

# Equipment Manual



**Envirotronics** 

# How did we do?

Thank you for purchasing this Envirotronics chamber. While we feel we have made every effort to ensure that you are completely satisfied with our equipment, we would like to give you this opportunity to tell us how we did. Your observations, opinions, and suggestions are more than "important to us" - they are vital to our continual improvement. Please take a moment, answer the questions below and let us know how you feel about your experience with Envirotronics.

When you have finished, please return the form to us. You may fax it to us at (616) 554-5021, email it to us at [quality@envirotronics.com](mailto:quality@envirotronics.com), or return it to us through the mail at: Quality Department, Envirotronics, 3881 N. Greenbrooke SE, Grand Rapids, MI 49512, USA.

Thank you for helping us to serve you better.  
Your Envirotronics Team

Date \_\_\_\_\_  
Name \_\_\_\_\_ Position \_\_\_\_\_  
Company \_\_\_\_\_  
Location \_\_\_\_\_

## Sales

|  | Yes                      | No                       |
|--|--------------------------|--------------------------|
| Did our salesperson seem knowledgeable? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Was our salesperson courteous and prompt in responding to your requests? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Did our salesperson advise you that we have a full service department, offer A2LA accredited calibrations, and preventive maintenance plans? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Did our salesperson explain our Value Plus Program to you? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Did our salesperson provide you with after-the-sale follow-up? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Did your experience with our salesperson...<br><input type="checkbox"/> exceed your expectations?<br><input type="checkbox"/> meet your expectations?<br><input type="checkbox"/> fall short of your expectations? |                          |                          |

## Delivery

|   |                          |                          |
|---|--------------------------|--------------------------|
| Did you receive our equipment specifications and quotations when promised? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Did you feel our "lead time" was... <input type="checkbox"/> short <input type="checkbox"/> about what you expected <input type="checkbox"/> too long |                          |                          |
| Was the equipment delivered when it was promised? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Do you feel the equipment was delivered in good condition? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Did Envirotronics select the carrier for this shipment? .....   | <input type="checkbox"/> | <input type="checkbox"/> |

## Equipment

|  |                          |                          |
|--|--------------------------|--------------------------|
| Did the equipment you received match what you feel you had ordered? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Does the equipment perform as expected? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Did you order an "equipment start-up"? .....   | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you purchased any spare parts? .....  | <input type="checkbox"/> | <input type="checkbox"/> |
| Who performs the calibrations & maintenance service on your environmental test equipment? _____  |                          |                          |
| Does your Envirotronics equipment ...<br><input type="checkbox"/> exceed your expectations?<br><input type="checkbox"/> meet your expectations?<br><input type="checkbox"/> fall short of your expectations? |                          |                          |
| Would you purchase equipment from Envirotronics again? .....   | <input type="checkbox"/> | <input type="checkbox"/> |

## Comments



## HOW TO USE THIS MANUAL

This manual is presented as a general guide to assist in the installation, start up, operation, trouble shooting and preventive maintenance for your Envirotronics equipment.

Some of the instructions and procedures may not apply to your specific chamber.

Images used in this manual may not match your equipment exactly. Use them only as a general guide.

For information regarding installation of your chamber, refer to the section titled **Installation**.

For information regarding start Up and Operation of your chamber, refer to the section titled **Start Up / Operation**

For information regarding troubleshooting and maintenance of your chamber, please refer to the section titled **Troubleshooting / Maintenance / Calibration / Service**

For information regarding your chamber's specifications, description, instrument manual(s), drawings , and other information specific to your equipment, please refer to the section **Information About Your Equipment**.

## NAVIGATION

Bookmarks have been provided to the various sections of your manual. Click on the desired bookmark in the Bookmarks Tab Window located in the left panel to go to the desired section.



**Envirotronics™**

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**Web: [www.envirotronics.com](http://www.envirotronics.com)**



## COMPLIANCE

**A**ll Envirotronics equipment is manufactured in compliance with the appropriate military standards, ASTM specifications, and/or customer purchase-order-specified requirements.

Envirotronics' power panels are in compliance with UL508A First Edition dated April 25, 2001, NFPA79 requirements, and ETL labeled. Equipment shipping into Canada is certified to CAN/CSA C22.2 NO.14 and ETL labeled. Equipment shipping into the European markets, where applicable, has C.E. "Declaration of Conformity" certificates provided and is in compliance with European standards. When incorporated in equipment purchase specifications, our equipment is manufactured to conform to SEMI S2-0200, and SEMI S8-1000 guidelines



## SCOPE/GENERAL INFORMATION

**E**nvirotronics has prepared this manual to assist you during installation, start-up and operation of your environmental test equipment. You can download a copy of Envirotronics' Systems Plus or Solutions Plus manual from our website [www.envirotronics.com](http://www.envirotronics.com). Please keep in mind this manual is generic to our equipment there may be options described you did not purchase. Please refer to equipment specification page or your purchase order.

It is recommended that you read the manual and electrical safety instructions prior to starting up the equipment, and follow proper Lock-out-Tag out (LOTO) procedures, electric, air, and water supply lines. Also, allow access and clearance of 48" in front of all electrical enclosure or where electrical work is to be performed.

We recommend that the manual be located in an accessible location. If service is required, the manual should be readily available to aid in the troubleshooting process.

Included in this manual, you will find a system start-up checklist. This checklist is a brief listing of the major items covered in this manual. Please refer to the appropriate sections to assure a smooth and safe start-up. Envirotronics also recommends proper training for use of your new equipment. Contact Envirotronics' Service Department for cost and availability for this service @ 1-800-368-4768 or email <[service@envirotronics.com](mailto:service@envirotronics.com)>.

An integral part of the manual is our warranty statement. We have also included a recommended list of spare parts that you may wish to purchase.

### NOTICE SIGNAL WORDS:

Signal Word: The word or words that call attention to the safety sign and designate a degree or level of hazard seriousness. The signal words for product safety signs are **DANGER**, **WARNING**, and **CAUTION**.

**DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

**WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

**MSDS:** *Documentation is located in back of this manual for any hazardous chemicals shipped or contained with your new equipment.  
Personal protection equipment, defined by the MSDS, should be used as instructed.*

*In case of emergency please post an appropriate phone number for your personnel to call for immediate help.*

**GENERAL INFORMATION**

THE MATERIALS OF CONSTRUCTION BREAKDOWN:

| <b>TYPE</b>           | <b>PERCENT</b>  | <b>REMARKS</b> |
|-----------------------|-----------------|----------------|
| STEEL                 | 65%             |                |
| STAINLESS STEEL       | 25%             |                |
| COPPER                | 5%              |                |
| ELECTRICAL COMPONENTS | 5%              | NON-FLAMMABLE  |
| <b>OTHER</b>          | <b>TYPE/AMT</b> |                |
| REFRIGERANT           | 404A(HP62)6#    | NON-FLAMMABLE  |
| OIL                   | SL32SC .5 GAL   |                |

**Note:** Other oils or refrigerants may be used in your chamber



## Installation and Equipment Relocation

### Installation and Relocation of Environmental Test Systems

Complex environmental test equipment requires technicians skilled in proper installation to ensure reliable performance. Whether your installation is as simple as wiring the interconnect of a remote control console, piping for a remote air-cooled condenser, or assembling a panel construction walk-in or drive-in chamber on site, Envirotronics field construction personnel have the knowledge and experience to get the job done right for you.

In today's business world, circumstances may require that your existing environmental test equipment be relocated. Whether your equipment needs to be relocated to another part of your facility or to a facility in another part of the world, Envirotronics' field construction personnel, once again, are ready to meet your requirements.

Envirotronics employs personnel dedicated to installing new equipment, used equipment, disassembly, moving, and reassembly of equipment. As all services offered by Envirotronics, installation and system relocations are available on all makes and models of environmental test equipment.

Do you have a system that is in need of installation or relocation? Please contact Envirotronics' Customer Support Group for more information and/or a quote.



***When you contact us regarding your installation or relocation, be sure to ask about how you can be a part of our Value Plus Program.***

***Contact our Customer Support Group today!  
Tel: 616-554-5022 • Fax: 616-554-5024  
• Email: [service@envirotronics.com](mailto:service@envirotronics.com)***



# Envirotronics<sup>®</sup>

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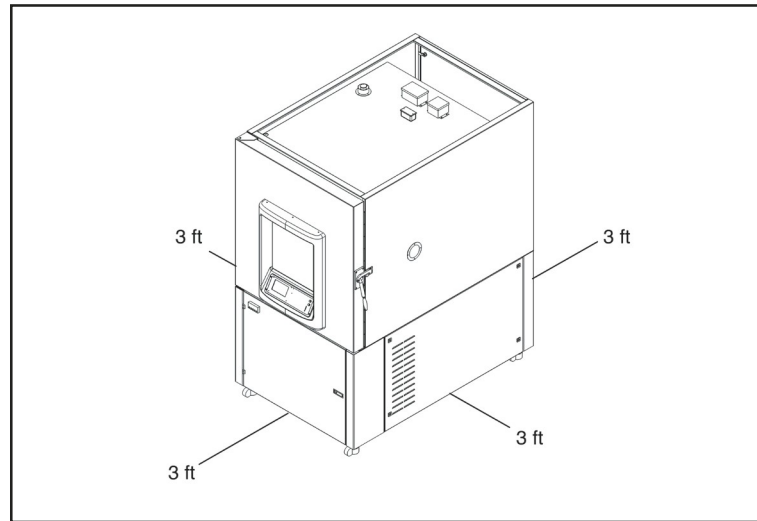
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Email [sales@envirotronics.com](mailto:sales@envirotronics.com)  
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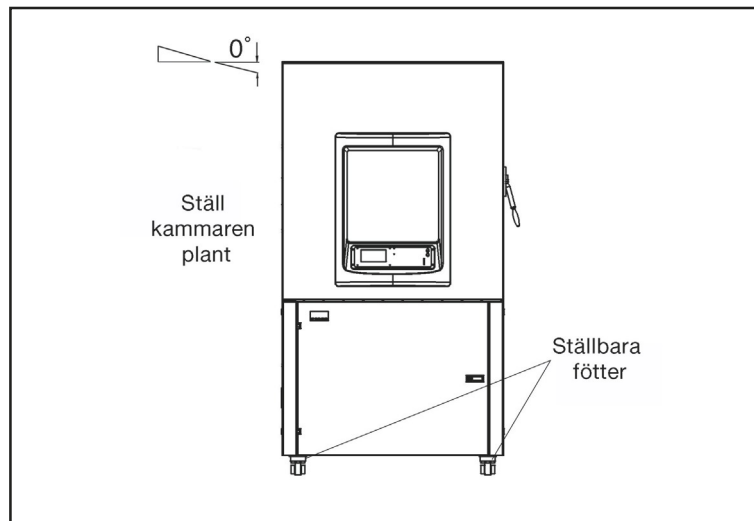
Web [www.envirotronics.com](http://www.envirotronics.com)



## CHAMBER INSTALLATION



First, locate the area in which your chamber will be installed. Check the area selected for its serviceability to the machinery compartments, both electrically and mechanically. In the event your equipment is too large to move through halls and doorways, consult factory as to what can be detached for the move in.



Place equipment in desired location, reinstall any detached components that had been detached through arrangements with Envirotronics for the move in. We recommend that the chamber and machinery compartment (being either a self-contained system or component system) be leveled. Leveling helps assure the systems' optimum performance promoting good oil return on the refrigeration system and proper drainage of any accumulated moisture.

