TERRA UNIVERSAL.COM
Critical Environment Solutions

Supplemental Manual *Document No. 1788-26*

IsoDry™ RH Control System

Supplemental Manual

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Proprietary Notice

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Safety Notice

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.

1.0 Introduction

This manual is intended to be a supplement to **Doc. #1800-40: Desiccators and RH Controllers** that outlines the setup and operating instructions that are specific to the IsoDry™ System and its components.

The defining feature of this system is the IsoDry™ Gas Dilution Module. The Adjust-A-Shelf cabinet, Dual Purge, and NitroWatch are slightly modified to integrate with the Gas Dilution Module, but are for the most part identical to the standard versions described in Doc. #1800-40.

The IsoDry™ RH Control System is only compatible with Adjust-A-Shelf desiccators that carry the IsoDry™ moniker.

IsoDry™ System Compatibility
Single Column IsoDry™ Adjust-A-Shelf™
Double Column IsoDry™ Adjust-A-Shelf™

IsoDry™ Desiccator Cabinet (3-chamber, single-column design)

NOTE — **This manual focuses on specific setup and operating instructions for the IsoDry™ RH Control System. For installation instructions and general specifications for the Adjust-A-Shelf™ Cabinet, Dual Purge, or NitroWatch, refer to Doc. #1800-40: Desiccators and RH Controllers.**

All of Terra's IsoDry™ Desiccator Cabinets employ a similar nitrogen-flow design:

1. High-purity nitrogen gas is fed into a plenum at the rear of the desiccator (single-column design) or directly into one of the chambers (double-column design) where it mixes with the air inside the cabinet. When the Relative Humidity (RH) climbs above set-point level, a high-flow purge is activated.

2. The IsoDry™ Gas Dilution Module continuously circulates this nitrogen-rich air mixture throughout the desiccator, further blending the nitrogen gas with the air and diluting any moisture present inside the cabinet.

3. The influx of nitrogen gas pressurizes the desiccator, and air is released through the automatic relief/bleed (RB) valves, allowing the concentration of nitrogen gas in the desiccator to rise until the desired RH level is reached. At this time, the nitrogen purge reverts to a low flow.

The IsoDry™ System is made up of four main components:
1. The IsoDry™ Desiccator Cabinet
2. The IsoDry™ Dual Purge
3. The IsoDry™ NitroWatch
4. The IsoDry™ Gas Dilution Module

IsoDry™ Dual Purge System

The Dual Purge System controls the nitrogen gas input. The system provides two levels of nitrogen purging to protect your stored materials: Low-level purge and high-level purge.

- Low-level purge maintains the minimum pressurization necessary to block out moisture and contaminants while the desiccator doors are closed.

- The high-level purge activates when the RH level rises above the set-point and is designed to minimize the impact of introducing outside air to the stored materials. An adjustable time delay maintains the high-level purge for a set time after the set-point is reached, followed by a return to low-level purging.

The IsoDry™ Dual Purge System is designed for enclosures that feature several access doors. It relies on the IsoDry™ NitroWatch to activate the high- and low-level purges.

Each unit features a system line pressure gauge and regulator, internal positive pressure gauge, a 2-amp fuse (located inside the housing), a flowmeter, and all necessary gas line connections.

In addition, each unit features an alarm that flashes if the inlet line pressure falls below 30 psi. This alarm alerts the user of a problem with the supply line.

WARNING **Automatic RB Valves are required in nitrogen-purged desiccators to prevent dangerous pressure buildup.**

IsoDry™ NitroWatch

The NitroWatch offers set-point control of RH levels via automatic control of the Dual Purge System and IsoDry™ Gas Dilution Module.

The NitroWatch senses and displays the relative humidity level (from ambient to 0%) inside a desiccator within 2% RH. It operates in tandem with the Dual Purge System and the Automatic RB Valves to precisely and automatically control the flow of nitrogen into the desiccator and maintain a preset humidity level, no matter how operating conditions may change. It thus compensates for factors you may not have time to worry about, such as how often parts are accessed, the size and condition of the desiccator, variations in ambient humidity, and long periods without operator supervision.

The NitroWatch consists of two basic components: a humidity sensor and an indicator/controller unit.

