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Introduction

This manual is designed to aid and instruct the user in the installation, operation and service of the PGC-6 series controlled environment chamber, referred to as simply “chamber” or “unit” in this manual. The contents of the manual will provide a reference for the programming of the chamber to meet the basic requirements for simulated environmental studies.

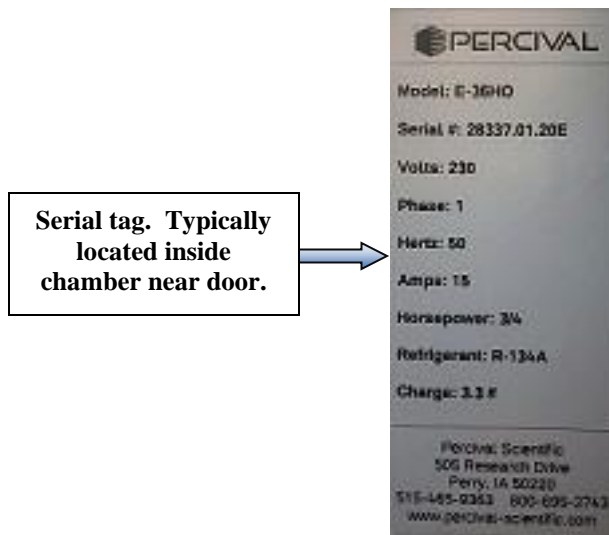
The user is reminded that Percival Scientific, Inc. is available to assist the technician (or researcher) in setting up programs for specific projects. We can be reached via telephone by calling either 1-800-695-2743 or 515-465-9363, or by sending e-mail to service@percival-scientific.com.

Percival Scientific continuously studies the design of its controlled environment equipment in order to offer the customer the best equipment available for their lab needs. As a consequence, changes in the design and operation of equipment occasionally occur without publication. Please feel free to contact Percival Scientific directly for product updates.

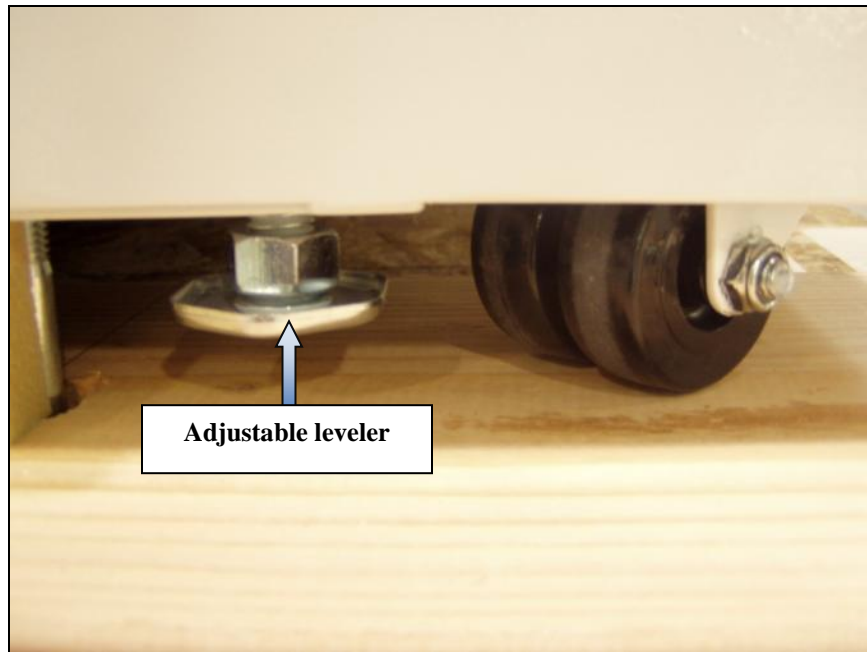
Installation

Locate the chamber

The location of this chamber is extremely important in order to achieve and maintain optimum performance from the unit throughout its designed operating range(s). The initial factor for determining the proper location is the service facilities. Refer to the chamber’s serial tag and/or the Basic Cabinet Electrical Diagram for electrical service requirements and locate the unit near the proper facilities.



The area in which the chamber is to be located should be as level as possible. Adjustable levelers may have been provided to allow for compensation for unevenness in the floor area. If not, wood or metal shims may be used to level the unit.



Care should be taken to locate this chamber in an area that allows suitable ventilation and circulation. If an air-cooled condensing unit is provided, allow a minimum six-inch space at the rear of the chamber to properly ventilate the condensing unit. If an air-cooled condensing unit is provided, do not block the air inlet screen that covers the front of the condensing unit compartment.

To maintain maximum efficiency from this unit, it is suggested that ideal ambient conditions be approximately 75°F (24°C) and 50% relative humidity. High ambient temperatures may measurably affect the unit's performance.

Uncrate the chamber

If the chamber is crated, remove the top and sides of the crate and all wrappings. If it is not crated, remove the shrink-wrap surrounding the unit. Carefully inspect these shipping materials (crate or shrink-wrap) to insure no loose parts were fastened to them that may accidentally be discarded. Some loose parts may have been shipped separately. Please verify that the proper quantity and type of parts were received as per the Bill of Lading.

Remove loose parts and shipping materials

Remove all loose parts and shipping materials from inside the chamber. Unwrap all loose parts that are to be installed in or on the unit.

Remove chamber from skid

From the underside of the skid, remove the four bolts holding the chamber to the skid and carefully slide the unit off the skid or use a forklift to lift the chamber off the skid.

⚠ WARNING

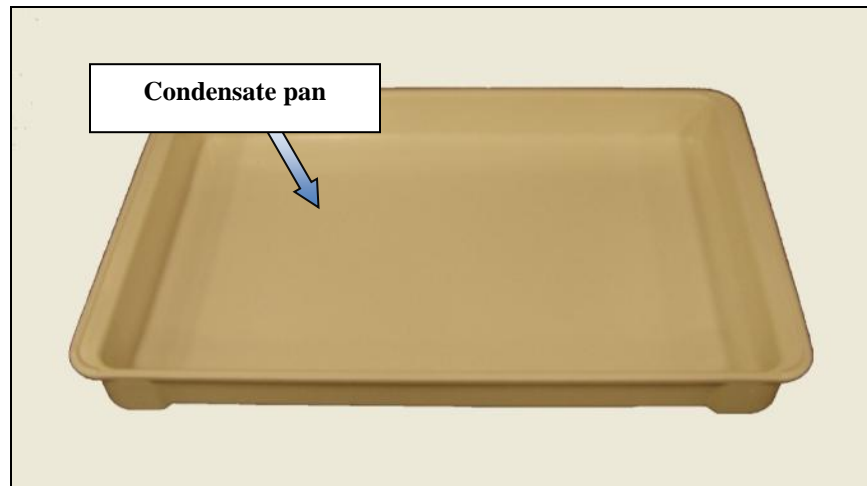
The chamber is heavy!!!

Vacuum chamber floor

Vacuum out the chamber floor. Be sure not to miss vacuuming the edges and corners of the floor. During shipment metal filings may drop and settle on the floor. If these filings are not vacuumed, they will potentially contribute to rusting of the floor.

Install condensate pan or connect tubing to drain line

If a condensate pan was shipped with the chamber, place it under the chamber beneath the drain in the floor. The pan collects all water that is drained from the chamber. The pan should be checked periodically and emptied when full to prevent water from overflowing onto the floor.



If a condensate pan is not provided then a floor drain line exists. The floor drain line is plastic tubing that directs condensed water from the chamber. The tubing terminates at the bottom rear of the chamber. Connect tubing to this line and direct to an appropriate drain.



Make water-cooled condensing unit connections (if applicable)

If a water-cooled condensing unit is utilized, make water inlet and outlet connections to the unit. If assistance is required in making these connections, contact your service representative. If no service representative is available, contact Percival Scientific for instructions on making these connections.