## INSTALLATION & START UP SAFETY INSTRUCTIONS

Follow all **WARNINGS** to prevent personal injury or death.

- WARNING:** To safely install the chamber, you must read the **General Safety Instructions**.
- WARNING:** To install or start up the chamber you must read the applicable instructions in this manual. If you need help, contact the nearest Envirotronics Field Service Office.
- WARNING:** Do not perform the start-up procedure until all other installation is complete. Before starting up the chamber, you must read the operating instructions.
- WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure. Check your Lock-Out / Tag-Out Procedures.
- WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place. Use your Lock-Out / Tag-Out Procedures.
- WARNING:** Before service or repair allow chamber to cool to ambient room temperature before entry.
- WARNING:** If your chamber has an LN<sub>2</sub>, or GN<sub>2</sub> injection system make sure it is vented according to the instructions on LN<sub>2</sub> Cooling. If the LN<sub>2</sub>, GN<sub>2</sub> is injected directly into the test space, nitrogen gas or carbon dioxide gas is left in the chamber test area. This gas must be adequately diluted by the surrounding room air. Using the chamber in a poorly ventilated area results in a lack of oxygen, which could cause death.

Follow all **CAUTIONS** to prevent equipment damage

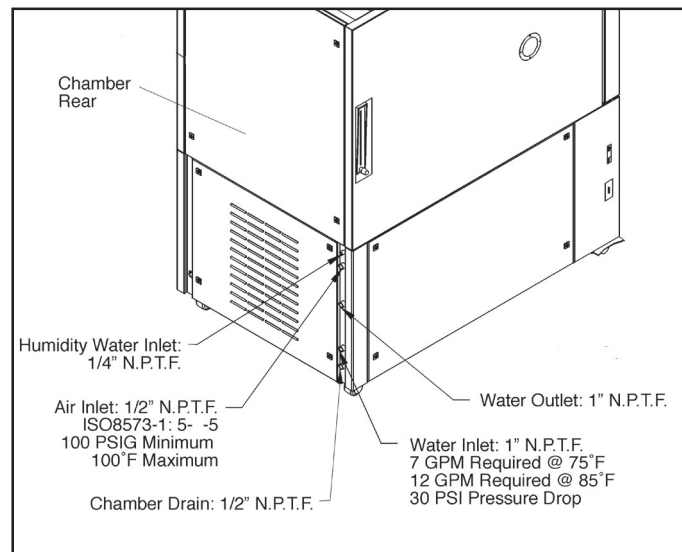
- CAUTION:** Use the electrical power supply shown on your chamber's electrical drawing and serial tag. Air, water, and other supplies must be within the limits shown in the applicable instructions or drawings.
- CAUTION:** This equipment is heavy; use the proper equipment to move it. Do not put strain on pipes or external components.

## GENERAL SAFETY INSTRUCTIONS

**Read all WARNINGS to prevent personal injury and death.**

- WARNING:** Do not operate this chamber unless it is completely assembled.
- WARNING:** This chamber operates at extreme temperatures. To prevent severe burns or frostbite, avoid contact with air, objects, and surfaces that are hot or cold.
- WARNING:** Use this chamber only for testing the products it was designed to test. Do not put products in the chamber that could burn or explode at high temperatures.
- WARNING:** Make sure all warning labels remain attached to the chamber. If needed, order new labels from Envirotronics Service Department.
- WARNING:** Make sure the door(s) are closed while the chamber is operating. Before opening the door, make sure the blower wheels are not rotating, and make sure the test space is near room temperature.
- WARNING:** The gases from GN2 purge systems and, LN2 injection systems, displace regular room air and can cause you to suffocate. To safely install and use these systems, you must follow the instructions on the material containers, the installation instructions in the LN2 Cooling section of this manual.
- WARNING:** Dangerously high voltages that could kill you are present in the electrical system. Before doing any electrical work, disconnect the electrical power with Main Power Disconnect switch.
- WARNING:** Before working near moving parts, disconnect the electrical power with the Main Power Disconnect switch. Keep all guards and shields in place. If your system has refrigeration compressors with Pump Down Pressure Switches (PDPS), they can start at ANY time while the main power is connected - even when the chamber is not operating. Keep fingers away from compressors head fans. Use LOTO Procedures.
- WARNING:** This manual has important safety information. All users must read. Before installing or starting up the chamber, read instructions. Before operating the chamber, read instructions, before performing maintenance, read instructions, before servicing the chamber, read instructions. Safety instructions may also appear in instrumentation manuals supplied with this chamber. Keep this manual in a place where it will be available to anyone working with the chamber.
- WARNING:** If you work with a hazardous material, read the MSDS (Material Safety Data Sheet) and the safety instructions on the container and provide proper personal protective equipment as instructed by MSDS.
- WARNING:** When accessing disconnect for air filters use an OSHA approved ladder, *such as the one supplied By McMaster-Carr P/N 8188T88 (Ladder 48" with handrails) that meets OSHA and Ansi A14.7 standards or equipment.*

## WATER SYSTEM INSTALLATION



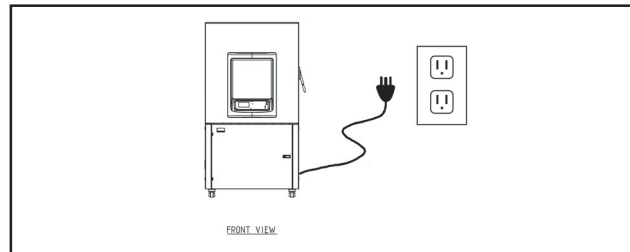
On water cooled systems, connect the inlet water line to the line marked condenser inlet. Connect the drain side of the line to the connection marked condenser outlet.

The water valves are rated at 100 p.s.i. maximum. **DO NOT EXCEED THE PRESSURE.** Water connections should be made with a line connection of at least the same size as the inlet and outlet fittings.

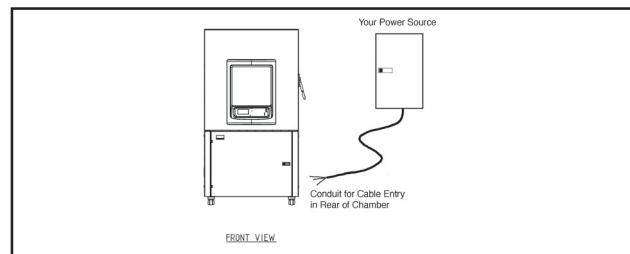
**CAUTION: RISK OF ELECTRICAL SHOCK. DISCONNECT POWER BEFORE SERVICING UNIT. USE LOTO Procedures.**

## ELECTRICAL INSTALLATION

Electrical power for your test chamber is typically supplied in one of two methods.



One method of connecting your test chamber to electrical power is with the use of a receptacle and plug. Before connecting power, verify current voltage and phase of your chamber. This information is located on the equipment's specification page and on the electrical drawing. If you have any questions regarding your chamber power requirements, please consult the factory. The use of improper power can void your warranty.



Another method of connecting electrical power to your equipment is by hard wiring. A main power distribution block or a main power disconnect (optional) will be located in the electrical compartment for this purpose. Again verify that proper voltage and current requirements have been supplied according to the information on the equipment specification page and on the electrical drawing.

For questions regarding wire sizing, conduit sizing or conduit piping practices, please consult a licensed contractor in your area or your facilities manager. State, local and company codes govern the methods and practices used on installation of electrical hook ups and use your LOTO Procedures.

**WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure.

**WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place.



### ELECTRICAL SYSTEM

An electrical system drawing has been included in this manual. Please refer to the drawing during the following explanation of the system.

You will note in the upper left hand corner of the drawing, the appropriate voltage and current requirements of the system. Before applying power to the system, verify that the appropriate electrical service has been supplied.

There are numbers running vertically along the left side of the print. These are line numbers that allow you to utilize the information given along the right hand side. Along the right side of the circuitry, you will find line identifications and numbers. These numbers will indicate what line(s) a component such as a contactor (or relay) has contacts located. Multiple line numbers indicate that there are several contacts.

The print shows all of the wires located within the system. The main control wires have been returned to the main terminal strip within the electrical enclosure for ease of troubleshooting.

Please note that all high voltage components have a current rating shown on the drawing. It is generally recommended that these readings be checked during the start-up procedure. During normal calibration or preventive maintenance checks, it is recommended that current readings be taken to verify that everything is in good working condition. Readings should be within +/-10% of the ratings shown on the drawings.

If a high-heat limit is shown on the drawing, it is recommended that the performance of this limit be checked periodically. Simply adjust the temperature setting of the high heat limit (typically set at 360° F) to a lower value and verify that it trips. Once the device is tripped, a manual reset is required.

**WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure.

**WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place.

**ELECTRICAL SYSTEM (Continued)**

The following legends are typical on Envirotronics' system drawings:

- C - Circulator Motor Contactor:** This applies power to the circulator motor(s).
- MH - Master Heat Contactor:** This is a safety contactor that powers the heaters. This contactor can only be energized if all safety devices are within limits.
- H1,H2, H3 - Heat Relays:** These are control contactors that apply power to the heaters. The H2 or H3 contactors are normally operated on a time delay (TD) output following H1 being put into demand.
- CR - Control Relay:** This is used to either energize or de-energize solenoids or other control devices.
- CF - Condenser Fan Contactor:** This applies power to the condenser fan motors (on air cooled systems).
- HF - Head Fan Contactor:** This applies power to the head fans (when applicable).
- TD or TR - Time Delay Relay:** This is used either to time on or off control devices.
- EVR - Event Relay:** This is used either to turn on or off other control devices.
- Compressor Contactors:** These will be identified by either HS (High Stage) or LS (Low Stage)  
*Note: HS indicates the R404A side of the system.  
LS indicates the R508B side.*

The following legends are for humidity systems only:

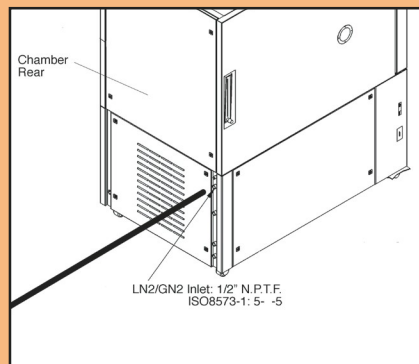
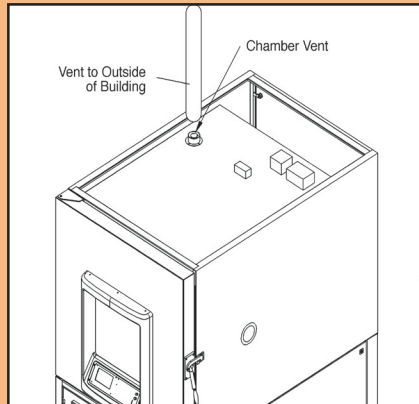
- MW - Master Water Contactor:** This is a safety contactor which powers the heaters. This contactor can only be energized if all safety devices are within limits.
- W1 - Water Relay:** This is an additional contactor that applies power to the humidity elements.

**WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure.

**WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place.

## LN2 BOOST INSTALLING A GN2, LN2, SYSTEM

**WARNING:** Improper installation of a GN2 (gaseous nitrogen), or LN2 (liquid nitrogen), system can cause death by suffocation. Make sure the chamber is vented to the following instructions.



1. Connect a vent line from the chamber vent, located on top of the chamber, to the outside of the building.

- Make sure the vent outlet is not near a fresh air intake to the building.
- To prevent back pressure, the vent line must be short, straight, and at least as large in diameter as the chamber vent.
- If your chamber has more than one vent, repeat this step for the other vent(s).

