GEO Calibration
Humidity Control Company

MODEL 2000 SP-SH

User Manual

English

Deutsch

Francais

GEO Calibration Inc.
2190 Smithtown Avenue
Ronkonkoma, NY 11779
USA

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INTRODUCTION

MESSAGE FROM GEO CALIBRATION

Thank you for purchasing the GEO Calibration Model 2000 SP-SH humidity and temperature generator/calibrator. We look forward to providing you the highest quality technical support as you become familiar with your new humidity and temperature calibrator.

To better familiarize yourself with the Model 2000 SP-SH, please **visit our Youtube Channel by searching GEO Calibration for user friendly videos.**

To start using your GEO Model 2000 SP-SH immediately, you may proceed to our **Quick Start Guide (page 17).**

For a deeper review of the Model 2000 SP-SH, See our **Calibration Technical Recommendations (page 29).**

Regards,
GEO Calibration Service Team

WARNING

As you read through this product manual, please familiarize yourself with our recommended best practices. By following the proper procedures, you will ensure your unit consistently performs to its highest potential.

Once you have removed the Model 2000 SP-SH from its external packaging, please visually inspect the unit for damage. If damage is found, please immediately contact your supplier.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Each GEO Calibration product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is one year and begins on the date of shipment. Parts, product repairs, and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a GEO Calibration authorized reseller, and does not apply to fuses, disposable batteries, desiccants, distilled water, or to any product which, in GEO Calibration's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. GEO Calibration does not warrant that software will be error free or operate wi thout interruption.

GEO Calibration authorized resellers shall extend this warranty on new and unused products to end-use customers only but have no authority to extend a greater or different warranty on behalf of GEO Calibration. **Warranty support requires activation and registration at:**

https://www.geocalibration.com/register

and is purchased through a GEO Calibration authorized sales outlet or Buyer has purchased unit directly from GEO Calibration. GEO Calibration reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country. GEO Calibration's warranty obligation is limited, at GEO Calibration's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a GEO Calibration authorized service center within the warranty period.

To obtain warranty service, contact your nearest GEO Calibration authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). GEO Calibration assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If GEO Calibration determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including over voltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, GEO Calibration will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer, shipped Ex Works FOB Suffolk County NY.

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. GEO CALIBRATION SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

GEO Calibration Inc.
2190 Smithtown Avenue
Ronkonkoma, NY, 11779
U.S.A.

UNPACKING INSTRUCTIONS

Once you have removed the Model 2000 SP-SH from its external packaging, please visually inspect the unit for damage. If damage is found, please immediately contact your supplier.

CALIBRATOR APPLICATIONS

The GEO Model 2000 SP-SH Humidity Calibrator generates and maintains a controlled humidity and temperature environment for the purpose of testing or calibrating humidity and temperature sensors, also known as hygrometers. The humidity calibration range is 5% up to 95%, while the temperature range is from 5°C to 55°C.

See the full technical specifications (page 29).

The system's accuracy is achieved via a NIST traceable internal control and reference probe.

The Model 2000 SP-SH can calibrate many hygrometer types:

- Probes
- Data-loggers
- Chart Recorders
- Additional Assorted Hygrometers

Please review the dimensions of the calibration chamber to ensure compatibility with the size requirements of any hygrometers you intend to calibrate. You may require an Expansion Chamber. Your GEO representative should have reviewed this with you at time of purchase, if not, please contact our support team and they will size an Expansion Chamber accordingly.

The Model 2000SP-SH allows for multiple types and sizes of hygrometers, for a complete list please contact us at support@geocalibration.com.

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STANDARD PACKING CHECK LIST

Contents of Shipment			
✓	QTY	Part Number	Description
	1	01-202-00-0000	Model 2000 SP-SH Humidity Generator
	1	01-200-11-0001	Desiccant Canister
	1	01-200-36-0002	Reference Standard / Control Probe
	1	01-200-36-0011	2 Part Desiccant Tool
	1	01-200-01-0013	Desiccant Clamps
	1	01-200-01-0035	2000 SP-SH Accessories Kit
	1	01-200-36-0013	GEO Accessories Box
	1	02-350-07-0005	Clear Door
	1	01-200-08-0025	Chamber Insert for Air Circulation
	1	01-202-02-0010	Model 2000 SP-SH Rack Mounting Bracket
	1	N/A	Calibration Documents / Trace Paperwork
	1	2000SPSH_UM	Model 2000 SP-SH User Manual

Contents of GEO Accessories Kit			
✓	QTY	Part Number	Description
	1	01-200-82-0001	GEO Accessories Bag
	1	01-200-36-0006	Fill Syringe (20ml)
	1	01-200-69-0001	Type A Male to Type A Male USB Cable
	1	01-202-30-0001	DC Cable
	1	01-202-36-0002	Power Supply (DC 12V@12A) with Power Cord (Optional)

STANDARD PACKING CHECK LIST

Contents of GEO Accessories Box			
✓	QTY	Part Number	Description
	1	01-001-00-0017	6 Port Door Square with 6 Plugs
	4	01-001-66-0001	GEO Knobs (1 piece)
	1	01-200-01-0036	GEO Bungs (7 pack)

Calibration Documents			
✓	QTY	Part Number	Description
	1	NO REORDER	Factory Calibration Report
	1	01-999-99-0001	ANAB ISO 17025 Calibration Certification (IF ORDERED)

VISUAL ITEM CHECK LIST

Listed below are standard contents included with the purchase of a new Model 2000 SP-SH.

Humidity Generator

GEO Calibration
Model 2000 SP-SH
P/N: 01-202-00-0000

Desiccant Canister

Pre-Filled with molecular sieve

P/N: 01-200-11-0001

Control Probe

HC2-S HygroClip
control probe (pre-installed)

P/N: 01-200-36-0002

Plastic Wrench

P/N: 01-200-36-0011

2000 SP-SH Accessories Kit

Contents:
See Page 10
P/N: 01-200-01-0035

2000 SP-SH Accessories Box

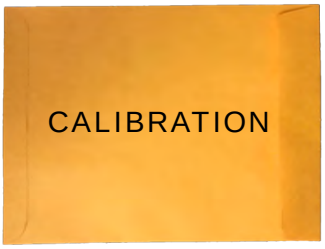
Contents:
See Page 11
P/N: 01-200-36-0013

Chamber Insert for Air Circulation

P/N: 01-200-08-0025

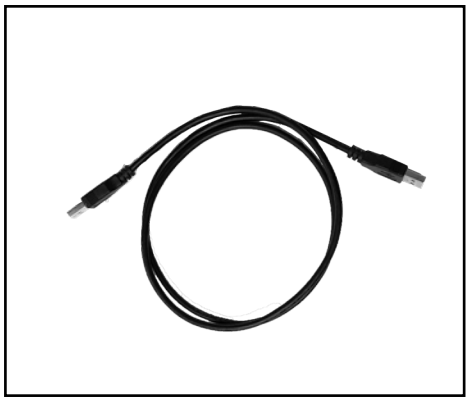
Desiccant Clamps

P/N: 01-200-01-0013



Calibration Documents

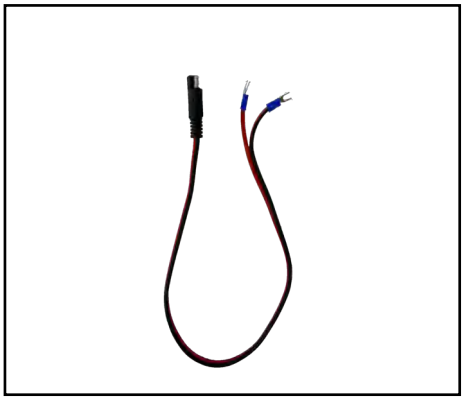
ACCESSORY BAG CONTENTS



USB Cable

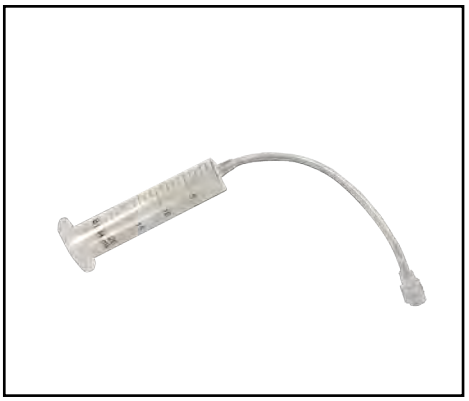
(A to A)

P/N: 01-200-69-0001



DC Cable

P/N: 01-202-30-0001



Fill Syringe

P/N: 01-200-36-0006

Power Supply (Optional)