The **Humidity Sensor**, which senses the humidity level, is mounted inside the controlled environment. It employs 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 ± 2% RH at a temperature of 68°F. The voltage output of the sensor is directly proportional to the humidity.

A 3-prong connector allows easy connection of the sensor to the Control Unit.

The **Control Unit** provides the indicators and controls necessary to set the desired humidity level and to measure the actual humidity level inside the desiccator.

IsoDry™ Gas Dilution Module

The Gas Dilution Module, unique to IsoDry™ Desiccator Systems, rapidly blends high-purity nitrogen with the ambient air and circulates the nitrogen-rich mixture throughout the desiccator, essentially diluting the amount of moisture present in the air. By expediting this process, the gas dilution module provides three key benefits: it quickly lowers humidity levels after moisture enters the cabinet, minimizes the moisture exposure time of sensitive materials, and provides humidity uniformity throughout the cabinet. The speed of the fans can be adjusted using the Speed Dial on the back of the Dual Purge.

2.0 Installation

CAUTION

- **Do not position the desiccator components so that the power supply and nitrogen source connections are inaccessible. The power supply serves as the main disconnect for the system.**
- **Never use alcohol or other cleaning agents on acrylic surfaces.**

WARNING

To prevent dangerously low oxygen levels and risk of asphyxiation, nitrogen-purged systems should only be installed in a well-ventilated area.

Before installation and operation, carefully unpack the desiccator and accessories and check for signs of damage or missing parts. Wipe down with a particle-free cloth.

Installation requires a supply of clean, dry air or nitrogen (less than 5 ppm(v) H2O) and 1/4" polyethylene tubing. The Dual Purge universal power supply operates on 110/120VAC, 60Hz or 220/240VAC, 50Hz with no required switch settings. All grounded cabinets feature grounding terminals in the upper-right corner of the cabinet. For standard grounding, simply connect the grounding terminal to your in-house ground.

IsoDry™ Dual Purge™ and IsoDry™ NitroWatch™ Set-Up

NOTE

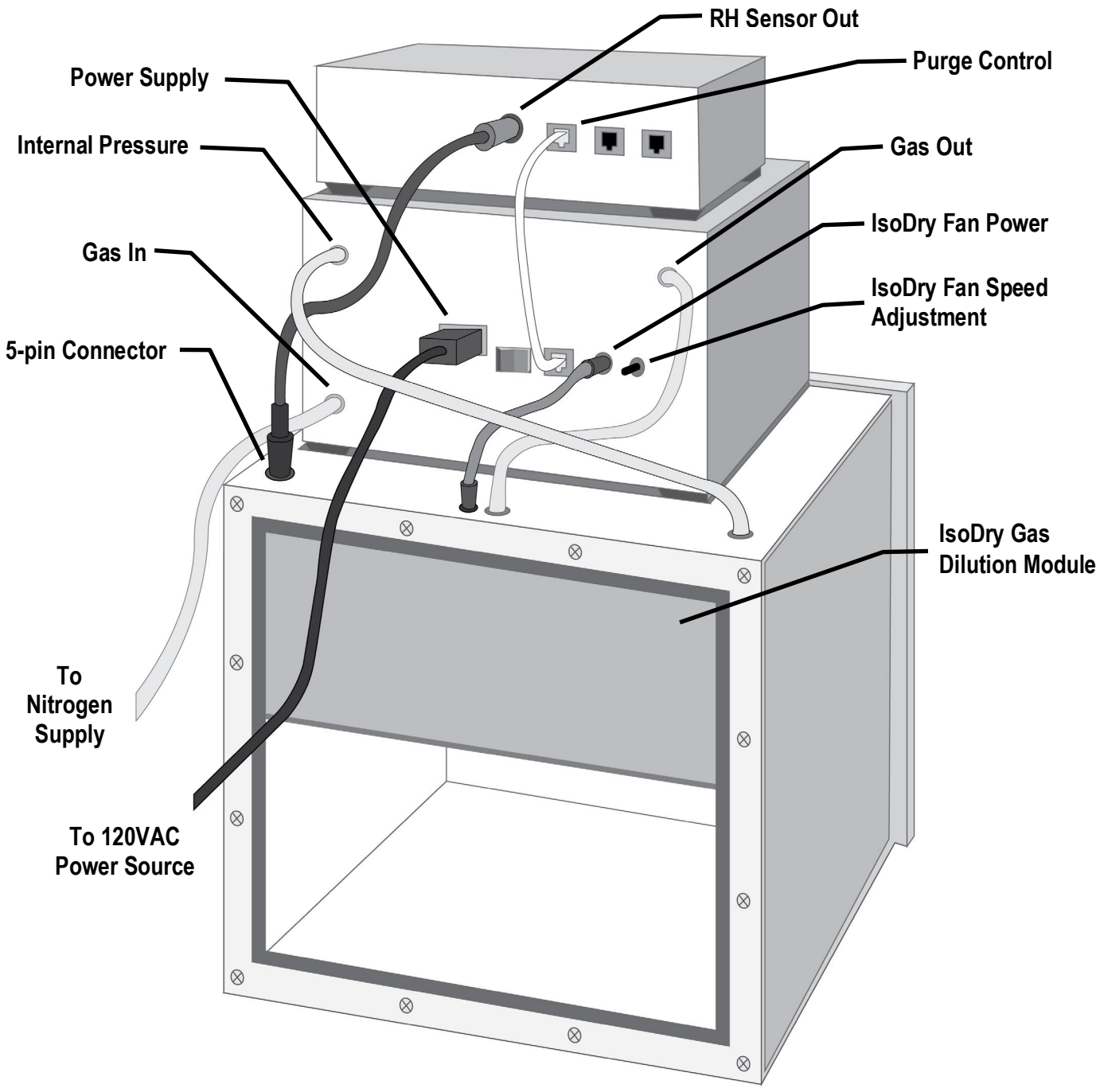
The NitroWatch draws its power from the Dual Purge System and will not operate unless the Dual Purge System is plugged in and turned ON.