Make humidifier water source connection (if applicable)

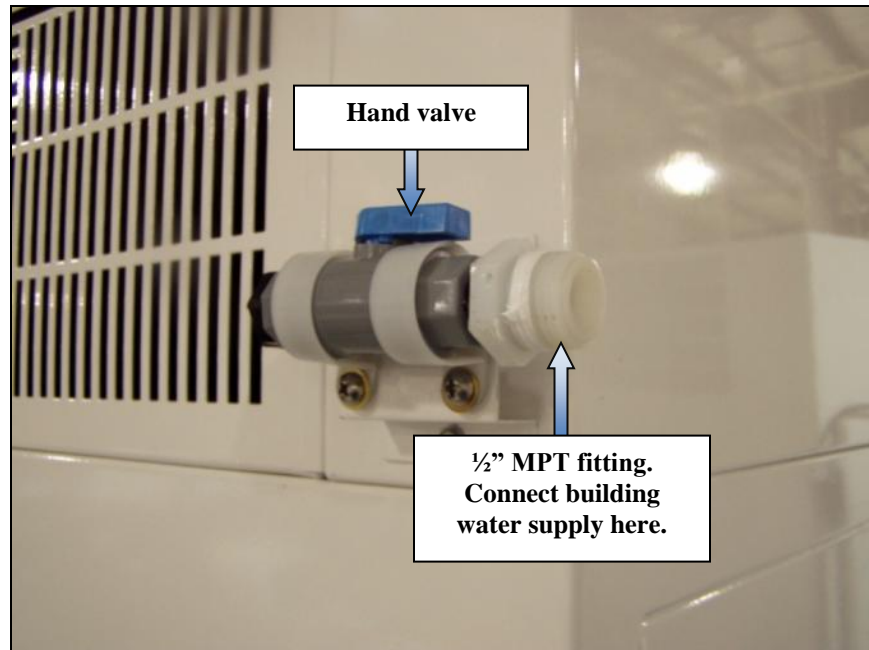
- Ultrasonic humidifier water requirements – If an ultrasonic humidifier is provided, refer to the attached Stulz instruction manual for water requirements. The Stulz manual is located in the **Associated Diagrams, Schematics and Miscellaneous Information** section of this manual. It is recommended that the Stulz manual be thoroughly read before operating the chamber to ensure that the humidifier will operate as designed.

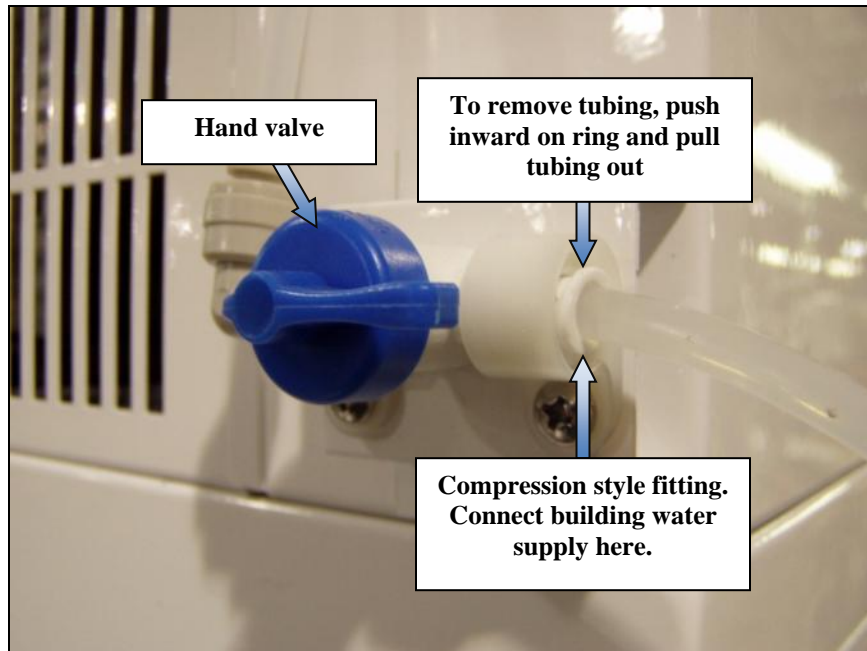
Note: For ultrasonic humidifiers it is required that demineralized water is used and the supply meets or exceeds the requirements listed in the attached Stulz manual.

- Pan-type or spray nozzle humidification water requirements – pH: 7.0 ± 0.5
- Filtration: < 2 microns
- Resistivity: 0.5 – 5.0 MΩ
- Water Pressure: Minimum 40PSI required for spray nozzle humidification.

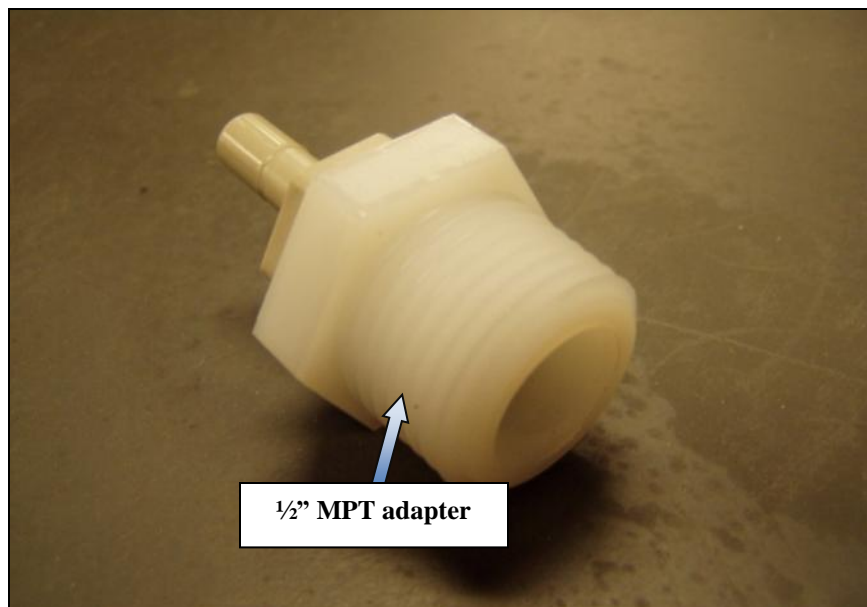
Note: It is strongly recommended that de-ionized, distilled or de-mineralized water (water that has been treated to remove nearly all minerals and sodium that occur naturally in water) be used for pan-type or spray nozzle humidification. If using mineralized water, expect chemical and mineral buildups throughout chamber requiring frequent and thorough cleaning to prevent system performance degradation and equipment damage. It is recommended that de-ionized water be used. De-ionized water can be obtained by adding a water softener to the water supply.

When a humidifier is supplied, the chamber is equipped with a hand valve and water line which terminates with either a ½ inch MPT fitting or a compression style fitting. The humidifier water supply fitting is located on the outside rear of the chamber or inside the end section. To access the valve when it's located inside the end section, remove the end panel or rear bottom panel of the end section. The end panel simply lifts out and the rear bottom panel is secured with screws. The water line shut off valve can be used to shut off the water supply to the humidifier during maintenance or troubleshooting.





If a 1/2" MPT fitting is supplied, your water supply (see note above) should be connected to this line with a 1/2" FPT fitting for proper compatibility. If a compression style fitting is provided, either connect 1/4" tubing directly to the fitting or install a 1/2" MPT adapter. To directly install 1/4" tubing simply insert the tubing into the fitting as far as it will go (see photo above). If it becomes necessary to remove the tubing, push inward on the ring surrounding the tubing and pull the tubing out of the fitting.



(Optional) 1/2" MPT adapter. Insert into compression fitting and connect water supply with 1/2" FPT fitting

Once the proper water supply connections have been made, open the water line hand valve and turn the water supply source on. The humidifier automatically adjusts for the proper water level.

⚠ WARNING

Under normal temperature operating conditions, to prevent damage to humidifier, always ensure that the water supply source is on and the water line shut off valve is in the open position. Operating the humidifier without water may damage the humidifier.

