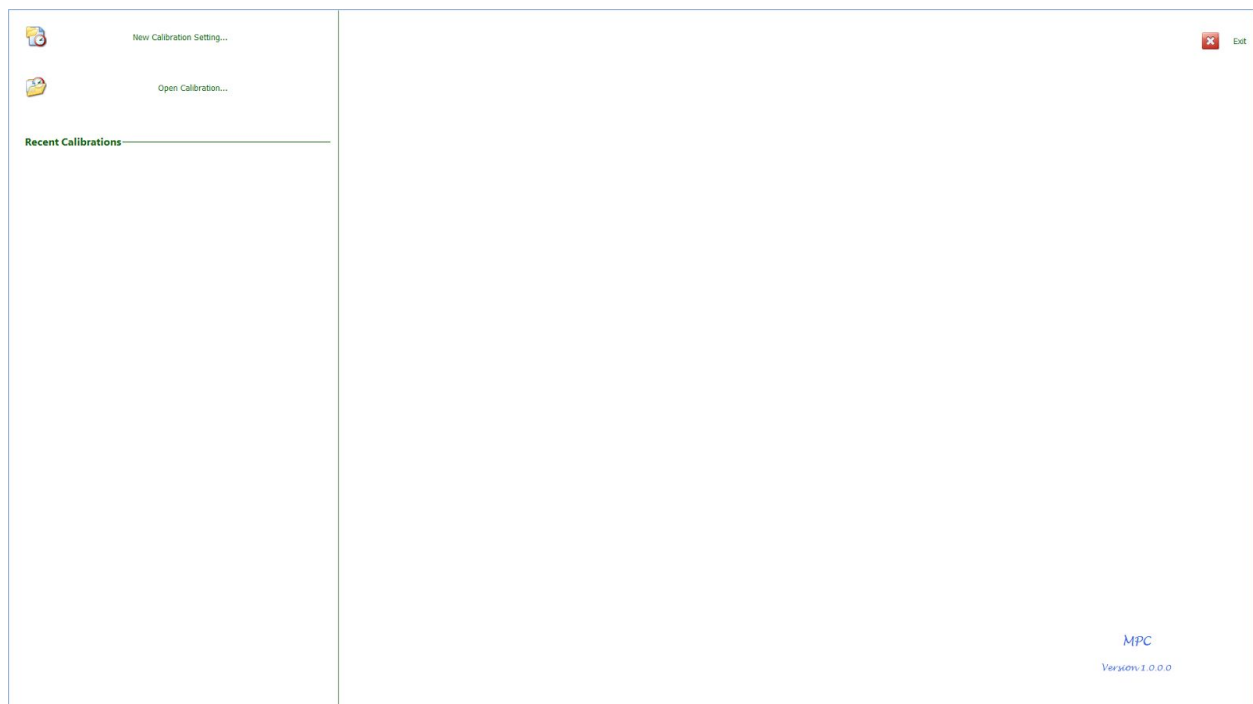
## Multiple Probe Calibrator

The MPC program allows you to calibrate the probes automatically. The program will guide you through the setup and parameters needed to get started.

The Multiple Probe Calibrator Software controls the GEO 4000 Probes. It has the following features:

- Automatically sets temperature points, humidity points, of the GEO Calibration 4000 generator.
- Use the chamber or the probe as a reference point
- Select from different probes for calibration
- Choose up to 2 points for temperature calibration, and 8 for humidity calibration, with the option for nearest, lowest, or highest end point.
- Calibration setting profiles

### Getting Started



To get started with the Multiple Probe Calibrator software, select *New Calibration Settings...* This will open a window and ask for a name input. You can open this profile later on since all of the parameters are saved in the file. Select a name and click Next in the bottom right.




