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# Dry Glove Box Instruction Manual

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## **WARRANTY**

This product is warranted against defects in material and workmanship during the first 12 months after original date of shipment.

The factory will, at its option, repair or replace defective material within this period at no charge for parts and labor.

All returns or exchanges must first be authorized by COY LABORATORY PRODUCTS, INC.

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14500 COY DRIVE  
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The responsibility of COY LABORATORY PRODUCTS, INC., is limited to the purchase price of this product, and COY LABORATORY PRODUCTS, INC., will not be responsible for any Consequential damages.

This warranty does not cover damage in shipment or damages as a result of improper use or maintenance of this product. This warranty does not cover damages caused by excessive line transients on the AC supply line.

## WARNINGS

1. If your Glove Box is used with any type of gas purge, the pressure regulator must not be set higher than 15 psi. Flow Rates greater than 15 psi may damage the glove box and void the warranty.
2. Never obstruct gas flow in or out of the Pressure Relief Valves.
3. The **Polymer & Aluminum Glove Box** styles are not intended for vacuum or high pressure operation.
4. Running the humidity apparatus dry will damage the pump and void the factory warranty.
5. To improve the life expectancy of each apparatus (humidification/dehumidification) the user should turn off the apparatus not in use at the time with the Automatic Humidity Controller. For example, when dehumidifying the chamber, or when the desired set point is below ambient humidity levels, turn the humidification switch off.
6. Only distilled water should be used with the humidification apparatus to prolong product life.
7. **Never pull a vacuum** on Polymer or Aluminum Glove Box. This could crack/damage the glove box and void the warranty.

## **1.0 Introduction**

This Glove Box is designed for humidity control applications where there is a need to control the humidity either below and/or above ambient conditions. It can be used in either Automatic or Manual Control mode.

The Humidity Controller provides automatic monitoring and control of the relative humidity. It activates the necessary system when the moisture level deviates from the adjustable set point.

The safety relief/bleed valves provide pressure relief with the control system and also function as check valves, ensuring no moisture or contaminants enter the Glove Box in the event of a system failure causing negative pressure.

The Manual Control requires an operator's periodic check with the supplied Hygrometer to be sure the humidity is as desired. Then, turning the appropriate equipment pump switch "ON" or "OFF" will control the desired level.

## **1.1 Glove Box Components Overview**

- Ball Valve (1/4" Quick Disconnect Fitting)
- Pressure Relief Valves (3 on rear of the chamber)
- Internal Plug Strip
- Diaphragm Top
- Gloveless Sleeve & Arm Port Plugs
- Large Side Door
- Automatic Humidity Controller
- Dehumidification Apparatus (Desiccant capsules and pump)
- Added Capacity Dryers (optional upgrade)
- Dry Gas Purge System (option)
- Circulation Fan

### **1/4" NPT Ball Valve**

This ball valve located on the upper right side of the glove box (see figure #1 page 7) can be used for purging operations. The ball valve is equipped with a 1/4" o.d. Quick Disconnect female and male fittings for Flexible tubing. See section 2.2 (page 9) for installation of tubing and Quick Disconnect Fittings

Never purge the glove box at a higher rate than 15 psi (with 1/4" o.d. Tubing). Doing so could over pressurize and damage the glove box.

NOTE: Damage from over pressurizing the glove box will void the warranty.

## **Pressure Relief Valve**

The pressure relief valve relieves the glove box of large internal pressure changes associated with gas purges. The valve is an automatic system that simply allows gas to escape to the room atmosphere when the glove box internal pressure rises.

The pressure relief valve can handle up to 15 psi of gas flow. Larger flow rates may over pressurize and damage the glove box.

## **Plug Strip & Feed-Through Adapter**

A power supply is sealed into the glove box through the COY Feed-Through Adapter. The plug strip is equipped with a circuit breaker and ON/OFF switch.

The Feed-Through Adapter is a rubber stopper that has been cut apart to accept the cord of the plug strip and resealed with silicone and placed in the plastic feed through, which is then attached to both sides of the glove box by threading the cap nut. Please note when loosening or reattaching the feed through the black rubber O-ring must be placed on the outside of the glove box to ensure an airtight fit.

## **Diaphragm Top**

The diaphragm top is designed to compensate for small volume changes on the interior of the glove box associated with the user entering and exiting the glove box through the gloves.

Manufactured from 20 mil Poly Vinyl Chloride (PVC) the vinyl is durable and long lasting. When the glove box is purged, this top will expand until the pressure relief valve activates and relieves the excess pressure.

***Please note:** on some custom glove box designs the Diaphragm Top is located on the back wall of the glove box or other location. For these designs please make sure the diaphragm has room to expand and that there are no sharp objects that could damage the vinyl.*

## **Gloveless Sleeves & Arm Port Plugs**

Gloveless Sleeves allow for barehanded entry into the glove box with the cuff fitting snugly around the users forearms to ensure an airtight fit.

The Arm Port Plugs seal the glove box atmosphere when not in use. See section 4.4 (page 21) for details on replacing a gloveless sleeve or cuff.

## **Large Side Door**

Access point for large equipment. Latched at three separate points to ensure airtight seal.

## **Automatic Humidity Controller**

Measures and controls the humidity levels inside the glove box by turning on and off the pumps that run the Humidification and Dehumidification Apparatus. All based on the set-point chosen by the user. Controller is placed outside the glove box in a convenient location for the user.