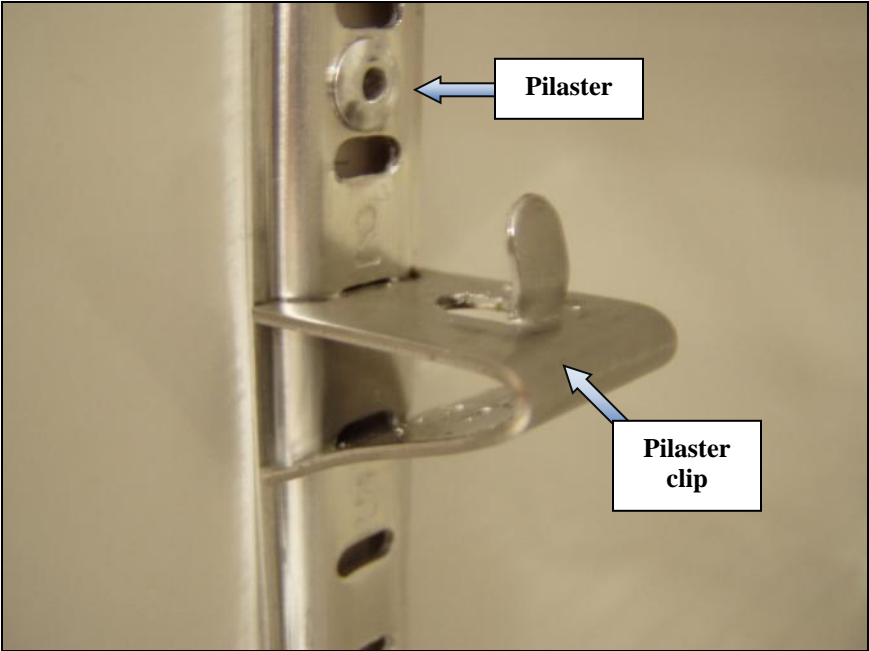
Install shelving

Securely fasten the supplied pilaster clips into the pilasters located inside the chamber at the desired elevation for each shelf.

A pair of pliers or similar tool may be required to install shelf clips on the pilasters. Once the clips have been securely attached, install the shelves by resting the shelf frame on the clip's upper surface between the pilaster and the clip's raised tab.

Repeat this process with any additional shelves.

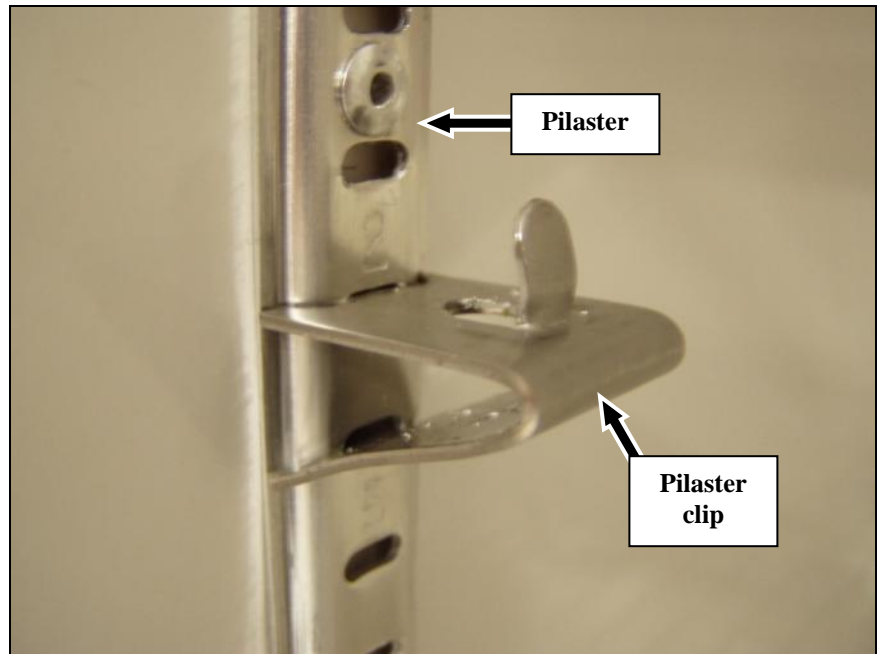
PGC-6L2 This chamber has a tiered configuration which utilizes two or more steel wire shelves.



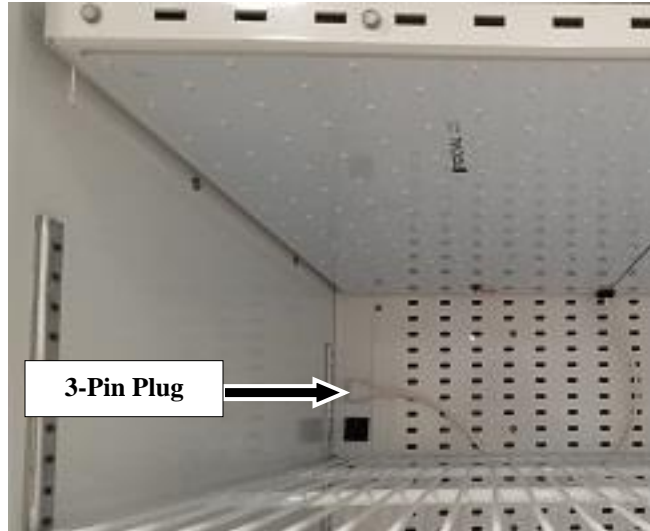
Install SciWhite® LED tiles (standard)

If your chamber includes standard SciWhite® LED tiles, the fixtures may need to be installed.

- PGC-6L2 Securely fasten the supplied pilaster clips into the pilasters located inside the chamber at the desired elevation for each fixture.
A pair of pliers or similar tool may be required to install the clips on the pilasters. Once the clips have been securely installed, install the fixture on the clips.



Before starting the chamber, be sure that all the 3 pin plugs are securely inserted to the correct outlet.



Install fluorescent and / or incandescent lamps (if applicable)

The PGC-6 series controlled environment chamber is capable of utilizing different lamp fixture styles as lighting options. Depending on the option you ordered, you will have lamp fixtures supplied with either standard fluorescent lamps, compact fluorescent lamps or HID lamps. Locate and install all lamps in the lamp fixtures supplied.

Refer to the chamber lighting diagram(s) provided in the **Associated Diagrams, Schematics and Miscellaneous Information** section of this manual for lamp style and wattage requirements.

It is possible that the style of fluorescent lamps used in this chamber do not show visible signs of aging (darkening of the ends). It is recommended that the lamps in this chamber be replaced after every 12,000 hours of use for tube and compact fluorescent lamps. **Failure to replace lamps may cause damage to lamp fixtures.**

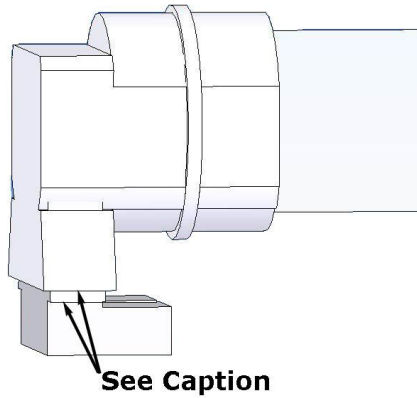
PGC-6NL	This option does not include lights.
PGC-6L	Two or more lamp fixtures consisting of tube fluorescent bulbs and incandescent bulbs are utilized in this configuration. Please refer to the instructions below to install bulbs in the lamp fixtures. When plugging in lamp fixtures, please ensure the plugs are completely inserted into their respective receptacles. Failure to do this can cause damage to the lamp fixture and possibly to the receptacles. *

Standard tube fluorescent lamp installation/removal (if applicable)

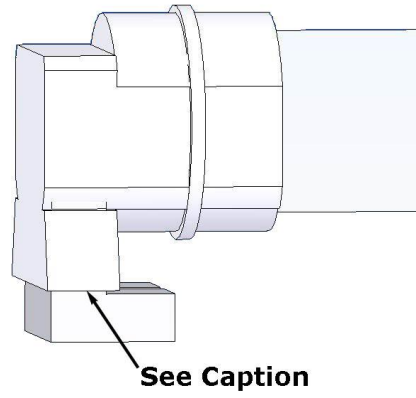
To install a standard tube fluorescent lamp, place end caps over the ends of the lamp and slide the lamp with caps over the lamp holders until it snaps in place. Do not

twist lamps as they may break. To remove any lamp, grasp the lamp by the end caps and pull the lamp straight away from the lamp holders.

