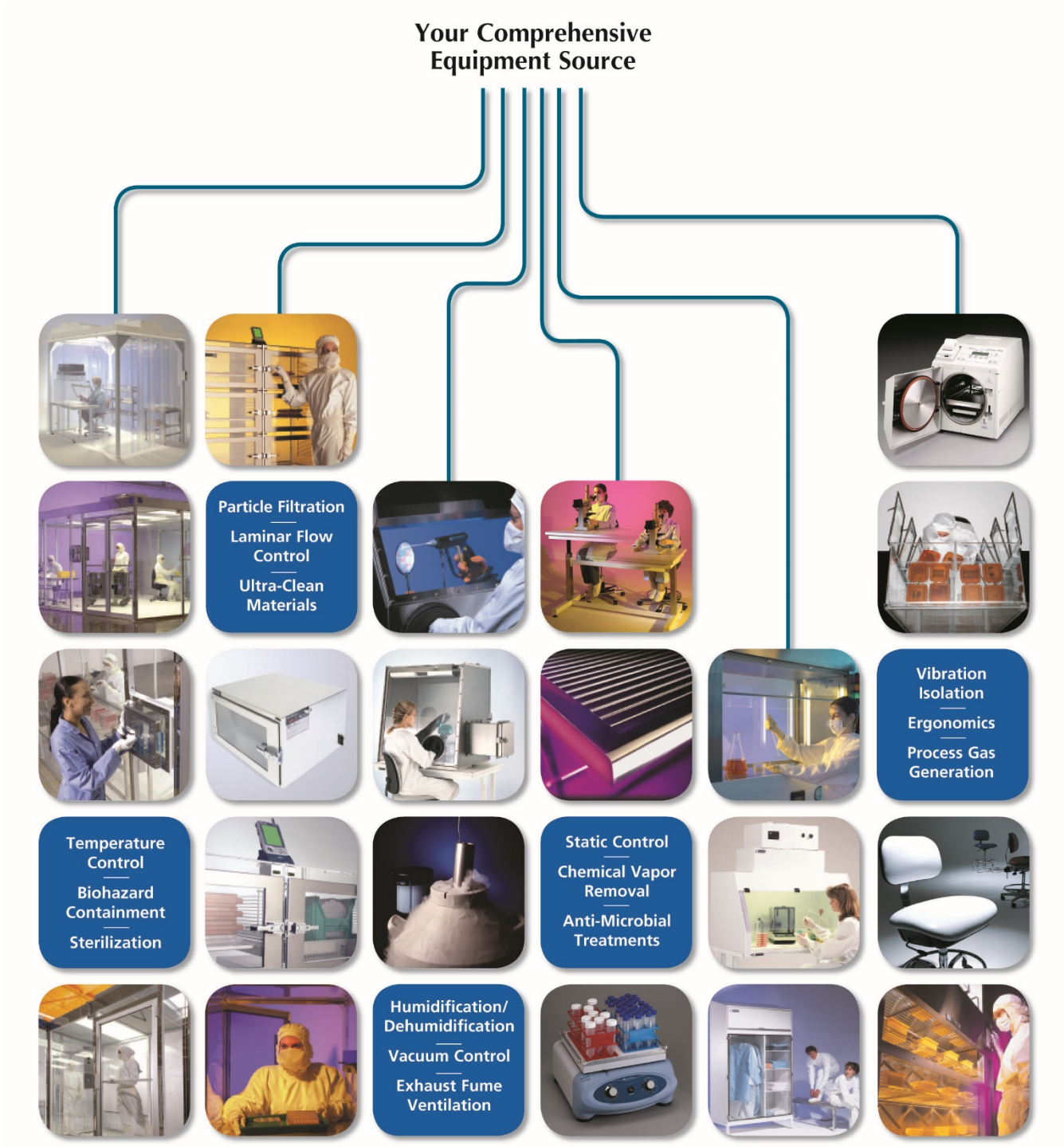
TERRA UNIVERSAL.COM
Critical Environment Solutions

