



# Reach In Series Owner's Manual Chamber Operation

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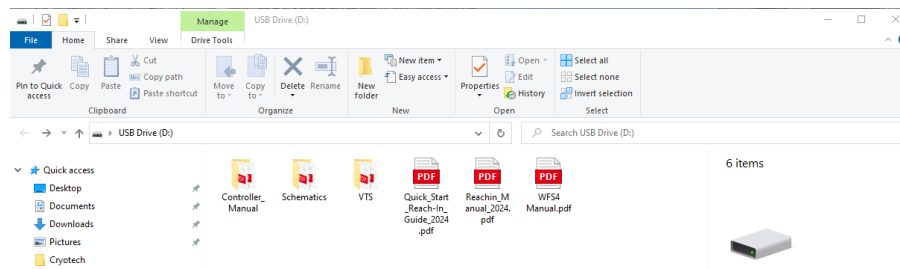
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## NAVIGATING THE USB DRIVE

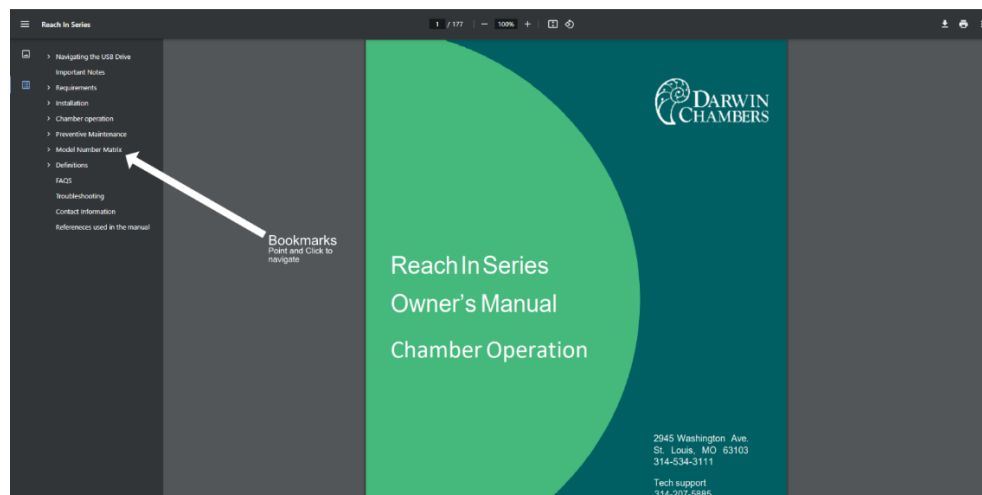
This product manual has been produced to provide a simplified overview of each chamber. Each USB Drive consists of multiple folders used to categorize the contents. The USB consists of the Product Manual, Quick Start, Spec Sheets, Schematics and Drawings, and a Warranty folder.



**Figure 1**

### Product Manual

The product manual is in an Adobe PDF format. With bookmarks built into the document, navigation has been simplified. In addition, the manual can be emailed, saved to a pc, and when saved to a pc note can be placed within the document for future reference.



**Figure 2**

### Quick Start

The Quick Start is to find installation instructions for the chamber and our most popular accessories. Please read all applicable instructions before proceeding with the installation process.

### Schematics

The Schematics folder includes the chamber's electrical schematic and the chamber's dimensions.

### Warranty

The Warranty folder contains the Darwin Chambers Co. standard reach-in warranty statement.

## IMPORTANT NOTES

- NOTE 1:** *Pictures within this manual may vary due to product improvement.*
- NOTE 2:** *If an optional circular chart recorder has been purchased, do not plug in the environmental chamber until the recorder's pen caps and any packing material has been removed from both the pens and chart plate. Failure to remove the pen caps and packing material could result in damage to the chart recorder pens and / or result in a voided calibration.*
- NOTE 3:** *The Fuji controller setup parameters vary from cabinet to cabinet due to the AUTO-TUNE feature. To avoid any unnecessary difficulties in chamber operation, do not attempt to change any parameters, except for the set value (SV), without first taking note of all stored values. Failure to do so may result in extra expenses for customer service visits and possible replacement of parts.*
- NOTE 4:** *Through alarms, each Fuji Microcontroller does act as a component fail safe and protect your chamber from further damage in the event the process value (PV) excessively deviates for some unforeseen reason. For your convenience, Darwin Chambers typically pre-sets these alarms with a 15-minute delay to allow an adequate amount of time for the PV to recover in the event of a power outage/door opening.*
- NOTE 5:** *If your chamber includes the optional ultrasonic humidification system, a possible situation of the chamber producing condensation can occur. The condensation is channeled to the outside of the cabinet by polyurethane tubing on the rear of the chamber. It is strongly recommended that your new chamber be positioned near a drain or that a condensate removal kit be purchased from Darwin Chambers to facilitate condensate removal.*
- NOTE 6:** *When utilizing the optional ultrasonic humidification system, softened water should not be connected to the chamber. The use of soft water will introduce 5 to 7 times more salt into the humidifier. The salts may result in a humidifier failure and/or damage to the metals within the chamber.*
- NOTE 7:** *Your chamber comes equipped with an access port. This port should remain securely closed (with the provided insulation inserted) to ensure that unnecessary condensation will not occur, and that consistent uniformity will be maintained.*
- NOTE 8:** *If the optional heated regenerative desiccant dehumidifier has been purchased and the desired chamber application requires a high temperature and medium to high humidity, the dehumidifier and its high temperature ducts should be disconnected from the chamber. Failure to remove the dehumidifier and its ducts under such circumstances may result in the accumulation of condensation within the unit's ducts/piping, thus becoming an electrical and safety hazard.*
- NOTE 9:** *The TH and FS Series of chambers utilize a 30 second timed delay during chamber startups and immediately following a defrost cycle before providing power to the evaporator fan(s). This helps ensure that the evaporator is cold and can rapidly dissipate heat in an efficient manner.*
- NOTE 10:** *The FS Series chamber utilizes a Dwyer Temperature Switch to maintain precise control over the defrost cycle. The set points for the defrost settings should not be adjusted without first contacting a technical support representative to avoid undesirable chamber operation.*
- NOTE 11:** *The AR Series of chambers includes an electrical outlet mounted on the chamber's rear. The intent of the outlet is to provide a means to remove power from the dehumidification system in the event of a high temperature alarm. Failure to utilize this outlet may unnecessarily place the product at risk in the event of a chamber malfunction.*

## REQUIREMENTS

### Electrical

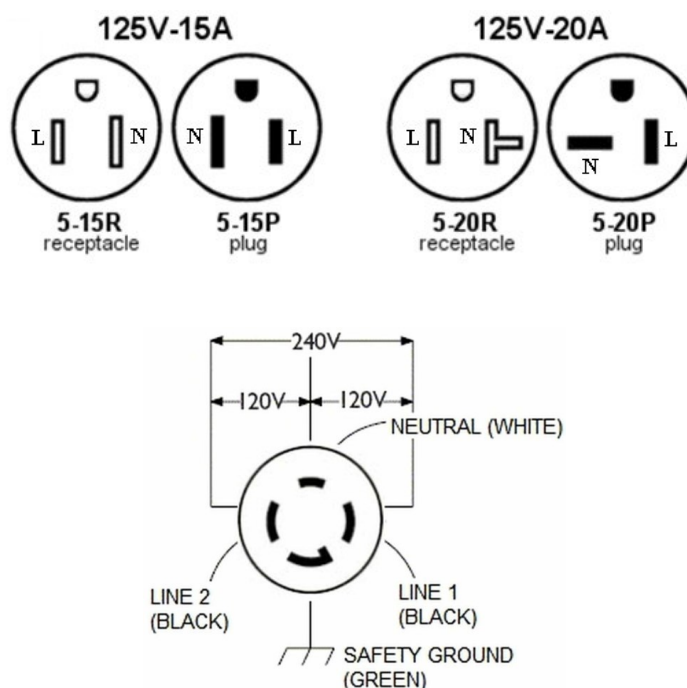
\*120 Volt AC, Single Phase, 60 Hz,

\*\*15 or 20 Amp dedicated circuit.

\* Overseas models utilize an optional step-down transformer to achieve 120 Volt AC operation.

\*\* Values may vary depending on the unit. Please refer to the chamber's Data Label for model specific values.

Required NEMA Plugs and Receptacles



115/208-240 60Hz 20A chambers

**Figure 3**

In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This machine is equipped with an electric cord that has an equipment-grounding conductor and a grounding plug. The plug must be inserted into a matching outlet that has been properly installed and grounded in accordance with all local codes and ordinances. Do not modify the plug provided; if it will not fit the outlet, have the proper outlet installed by a qualified electrician. Improper connection of the equipment-grounding conductor can result in risk of electric shock. If repair or replacement of the electric cord or plug is necessary, do not connect the grounding conductor to a live terminal. Check with qualified electrician or service personnel if the grounding instructions are not clear, or if there is doubt as to whether the machine is properly grounded.

**The chamber was designed for indoor use only.**

**Intended Use:** This chamber is intended to be used for close tolerance temperature and/or humidity conditioning of laboratory samples.

**Unintended Uses:** This chamber is not designed for storage of flammables, explosives, hazardous materials, human occupants, etc. Failure to follow the proper intended uses may result in fire, serious injury, or death.

**Chamber breakers:**

Heater: 10 Amp 250 Volt

\*Humidifier: 5 Amp 250 Volt

\*\*Door Frame Heater: 5 Amp 250 Volt

\*Chambers with humidity control only.

\*\* 011 Chambers with humidity control only

**General Specifications:**

Voltage: 120VAC  $\pm 10\%$

Phase: 1

Hertz: 50/60 Hz.

**Pollution Degree: 2**

**Overvoltage Category: II**

**Ambient Temperature:** 72°F  $\pm 8^\circ\text{F}$  and a dewpoint at or below 52°F (72°F / 50% RH)

**Altitude:**  $\leq 2500$  Meters

**Ambient**

A surrounding environment of 72°F  $\pm 8^\circ\text{F}$  and a dew point at or below 52°F (72°F 50%Relative Humidity) is recommended.

**Exterior Operating Space**

A minimum of 12 inches of clearance from the top of each chamber, and six inches on all sides is required.

**NOTE:** To achieve the best performance from your chamber, it is important to keep the unit in an area that is air-conditioned during the summer months. The reason for this is mainly due to high ambient dew points, which may introduce more humidity into the chamber than the standard chamber can remove during the normal course of operation. The recommended solution for areas that may fall outside the desired temperature and humidity levels is normally the application of a dehumidification system: either electric heat regenerated desiccant type or compressed air type.

## Interior Operating Space

Proper product and shelf placement are essential to the flow of air and directly affects the chamber uniformity. Darwin Chambers recommends that the bottom shelf be placed no lower than three inches from the floor and one inch from the rear wall of the chamber. Similar care should be given to the placement of product throughout the unit. It is strongly suggested that all products remain a minimum of two inches from each side and the rear of the chamber and no less than four inches away from the ceiling of the chamber.

## INSTALLATION

### Tools Required

- Level
- $\frac{3}{4}$ " socket and ratchet

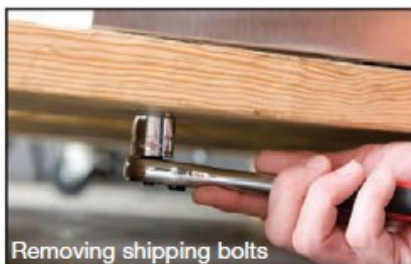
### Procedure

1. Make certain the chamber is as close to the final location as possible.
2. Unpack the chamber and ensure that the unit includes wire shelves, 4 shelf clips per shelf, and any optional accessories.



This is not a one-person job; at least two strong people will be needed to move and steady the chamber.

3. Remove the chamber from the shipping pallet. Typically, the shipping pallet will be attached to the chamber with four bolts — use a ratchet and a  $\frac{3}{4}$ " socket to remove the bolts.



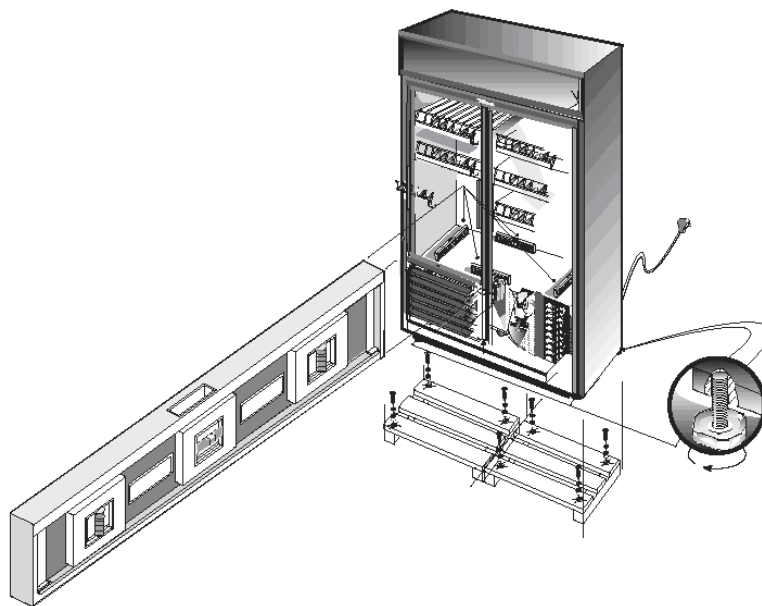
**Figure 4**

4. Once all the bolts are removed, carefully reposition the chamber so that one side of the chamber is slid off the pallet one corner at a time while fully installing the casters and/or leveling legs until they are flush with the chamber's frame. Make certain the unit is well supported, as most chambers are top heavy and can cause significant injury or death if they fall.



**Figure 5**

5. Set the chamber in its final location.
6. Level the chamber, first from front to back and side to side. This can be accomplished by placing shims between the caster plate and the chamber. Proper leveling ensures effective condensate removal from within the chamber and if applicable, a tighter relative humidity process value.



**Figure 6**

7. Install the chamber's shelving. Proper shelf placement is essential to the flow of air directly affecting the chamber's uniformity. Darwin Chambers recommends that the bottom shelf be placed no lower than three inches from the floor and one inch from the rear wall of the chamber. Similar care should be given to the placement of product throughout the unit. It is strongly suggested that all products remain a minimum of two inches from each side and the rear of the chamber and no less than four inches away from the ceiling of the chamber.
8. Plug the chamber into its own dedicated circuit that meets the minimum dedicated circuit requirements specified on the chamber's data label.

**NOTE:** Connecting the chamber to an extension cord may void the warranty and should be avoided.

## Ultrasonic Humidifier (Optional)

Darwin Chambers Co. uses ultrasonic humidification to generate humidity. The most common humidifier, the external humidifier, is available on all humidity capable chambers. Typically located on the chamber's top exterior (below the safety grill), the ultrasonic humidifier provides an easily serviceable energy efficient means of chamber humidification.

### Humidifier Requirements

#### Water Quality

The ultrasonic humidifier requires the use of a water supply that can meet the following water specifications: A conductivity of  $0.1 \mu\text{S} - 10 \mu\text{S}$  (Micro Siemens), TDS (Total Dissolved Solids) of less than 10 PPM (Parts per Million), and 1-10 PSI (Pounds per Square Inch) of supply water pressure. The conductivity requirements are necessary to ensure that the humidifier's ultrasonic transducer's conductivity sensor can adequately detect the presence of water. Without the proper conductivity, the ultrasonic transducer may burn out and/or function improperly. Meeting the TDS requirements will ensure that sediment within the water supply will not accumulate within the humidifier or be dispersed throughout the chamber. The accumulation of sediment within the humidifier may result in humidifier deterioration and/or malfunction. Sediment being dispersed throughout the chamber could also result in corrosion, mechanical/electrical problems, and samples placed within the chamber being blanketed by the sediment.

**PLEASE NOTE:** Darwin Chambers Co. recommends the use of an R.O. system, a Darwin Chambers Co. brand D.I. water filtration system, or a Darwin Chambers R.O./D.I. filtration system to meet the water quality specifications. In addition, the use of a water softener will void the chamber warranty.

#### Water Level

When the humidifier's reservoir has been filled, there should be approximately three quarters ( $3/4$ ) inches of water above the crossbeam/conductivity sensor of the ultrasonic transducer.

**NOTE:** If the water level exceeds the 1" inch level, the transducer's capacity to produce humidity will be greatly diminished. In addition, water **MUST** cover the crossbeam of the ultrasonic transducer by a minimum of  $1/4$ " otherwise the transducer will stop generating humidity automatically.