2. Find the GN2, LN2 inlet on the chamber (the assemblies are labeled), and connect the needed supply:

- For GN2 systems, connect a gaseous nitrogen supply to the inlet at a maximum pressure of 100 psig.
- For LN2 systems, connect a liquid nitrogen supply to the inlet at a maximum pressure of 80 psig. Include a high-pressure relief valve in the line, and insulate the line.

3. Use a leak-detecting solution to check for leaks.

The cooling portion of this Envirotronics Test Chamber is being enhanced through direct injection of liquid nitrogen. This is used as a boost for faster pulldown rates.

The system utilizes a redundant solenoid as well as a control solenoid. The redundant solenoid is enabled whenever there is a cooling command.

The control solenoid circuit is enabled via a delay timer. This timer setting should be great enough to avoid overshooting at control. A repeat cycle timer is also energized (sometimes called a percentage timer) cycling the control solenoid off

### **LN2 BOOST INSTALLING A GN2, LN2, SYSTEM (Continued)**

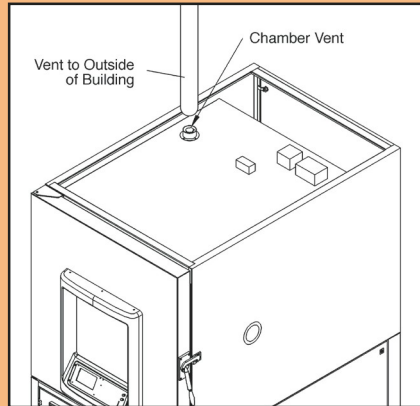
then back on. This repeat cycle timer can be changed to vary the pulldown rates. An indicator light next to the function switch will indicate when the LN2 control solenoid is open.

Power will be de-energized to the LN2 boost circuit when the cooling output of the controller starts pulsing as the chamber nears the setpoint.

**WARNING:** Avoid exposing yourself to air and equipment that is not at room temperature. Please check the equipment nomenclature to see if the LN2 boost applies to your chamber.

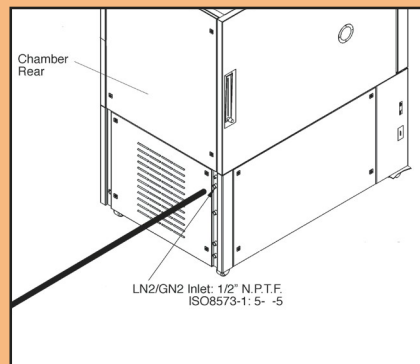
## LN2 COOLING INSTALLING A GN2, LN2, SYSTEM

**WARNING:** Improper installation of a GN2 (gaseous nitrogen), or LN2 (liquid nitrogen), system can cause death by suffocation. Make sure the chamber is vented to the following instructions.



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- Make sure the vent outlet is not near a fresh air intake to the building.
- To prevent back pressure, the vent line must be short, straight, and at least as large in diameter as the chamber vent.
- If your chamber has more than one vent, repeat this step for the other vent(s).



2. Find the GN2, LN2 inlet on the chamber (the assemblies are labeled), and connect the needed supply:

- For GN2 systems, connect a gaseous nitrogen supply to the inlet at a maximum pressure of 100 psig.
- For LN2 systems, connect a liquid nitrogen supply to the inlet at a maximum pressure of 80 psig. Include a high-pressure relief valve in the line, and insulate the line.

3. Use a leak-detecting solution to check for leaks.

The cooling portion of this Envirotronics' Test Chamber is through direct injection of liquid nitrogen.

The system utilizes a redundant solenoid as well as a Baumann LN2 control valve. The redundant solenoid is enabled when the cool switch has been turned on and the controller is calling for cooling. The redundant solenoid will close after there hasn't been a cooling demand for 90 seconds.

The Baumann I/P positioner receives a linear 4-20mA signal from the controller.

**LN2 COOLING  
INSTALLING A GN2, LN2, SYSTEM (Continued)**

The positioner converts this signal to an air pressure based on the following formulas  $4-20\text{mA} = 3-15\text{ psig}$ . The air pressure then opens the control valve allowing LN2 to be injected into the chamber. When the chamber nears the setpoint, the pressure will be reduced allowing the valve to close, thereby reducing the flow of LN2. An indicator light next to the function switch will illuminate when there is a cooling signal to the I/P converter.

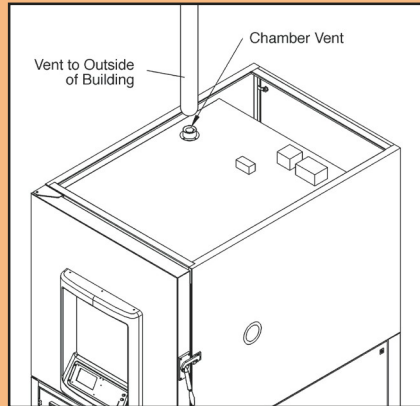
Your chamber is equipped with a Baumann Series 763 Single-Acting Positioner. Before operation, you may need to verify calibration. Sometimes during shipment, settings may change. Use operation instructions contained in this manual to re-calibrate if required. If you require further assistance with this procedure, please call Envirotronics' Product Support Group.

**Envirotronics Product Support Group: 1-800-368-4768**

**WARNING:** Avoid exposing yourself to air and equipment that is not room temperature.

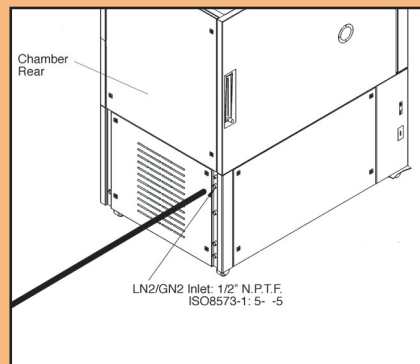
## LN2 COOLING THROUGH COIL INSTALLING A GN2, LN2, SYSTEM

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- For LN2 systems, connect a liquid nitrogen supply to the inlet at a maximum pressure of 80 psig. Include a high-pressure relief valve in the line, and insulate the line.

3. Use a leak-detecting solution to check for leaks.

The cooling portion of this Envirotronics' Test Chamber is the evaporation of liquid nitrogen through an evaporator coil.

The system utilizes a redundant solenoid as well as a Baumann LN2 control valve. The redundant solenoid is enabled when the cool switch has been turned on and the controller is calling for cooling. The redundant solenoid will close after there hasn't been a cooling demand for 90 seconds.

The Baumann I/P positioner receives a linear 4-20mA signal from the controller.

## **LN2 COOLING THROUGH COIL INSTALLING A GN2, LN2, SYSTEM (Continued)**

The positioner converts this signal to an air pressure based on the following formulas  $4-20\text{mA} = 3-15\text{ psig}$ . The air pressure then opens the control valve allowing LN2 to flow through the evaporator coil. When the chamber nears the setpoint, the pressure will be reduced allowing the valve to close, thereby reducing the flow of LN2. An indicator light next to the function switch will illuminate when there is a cooling signal to the I/P converter.

Your chamber is equipped with a Baumann Series 763 Single-Acting Positioner. Before operation, you may need to verify calibration. Sometimes during shipment, settings may change. Use operation instructions contained in this manual to re-calibrate if required. If you require further assistance with this procedure, please call Envirotronics' Product Support Group.

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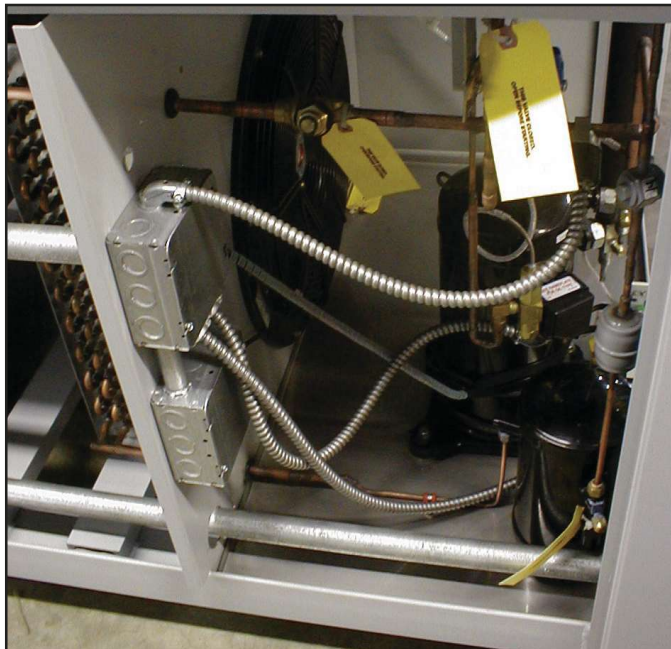


## REFRIGERATION SYSTEM INSTALLATION

Prior to starting any refrigeration system, the following checks should be made.



1. Verify that all refrigeration lines remained secure during shipment.
2. Look for the presence of fractured lines. This is sometimes indicated by the presence of an oil mist coating lines and components.



3. Backseat all valves with yellow tags prior to start-up. Your system has been pumped down for shipment. (If applicable to your chamber.) Reference yellow sheet on the inside of the electrical box door. Initials on this sheet will indicate the number of valves front seated.

**REFRIGERATION SYSTEM INSTALLATION (Continued)**

**CAUTION:** To remove compressor, heavy component: Compressor weighs 65#. To safely remove, you should first slide the compressor towards the rear of the (tool) chamber before attempting to lift it. This requires a two-person lift.

**REFRIGERATION SYSTEM**

The refrigeration portion of your Envirotronics' test chamber may be configured in one of many variations, based on the size of the compressors. Refer to the enclosed system drawing during the following explanations of system operation. Envirotronics recommends using a trained refrigeration technician or call or email Envirotronics' Service Department for help and cost to assist (Tel: 616-554-5022 or [service@envirotronics.com](mailto:service@envirotronics.com)).

By referring to the electrical drawing, you are able to determine which safety devices have been installed in your system. These devices will be located directly to the left of the compressor safety relay (generally marked CR2). Typically, there are from two to six safety devices, depending on the size of the system.

The high-low pressure switches are intended to monitor the pressures within the individual refrigeration systems. If the high-low pressure switch(es) are tripped, they must be reset manually. Do not reset more than twice without consulting the factory.

The two oil pressure switches monitor the oil pressure within the compressors. Oil level within Carlyle compressors should be between the 1/8 and Copeland compressors should be between 1/3 and 1/2 level. If improper oil levels are observed, our Product Support Group should be contacted.

Inherent overload protection may also be included in the compressors. If tripped, these devices must cool down before they reset themselves. If the inherent protection is tripped, our Product Support Group should be contacted

**Envirotronics Product Support Group: 1-800-368-4768**



With units that utilize the Systems Plus: after resetting manually, the alarm ACK key must be pressed and then the alarm reset key depressed on the Systems Plus to return to normal operation.

**CAUTION: ONLY QUALIFIED SERVICE PERSONNEL SHOULD ATTEMPT TO CHARGE AN R23 SYSTEM. REFRIGERANT 23 IS 610 PSIG AT AMBIENT TEMPERATURE. EXTREME CARE SHOULD BE USED IN HANDLING THIS REFRIGERANT.**

### **R23 REFRIGERATION SYSTEM CHARGING PROCEDURE**

To verify that the R23 pressures are normal, first look at the serial tag located within the electrical compartment. Compare the actual pressure with the pressure required.