## Probe Selection

Back

Select Calibration Information

Pick Probe Type

Available Probe Types

 AirChip 3000  
Rotronics

Pick Calibrates

Calibrate Temperature

Calibrate Humidity

Pick Reference Point

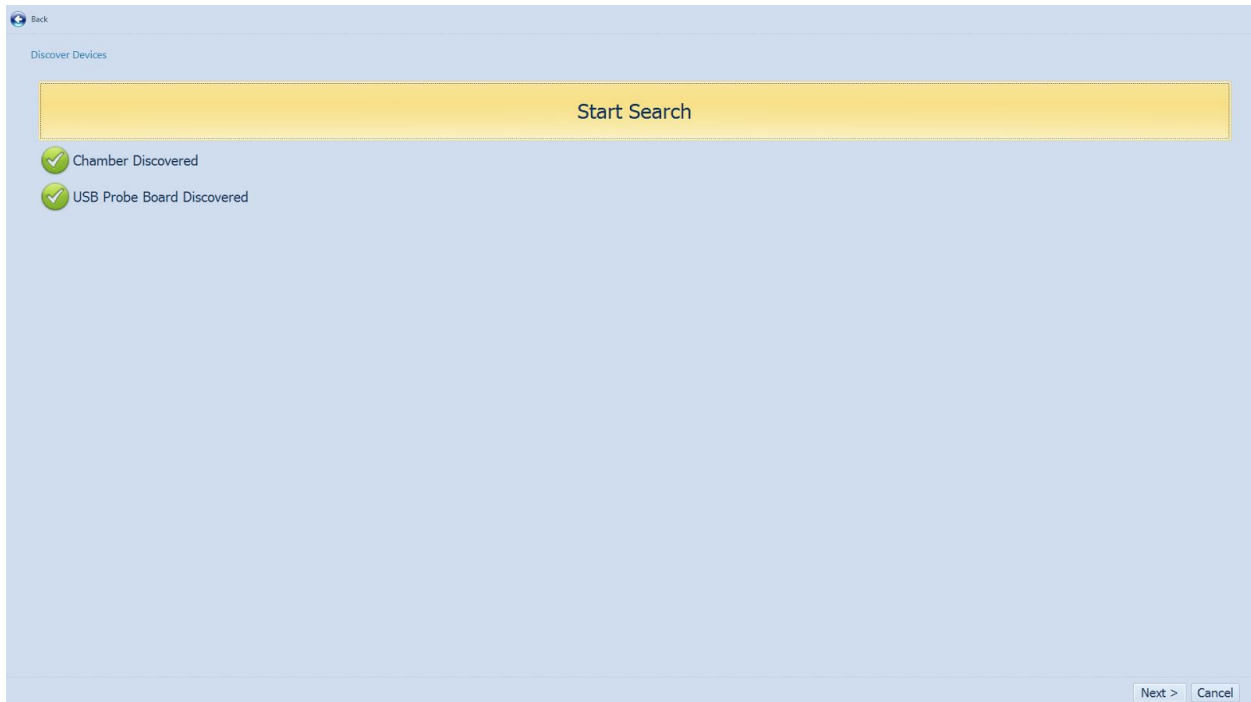
Chamber as reference point

Probe as reference point

Next > Cancel

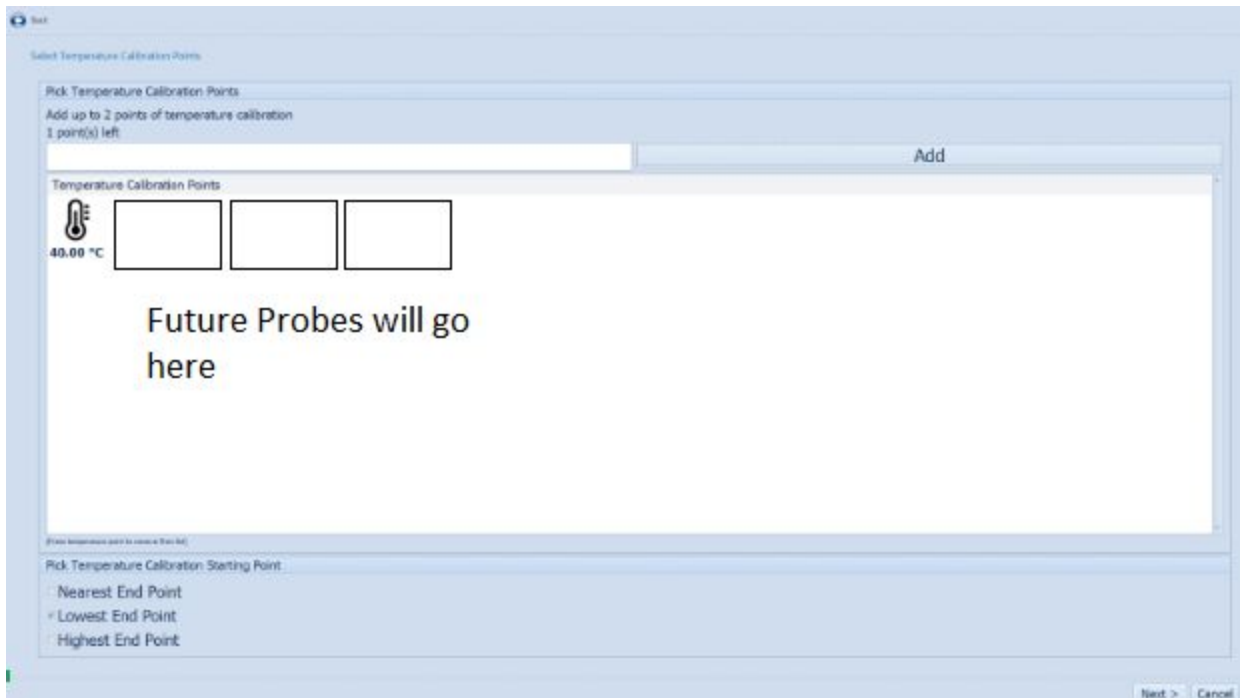
You can select the probe that you would like to use for calibration. You must also select the temperature/humidity, and reference point. The software will not allow you to proceed until all of the required fields are set.

## Discover Devices



The software will now send a heartbeat to the chamber and the USB probe board. Click Start Search. When the software finds both boards, click Next.

## Calibration Information



You will select the calibration points for temperature and humidity for these screens. You can only select

2 points of temperature and 8 points of humidity. The first screen is designated strictly for temperature and the second screen for humidity. Also, select the temperature calibration starting point on the bottom of the screen.

You will receive a confirmation screen stating that everything is set correctly. Select *Next* and the software will begin to run as intended.

## 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 4000

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

*GEO Calibration*

*2190 Smithtown Ave*

*Ronkonkoma NY 11779*

*+1 (631) 471-6157*

<http://www.geocalibration.com/>

[info@geocalibration.com](mailto:info@geocalibration.com)

## Technical Details

- The warranty card
  - Conditions for Voiding Warranty
    - DO NOT OPEN OR MODIFY UNIT
    - Tamper Stickers
  - Warranty Period