NOTE: The lamp holder caps must be securely installed against the lamp holders! Please reference the drawings below:



Incorrect installation – gap exists between lamp holder cap and lamp holder



Correct installation – no gap exists

Note! Never plug in lights or lamp fixtures when the chamber power is on.

Compact fluorescent lamp installation/removal (if applicable)

To install a compact fluorescent lamp when metal support clips are supplied, insert the lamp into the lamp holder and push upward on the opposite end of the lamp near the clip until the clip supports the lamp. To remove a compact fluorescent lamp, pull downward on the lamp near the clip and once the lamp is free from the support clip, pull the lamp straight away from lamp holder. Repeat this process with any additional lamps.

To install a compact fluorescent lamp when plastic support clips are supplied, insert the lamp into the end support clip and then push lamp directly into the lamp holder. Next, secure the lamp by closing the clip. To remove a compact fluorescent lamp, unclip the end support and pull the lamp directly away from lamp holder. Repeat this process with any additional lamps.

Note! Never plug in lights or lamp fixtures when the chamber power is on.

Make chamber electrical connection

Before making the chamber electrical connection, check the line for proper size and voltage. Refer to the serial plate or Basic Cabinet Electrical Diagram for unit voltage and amperage requirements. For example, if a 120VAC, 15-amp connection is required, ensure that the source power and service receptacle is 120VAC and meets or exceeds 15A. **If your unit is equipped with (2) power cords, each cord must have a dedicated circuit (2 separate**

circuits) even if the total amperage is under the rated amps of the circuit. Consult an electrician if unsure. The line voltage generally should not be $\pm 10\%$ outside of the voltage required for your chamber. If the voltage is outside of this range, damage to the subcomponents of the chamber can occur.

The National Electric Code states that a circuit cannot be loaded more than 80% of the circuit capacity for continuous load applications. This means for a 20-amp circuit, you can only have a maximum of 16 amps plugged into that circuit. A maximum of 12 amps for a 15-amp circuit.

For models provided with hermetic (welded) condensing units with extended voltage motors (e.g. 208/230V), it is recommended that the voltage be within the range of -5 % to +10 %. Refer to the condensing unit item listing on the Basic Cabinet Electrical Diagram for condensing unit voltage requirements.

Once the line voltage and size has been verified, connect the chamber's electrical source plug(s) to the appropriate service receptacle(s). The use of extension cords and/or power strips is strictly prohibited.

⚠ CAUTION

Insufficient electrical service will cause the circuit breaker to trip at the service load center, leading to premature failure and voiding the warranty.



Single 20-amp duplex circuit rated for only one power cord.



Two cords plugged into the same circuit is not recommended.



Quadplex 20-amp outlet. Each side should be labeled if separate circuits. Left side on one circuit (one cord), right side on another circuit for the second cord.

Be sure that all plugs are secured before switching the power on.

After ensuring that all the plugs are secure, turn the power switch located on the control panel to the “On” position. If the chamber does not immediately power up, a malfunction in the unit may have occurred. If this happens, please contact Percival Scientific as soon as possible to request technical assistance.

Chamber Operating Ranges



Operating this chamber outside the specified ranges could result in loss of temperature/humidity control, cause mechanical component damage/failure and could invalidate the warranty.

Temperature

The PGC-6 controlled environment chamber is designed to operate within the temperature ranges specified in Table 1 below.

Table 1 Standard Chamber Operating Ranges (Temperature) *	
PGC-6NL	2°C to 44°C ± 0.5°C
PGC-6L2	2°C to 44°C ± 0.5°C (lights off) 7°C to 44°C ± 0.5°C (lights on)

* - These temperatures are achievable when ambient conditions are 24°C (75°F) or below. Higher ambient temperatures may affect the operating ranges.

Humidity (if applicable)

The PGC-6 controlled environment chamber is designed to operate within the humidity ranges specified in Table 2 below.

Table 2
Standard Chamber Operating Ranges (Humidity)

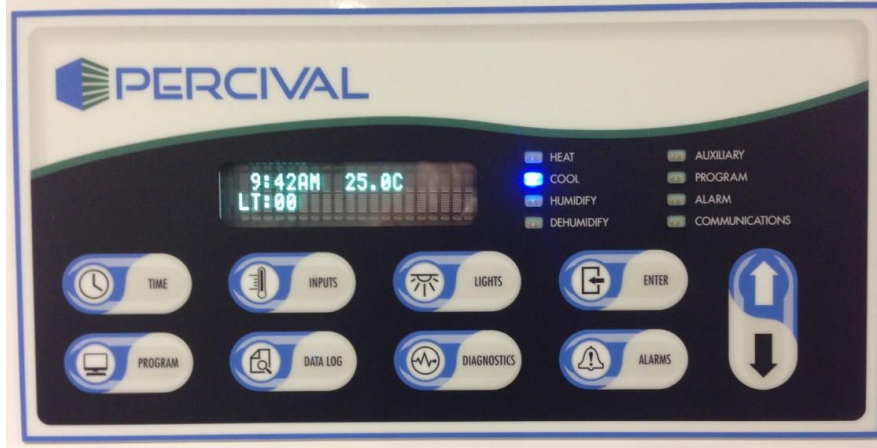
PGC-6 Series	Up to 85% (lights off) over 15°C to 30°C *
	Down to 40% when optional dehumidification system is provided *
* Various humidifier & chamber options may affect humidity ranges listed. Humidity tolerances: ± 5% when HMP110 controlled, ± 10% when HMP60 controlled.	

* - These humidity levels are obtainable with all lights off. With the lights turned on, the maximum humidity level that can be obtained will decrease. Certain ordered humidifier and chamber options may further affect the operating ranges.

Note: The operating temperature range for all standard humidification / dehumidification packages is **15°C to 30°C**. Chambers equipped with any standard humidification / dehumidification option must be operated within this specified temperature range when the humidification / dehumidification system is enabled. If test requirements call for temperatures below 15°C or above 30°C, the humidification / dehumidification system should be disabled. Please refer to the attached *Intellus Controller Manual* for instructions regarding disabling the humidification / dehumidification systems. **The systems are automatically disabled outside of 10°C and 40°C.** Failure to follow these procedures could result in loss of temperature control or cause mechanical malfunction in the chamber.

Control System

The standard control system for the PGC-6 controlled environment chamber consists of an Intellus microprocessor programmable controller and the mechanical components that condition the chamber environment. Please refer to the attached *Intellus Controller Manual* for information regarding the use and operation of the Intellus microprocessor and how it controls/maintains chamber temperature, humidity (if provided), CO₂/Auxiliary (if provided), lighting and utilizes programs.



IntellusUltra Controller

On standard PGC-6 series chambers, a ceiling mounted unit cooler, employing air circulating fans and an evaporator, works in conjunction with one or more electric heaters and a condensing unit to heat and cool the chamber. Heating of the air is accomplished using a combination of electrical wire heaters and by diverting hot gas from the compressor to the evaporator. Cooling of the air is accomplished by diverting cooled refrigerant to the evaporator.

Note! When placing your experiment on the shelving, locate the containers in as uniform and evenly spaced pattern as possible to minimize the obstruction of developed airflow patterns. Completely covering the shelves will adversely affect chamber performance. As a rule of thumb, Percival Scientific recommends that no more than 80% of the total shelf area be covered.

Sensor Aspirator Box

All control sensors (temperature, humidity, etc.) are located inside an aspirator box. The purpose of the aspirator box is to pull a sample of air over the sensors. Placing the sensors in the box reduces the effect that radiant energy produced by lighting has on them. Unprotected sensors can also be adversely affected if they are subjected to the varying airflow patterns throughout the chamber. Placing the sensors in the box ensures a uniform sample of air will be passed over the sensors. The location of the box ultimately determines temperature and humidity control of the chamber. Place the box in a location that allows for free movement of air.