Installation and Operating Guide *Document No. 1800-19*

Smart® IsoDry® Nitro-Watch™ System



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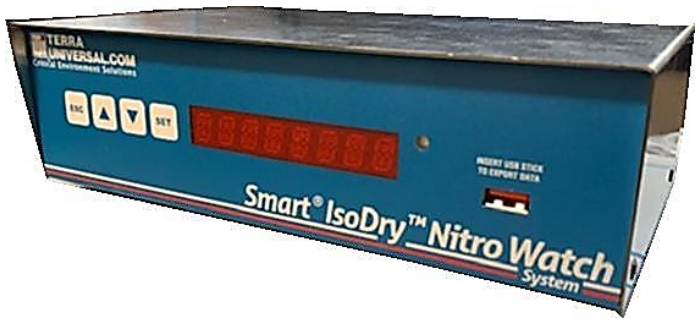
1. General Information

The Smart® IsoDry® Nitro-Watch™ senses and displays the relative humidity level (from ambient to 0%) inside a desiccator or glove box within ±1.5% RH. It operates in tandem with the Dual Purge System and Automatic RB Valve to precisely and automatically control the flow of nitrogen into the desiccator, or glove box, and maintain a preset humidity level, no matter how operating conditions may change. The Nitro-Watch™ consists of a humidity sensor and a controller unit. This system also logs RH, temp, door open/close, purge on/off, and sensor removal/ attachment. The system can log months of data depending on the logging interval selected, all of which can be downloaded to a USB flash drive.

Nitro-Watch™ Sensor



Nitro-Watch™ Controller

Note: This manual focuses on specific setup and operating instructions for the Smart® IsoDry® Nitro-Watch™ Control system. For installation instructions and general specifications for these products please see below:

Adjust-A-Shelf™ Cabinet or Dual Purge	**Doc. #1800-40: Desiccators and RH Controllers**
IsoDry® desiccator	**Doc. #1788-26 IsoDry® RH Control System**
GloveBox	**Doc. #1800-42 Series 100 GloveBox**

1.1 Description

The Smart® IsoDry® Nitro-Watch™ interface includes four physical buttons (ESC, Up arrow, Down arrow, SET) to navigate and change data with an eight character 14-segment LED display. The connectors for the system are:

- RH sensor: phone-jack
- Door Switch: phone-jack
- Purge Control: phone-jack
- Data log transfer to thumb drive: USB

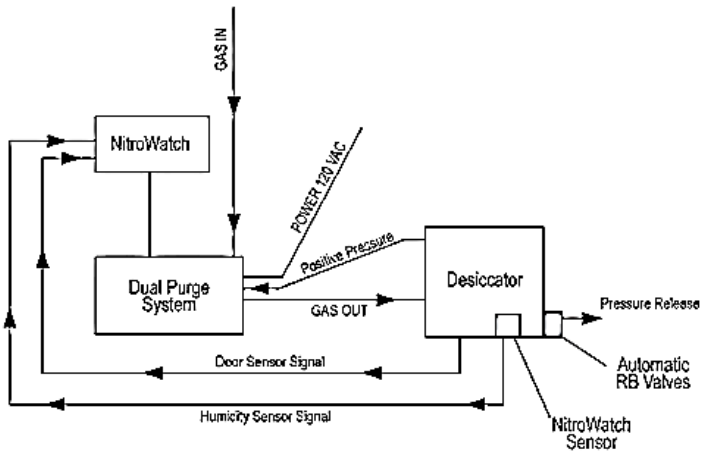
LED light status indicator shows data logging and transfer status:

- LED light is off: there is no activity
- LED light is blinking red at the user defined interval: the system is logging data
- LED light is rapidly flashing green: data is being transferred to the USB flash drive from an internal SD card.
- LED light is rapidly blinking blue: there is no space available on the USB flash drive.

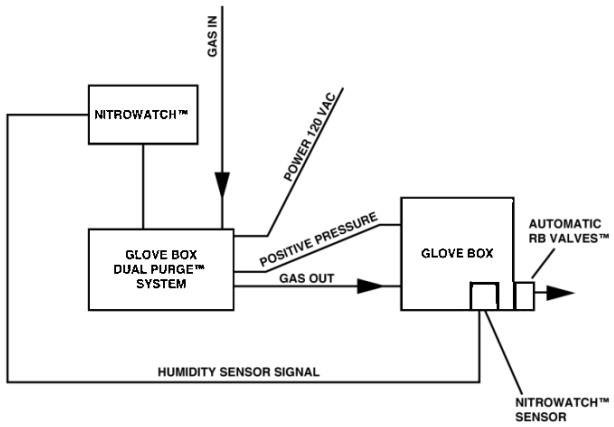
1.2 Operation

The Nitro-Watch™ controller receives the RH/temperature reading from the Nitro-Watch™ RH sensor and displays current RH%, RH alarm (RH high or RH low alarm), door alarm, and RH% set point. The controller regulates the solenoid valve by sending an ON/OFF signal to the IsoDry® Dual Purge based on the door, or RH status, determined by the user settings inputted to the Nitro-Watch™ and Dual Purge.

