## Supplemental Information – LED Fixtures

Three (3) LED tiles per tier are provided which contain dimmable LEDs capable of producing ***up to 405 µmol/m²/sec at 6" / 15 cm from the fixture at 25°C.*** A two-channel combination of white SciWhite® and infrared PetriClear™ LEDs are included.

***Please Note:*** *The infrared PetriClear™ LEDs are not visible, so will not visually appear to be "on" when the chamber is illuminated.*

*Temperatures above 40° C may significantly dim the LEDs. It is recommended that you verify the light intensity using an independent sensor.*

**Dimmable Lighting Process:**

LED dimming is accomplished in an "open loop" configuration, where set points are entered into the Intellus controller as percentages and the controller scales its output voltage to the LED control modules to correspond with the set point.

**Intellus Display and Setup:**

The lighting outputs are set up on the Intellus controller as follows:

- Light 1 controls the white and infrared LEDs on all tiers.

When running manual settings, LED lighting levels are input as percentages, and are set on the Intellus Controller in the Lights menu. To enter the Lights menu so that the lighting set points can be changed, press the **LIGHTS** key on the Intellus Controller. Use the arrow keys to navigate through the menu and select the desired light output (the number of available outputs will vary according to the type of chamber and options ordered). To change a light setting, press the **ENTER** key and use the arrow keys as necessary to change the setting. Press the **ENTER** key a second time to accept the changed setting. To exit the Lights Menu and return to the Main menu, press the **LIGHTS** key.

Lighting levels can be programmed using the programming features of the Intellus controller. For more information on using the Intellus controller to program the lighting levels, please refer to the attached ***Intellus Controller Manual.***

**NOTE: Running the chamber in Diurnal mode will cause all LED modules to energize at full intensity. Conversely, during the night cycle in Diurnal mode, all light outputs will be de-energized. Only the Manual and Program modes are conducive to the intermediate light intensities available through the dimming option.**

On the main display screen, the lighting level for each dimmable lighting output will be displayed as a bar corresponding to the lighting set point (percentage).

Example: A chamber with two dimmable light outputs with settings of 75% and 50% will show two bars in the light outputs portion of the main display, with the first bar 75% full and the second bar half full.

**Service and Maintenance:**

**LED modules not working:**

- ✓ **Power plugs:** Check to ensure that the power plugs for the fixture are securely installed in their receptacles.

- ✓ Refer to the electrical diagram provided in the ***Associated Diagrams, Schematics, and Miscellaneous Information*** section of this manual. Check the DC power supplies for the LED modules. A green LED illuminates on each power supply when the LED modules are programmed on. Each power supply is powered with 115V power and output a signal of 24VDC between each V+ and V- terminal.

- ✓ If other troubleshooting steps do not correct the issue, replace LED interface board.

**Individual LED module not working:**

- ✓ Replace module with a known working module. If the known working module does not work, check wiring from fixture receptacle to LED module located inside fixture.

## Supplemental Information – Condensation Avoidance

The chamber has been designed with a higher light intensity than necessary for plant tissue culture to provide maximal utility for user experiments. Running it at this higher intensity can cause heavy condensation on the inside of petri dishes. To avoid this, run the chamber at a light intensity no higher than 150µmol/$m^2$/s (center of the shelf measurement with the door closed) at 15 cm. Stacked petri dishes may have different results. It is advisable to calibrate your lights-on offset to this lower intensity and allow at least 4 hours after a light change for conditions to settle.

If you are still experiencing condensation, some further guidelines include:

- using a multi-step program in ramping mode to smooth out abrupt changes
- conducting analysis during the night period immediately before the day period
- recalibrating temperature offsets
- insulating the bottom of the dishes
- conditioning dishes and their lids to the same temperature as the chamber before closing lids

## Supplemental Information - Connect Tubing to Unit Cooler Drain Line

The unit cooler drain line exits out the rear wall of the chamber. Connect the supplied white plastic tubing to this drain line and direct to an appropriate drain or drain pan.


## Supplemental Information – Ultrasonic Humidification System

**⚠ WARNING**

**Do not enable humidification in the Intellus controller until water is supplied to the humidifier. Failure to supply water before operation may damage the humidifier.**

**Note:** It is required that de-mineralized water (water that has been treated to remove nearly all minerals and sodium that occur naturally in water) be used for humidification.

### System Overview

Humidification in this chamber is accomplished with an ultrasonic humidifier. The humidifier has a water reservoir which maintains a specific water level with a float switch. Located inside the reservoir are a series of transducers which vibrate at very high

frequencies. The specific frequency and vibration amplitude cause the water in the reservoir to atomize into very tiny droplets.