Please note that the location of the box determines control for the entire chamber. If temperature and humidity control of a particular area of the chamber is important to your experiment, move the box to this location.



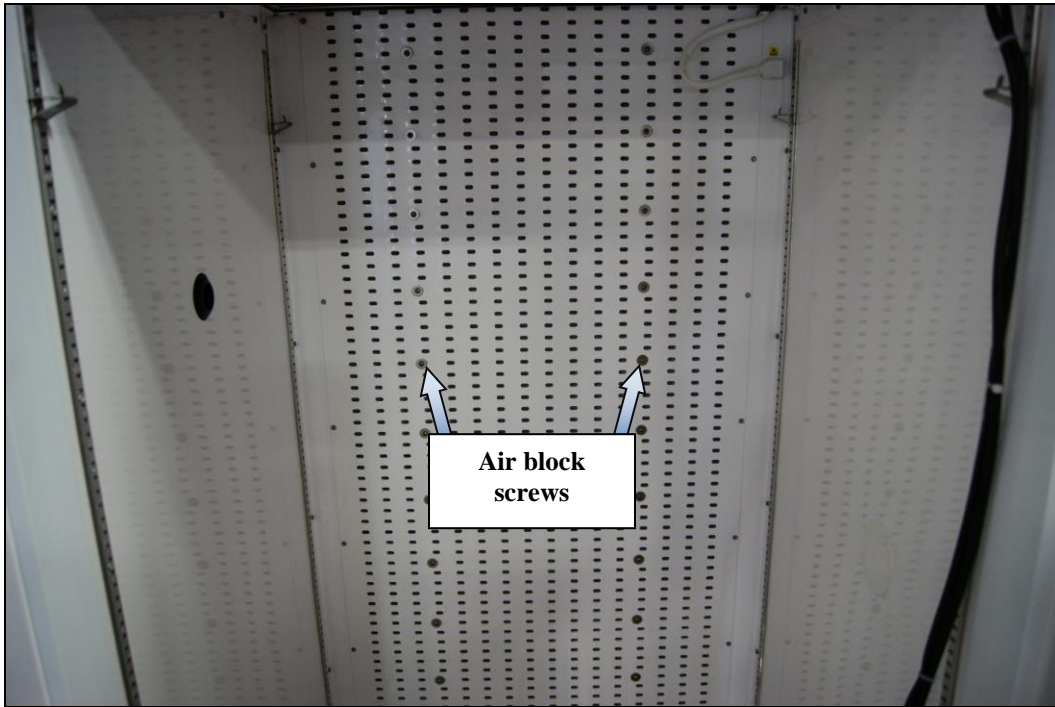
Remote Alarm Contacts (if applicable)

If the remote alarm option is incorporated, a terminal block is provided to connect an existing remote alarm system to the chamber's temperature safety system. Dry alarm contacts are provided with a normally closed set of contacts and a normally open set of contacts. Depending on the input trigger required for the existing alarm system, make an electrical connection from the alarm input to the appropriate terminals on the terminal block. If a temperature safety occurs, the state at each set of the contacts will change, meaning that the normally open contacts will close and the normally closed contacts will open.

Air Blocks (if applicable)

Adjustable air blocks may have been provided to increase or decrease the level of airflow over one or more shelves. If you desire more or less airflow over a shelf, adjust an air block by loosening the screws for the air block you wish to adjust. Each air block is adjusted with a pair of screws. **Do not remove the screws or the air block panel will detach.** Only unscrew the screws far enough so that the air block panel will slide horizontally. Once the panel has been adjusted, retighten the screws.

Percival Scientific adjusts the panels at the factory to achieve optimum temperature uniformity between each tier of shelving. Normally, you do not need to adjust the panels. If you observe that the temperature uniformity is not optimal, you can adjust the panels. Please be aware that adjusting the panels will affect the uniformity over the other tiers of shelving (e.g. increasing the airflow over the top tier of shelving will decrease the airflow over the lower tiers).



Chamber Lighting (if applicable)

The Intellus controller is used to control all lighting within the chamber. Please refer to the attached *Intellus Controller Manual* provided for more information. Fluorescent lighting is accomplished in either an on/off or dimmable fashion. If the lighting is controlled in an on/off fashion, one or more lighting outputs have been set up on the Intellus controller to turn the lights on and off.

If lighting is controlled in a dimmable fashion, either the auxiliary channel or one or more lighting outputs have been set up on the Intellus controller to dim the lights. If the fluorescent lights are set up to dim, there will be a minimum and maximum programmable level allowed for the lighting. If dimmable lighting is provided, please refer to the supplemental information on dimmable lighting provided in the **Associated Diagrams, Schematics, and Miscellaneous Information** section for additional information.

Lighting Specifications

Listed in Table 3 below are maximum achievable light intensities in the standard PGC-6 Series controlled environment chambers.

Table 3 Lighting specifications in micromoles (µmoles)	
PGC-6NL	Not applicable. This chamber does not come with lights
PGC-6L2	680 µmoles / m ² / sec @ 6" from the LED fixtures *

* All published light intensities are measured 6" from the center of the fixture at a temperature of 24°C and a lifetime of 100 hours. These conditions for measurement are a plant growth industry standard.

Chamber Humidity (if applicable)

The Intellus controller is used to control any humidification or dehumidification system provided with the chamber. Please refer to the attached *Intellus Controller Manual* provided for more information.

When the controller senses the chamber relative humidity level has dropped below the set point, it activates the humidification system if it is programmed to be on. When the controller senses that the relative humidity level has risen above the set point, it activates the dehumidification equipment (if applicable) if the dehumidification system is programmed to be on. When relative humidity levels considerably above ambient are desired, turn the dehumidification system off. Likewise, for low relative humidity levels deactivate the humidification system. Depending on ambient conditions, relative uniformity should improve.

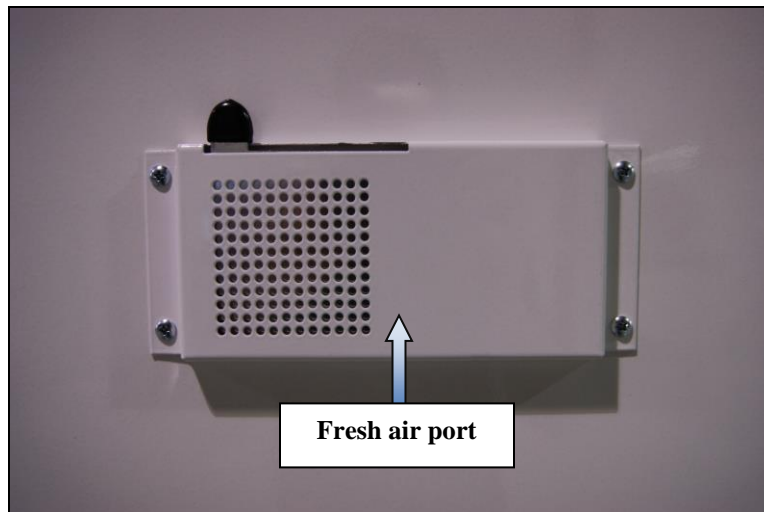
The performance of humidity control is dependent upon the laws of thermodynamics. As the temperature controller cycles the flow of refrigerant to the evaporator coils the relative humidity will fluctuate as the temperature of the evaporator coils fluctuate.

Excessive dehumidification will cause the dehumidifying coil (if applicable) to freeze water on its surface, thus reducing the air flow, which in return will cause poor temperature and humidity control. If this condition occurs, raise the relative humidity control setting.

If the chamber was ordered with humidification only, please ensure that the access ports are open when operating the humidity system. Doing so will improve the control of the humidity system. The ports should only be closed when you want to obtain higher levels of humidity.



When operating at levels greatly above or below ambient relative humidity, it will be necessary to close the fresh air intake ports (if applicable) of the chamber. If you have any questions or any problems, feel free to contact our offices for advice.