1. Plug one end of the low-voltage phone cable into the “Purge Control” jack on the back of the Dual Purge and plug the other end into the “Purge Control” jack on the back of the NitroWatch.
2. Plug the 5-pin cable into the “RH sensor” jack on the back of the NitroWatch and connect it to the desiccator’s RH sensor.
3. Use the 12V power cable to connect the IsoDry™ Gas Dilution Module to the “IsoDry Power” jack on the back of the Dual Purge.
4. Insert the provided cord plug into the “Door Switch” jack. Leave the “R/H Output” jack empty.
5. Use ¼” tubing to connect the nitrogen gas supply to the “Gas In” port on the back of the Dual Purge.
6. Use ¼” tubing to connect the “Gas Out” port on the back of the Dual Purge to the nitrogen inlet port on the desiccator.
7. Plug the 120VAC power cable into the Dual Purge and an appropriate grounded outlet.

CAUTION

Installation of at least one Terra Automatic RB Valve (Cat. #1600-60B) is required to protect against permanent damage to seals and doors.

IsoDry™ System Setup (Rear View)



3.0 Operation

Dual Purge System Operation

1. **Zero Calibration**: This routine is run before shipping to ensure that the pressure sensor that activates the Low Pressure Alarm is properly calibrated. You need to run the routine only if the Low Pressure Alarm is activated even though the Dual Purge is connected to a nitrogen supply with at least 30 psi of pressure.

   To perform the zero calibration routine, disconnect the incoming gas supply line (Any pressure on the internal pressure transducers will be subtracted from the reading during normal operation, resulting in incorrect low-pressure alarms).

   Press and hold SET and UP buttons while turning on system power. The display will indicate "CAL" and then automatically set the zero value.

2. **Initial Programming**: Turn ON the Dual Purge System while depressing SET (the left button on the front control panel). Each time you release and then press and hold the SET button, you will advance through the following control functions. Use UP/DOWN to change default settings (shown in parentheses):

   Prg 1 Purge Delay (minutes): Number of minutes high purge remains active after door is closed (default: 0)

   Prg 2 Purge Delay (seconds): Number of seconds that the high purge remains active after door is closed (default: 5). If operating the Dual Purge without a NitroWatch, you should increase this setting to 60.

   door After switching to high purge, the number of seconds to delay before turning on the beeper alarm.

   beeP State of the BEEPER enable (default: ON)
   Glo Activates GLOVE BOX control mode--Press UP to turn ON and proceed to glove box pressure setting, DOWN to turn OFF (default: OFF). In GLOVE BOX mode, this setting lets you adjust the pressure (milli-inches WG) at which the high purge is activated (default: 0.2). See “zero calibration” above.