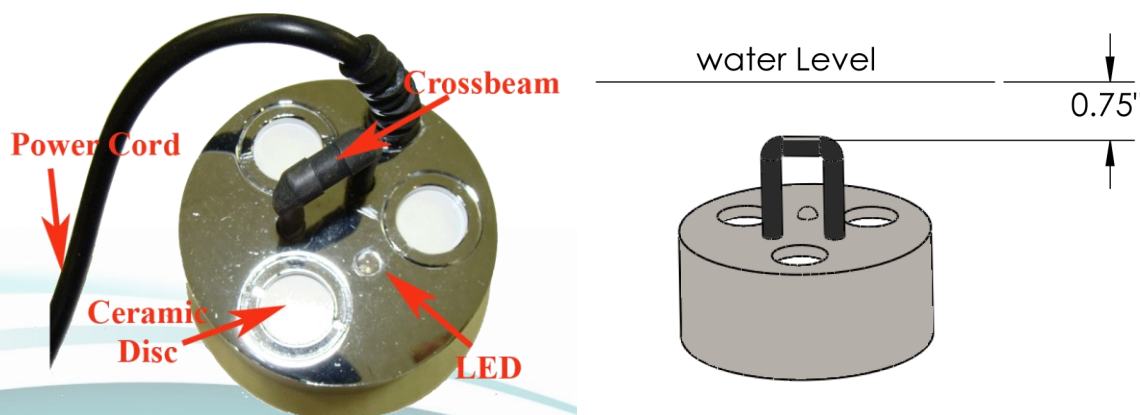


Figure 7

## Humidifier Installation Instructions

- 1 The ultrasonic humidifier is shipped pre-installed upon each chamber. Installation consists merely of supplying a  $\frac{1}{4}$ " polyurethane tube from the filtered water supply (not included) to a  $\frac{1}{4}$ " union (located on the top rear of the chamber). To connect the tubing from the supply, simply insert the water line securely into the union.



**Figure 8**

- 2 Open the water supply to the chamber and allow the humidifier to fill with water.

**Note:** To avoid damage to the humidifier float, ensure the water supply has been regulated to 1-10 psi.

## CHAMBER OPERATION

Once the utilities have been connected, secured and shelves, drain lines (when applicable) and chamber put in place. You are now ready to turn on the chamber.

### Powering the Chamber On and Off



**Figure 9**

To power the chamber on/off the chamber includes a rocker switch actuated thermal circuit breaker mounted within the face plate. Switch the breaker to the right to the (–) right hand/closed side to enable the chamber's power. To remove power from the chamber, switch the breaker to the (O) left/open side.

Your chamber will now run and the last set points that were set in the controller. To change set points, see the controller section applicable to the controller on your chamber. If your chamber has the Fuji PXF4 controller you can view operation in the next section. For all other controller types please review the included flash drive or zipped folder for other controller operations and setup. Use this manual for mechanical features of your chamber and retain the controller manual to see how to interface with that device. The next section can be skipped for non-fuji Controls.

| Controller Types                                                                    |                                                                                     |                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Fuji PXF4 Loop Controller                                                           | West Controller EC4 (see separate manual)                                           | Future Design Controls (FDC) MCT4 (see separate manual)                             | Future Design Controls (FDC) MCT-CM (see separate manual)                            |
|  |  |  |  |

**Table 1**

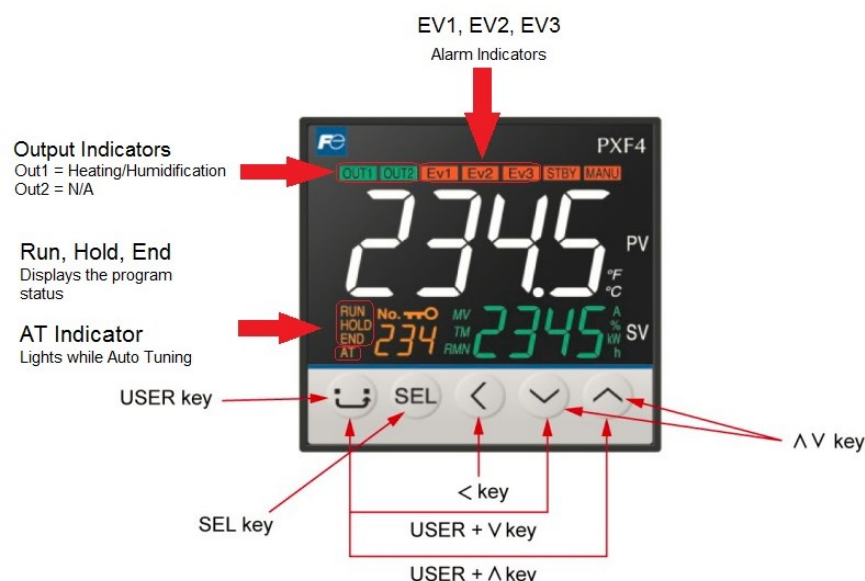
## Controls

Controller referred to as \*\*Loop1 in this manual will refer to the temperature controller. \*\*\*Loop 2 may refer to Relative Humidity controller, Light controller, CO2 controller, or Oxygen controller. When more than 2 controllers' relative

humidity will be \*\*\*Loop 2. \*\*\*\*Loop 3 will then be Light controller or any among the other loop controls. The light control typically does not have a feedback sensor. Therefore, controls the lights in an open loop format.

Fuji Controller may also be used with a virtual touch screen. This gives simplicity to the front of the chamber of basic controls. However, gives the complexity of touchscreen features being able to interface with the touch screen on most formats like smart phone, tablet, or PC. This includes Datalogging and interacting with the chamber remotely over the internet with no special IT assistance.

### Fuji PXF4 Controls



**Figure 10**

**This diagram is intended as a quick reference to the controller's functionality. Some functions are dependent upon the chamber type, the controller type, and which options have been purchased.**

### Changing the Set Value (SV) for Temperature or Relative Humidity

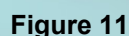
Press the left (<), up (^) or down (v) arrow to change the set value. When changing the set value (SV), if the process value and the new set point are far enough apart from high to low, an adjustment to the heat alarm is suggested for thermoelectric series chambers. This will prevent a premature disabling of evaporator fans and help ensure the chamber will reach the set point. Thermoelectric series chambers disable evaporator fans with the heater. Please refer to the section "Changing Alarm Parameters" for more information.

For the initial setup or a much different set point from before, more than  $\pm 5^{\circ}\text{C}$  or %RH an auto-tune is recommended. Wait until the chamber has reached or within  $1^{\circ}$  or 1% before auto tuning. See the "Auto-Tune the Controller" section of this manual.

### Navigating the Menu

The Fuji PXF4 Micro Controller offers a large range of customizable settings that have been preprogrammed from the factory to best suit the chambers intended operation. To adjust any parameters other than the Set Value (SV) the

**NOTE:** *Of the 13 channels within the standard PXF4 several of the channels and parameters are not utilized and have been masked to expedite the menu navigation process. It is not recommended to alter any preprogrammed parameters without first documenting the current parameter and/or adjusting any parameter not discussed within this user manual. For any parameter information not available within this product manual, please refer to the Fuji PXF4 User Manual.*



## Auto-Tune the Controller

Auto-Tuning allows the controller to calculate the optimum level of control required to maintain the desired setting value (SV). This feature will not "fix" a chamber with a problem — it only fine-tunes an already controlling chamber. Do this if the SV or some other important variable (load, outside temperature, etc.) has changed and the control is less than desirable.



Figure 12

**TECH TIP** If an Auto-Tune is required, it should be performed after the process value (PV) has stabilized at the desired set value (SV). For chambers that have two Fuji PXF4 controllers (one for temperature and one for humidity), the temperature controller must be Auto-Tuned first. Then allow the temperature to stabilize before performing an Auto-Tune on the chamber's humidity controller.

To enter the Auto-Tune mode, press "SEL" key to enter the Operation Control Mode. Press arrow keys to scroll until (At) is displayed in the PV screen. Press "SEL" once and "off" will start to flash on the SV screen. To change the value from "off" to "on", simply press the up-arrow key. Then press "SEL" once to activate the Auto-Tune (At) mode. Once the Auto-tune mode is activated, the "on" value will stop flashing and a red indicator light (on the lower-left corner of the controller) will start flashing. This indicates the controller is now in Auto-Tune mode. When the indicator light stops flashing, the Auto-Tune process will then be completed. To exit the menu, simply press the User Key and the default PV/SV screen will then be displayed.

**NOTE:** Do not open the door(s) or make any changes while the unit is Auto-Tuning. Auto-Tuning typically will take anywhere from 5 minutes to 20 minutes—there will be a light flashing in the lower left-hand corner of the controller during this process.

## Changing Alarm Parameters

The controller has a deviation high/ low audible alarm ("AL1L & AL1H") a deviation High alarm ("AL2" - heating), and a deviation low alarm ("AL3"). For ease of use, these alarms are preset from the factory with deviation alarms that are typically triggered at  $\pm 2.0^{\circ}\text{C}$  (AL1=2.0°C and AL2=2.0°C are set as positive values).

**NOTE:** The factory preset alarm parameters values (AL1L and AL1H) may vary depending upon the chamber type and the intended operation range. Please refer to Table 2 for the standard factory preset alarm values by chamber type. Feel free to adjust the audible alarm to meet your desired warning of the chamber being out of your specification.

**EXAMPLE:** A temperature controller with deviation alarms set at  $\pm 2.0^{\circ}\text{C}$  is programmed to control at  $30.0^{\circ}\text{C}$ . In this configuration, AL1H would be equivalent to  $30.0^{\circ}\text{C} + 2.0^{\circ}\text{C}$  (or  $32.0^{\circ}\text{C}$ ). AL1L would equal  $30.0^{\circ}\text{C} - 2.0^{\circ}\text{C}$  (or  $28.0^{\circ}\text{C}$ ). With these alarms if the temperature reaches  $32.1^{\circ}\text{C}$  then AL1H will go into alarm after delay time. If the process value reaches  $27.9^{\circ}\text{C}$ , AL1L will go into alarm after delay time.

| Typical Factory Preset Alarm Values by Chamber Designed Operating Range |                                                  |                                                                         |                        |                                                   |
|-------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|------------------------|---------------------------------------------------|
| Alarm PV                                                                | $10.0^{\circ}\text{C}$ to $60.0^{\circ}\text{C}$ | $2.0^{\circ}\text{C}$ to $8.0^{\circ}\text{C}$ or $5.0^{\circ}\text{C}$ | $<0.0^{\circ}\text{C}$ | $-20.0^{\circ}\text{C}$ to $<0.0^{\circ}\text{C}$ |
| $\pm 2.0^{\circ}\text{C}$                                               |                                                  |                                                                         |                        |                                                   |
| $\pm 3.0^{\circ}\text{C}$                                               |                                                  |                                                                         |                        |                                                   |
| $\pm 5.0^{\circ}\text{C}$                                               |                                                  |                                                                         |                        |                                                   |

**Table 2**

AL1L and AL1H both have a delay of 15 minutes by default before an alarm is triggered and the alarm audible begins to sound. This delay allows access to the chamber without the alarm going off every time the chamber deviates from the controlling set value. The delay time is set in minutes and adjustable, please refer to the following section: Adjusting the Alarm Delay Time for additional information. Users can adjust the delay time to meet their needs to either be alerted sooner or later to give more time to recover from loading the chamber.

The AL3 alarm parameters are programmed to be a designated switchover point that when triggered, will automatically switch from cooling to heating control. On the temperature controller the alarm is set as a lower limit deviation alarm. It is controlled through AL3. AL3 is preset from the factory to a low deviation value of  $1.0^{\circ}\text{C}$ . (The setting is an absolute value. Making this value a negative number will have the opposite effect than intended.) The  $1.0^{\circ}\text{C}$  is a set range. If a chamber's process value exceeds  $1.0^{\circ}\text{C}$  below the set value, the automatic switch is triggered. When the process value comes back within  $1.0^{\circ}\text{C} +$  the AL3 hysteresis value of 2.0 of the set value the automatic switch is turned off.

**EXAMPLE:** If a chamber that is controlling at  $25.0^{\circ}\text{C}$  has its SV raised to  $40.0^{\circ}\text{C}$ , AL3 will then cause the chamber to operate in "Heat Only Mode." AL3 is disabled at any PV that exceeds  $1.0^{\circ}\text{C}$  less than the SV. AL3 will be reenabled when the PV equals or exceeds the  $\text{SP-AL3} + \text{AL3 Hysteresis}$ . In our example the cooling will not be enabled until the PV value exceeds  $41.0^{\circ}\text{C}$  or the set point is lowered.

To change the factory preset AL3 (AL3) alarms, go into the Operation Control Mode and use the down arrow key to scroll through the parameters until the controller displays AL3. Adjust the desired setting by first pressing the SEL button and then utilizing the arrow keys ( $1.0^{\circ}\text{C}$  is the factory preset) to change the parameter. Confirm the new parameter by pressing SEL one additional time.

**NOTE:** Once the temperature exceeds more than the value of AL3 below the set value, then the cooling portion of the chamber will shut off and go into "Heat Only Mode." For the cooling control to regain control, the temperature must be above the  $\text{SP} - \text{AL3} + \text{AL3 hysteresis}$ .

### Adjusting the Alarm Delay Time

To change the alarm delay time, press and hold down the SEL button for 3 seconds until Ch1 appears on the display. Press the down arrow key until Ch5 is displayed. Press SEL to enter Ch5 and then use the down arrow key to reach DLY1. When DLY1 appears press the SEL key one time (until the displayed value begins to flash). Using the

up/down arrow keys, adjust the DLY1 time to 15 minutes or another desired setting. Press the SEL key to confirm the setting. Using the same procedure, adjust the DLY2 time to the desired setting.



**Figure 13**

## Alarm Condition

Once the high and low alarms have been set and the process value has passed the set alarm values (AL1), and if the chamber does not come back within the alarm limits before the delay time fully elapses the unit will then enter alarm condition. When in an Alarm Condition, the Ev1 indicator on the controller will illuminate and the chamber will create an audible sound to alert the end user.

**NOTE:** *If the alarm condition is not cleared the chamber may not be able to come back into specification or function as designed. EV2 controls all heated related items in the chamber and may disable that function. EV3 controls the cooling of the chamber when applicable. When the EV2 or EV3 light is off that assigned function is off.*

Several key indicators will signal an alarm condition. The first of these indicators will be an audible siren. If the alarm was silenced by pressing the alarm silence button on the control panel, this audible will not be present. And the most important method that can be utilized to determine the alarm condition is by looking for the Ev1 indicator to be illuminated on the controller(s).

**NOTE:** *The Ev1 light indicates whether the chamber is in a high or low alarm condition.*

To clear the alarm condition, you first must recognize whether the chamber is in high or low alarm (see above). Then press the SEL button to enter the Operation Control Mode. Once inside the Operation Control Mode menu use the up/down keys to navigate until you see either the AL1L or AL1H parameter, depending on the type of alarm the chamber is in (high AL1H or low AL1L). Once you reach the appropriate parameter, press the SEL button. This will cause the value displayed to flash. Document the current alarm value; then press the up key to increase the current value considerably. Confirm the new parameter by pressing the SEL button and the alarm will disable.

**EXAMPLE:** *If your chamber is in low alarm and the process value is at 15.0°C while the set value is 30.0°C, AL1L needs to be increased to 15.0°C or greater ( $30.0^{\circ}\text{C}$  (SV) –  $15.0^{\circ}\text{C}$  (PV) =  $15.0^{\circ}\text{C}$ ) to clear the alarm. If the chamber is in high alarm and hypothetically had a process value of 40.0°C and the set value was 30.0°C, AL1H requires an adjustment of 10.0°C or greater ( $40.0^{\circ}\text{C}$  (PV) –  $30.0^{\circ}\text{C}$  (SV) =  $10.0^{\circ}\text{C}$ ) to clear the alarm. Once the appropriate value has been increased, press the SEL button one last time to confirm the changes. Press the User Key to exit the menu.*

Once the chamber has returned to its normal operating range, remember to return the alarms to their original settings.