(DC 12V@12A)
with Power Cord
P/N: 01-202-36-0002

ACCESSORY BOX CONTENTS

Chamber Door
With plug set

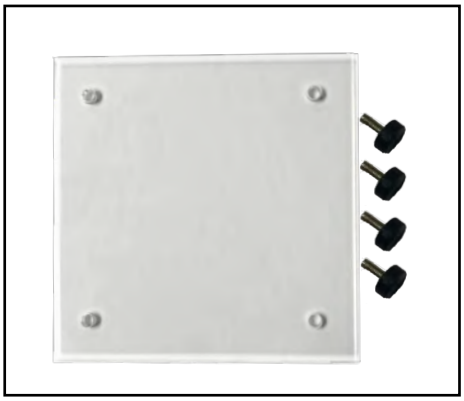
P/N: 01-001-00-0017

4 Piece GEO Knob Kit

P/N: 01-001-66-0001

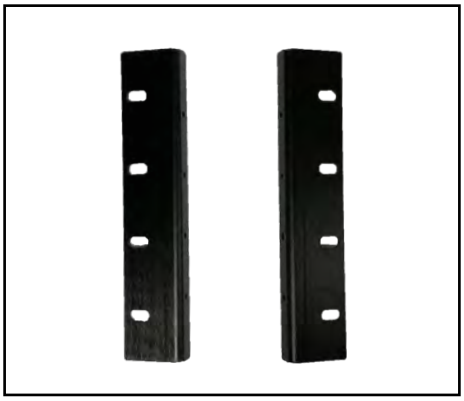
7 Piece Bung Kit

P/N: 01-200-01-0036



Clear Door

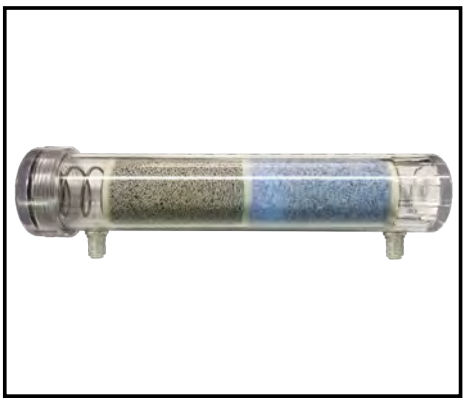
P/N: 02-350-07-0005



Rack Mounting Bracket

P/N: 01-202-02-0010

AVAILABLE ACCESSORIES



Replacement Desiccant

P/N: 01-200-11-0001

Replacement Fill Syringe

P/N: 01-200-36-0006

Replacement Control Probe

HC2-S HygroClip
control probe (pre-installed)
P/N: 01-200-36-0002

ISO 17025 System Recalibration

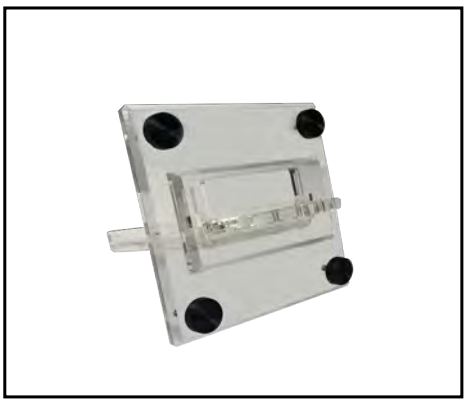
P/N: 01-999-99-0004

971 Door

P/N: 01-001-00-0029

Chilled Mirror Door

P/N: 01-001-00-0010



Drawer Door

P/N: 01-001-00-0026

Expansion Chamber

P/N: 01-054-00-0000

Silicone Adapter Variations (Regular and Slimline)

AVAILABLE ACCESSORIES

Humidity Generator		
QTY	**Part Number**	**Description**
1	01-200-11-0001	Desiccant Canister
1	01-200-36-0002	Control Probe
1	01-200-01-0035	2000 SP-SH Accessories Kit
1	01-200-08-0025	Chamber Insert for Air Circulation
2	01-200-01-0013	Desiccant Clamps
1	01-200-69-0001	USB A to A Cable
1	01-202-30-0001	DC Cable
1	01-202-36-0002	Power Supply (DC 12V@12A) with Power Cord (Optional)
1	01-200-36-0006	Fill Syringe (20ml)
1	01-200-01-0036	7 Piece Bung Kit
1	01-200-36-0011	2 Part Desiccant Tool

AVAILABLE SERVICE

QTY	Part Number	Description
1	01-999-99-0001	ANAB ISO 17025 Calibration Certification

AVAILABLE ACCESSORIES

Chamber Doors		
QTY	**Part Number**	**Description**
1	01-001-00-0017	6 Port Square Door with Plugs
1	01-001-00-0018	6 Port Round Door with Plugs
1	01-001-00-0024	6 Port Square Slimline Door with Plugs
1	01-001-00-0010	4 Port Chilled Mirror Door with Plugs
1	01-001-00-0003	4 Port Square Door with Plugs
1	01-001-00-0004	4 Port Round Door with Plugs
1	01-001-00-0028	2 Port Door with Plugs
1	01-001-00-0029	2 Port 971 Door with Plugs
1	02-350-07-0005	Solid (No Ports) Clear Square Door
4	01-001-66-0001	GEO Door Knobs
1	01-001-00-0026	Sample Drawer Door
Custom door available, please contact us for more information.		

Expansion Chamber			Usable Dimensions		
QTY	**Part Number**	**Description**	**W**	**D**	**H**
1	01-054-00-0000	Standard	7.67”	6.69”	12.9”

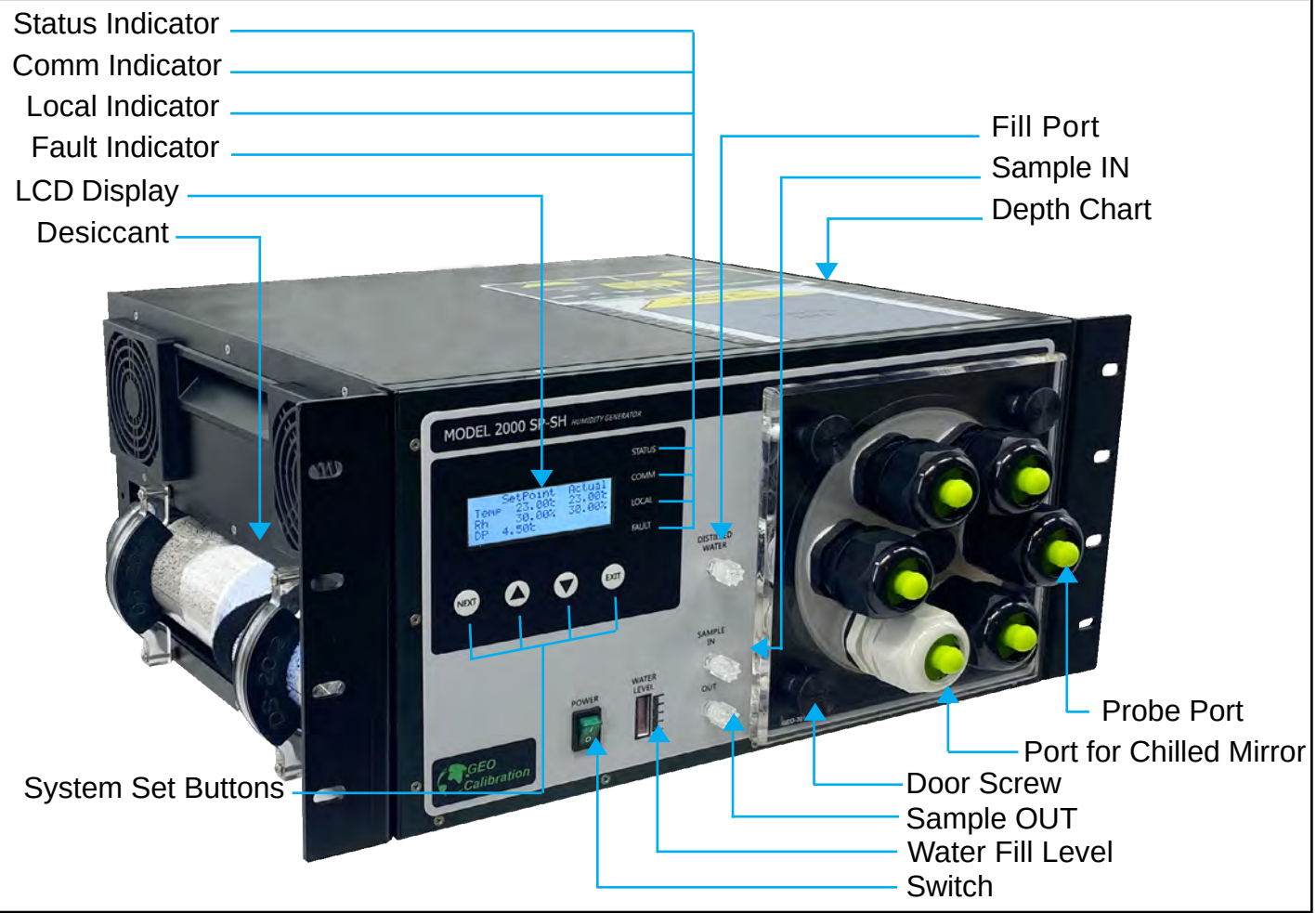
AVAILABLE ACCESSORIES

Grommets / Bungs						
M36 are for Standard Hygrometers PG36 are for Chilled Mirror Adapters						
Part Number	Type		Bung Size		Port Size	
			mm	in	mm	in.
01-004-09-0001	Regular	M36	31.00	1.22”	0.000	0.000”
01-004-09-0002					3.175	0.125”
01-004-09-0003					6.350	0.250”
01-004-09-0004					9.525	0.375”
01-004-09-0005					12.700	0.500”
01-004-09-0006					15.875	0.625”
01-004-09-0007					19.050	0.750”
01-004-09-0008					22.225	0.875”
01-004-09-0009					25.400	1.000”
01-004-09-0020	Slimline	M36	31.00	1.22”	3.175	0.125”
01-004-09-0021					6.350	0.250”
01-004-09-0022					9.525	0.375”
01-004-09-0023					12.700	0.500”
01-004-09-0024					15.875	0.625”
01-004-09-0025					19.050	0.750”
01-004-09-0026					20.950	0.825”
01-004-09-0027					25.400	1.000”
01-004-09-0034	Regular	PG36	44.45	1.75”	00.000	0.000”
01-004-09-0028					12.700	0.500”
01-004-09-0029					15.875	0.625”
01-004-09-0030					19.050	0.750”
01-004-09-0031					25.400	1.000”
01-004-09-0032					31.750	1.250”
01-004-09-0033					34.290	1.350”
01-004-09-0035	Slimline	PG36	44.45	1.75”	9.525	0.375“
01-004-09-0036					15.875	0.625“
01-004-09-0037					25.400	1.00“

UNIT DIAGRAM AND PARTS LISTING

Below you will find a diagram of the Model 2000 SP-SH's various operational parts.

FRONT



REAR

QUICK START GUIDE

This guide is intended to give you the necessary information to quickly get up and running with your 2000 SP-SH humidity and temperature generator.