The humidity sensor is mounted inside the desiccator or glovebox. It uses a fast-response capacitive probe whose capacitance is proportional to the humidity level. The sensor is capable of measuring humidity over the entire humidity range, from 0 to 100% RH, with an accuracy of ± 1.5% RH at a temperature of 68 degrees F.



Nitro-Watch™ attached to a Desiccator



Nitro-Watch™ attached to a GloveBox

1.3 Part Numbers Covered by this Manual

9500-06A	Smart® IsoDry® Nitro-Watch™ Controller for Desiccator Cabinets
9500-06A-GB	Smart ® IsoDry® Nitro-Watch™ Controller for Gloveboxes
9500-02B	IsoDry® Nitro-Watch™ Sensor for Desiccator Cabinets
9500-02B-GB	IsoDry® Nitro-Watch™ Sensor for Gloveboxes

2. Safety

Proprietary Notice	**Safety Notice**
This manual pertains to proprietary devices manufactured by Terra Universal, Inc. Neither this document nor any portion of it may be reproduced in any way without prior written permission from Terra Universal. Terra Universal makes no warranties applying to information contained in this manual or its suitability for any implied or inferred purpose. Terra Universal shall not be held liable for any errors this manual contains or for any damages that result from its use.	A thorough familiarity with all operating guidelines is essential to safe operation of the product. Failure to observe safety precautions could result in poor performance, damage to the system or other property, or serious bodily injury or death. The following symbols are intended to call your attention to two levels of hazard involved in operation. CAUTION — **Cautions are used when failure to observe instructions could result in significant damage to equipment.** WARNING — **Warnings are used when failure to observe instructions or precautions could result in injury or death.**
The information presented here is subject to change without notice.	

Critical Operating Conditions

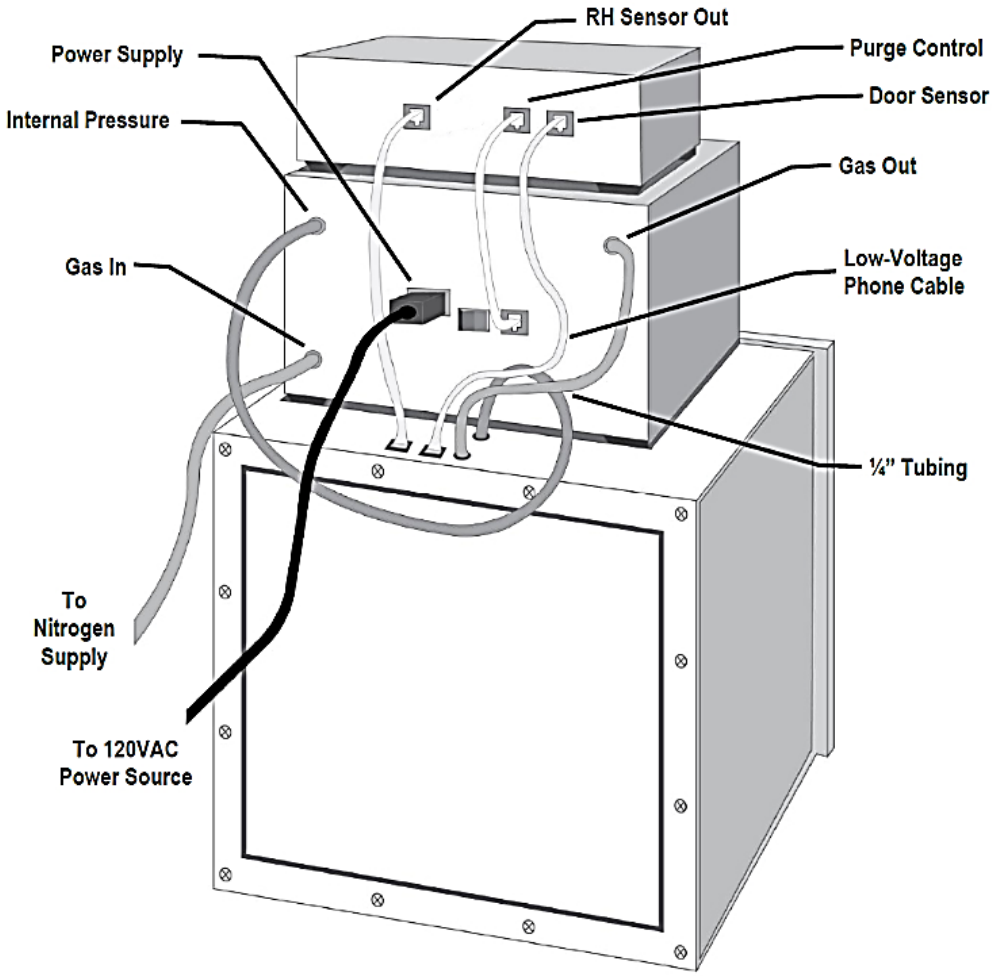
- Because the humidity sensor is exposed to moisture during shipping, the system must generally operate for a couple of days in a dry Nitrogen environment before the sensor dries out and delivers completely accurate readings.
- Never use this equipment with gases that are non-compatible with the materials of the construction. This may cause damage to equipment or injury to personnel.
- This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.
- Do not release toxic or flammable gases in the vicinity of personnel. Be sure that venting and disposal methods are in accordance with Federal, State and local requirements.
- If toxic or flammable gases are used with this equipment, emergency equipment applicable to the gases in use should be available in the operating area.
- Sensors and controllers are factory calibrated to operate at the pressures specified with the order. Attempts to operate them under conditions different than ordered may result in less than desirable performance or may cause the unit to fail to function.
- The air must be completely turned off before any adjustments are made to the controller or else the readings will be inaccurate.
- The Nitro-Watch™ draws its power from the Dual Purge System and will not operate unless the Dual Purge System is plugged in and turned on.