## **Dehumidification Apparatus**

Consist of the Desiccant Cartridges mounted on the rear of the chamber and the pump that circulates air from the glove box through the desiccant and back into the glove box.

## **Added capacity dryer**

Added desiccant capsules to increase time between desiccant regeneration. Standard on all 2 person (5 & 6 ft) glove boxes. Optional on all other glove box sizes.

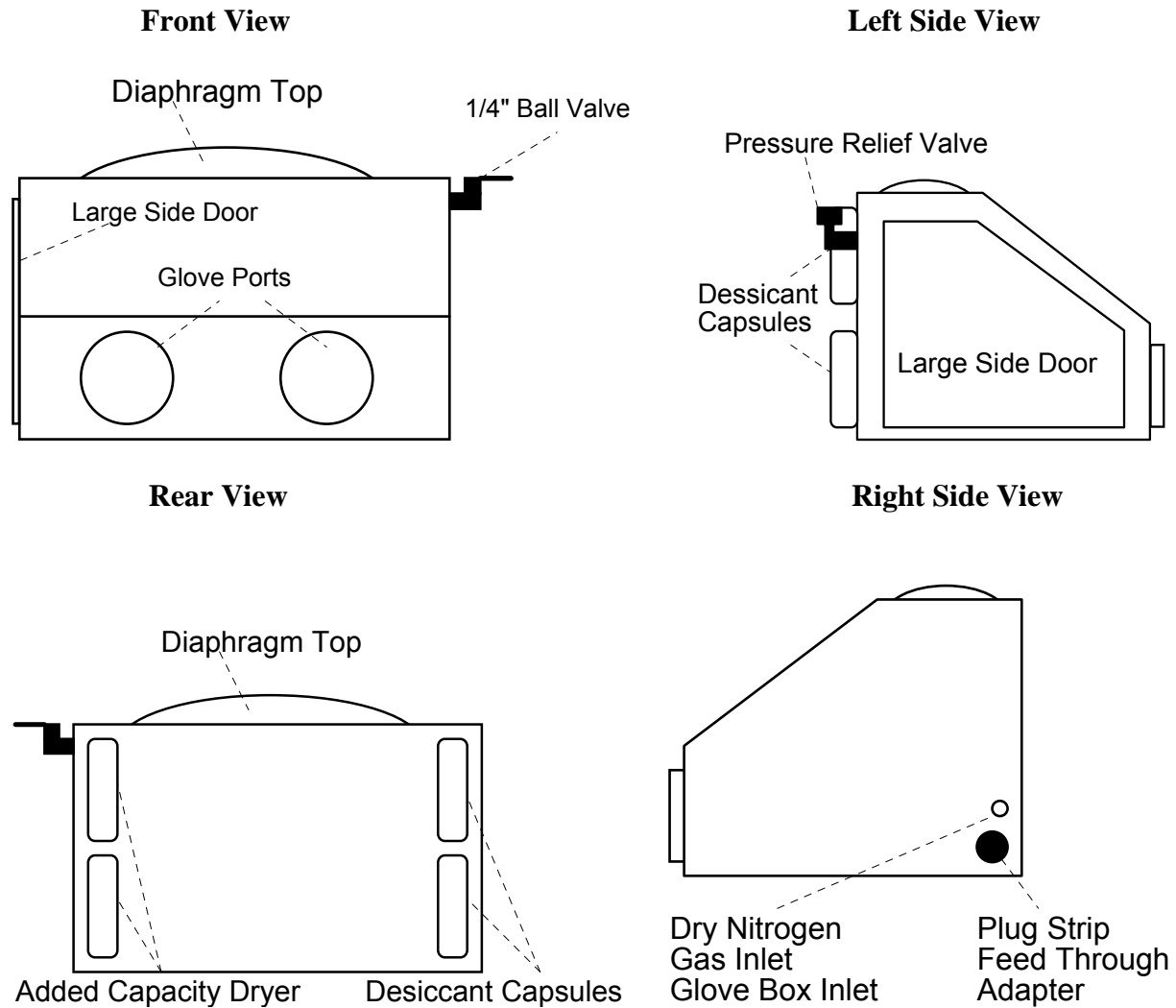
## **Circulation Fan**

Circulates glove box atmosphere ensuring proper humidity mix throughout the glove box. This unit should always be plugged in and working.

## **Dry Gas Purge System**

An alternative means to dry the glove box by using any inert dry gas to lower humidity levels. This automatic system has adjustable flow meters to control drying times. The Electronic solenoid is triggered by the Automatic Controller to allowing gas to flow into the glove box. The Automatic Pressure Relief valves vent excess pressure. System can be used on tandem with Dehumidification System.

## **Figure # 1 Glove Box Configuration**



## **2.0 Glove Box Assembly**

Most of the Glove Box has been pre-assembled at the factory with all accessory parts, Pressure Relief Valve, 1/4" Ball Valve, Large Side Door, Gloveless Sleeves, and Plug Strip installed. Below are the basic instructions for assembling the rest of the Glove Box.

Remove all packing and shipping boxes from the interior of the glove box.