It includes the following instructions:

- Filling the Reservoir
- Powering On the Unit
- Operating the Front Panel Controller
- Reading the Status Indicator Lights
- Unit Screen Navigation
- Changing the Door / Opening the Chamber

VIDEO VERSION

A video version of this guide is available at:

www.geocalibration.com

and the YouTube Channel

by searching GEO Calibration

Read Before Turning On The Unit

1.

After receiving the unit, open the door to let the chamber dry for 10 minutes. Use soft paper tower to wipe the water in the chamber if needed.

2.

Turn on the unit and set the temperature to 30 °C and humidity to 30 % to let the unit settle, approximately for 20 minutes (first time only).

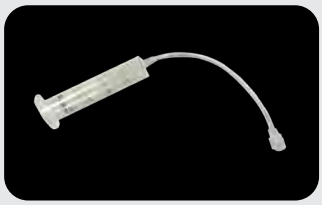
PLEASE NOTE:

1. Do not use alcohol inside the chamber.
2. The above instruction must be followed to ensure unit is dry from any changes during shipping.

Supplies Needed

Distilled Water Only

Fill Syringe



1. Locate the Fill Port

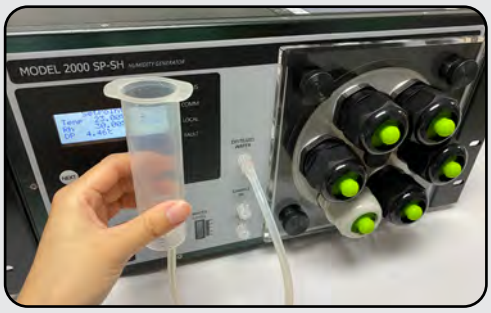
The port is labeled and located on the middle lower portion of the front panel.

2. Remove the Fill Cap

Rotate Counter-Clockwise to remove.

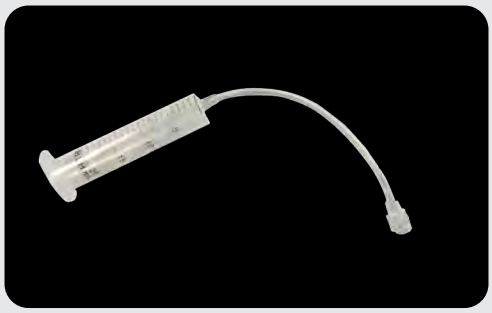
3. Attach Fill Syringe to Fill Port

Press the fill syringe tip into the fill port, then rotate the cap clockwise to secure.



4. Elevate and Fill Syringe

- Pour distilled water into the elevated tube body.
- Take care not to insert any air into the reservoir.
- Monitor the water level indicator while filling.



5. Loosen and Remove Syringe

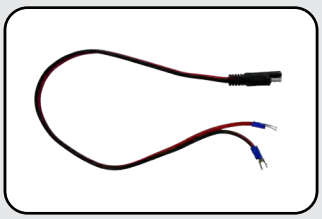
Turn the fill syringe tip counter-clockwise to loosen.

6. Re-Install the Fill Cap

Turn the cap clockwise to tighten the cap and seal the fill port.

Supplies Needed

DC Cable

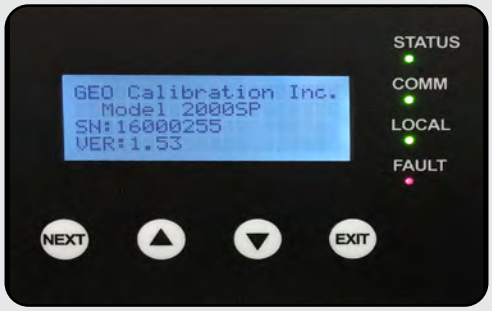


1. Locate the Power Installation

2. Plug Power Supply

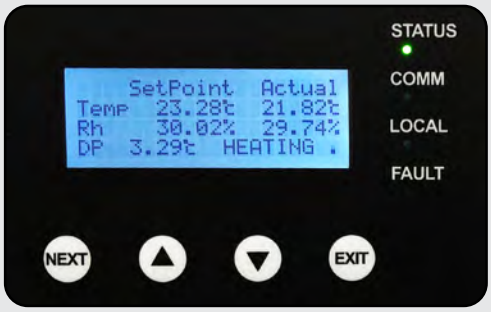
Voltage range is 12V DC @10-12A
Or Car Battery 12-13.4 VDC @10-12A
Maximum power usage is 240 Watts.

3. Set Power Switch to “ON”



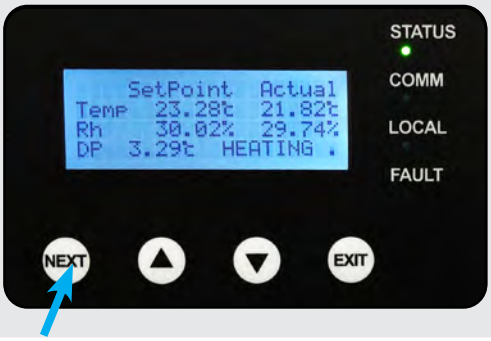
1. Boot Screen

Manufacturer Name
Model Number
Serial Number
Firmware Version Number



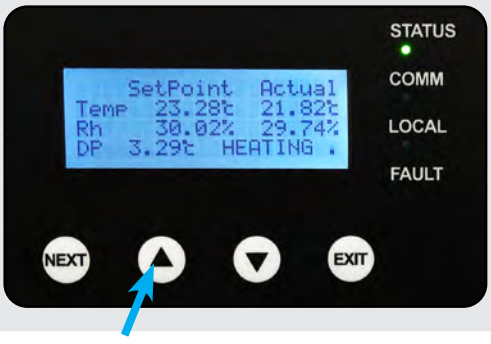
2. Observe the Display

Current Temperature	Top Right
Current Relative Humidity	Middle Right
Programmed Temperature	Top Left
Programmed Relative Humidity	Middle Left
Calculated Dew Point	Bottom Left



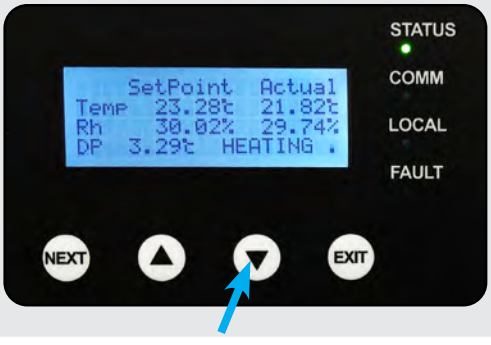
3. Changing Humidity & Temperature

Pressing the "Next" button activates the set-point interface. The selected field will repeatedly flash its current programmed value. Repeated presses will toggle between the Humidity and Temperature fields.



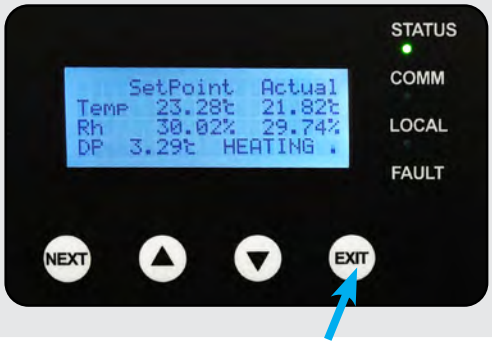
4. Raise the Desired Set-point

Pressing the "UP" key will raise the selected set-point.
Holding the "UP" key will rapidly raise the selected set-point.



5. Lower the Desired Set-point

Pressing the "DN" key will lower the selected set-point.
Holding the "DN" key will rapidly lower the selected set-point.



6. Commit Your Changes

Pressing the “EXIT” key will commit your changes.
It will submit your change after 5 seconds.

ENTERING TEMP & RH SET-POINTS

From the Main Screen press the ‘NEXT’ Button. The current set point for temperature will flash indicated in the figure below. If the ‘NEXT’ Button is pressed again, set point for RH will flash. This means user can change the value of set point by using ‘UP’ and ‘DN’ Arrow Button.

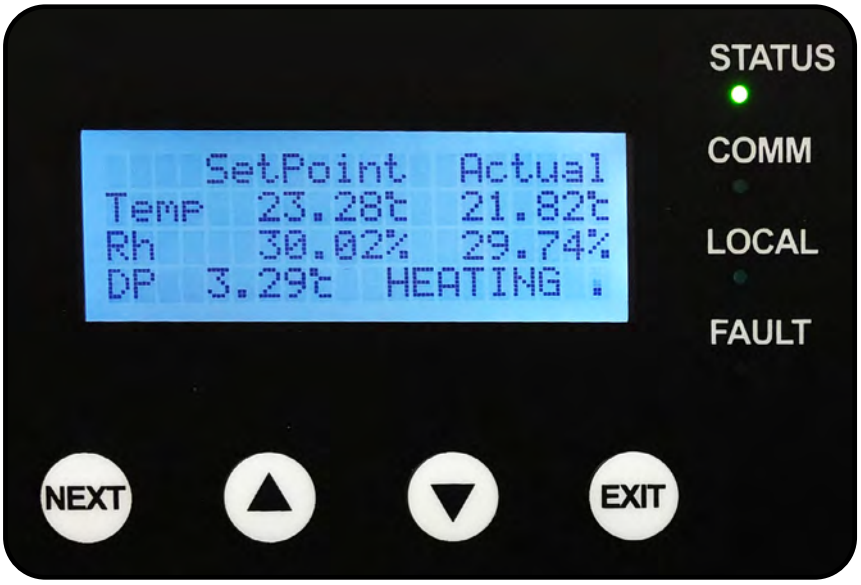


Figure 1 Main menu

BUTTON OPERATION

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

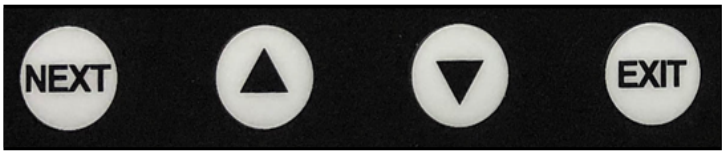


Figure 2 Push buttons

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 10 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.