   DonE Settings are complete; press SET once more to begin operation.

   Made a mistake? To reset the system, turn the system OFF while in setup mode and restart while holding the SET button.

3. **Operation Display Functions:** After completing initial programming, press the specified button to view these operating conditions:

   High Purge Bypass: Press and hold SET

   In some applications (especially using fine powders in a glove box), you may wish to deactivate the high purge function, which could create turbulence. To do so, press DOWN while holding SET. To activate high purge, hold UP while holding SET.

   Incoming Line Pressure: Press and hold UP (displays line pressure in PSI)

   Turn the pressure regulator (the round knob on the right side of the Dual Purge control panel) until the pressure gauge reads 30 psi (for bench-top desiccators) or 40 psi (for larger standing desiccators). Note that regulator knob is reverse-threaded: rotate clockwise to open the valve and increase pressure, or counterclockwise to close the valve and reduce pressure. For safe operation, pressure should be externally regulated below 70 psi.

Internal Pressure: Press and hold DOWN (displays internal cabinet pressure in milli-inches of WG)

NOTE

On systems with very large plastic access doors, a continuous purge can cause temporary door deflection and gas leakage. This condition does not indicate a permanent leak and generally does not damage the cabinet. When pressure is removed, doors return to their natural position and re-establish an effective seal. This deflection does, however, result in nitrogen waste and indicates the need to reduce the flowmeter setting.

Purge Timer: Press and hold UP and DOWN simultaneously to review the number of seconds the high-flow purge is active after set-point is reached. To change this value, see "Initial Programming" above.

"Hi" Indicator indicates that the Dual Purge System is in high-purge mode (you will see at least one bar to the right of this display, which indicates an internal positive pressure).

Flashing "Lo Pres" indicates the absence of incoming line pressure. Check the line for proper connection, and check the nitrogen source to ensure to ensure incoming flow.

4. **Flowmeter Operation**: The Dual Purge System includes a flowmeter, which provides a continuous low-level purge to maintain a constant positive pressure inside the cabinet. The flowmeter also ensures uninterrupted nitrogen flow if power or system electronics ever fail.

   If continuous purging is desired, open the flowmeter to 5 – 10 SCFH (depending on chamber size). This is recommended if you require a very low humidity set point (less than 10%RH) or if doors are frequently opened. Continuous purging will tend to drive the %RH level very low.

   If continuous purging is not required, close the flowmeter. The Dual Purge System will initiate a gas purge only when the humidity level climbs above the set point.

5. **Dilution Fan Adjustment:** The dilution fan speed control, located on the rear of the Dual Purge panel, allows fan speed adjustment. Turn the knob clockwise to speed up the fan (maximizing dilution efficiency), or counter-clockwise to slow down the fan (reducing turbulence inside the cabinet).

NitroWatch™ Operation

1. **Initial Programming:** Turn ON the Dual Purge System while holding down the SET button on the NitroWatch control panel (the left button on the front control panel).

   Each time you release and then press and hold the SET button, you will advance through the following control functions. Use the UP/DOWN buttons to change default settings (shown in parentheses):

   Door Number of seconds to delay after the door is opened before turning on the beeper alarm.

   rH Relative Humidity High Purge Delay Alarm: No. of seconds the RH level must remain above the set point to activate the alarm (default: 60)

   beeP Enables/Disables Beeper Alarm (default: ON)

   hU HUMEX operation selector – when in the OFF mode, the system operates as a NitroWatch (maintaining below-ambient humidity). In the ON mode, the system operates with Terra's Humex2 (maintaining above-ambient humidity). Default: OFF.