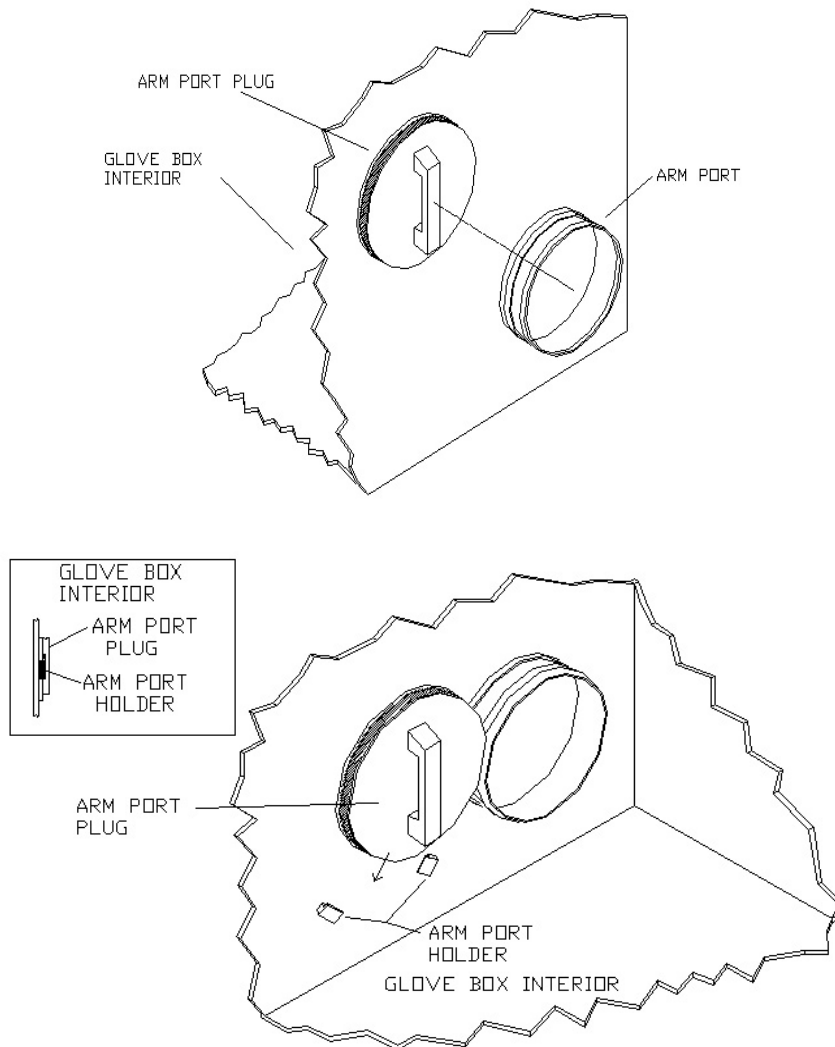
## 2.1 Arm Port Plugs Assembly

Install Arm Ports as illustrated by figure #2. To allow easy access in and out of the glove box, position the arm ports on the Arm Port Holder inside.

*HINT: For easy operation of the arm port plugs, when placed in the Arm Ports to seal the atmosphere, tilt the bottom portion of the Arm Port Plug in first and then tilt the top portion in to seal the atmosphere.*

**NOTE: For units installed with Iris Ports the Arm Port Plugs are designed to seal from the outside and are not kept inside the glove box.**

**Figure # 2 Arm Port Plug Operation**



## 2.2 Installation of Tubing to Quick Disconnect Fittings

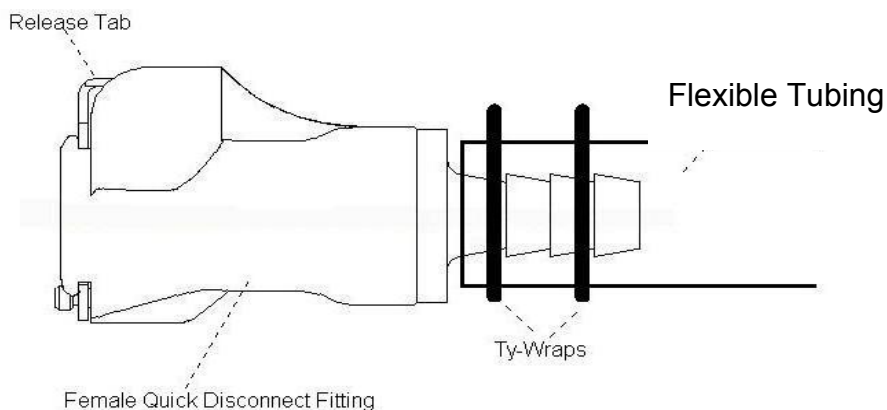
To install Flexible tubing to the fittings, follow the instructions listed below and figure #3 (below) as a reference.

1. Place a female fitting on each end of tubing.
2. Place 2 ty-wraps around the hose barb on the female fittings and pull them as tight as possible.
3. Cut off excise ty-wrap.
4. Insert Female fitting connected to the tubing to the Male fitting on the Glove Box Ball Valve. When fitting is seated correctly, you will hear a “click”.
5. To disconnect the tubing, depress the silver tab on the male fitting and separate.

When disconnected, the fittings on the glove box automatically seal the glove box atmosphere.