## Silencing the Alarm



**Figure 14**

During an alarm condition, the chamber will trigger an audible warning. The warning is also indicated by the illumination of the Ev1 indicator on the affected controller. In the event of an alarm, and the expiration of the alarm delay, an audible alarm will sound. Located upon the controller's faceplate, the alarm silence button provides a simplified means to mute the alarm until the associated alarm has been cleared. To make use of the alarm silence, simply press the button and the audible will cease. **Note:** *When the VTS is used the application connected to the VTS will still produce an audible until silenced on the HMI screen."*

**NOTE:** *The alarm silence button only provides a means to mute/disable the audible warning.*

## Ramp Soak Operation

The Fuji PXF4 can control and adjust set values based upon a user specified program; this process is known as a ramp soak. Ramping refers to the changing of the set value over a given interval. Soaking is the length of time the chamber remains at set value. To set up the ramp soak operation you first must enter the setup menu. This can be accomplished by pressing and holding the SEL button for 3 seconds until Ch1 is displayed on the controller. Once Ch1 is displayed on the controller use the down arrow to scroll until the controller says Ch3, this is where the parameters needed to the setup of the ramp soak operation are located.

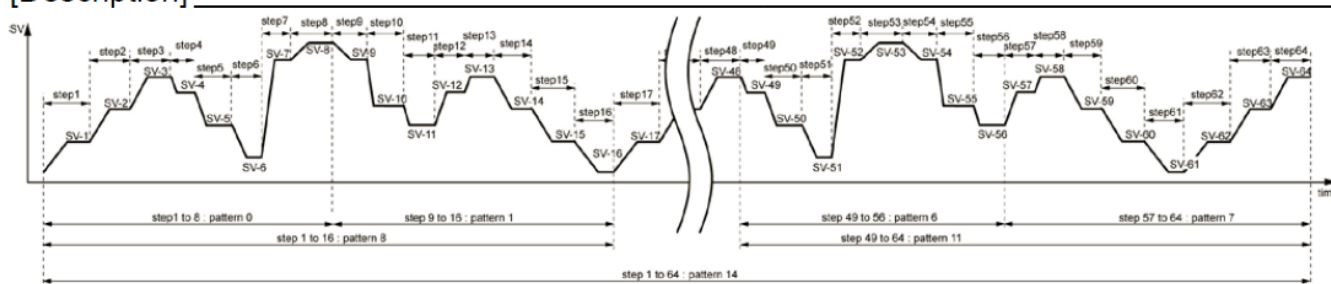


**Figure 15**

Enter Ch3 by pressing the SEL button. The first parameter within Ch3 is pattern (PTn). The pattern parameter is utilized to set which steps are utilized within the ramp soak operation. There are seven possible patterns, each that utilizes a specific portion of the available ramp soak steps. Please refer to Figure 16 to select the pattern that incorporates the number of steps required to complete the desired operation. Please Note: It is possible to store and utilize more than one program by placing SV's, ramp, and soak times into steps belonging to separate patterns. In

such a scenario, the program utilized would be solely dependent upon the pattern selected. For instance, pattern 0 would select steps 1 – 8 and then pattern 1 would be selected to utilize steps 9 – 15.

### [Description]



**Figure 16**

**NOTE:** The PXF4 controller is capable of 64 segments, however many steps may be masked. If additional steps are required, please email [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com) for assistance.

Once the desired pattern has been selected, press the down arrow button to scroll until the parameter "SV-1" is visible on the top (White) screen. "SV-1" is the first desired set value. To change the SV, quickly press the SEL button to make the parameter begin to flash. Then utilize the up/down buttons to adjust the set value to the desired setting. Press the SEL button one more time to confirm the parameter (the SV will cease to flash). Once the parameter has been confirmed, press the down arrow to scroll to the next parameter.



**Figure 17**

The next parameter is "TM1r". "TM1r" is the ramp time for the 1st segment. When the "TM1r" has been set, scroll to the next parameter "TM1S". "TM1S" is the 1st segment soak time, or how long the chamber stays at the "SV-1" parameter prior to the 2nd segment of the program. After the 1st segment has been completed, the 2nd segment parameters will appear in the same format as the 1st parameters except for utilizing the number 2 (i.e., SV-2, TM2r, and TM2S).



**Figure 18**

Once the all the SV's, ramp, and soak times have been placed into the controller utilize the down arrow button to scroll to the Gsoak parameter. The guaranty soak parameter ensures that the chamber soaks within set tolerance/Limits for the duration of the soak. If the chamber deviates from the set limits or fails to reach the programmed SV, then no soak time will be utilized until the chamber reaches and/or returns to the specified limits. The guaranty soak limits are determined by the GS-L and the GS-H. Preset from the factory the guaranty soak parameter is set to "On" and the limits are set at  $\pm 5.0^{\circ}\text{C}$ .



**Figure 19**

Finally, scroll using the up/down button until the parameter, "Mod" is visible. Set "Mod" to a value of 0 if it is desired that the chamber maintains the last set value after the program has expired. Set "Mod" to a value of 1 if it is desired to have the program repeat continuously. If "Mod" is set to "9" the program will also continuously repeat in a manner like setting the parameter to a 1. However, by setting "Mod" to a 9, if the chamber is turned off and/or loses power and upon having power reapplied, the chamber will initiate the ramp soak cycle regardless of whether the chamber was running a program prior to the loss/removal of power.



**Figure 20**

To initiate the ramp soak operation, you must enter Operation Control Mode and scroll to the “PRG” parameter. Turn this parameter to “Run” to start the operation. For additional ramp soak operation guidance please visit pages 8, 9, 15, and 16 of the Fuji Manual. **Please NOTE:** At the completion of the ramp soak operation, set value adjustments cannot be made without first changing the “PRG” parameter to “Off.”

### Locking the Controller

Scroll to “LOC” in the Operation Control Mode menu. To change any settings, enter a “0.” To “lock” all settings including the SV, change the parameter to a “1.” To lock all settings except the SV set the parameter to a value of “2.”



**Figure 21**

### Standby Mode

Allows you to switch between operation mode and standby mode. Standby mode is useful to turn off controls while performing calibrations/maintenance or long load time of the chamber. Or if operation is not needed and do not want to be disturbed by unnecessary alarms.

The following items are not used during standby. Meaning will be disabled.

- Control output (-5.0 to 105.0%)
- Alarm output (ON/OFF)
- Transfer output (ON/OFF)

To enable standby mode with standard settings from the main screen press USER +  $\wedge$  key. For nonstandard (see User Keys) or standard setting alternatively you can press the SEL button quickly. STbY will appear on the display. Press the SEL button again quickly and oFF will begin to flash. Use the  $\wedge$  key to select On. Press the SEL button again to accept the change. The controller is now in standby mode. To disable standby mode, repeat the steps. Except for select On to Off.

## User Keys

The User Key on the fuji controller may be programmed from factory for quick access. The following are options available on the Fuji controller.



**Figure 22**

## Standard User Key

### USER key

- Press this key once in PV/SV display to switch between SV display and MV display.
- Press and hold this key in PV/SV display to start the assigned function. (No function is allocated at the factory.)
- Press this key once in operation control mode, channel-selection mode, or setup mode to return to PV/SV display.

### USER + $\wedge$ key

- Press and hold this key in PV/SV display to start the assigned function of switching between RUN and standby.

### USER + v key

- Press and hold this key in PV/SV display to start the assigned function of switching between start/stop of auto-tuning.)

## Operation keys



**Figure 23**

### ***Program select user key.***

On some chambers the ramp soak option can be quickly changed programs from 0-14 and start, hold, and turn off a program using the User Keys.

### **Operating procedure**

Press and hold this key in PV/SV display to start the assigned function of Ramp soak pattern +1. (*Up to 15 ramp soak programs could be configured*) The display will flash new available program. Release and press button again to increment to next program.

| Ptn | Steps          | Ptn | Steps          |
|-----|----------------|-----|----------------|
| 0   | Steps 1 to 8   | 8   | Steps 1 to 16  |
| 1   | Steps 9 to 16  | 9   | Steps 17 to 32 |
| 2   | Steps 17 to 24 | 10  | Steps 33 to 48 |
| 3   | Steps 25 to 32 | 11  | Steps 49 to 64 |
| 4   | Steps 33 to 40 | 12  | Steps 1 to 32  |
| 5   | Steps 41 to 48 | 13  | Steps 33 to 64 |
| 6   | Steps 49 to 56 | 14  | Steps 1 to 64  |
| 7   | Steps 57 to 64 |     |                |

**Table 3**

USER + ^ key

Press and hold the USER + ^ key in PV/SV display to start the assigned function of ramp soak Run / Off (starts or ends program.)

USER + v key

- Press and hold the USER + v key in PV/SV display to start the assigned function of Ramp soak Run / Hold (pauses the ramp or soak)

### Timer Alarm Function

EV3 on some chambers is used as a countdown timer. This is to give a notification that the set time has expired. This is useful for when decontaminating product in the chamber or the chamber. This only sounds a horn and does not disable any components. See alarm delays in Adjusting the Alarm Delay Time to set the time interval for delay 3.

#### Operation keys



**Figure 24**

Press and hold the user key in PV/SV display to start the assigned function of Timer EV3. The SV value will blink once activated. When the time has expired, the alarm will sound. The EV3 light will also illuminate. Hold the User Key again till SV display blinks and the alarm will silence and reset the timer.

**Note:** The Silence alarm button will not work to silence the timer alarm. This is so that if chamber alarms when not running timer, the chamber can make an audible sound.

The remaining time on timer 3 can be viewed in Channel 4.

#### Operating procedure

1. Check that the PV/SV display is shown.
2. Press and hold the SEL key to display CH1 (PID parameters).
3. Use the v key to access CH4 (Monitor parameters).

4. Press the SEL key to enter CH4 (Monitor parameters). tM3 is displayed.
5. The remaining time on timer 3 is displayed.
6. Press the user key to return to the PV/SV display.

### Controller Parameter Settings

The factory preset controller parameter values should be included with the owner's documentation. If this information is missing, or if it has been lost or misplaced, please contact Darwin Chambers Company at 877-783-6774, you can also send an email to [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).

### Virtual Touch Screen (VTS)

The Virtual Touch Screen is a way to interface with the fuji controllers remotely. This includes being able to control somewhere else in the laboratory or somewhere else in the world with internet connection. Use of the fuji controllers stays the same. However, with the VTS the user may interact with chamber using their smart phone, tablet or on a PC/Laptop. This allows for capacitive touchscreen that feels more familiar than the other touchscreens. As you're using a familiar device to interface with the system. Ergonomics is setup to use with a smart device in portrait mode to allow thumb control/operation while being able to view most functions on the screen.

### cMT-SVR Startup Guide



Figure 25

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |                                                                                   |                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Features</b><br>Supports Display on cMT Viewer Clients<br>Compact Design and DIN-rail Mountable<br>Fan-less Cooling System<br>Built-in 256 MB Flash Memory<br>SD Card Slot for Expansion of Storage<br>One USB Host Port<br>One Gigabit Ethernet Port<br>Supports E-mail<br>Supports MPI 187.5K<br>Built-in Power Isolator<br>Built-in EasyAccess 2.0 License (cMT-SVR-102/202)<br>Wi-Fi compatible with 802.11 b/g/n (cMT-SVR- 200/202)<br>Wide input voltage range:10.5~28VDC (cMT-SVR-200/202) |                       |  |              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       | <b>cMT-SVR-100/102</b>                                                            | <b>cMT-SVR-200/202</b>                                                                          |
| <b>Memory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Flash                 | 256 MB                                                                            | 256 MB                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | RAM                   | 256 MB                                                                            | 256 MB                                                                                          |
| <b>Processor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       | 32-bit RISC 600MHz                                                                | 32-bit RISC 600MHz                                                                              |
| <b>I/O Port</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SD Card Slot          | SD/SDHC                                                                           | SD/SDHC                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | USB Host              | USB 2.0 x 1                                                                       | USB 2.0 x 1                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | USB Client            | N/A                                                                               | N/A                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Ethernet              | 10/100/1000 Base-T x 2                                                            | 10/100/1000 Base-T x 1                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Wi-Fi                 | N/A                                                                               | IEEE 802.11 b/g/n<br>802.11b: max 18.01 dBm<br>802.11g: max 11.02 dBm<br>802.11n: max 12.20 dBm |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | COM Port              | COM1: RS-232<br>COM2: RS-485 2W/4W<br>COM3: RS-485 2W                             | COM1: RS-232<br>COM2: RS-485 2W/4W<br>COM3: RS-485 2W                                           |
| <b>RTC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       | Built-in                                                                          | Built-in                                                                                        |
| <b>Power</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Input Power           | 24±20%VDC                                                                         | 10.5~28VDC                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Power Isolation       | Built-in                                                                          | Built-in                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Power Consumption     | 230mA@24VDC                                                                       | 1000mA@12VDC ; 450mA@24VDC                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Voltage Resistance    | 500VAC (1 Minute)                                                                 | 500VAC (1 Minute)                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Isolation Resistance  | Exceed 50MΩ at 500VDC                                                             | Exceed 50MΩ at 500VDC                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Vibration Endurance   | 10 to 25Hz (X, Y, Z direction 2G 30 minutes)                                      | 10 to 25Hz (X, Y, Z direction 2G 30 minutes)                                                    |
| <b>Specification</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | PCB Coating           | Yes                                                                               | Yes                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Enclosure             | Plastic                                                                           | Plastic                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Dimensions WxHxD      | 27 x 130 x 115 mm                                                                 | 27 x 130 x 115 mm                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Weight                | Approx. 0.18 kg                                                                   | Approx. 0.18 kg                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mount                 | 35 mm DIN rail mounting                                                           | 35 mm DIN rail mounting                                                                         |
| <b>Environment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Protection Structure  | IP20                                                                              | IP20                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Storage Temperature   | -20° ~ 70°C (-4° ~ 158°F)                                                         | -20° ~ 70°C (-4° ~ 158°F)                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Operating Temperature | -20° ~ 55°C (-4° ~ 131°F)                                                         | -10° ~ 55°C (14° ~ 131°F)                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Relative Humidity     | 10% ~ 90% (non-condensing)                                                        | 10% ~ 90% (non-condensing)                                                                      |

Specification

Table 4

## Dimensions

*cMT-SVR-100/102*

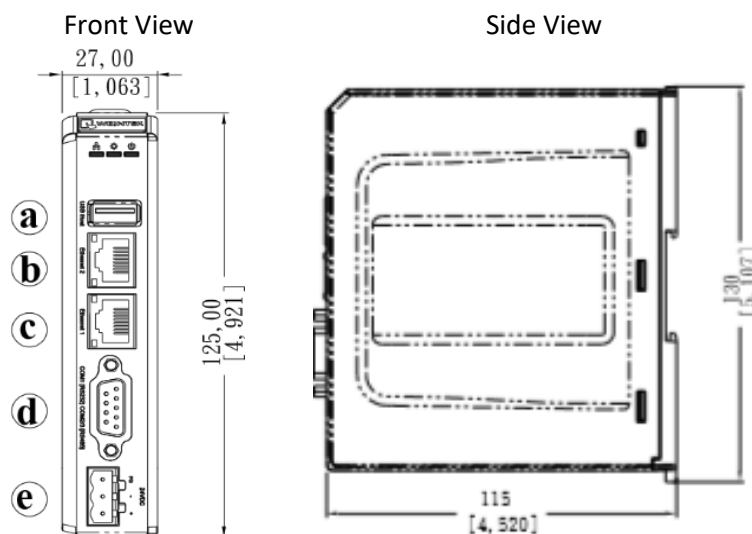


Figure 26

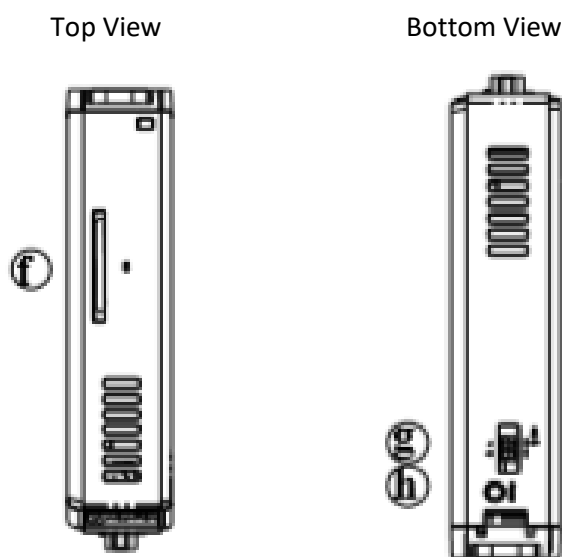


Figure 27

|          |                                                |          |                 |
|----------|------------------------------------------------|----------|-----------------|
| <b>a</b> | USB Host Port                                  | <b>e</b> | Power Connector |
| <b>b</b> | Ethernet 2 Port                                | <b>f</b> | SD Card Slot    |
| <b>c</b> | Ethernet 1 Port                                | <b>g</b> | DIP Switch      |
| <b>d</b> | COM1 RS-232, COM2 RS-485 2W/4W, COM3 RS-485 2W | <b>h</b> | Reset Button    |