Add ADJUST parameter: Use this function to compensate for measured discrepancies between the NitroWatch %RH readout and that of an independent %RH calibrator. Press the UP/DOWN keys to adjust the scale up or down. (Default: 0)

NOTE

This adjustable offset value will wrap around if the maximum or minimum is exceeded. For example, if you try to set the adjust value above the maximum scale offset of 49.5, the value will wrap around to –50. Also, a side effect of using an offset value other than zero is that the R/H range will be reduced. For example, if the offset value is –10, then the maxi um R/H value that can occur is 90 because the input value (100) will be added to the adjust value before the system uses it.

AIr ALARM time selector, which allows you to specify the alarm scale determined above in either minutes – LONG – or seconds – SHrt. (default: SHrt)

Press SET again to advance to Normal Run Mode.

Made a mistake? To reset the system, turn the NitroWatch OFF while in setup mode and restart while holding the SET button.

2. **Adjust Humidity Set Point:** After completing initial programming, press the SET button to view the current % RH set point (default setting: 15%). Use the UP/DOWN keys to change this set point. Wait for a couple seconds without pressing any buttons to save the new set-point.

3. **Beeper Silencing**: Press any front panel button to silence the beeper during an alarm condition.

   The NitroWatch will now activate high-flow purging whenever the %RH level inside the desiccator exceeds the specified set point. Your desiccator is ready for operation.

CAUTION

Installation of at least one Terra Automatic RB Valve (Cat. #1600-60B) is required to protect against permanent damage to seals and doors

For optimal efficiency of gas delivery and reduced %RH recovery times, Terra recommends factory installation of one RB valve in each desiccator chamber.

NOTE

If the Dual Purge System remains at high-level purge, or if it frequently fluctuates between high and low-level purge, you need to increase your flowmeter setting. Increase the flowmeter setting until the humidity level falls a few percent below your set point. At this flowmeter setting, the system will be able to maintain the desired humidity while on the low-level purge—and save nitrogen.

NOTE

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.

4.0 Desiccator Service and Maintenance

CAUTION

- **Do not clean acrylic with alcohol or other strong cleaning agents.**
- **Do not expose static-dissipative PVC to extreme heat or direct sunlight.**
- **A Terra stainless steel shield is required on the bottom of each static-dissipative PVC desiccator chamber to prevent scratching.**

Refer to the **Doc. #1800-40: Desiccators and RH Controllers** for information regarding the care and service of your desiccator.

5.0 Troubleshooting

Terra Universal's desiccators are designed to provide years of reliable, efficient service. If you should experience any problems that arise during operation of your desiccator with the Dual Purge System and NitroWatch, refer to the appropriate troubleshooting procedure below. If the problem persists, or if you encounter any problems not described below, call Terra Universal for additional assistance.

WARNING

Do not attempt to disassemble any of the modules. Contact Terra for assistance.

PROBLEM: System won't turn on.

POSSIBLE SOLUTIONS:

1. Make sure that the power cord of the Dual Purge System is plugged into an appropriate outlet and that the two telephone cables to the NitroWatch and desiccator are properly connected.
2. Make sure that the power switch of the Dual Purge System is in the ON position.
3. Check the fuse of the Dual Purge System. The 2 amp fuse, mounted on the circuit board controller, is accessible once the stainless steel housing cover is removed.

PROBLEM: System stays in high purge at all times.

POSSIBLE SOLUTIONS:

1. Check door seals of the desiccator to make sure that there are no leaks.
2. If you require a very low humidity level, you may need to increase the flowmeter setting on the Dual Purge System. You should increase the flowmeter setting until the system maintains a humidity level a few percent below the humidity set point without switching to the high-level purge. Remember, though, that the Dual Purge System should be able to maintain the humidity level you require with a low-level

purge as long as access doors remain closed.

3. If you are operating a large desiccator and require a low humidity level, your system may need to operate on high purge much of the time to compensate for the hygroscopic characteristics of the acrylic (or static-dissipative PVC) desiccator walls. These materials absorb moisture from outside of the desiccator and pass it inside. The higher the difference between the external and internal humidity levels, the more nitrogen you will need in order to remove this moisture. Yet if you operate on high-flow purge most of the time, you consume large amounts of nitrogen and run the risk of pressure build-ups.