*NOTE: Never purge the glove box at a higher rate than 15 psi. (with 1/4" o.d. Tubing) Doing so could over pressurize and damage the glove box. Damage from over pressurizing the glove box will void the warranty.*

### **Figure # 3 Tubing connection to Quick Disconnect Fitting**



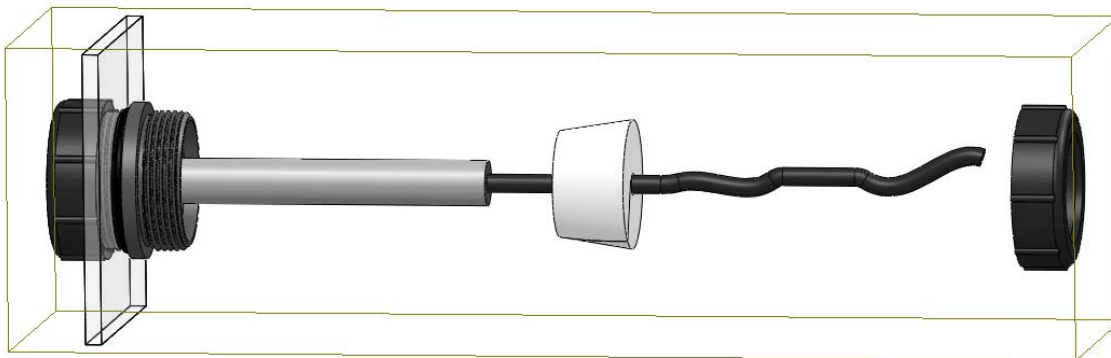
## 2.3 Automatic Humidity Controller Assembly

Unpack the humidity controller and position it so that it is easily accessible to the user (nearby shelf or space on the bench top). Do not place on top of the glove box during operation as the Diaphragm Top needs to be able to expand without interference. Keep in mind that the controller is limited by the length of the sensor cable and the cords for the humidification and dehumidification pumps.

Once the Controller is situated to your satisfaction, install the sensor into the rear wall of

the glove box following figure #4 and the instructions listed below.

### **Figure # 4 Sensor Connection**



- Step 1) Slide the Humidity sensor down through the Nut
- Step 2) Using the predrilled hole rubber stopper, insert the Humidity sensor cord into rubber stopper.
- Step 3) Push the rubber stopper back into the port as far as possible and screw the nut down tightly. The Humidity sensor should be about 2-3 inches into the chamber.

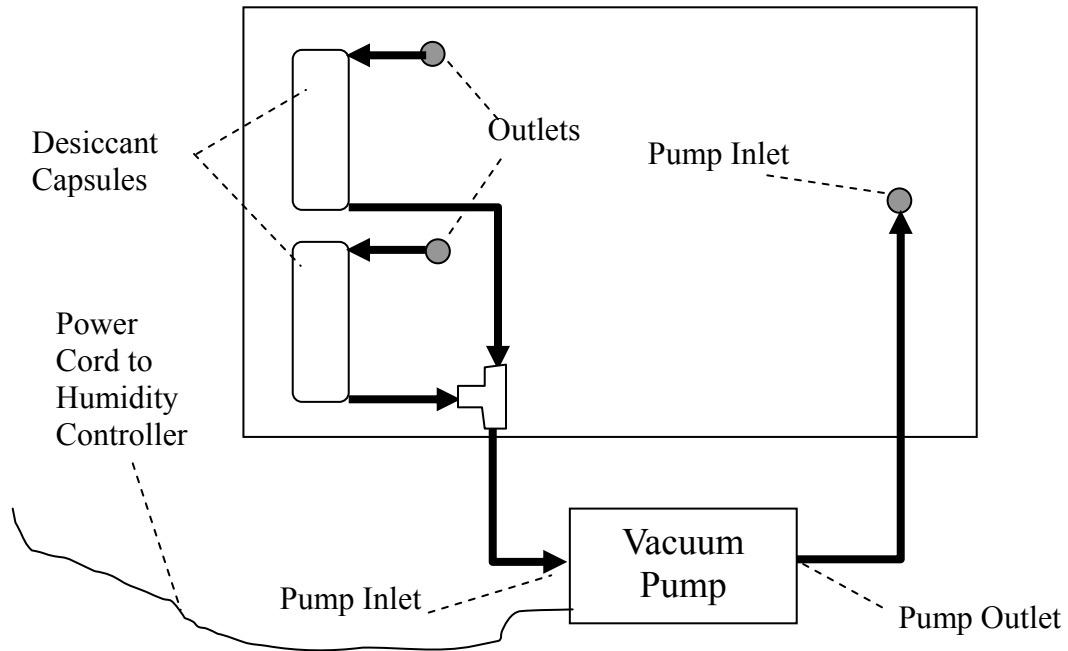
Finally plug the sensor into the back of the Humidity Controller. Make sure the humidity controller is unplugged and turned off until all other systems are connected.

## **2.4 Dehumidification Apparatus Assembly**

The Dehumidification Apparatus (desiccant capsules) are installed at the factory, and connected to the glove box with the tubing. It is at this point you should now connect the vacuum pump to the desiccant and glove box with the provided Flexible tubing. Connections should be made using figure #5 as a guide or figure # 6 (page 11) if the Added-Capacity Dryer has been purchased.