Note: The operating temperature range for all standard humidification / dehumidification packages is **15°C to 30°C**. Chambers equipped with any standard humidification / dehumidification option must be operated within this specified temperature range when the humidification / dehumidification system is enabled. If test requirements call for temperatures below 15°C or above 30°C, the humidification / dehumidification system should be disabled. Please refer to the attached *Intellus Controller Manual* for instructions regarding disabling the humidification / dehumidification systems. **The systems are automatically disabled outside of 10°C and 40°C.** Failure to follow these procedures could result in loss of temperature control or cause mechanical malfunction in the chamber.

Maintenance

The following information describes the recommended maintenance procedures that should be periodically performed.

⚠ WARNING

Insure that chamber power is removed prior to performing any maintenance!

Condensate pan (if applicable)

The condensate pan is located under the chamber. This pan collects all water drained from the chamber and should be checked weekly and emptied as required. The condensate pan can be emptied without removing chamber power.

Recommended maintenance schedule: Weekly.

Case

To clean the chamber's interior and exterior, use soap (or mild liquid detergent) and water. Do not use abrasive type cleaners because these will scratch the surface.

To clean stainless steel, use an approved stainless steel cleaner.

Recommended maintenance schedule: Every 3 months.

Air cooled condensing unit (if applicable)

It is necessary for air to pass freely over the condenser. Air flow is provided by a fan and motor which operate when the chamber is on. Dust will tend to collect on the condenser and condenser fan blade on the side at the point of air entry. To clean, locate the condenser and fan blade on the condensing unit. Blow the dust out of the condenser from behind with compressed air or by brushing and vacuuming. Wipe the condenser fan blade with a clean cloth to remove dust and dirt.

Recommended maintenance schedule: Every 3 months.

Water cooled condensing unit (if applicable)

It is recommended that a service group check the condensing unit's water flow rate every six to twelve months.

Evaporator and fan blades (unit cooler)

It is recommended that the evaporator and fan blades be inspected for the accumulation of dirt. To access the evaporator and blades, carefully remove the unit cooler cover. Accumulation of dirt around the evaporator fin openings will indicate the need for cleaning the blades and evaporator. Clean the evaporator by brushing, vacuuming and/or by using compressed air. The unit cooler drain line and humidifier reservoirs should be checked and cleaned, if necessary, at this time with a solution of vinegar and water.

On chambers provided with phenolic coated evaporator coils, the following procedures can be used to clean the evaporator.

NOTE: The following procedures are approved for **phenolic coated coils only** and should not be used for chambers equipped with standard coils.

1. Disconnect power to the chamber by removing all chamber power cords.
2. Remove all interior lamp fixtures and shelving. There may be electrical heaters mounted behind the unit cooler that should be removed prior to cleaning.
3. Flush the coil with water to rinse loose residue clean and allow the water to soak 10-20 minutes to loosen any surface residue. Avoid spraying water into any exposed receptacles.
4. Acceptable cleaners
 - a. Liquid soap detergent and warm water
 - b. Lysol
 - c. Pinesol
 - d. Pine oil or other terpene based cleaners
5. Flush unit with cleaner thoroughly until all signs of residue are eliminated.
6. Rinse with clean water.
7. Allow the unit to dry completely prior to putting the unit back into service.

Recommended maintenance schedule: Every 12 months.

Fan blades (if applicable)

It is recommended that the fan blades be inspected for the accumulation of dirt. To access the fan blades, remove the protective fan guards. Clean the blades by brushing, vacuuming and/or by using compressed air.

Recommended maintenance schedule: Every 12 months.

Shelf air diverters (if applicable)

On certain PGC-6 models air diverters may have been provided beneath the shelves. To clean the air diverters, remove the shipping screws that secure the diverters to the chamber and carefully slide each diverter out of the chamber. Remove the perforated covers by removing the screws. Clean the inside of the diverters. After cleaning, re-install the perforated covers and carefully slide the diverters back into the chamber. Insure that each diverter is pushed all the way against the rear wall.

Lamps (if applicable)

To maintain optimum light intensity, a monthly check of the lamps is suggested. Trouble may develop with the lighting system in any one of three areas: The lamps, the electrical wiring or the ballasts. By systematically checking each component, the trouble may be isolated and corrected.

Replacing a suspected bad tube with a known good tube can check lamps. If this fails to correct the problem the ballast may be defective. Check the ballast for over-heating and check voltage output.

It is possible that the style of lamps used in this chamber do not show visible signs of aging (darkening of the ends). It is recommended that the lamps in this chamber be replaced after every 12,000 hours of use for tube and compact fluorescent lamps. **Failure to replace lamps may cause damage to lamp fixtures.**

Refer to the Installation section of this manual under the “**Install Lamps**” section for information on lamp installation and removal.

NOTE: The chamber may utilize ballasts that control multiple-lamps. When changing a failed bulb, it is recommended that all lamps controlled by the multiple-lamp ballast are simultaneously replaced.

Pan type humidifier (if applicable)

If provided with a humidifier pan that is mounted behind the unit cooler it is recommended that the pan be removed and cleaned. Prior to cleaning the pan, shut off the water supply to the humidifier by closing the water supply hand valve located on the outside rear of the chamber or inside the end section. Remove the upper light fixture. Place a bucket under the drain tubing located in the pan front. Open the drain and allow all water to drain from the pan. Remove the humidifier pan by unscrewing the pan from the rear receptacle panels and ceiling. Unplug the humidifier heater and float switch power cords from their receptacles. Remove the humidifier heater and float switch from the pan. Clean the pan with a mixture of vinegar and water. Baking soda may also be added to the mixture if necessary. When finished, reinstall the components in the reverse order.

Recommended maintenance schedule: Every 6 months or sooner depending on water quality.

Ultrasonic humidifier (if applicable)

To access the ultrasonic humidifier, lift the end panel up and pull the bottom of the panel toward you. The panel should drop out of the support.





Periodically check the discharge from the humidifier (while the Intellus controller is calling for humidity) to verify that the humidified air produced is composed of very fine water droplets. The proper humidity rich air discharged from the ultrasonic humidifier is composed of very small water droplets and looks like fog or smoke. The production of large water droplets or no water droplets at all could signal a malfunction in the humidifier.

Recommended maintenance schedule: Periodic – at the customer’s discretion

Perform proper upkeep on the treated water system used to supply water to the humidifier. Water with improper mineral content can rapidly cause premature problems with the ultrasonic humidifying elements and lead to malfunction of the humidity system. Please refer to the humidity section under installation for reference on the required water quality for the ultrasonic humidification system.

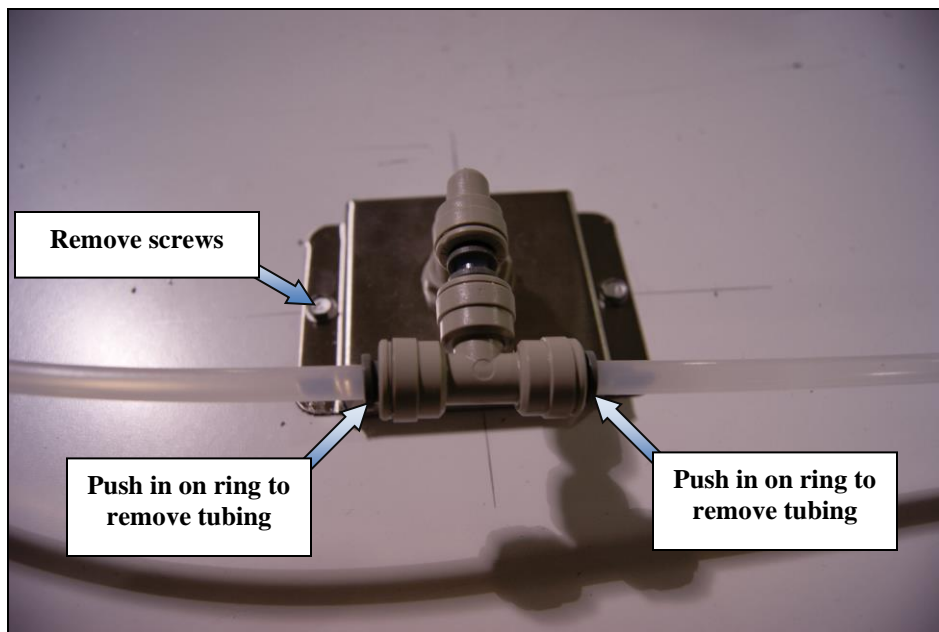
Recommended maintenance schedule: As per the manufacturer’s requirements

For additional maintenance information on ultrasonic humidifiers, please refer to the Stulz manual provided in the **Associated Diagrams, Schematics and Miscellaneous Information** section of this manual.