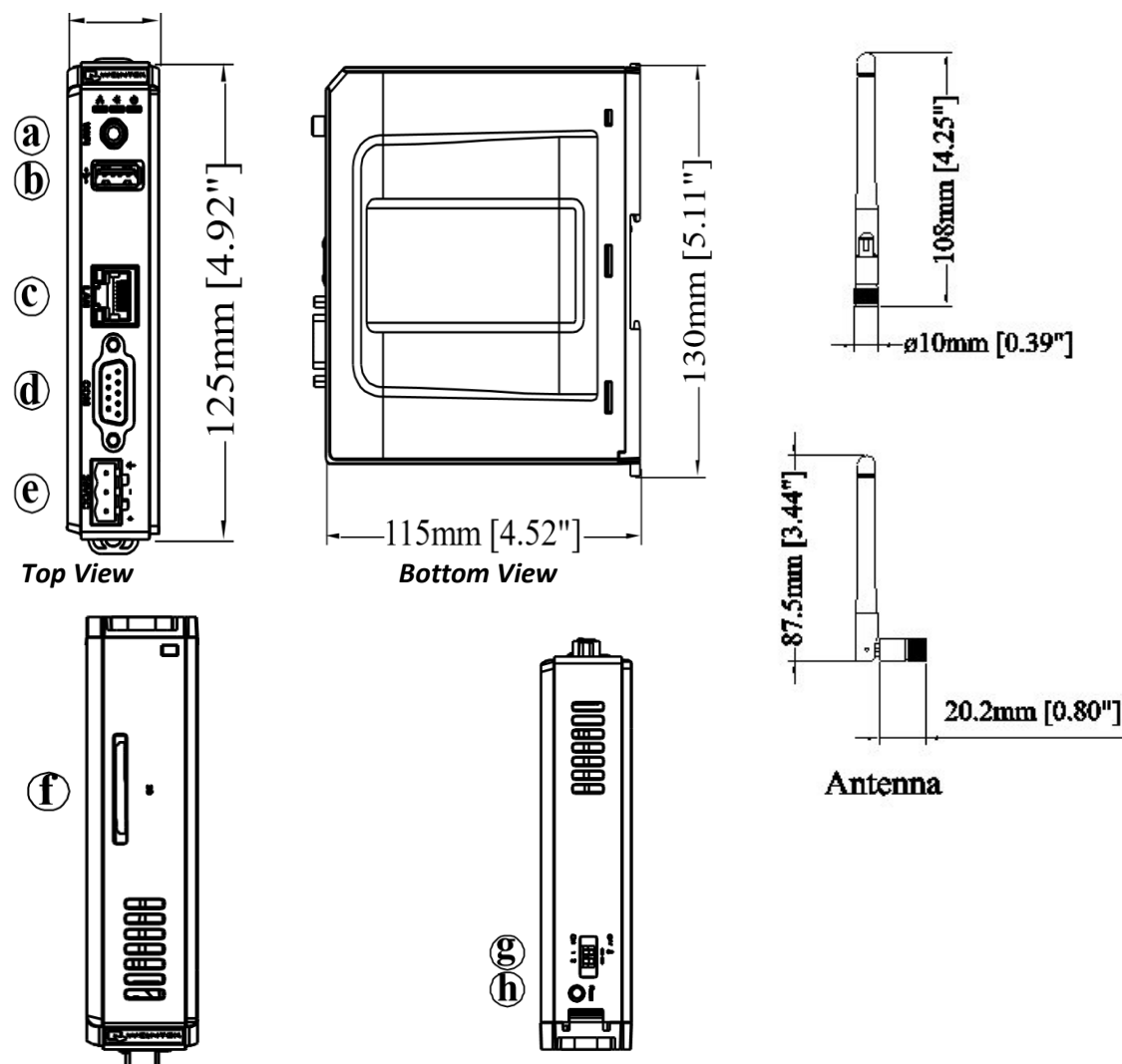
Table 5

**cMTSVR-200/202**

27mm [1.06"]

Front View

Side View



|          |                                                |          |                 |
|----------|------------------------------------------------|----------|-----------------|
| <b>a</b> | Wi-Fi                                          | <b>e</b> | Power Connector |
| <b>b</b> | USB Host Port                                  | <b>f</b> | SD Card Slot    |
| <b>c</b> | Ethernet Port                                  | <b>g</b> | DIP Switch      |
| <b>d</b> | COM1 RS-232, COM2 RS-485 2W/4W, COM3 RS-485 2W | <b>h</b> | Reset Button    |

Table 6

### Connector pin designations

| PIN# | COM1 RS-232 | COM2 RS-485 |     | COM3 RS-485 |
|------|-------------|-------------|-----|-------------|
|      |             | 2W          | 4W  |             |
| 1    |             |             |     | Data+       |
| 2    | RxD         |             |     |             |
| 3    | TxD         |             |     |             |
| 4    |             |             |     | Data-       |
| 5    | Ground      |             |     |             |
| 6    |             | Data+       | RX+ |             |
| 7    |             | Data-       | RX- |             |
| 8    |             |             | TX+ |             |
| 9    |             |             | TX- |             |

Table 7

### USB host port and SD card slot

USB 2.0 full speed host interface supports USB drive. While using an external hard drive, use external power supply. Do not use USB port to charge external device. The SD card is used as an expansion of storage 32GB.

### Ethernet port

The unit has one/two 10/100/1000M Gigabit Ethernet ports.

The LED indicators on the Ethernet port indicate:

Orange LED: LAN link status

Green LED: Active communication status

### DIP switch.

Each unit is equipped with a reset button and a set of DIP switches. When using the DIP switches to change modes, the corresponding functions will be triggered.

When SW1 is turned ON position and chamber is turned on again, the IP setting is restored to default:

cMT-SVR-100/102  
Ethernet 1: DHCP  
Ethernet 2: 192.168.100.1  
cMT-SVR-200/202  
Ethernet 1: DHCP  
Wi-Fi: DHCP



| SW1 | SW2 | Mode                         |
|-----|-----|------------------------------|
| OFF | OFF | Normal mode                  |
| ON  | OFF | Restore Ethernet IP settings |
| OFF | ON  | Boot loader mode             |
| ON  | ON  | Restore factory default      |

Figure 28

**Note:** Reboot cMT-SVR after adjusting DIP switches to start the corresponding mode. When restore factory default, the project file and history data stored in the unit are all cleared.

### LED indicator

LED indicators show the operation status of cMT-SVR.

|                      |                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------|
| Power (Orange)       | Indicates power status.                                                                                     |
| CPU (Green)          | Indicates CPU status.                                                                                       |
| Communication (Blue) | Indicates communication status. It flashes during communication and may stay on when communication is good. |

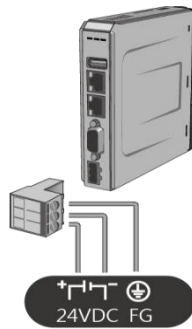
Table 8

### Lithium battery

A cMT-SVR Series HMI requires a CR1225/CR1220 coin type lithium battery to keep the RTC running. Due to the difference in manufacturing time, the battery type can either be CR1225 or CR1220 3V lithium battery. To change the battery, please choose the type depending on the model you use.

### Power connection

Power: The unit can be powered by DC power only, cMT-SVR-100/102 voltage range: 24±20% Volts DC, cMT-SVR-200/202 voltage range: 10.5~28 Volts DC, compatible with most controller DC systems.



**Figure 29**

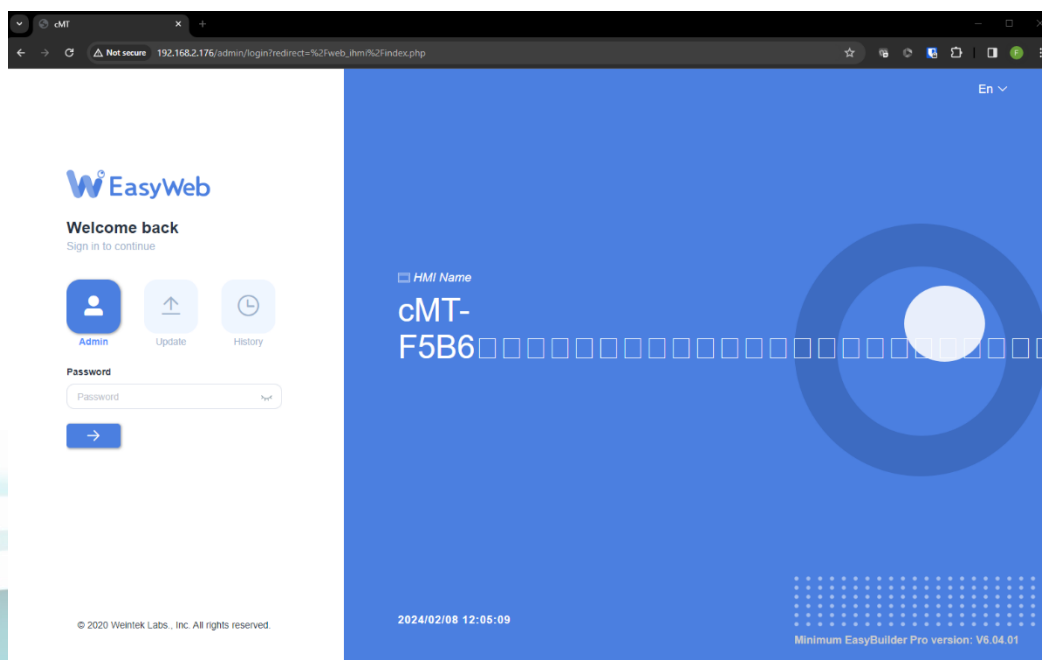
**Note:** Connect positive DC line to the '+' terminal and the DC ground to the '-' terminal.

## System Setting

Connect cMT-SVR via Ethernet cable or Wi-Fi and configure system settings using the following two ways.

### *Set in internet browser.*

Open internet browser (IE, Chrome, or Firefox), and enter cMT-SVR IP address (for example: 192.168.1.15/web\_ihmi) to configure cMT-SVR.



**Figure 30**

Install cMT Viewer on PC or via App or Play store devices

cMT Viewer application for PC will be available on the flash drive sent with the chamber. When using a smart device can be downloaded via the App store for Apple devices (<https://apps.apple.com/us/app/cmt-viewer/id553431850>) and the Play store for Android devices ([https://play.google.com/store/apps/details?id=com.weintek&hl=en\\_US](https://play.google.com/store/apps/details?id=com.weintek&hl=en_US)). Search for cMT viewer.

Apple Devices



Android Devices

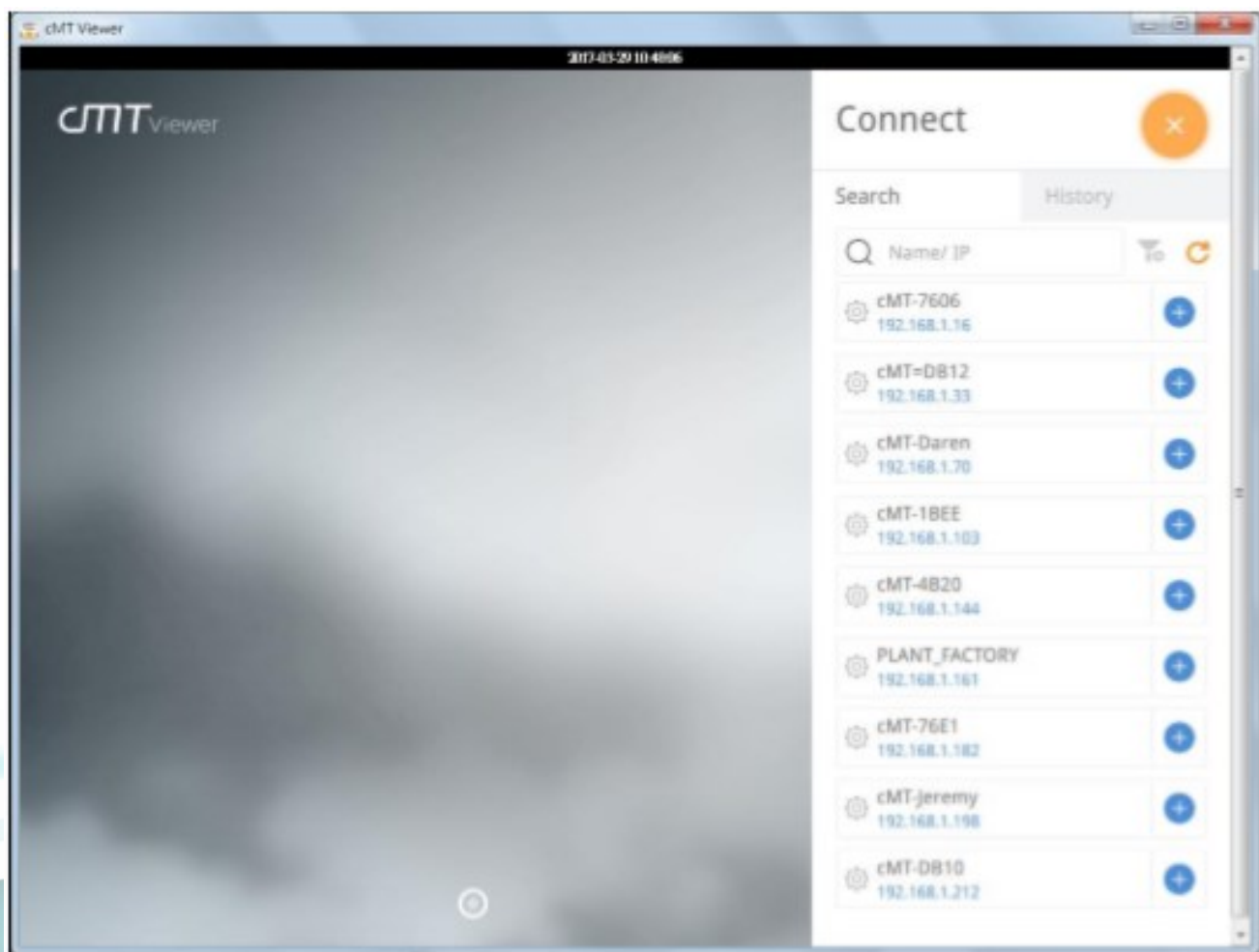


Figure 31

**Note:** For the initial setup we recommend using a PC and connecting both devices via the LAN port.

Once installed launch cMT Viewer App, tap Search, select the cMT-SVR and tap  icon to configure.

## cMT SVR System Setting

### Information

The following part introduces cMT-SVR system information.



## Welcome back

Sign in to continue



Admin



Update



History

**Password**

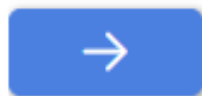
 

Figure 32

| Icon                                                                                         | Description                      |
|----------------------------------------------------------------------------------------------|----------------------------------|
| <br>Admin   | Login as Administrator.          |
| <br>Update  | Login to Update program.         |
| <br>History | Login to download History Files. |

Table 9

## System Setting

The following part introduces cMT-SVR system setting.