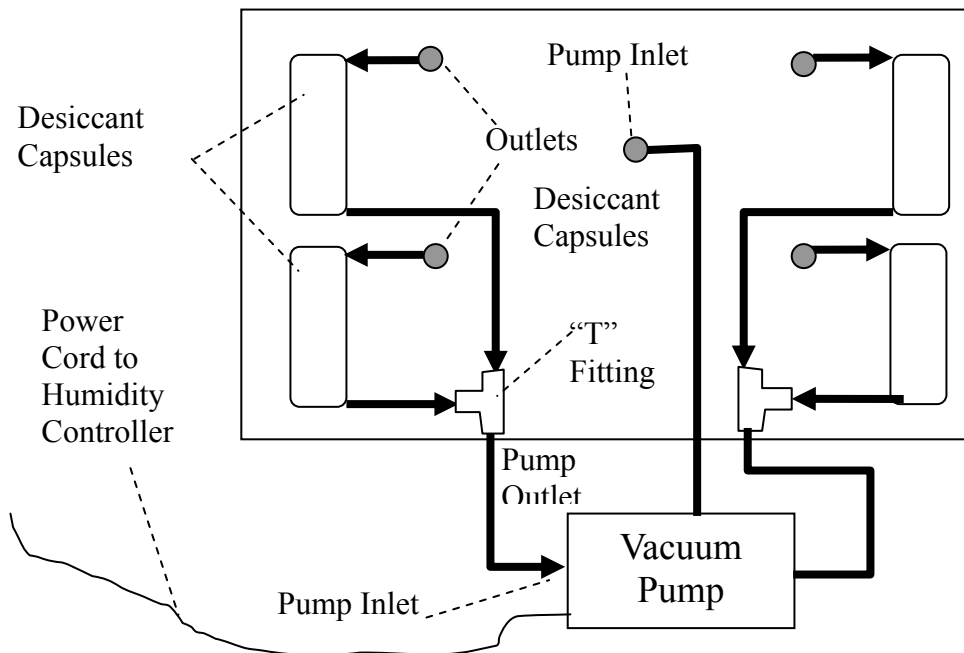
**Figure # 5 Dehumidification Connections**

*Rear View of Glove Box*



**Figure # 6 Dehumidification Connections for Added-Capacity Dryer**

*Rear View of Glove Box*



The final step in setting up the dehumidification part of the system is to plug the Vacuum Pump into the back of the Automatic Humidity Controller labeled “DECR” (See figure # 12 on page 18 for more details).

*NOTE: The direction of the air traveling through the system should be as follows:*

**Glove Box → Desiccant → Pump → Glove Box**

*This ensures the majority of the air is dried prior to entry into the pump. Moist air will corrode the pump and shorten its lifespan.*

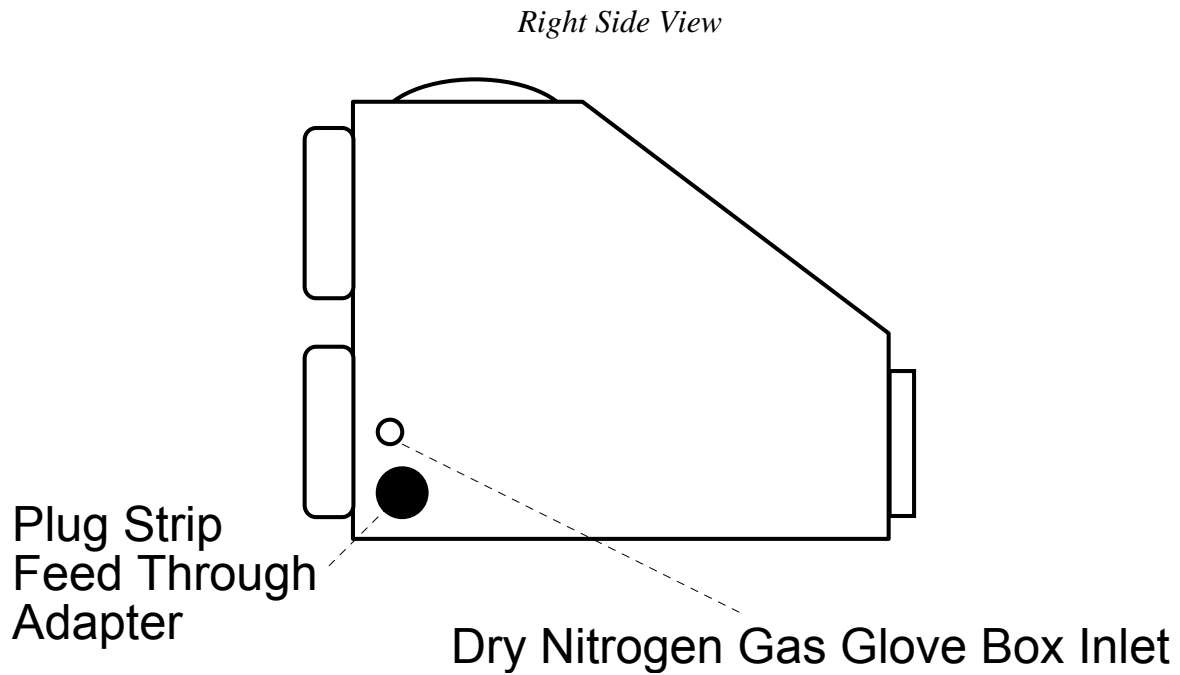
**Manual Control Connection:** Connection is exactly the same as mentioned above except the unit is equipped with a digital hygrometer that should be placed inside the glove box for measuring humidity levels. The Pump power cord is equipped with an ON/OFF switch which should be placed in a position that is easy to reach for the user. The power cord is plugged into a nearby power outlet.