3. Start-Up

- The controllers should be located in a clean dry atmosphere relatively free from shock and vibration.
- Leave sufficient room for access to the electrical components and install in a manner that permits easy removal if the instrument requires cleaning.
- Contamination or corrosion may occur when used with reactive gas as a result of plumbing leaks or improper purging.
- These controllers should only be used with inert gases like Nitrogen and Argon.

3.1 Installation for Desiccator and Glove Box

1. Use ¼" tubing to connect the Internal Pressure inlet and Gas Out port to the desiccator/glovebox.
2. Use a low-voltage phone cable to connect the two ports labeled "Purge Control" on the Nitro-Watch™ and Dual Purge.
3. Use another low-voltage phone cable to connect the Nitro-Watch™ "Door Sensor" port to the desiccator – not applicable for Glovebox.
4. Use a third low voltage phone cable to connect the Nitro-Watch™ RH Sensor port to the matching port on the desiccator/GloveBox.
5. Connect the nitrogen supply to the Gas In port on the Dual Purge using ¼" tubing.
6. Use the power supply cable to connect the Dual Purge to a 120VAC outlet.

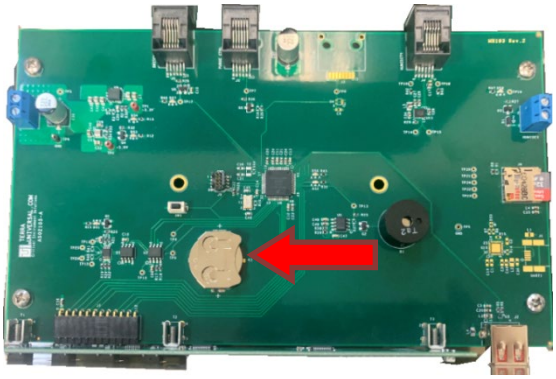


3.2 Battery Insertion

The Smart® IsoDry® Nitro-Watch™ uses a CR2032 coin cell battery to keep time while power to the system is off. The battery needs to be added to the circuit board before system start up. If no battery is present the system will not keep time when the system is powered off and the system time will need to be set again when the system is turned on. Follow the steps below to install the battery:

1. Unfasten the screws on both sides of the Nitro-Watch™ Controller to remove the cover.

2. Remove the cover to expose the circuit board.
3. Insert the battery into the battery holder.



4. Reattach and secure the cover over the circuit board.
5. Begin System Configuration process.

3.3 Initial Programming

Note: When the system starts-up in Nitro-Watch™ mode "TERRA UNIVERSAL NITROWATCH" will scroll across the display screen. When in HUMEX mode "TERRA UNIVERSAL HUMEX" will scroll across the display screen.