Admin
Update
History

**Password**

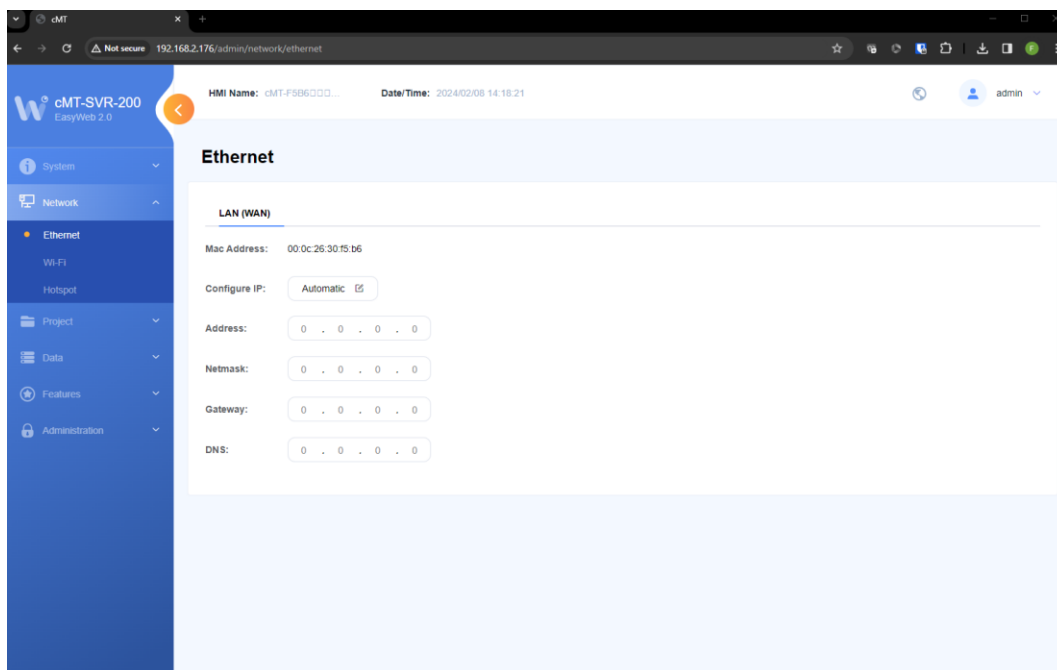
→

Figure 33

There are two modes, [System setting] and [Update]. [System Setting] controls all the settings while [Update] controls limited items. For safety, specify password for configuration. Enter password to log in and then select [History] to back up history data. The password from Initial setup is 111111.

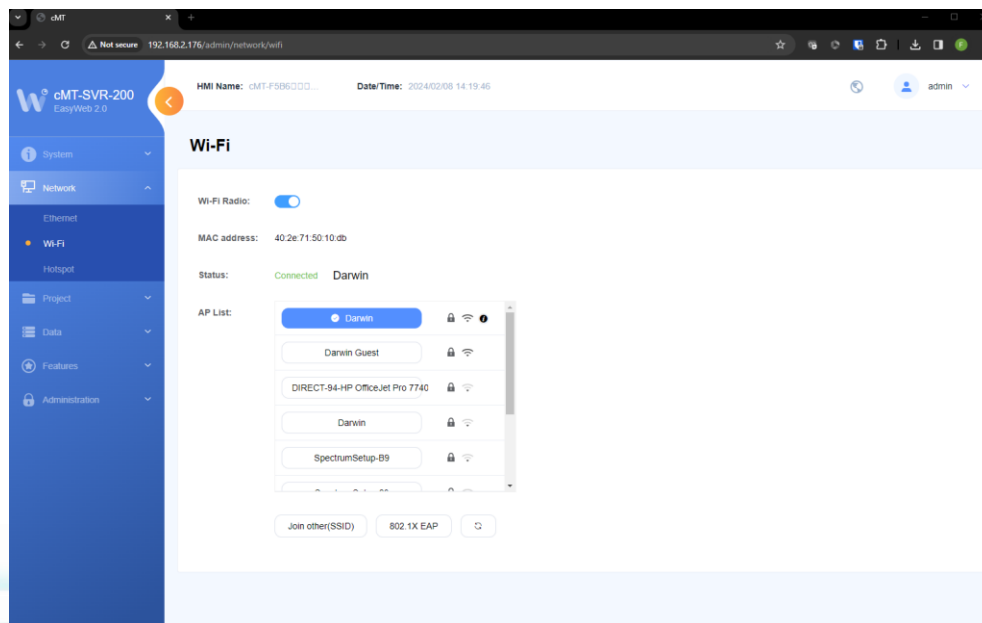
## Network

Set the IP address of Ethernet port. cMT-SVR-100/102 has two Ethernet ports while cMT-SVR-200/202 only has one.



**Figure 34**

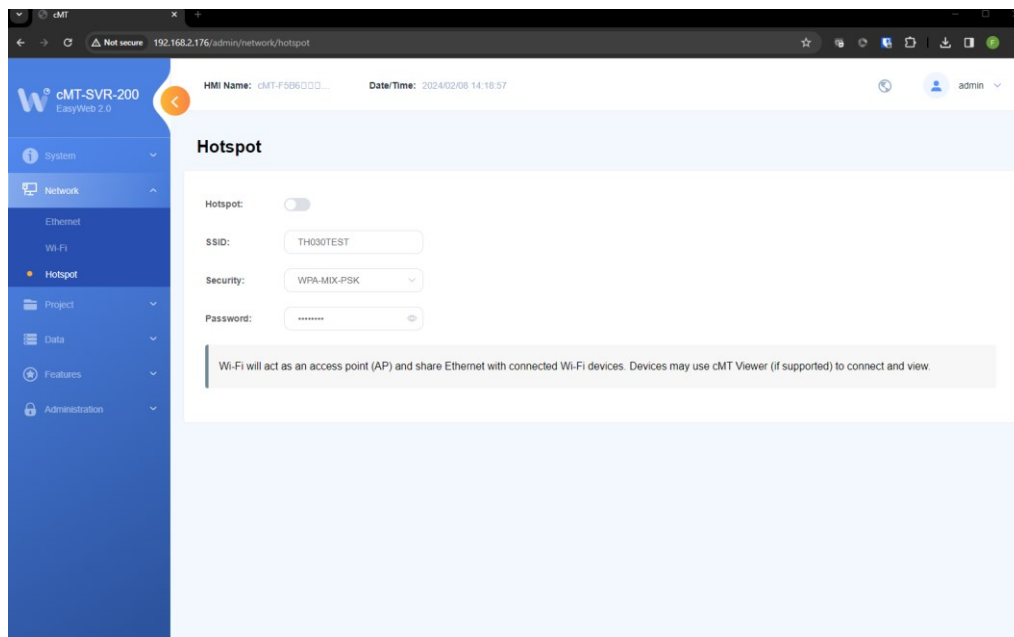
Wi-Fi cMT-SVR-200/202 can be connected via Wi-Fi. The settings page is shown below.



**Figure 35**

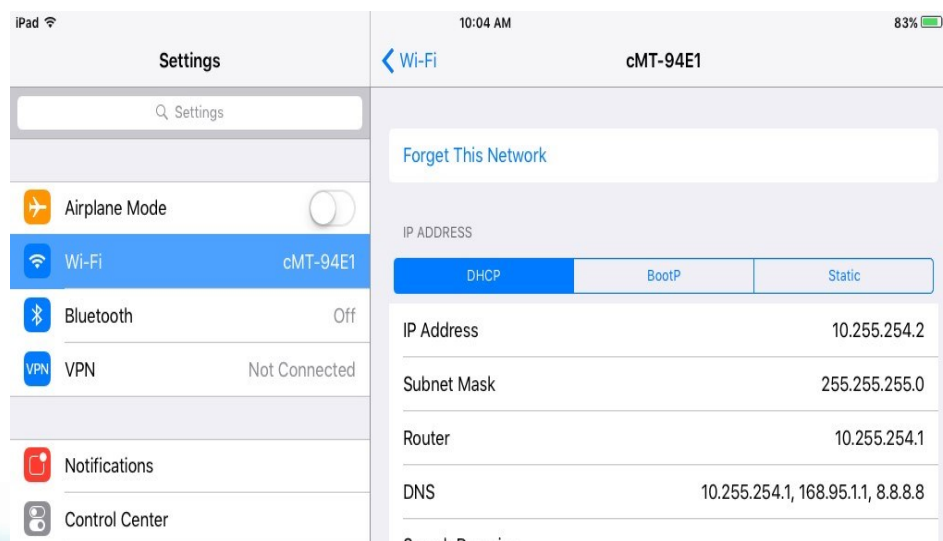
### **Wi-Fi Hotspot**

Using Wi-Fi hotspot on cMT-SVR-200/202 is possible.



**Figure 36**

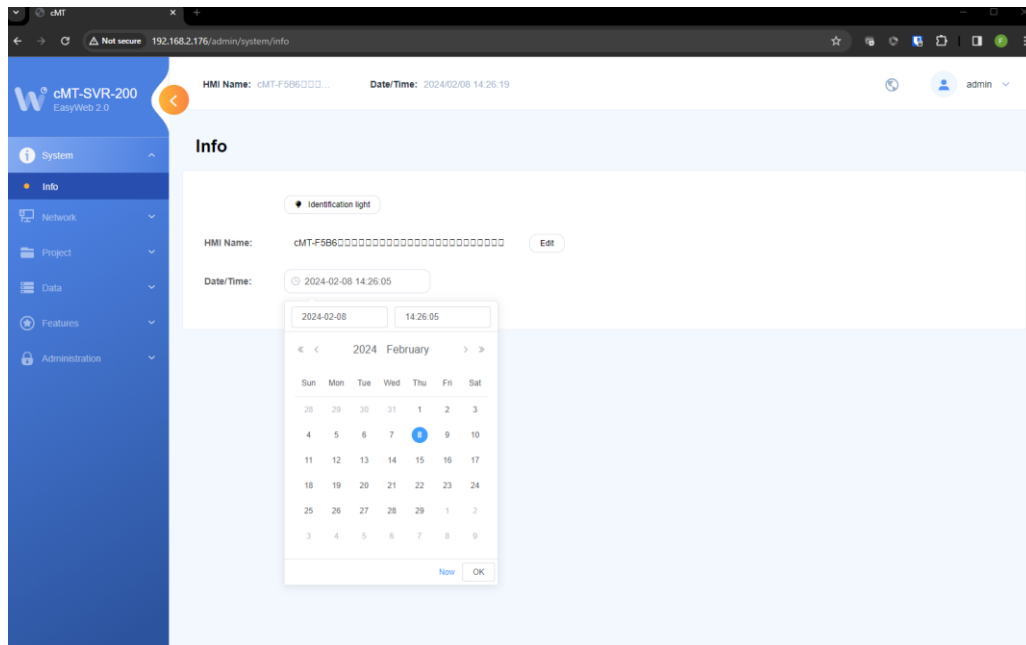
After setting hotspot, computers and portable devices that support Wi-Fi can connect with cMT-SVR-200/202 to wirelessly edit the project, download files, or monitor using cMT Viewer.



**Figure 37**

## Date/Time

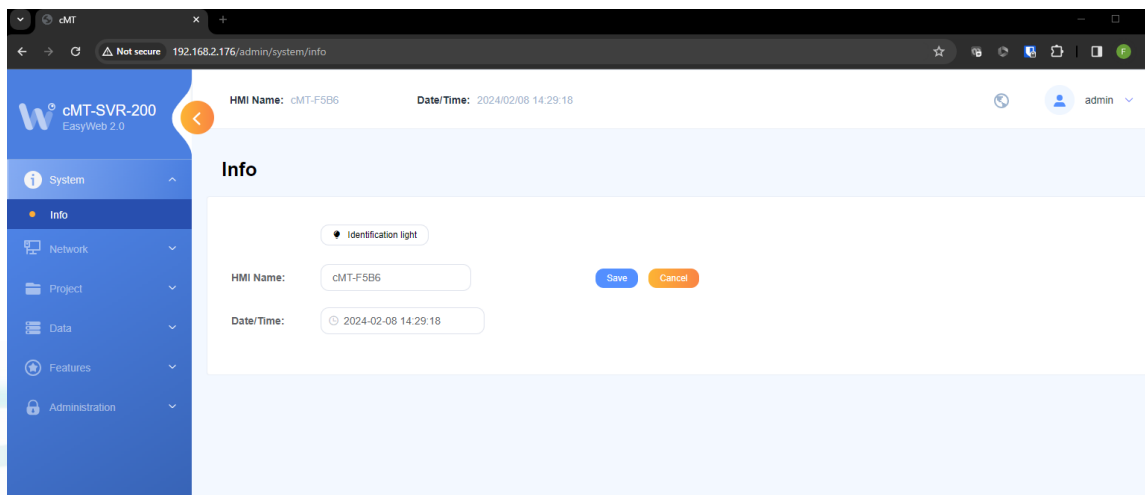
Set time or select [Now.] to synchronize cMT-SVR time with PC time. Daylight saving is enabled to occur March second Sunday at 2AM and end November first Sunday at 3am.



**Figure 38**

### ***HMI Name***

Enter a cMT-SVR name to identify the unit. This saves the trouble of remembering the IP address of each unit. The HMI name will also be used in the email from name for the email account address. Click the [Identification light] button to turn on the CPU light of the unit. The light flashes 3 times to aid in finding the unit.



**Figure 39**

## History

Clear or backup history data in cMT-SVR.

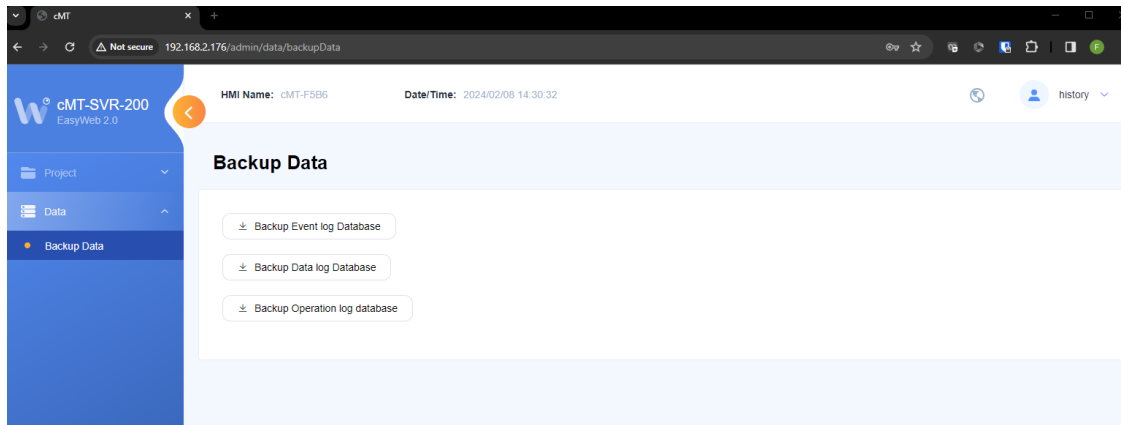


Figure 40

## Email

Set the mail address and contact group. The email settings that come with the chamber are for testing only with a known good email account. Please see your email administrator to set up correct email credentials for your email accounts. Darwin reserves the right to update these credentials without notification to any end user using this account.

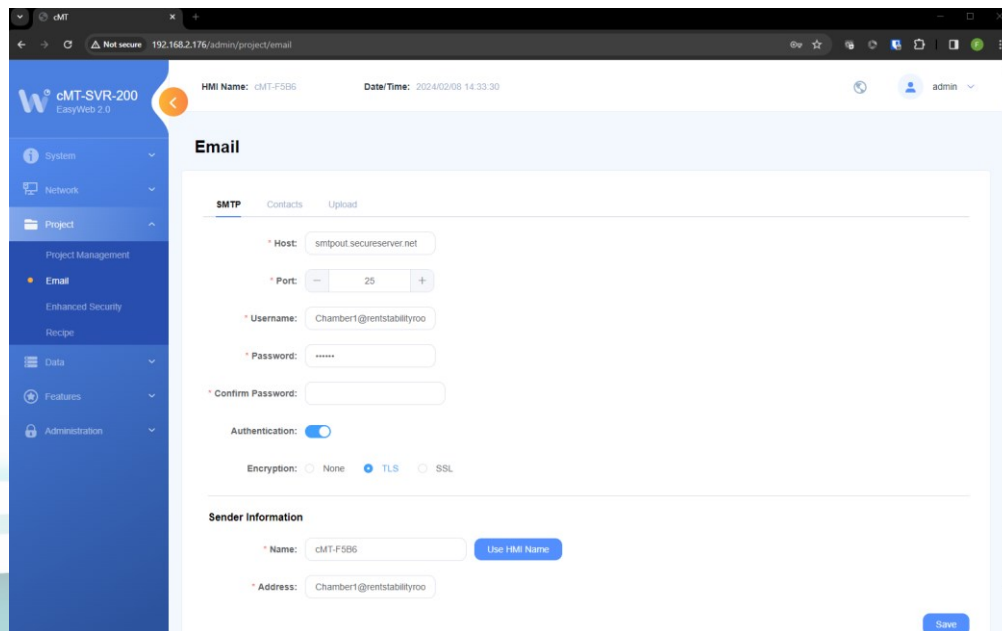


Figure 41

## Project Management

Restart, update, or backup project file. Can be used to restore factory default program saved on the SD card under default folder. Contact technical support before attempting.