## **2.5 Dry Gas (N<sub>2</sub>) Purge System (additional option or substituted for Desiccant System)**

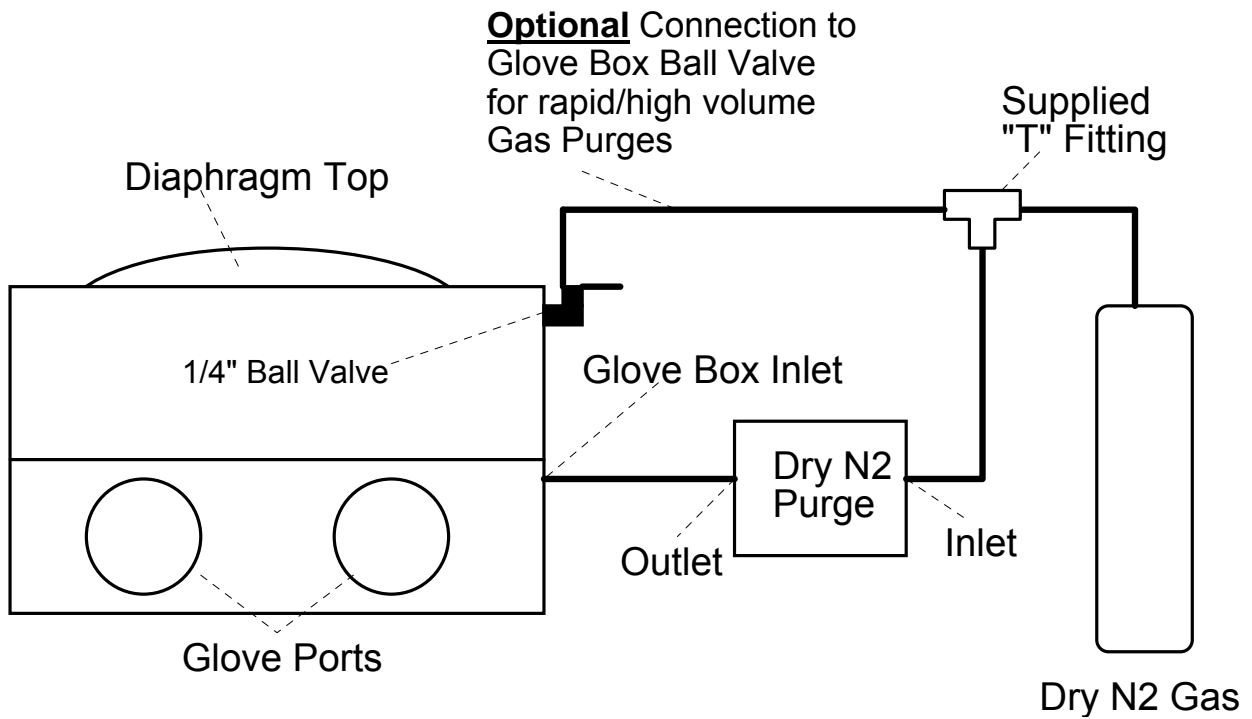
If the Dry Nitrogen Purge System has been purchased with the unit, connect the gas lines from the tank to the Purge Unit and Glove Box as shown in Figure’s # 7 & 8. The Purge Unit should be plugged into the back of the Humidity Controller in the outlet labeled “DECR” for operation (see figure # 10 on page 14).

If the unit is an addition to the desiccant system for drying, then both the dehumidification pump and Dry Nitrogen Purge System will be plugged into a supplied plug strip and the plug strip will be plugged into the “DECR” receptacle on the Humidity Controller (see figure # 10 on page 14).