TERRA UNIVERSAL NITROWATCH

- Press and hold the SET button while turning on the system power through IsoDry® Nitro-Watch™ system to navigate to "System Configuration Mode."

SYSSETUP

- Press the **UP** or **DOWN** arrow to navigate through the system menu.
- Press the **SET** button to accept the values.
- Press the **ESC** button to clear the inputted value for the current menu item back to default and return to the previous menu item.

Note: HUMEX mode would provide inline humidification of nitrogen or other process gas being fed into the desiccator or glovebox from ambient to 100%. Do not alter this setting from the factory default unless you are trained to do so.

3.3.1 System Configuration Menu

Display	*Description*	*Function*	*Unit*	*Default*	*Active Keys*
DR ALARM	*Door Open Alarm Delay (Door Sensor Only)*	The number of seconds the door remains open before the alarm.	Seconds: 0-255	10	UP/DWN to increment/decrement sub-menu values SET to accept values and jump back to main menu
DR DELAY	*Door Delay (Door Sensor Only)*	The number of seconds to activate the purging after the door is open.	Seconds: 0-255	0	UP/DWN to increment/decrement sub-menu values SET to accept values and jump back to main menu
RH ALARM	*RH Purge Alarm Delay*	The number of seconds the RH level must remain above (or below for HUMEX mode) the set point to activate the alarm.	Seconds: 0-255	10	UP/DWN to increment/decrement sub-menu values SET to accept values and jump back to main menu
BEEP	*Beeper Used for Alarms*	Alarm	X	ON	UP/DWN to toggle between ON/OFF
HUMEX	*Humex Mode*	"OFF" maintains below ambient humidity (standard Nitro-Watch™ functionality). "ON" maintains above ambient humidity.	X	OFF	UP/DWN to toggle between ON/OFF
RH CAL	*RH Calibration*	Turn ON/OFF the calibration algorithm for the humidity sensor calculation. **Note:** the Nitro-Watch™ sensor operates at an accuracy of ±1.5% RH without any calibration required. However calibration may be performed using the calibration settings if the user wishes to calibrate based on a reference device.	X	OFF	UP/DWN to toggle between ON/OFF
A	*Calibration Parameter*	-These parameters are coefficients and intercepts for an equation to calibrate the RH sensor's readings and compensate for measured discrepancies. If RH CALIBRATION is ON, allows cubic equations for A term. -If OFF, then skip.	(-99.99999, +99.99999)	0	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to increment/decrement within each digit SET to save and move to the next digit SET after last digit to save and move to next menu item ESC to cancel action and jump back to sub-menu #1
B	*Calibration Parameter*	-These parameters are coefficients and intercepts for an equation to calibrate the RH sensor's readings and compensate for measured discrepancies. If RH CALIBRATION is ON, allows cubic equations for B term. -If OFF, then skip.	(-99.99999, +99.99999)	0	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to increment/decrement within each digit SET to save and move to the next digit SET after last digit to save and move to next menu item ESC to cancel action and jump back to sub-menu #1
C	*Calibration Parameter*	-These parameters are coefficients and intercepts for an equation to calibrate the RH sensor's readings and compensate for measured discrepancies. If RH CALIBRATION is ON, allows the user to set the cubic equations for C term. -If OFF, then skip.	(-99.99999, +99.99999)	0	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to increment/decrement within each digit SET to save and move to the next digit SET after last digit to save and move to next menu item ESC to cancel action and jump back to sub-menu #1
D	*Calibration Parameter*	-These parameters are coefficients and intercept for an equation to calibrate the RH sensor's readings and compensate for measured discrepancies. If RH CALIBRATION is ON, allows the user to set the cubic equations D term. -If OFF, then skip.	(-99.99999, +99.99999)	0	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to increment/decrement within each digit SET to save and move to the next digit SET after last digit to save and move to next menu item ESC to cancel action and jump back to sub-menu #1