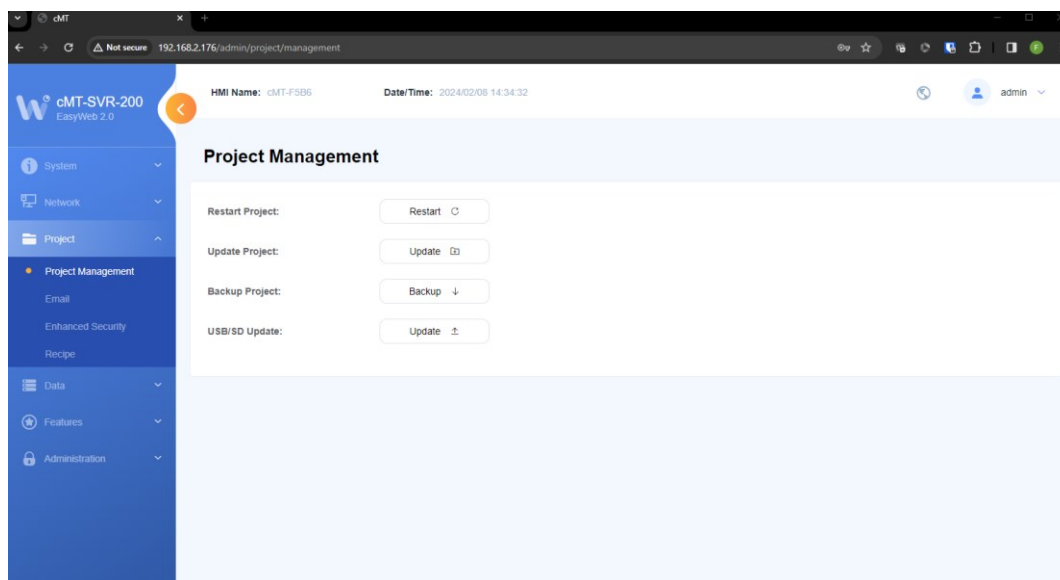


Figure 42

## System Password

Set the password for System Settings login, and the password for transferring project file and history data.

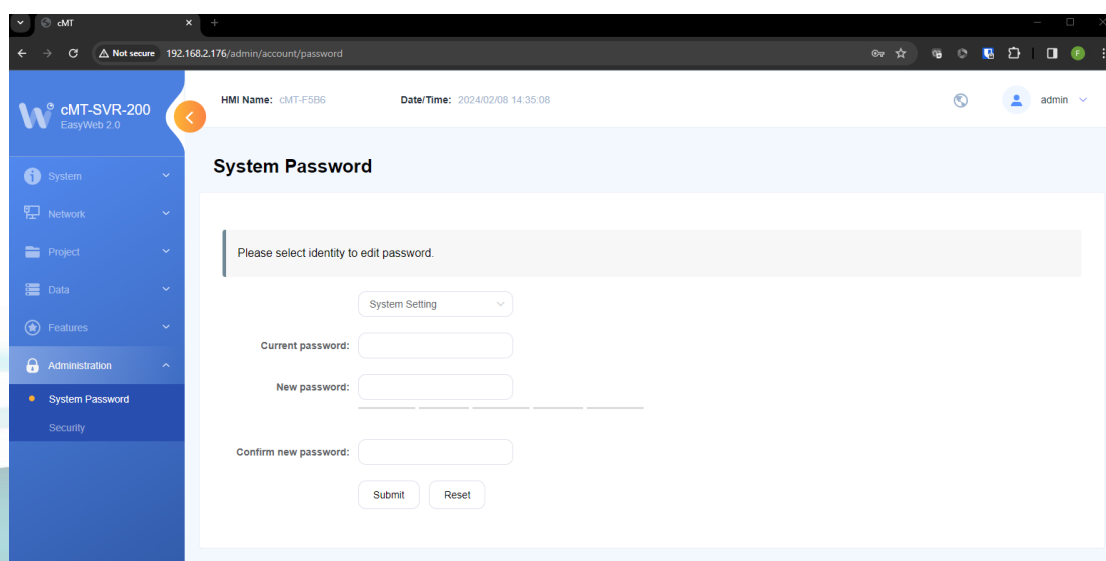


Figure 43

## EasyAccess 2.0

Activate EasyAccess 2.0 and configure proxy settings. Easy Access is a VPN connection to the HMI over the internet. Using EasyAccess 2.0 on PC or other internet accessible device with EasyAccess 2.0 installed, will allow access to the chamber anywhere you have internet access. A free EasyAccess account is required. <https://account.ihmi.net/domain/index.php>



See Getting Started with Easy Access 2.0 for setup with PC and smart devices.

<https://support.ihmi.net/ea20/getting-started>



Figure 44

## cMT Viewer App

cMT Viewer can connect and control cMT Series HMI models. The devices that support cMT Viewer are: cMT-iv5 (Built-in), iPad/iPhone (Download from iOS® APP Store), Android™ (Download from Google Play), Windows®.

Please note that:

1. Each cMT Viewer device can simultaneously connect with 4 cMT Series models.
2. Each cMT Viewer device can simultaneously monitor 50 cMT Series models (under Monitor Mode).
3. Each cMT Series model can simultaneously connect with 3 cMT Viewer devices.

### 4.1 Introduction of icons

| Icon                                                                                | Description                          |
|-------------------------------------------------------------------------------------|--------------------------------------|
|  | Tap this icon to run cMT Viewer App. |

| Icon                                                                              | Description                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|  | Tap the Start Button when running the project to return to cMT Viewer home screen. |
|  | Tap this icon to configure cMT Viewer.                                             |
|  | Tap this icon to change the screen layout in Monitor Mode.                         |
|  | Tap this icon to search for all cMT Series HMIs on the same network.               |

Table 10

### *How to load project file to cMT Viewer*

Step 1. Launch cMT Viewer App and tap the + button as shown below.

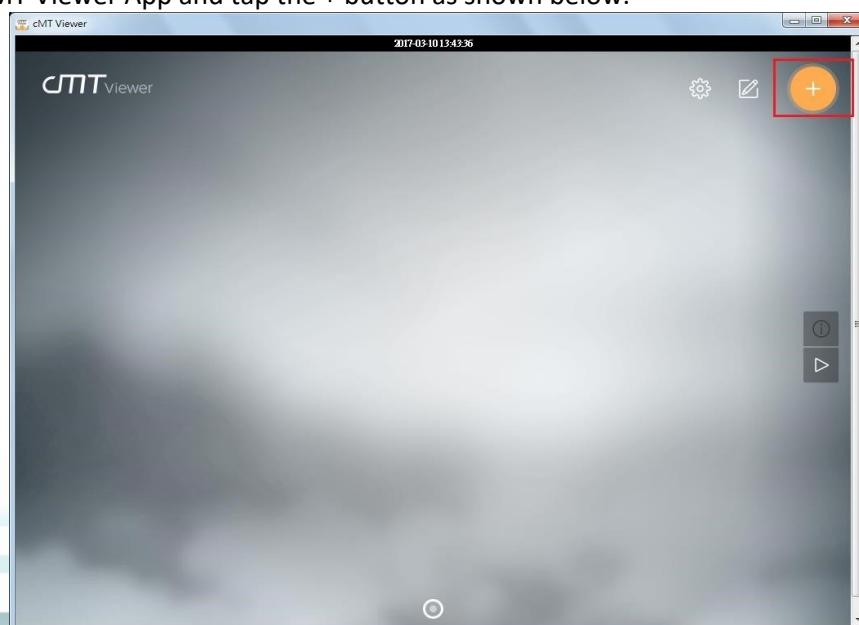


Figure 45

Step 2. Search for all the cMT Series HMI on the same network.

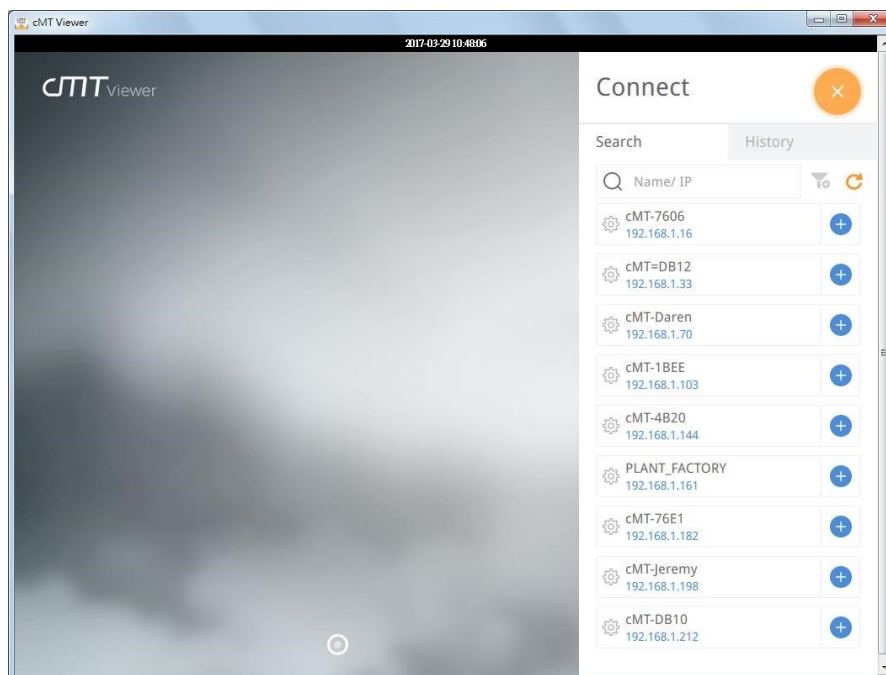


Figure 46

Step 3. Select a cMT Series HMI, tap  and then enter password. If [Use the same password for other machines] checkbox is selected, entering password will not be necessary when adding other cMT Series HMI that use the same password.

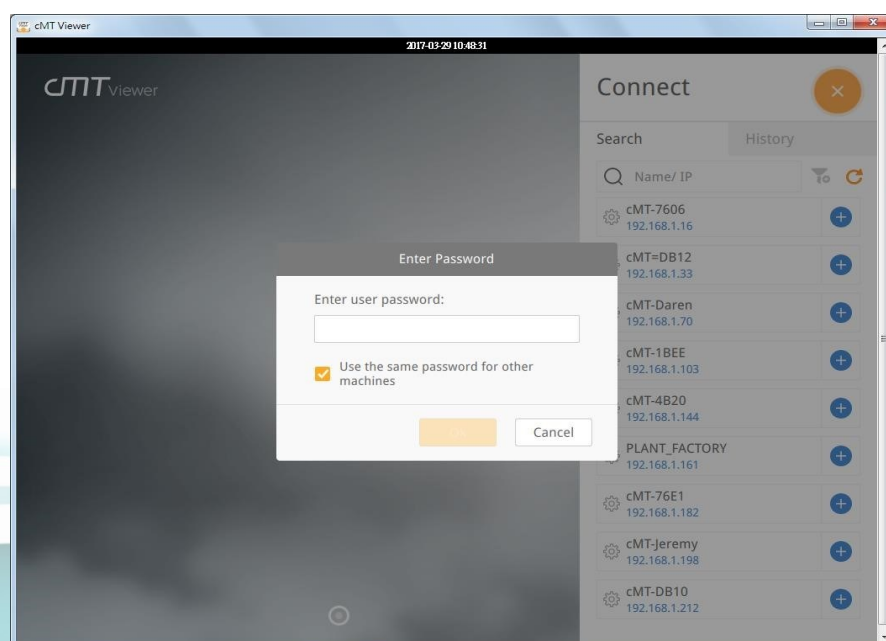


Figure 47

Step 4. When finished, cMT Viewer will display the project.

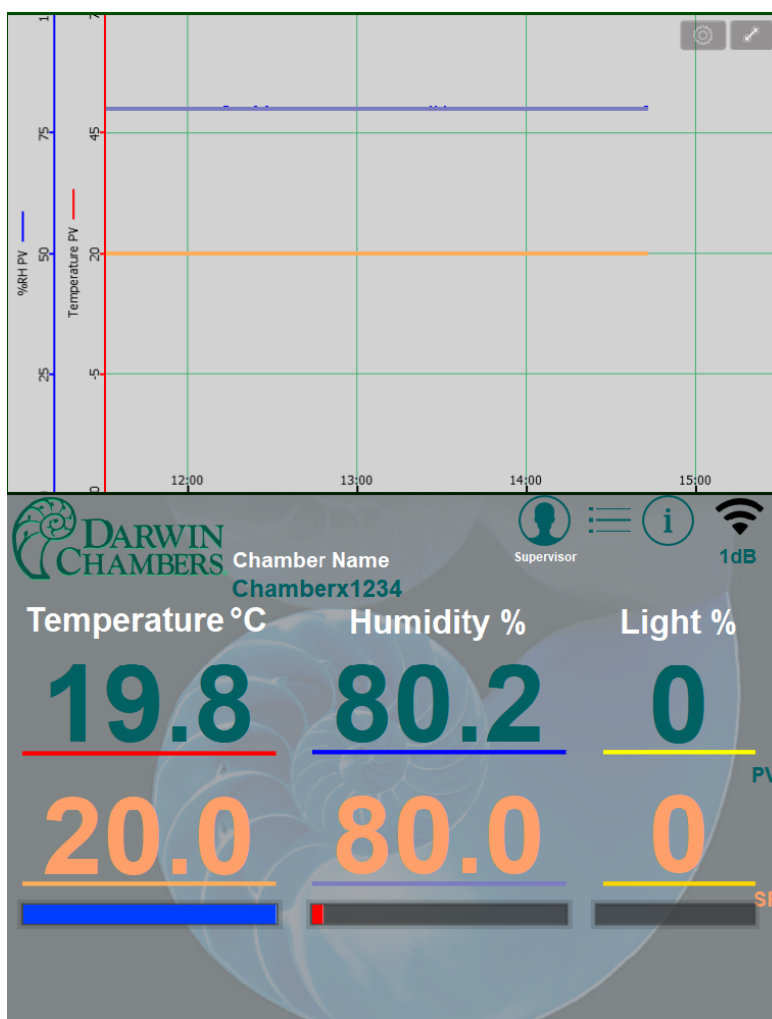


Figure 48

Tap the Start Button to return to the main screen. To connect to another cMT-SVR, follow the preceding steps to search for cMT-SVR and load the project. The



+ button of the connected cMT Series HMI will turn grey:

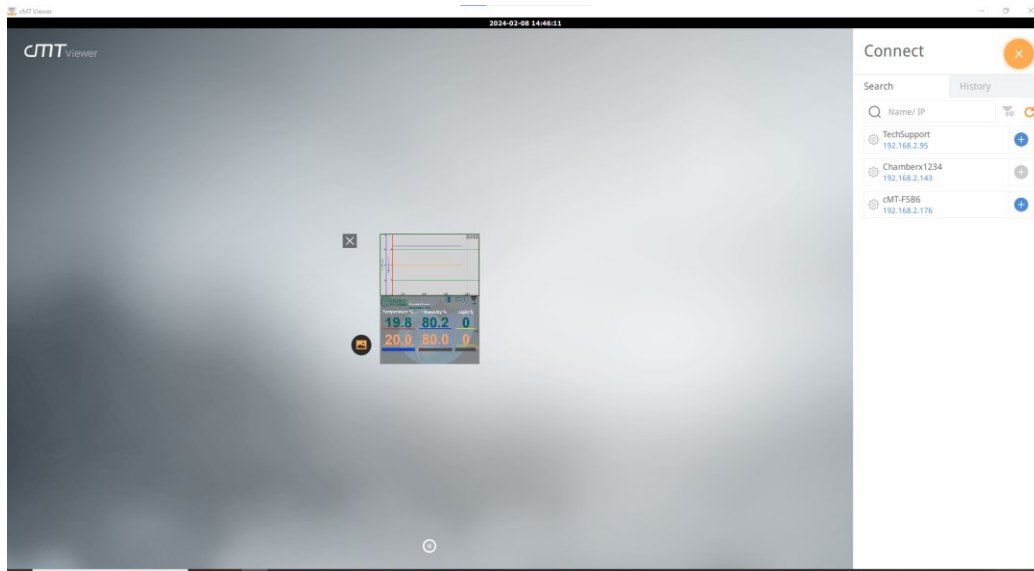


Figure 49

### *How to open cMT Viewer settings page*

Step 1. In cMT Viewer main screen tap  icon.