The ‘EXIT’ button has one additional use when the Model 2000 SP-SH 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 ‘HEATING’. 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 ‘HEATING’ 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 Model 2000 SP-SH Windows application.

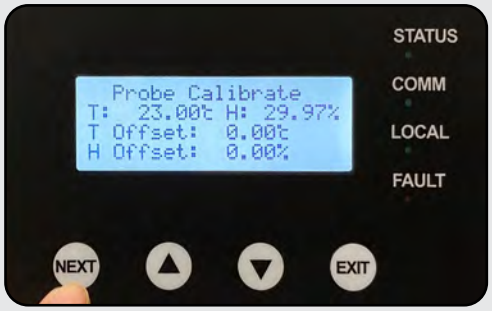
The ‘LOCAL’ light indicates that the unit’s environmental condition is being modified locally from the front panel. That is the current chamber environment has overridden the setting made by the GEO-DFB application.

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.

By pressing the “NEXT” button and holding, user can quickly review the system settings of each screen.

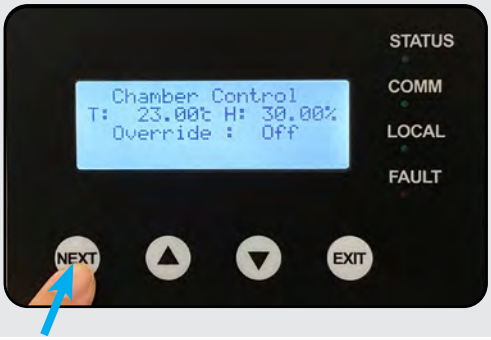
1. Main Display

Current Temperature	Top Right
Current Relative Humidity	Middle Right
Programmed Temperature	Top Left
Programmed Relative Humidity	Middle Left
Calculated Dew Point	Bottom Left



2. Probe Calibration

Current Temperature	Top Left
Current Relative Humidity	Top Right
Temperature Offset	Middle
Humidity Offset	Bottom



3. Chamber Control

Current Temperature	Top Left
Current Relative Humidity	Top Right
Override	Bottom

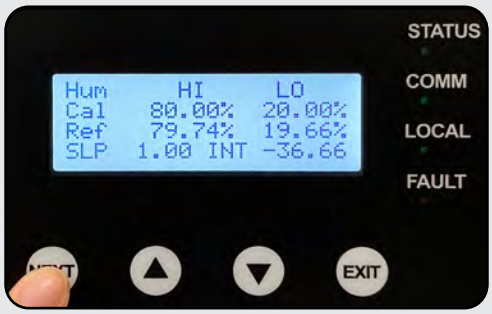
4. BIT Heat Exchanger

5. BIT Humidity Gen

6. Error List

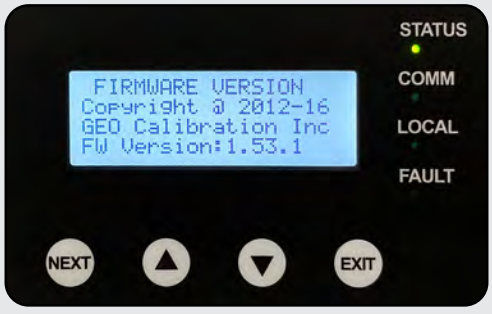
7. Two Point Calibration for Temperature

Reading Temperature@40°C	Top Left
Reading Temperature@23°C	Top Right
Reference Temperature@40°C	Middle Left
Reference Temperature@23°C	Middle Right
Temperature Slope	Buttom Left
Temperature Intercept	Buttom Right



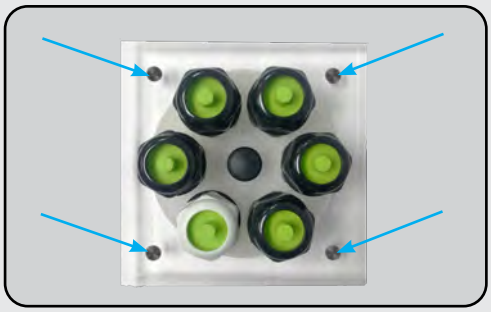
8. Two Point Calibration for Humidity

Reading Relative Humidity@80%	Top Left
Reading Relative Humidity@20%	Top Right
Reference Relative Humidity@80%	Middle Leftt
Reference Relative Humidity@20%	Middle Right
Relative Humidity Slope	Buttom Left
Relative Humidity Intercept	Buttom Right



9. Firmware Version

Manufacturer Name
Model Number
Serial Number
Firmware Version Number



1. Unscrew the Corner Screws

Remove screws by turning in a counter-clockwise motion.

2. Loosen Center Screw

In some door variations, there is a center screw that serves the purpose of creating a tighter seal. If this screw exists, it must also be loosened using a counter-clockwise motion before the door can be removed.

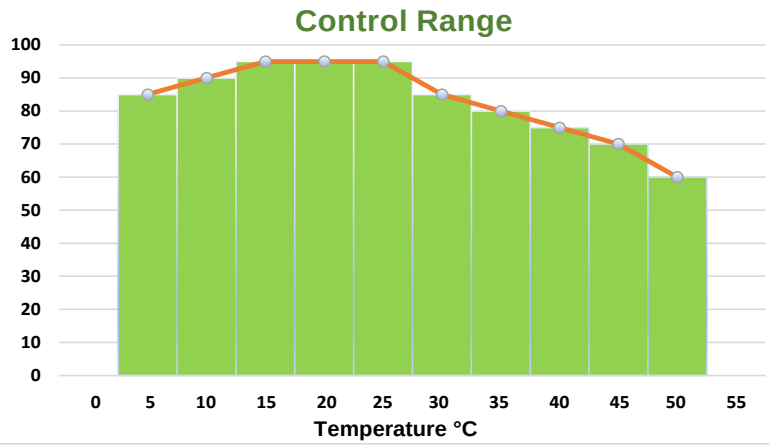
3. Remove the Door

The best removal method is to pull from the top of the door to break the seal. Once the top is loose, lift and pull to fully remove the door.

4. Reinstall the Door

GENERAL SPECIFICATIONS

CALIBRATION TO (17025 TRACEABLE TO NIST)	**TRANSFER STANDARD**	No Charge	
	CERTIFICATE	17025 Validation (Additional Fees Apply)	
OPERATING AMBIENT CONDITIONS	**TEMPERATURE**	18 °C to 28 °C	
	HUMIDITY	Up to 80 % RH	
STORAGE CONDITIONS	**TEMPERATURE**	-20 °C to 50 °C	
	HUMIDITY	0 % to 95 % RH (non-condensing)	
ALTITUDE	**2000 m**		
CALIBRATION SYSTEM ACCURACY	**TEMPERATURE**	± 0.10 °C Or Better Typically ± 0.05 °C	*Based on Probe Accuracy
	HUMIDITY	± 1.00 % RH Or Better Specially tuned systems can be as good as ± 0.60 %	*Based on Probe Accuracy
	CONTROLLER TYPE	PID Controller	
UNIFORMITY	**TEMPERATURE**	0.10 °C Or Better Typically ± 0.05 °C	
	HUMIDITY	0.30 % RH @ 18 °C to 28 °C Or Better Typically ± 0.25 %	
STABILITY	**TEMPERATURE**	0.05 °C	
	HUMIDITY	0.15 % RH @ 18 °C to 28 °C	
WARM-UP PERIOD	**AMBIENT CONDITIONS**	30 Minutes Maximum	
	COLD	30 Minutes	
RESOLUTION	**DISPLAY**	Temperature	0.01 °C
		Humidity	0.01 % RH
		Dew Point	0.01 °C (Calculated)
	USB	Temperature	0.01 °C
		Humidity	0.01 % RH



RAMP / SOAK RATE OF CHANGE *Depends on ambient and desiccant conditions		
TEMPERATURE	High → Low	1.50 °C / minute *Typical
	Low → High	5.00 °C / minute *Typical
HUMIDITY	High → Low	5.00 % RH / minute *Typical
	Low → High	10.00 % RH / minute *Typical

CONTROL RANGE			
TEMPERATURE	5 °C to 55 °C		
HUMIDITY@ 18°C	5 % to 95 % RH	**HUMIDITY@ 35°C**	5 % to 80 % RH
HUMIDITY@ 23°C	5 % to 95 % RH	**HUMIDITY@ 40°C**	5 % to 75 % RH
HUMIDITY@ 30°C	5 % to 85 % RH	**HUMIDITY@ 50°C**	5 % to 60 % RH

SPECIFICATION ANNOTATIONS

If the desired humidity set-point is higher than 70%,

* Set the temperature to your desired point first, and let the chamber stabilize. Next, set the humidity to the desired set point.

** To achieve low temperature with high humidity, you must first set the humidity value to 70% or lower, and let the chamber stabilize. Then, set the temperature to the desired set point. This avoids condensation appearing within the chamber.