Display	*Description*	*Function*	*Unit*	*Default*	*Active Keys*
DATA LOG	*Data Logging Interval (SD card logs humidity only and door open or closed events must be logged as they occur.)*	The time interval at which data is logged to the system's memory. For example, data logging set at 10 means the data will be logged every 10 seconds.	1 SEC, 10 SEC, 30 SEC, 1 MIN, 5 MIN, 1 HOUR	1 MIN	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to toggle between allowed values SET key to accept values and jump to main menu ESC to cancel action and jump back to sub-menu #1
DATE FMT	*Date Format*	The format in which date is inputted and logged in data logging.	DMY/MDY	MDY	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to toggle between allowed values SET to accept values and jump to main menu ESC to cancel action and jump to main menu
SET DATE	*Input Date*	The user inputs the current date, in the format selected from the date format menu option. Display will show "MM.DD.YYYY" as default. Underscore "_" indicates the current field selected for input i.e. "12._M.YYYY"	MM.DD.YYYY	MM.DD.YYYY	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to toggle between allowed values SET to move from one field to the next (i.e. MM to DD) SET to accept values after last field and jump to main menu ESC to cancel action and jump to main menu
SET TIME	*Input time in 24 hour format*	The user inputs the time in 24 hour format. Display will show "HH:MM" as default. Seconds are always assumed to be 00 when entering a time.	HH:MM	HH:MM	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to toggle between allowed values SET to move from one field to the next (i.e. HH to MM) SET to accept values after last field and jump back to main menu ESC to cancel action and jump to main menu
TEMP	*Temperature Units*	The units in which temperature is logged.	C/F	F	UP/DWN to navigate within sub-menu #1 SET to jump to sub-menu #2 UP/DWN to toggle between allowed values SET to accept values and jump to main menu ESC to cancel action and jump to main menu

➢ System setup is complete.

3.4 Stand-By Display

- RH reading from sensor.
- RH alarm (high or low depending on Nitro-Watch™ vs. HUMEX mode).
- Door alarm (if door is open).

1. Press SET button to see the RH% set-point number.
2. Use the Up or Down arrow to increase or decrease set point.
3. Press SET again to save the new set point value.
4. Display will show the current RH% after new value is set.

Note: Press ESC button to temporarily deactivate the alarm beeping sound. The screen will still show the alarm is active, but the sound will be muted.

Note: If the sensor is disconnected during operation, the system will trigger the alarm sound and the "NoSensor" will display on the screen.

3.5 Data Transfer

The data file size for the Smart® IsoDry® Nitro-Watch™ is approximately 4 MB or 113,000 readings. This is approximately 32 hours of data when logging at a 1 second interval, 2 weeks of data at a 10 second interval, 6 weeks of data at a 30 second interval, or 12 weeks at a 1 minute interval. The Smart® IsoDry® Nitro-Watch™ logs RH, temp, door open/close, purge on/off, and sensor removal/ attachment. The system can log months of data depending on the logging interval selected. When the system reaches the 4MB limit, the data will begin to wrap and overwrite the oldest data with the new data. Data can be saved onto a USB flash drive without third party software – follow the steps below to complete the transfer:

1. Plug in a USB drive – data is automatically copied over in CSV format. The LED status light will rapidly blink green during data transfer.
2. Do not remove the USB drive during data transfer.
3. Complete transfer of the 4 MB data file takes approximately 2.5 minutes. The LED status light will stop blinking green when data transfer is complete.
4. There will be a new file called EVENTLOG.CSV on the USB drive. If that file already exists on the USB drive, it will be overwritten.

The Smart® Nitro-Watch™ is compatible with most USB 1.0, 2.0, and 3.0 thumb drives.

Note: The system does not log data while transferring data to the USB drive.

Data Format

The data file from the Smart® IsoDry® Nitro-Watch™ contains the following columns:

A. Date
B. Time
C. % RH, or event name
D. Temperature, or event status
E. Temperature Units (C or F)

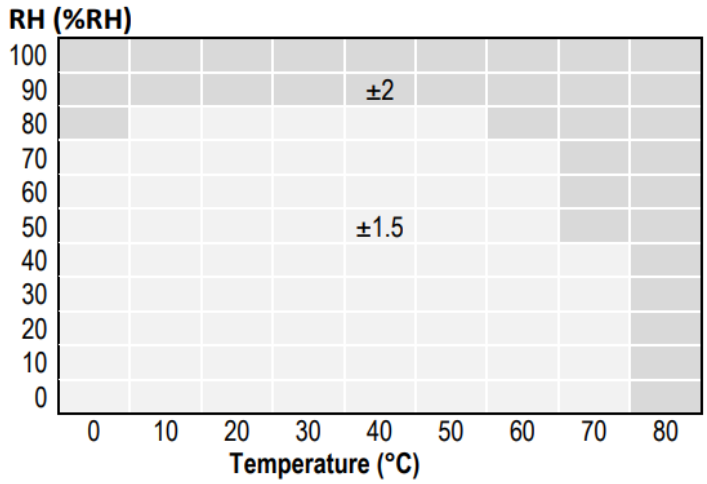
Example of data table

	A	B	C	D	E
1	12/22/2020	12:51:53 PM	29.1	78.7	F
2	12/22/2020	12:52:03 PM	29.1	78.7	F
3	12/22/2020	12:52:13 PM	29.1	78.7	F
4	12/22/2020	12:52:23 PM	29.2	78.7	F
5	12/22/2020	12:52:33 PM	29.1	78.7	F
6	12/22/2020	12:52:43 PM	29.1	78.7	F
7	12/22/2020	12:52:53 PM	29.1	78.8	F
8	12/22/2020	12:53:03 PM	29.1	78.7	F
9	12/22/2020	12:53:06 PM	Door	opened	
10	12/22/2020	12:56:01 PM	Purge	on	
11	12/22/2020	12:56:07 PM	24.1	79.4	F
12	12/22/2020	12:56:15 PM	Door	closed	
13	12/22/2020	12:56:15 PM	Purge	off	
14	12/22/2020	12:56:17 PM	24.3	79.4	F

4. Specifications

Specifications	
Smart® Nitro-Watch™ Controller Dimensions	9"W x 5.5"D x 2.5"H
Power Requirements	12 VDC (from Dual Purge)
Sensor Dimensions	4.385"W x 1.5"D x 0.89"H
Case material	304 Stainless Steel
Display	3⅛" Digit LED display
Electrical Connections	Phone-Jack
Measuring Range	0-100% RH
Accuracy (at 20°C)	±1.5%RH
Display Resolution	± .1%RH
Sensor Calibration	None required, but calibration is possible using the calibration settings.

Sensor Accuracy: RH% vs. Temperature



5. Testing

Humidity sensor should be tested and replaced as necessary (about every 5 years under normal use).

6. Trouble Shooting

Power Concerns

Problem: System Unresponsive
Possible Solutions:

1. Inspect power cable leading from the unit. Make sure that it is fully connected to the unit's power port.
2. Make sure that the power cord is plugged into a functioning outlet of appropriate voltage.
3. Replace if necessary.

RH Concerns

Problem: System stays in high-flow purge at all times
Possible Solutions:

1. Make sure that all access doors are closed and that all sensor switches are making contact.
    a. Check door seals for leaks.
2. Make sure RH sensor is reading RH correctly.

Operation Concerns

Problem: System delivers an obviously incorrect humidity reading
Possible Solutions:

1. Disconnect and then reconnect the low-voltage cable connecting the humidity sensor to the Smart® Nitro-Watch™ module.
2. Check the sensor connection to the rear panel of the control module.
    a. If the connection is good and the unit still fails to deliver an accurate reading, contact Terra Universal.

Problem: System delivers a low-pressure alarm.
Possible Solutions:

1. Set the flowmeter to 7 SCFH, and set the regulator to 30 psi on the Dual Purge unit.

Data Logging

Problem: System does not transfer data to USB drive when USB drive is plugged in
Possible Solutions:

1. Remove and re-insert USB drive.
2. If LED status light flashes blue, there is not sufficient memory on the USB drive. Remove some data and try again.
3. The Smart® Nitro-Watch™ may not be compatible with your USB drive. Try a different make or model of USB drive.

7. Replacement Orders

Provide sales associate with pertinent information, such as serial number, model number and date, for replacement parts or a new Nitro-Watch™. The label is located on the bottom of the Nitro-Watch™ controller.