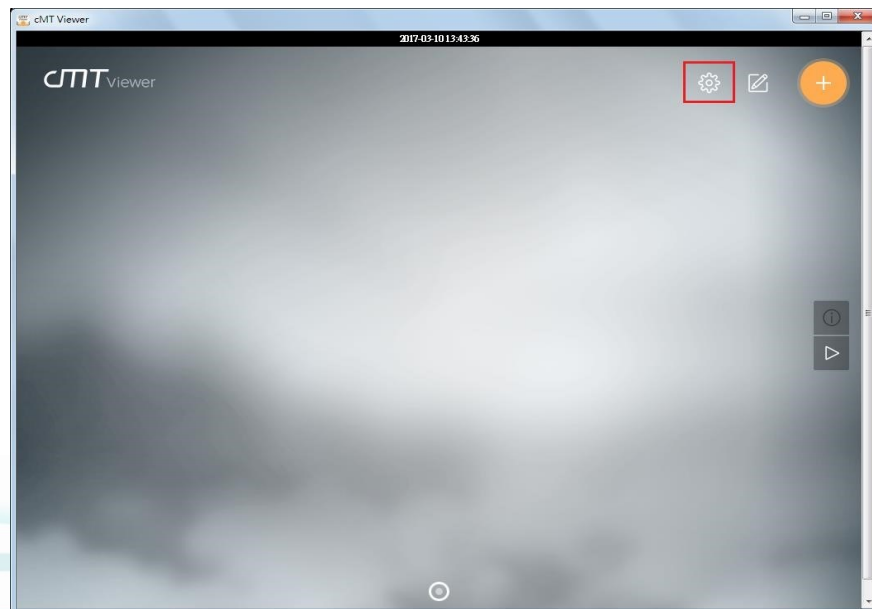
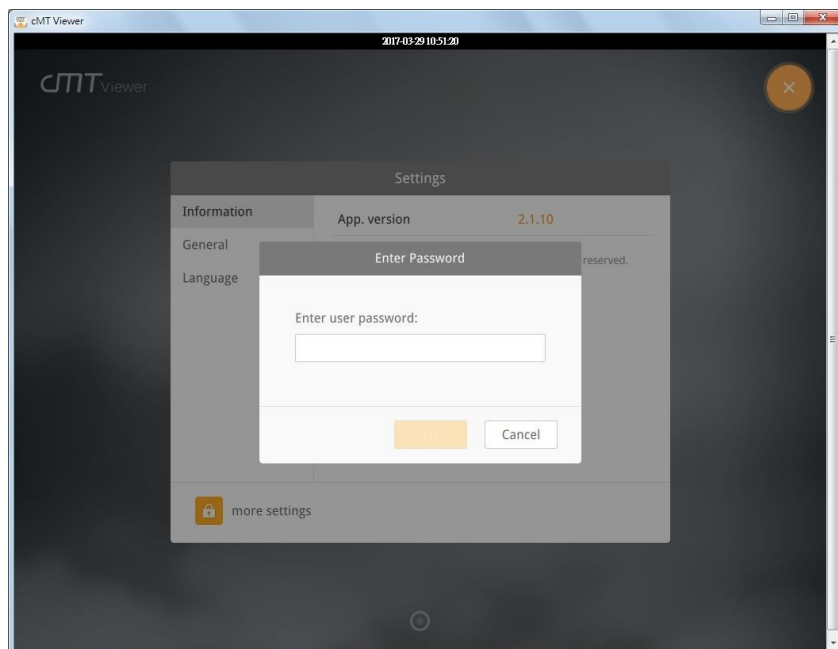


Figure 50

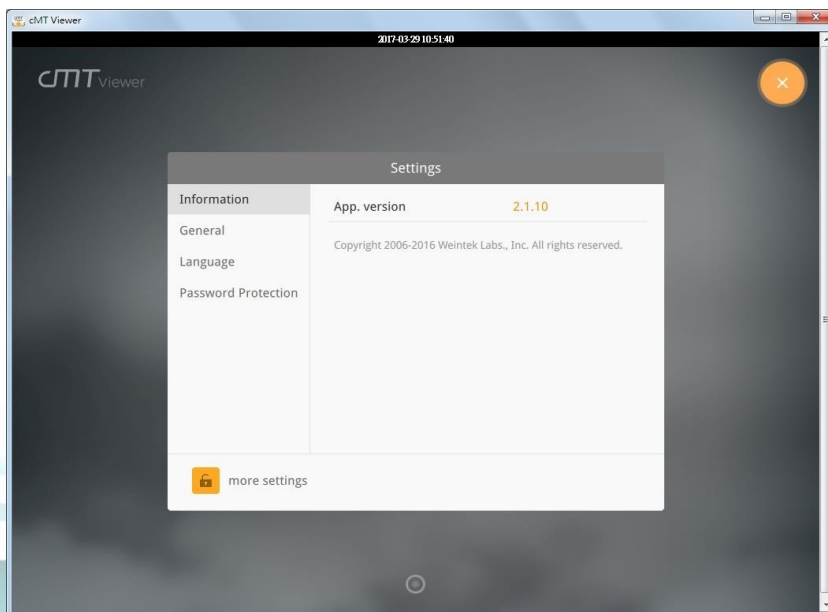
Step 2. Enter password to open [more settings].



**Figure 51**

## Information

cMT Viewer version information.



**Figure 52**

## General

cMT Viewer display settings.

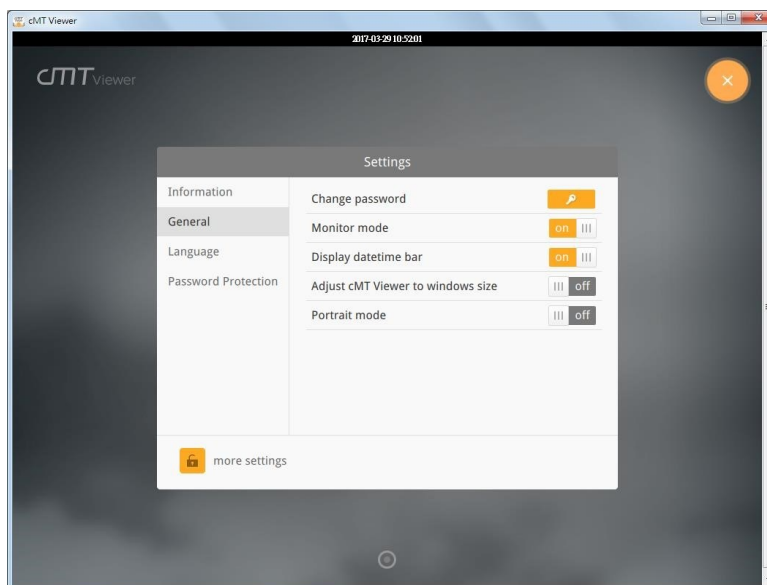


Figure 53

## Language

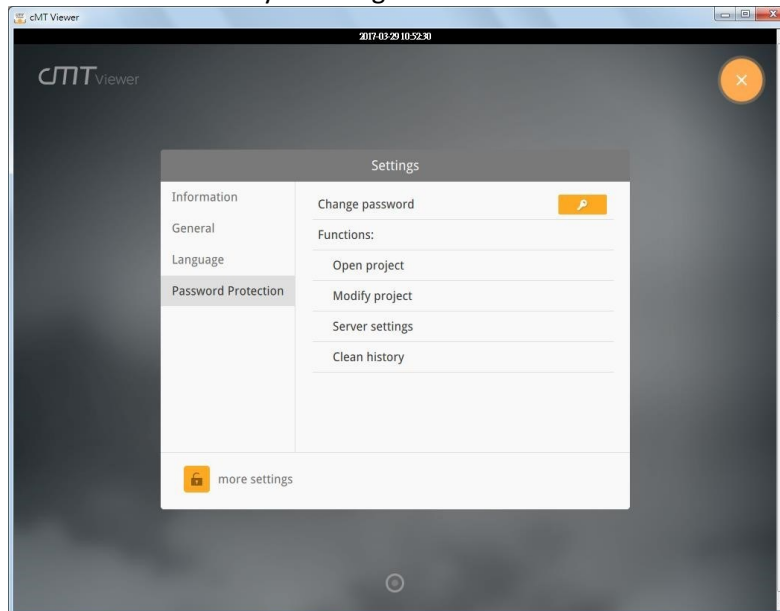
cMT Viewer interface language menu.



Figure 54

### ***Password Protection***

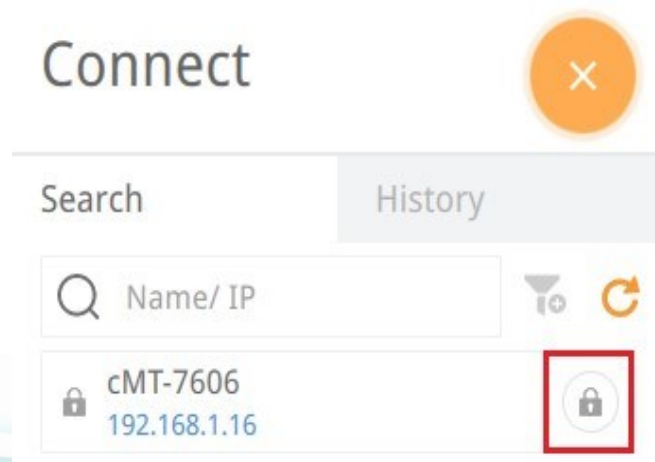
After setting, entering password will be necessary for using these functions.



**Figure 55**

### ***Open project***

If this function is protected by password, adding new cMT Series HMI will require password.



**Figure 56**

### ***Modify project.***

If this function is protected by password, changing layout of Monitor Mode will require password.

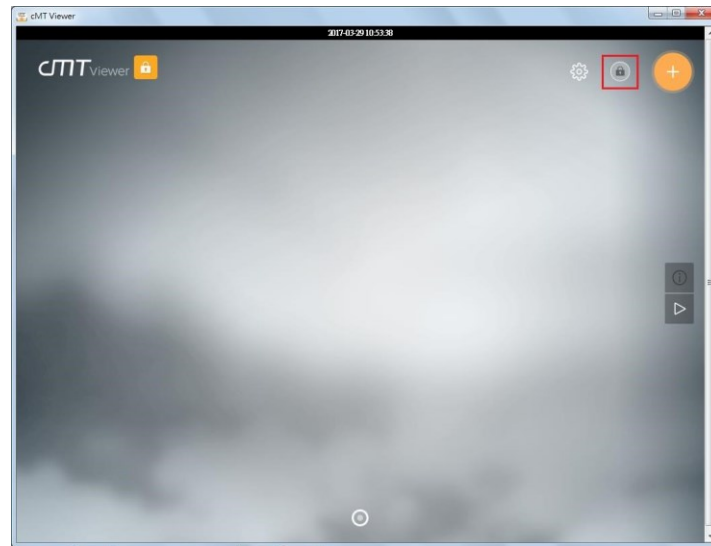


Figure 57

### *Server settings*

If this function is protected by password, entering cMT system settings using cMT Viewer will require password.

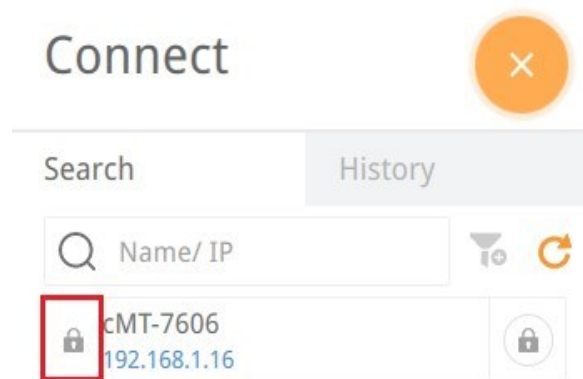


Figure 58

### *Clear history*

If this function is protected by password, clearing connection history in History page will require password.

## Connect

Search

History





cMT-DB10  
192.168.1.212



Figure 59

To use password protected functions, tap the lock icon  in the upper left corner and enter password.

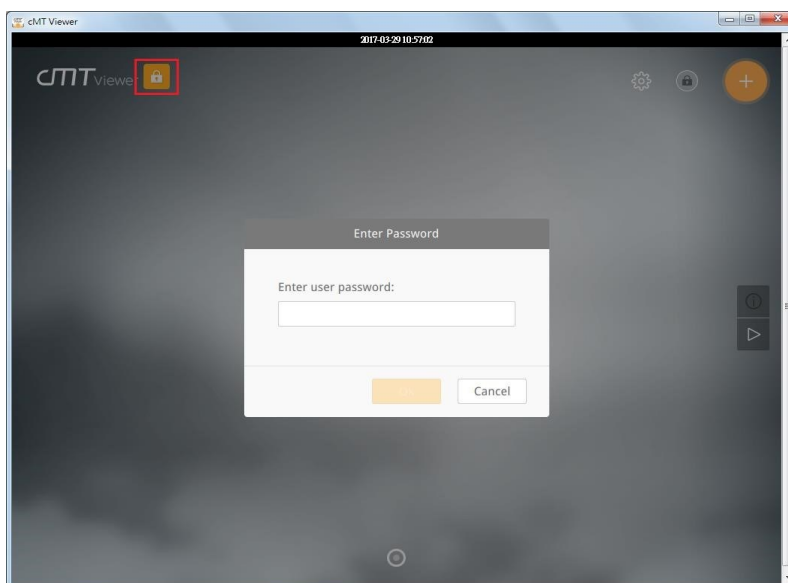
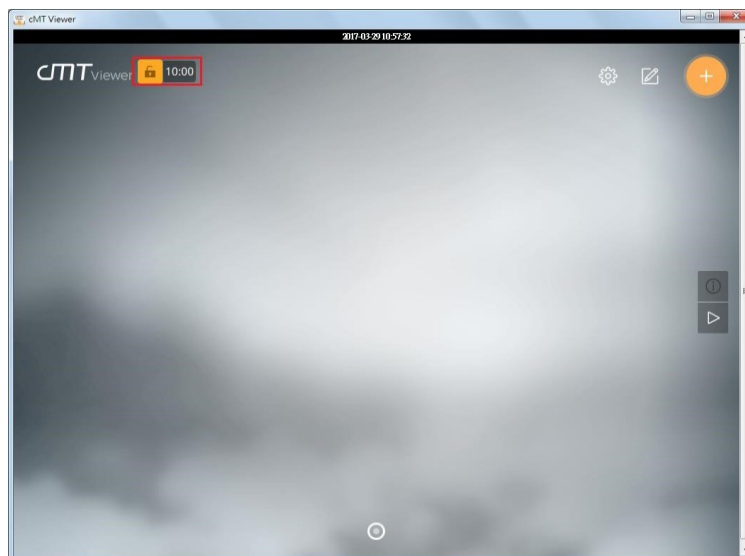


Figure 60

After entering password, cMT Viewer will start a countdown timer of 10 minutes, when it is over, the functions protected by password will be locked again. The countdown timer can be reset by tapping any button in cMT Viewer. To reset the timer to zero, tap .

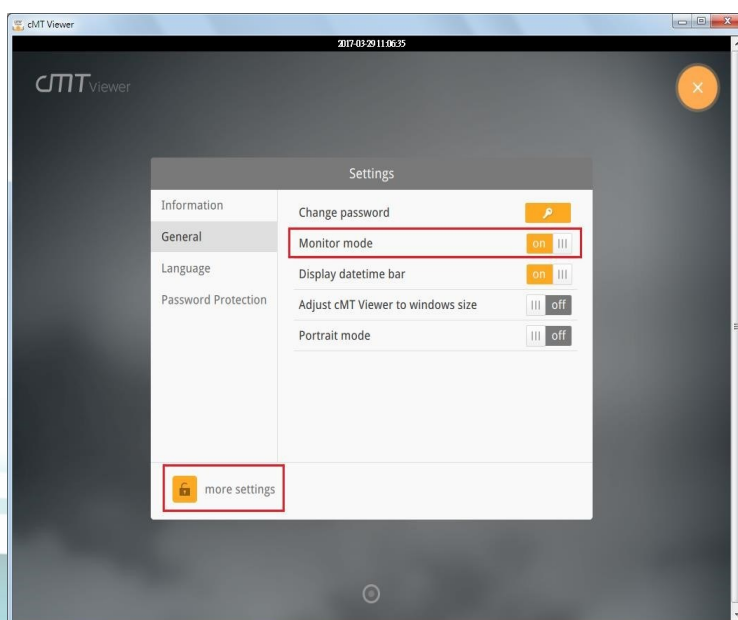


**Figure 61**

### **Monitor Mode**

cMT Viewer supports Monitor Mode. In Monitor Mode, the user can select up to 50 HMIs (chambers) to monitor simultaneously, without the need for accessing each cMT.

Step 1. Open [more settings] in cMT Viewer, go to General page and enable [Monitor mode].