Note:

If condensation is formed in the chamber:

A. Open the chamber door and wipe any visible water away with a paper towel.

B. Set humidity to 30% and temperature to 30 °C then let the unit dry and stabilize.

CONSUMABLES

WATER	**RESERVOIR**	200 ml
	SPILL RESISTANT	Yes
	REQUIRED FLUID	Distilled Water Only
	EST. REFILL PERIOD	15 Days to 1 Month (Typical) *Depends on Usage
	FILL INDICATOR	Floating Ball
DESICCANT	**TYPE**	Molecular Sieve
	REPLACEMENT	When Indicating Desiccant is 3/4 Used
	REPLACEMENT FREQUENCY	Depends Entirely on User Workload
	LOCATION	Left Side Mounted
	FASTENER	Desiccant Mounting Bracket Provided
RECALIBRATION	**FREQUENCY**	Depends on User Uncertainty Requirements
		Once Per Year Recommended

MECHANICAL

GENERATOR DIMENSIONS	**Measurement Type**	**Width**(with bracket)	**Width**(w/o bracket)	**Depth**	**Height**
	Metric	48.26 cm	40.26 cm	38.50 cm	23.50 cm
	English	19.00 in	15.85 in	15.16 in	9.26 in
CHAMBER DIMENSIONS	**Measurement Type**	**Diameter**	**Depth**		
	Metric	14.50 cm	20.00 cm		
	English	5.71 in	7.87 in		
WORKING DIMENSIONS AND VOLUME	**Measurement Type**	**Diameter**	**Depth**		
	Metric	12.50 cm	10.90 cm		
	English	4.92 in	4.29 in		
	Volume	1.5 Liter Effective Working Volume			
WEIGHT	Unit Only	Metric	10.07 kg		
		English	22.20 lb		
STANDARD PORT QUANTITY	Depends on doors	Availability: 6 Ports, 5 Ports, 4 Ports, 2 Ports			
CHILLED MIRROR PORTS	In and Out				
			Probe Range	**Actual Unit Range**	
PROBE ANALOG OUTPUTS AVAILABLE	0 - 1 Volt	Temperature	- 40.00 to + 60.00 °C	+ 5.00 to + 60.00 °C	
		Humidity	0 to + 100.00 %	+ 5.00 to + 95.00 %	

ELECTRICAL

OUTPUT POWER SUPPLY	12V DC @ 10-12A / Car Battery 12-13.4 VDC @10-12A	Maximum Power 240 Watts

CALIBRATION

UUTs (UNITS UNDER TEST)

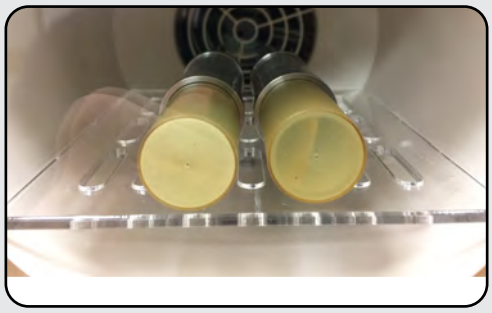
Port Adapter

Supplies Needed

UUT
[Unit Under Test]

1. Select Port Size Adapter

Measure the diameter of the UUT and select the appropriately sized silicone adapter. Unscrew the Model 2000 SP-SH door and replace the adapter if necessary. Ensure the door is securely fastened to the chamber.



2. Insert UUT

Insert your UUT at least 3 inches into the Model 2000 SP-SH chamber.

3. Program Unit Set-points

Allow the unit to reach the programmed set-points and settle. To best preserve desiccant, it is advised that you begin multi-point calibrations with low humidity set-points.

4. Compare Readouts

Follow the manufacturer's recommendation for recalibration and programming offsets.

CONTROL / REFERENCE PROBE CONFIGURATION

The probe calibration screen allows the user to introduce a calibration offset to the internal probe used to control the GEO Calibration 2000 SP-SH chamber. This allows the user to calibrate the internal probe to an external reference.

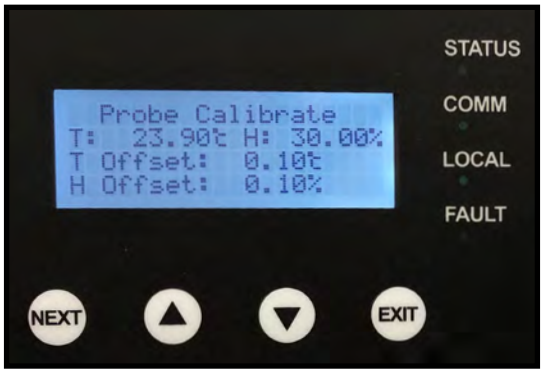


Figure 5 Control Probe Calibration

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.

1. Clear Temperature and Humidity - Offsets

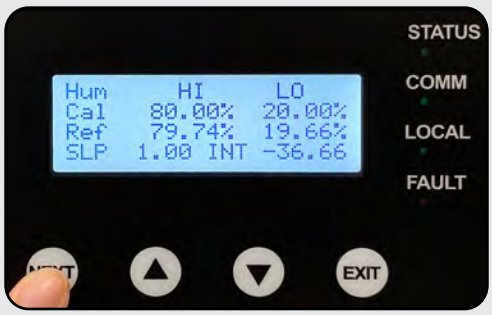
1. Clear the temperature offset to a 0.0 °C on Probe Calibration Screen.
2. Clear the humidity offset to a 0.0 % on Probe Calibration Screen.

2. Clear Temperature – Slope and Intercept

1. Set temperature Ref HI Point to 40 °C and Ref LO Point to 23 °C on Two Point Calibration for Temperature Screen and then press the Exit Button.
2. By doing this the system will clear the Slope and Intercept automatically for temperature.

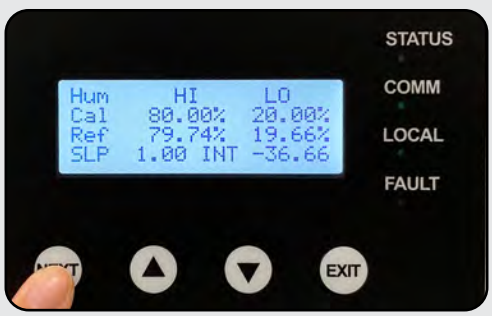
3. Clear Temperature – Slope and Intercept (Cont'd)

3. The Slope value will be 1.00 and the Intercept value will be 0.00. This is to clear all previously calibrated settings.



4. Clear Humidity – Slope and Intercept

1. Set humidity Ref HI Point to 80% and Ref LO Point to 20% on Two Point Calibration for Humidity Screen and then press the Exit Button.
2. By doing this the system will clear the Slope and Intercept automatically for Humidity.



5. Clear Humidity – Slope and Intercept (Cont'd)

3. The Slope value will be 1.00 and the Intercept value will be 0.00. This is to clear all previously calibrated settings.

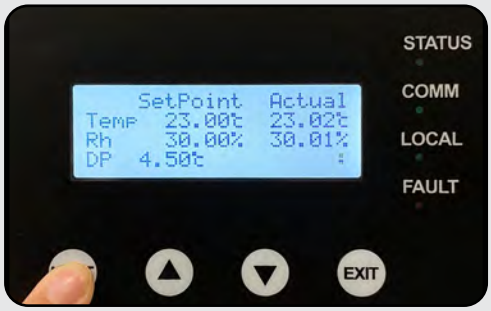
REQUIREMENTS:

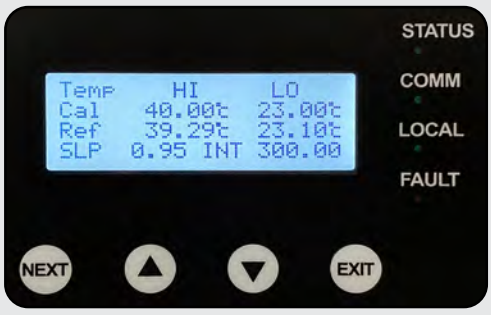
Firmware Version: 1.53 or higher
High Accuracy Certified Reference Probe inserted into the chamber
System settings as per page 2 of this document
Pen and paper to record reference probe readings

PLEASE NOTE:

GEO recommends the two points calibration are 23 °C and 40 °C for Temperature and 20% to 80% for Humidity. These ranges are the most linear, and probe performance outside of these ranges are less linear.

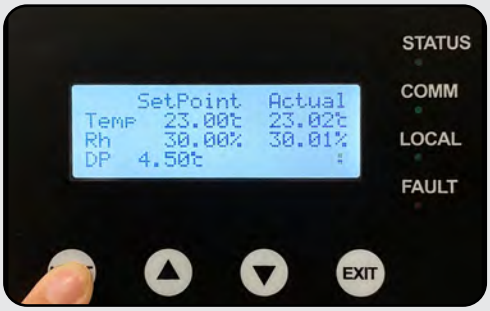
TWO-POINT CALIBRATION - TEMPERATURE

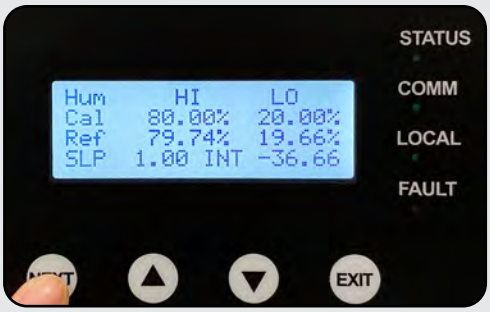




1. Set temperature to 23 °C on Main Display and let the unit settle.
2. Record the readings of your reference probe on paper for later entry.
3. Then set temperature to 40 °C on Main Display and let the unit settle.
4. Record the readings of your reference probe on paper for later entry.
5. Now toggle to Two Point Calibration for Temperature Screen and enter the Ref HI and LO previously recorded values, after entering these values press the EXIT Button.
6. The system will calculate slope and intercept automatically for temperature.

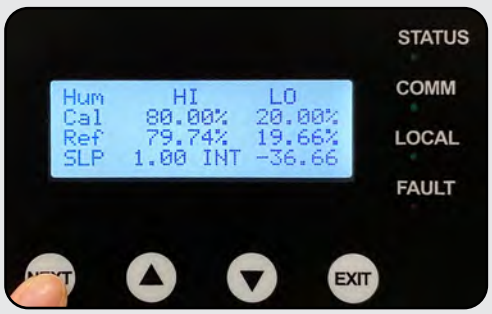
TWO-POINT CALIBRATION - HUMIDITY





1. Set temperature to 23°C and humidity to 20 % on Main Display and let the unit settle.
2. Record the readings of your reference probe on paper for later entry.
3. Then set humidity to 80 % on Main Display and let the unit settle.
4. Record the readings of your reference probe on paper for later entry.
5. Now toggle to Two Point Calibration for Humidity Screen and enter the Ref LO and HI previously recorded values and press the EXIT Button. The system will calculate slope and intercept automatically for humidity.

TWO-POINT CALIBRATION - VERIFICATION



1.Set temperature to any point within the specifications and let it settle down and compare the system conditions with the Reference probe, it should match with in 0.1 °C.
2. Set humidity to any point within the specifications and let it settle down and compare the system conditions with the Reference probe, it should match with in 1.0%.
3. Your Two Point Calibration is complete.