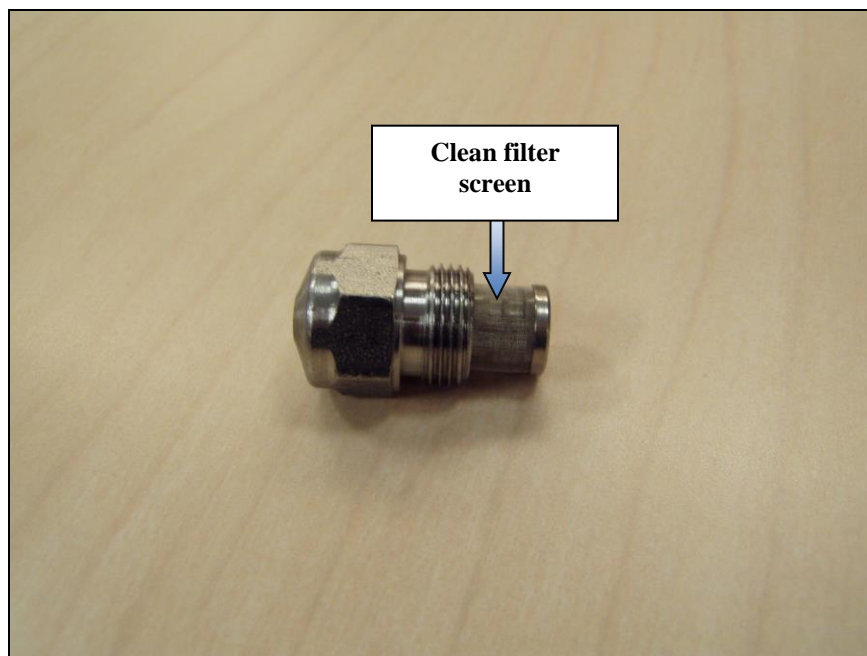
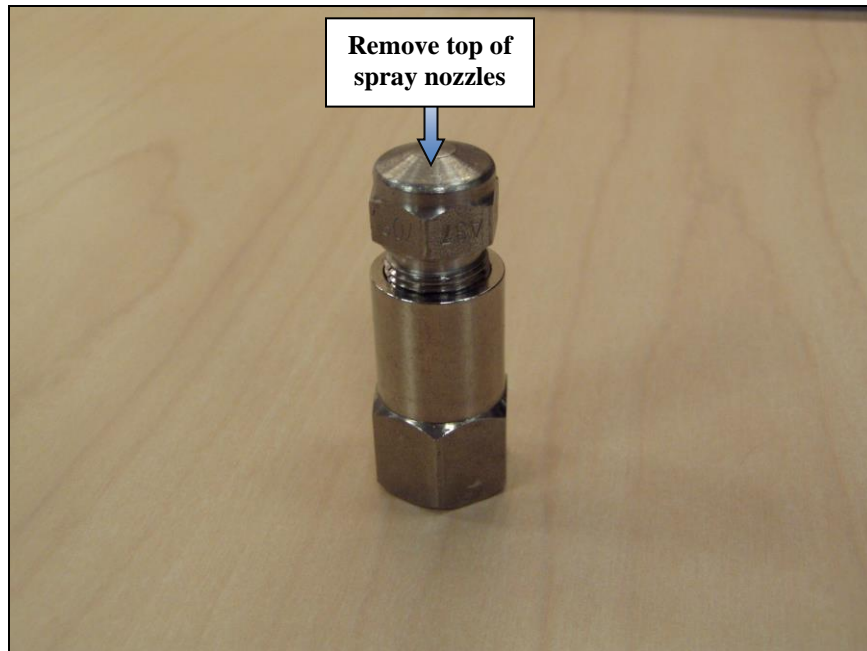
Spray nozzles (if applicable)

The spray nozzle support brackets are located on top of the unit. Close the water line hand valve which is located either in the condensing unit compartment or on the rear of the chamber before attempting to clean the spray nozzles. Next, disconnect the water lines from each spray nozzle by pressing inward on the compression fittings surrounding the tubing. It is suggested to place a small bucket or other water receptacle under the tubing to catch the water that will drain from the tubing. Pull the tubing out once you have pushed the fitting ring all the way in.

Once the water lines are disconnected, remove the screws that secure the spray nozzle support brackets to the top of the chamber. Next, carefully pull the spray nozzles out by lifting straight up on the brackets. The spray nozzles have been wrapped in foam to provide a seal around the nozzles. The foam will provide resistance when removing the nozzles.



Check the filter screens inside the spray nozzles for the accumulation of deposits. Clean as necessary. To access the filter screens, twist the tops of the spray nozzles off by using a wrench. If there are deposits in the spray nozzle screens, ensure that the water supply meets or exceeds the requirements listed above.



Inspect the water line supplying the spray nozzles to ensure that there are no kinks in the line and that the water flow is sufficient. A minimum water supply of 40 PSIG is required. When finished, reinstall the components in the reverse order.

Recommended maintenance schedule: Every 6 months or sooner depending on water quality.

Temperature Conversion Chart

Locate the temperature you wish to convert in the center or common column of the chart. If you are converting a Centigrade reading to Fahrenheit, read the adjacent Fahrenheit temperature in the right hand column under F. For a Fahrenheit conversion to Centigrade, read the adjacent Centigrade temperature in the left-hand column under C.

C.	F.	C.	F.	C.	F.			
-73.3	-100	-148	0.56	33	91.4	24.4	76	168.8
-67.8	-90	-130	1.11	34	93.2	25.0	77	170.6
-62.2	-80	-112	1.67	35	95.0	25.6	78	172.4
-56.7	-70	-94	2.22	36	96.8	26.1	79	174.2
-51.1	-60	-76	2.78	37	98.6	26.7	80	176.0
-45.6	-50	-58	3.33	38	100.4	27.2	81	177.8
-40.0	-40	-40	3.89	39	102.2	27.8	82	179.6
-34.4	-30	-22	4.44	40	104.0	28.3	83	181.4
-28.9	-20	-4	5.00	41	105.8	28.9	84	183.2
-23.3	-10	-14	5.56	42	107.6	29.4	85	185.0
-17.8	0	32	6.11	43	109.4	30.0	86	186.8
-17.2	1	33.8	6.67	44	111.2	30.6	87	188.6
-16.7	2	35.6	7.22	45	113.0	31.1	88	190.4
-16.1	3	37.4	7.78	46	114.8	31.7	89	192.2
-15.6	4	39.2	8.33	47	116.6	32.2	90	194.0
-15.0	5	41.0	8.89	48	118.4	32.8	91	195.8
-14.4	6	42.8	9.44	49	120.2	33.3	92	197.6
-13.9	7	44.6	10.0	50	122.0	33.9	93	199.4
-13.3	8	46.4	10.6	51	123.8	34.4	94	201.2
-12.8	9	48.2	11.1	52	125.6	35.0	95	203.0
-12.2	10	50.0	11.7	53	127.4	35.6	96	204.8
-11.7	11	51.8	12.2	54	129.2	36.1	97	206.6
-11.1	12	53.6	12.8	55	131.0	36.7	98	208.4
-10.6	13	55.4	13.3	56	132.8	37.2	99	210.2
-10.0	14	57.2	13.9	57	134.6	37.8	100	212.0
-9.44	15	59.0	14.4	58	136.4	38	100	212.0
-8.89	16	60.8	15.0	59	138.2	43	110	230.0
-8.33	17	62.6	15.6	60	140.0	49	120	248.0
-7.78	18	64.4	16.1	61	141.8	54	130	266.0
-7.22	19	66.2	16.7	62	143.6	60	140	284.0
-6.67	20	68.0	17.2	63	145.4	66	150	302.0
-6.11	21	69.8	17.8	64	147.2	71	160	320.0
-5.56	22	71.6	18.3	65	149.0	77	170	338.0
-5.00	23	73.4	18.9	66	150.8	82	180	356.0
-4.44	24	75.2	19.4	67	152.6	88	190	374.0
-3.89	25	77.0	20.0	68	154.4	93	200	392.0
-3.33	26	78.8	20.6	69	156.2	99	210	410.0
-2.78	27	80.6	21.1	70	158.0	100	212	413.0
-2.22	28	82.4	21.7	71	159.8	104	220	428.0
-1.67	29	84.2	22.2	72	161.6	110	230	446.0
-1.11	30	86.0	22.8	73	163.4	116	240	464.0
-0.56	31	87.8	23.3	74	165.2	121	250	482.0
0.00	32	89.6	23.9	75	167.0			