Order Number _____

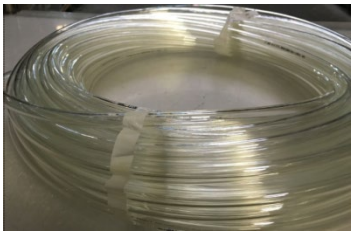
Serial Number _____

Unit Model Number_____

Date _____

8. Replacement Parts

Sensor for Desiccator Cabinets	**9500-02B**
Sensor for Gloveboxes	**9500-02B-GB**



Polyurethane Tubing	**PL01307**	**¼" O.D. x 170" I.D.**
Polyurethane Tubing	**PL02122**	**⅜" O.D. x 250 I.D.**

Cord Patch, Nitro-Watch to Sensor	**AS04159**
Cord Patch, Nitro-Watch to Desiccator	**AS04160**
Cord Patch, Nitro-Watch to Dual Purge	**AS04259**

9. Warranty

Products Manufactured by Terra: Terra Universal, Inc., warrants products that it manufactures to be free from defects for a period of 12 months for parts and 90 days for labor, commencing from the date of shipment. This limited warranty covers parts and labor, but not transportation and insurance charges. Terra's sole responsibility is to repair or replace, at its option, any part of the product that proves defective or malfunctioning during this time limit. In some cases, components incorporated in Terra Universal products are covered by additional warranties from component manufacturers; obtain specific information from Terra sales representatives. Repairs may be completed by 3rd party service agents approved by Terra Universal. Terra Universal reserves the rights to limit this warranty based on a service agent's travel, working hours, the site's entry restrictions and unobstructed access to serviceable components of the product. This warranty is void if the equipment is abused or modified by the customer, is operated outside Terra's operating instructions or specifications, or is used in any application other than that for which it is specified. This warranty does not include routine maintenance or service procedures, shipping damage, nor damage from misuse, intentional or unintentional abuse, neglect, natural disasters, or acts of God.

Products Manufactured by Others: Terra Universal, Inc., warrants that, to the best of its ability, Terra's representations of products that are manufactured by others reflect the manufacturer's representations, subject to change without notice. Sole warranty for these products is the original manufacturer's warranty that is passed forward to the purchaser and constitutes the customer's sole remedy for these products. Detailed warranties for distributed products are available through Terra sales representatives.

Freight Shortage or Damage: Upon receipt of any equipment from Terra Universal, Inc., customer shall immediately unpack and inspect for damage or shortage. The customer shall not accept a damaged package or a short shipment until the carrier makes a "damage or shortage" notation on both the carrier's and customer's copy of the freight bill or delivery receipt. Service title passes when the shipment is loaded, so customer is responsible for filing and collecting a freight claim. Any replacement products must be ordered and paid for separately. For Terra's "Policy and Procedures for Returning Goods," see Terra's Internet site: www.TerraUniversal.com.

Generally, customers can improve the chance of collecting on a freight claim by following these procedures: 1) formally requesting that the carrier inspect the shipment immediately upon suspecting damage or shortage to verify condition; 2) notifying the carrier upon discovery of concealed damage and requesting an inspection within 15 days of receipt, both in person or phone and following up via mail; 3) keeping the shipment as intact as possible, including retaining original packaging materials and keeping the product as close to the original receiving location as possible; 4) holding salvage for disposition by the carrier.

All Claims: Terra Universal expressly disclaims all other warranties, expressed or implied or implied by statute, including the warranties of merchantability or fitness for intended use. Terra Universal is not responsible for consequential or incidental damages arising out of the purchase or use of the products supplied by Terra Universal. Terra Universal is not liable for damage to facilities, other equipment, products, property or personnel of others, or of their agents, suppliers, or affiliated parties, which is caused or alleged to have been caused by products supplied by Terra Universal. In any event or series of events, Terra Universal's total liability for any and all damages whatsoever is limited to the lesser of the actual damages or the original invoice cost of the items alleged to have caused the damage. The customer's sole and exclusive remedy for any cause of action whatsoever is repair or replacement of the non-conforming products or refund of the actual purchase price, at the sole option of Terra Universal. All claims must be made in writing within 90 days of the date the product was shipped. Any claims not made within this time limit shall be deemed waived by the customer. Terra Universal is not responsible for any additional costs of repair caused by poor packaging or in-shipment damage during return.

Warranty Returns: All warranty returns must be authorized in advance by Terra Universal and approved under an RMA. Unless approved in advance for good reason, all returns must be in original condition, including all manuals, and must be packaged in original packaging materials. All returned goods are to be shipped to Terra Universal, freight prepaid at customer's expense. See Terra's "Policy and Procedure for Returned Goods."

Thank you for ordering from
Terra Universal!