SYSTEM RECALIBRATION

SYSTEM UNCERTAINTY

The absolute uncertainty of the system depends on multiple variables:

- System Warm Up – All components must be warmed up and stabilized before doing any calibration, as mentioned before, humidity depends on temperature, and the system must stabilize to ambient room conditions before performing calibrations.

- Uniformity – Mixing of the humidity and temperature inside the chamber can cause uniformity issues. GEO has a unique chamber design to achieve high uniformity within all GEO chambers.

- Sensor/Probe Uncertainty – This is the largest contributor to system uncertainty and that is why system probes are calibrated using instruments and standards traceable to the National Institute of Standards and Technology (NIST).

- Controller Error – Our Controllers use PID loops with calculations down to 7 digits. These calculations have fractional errors that can compound if ignored. GEO's proprietary solutions are able to minimize controller error, leaving only a small amount of uncertainty contribution.

- Hysteresis – Hysteresis is the system's error based on its usage history. GEO engineers have developed system modeling techniques to significanlty reduce hysteresis uncertainties.

AUTO-CALIBRATION | PC SOFTWARE

This process is only available for licensed customers. For Auto-Calibration procedures please refer to Appendix A.

Customers not having purchased the license for Auto-Calibration software, please refer to the following pages for unit offset calibration.

REFERENCE STANDARD RECALIBRATION

Control Probe / Reference Sensor

Overview

The Model 2000 SP-SH functions through the use of a dual PID controller. This controller takes the humidity and temperature values from an internal capacitance probe and further performs calculations that are then used to generate the user entered humidity and temperature set points. This sensor is factory calibrated, and upon request, additionally calibrated by an ISO 17025 accredited laboratory using either a chilled mirror or two-pressure primary reference standard.

When calibrating the Model 2000 SP-SH, the chamber must be measured at a variety of temperatures and relative humidity levels. It is recommended applying measurement guardbands to improve system accuracy and reduce any measurement uncertainties. The Model 2000 SP-SH's humidity and temperature offsets must be changed if the control probe's readings are found to be outside of the allowed tolerances when compared to the reference.

Capacitive Recalibration Intervals

The scope and uncertainty requirements of this calibration will vary per customer. The capacitance probes that we use have an average drift of 1.0% RH per year. You should account for this interval, as well as your laboratory's uncertainty budget when calculating out your desired recalibration interval. The table below illustrates accuracy drift after 6, 12 and 24 months.

Timeframe	6 Months	12 Months	24 Months
Drift (%RH)	0.5% RH	1.0% RH	2.0% RH

Based on this information, you may wish to shorten or lengthen your calibration interval to respectively increase accuracy or decrease costs.

Chilled Mirror Recalibration Intervals

Chilled mirrors operate by measuring light defraction caused by frost or condensation formation on a mirror. Unless the mirror is damaged, it is not mandatory to recalibrate. It will require periodic cleaning, as per the manufacturer's instructions.

Internal Capacitive Probe - Self Re-calibration Overview

We advise that you return your capacitive reference probe to GEO Calibration for recalibration. However, for customers that are international or operate where policy restricts the use of international services, self recalibration is an option.

The following supplies are needed to recalibrate the internal capacitive control/reference probe:

- HW4 Calibration Software
- HygroClip DI Adapter Cable HC2 Pbe/USB, 6Ft
- A calibration reference with uncertainties of 0.5% RH or better.

REFERENCE STANDARD RECALIBRATION

Self Recalibration Procedure

To read the recalibration procedure of the control / reference probe, please refer to the unit's user manual, and the HW4 software manual found at the following URLs as of publication of this manual:

https://s.campbellsci.com/documents/ca/manuals/hc2-s3-l_man.pdf

https://goo.gl/n7qE1G

https://www.instrumart.com/assets/rotronic-hygroclip2-probes-manual.pdf

Before recalibration of any control probe, ensure that the unit and probe have both completely settled at 23ºC for at least ten minutes.

Maintaining Probe Accuracy

The following text is the recommended maintanence best practices from Rotronic.

"The HC2S3 probe requires minimal maintenance, but dust, debris, and salts on the filter cap will degrade sensor performance. Check the white filter on the end of the sensor for debris. If dirt or salt is engrained into the filter, it should be cleaned with distilled water or replaced. Make sure the filter is connected firmly with your fingers — do not over tighten.

Check the radiation shield monthly to make sure it is free from dust and debris. To clean the shield, remove the sensor from the shield. Dismount the shield. Brush all loose dirt off. If more effort is needed, use warm, soapy water and a soft cloth or brush to thoroughly clean the shield. Allow the shield to dry before remounting.

Replace corroded, discoloured or clogged filters. To replace the filter, unscrew the filter from the probe and pull it straight away, being careful not to bend or damage the sensors. Before putting on the replacement filter, check the alignment of the sensors with the probe, and if necessary, carefully correct the alignment before installing the filter.

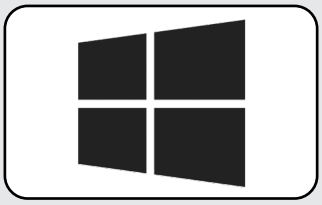
The Teflon filter is recommended when the sensor is installed in close proximity to the ocean or other bodies of salt water. A coating of salt (mostly NaCl) may build up on the radiation shield, sensor, filter and even the sensors. A build-up of salt on the filter or sensors will delay or destroy the response to atmospheric humidity.

Long term exposure of the relative humidity sensor to certain chemicals and gases may affect the characteristics of the sensor and shorten its life. The resistance of the sensor depends strongly on the temperature and humidity conditions and the length of the pollutant influence."

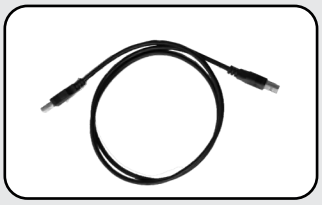
ENTERING MODEL 2000 SP-SH OFFSETS

Supplies Needed

Windows PC with USB Port



USB Cable



Unit Offset Calibration via PuTTY

The Model 2000 SP-SH also allows users to make two, single point adjustments for both temperature and humidity. It is recommended that users recalibrate their unit as needed to fit their overall uncertainty requirements.

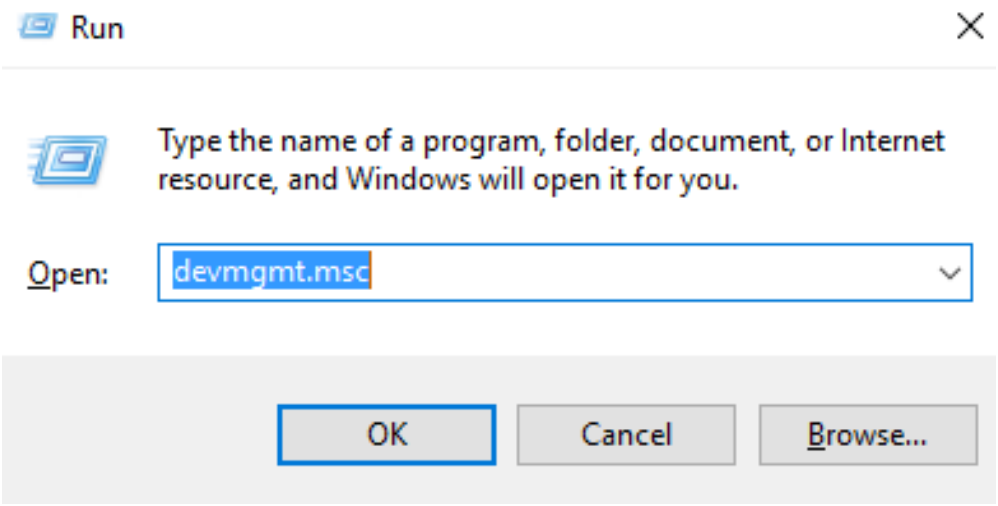
The reference sensor used for this recalibration should be either a two-pressure or chilled mirror primary measurement standard.

The following software items are required for this recalibration:

- Windows Device Manager
- PuTTY *

Accessing the Device Manager

Press and hold the Windows key, tap R, then release both keys.
A Run window will appear. Type **devmgmt.msc** into this window, then hit Enter on your keyboard.



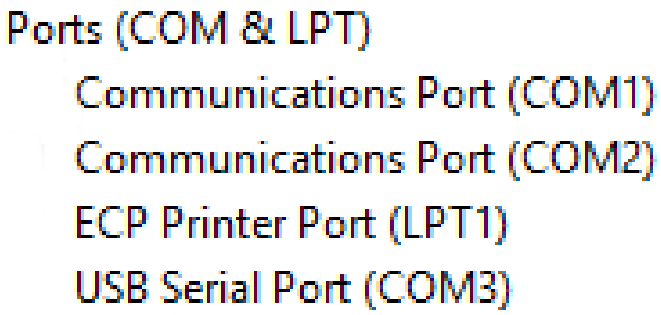
* PuTTY is a free and open-source terminal emulator. It is distributed under the MIT Software License, and is completely free for unrestricted commercial use. For more details on the PuTTY license, click here.

ENTERING MODEL 2000 SP-SH OFFSETS

Reading the COM Port

At this time, plug the unit's power supply into an approved power source.
Plug the USB mouse and keyboard into the Unit.
Toggle both the power switches to the "ON" position.

With Device Manager open, expand the Ports (COM & LPT) menu. While watching the expanded Ports sub-menu, plug the free end of the USB cable into the computer. A new entry will appear, called USB Serial Port. To the right of this text, will be parenthesis. Remember the text enclosed within these parenthesis. This is your COM Port, and will be referenced in the following sections.



Installing PuTTY

Visit www.ninite.com/putty to download the PuTTY installation executable file.

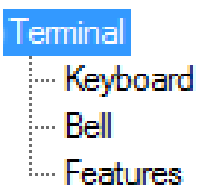
Run the executable and follow the automatic installer instructions to install PuTTY.