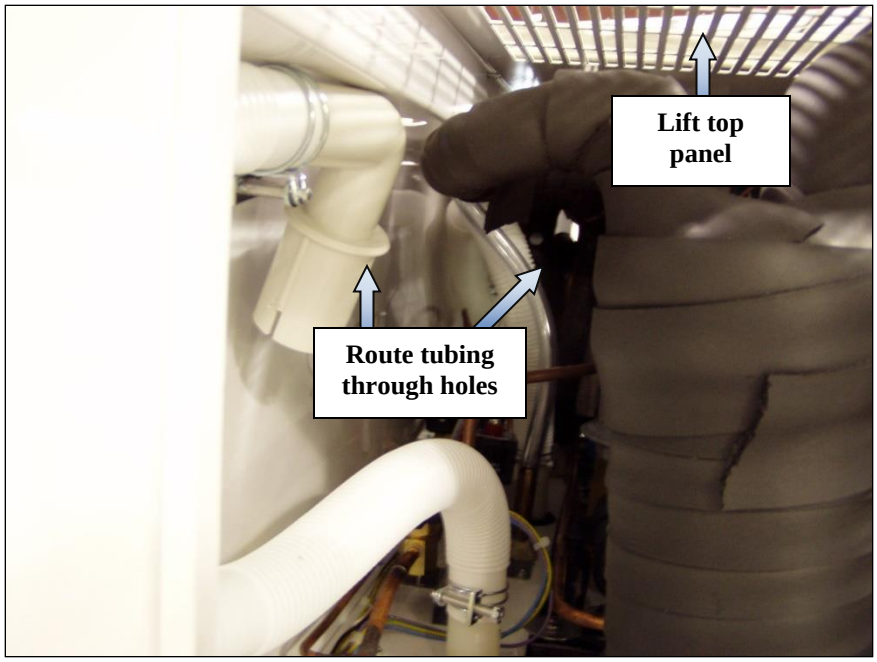
All humidity settings are controlled with the Intellus controller. Please refer to the attached ***Intellus Controller Manual*** for programming information.

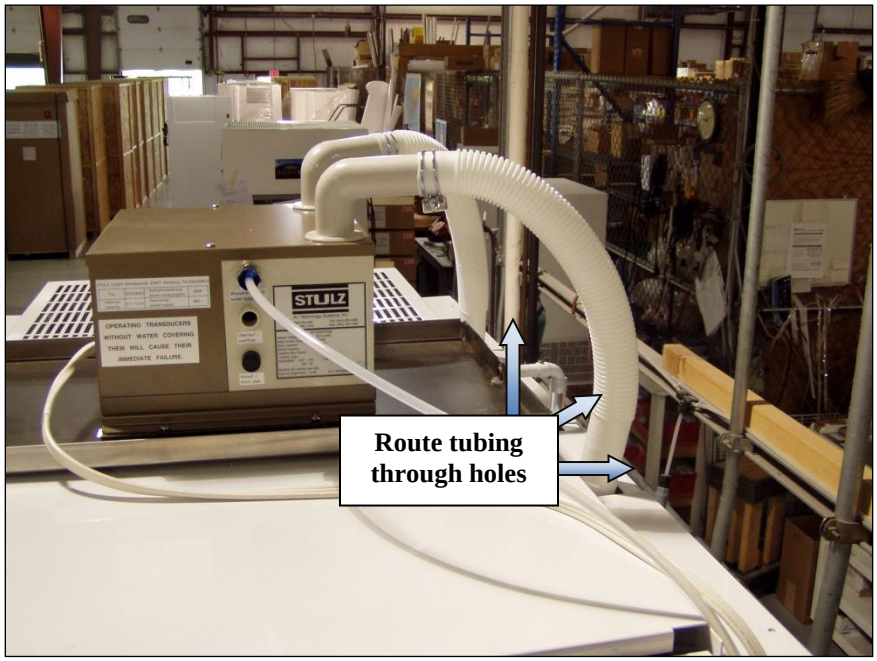
## Installation

| | | |
|---|---|---|
| Ultrasonic humidifier water requirements | – | 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. Refer to the chamber equipped list presented in the front of this manual for the appropriate humidifier model equipped on your chamber. 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.**