**Figure # 7 Dry Nitrogen Purge Connections**



**Figure # 8 Dry Nitrogen Purge Connections**



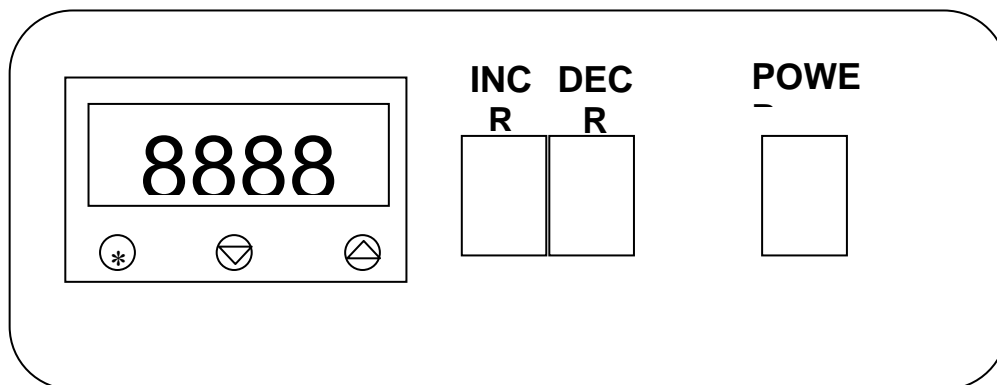
### 3.0 Operation of Components

#### 3.1 Automatic Humidity Controller

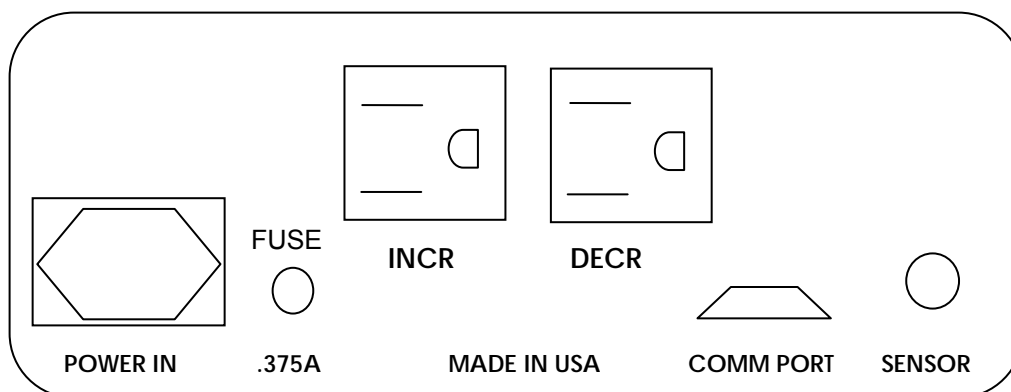
*Use Figures # 9 & 10 as a reference*

- 1.) With the appropriate systems plugged into the back panel of the Controller, plug the controller into an appropriate power supply outlet and turn the controller “ON”.
- 2.) Adjust the set point by pressing and holding the “\*” Button. The letters designating percent relative humidity will appear (rh) followed by the current set point value.
- 3.) To adjust the set point higher, press the “▲” button. To adjust the set point lower, press the “▼” button.
- 4.) Turn the appropriate INCR (increase % Rh) DECR (decrease % Rh) as needed
- 5.) The Microprocessor will determine the amount of output from the operating system needed to maintain the desired set-point. If less than the full output capacity of the operating system is required, the controller will provide pulses of power to the unit to limit the output. The outlet (and operating system) will be turned ON/OFF cyclically to obtain an average appropriate to maintain the desired set-point.

**Figure # 9 Connections on Front of Humidity Controller**



**Figure # 10 Back Panel of Humidity Controller**



### 3.2 Dehumidification System (desiccant)

When in operation the dehumidification System draws glove box atmosphere through the desiccant capsules, drying the “wet air”, then through the vacuum pump and back into the glove box.

#### Automatic Mode

Turn on the automatic controller, turn on the DECR switch, and choose the desired set point below ambient humidity levels.

*SETTING HUMIDITY LEVELS: press and hold the \* and down or up arrow buttons on the front of the humidity controller to adjust levels. Release when desired set point is reached.*

The controller will activate the dehumidification pump whenever the sensor detects a reading above the chosen set point.

*NOTE: a Red Light on the digital readout will appear when the dehumidification system is operation.*

#### Manual Operation

Turn the switch to the vacuum pump on and monitor the Humidity readings on the digital Hygrometer provided. Turn the pump ON/OFF based on your desired set-point and the readings. If a continually dry atmosphere is required it is okay to leave the pump on for extended periods of time.

#### Performance

Attainment of the desired humidity will vary according to the desired level, the ambient or room humidity level, the glove box size, air flow rate and glove box contents. Frequency of door activity and room humidity levels will thereafter determine the systems ability to maintain the desired level.



By way of reference, tests at the factory indicate the humidity level in a 3 ft. wide (10 cu. ft.) Polymer Glove Box will drop from 70% Rh to <5% in approximately 1.5 hours. The test glove box had 2 desiccant capsules and the pump was at its maximum flow rate of 1.25 cubic feet per hour (CFH).

*HINT: To achieve optimum performance at low levels you may need to place a cuff length glove on the gloveless sleeves.*

### **Regeneration of Desiccant**

Indicating Desiccant displays the moisture saturation level by a color change (blue to pink). To rejuvenate the desiccant, spread in thin layers on a pan or cookie sheet in an oven and bake for 1-2 hours at 200° C. Allow desiccant to cool, and then return to acrylic capsule.

### **3.3 Dehumidification System (dry N2 purge)**

When in operation, the Dry Nitrogen Purge System pumps in the desired gas through the installed distribution tube. The dry air pushes out moist air in the glove box through the pressure relief valve.

*SETTING HUMIDITY LEVELS: press and hold the \* and down or up arrow buttons on the front of the humidity controller to adjust levels. Release when desired set point is reached.*

To operate, turn “ON” the Dry Gas Purge unit, turn “ON” the DECR switch and then choose a desired set point. The controller will purge gas in automatically based on the chosen set point and the measured humidity readings.

The controller will activate the Dry Gas Purge whenever the sensor detects a reading above the chosen set point.

*NOTE: a Red Light on the digital readout will appear when the dehumidification system is operation.*

### **Performance**

Attainment of the desired humidity will vary according to the desired level, moisture content of gas being purged into the glove box, the ambient or room humidity level, the glove box size, air flow rate and glove box contents. Frequency of door activity and room humidity levels will thereafter determine the systems ability to maintain the desired level.

*Test Data: 5 ft. Glove Box (25 cubic ft.) was used for the test at the factory with the nitrogen gas regulator set at 15 psi and the Dry N2 Purge System set at 100 scfh. From 71% Rh to 12% Rh took 54 minutes, and used 1025 psi of gas.*

## **4.0 Care and Cleaning**

### **4.1 Care and Cleaning (Dehumidification System)**

Periodically the Desiccant will need to be rejuvenated. This can be done by pouring the desiccant out of the capsule and placing it in an oven to dry. The drying time is 1-2 hours at 200° C. Allow the desiccant to cool completely prior to returning it to the acrylic capsules. Desiccant should be replaced once a year based on average use.