To obtain the system standby (actual) pressure, follow this procedure:

1. Backseat the suction and discharge service valves on the R23 compressor; valves turned all the way counterclockwise.
2. Connect a set of manifold gauges to the system, suction gauge to suction service valve and discharge gauge to discharge service valve. Attach the center hose to the tank of R23. Prior to allowing gas to enter the system, the hoses should be evacuated by using a vacuum pump or an EPA recognized method of purging the hoses.
3. After the lines have been either evacuated or purged, close the R23 tank and tighten all of the fittings. Then open both the suction and discharge valves 1/2 turn. The standby pressure of the system will now be observed on the gauges. Proper charges will be read only if the chamber and cascade condenser are stabilized at ambient temperature.

If, after observing standby pressure, it is determined that additional gas is required, follow this procedure:

1. Leak check entire system with either electronic or Halide leak detectors.
2. Repair leaks as necessary.
3. Evacuate system.
4. Attach manifold as previously discussed.
5. Open both manifold valves and open the R23 tank to allow gas to flow into the system. When the gauges record the proper standby, close the valve on the R23 tank. Allow the chamber to stand for 15 minutes to stabilize the pressure. If required, add additional R23 and repeat the above procedure until the proper standby pressure is maintained.
6. After the proper pressure has been maintained, close both manifold valves (clockwise) and the R23 tank valve.
7. Allow the system to run and verify operating pressures.
8. If pressures are normal, backseat the compressor service valves and remove the gauges.

**CAUTION: ONLY QUALIFIED SERVICE PERSONNEL SHOULD ATTEMPT TO CHARGE A SUVA HP95 SYSTEM. SUVA HP95 IS 610 PSIG AT AMBIENT TEMPERATURE. EXTREME CARE SHOULD BE USED IN HANDLING THIS REFRIGERANT.**

### **SUVA HP95 REFRIGERATION SYSTEM CHARGING PROCEDURE**

To verify that the SUVA HP95 pressures are normal, first look at the serial tag located within the electrical compartment. Compare the actual pressure with the pressure required.

To obtain the system standby pressure, follow this procedure:

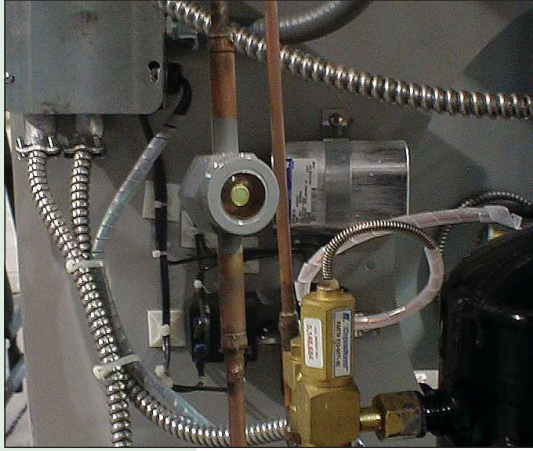
1. Backseat the suction and discharge service valves on the SUVA HP95 compressor; valves turned all the way counterclockwise.
2. Connect a set of manifold gauges to the system, suction gauge to suction service valve and discharge gauge to discharge service valve. Attach the center hose to the tank of SUVA HP95. Prior to allowing gas to enter the system, the hoses should be evacuated by using a vacuum pump or an EPA recognized method of purging the hoses.
3. After the lines have been either evacuated or purged, close the SUVA HP95 tank and tighten all of the fittings. Then open both the suction and discharge valves 1/2 turn. The standby pressure of the system will now be observed on the gauges. Proper charges will be read only if the chamber and cascade condenser are stabilized at ambient temperature.

If, after observing standby pressure, it is determined that additional gas is required, follow this procedure:

1. Leak check entire system with either electronic or Halide leak detectors.
2. Repair leaks as necessary.
3. Evacuate system.
4. Attach manifold as previously discussed.
5. Open both manifold valves and open the SUVA HP95 tank to allow gas to flow into the system. When the gauges record the proper standby, close the valve on the SUVA HP95 tank. Allow the chamber to stand for 15 minutes to stabilize the pressure. If required, add additional SUVA HP95 and repeat the above procedure until the proper standby pressure is maintained.
6. After the proper pressure has been maintained, close both manifold valves (clockwise) and the SUVA HP95 tank valve.
7. Allow the system to run and verify operating pressures.
8. If pressures are normal, backseat the compressor service valves and remove the gauges.

**CAUTION: ONLY QUALIFIED SERVICE PERSONNEL SHOULD ATTEMPT TO CHARGE AN R404A SYSTEM.**

### R404A REFRIGERATION SYSTEM CHARGING PROCEDURE



The R404A system is not charged by standby pressures. To monitor the R404A system, turn the system on and set in a low temperature set point so that the system is reducing the chambers temperature (pulldown). After 2 minutes of operation, observe the sightglass. The sightglass should be free of all bubbles. If not, additional R404A is required.

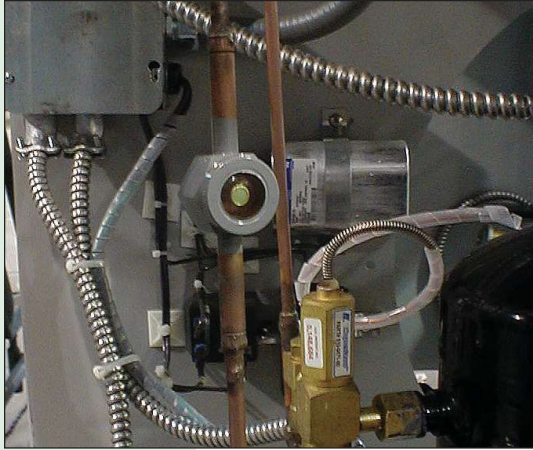
To charge the system, proceed as follows:

1. Backseat the suction and discharge service valves on the R404A compressor. Valves turned all the way counterclockwise.
2. Connect a set of manifold gauges to the system, suction gauge to suction service valve and discharge gauge to discharge service valve. Attach the center hose to the tank of R404A. Prior to allowing gas to enter the system, the hoses should be evacuated by using a vacuum pump or an EPA recognized method of purging the hoses.
3. After lines have been either evacuated or purged, close the R404A tank and tighten all fittings. Then open both the suction and discharge valves 1/2 turn. The pressure of the system will now be observed on the gauges.
4. Allow the system to operate for 2 minutes (minimum).
5. Open the suction manifold only. **DO NOT PUT R404A INTO THE DISCHARGE PORT.** Allow liquid refrigerant to flow into the suction side until the sightglass becomes clear. Do not allow suction pressure to exceed 50 PSI while adding liquid refrigerant.
6. Continue to monitor the sightglass during the pulldown and if required, add more R404A.
7. After the bubbles clear, backseat the compressor valves, frontseat the manifold valves and remove the gauges.



**CAUTION: ONLY QUALIFIED SERVICE PERSONNEL SHOULD ATTEMPT TO CHARGE AN R507 SYSTEM.**

### R507 REFRIGERATION SYSTEM CHARGING PROCEDURE



The R507 system is not charged by standby pressures. To monitor the R507 system, turn the system on and set in a low temperature set point so that the system is reducing the chambers temperature (pulldown). After 2 minutes of operation, observe the sightglass. The sightglass should be free of all bubbles. If not, additional R507 is required.

To charge the system, proceed as follows:

1. Backseat the suction and discharge service valves on the R507 compressor. Valves turned all the way counterclockwise.
2. Connect a set of manifold gauges to the system, suction gauge to suction service valve and discharge gauge to discharge service valve. Attach the center hose to the tank of R507. Prior to allowing gas to enter the system, the hoses should be evacuated by using a vacuum pump or an EPA recognized method of purging the hoses.
3. After lines have been either evacuated or purged, close the R507 tank and tighten all fittings. Then open both the suction and discharge valves 1/2 turn. The pressure of the system will now be observed on the gauges.
4. Allow the system to operate for 2 minutes (minimum).
5. Open the suction manifold only. **DO NOT PUT R507 INTO THE DISCHARGE PORT.** Allow liquid refrigerant to flow into the suction side until the sightglass becomes clear. Do not allow suction pressure to exceed 50 PSIG while adding liquid refrigerant.
6. Continue to monitor the sightglass during the pulldown and if required, add more R507.
7. After the bubbles clear, backseat the compressor valves, frontseat the manifold valves and remove the gauges.

### JACK SHAFT / BLOWER WHEEL INSTALLATION

*If your equipment has fan blades, disregard this section.*



The jack shaft(s) and blower wheel(s) combination may have been removed from this environmental test chamber due to shipping height considerations. Please follow this procedure to insure proper performance and reliability.

1. Mount this jack shaft assembly on the top of the chamber in the orientation shown on your assembly drawing. The bolts needed have been placed back in their proper holes on top of the chamber. Remove these before setting the jack shaft assembly in place, on top of the 1/8" thick neoprene gasket. Bolt down the jack shaft assembly with the bolts, lock washers and flat washers provided.

2. Now that this is done, determine the shaft that each blower wheel will mount on. (This will be marked on each wheel.) Remove the inlet cone(s) from the plenum. Inspect the interior shafts and blower wheel. The shaft also has a washer and a LH threaded screw tapped into its end; remove these for blower installation.

Note on the blower wheel, the two set screw locations. There are two set screws per hole; the second one is to lock the first set screw in position. Each set screw must be prepared with the removable "loctite".

3. Prepare each set screw with "loctite" and thread into the tapped hole without protruding into the bore. Insert the keyway into the keyseat and slide the blower wheel onto the appropriate shaft. The back plate of the blower wheel should be approximately 1" from the chamber liner.

4. Align the set screw to the drill cup located on keyways and tighten to the shaft. Then thread the "jam" set screws into each tapped hole and tighten. Replace the washer and LH bolt in the end of the shaft and tighten. Repeat this paragraph for each blower wheel.

**JACK SHAFT / BLOWER WHEEL INSTALLATION (Continued)**

5. Re-install the inlet cone for each wheel, make sure the wheel will not rub on the inlet cone when spinning. Make any appropriate adjustments.
6. Make sure all bolts and set screws are tight. Then re-connect the liquidtite conduit to the motor(s); wire as shown on the motor nameplate. The final step is to attach the jack shaft guard to the jack shaft framework.

**LUBRICATION PROCEDURE**

Lubricating the fan shaft bearings is a very important preventive maintenance procedure that must be upheld in order to extend bearing life.

It is recommended that the bearings be lubricated once every month for a chamber that is operating 40 hours per week or greater and once every two months for a chamber that is operating 20-40 hours per week. The recommended lubricant is Dow Corning BR2-Plus or a grease conforming to NLGI grade #2.

When lubricating the fan shaft bearing, it is best to look at the bearings to prevent over-greasing. Add grease to each bearing until the first sign of grease is exiting out from between the bearing and the outer race. This is a sign that the bearing is properly lubricated. The recommended amount of grease is 1 to 2 strokes (5/8 to 7/8 oz.) with a standard grease gun.

Follow the above directions very carefully to maintain optimum performance characteristics. Please call Envirotronics' Product Support Group if there are any questions regarding this procedure.

**Envirotronics Product Support Group: 1-800-368-4768  
616-554-5022**



## HUMIDITY SYSTEM

Envirotronics offers two different types of humidity systems. The first is a Mechanical Humidity System or steam generator type. The second being an Atomizing Humidity System.

It is very important to determine which type of humidity is incorporated in your environment test chamber.