Once the installation is complete, run PuTTY by double clicking on the newly created desktop icon.

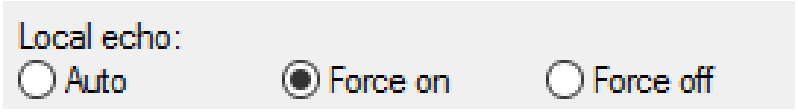
PuTTY Setup

Ensure that PuTTY is running on your computer.

From the Category option on the left side of the window, click Terminal menu item to expand the sub-menu.



Under Local echo, select the Force on button



ENTERING MODEL 2000 SP-SH OFFSETS

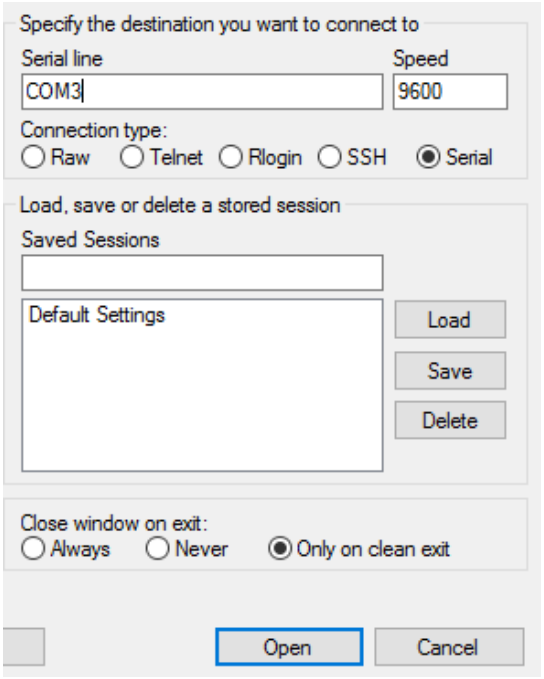
Connecting Through PuTTY

In PuTTY, select **Session** menu under Category on the left

Input your COM Port (reference **Reading the Serial Port** instruction from above) into the **Serial line** field

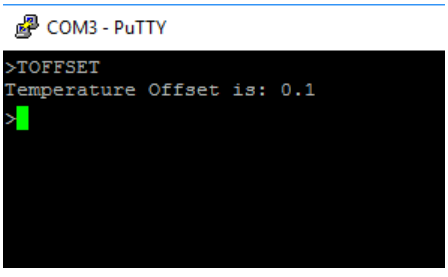
Under **Connection type**, select **Serial**

Click **Open**

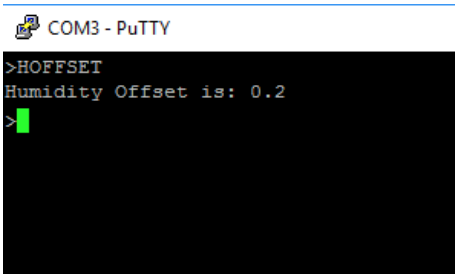


Reading Temperature and Humidity Offsets

Temperature: type **TOFFSET** and press the enter key. The unit will query and display the temperature offset



Humidity: type **HOFFSET** and press the enter key. The unit will query and display the humidity offset



ENTERING MODEL 2000 SP-SH OFFSETS

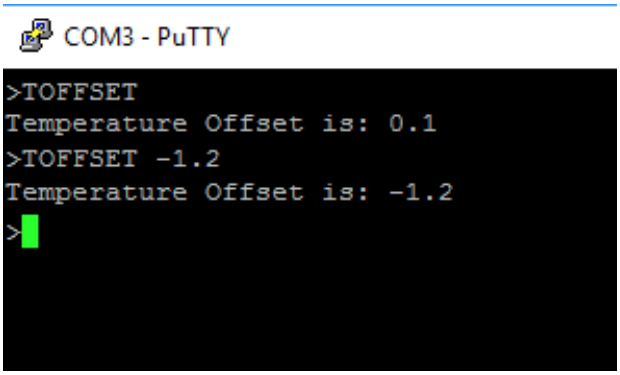
Changing Humidity and Temperature Offsets

PLEASE NOTE:

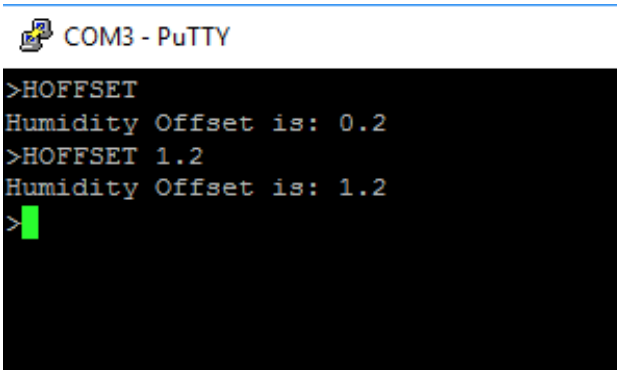
#.# is a placeholder

In the following instructions, replace # with your desired integers.
(For example, #.# would become 1.2 or -0.2)

Temperature: type **TOFFSET #.#** and press the **Enter** key. The unit will query and display the temperature offset. Ensure it has been changed by typing in **TOFFSET** . Press the **Enter** key.



Humidity: type **HOFFSET #.#** and press the **Enter** key. The unit will set the humidity offset to the new value given by the argument. Ensure it has been changed by typing in **HOFFSET** . Press the **Enter** key.



SAFETY WARNING

GENERAL SAFETY INFORMATION

- Read all provided and available safety information before you use the Model 2000 SP-SH.
- Carefully read all available instructions.
- Use only the power cord and supply approved for the voltage for the Model 2000 SP-SH.
- Replace the power cord if the insulation is damaged or if the insulation shows any signs of wear.
- Make sure the ground conductor in the power cord is connected to a functioning ground.
- Disruption of the ground could put voltage on the chassis that could cause death.
- Use the Model 2000 SP-SH only as specified, or the protection supplied by the Product can be compromised.
- Do not put the Model 2000 SP-SH where access to the power cord isn’t possible.
- Immediately cease using and disable the Model 2000 SP-SH if it is damaged.
- Do not use the Model 2000 SP-SH if it operates in an incorrect way.
- Do not operate the Model 2000 SP-SH with unit casing removed. Hazardous voltage exposure is possible.
- Use only specified GEO Calibration replacement parts.
- The Model 2000 SP-SH may only be repaired by approved technicians.
- The Model 2000 SP-SH reservoir must be completely emptied before shipment.
- Do not use the Model 2000 SP-SH around explosive gas, vapor, or in damp or wet environments.

SAFETY WARNING

DISPOSAL SAFETY INFORMATION

European Union—Disposal Information

The symbol above means that according to local laws and regulations your product and/or its desiccant shall be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities. The separate collection and recycling of your product and/or its desiccant at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

Locations

GEO Calibration Inc
2190 Smithtown Avenue, Ronkonkoma, NY 11779, USA
Tel.: +001 (631) 471 - 6157 ● Fax: +001 (631) 471 - 6158
support@geocalibration.com ● www.geocalibration.com

REPAIRS

UNIT REPAIR PROCEDURES

- **Contact GEO Calibration and request an RMA #**
- **Have the Product information ready such as the purchase date and serial number to schedule the repair**
- **Ship the unit to GEO in the original shipping container or one designed specifically for “Safe Travel”**
- **Apply your RMA # on the outside of the shipping package in large numbers**
- **Apply the top right portion of your quotation with RMA # and barcode to the outside of the shipping package, so that it is visible**
- **Include a copy of all GEO communication documentation inside your package**
- **Estimated Return Ship-Date is 15 business days from the date both the unit and a valid method of payment is received**
- **On the Purchase Order, please ensure the “Vendor Name” is GEO Calibration Inc., and the address is 2190 Smithtown Avenue, Ronkonkoma NY 11779**
- **Payment Terms are “Immediate Payment” from Date of Invoice, FOB Origin, the respective Dollar Amounts, and any return shipping instructions are completed. (Please, do not send a copy of your internal “Purchase Requisition” as we need the actual “Purchase Order” with the above items included)**
- **Reference the RMA # on the completed PO and forward a copy via fax (631.471.6158) or email to: service@geocalibration.com**
- **If credit card is being used for payment and has not been provided as yet, please call +1 (631) 471 - 6157 and provide information; referencing your RMA # when you call**
- **** Exception pricing may apply upon evaluation by the service center. If applicable, this will be presented in a formal re-quote before proceeding****
- **Please note that a “Payment Method” must be on file, reviewed and approved before any service work may begin on your item**
- **If you have any questions do not hesitate to call or email us.**

Please ship the unit to:

Attn: Repairs
GEO Calibration Inc.
2190 Smithtown Avenue
Ronkonkoma, NY, 11779, USA

MAINTENANCE

SERVICE SCHEDULE

- **Maintenance Recommendations:**
  GEO Calibration recommends that the unit be annually shipped back to our facility for general maintenance.

Daily	Semi-Annual	As Needed
General Cleaning (Use Proper Cleaning Materials)	Control Probe Calibration	Refill Reservoir with Distilled Water
Ensure the Water Reservoir is Filled		Replace Desiccant Canister
Ensure the Desiccant Ports contain at least one fresh canister.		

ERROR CODES AND DESCRIPTIONS

Error Code	Description
“No Analog Detected”	Internal Hardware Fault Detected
“Internal Probe Fail”	Internal Hardware Fault Detected
“No HumGen Temp”	Temperature probe failure.
“HumGen Low Limit”	The temperature of the ambient environment is too low for unit operation.
“HumGen High Limit”	The humidity generator has exceeded a high unit. Perform maintenance check of ambient environment and water supply.
“EEPROM Cfg Reset”	The unit configuration settings have been reset to factor default.
“EEPROM Cal Reset”	Factory calibration data reset to default.

For questions, please contact GEO Calibration.You may also visit our website at www.geocalibration.com for more assistance.