### **4.2 Care and Cleaning (Humidifier)**

The Humidifier must be cleaned regularly to maintain peak performance. Ordinary tap water contains many minerals and chemical which can leave deposits and affect the absorbency of the wick. COY recommends using only distilled water because of this.

When cleaning is necessary, unplug the electrical cord and carefully remove the Fan Assembly from the black rubber Feed Thru adaptor. With a soft cloth and vinegar, wipe the whole assembly to remove any dirt and mineral deposits. Thoroughly rinse with clean water and allow drying before reconnecting electrical power.

Do not clean any part of the system with solvents or with water hotter than 100° C. If you do not intend to use the system for an extended time, empty all water from the system and clean with vinegar. This will help prevent a buildup of mineral deposits and bacterial growth.

### **4.3 Care and Cleaning of the Glove Box**

#### **Care of Polycarbonate material**

There are several precautions you can take to prolong the life of your glove box.

Precautions you should carefully follow are:

1. Do not use abrasive cleaners at any time on the Polycarbonate portions of the glove box
2. Do not use any solvent like liquids to clean the plastic. Isopropyl alcohol is acceptable as well as a mild bleach solution (5-10%).
3. Keep equipment and shelving units within easy reach so you do not stretch the chamber sleeves.
4. Rings and jewelry should be removed prior to using the glove box so as the polycarbonate is not scratched or the sleeves and gloves are not torn. Finger nails should also be clipped short.
5. Protect the glove box from organic solvent fumes and nearby painting and plastering. If splashed, wipe immediately while wet with a soft cloth.

## **Cleaning the Polycarbonate**

Dust and clean with a soft cloth or chamois having first sprayed on a plastic cleaner. (COY part no. 1600-480) The use of a mild soap or detergent and plenty of water is good. Dry with a soft cloth or chamois.

Minor scratches can be removed by hand polishing. Polishes are best applied with a soft cloth dampened with water first. Several applications may be necessary, but most minor scratches can be reduced and the clarity improved in a short time.

## **4.4 Care of Sleeves and Gloves**

The arm length gloves are made of neoprene rubber and are susceptible to punctures and tears. Wear cotton gloves when working with sharp objects. Remove jewelry. If a hole is punctured in the glove, it must be replaced. Do not use the glove box until the damaged gloves have been replaced.

Gloveless Sleeves are standard with the Humidity Control Glove Box but Sleeve Length Gloves may be substituted for these.

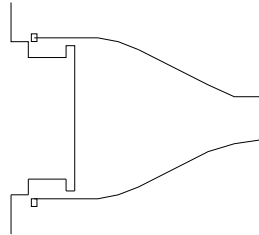
The arm length gloves and gloveless sleeves are made of neoprene rubber and are susceptible to punctures and tears. Wear cotton gloves when working with sharp objects. Remove jewelry. If a hole is punctured in the glove/sleeve, it must be replaced. Do not use the glove box until the damaged gloves have been replaced.

Butyl and Hypalon Gloves are also available.

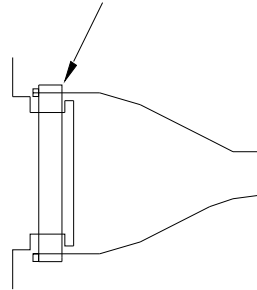
*See Figures 11 and 12 for details on attaching the glove to the glove box.*

**Figure # 11 Sleeve Attachments to Glove box**

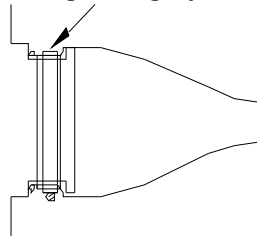
1. Place sleeve on chamber.



2. Place rubber band over sleeve.

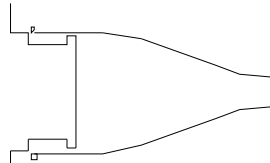


3. Place clamp over rubber band & tighten lightly.

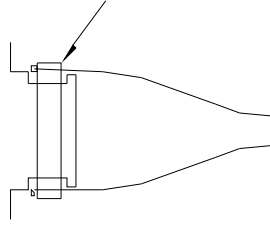


## **Figure # 12 Gloveless Sleeve and Gloveless Sleeve Cuff Attachment**

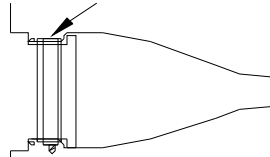
1. Place sleeve on chamber.



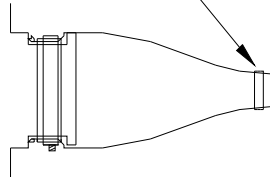
2. Place rubber band over sleeve.



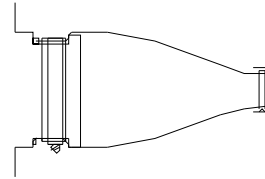
3. Place clamp over rubber band & tighten lightly.



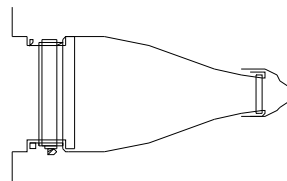
4. Place plastic cuff support over sleeve.



5. Roll sleeve over plastic cuff support.



6. Stretch latex cuff over sleeve & cuff support.



7. Place "O" ring on top of cuff & sleeve in groove of plastic support.