### CAUTION:

Humidity chambers need purified water to create humidity. As the water is heated to create vapor for humidity, it leaves any impurities behind. Supplying straight tap water will leave deposits on the humidity heater, which requires more cleaning, produces less efficient heating, and shortens the heater's life.

On the other end of the spectrum is water that is too pure. Water which is too pure will try to refresh itself with missing minerals. Over time, too-pure water will etch holes into the stainless steel material on the chamber. A hole in a chamber will allow moisture to fill up the insulation space.

Weiss Envirotronics, Inc., recommends having your supply water (tap water) evaluated by a reputable source to identify impurities in your water supply. One such source would be **Thermo Scientific (Barnstead)**. This is usually a free service.

### TERMINOLOGY:

What is deionization?

Deionization (or demineralization) simply means the removal of ions. Ions are electrically-charged atoms or molecules found in water which have either a net negative or positive charge. For many applications using water as a rinse or ingredient, these ions are considered impurities and must be removed from the water.

### ACIDITY:

pH Value – measured on a scale of 0 to 14

-0 = very acid

-7 = neutral

-14 = very alkaline

### TURBIDITY:

Suspension of fine, non-dissolving particles in water; sometimes indicated by cloudy or colored water and usually measured in ppm (parts per million).

**CAUTION Continued:**

**HARDNESS/ION CONTENT:**

Many compounds, mainly calcium and magnesium but including sodium, potassium, chloride, nitrates, iron, copper, etc., break down and dissolve in water. Measured by resistivity ( $\Omega$ -cm); conductivity ( $\mu$ mho/cm), or complete water analysis (ppm each contaminant).

**HUMIDITY WATER REQUIREMENTS:**

|                          |  |
|--------------------------|--|
| TURBIDITY                | less than 5 NTU* and preferably less than 1 NTU* |
| COLOR                    | Less than 5 on the pH color scale                |
| FREE CHLORINE            | Less than .2 ppm                                 |
| CHLORAMINE               | Less than .2 ppm                                 |
| CHLORIDE                 | Less than .2 ppm                                 |
| TOTAL IRON AND MANGANESE | Less than .3 ppm                                 |
| ORGANICS                 | Less than 1 ppm (as determined by oxygen)        |
| ACIDITY (pH)             | Between 6 to 7 pH                                |
| RESISTIVITY              | Between 50,000 $\Omega$ to 1 M $\Omega$ .        |

\* Turbidity is measured in NTU: Nephelometric Turbidity Units

Humidity water quality is an important issue. Non-corrosive, non-scale-forming water is required for humidity systems. Water that is super pure or impure will cause problems in the system.

**EFFECTS OF UNACCEPTABLE WATER:**

- HEATER FAILURE
- EXCESS SCALE AND MINERAL DEPOSITS IN VAPOR GENERATOR
- POOR HUMIDITY CONTROL
- CORROSION OF HUMIDITY SYSTEM
- MINERAL “LEACHING” FROM CHAMBER OR PRODUCT

**WEISS ENVIROTRONICS, INC. RECOMMENDED WATER**

**DEIONIZATION SYSTEM:**

Supply water regulated to 25-30 psi.

Pre-filter to remove the rust/iron from the supply water, using the following **Barnstead-** brand products:

**D5839 B-Pure, ½ size filter holder (one each)**

**D2780 Dual pressure gauge kit (one each)**

**FL583X1 5 Micron Filter, ½ B-Pure**

**CAUTION Continued:**

After the pre-filter, use a **D0832 cartridge** (contains carbon and mixed-bed resin) to remove the chlorine, chloramine and chloride from the water. After the pre-filter, this is the first filtration cartridge in the holder.

The second cartridge, **D0809** (removes carbonates), completes the filtration process to condition the water for the chamber. Cartridge D0832 combined with the D0809 will process a total of 2350 liters to the above-listed water requirements.

The above-listed water-deionization system satisfies Weiss Envirotronics' humidity water requirements. Other systems may be used if equivalent. **Using improperly-deionized water may affect your warranty if components are damaged.**

**RECOMMENDATION:**

It is also recommended the chamber be cleaned between tests using a 50/50 solution mix of distilled water and white vinegar to neutralize and clean contaminants. This will neutralize and clean contaminants between tests without adding additional chemicals.

Adding a compressed air purge system to add additional oxygen to the system is recommended in areas where chloramine is added to the supply water.

**Please consult Envirotronics Product Support Group: 1-800-368-4768**

**Over Temp Check Out Procedure**

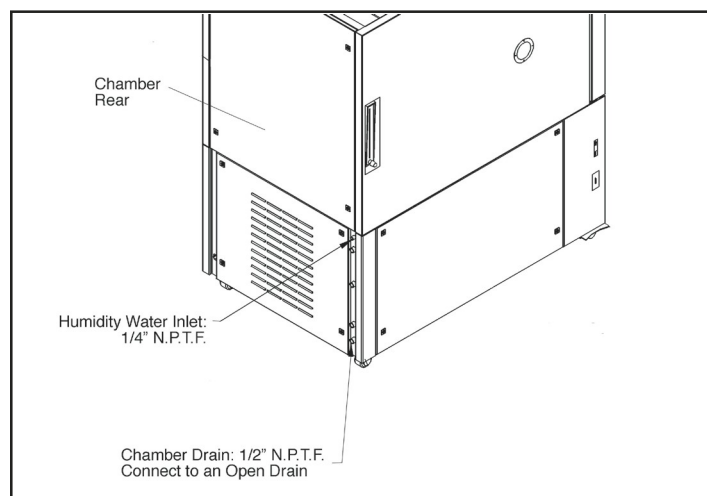
- Step #1 Use LOTO procedure for electric and water.
- #2 Drain Steam Generator tank of water
- #3 Apply power per LOTO procedures (remove LOTO tags per your companies LOTO).
- #4 Monitor temperature to 250°F. Watch for trip condition to shut down heater.
- #5 Reset temperature controller. Turn water on to re-fill steam generator tanks.
- #6 Verify steam generator is heating properly.

REPEAT PROCEDURE QUARTERLY

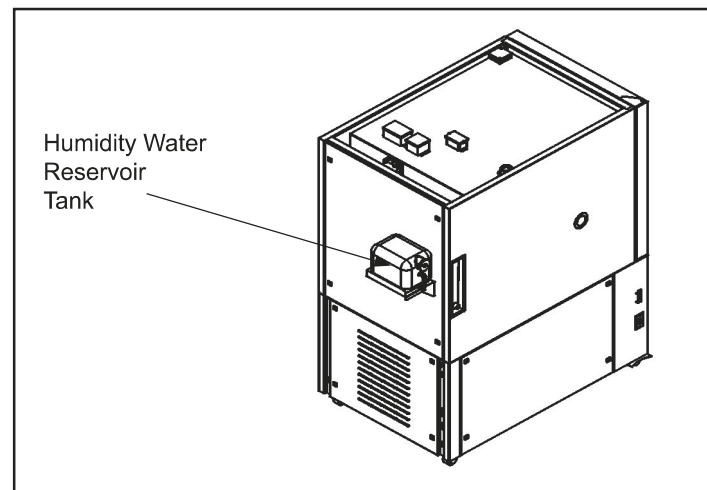
Please be aware this checkout procedure may cause damage to heater and or cause replacement.

## MECHANICAL HUMIDITY WATER REQUIREMENTS

On a humidity system, water is required for the steam generator. Also, systems not utilizing a solid state humidity sensor may use a wick tank to measure wet bulb temperature for relative humidity measurements. If a wick tank is included, periodic replacement of the wet sock is required. It is recommended that the wet sock is replaced once a week or prior to a test that has a duration of more than two weeks. *Refer to: Humidity System Caution Section.* Connect humidity inlet water to the connection provided marked humidity water inlet. Water levels in the wick tank and the steam generator are controlled automatically by individual float mechanisms.



The humidity water outlet should be connected to an open drain.



If your system utilizes a reservoir tank, the tank must be placed on top or at an elevation higher than the chamber.

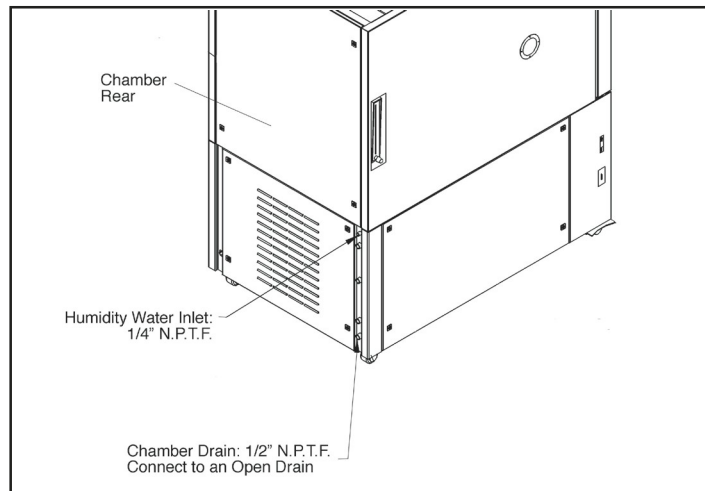
**MECHANICAL HUMIDITY WATER REQUIREMENTS (Continued)**

Humidity water quality is an important issue for the customer to consider. *Refer to: Humidity System Caution Section.*

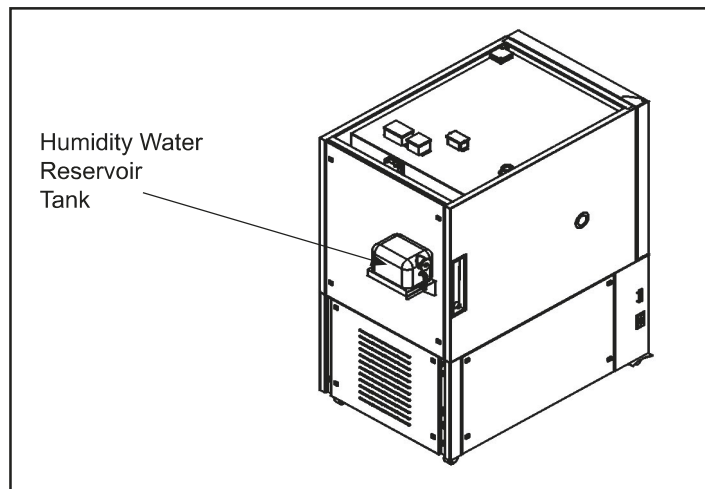
**CAUTION:** For filling or removing portable water container used for humidity water supply use an OSHA approved ladder such as supplied by McMaster-Carr P/N 8188T88 (Ladder 48" with handrails) meets OSHA and ANSI A14.7 standards or equivalent.

## ATOMIZING HUMIDITY WATER REQUIREMENTS

On a humidity system, water and air is required for the atomizing humidity system. Also, systems not utilizing a solid state humidity sensor may use a wick tank to measure wet bulb temperature for relative humidity measurements. If a wick tank is included, periodic replacement of the wet sock is required. It is recommended that the wet sock is replaced once a week or prior to a test that has a duration of more than two weeks. *Refer to: Humidity System Caution Section.* Connect humidity inlet water to the connection provided marked humidity water inlet. Water levels in the wick tank and the steam generator are controlled automatically by individual float mechanisms.



The humidity water outlet should be connected to an open drain.



If your system utilizes a reservoir tank, the tank must be placed on top or at an elevation higher than the chamber.