DESICCANT CHANGE VISUAL GUIDE

Overview

The Model 2000 SP-SH ships with a fresh desiccant canister. Each time the Model 2000 SP-SH dries the internal volume of air, the desiccant will become more saturated with water. For optimal performance, the user must periodically replenish or replace the used desiccant. The desiccant type is molecular sieve, which may be regenerated by the user through heating or baking. The desiccant reheating will become less effective after several regenerative sessions.

The user must replace the desiccant as soon as they see drying performance begin to degrade. To aid in this process, the Model 2000 SP-SH has an on-screen indicator that displays once sub par drying performance is detected. In addition to the on-screen indicator, the desiccant itself also contains a chemical that changes color from blue to pink when saturated with water. The user should change the desiccant once approximately 75% of the molecular sieve has changed in color from blue to pink.

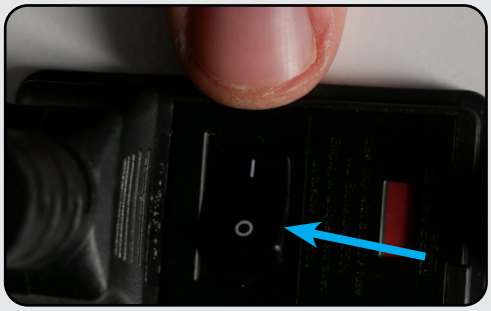
Desiccant Change Procedure

We advise that you purchase extra replacement desiccant canisters directly from GEO Calibration. It is possible to purchase the desiccant in bulk, disassemble the canister and replace the used desiccant with unused desiccant, however, this procedure requires the user to carefully re-assemble the desiccant canister. If this re-assembly is done incorrectly, then air leaks may occur and the unit performance may suffer.

For visual instructions on how to perform a refill of a desiccant canister, please see the next page.

Additional instructions can also be found on the website of the desiccant supplier.

https://secure.drierite.com/catalog3/page19b.cfm



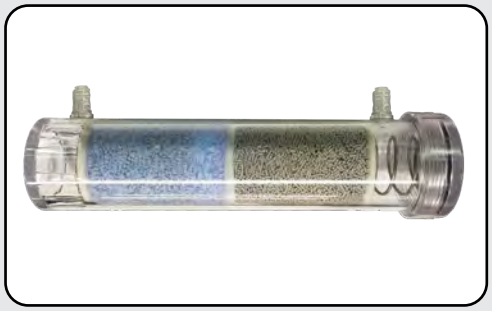
1. Power Off the Unit

Ensure that the unit is powered off before proceeding with a desiccant change.

2. Loosen Hook & Loop Straps

3. Firmly Grasp Desiccant

This will cause the old desiccant canister to slide from the female adapters. Remove this desiccant completely from the housing and set aside.

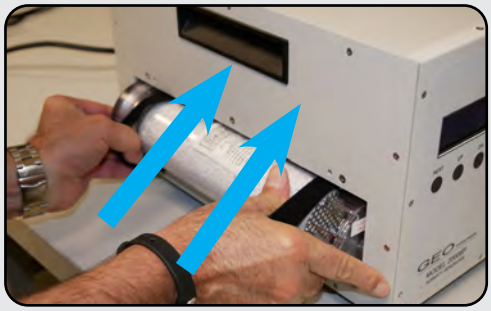


4. Locate New Desiccant Canister

Remove the used desiccant canister and replace with the fresh desiccant canister.

5. Firmly Insert Desiccant Canister

Ensure the hose barbs properly line up with the sockets on the inside of the desiccant housing.



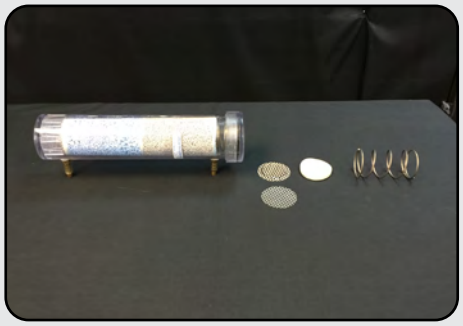
6. Press with Force

Firmly press the seal with both thumbs into the canister housing.

7. Secure Hook & Loop Straps

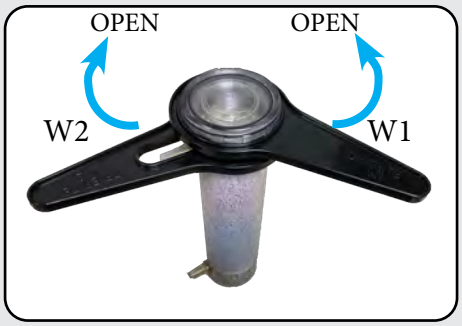
1. Remove Desiccant

Follow the initial steps from the previous section entitled “Desiccant Change”.



2. Open Top Cover of Desiccant

Save the spring, the sieve and the three white felt filters. Discard previous desiccant. Wipe the inside of the desiccant cannister with a clean cloth. Beat filters clean of debris. Clean the sieve and the spring.



PLEASE NOTE:

If the cap is too tight, use the desiccant wrenchs to loosen the cap.
The method of using wrenchs please see the figure on the left.

3. Fill Canister with Desiccant

Put the white filter at the bottom. Put the white desiccant inside. Gently tap. Put another filter. Add blue desiccant. Put one more filter. Put one more sieve. Put the spring. Tighten the cover.

DRAINING THE RESERVOIR

1. Locate the Main Drain Port

Turn the cap counter-clockwise to remove.

2. Move the Unit to Table Edge

Position a bowl shaped object underneath the unit to catch the drained water.

3. Remove the Drain Cap

Tilt the unit to ensure maximum water removal.

4. Replace & Tighten Drain Cap

Tighten the drain cap in a clockwise motion. Ensure that the drain cap has a tight seal and no water is leaking.

CONDENSATION IN THE CHAMBER

1. Power Off the Unit

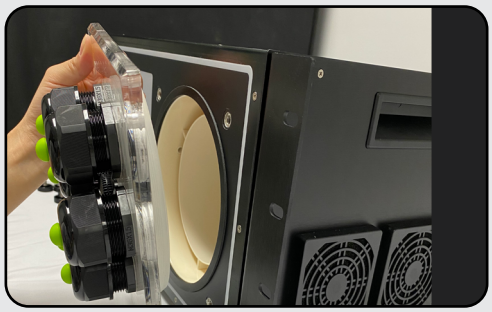
Ensure that the unit is powered off. This is so that no desiccant is wasted while the unit is not in operation.

2. Open the Chamber Door

Follow the door opening procedure from the quick start guide.

3. Remove Condensation

Clean all condensation with an absorbent cloth such as a paper towel or bath towel.



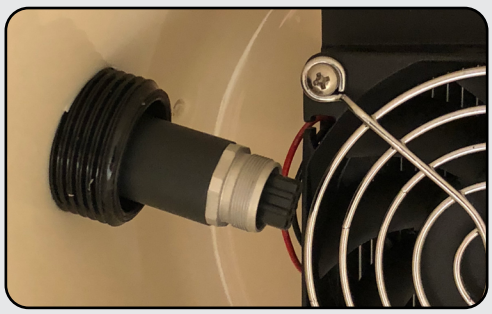
1. Open Chamber Door

Turn the screws counter-clockwise to loosen.
Remove the door.

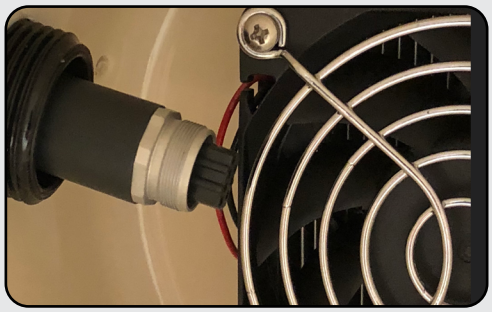
2. Remove Chamber Insert

3. Loosen Metal Connector

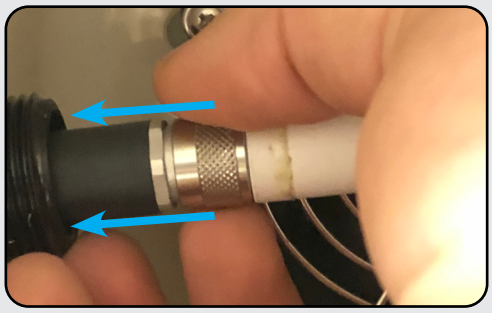
Twist towards the chamber opening to loosen.



4. Remove Probe Head

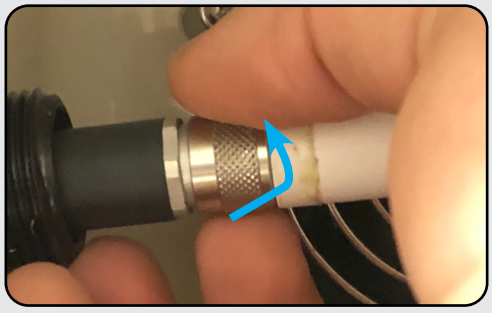


5. Locate Probe Connector



6. Press Probe into Connector

Slowly rotate the probe head as you press into the cabling body. You will feel the probe “seat” itself once the male - female parts align.



7. Secure Metal Connector

Twist the metal connector away from the chamber entrance to secure the probe head to the probe cabling body.

1. Locate The Mounting Place

2. Tighten the screws

INDUSTRIES

PHARMACEUTICAL MANUFACTURING

CALIBRATION LABS

BIOMEDICAL / GENETICS

R&D FACILITIES

FOOD PRODUCTION

AUTOMOTIVE MANUFACTURING

AEROSPACE / SPACE FORCE

HOSPITAL / MEDICAL

CLEAN ROOMS

CELL PHONE / TOWER CALIBRATION

EARTH SCIENCE

ARMY AND NAVY

AIRPORT

For a complete product and accessory review, please visit our website: www.geocalibration.com

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Humidity Control Company

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Website: www.GeoCalibration.com

GEO Calibration

Humidity Control Company

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Rev A