Service Information - Temperature System

WARNING

**Disconnect all unnecessary electrical power when servicing equipment.
Majority of circuits are high voltage.**

Loss of temperature control - overheating or overcooling

- ✓ **Intellus controller:** Check the controller for the correct voltage output to the heating and/or cooling relay. The voltage should be approximately 5VDC. If the controller fails to output the correct voltage, repair or replace the controller.
- ✓ **Temperature sensor:** Check the sensor for the correct resistance and replace if necessary. The correct resistance is 100 ohms at 0°C.
- ✓ **Heating and/or cooling relays (as applicable):** Check the existing heating and/or cooling relays for correct output voltage.
- ✓ **Hot gas solenoid valve (if applicable):** When in the heating mode, the hot gas solenoid valve should be open and in the cooling mode the valve should be closed. If the valve is not functioning, replace solenoid or entire valve, evacuate, and recharge the refrigeration system - see Refrigeration Diagram and/or serial plate for type and amount of charge.
- ✓ **Liquid line solenoid valve (if applicable):** When in the heating mode, the liquid line solenoid valve should be closed and in the cooling mode the valve should be open. If the valve is not functioning, replace solenoid or entire valve, evacuate, and recharge refrigeration system - see Refrigeration Diagram and/or serial plate for type and amount of charge.

Loss of temperature control - overheating

- ✓ **Loss of refrigerant:** Check for loss of refrigerant. If leaks are found, correct, evacuate and recharge the refrigeration system - see Refrigeration Diagram and/or serial plate for refrigerant type and amount.
- ✓ **Restricted expansion device or restricted drier:** If adequate refrigerant exists in the system and if suction pressures are acceptable, the expansion device (capillary tube or expansion valve) inlet and/or the drier could possibly be restricted. To check the drier, gauge the outlet temperature with the inlet temperature. If the outlet is as warm as the inlet temperature, the drier is operating properly - if colder than the inlet, the drier is restricted.
- ✓ **Condenser & condenser fan:** Check the condenser and fan. If dirty, clean condenser and fan. Replace motor and fan if necessary. Check condenser air inlet temperature

near center from approximately one inch away. If above 90°F, provide cooler air (by means of a circulation fan, air conditioner, etc.). If water-cooled, check the head pressure and rate of flow. If necessary, adjust the rate of flow, clean condenser, or replace condenser.

- ✓ **Compressor:** If the compressor fails to operate, check the power source, overload protector, start relay (if provided), and windings. Replace as required.
- ✓ **Air circulating fans:** If the chamber is overheating, check the air circulating fans. Clean as necessary. If the fans are not operating properly, replace either the motor or the entire assembly (fan, motor, and blade).
- ✓ **Evaporator:** Check evaporator airflow openings by observing the amount of light passing through the fin spaces. Clean as required.

Loss of temperature control - overcooling

- ✓ **Heating heater:** Check the heating heater located inside the chamber for proper function.
- ✓ **Reheat heater (if applicable):** If the chamber overcools when in the dehumidification mode, check the reheat heater for proper function.

General temperature system problems

- ✓ **Temperature indicator reads incorrect temperature:** If the temperature inside the chamber disagrees with the indicator, adjust the calibration offset.

Service Information - Lighting System (if applicable)

⚠ WARNING

**Disconnect all unnecessary electrical power when servicing equipment.
Majority of circuits are high voltage.**

Lighting malfunctions - group of lamps not on

- ✓ **Intellus controller:** Check the controller for correct voltage output to the lighting relays. The voltage should be approximately 5VDC. If the controller fails to output the correct voltage, the controller will need to be repaired or replaced.
- ✓ **Lighting relay:** Check existing lighting relays for proper function and replace if necessary.

- ✓ **Fixture power cords:** Check existing fixture power cords to insure that they are plugged securely into their receptacles.
- ✓ **Ballast failure:** Locate the defective ballast in the mechanical compartment or lamp fixture by tracing wires from lamps that are not working to ballast. Replace ballast.

Lighting malfunctions - fluorescent not on

- ✓ **Installation:** Insure that the lamp is properly seated in its lamp holder. Check the lamp holder's wiring and connections.
- ✓ **Lamp failure:** Replace the defective lamp with a known good lamp. The chamber may utilize ballasts that control multiple-lamps. When changing a failed bulb, it is recommended that all lamps controlled by the multiple-lamp ballast are simultaneously replaced.

Service Information - Humidity System (if applicable)

⚠ WARNING

**Disconnect all unnecessary electrical power when servicing equipment.
Majority of circuits are high voltage.**

Loss of humidity control

- ✓ **Intellus controller:** Check the controller for correct voltage output to the humidification and/or dehumidification relay. If the controller fails to output the correct voltage (approximately 5VDC), repair or replace the controller.
- ✓ **Signal conditioner and/or sensor failure:** If provided, check the voltage signal from the signal conditioner to the controller. For the HMP60 sensor, the voltage should be more than 0VDC but less than 1VDC. For the HMP110 sensor, the voltage should be more than 0VDC but less than 5VDC. If it is not, the sensor may need to be replaced.
- ✓ **Humidification and/or dehumidification relays:** Check humidification and/or dehumidification relays for the correct output voltage.
- ✓ **Ultrasonic humidifier (if applicable):** If an ultrasonic humidifier was provided, please refer to the attached ultrasonic humidifier manual for troubleshooting information.
- ✓ **Spray nozzles (if applicable):** Check nozzle outlets for blockage. Clean if necessary. Check filter inside nozzle for blockage and clean if necessary. Check water pressure to spray nozzles. Nozzles require 40 PSIG water pressure.

Loss of humidity control - over dehumidifies

- ✓ **Dehumidification solenoid valve (if applicable):** If the valve will not close, replace the solenoid or entire valve, evacuate, and recharge the refrigeration system - see refrigeration diagram and/or serial plate for type and amount of charge.

Loss of humidity control - no humidification

- ✓ **Insufficient water level in humidifier:** Check the water in the humidifier and, if low, check for proper operation of the mechanism that fills the humidifier (float valve, solenoid valve, etc.).

Loss of humidity control - no dehumidification

- ✓ **Dehumidification solenoid valve (if applicable):** If valve will not open, replace solenoid or entire valve, evacuate, and recharge the refrigeration system - see refrigeration diagram and/or serial plate for type and amount of charge.
- ✓ **Refrigeration system failure:** Check other components of refrigeration system for proper operation.

Service Information - General

⚠ WARNING

**Disconnect all unnecessary electrical power when servicing equipment.
Majority of circuits are high voltage.**

- ✓ **Chamber does not power up:** Check source (facility) electrical power, circuit breakers, fuses, etc. Check chamber power cords, circuit breakers, power switches, etc.
- ✓ **Convenience receptacles do not work:** Check wiring, connections, and physical condition of receptacles.
- ✓ **Circuit breaker trips:** Check electrical system for shorts and convenience receptacles for overloading. Check voltage to chamber. Check electrical connections (must be tight) at circuit breaker.

Partial Parts List

Available on request.