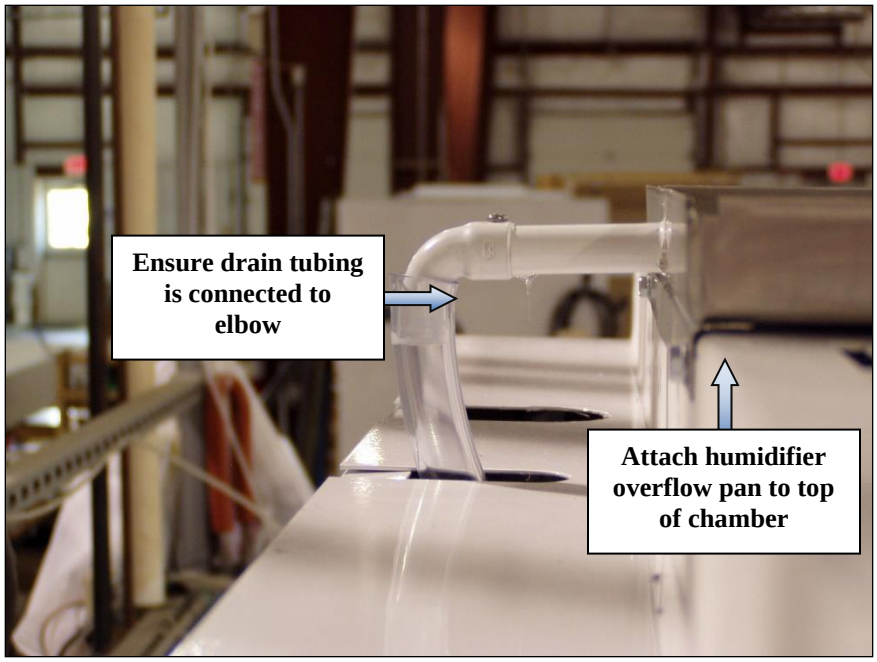
Locate and unpack the ultrasonic humidifier and related components. The tubing that connects from the chamber to the humidifier must be reattached to the humidifier. The tubing is located in the top mechanical compartment of the chamber. Remove the screws that secure the rear of the top panel, lift the rear of the panel and route the tubing through the holes provided in the top panel. A total of three tubes need to be routed through the top. A clear plastic drain tube is used to drain water from the humidifier overflow pan. This tube should be routed through the center hole. Once the tubing has been routed through the holes, reattach the top panel.



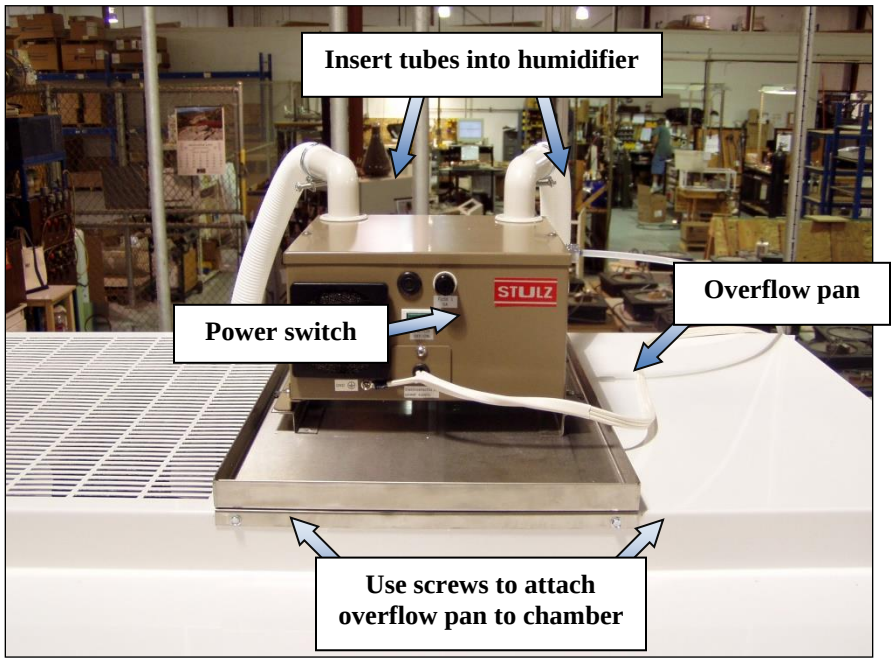




Next, install the ultrasonic humidifier and overflow pan on top of the chamber. The humidifier overflow pan should be attached to the top with the screws provided. Holes have been pre-drilled for attaching the overflow pan. Ensure that the humidifier power switch is in the 'On' position.

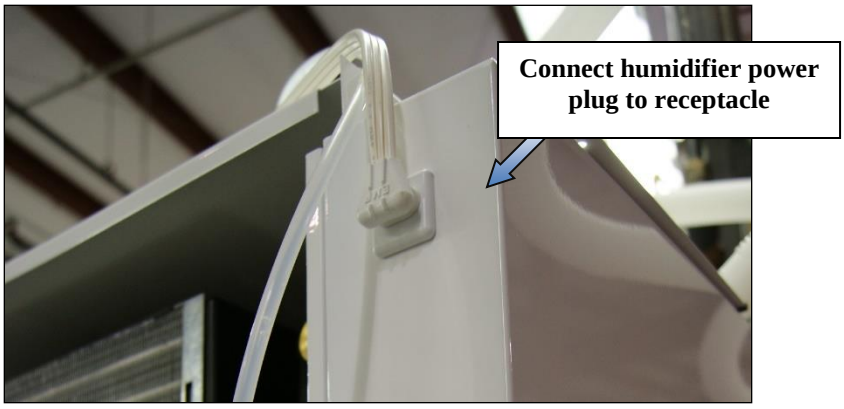
Next, ensure that the clear plastic drain tubing is connected to the humidifier pan overflow drain elbow. If it is not, locate the tubing and connect it to the drain elbow.