**CAUTION:** For filling or removing portable water container used for humidity water supply use and OSHA approved ladder such as supplied by McMaster-Carr P/N 8188T88 (Ladder 48" with handrails) meets OSHA and ANSI A14.7 standards or equivalent.

## ATOMIZING HUMIDITY SYSTEM

In some systems an atomizing system is used for humidity control in lieu of a traditional steam generator system. The atomizing system consists of:

Water and air regulator/filter/gauge assembly

Control solenoids

Atomizing nozzles

Mounting plate complete with all necessary plumbing

The system is controlled by the humidity output from the programmer/controller on your system. Time proportioned outputs are used to pulse/modulate the control solenoids which then introduce the atomized mist into the plenum. Water droplets are roughly the size of a dust particle, which produces the desired fogging within the chamber.

The advantages of the atomizing system over the steam generator are:

1. Less maintenance
2. Faster response
3. Better control due to the faster response
4. Easier to install
5. Less costly to operate (110 V only is required)

*Refer to: Humidity System Caution Section.*

## HUMIDITY SYSTEM OPERATION

Systems that incorporate humidity as an option, require the enabling of an Event or Auxiliary for humidity control. One type of controller is listed below for *examples* on how this is accomplished.

### 1) Solutions Plus

To operate your system in the humidity mode, Auxiliary 1 must be on. This is accomplished in one of two methods. Either as part of your program, Editor Program Screens, Item #14 (Auxiliary 1) or Manual Control Screen, Item #11.

Measurement of humidity can be accomplished in two (2) different methods. A Direct relative humidity (solid state) sensor like Vaisla's HMM30C or wet bulb dry bulb control.





## Equipment Start-Up



### Envirotronics' Equipment Start-Up is the Smart way to Start

There is no better way to get your new equipment off to a great start than to have a factory-trained expert on-site to ensure its proper performance. Protect your equipment/investment by having the Envirotronics' field service technician personally train you in its operation.

Envirotronics provides turnkey installation of both new and used environmental test equipment. Our field service technicians are factory-trained, EPA certified, and well-experienced in the installation and start-up of your equipment. Installation and Start-up performed by our field service technicians ensures that your equipment will perform to its full potential "right-out-of-the-crate".

Envirotronics has reduced start-up prices in an effort to assure the correct operation and proper use of your equipment. We strongly recommend that you take advantage of these prices when purchasing any new test chamber.

For pricing and more information, contact Envirotronics' Customer Support Group 616-554-5022.

*Here is a brief overview of our thorough start-up checklist:*

#### Electrical System

- main disconnect
- phasing
- line and control voltage and connections
- contact points, timer settings, fuses, and grounding
- general condition of boxes, labels
- compressor head fans & crankcase heaters
- heater frames and elements

#### Resistance Verification (Ohms)

- compressor three-phase and single-phase applications
- heaters & steam generator elements

#### Current Verification (Amps)

- high stage, low stage, and trim compressors
- heaters, circulators, steam generator, condenser fan motor, and blower motor

#### General Items

- physical condition of chamber, insulation, and quiet package
- condition of mineralacs, RCB's, tie straps
- labels
- panels and knobs
- drip pan
- door and door latch
- interior light bulbs
- grease bearings
- belts
- fan blades and blower wheels
- gauges

#### Instrumentation

- reading correctly
- check configuration, Temp Sentry limits, HLS settings
- sensors
- Systems Plus™, chart recorder, humidity sensor

#### Please note:

*Use of non-Envirotronics personnel for start-up could void your warranty.*

#### Refrigeration

- low and high stage refrigerant charge
- low and high stage pressure switch settings
- low and high stage oil level
- capacity controls
- low and high stage frostback
- low and high stage discharge temp
- fan cycling operation
- condenser and evaporator coils
- inlet and outlet water temperature
- inlet and outlet water pressure
- water regulator
- leak check
- solenoids
- cap tubes
- oil separators
- labels
- valves
- armaxflex on bulbs
- acid test on compressor oils

#### Humidity

- condition of boiler & boiler hose
- water level in wick tank
- leak check boiler
- fittings for tightness
- thermostat
- demineralizer cartridge
- atomizer fittings
- condition of nozzles
- water and air pressure regulator
- dry air purge
- leaks
- solenoids
- desiccant tower transfer
- moisture indicator
- CargoCaire Drier
- wheels and belts

**Ask about our A2LA accredited Calibration Services.  
Have your equipment calibrated by experts during your start-up!**

**Contact our Customer Support Group**

**Tel: 616-554-5022 • Fax: 616-554-5024 • Email: [service@envirotronics.com](mailto:service@envirotronics.com)**



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### START UP CHECKLIST

**Not all items on this list may apply to your chamber.**

If you have any questions regarding which items do or do not apply, please feel free to call Envirotronics' Product Support Group (616) 554-5022 or email [service@envirotronics.com](mailto:service@envirotronics.com). Reference electrical installation section of manual and electrical drawings.

- Proper voltage and current has been supplied. The voltage and current have been established for your chamber at the time of purchase. It is important that the correct power requirements have been met.

**Example:** 208 volt is not the same as 230 volt nor are they interchangeable. Use of the incorrect voltage (208) will void your warranty.

- Chamber has been leveled. Standard floors with slight (1/4" or less) variations are acceptable.
- Humidity water and humidity drain connected and water supply turned on. *Use an OSHA approved ladder such as supplied by McMaster-Carr P/N 8188T88 (Ladder 48" with handrails) that meets OSHA and ANSI A14.7 standards or equivalent.*

- Humidity water requirement: OHM range 50,000 to 200,000

### STARTING UP A CHAMBER

**WARNING:** You must operate the chamber to perform this procedure. Do not attempt to operate the chamber unless you have read the instructions.

**WARNING:** Do not start up the chamber until all the other installation procedures are complete. Make sure the chamber is completely assembled according to your engineering drawings.

### START UP PROCEDURE

*Before proceeding with this section, verify that all steps on the Start-up Checklist have been completed.*

- 1.) Turn function switch(es) to the off position.
- 2.) Turn on main power to chamber.
- 3.) Verify incoming voltage and control circuit voltage (110 volt) between X1 and X2.
- 4.) Set temperature safety device if applicable to desired temperature.
- 5.) The refrigeration system has been pumped down for shipment. Backseat all valves with yellow tags. (If applicable to your chamber.)
- 6.) Familiarize yourself with the controller which should be powered up at this time.
- 7.) Turn the function switch to the on position.
- 8.) This will enable the circulator contactor and the circulator will run.
- 9.) Check rotation of circulator motor. Direction should be indicated on the motor. (3 phase system only.)
- 10.) The setpoint value in the controller will enable the heating and cooling as required.

**NOTE:** Chambers employing an Envirotronics' Systems Plus™ Programmer/Controller require starting of the Systems Plus prior to turning on functions switches. Press 'start' key, select 'start system'...Enter. You can download the Systems Plus™ or Solutions Plus™ Manual on our Website [www.envirotronics.com](http://www.envirotronics.com).

**WARNING:** You must operate the chamber to perform this procedure. Do not attempt to operate the chamber unless you have read the instructions.

**WARNING:** Do not start up the chamber until all the other installation procedures are complete. Make sure the chamber is completely assembled according to your engineering drawings.

## SYSTEM OPERATION

### OPERATION SAFETY INSTRUCTIONS

Follow all **WARNINGS** to prevent personal injury and death.

- WARNING:** To safely operate the chamber, you must read the General Safety Instructions and all the instructions in this manual.
- WARNING:** Avoid exposing yourself to air and equipment that is not near room temperature. Port gloves are not designed to insulate your hands.
- WARNING:** Using gloves left in a chamber when the temperature is lower than 0 °C (32 °F) or higher than 37.8 °C (100 °F) could cause frostbite or burn your hands.
- WARNING:** Use your chamber only for testing the products it was designed to test. Do not put combustible or explosive materials in the chamber.
- WARNING:** Keep the chamber door closed while the chamber is operating.
- WARNING:** Breathing gas from the GN<sub>2</sub> (gaseous nitrogen), LN<sub>2</sub> (liquid nitrogen) system can cause death from suffocation. Dilute the air before entering the chamber.

Follow all **CAUTIONS** to prevent equipment damage.

- CAUTION:** Do not operate the chamber beyond the specifications.
- CAUTION:** To protect from temperatures that are too high or too low, you must use a protection device. Product protection is your responsibility.

*Before proceeding with this section, be sure that the **Start-up Checklist** and the **Start-up Procedure** have been completed. The Start-up Checklist and Start-up Procedure are completed initially when the chamber is installed and need not be repeated.*

1. Turn the master switch to the “on” position. This will enable the remaining switches to be functional by providing control circuit power.

The light switch, when applicable, enables the chamber compartment light.

---

**SYSTEM OPERATION (Continued)**

2. Turn the circulator switch to the “on” position. This not only enables the circulator motor, but also provides control circuitry power to the heat and cooling switches. If the circulator does not run, refer to the Troubleshooting Guide.
  
3. Turn the heat switch and cool switch to the “on” positions. This will enable the controller to output accordingly with the set point entered. For operating the chamber hot or cold, both switches should be in the on position to achieve the desired setpoint. If the circulator is turned on and the heat and cool switches are off, the chamber temperature will rise above the ambient due to the fan rotation working on the air. The friction of the fan blade on the air will create the heat that is displayed on your controller.
  
4. If applicable, turn the humidity switch on when operating the chamber in a temperature/humidity mode. A temperature/humidity mode is when both the dry bulb (sensible temperature) and humidity level at that temperature are being controlled simultaneously. The humidity mode switch is typically a manual-off-auto. The position selected is determined by the test you are running. If humidity control is not desired, place the switch in the off position. If you are operating the chamber continuously in a temperature/humidity mode either through the controller key pad or via automatic programmed control, place the switch in the manual position. If you are operating the chamber via programmed control only and your test requires you to change from a temperature only mode to a temperature/humidity mode, then place the switch in the auto position and activate Event #1 (or Aux#1 depending on the type of control instrument) of your program to automatically switch the system from temperature to temperature/humidity modes.

**Example:**           Event #1 on (temperature/humidity mode)  
                          Event #1 off (temperature mode)

Every chamber is designed with specific limitations for operating the humidity system. Please refer to the chamber specifications serial tag for maximum dry bulb temperature and minimum dewpoint temperature.



## Instrument Calibrations

### Instrument Calibrations

In order for your environmental test equipment to perform repeatable accurate tests, your instrumentation must be calibrated. Envirotronics is accredited for technical competence in the field of calibration and can provide the latest ISO/IEC 17025 (A2LA accredited) calibration services at your facility. Our field service technicians are highly trained and qualified to perform your instrument calibrations with reliability and confidence.



### Automotive Suppliers



Envirotronics is pleased to help make the task of compliance with the QS9000 3rd Edition Calibration Mandate much simpler. There is no need for you to take the time to actively seek an accredited laboratory. Envirotronics, certified ISO9001 in 1997, can provide the latest required ISO/IEC 17025 (A2LA accredited) calibration services at your facility. These services meet 17025 requirements and ensure that your company is in compliance with the most recent changes in the QS9000 3rd Edition mandate.

Please contact us for a copy of our Certificate of Accreditation and a copy of our Calibration Scope of Accreditation. You may also visit our website at <http://www.envirotronics.com/a2laced.html> to download and print a copy of these important documents to keep on file.

From the cost-saving Value Plus Program to preventive maintenance, emergency service and now A2LA accredited instrument calibrations, Envirotronics is the single-source supplier for all of your environmental test equipment needs. Take this opportunity to experience our top-notch customer service and begin a long lasting partnership with us.