PROBLEM: The system constantly switches between high and low purge.

POSSIBLE SOLUTIONS:

1. Make sure that all access doors are fully closed. Check door seals for leaks.
2. You should increase the flowmeter setting until the Dual Purge System maintains a humidity level a few percent below the set point without switching to the high-level purge.

PROBLEM: The desiccator is leaking excessively.

POSSIBLE SOLUTIONS:

1. Check the condition of the gasket on the desiccator. If it is cracked or peeling, call Terra for a replacement.
2. Check door alignment. Leaks may develop if doors are out of alignment.

PROBLEM: Line pressure gauge does not display any pressure, or displays the “Low Pressure” alarm at all times.

POSSIBLE SOLUTIONS:

1. Supply gas is down, or for some reason is not reading the Dual Purge system. Check your supply line for kinks or blockage.
2. If your gas system utilizes a filter, it may be clogged and need to be replaced.
3. Check the line pressure regulator to make sure it is not closed
4. Run the “Zero Calibration” routine described in Section 3.2

PROBLEM: The NitroWatch delivers an obviously incorrect humidity reading.

POSSIBLE SOLUTIONS:

1. Check the NitroWatch sensor connection on the rear panel of the control module. If the connection to the sensor is good, and the unit still fails to deliver an accurate reading, contact Terra Universal.

PROBLEM: The NitroWatch delivers a low-pressure alarm.

POSSIBLE SOLUTIONS:

1. Turn off the Dual Purge system using the back switch.
2. Disconnect the N_2 gas line.
3. Open the flowmeter and regulator.
4. Simultaneously press and hold the "Set" and "Up" buttons while turning on the Dual Purge system. The display will show "CAL". Press "Set" to proceed to the next setting.
5. Set under the "CAL" menu,
    a. "Prg1" to 0 minutes
    b. "Prg2" to 5 seconds
    c. "Door" to 60
    d. "Beep" to ON
    e. "Glov" to OFF
6. Re-connect the N_2 gas line, set the flowmeter to 7 SCFH, and set the regulator to 30 psi.

PROBLEM: The NitroWatch displays the "door" alarm.

POSSIBLE SOLUTIONS:

1. Make sure that a cord plug is present in the Door Switch input on the rear panel of the NitroWatch control module.

6.0 Specifications

NOTE **Refer to the original order form for the exact specifications/configuration of your desiccator.**

WARNING **Internal chamber pressure must never exceed 0.5 psi when the desiccator is purged with nitrogen.**

IsoDry™ Dual Purge System

Operating Temperature:	50°F to 140°F
Overall Dimensions:	12"W x 11 ¼"D x 7"H
Weight:	16 lbs.
Power Requirement:	120/220 VAC, 50/60 Hz, 0.5 Amp Universal power supply requires no switch settings.
Degree of Protection:	IPX0
Max Gas Inlet Pressure:	50 psi

IsoDry™ NitroWatch

Operating Temperature:	50°F to 140°F
Dimensions:	11"W x 6 ½"D x 3"H
Power Requirements:	12 VDC (Supplied by Dual Purge)
Sensor Dimensions:	11/2" x ¾" x 4"
Case Material:	Stainless steel
Display:	3 ½ digit LED display
Electrical Connections:	Screw terminals
Output:	0-5 V
Measuring Range:	0-100% RH
Accuracy (at 20° C):	± 2% RH
Display Resolution:	± 0.1% RH
Temp. Dependence:	± 0.04% RH/°C
Sensor Calibration:	None required, but scale offset routine allows display compensation. Capacitive sensor pick-up should be tested and replaced as necessary (about every 5 years under normal use).

IsoDry™ Gas Dilution Module

Operating Temperature:	50°F to 140°F
Dimensions:	13 ½"W x 7"H x 2"D
Power Requirement:	12 V (Supplied by Dual Purge)
Housing Material:	Stainless steel

NOTE **For a complete list of specifications for the Adjust-A-Shelf™ desiccator cabinet and the modules listed above, refer to Doc. #1800-40: Desiccators and RH Controllers.**

7.0 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. 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. 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, breakage of quartz baths after 60 days, 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!