Next, insert the humidifier tubes into the top of the humidifier and twist to lock.



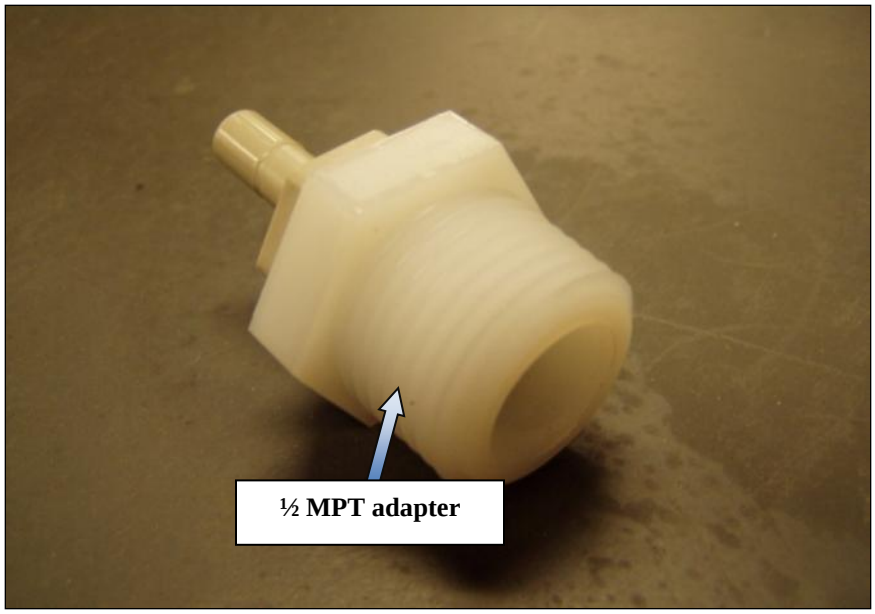

Next, connect the water line to the humidifier and to the water line hand valve. To connect the water line to the hand valve, simply insert the tubing into the compression fitting as far as it will go. If it becomes necessary to remove the tubing, press inward on the ring surrounding the tubing and pull the tubing outward. Next, connect the humidifier power plug to the receptacle located on the side of the chamber.


The chamber is equipped with a compression style fitting with a hand valve for the humidifier water. First, connect the supplied hand valve to the compression fitting. Your building water supply should be connected to this hand valve. Either connect ¼" tubing directly to the fitting on the valve or install the provided ½ MPT adapter. To directly install ¼" tubing simply insert the tubing into the fitting as far as it will go. If it becomes necessary to remove the tubing, push inward on the ring surrounding the tubing and pull the tubing out of the fitting.


**Compression style fitting. Connect the hand valve here.**

**Hand valve. Connect building water supply or MPT adapter here**




**(Optional) ½ MPT adapter. Insert into compression fitting and connect water supply with ½ FPT fitting**

Once the proper water supply connection has been made, turn the water supply source on and open any valves in line with the water line. The humidifier is designed to automatically fill and maintain the proper water level for proper operation.

**Intellus Setup:**

The humidification system is disabled when the chamber is shipped from our factory. Once the chamber has been fully installed and powered, to enable the humidification system, press the **%RH** key on the Intellus controller and use the arrow keys as necessary to select "Enable Humidify". Press the **ENTER** key and use the arrow keys to change this setting to **"Yes"**. Press the **ENTER** key to accept the change.

## Maintenance

For maintenance information, refer to the maintenance section in the ultrasonic humidifier manual provided as well as the information provided below.

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.

*Recommended maintenance schedule: As per the manufacturer's requirements*

## Service Information

### Loss of humidity control

- ✓ **Intellus controller:** Check the controller for correct voltage output to the humidification relay. If the controller fails to output the correct voltage (approximately 5VDC), replace the controller.

- ✓ **Signal conditioner and/or sensor failure:** 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.

- ✓ **Ultrasonic humidifier:** Check output from humidifier. Refer to the maintenance section for information on checking humidifier. Check voltage to humidifier when the Intellus controller is calling for humidity. The ultrasonic humidifier requires 48VAC. If the voltage is not 48VAC, check humidifier power transformer. Check humidifier relay for proper operation. For more service information, refer to the ultrasonic humidifier manual provided.

- ✓ For more service information on the humidification system, refer to the troubleshooting section in the ultrasonic humidifier manual provided as well as the Service Information section of the **Installation, Operation & Service Manual.**