**Contact our Customer Support Group for a quote on your instrument calibration needs.**

**Tel: 616-554-5022**

**Fax: 616-554-5024**

**Email: [service@envirotronics.com](mailto:service@envirotronics.com)**





# ISO/IEC 17025 COMPLIANCE

...made easy

According to the QS9000 3rd Edition Calibration Mandate, all instrument calibrations must be performed and certified by an accredited calibration laboratory. And now...the deadline for compliance with this mandate is already here!

At Envirotronics, we are pleased to make the task of compliance with this mandate much easier. There is no longer any need for you to actively seek an accredited laboratory. Envirotronics is proud to announce the receipt of A2LA accreditation for technical competence in the field of calibration.

***Envirotronics can now provide the latest ISO/IEC 17025 (A2LA accredited) calibration services at your facility!***

These services meet 17025 requirements and ensure that your company is in compliance with the most recent changes in the QS9000 3rd Edition mandate.

Our national network of field service technicians is highly trained and qualified to perform your instrument calibrations with reliability and confidence. From new and used equipment, preventive maintenance, and equipment modifications to equipment relocation,

spare parts, and now A2LA accredited instrument calibrations, Envirotronics is the single-source-supplier for all of your test equipment needs.

Please contact us for a copy of our Certificate of Accreditation and a copy of our Calibration Scope of Accreditation. Call our Customer Support Group and schedule your instrument calibration today!

**Need more info?**

Call **616-554-5022** or visit our website **www.envirotronics.com** to learn more about Envirotronics Equipment and Service.

***For A2LA Accredited Instrument Calibrations performed at your facility, call 800-368-4768 today!***



7/01



Registered ISO 9001 • A2LA Accredited Calibration Services • Locations Nationwide  
www.envirotronics.com • 800-368-4768 • 616-554-5022 • Fax 616-554-5024



Fill out the attached card and send it in to Envirotronics Calibration Services and we will contact you to schedule your next instrument calibration appointment.

## PLEASE CONTACT ME ABOUT INSTRUMENT CALIBRATIONS!

Name \_\_\_\_\_ Title \_\_\_\_\_  
Company \_\_\_\_\_ Division \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
Tel \_\_\_\_\_ Fax \_\_\_\_\_  
Email \_\_\_\_\_

How many instruments will require calibration? \_\_\_\_\_

What types of instruments will require calibration? \_\_\_\_\_

Who currently performs service on your environmental test equipment? \_\_\_\_\_

What industry magazines do you read? \_\_\_\_\_

What industry trade shows do you attend? \_\_\_\_\_

Would you like to receive information on our full line of environmental test chambers and equipment? \_\_\_\_\_

Fill out, cut out, and return to:

**Envirotronics Calibration Service**  
**3881 N. Greenbrooke SE**  
**Grand Rapids, MI 49512**

OR

**CALL 1-800-368-4768**

**WARNING: RISK OF ELECTRICAL SHOCK. DISCONNECT POWER BEFORE SERVICING UNIT.  
USE LOCK-OUT/TAG-OUT PROCEDURES.**

### TROUBLESHOOTING

Even though your system has been designed to provide years of trouble-free service, mechanical problems may occur. The following has been provided to assist the operator or maintenance department in finding problems. If the problem cannot be corrected after these checks are made, contact the Envirotronics' Product Support Group.

**Envirotronics Product Support Group: 1-800-368-4768  
616-554-5022**

The Troubleshooting Guide is set up in the following manner:

- The Roman numerals denote the problems. (I, II, III, IV, etc.)
- The capital letters denote the possible causes. (A, B, C, D, etc.)
- The numbers denote the solutions. (1, 2, 3, 4, etc.)

**WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure.

**WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place.



## TROUBLESHOOTING GUIDE

### I. No displays on instruments no indicator lights on panel

#### A. No incoming power

1. Verify power source problem and reestablish main power.

#### B. Transformer Secondary fuse blown

1. Find the reason for the trip.
2. Make necessary repairs.
3. Replace fuse.

#### C. Defective Transformer

1. Verify transformer has incoming power.
2. Replace transformer.

#### D. Loose terminals on control circuit

1. With main power off, tighten all electrical terminals.

#### E. Controller Defective

1. Verify power on incoming side to controller.
2. Consult factory.

### II. Circulator will not run

#### A. Power is not present

1. Master switch is in on position.
2. Is power passing through switch?

#### B. Defective motor

1. Verify wiring and voltage to motor.
2. Replace motor.

### III. Chamber will not heat

#### A. Circulator not running

1. Verify circulator is running. If not, use Section II for troubleshooting.

**WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure.

**WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place. Use Lock-Out / Tag-Out Procedures.

## TROUBLESHOOTING GUIDE (Continued)

### III. Chamber will not heat (Continued)

#### B. Heat relay defective

1. Verify high voltage to relay, if absent check fuse.
2. Verify control voltage to relay, if absent check controller output.

#### C. Controller not outputting

1. Verify controller is in heat demand. Refer to controller manual.

#### D. Heat links blown

1. Check resistance (power off) of all heating elements to verify heat link continuity.

*Note: The resistance value will not be (“0”).*

### IV. Chamber not cooling properly

#### A. Circulator not running

1. Verify circulator is running. If not, use Section II for Troubleshooting.

#### B. Cooling contactor(s) defective

1. Verify power to contactor(s).
2. Check incoming power. If present, check fuse(s).
3. Check outgoing power. If absent, replace compressor contactors.
4. Check control voltage to contactor. If absent, refer to controller.

#### C. Controller not outputting

1. Verify controller is in a cool demand. Refer to controller manual.

#### D. Reset all pressure switches on compressor(s)

#### E. Compressor defective

1. Consult factory after above items have been checked.

**WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure.

**WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place. Use Lock-Out / Tag-Out Procedures.



## Preventive Maintenance Program



### Preventive Maintenance Program

Your environmental test equipment can only be of value to you if it is in good running condition. Utilizing Envirotronics' Preventive Maintenance Program affords you the assurance that your test equipment will be ready to perform to specification when you need it - day after day, year after year.

Envirotronics' Preventive Maintenance Program consists of a minimum of two visits per year, per system by one of our factory-trained field service technicians. During each visit, all electrical components, refrigeration components, and other equipment and systems will be thoroughly inspected. Where possible, routine minor adjustments will be made to return your equipment to top running condition as a part of this service. Upon completion of the inspection, our service technician will provide you with a detailed recommendation of any additional repairs that may be needed.

An additional benefit of the Envirotronics Preventive Maintenance Program is that it is not limited to only Envirotronics-manufactured equipment. In fact, this indispensable program is **available for most makes and models of environmental test chambers!**

*Here is a brief overview of our thorough systems and components checklist:*

#### Electrical System

- main disconnect
- phasing
- line and control voltage and connections
- contact points, timer settings, fuses, and grounding
- general condition of boxes, labels
- compressor head fans & crankcase heaters
- heater frames and elements

#### Resistance Verification (Ohms)

- compressor three-phase and single-phase applications
- heaters & steam generator elements

#### Current Verification (Amps)

- high stage, low stage, and trim compressors
- heaters, circulators, steam generator, condenser fan motor, and blower motor

#### General Items

- condition of chamber, insulation, and quiet package
- condition of mineralacs, RCB's, tie straps
- labels
- panels and knobs
- drip pan
- door and door latch
- interior light bulbs
- grease bearings
- belts
- fan blades and blower wheels
- gauges

#### Instrumentation

- reading correctly
- check configuration, Temp Sentry limits, HLS settings
- sensors
- Systems Plus™, chart recorder, humidity sensor

#### Refrigeration

- low and high stage refrigerant charge
- low and high stage pressure switch settings
- low and high stage oil level
- capacity controls
- low and high stage frostback
- low and high stage discharge temp
- fan cycling operation
- condenser and evaporator coils
- inlet and outlet water temperature
- inlet and outlet water pressure
- water regulator
- leak check
- solenoids
- cap tubes
- oil separators
- labels
- valves
- armaflex on bulbs
- acid test on compressor oils

#### Humidity

- condition of boiler & boiler hose
- water level in wick tank
- leak check boiler
- fittings for tightness
- thermostat
- demineralizer cartridge
- atomizer fittings
- condition of nozzles
- water and air pressure regulator
- dry air purge
- leaks
- solenoids
- desiccant tower transfer
- moisture indicator
- CargoCaire Drier
- wheels and belts

*The cost of your Preventive Maintenance Program will depend on the size and type of your system and the desired frequency of inspection.*

**Contact our Customer Support Group for a quote on a Preventive Maintenance Program for your equipment today.**

**Tel: 616-554-5022 • Fax: 616-554-5024 • Email: [service@envirotronics.com](mailto:service@envirotronics.com)**



# Envirotronics™



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Email [sales@envirotronics.com](mailto:sales@envirotronics.com)

[service@envirotronics.com](mailto:service@envirotronics.com)

Web [www.envirotronics.com](http://www.envirotronics.com)



### PREVENTIVE MAINTENANCE

Since an environmental chamber is a sophisticated piece of test equipment, continuous monitoring of the system will minimize downtime due to mechanical malfunctions.

A good preventive maintenance program will assure that the major components are maintained properly and the system will give many years of uninterrupted service. Envirotronics does offer a Preventive Maintenance Contract, which can be purchased from Envirotronics' Product Support Group.

This contract was designed to cover not only the major system components, but also the general condition of your equipment. Some standard components require periodic replacement. Failure to replace these components may cause system downtime. For additional information, please contact our Product Support Group.

**Envirotronics Product Support Group: 1-800-368-4768  
616-554-5022**

*NOTE: Envirotronics provides service and parts for all makes and models of environmental test equipment.*

**WARNING:** Dangerously high voltages are present. Do not turn on the electrical power until you are instructed to do so in the start -up procedure.

**WARNING:** Disconnect the electrical power before working near moving parts. Keep all guards and shields in place. Use Lock- Out / Tag-Out Procedures.

**SCHEDULED PREVENTIVE MAINTENANCE INTERVALS**

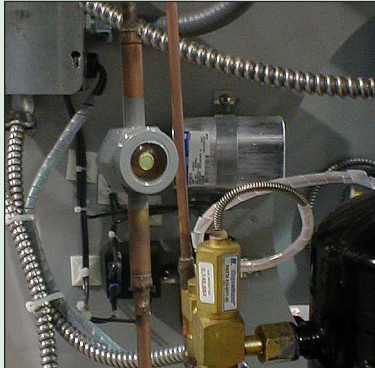
| Inspect                           | Daily | Weekly | Monthly | Quarterly | Semi-Annually | Annually | Procedure No. |
|-----------------------------------|-------|--------|---------|-----------|---------------|----------|---------------|
| High Stage Charge                 |       | ●      |         |           |               |          | 1             |
| Low Stage Stand-By                |       | ●      |         |           |               |          | 2             |
| Compressor Oil Level*             |       | ●      |         |           |               |          | 3             |
| Circulator Motor                  |       |        | ●       | ●         |               |          | 4             |
| Electrical Panel                  |       |        |         | ●         |               |          | 5             |
| Operating Currents                |       |        |         | ●         |               |          | 6             |
| Tubing Abrasion                   |       |        |         | ●         |               |          | 7             |
| Humidity Sensor Rotronics         |       |        | ●       |           |               |          | 8             |
| Atomizing Nozzle /Humidity system |       |        | ●       |           |               |          | 9             |
| Chamber                           |       |        | ●       |           |               |          | 10            |
| Wet Socks (If applicable)         |       | ●      |         |           |               |          | 11            |
| Condenser                         |       |        |         |           |               | ●        | 12            |

\* *Dark Compressor Oils (Perform oil flush on an as needed basis, typically when oil levels cannot be determined). Removal of oil sight glass for cleaning may be required.*

**Note:** *On the following Preventive Maintenance Pages, you will find a brief description of the above routine checks.*

## PREVENTIVE MAINTENANCE PROCEDURES

### Procedure No. 1: HIGH STAGE CHARGE



Observe the sightglass to see if there are any bubbles. This should be checked during pull down after at least 2 minutes of operation. Bubbles indicate a lack of refrigerant. If bubbles are seen during bypass operation, this does not indicate a gas shortage. Also, observe the color of the moisture indicator in the sightglass.