    - The Model 4000 is warranted for 12 months from date of delivery. Wear and tear is not covered. The warranty extends only to the original consumer purchaser and is not transferrable.
- Links to online documents and resources
  - Spec Sheets
    - <https://www.geocalibration.com/humidity-generators/model-4000/>
  - Online Demo System
    - <https://geocalibration.com/live-demo>
  - Quotations
    - <https://www.geocalibration.com/quote>
  - Accessories
    - <https://www.geocalibration.com/accessories/>
  - Upcoming Shows
    - <https://www.geocalibration.com/about/>
- Accessories:
  - Software accessories
    - The GEO Software comes packaged with Unit Control, Multiple Probe Calibrator, and an App Launcher. The app launcher will begin when you start the device. There will be 2 options to choose from. You can use the touch screen to select the application that you'd like to open. You can also use a mouse if you prefer. You can plug it into any of the USB ports below the screen. Do NOT plug in any peripheral into the USB ports below the chamber door except for the probes.
  - List of Door Options and Where to Buy
    - GEO Calibration has an assortment of door options for you to choose from. Please contact us at (631) 471-6157.

- Q&A
  - Can the unit operate at an angle or only a flat surface?
    - **Unit must work only on a flat surface**
  - What is the procedure if I break a component?
    - For all inquiries regarding broken components, please contact GEO Calibration at (631) 471-6157
  - Troubleshooting built in tablet.
    - [Windows 8.1 Manual](#)
  - How to Move the Unit?
    - Due to the weight and size of the unit, careful procedures must be in place before moving this. The unit must be moved with two people present.
    - Shipping Instructions
      - Unit Dimensions
        - L: 27.13 in.
        - W: 30.42 in.
        - H: 19.74 in.