Green is dry  
Yellow-green (chart reuse) is caution  
Yellow indicates moisture.

### Procedure No. 2: LOW STAGE STAND-BY

The stand-by may be read on the low stage discharge gauge prior to the day's operation if the equipment has been turned off overnight.

If the equipment has been running, the chamber (and cascade section) must be at ambient temperature and equalized to read the stand-by pressure.

### Procedure No. 3: COMPRESSOR OIL LEVEL



With compressor(s) running, the oil levels should be maintained between 1/8 to 3/8 on the sightglass. Oil leakage should not be tolerated. Any deviation from the normal oil level should be investigated immediately.

### Procedure No. 4: CIRCULATOR MOTORS

Check the rotation of the fan/blower (suction at the grill) and check the fan/blower for **stress fractures and cracks on blades or vanes and** tightness on the motor, shaft/jack shaft assembly. If your equipment has a jack shaft assembly, the bearings require lubrication once a month using *Dow Corning BR2-Plus or a grease conforming to NLGI grade #2.*

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**PREVENTIVE MAINTENANCE PROCEDURES (Continued)**

**Procedure No. 5: ELECTRICAL PANEL**

Check for components and wires that may vibrate loose during operation. Check for signs of contactor or relay arcing. Check to see the power and ground connections remain secure.

**Procedure No. 6: OPERATING CURRENTS**

With an amprobe, check the operating current of the compressors, heaters, circulator and other components. These components are shown on the electrical schematic.

**Procedure No. 7: TUBING ABRASION**

Check for evidence of friction wear on all refrigeration lines. Particular care should be taken on inspecting capillary tubes to pressure switches and gauges.

**Procedure No. 8: HUMIDITY SENSOR**

Clean dust filter. Cleaning should be done without removing the filter from the probe. Gently wipe the filter with a solution of water and mild detergent.

*NOTE: If this does not remove most of the stains, the filter should be replaced.*

**Procedure No. 9: ATOMIZING NOZZLES**

Make sure nozzles are clean and free of obstructions.

**Procedure No. 10: CHAMBER**

Clean interior of chamber with a stainless steel cleaner and inspect overall condition of box. If your chamber has windows, clean with a glass cleaner.

**Procedure No. 11: WETSOCKS**

Check wetsock for replacement weekly or every time a humidity test is begun. (If applicable to your chamber.)

**Procedure No. 12: CONDENSER**

Clean condenser as required by flushing or rodding as needed. Typically when discharge pressures are higher than normal.

*NOTE: This is a preventive maintenance list. You may add or delete items as your in house system requires.*



### **DECONTAMINATION AND DECOMMISSIONING, AND LOCK OUT / TAG OUT PROCEDURE**

From time to time it may become necessary to either replace or scrap out the test chamber. When this occurs, please consider the following information.

1. Check with your plant assets manager to see if equipment is leased or owned.
2. Check with your Envirotronics sales contact. Envirotronics has a program to purchase your used test chamber. Otherwise, contact local or regional used equipment buyers.
3. **Lock Out / Tag Out Procedure:**
  - a. Turn off disconnect for chamber, located on wall adjacent to the chamber.
  - b. Using a multimeter, verify incoming power is off at terminals.
  - c. Turn off air supply and lock out.
  - d. Turn off water supply. Approximately 6 gallons (22.8 liters) in system.
  - e. Check your company's LOTO procedures for additional instructions for your location.
4. Reclaim refrigerant. Approximately 5 - 6# of R404A (HP62) in system.  
*Please note: This should be accomplished by a trained refrigeration technician in compliance with state, federal and county requirements. Or, call the Envirotronics Customer Support Group:*

**Envirotronics Product Support Group: 1-800-368-4768  
616-554-5022**

5. Remove oil (RL32CF) from compressor. There should be approximately 1/2 gallon (1.9 liters) in the system.  
*Please note: This should be accomplished by a trained refrigeration technician in compliance with state, federal and county requirements. Or, call the Envirotronics Customer Support Group (number listed above).*
6. Remove water from Humidity system. There is approximately 6 gallons (22.8 liters) of water in the humidity system.

**CAUTION:** When removing water from the humidity system, use an OSHA approved ladder such as supplied by McMaster-Carr P/N 8188T88 (Ladder 48" with handrails) meets OSHA and ANSI A14.7 standards or equivalent.



### **DECONTAMINATION AND DECOMMISSIONING, AND LOCK OUT / TAG OUT PROCEDURE (Continued)**

7. Disconnect air line slowly to allow air to bleed out of the system.

**CAUTION:** When disconnecting air line, use an OSHA approved ladder such as supplied by McMaster-Carr P/N 8188T88 (Ladder 48" with handrails) meets OSHA and ANSI A14.7 standards or equivalent.

8. Use hand valve to release pressure in chamber to allow door to open (Altitude chambers only).

**WARNING:** Before service or repair allow chamber to cool to ambient room temperature before entry.

After performing the above listed steps, your chamber should be ready to place on a skid and secure for shipment.



## Spare & Replacement Parts

### Spare and Replacement Parts

Envirotronics is the one-stop shop for all your environmental test equipment parts needs. From small components and materials to sub-assemblies and systems, Envirotronics provides replacement and spare parts for most makes and models of environmental test equipment. To help eliminate confusion, our parts are identified by the Envirotronics part number **and** the original manufacturer's part number. This makes cross referencing and location of parts quick and easy. We are committed to your success.

All quotations for new Envirotronics equipment include an option for spare parts. We urge you to maintain a limited inventory of spare parts at your facility. Although our service vehicles are well equipped with many system components, there are occasions when unique parts are not readily available. Maintaining a small inventory of unique spare parts can dramatically reduce the downtime of your equipment.

Remember, owning an Envirotronics-made chamber is not a requirement to take advantage of this convenient and time-saving service. We stock parts for most makes and models. If we don't have your special part in stock, we will find it for you. There is no reason to spend your time hunting down replacement parts. Let us do the work for you!

Our friendly and knowledgeable customer support personnel are ready to help you. They have the resources and the experience to answer your questions and handle your parts order quickly and efficiently. Orders for stock parts that are received by 2:00 pm EST will be shipped the same day. We will ship via the carrier you designate, and overnight and Saturday delivery is available upon request.

Our Value Plus™ customers will enjoy an automatic 10% discount on all parts and materials and, in addition, will receive next day delivery of all parts in stock if ordered by 2:00 pm EST. To learn more about our Value Plus™ Program give us a call or visit our website at [www.envirotronics.com](http://www.envirotronics.com).



We have what it takes to keep your environmental test equipment running as it should. From parts and service to technical expertise and money-saving programs, Envirotronics is the one-stop shop for all of your environmental test equipment needs. Give us a call today to find out how we can help you. We want to be your chamber company.

#### Terms and Conditions

1. All orders must be accompanied by a written P.O.
2. Payment Terms are net 15 days A.R.O.
3. All price quotes for parts and materials are valid for 45 days.
4. The 10% discount will apply to Value Plus™ customers with a current contract only. No other cash discount will apply.
5. Most standard parts are in stock at Envirotronics' headquarters in Grand Rapids, Michigan, and if ordered prior to 2:00 pm EST, can be shipped the same day. Standard parts orders for our Value Plus™ customers, if ordered prior to 2:00 pm EST, can be delivered the following day. Shipping is F.O.B. our dock.

**Contact our Customer Support Group**

**Tel: 616-554-5022**

**Fax: 616-554-5024**

**Email: [service@envirotronics.com](mailto:service@envirotronics.com)**



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Web [www.envirotronics.com](http://www.envirotronics.com)



## **RECOMMENDED SPARE PARTS**

If a day or two of downtime does not present a problem for you to accomplish your testing requirements, read no further.

It is highly recommended that our customers maintain a minimum quantity of spare parts for emergency situations. Envirotronics maintains a complete inventory of spare parts at our main plant and each field service vehicle is stocked with frequently used parts and materials. However, there are occasions when certain parts are not readily available. Whether your chamber is under warranty or not, a “Spare Parts Package” can save you money.

- First, you save shipping costs.
- Second, you assure expedient repairs and minimize downtime.
- Third, you receive discounted prices if you purchase the package.

Please contact our Product Support Group if you have any questions or would like a quotation for a Recommended Spare Parts Package.

**Envirotronics Product Support Group: 1-800-368-4768  
616-554-5022**



## Value Plus™ Special Service Program

### Value Plus Special Service Program

Envirotronics' Value Plus Program is an all-inclusive pre-paid service agreement to be used for emergency service, refrigeration retrofits, calibrations, preventive maintenance, equipment relocation, instrument upgrades, equipment startups, installations, parts, and materials. In addition, the Value Plus Program offers many additional valuable cost-saving benefits. The program is available in blocks of \$4,000 and multiple blocks are available. Our Value Plus Customers enjoy the full benefit of this program until the total investment is exhausted.

### Become an Envirotronics "Value Plus Customer" and enjoy the following benefits...

- Labor rate **15% off** the normal local labor rate
- Travel time: **25% off** current service rate
- Mileage: **No charge**
- **10% discount** on all parts and materials
- **20% discount** on selected instrument calibrations
- **No overtime charges** Monday through Friday
- **Next day delivery** of all parts in stock if ordered by 2:00 PM Eastern Standard Time.
- **No expiration date**

Total Price is \$4,000 per Block  
**Contact our Customer Support Group  
to become a Value Plus Customer!**



### Terms and Conditions

1. The contract amount can be utilized for any type of service required, including emergency service, preventive maintenance, travel, parts, materials, calibrations, training, or any other service necessary.
2. Travel time: 25% off current service rate
3. Mileage: No charge
4. The 10% discount will apply to all parts and materials.
5. Technical support is available through the headquarters in Grand Rapids, MI between 8:00 AM and 4:30 PM Monday through Friday.
6. The 20% discount for calibrations is good for most instruments (some sensors are not included).
7. Overtime charges under this contract (weekends only) apply to Saturdays, Sundays, and Holidays. Saturdays will be time and one half. Sundays will be double time, and Holidays will be double time and one half. Weekend and Holiday rates are based on regular rates, not reduced rates.
8. Most standard parts are in stock at Envirotronics' headquarters in Grand Rapids, MI, and if ordered prior to 2:00 PM E.S.T., can be delivered the following day. Shipping is F.O.B. our dock.
9. This contract is valid until the total investment is exhausted.
10. Payment terms are net 15 days A.R.O. for the entire value of the contract. (Invoiced immediately upon receipt of P.O.).
11. Airfares, car rentals are billed at cost.

\* Prices are based on current rates and are subject to change. The above discounts are based on prepayment of the Value Plus invoice. Work performed prior to receipt of payment are billed at standard rates.

Travel time is based on portal to portal.