**Figure 62**

Step 2. Download the project file to cMT Series HMI using cMT Viewer, the Monitor Mode window appears. Alarm message will scroll on the bottom. The process values will flash when in warning and in alarm state. Wi Fi signal strength in upper right-hand corner. When using ramp / soak feature and enable on home screen is selected, the status of the program will appear on the bottom of the screen.

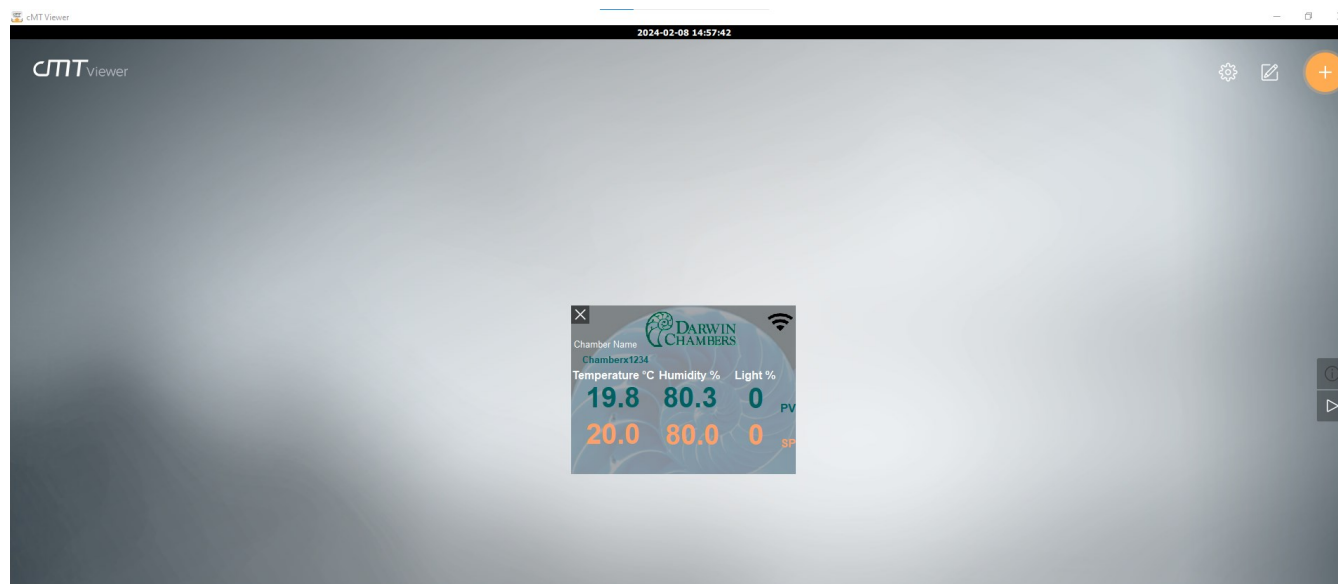


Figure 63

## HMI Screens (VTS)

The following screens may have screens that are not found on your chamber. This manual covers multiple chamber series and options they have.

### Main Screen

The Main Screen shows the trending data of the process value and setpoints of temperature, Humidity, and lights when applicable.

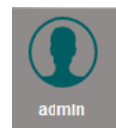
Icons on the main screen and top of each following screen.



Chamber is in Alarm. This will silence the alarm on the HMI. Then navigate to the alarm screen. If alarms are configured to the same as the output alarms the chamber will still have audible alarm that can be silence at push of button at chamber.



This icon is used as the login of the user to change settings. Login icon can be found on every page to prevent navigating back to login screen to make a change. When a user is logged in their name will appear here. If timed out the name will disappear.



The Setting icon is used to navigate to gateway of all the settings for the HMI and chamber.

The information icon is used to highlight function of the current screen you are on.

The Wi Fi icon is an indicator for signal strength. When Wi Fi is used as an Access Point the Icon will be black.

| In AP Mode or<br>Signal Strength:<br>Weak<br><br>< -70 dBm                        | Signal Strength:<br>Fair<br><br>-60 to -70 dBm                                    | Signal Strength:<br>Good<br><br>-50 to -60 dBm                                     | Signal Strength:<br>Excellent<br><br>>-50 dBm                                       |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |

Table 11

The Chamber name can be changed by a user with supervisor privilege. The name can have letters and numbers, limited to 32 characters. The Chamber Name will be in the Header of the emails to help segregate emails from multiple chambers.

The trending Chart can be adjusted as needed.



Use this icon to search for a certain day. Year, Month, Day format. i.e., 4 July 2020 would be 20200704



Use this icon to resize the chart or return to default setting.



Expand Y Axis

Narrow Y Axis

Re center to default

Expand X Axis

Narrow X Axis

Table 12

### Trend Display settings

| Cancel                                   | Option                   | Done                     |
|------------------------------------------|--------------------------|--------------------------|
| FILE SELECTION                           |                          |                          |
|                                          | (Current)                | ✓                        |
|                                          | 20240208                 |                          |
| TREND DISPLAY SETTING                    |                          |                          |
|                                          | Channel Visibility       |                          |
|                                          | Y Scale                  | On                       |
|                                          | Disable Y-axis scrolling | <input type="checkbox"/> |
| <a href="#">Reset to project default</a> |                          |                          |

Figure 64



Figure 65

The **Process values (PV)** will stay a dark green under normal operation. When the process value deviates away from set point greater than the value in the alarm screen, the process value will flash and change color. This will also occur on the monitor screen mode. This helps to see what chamber is in alarm when multiple chambers are connected to cMT Viewer. The process value will also appear in monitor mode like above. Then in the header on all screens. The line below the value is to indicate the color of line on the trend above.



Figure 66

The **Setpoint (SP)** values will stay orange in standard operation. To change setpoint the user must login and be a Class B user. When the setpoint value is “grayed out” the chamber is in a Ramp / Soak program and cannot be changed manually. The setpoint value will also appear in monitor mode as above image. However, it cannot be manipulated from the monitor mode screen.

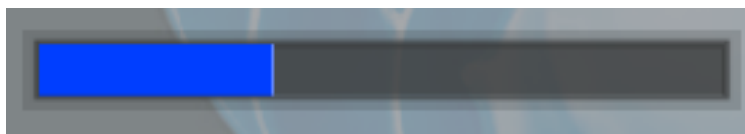


Figure 67

The **bar graphs** below the set point indicate the duty cycle of the controller. The graphs trending to full left are off, while trending to full right the output is full on.



Figure 68

Below the bar graph a **scrolling message** will appear when the chamber is in alarm. Scrolling messages will also appear on the monitor mode screen.

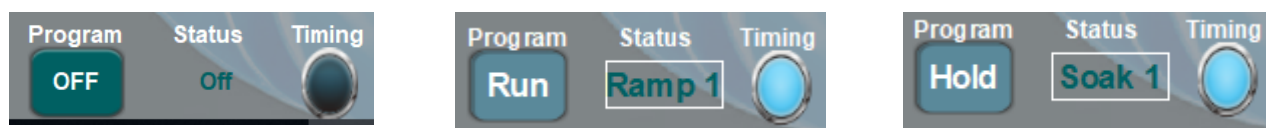


Figure 69

In ramp soak operation the **Program Off, run, hold** button along with the **status** and **timing** indicator can appear at bottom of the Home screen. Pressing the program button from off to run will start the current loaded program. Pressing the button again from run to hold will pause the program. Then finally pressing the program button from hold to off will stop the program. The ramp / soak operation indicators when enabled on main screen will also appear on the monitor mode screen. The button cannot be manipulated in the monitor mode screen.

The **Status** indicator reveals what stage the program is at currently. (i.e., The status indicator will change from Off to Ramp1 when started. Once the Ramp1 time has expired Status indicator will change to Soak1 until time is complete. **Note** that when times are set to 0 the ramp or soak will be skipped.)

The **Timing** indicator indicates when the time-of-day start is enabled.

### Home Screen

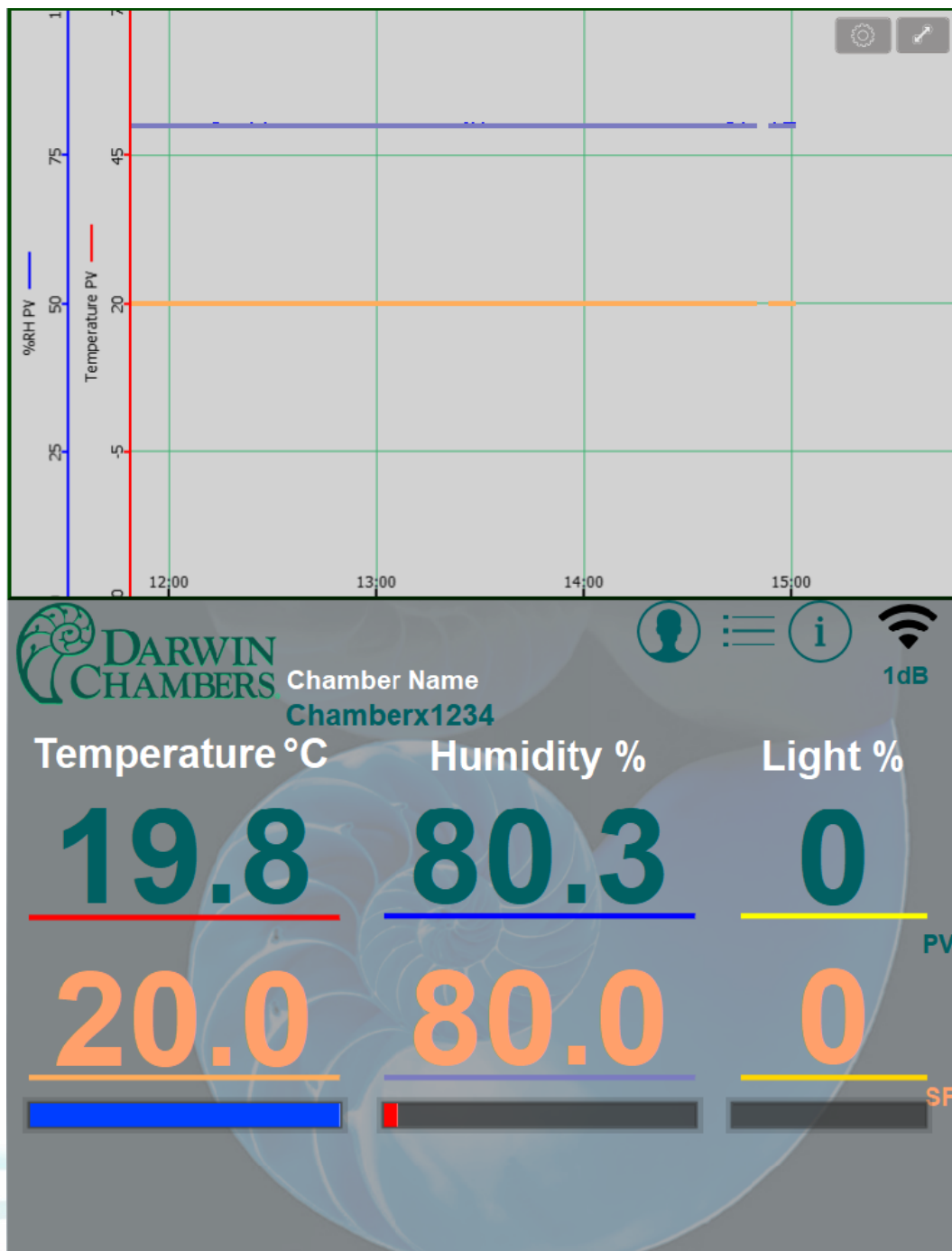


Figure 70

## Setting Menu

Setting menu is the root menu screen to navigate to all other screens or operations. Login with the correct Class of user then select icon picture to navigate to that screen.



Figure 71

## Historical Data

Historical data is the data log of the process and set point values for Temperature, Humidity, and Light when available. Data is collected every minute.

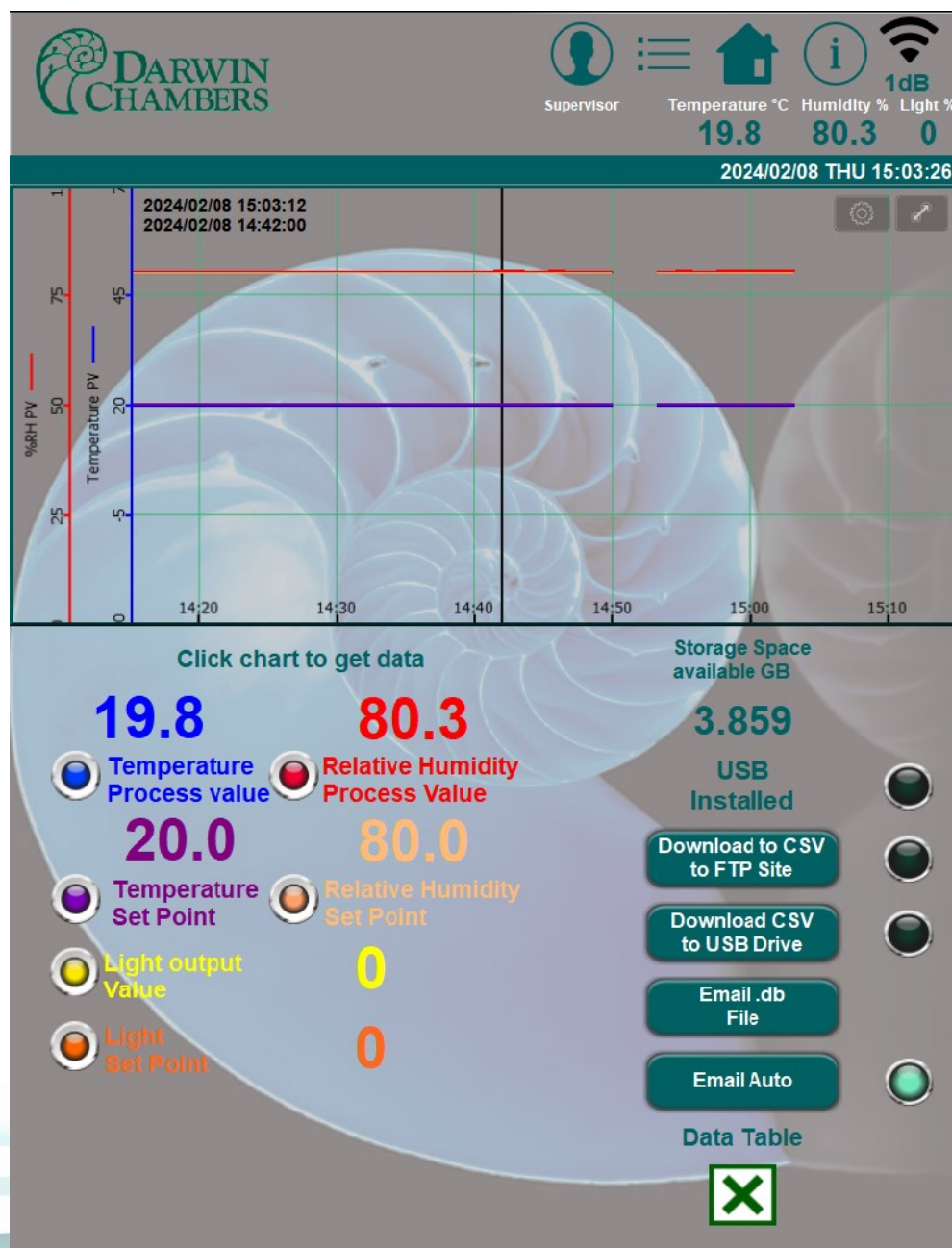


Figure 72



Use this icon to search for a certain day. Day, Month, Year format. i.e. 4 July 2020 would be 040720



Use this icon to resize the chart or return to default setting.



Expand Y Axis

Narrow Y Axis

Re center to default

Expand X Axis

Narrow X Axis

**Table 13**

When selecting any spot on the trending area of the chart an index line will appear. The values below the chart will adjust to that time. Time will appear in the upper left-hand corner.

Press radio button next to the label to turn the trend values on and off.

| Enabled                          |                                 | Disabled              |                                 |
|----------------------------------|---------------------------------|-----------------------|---------------------------------|
| <input checked="" type="radio"/> | Temperature Process value       | <input type="radio"/> | Temperature Process value       |
| <input checked="" type="radio"/> | Temperature Set Point           | <input type="radio"/> | Temperature Set Point           |
| <input checked="" type="radio"/> | Relative Humidity Process Value | <input type="radio"/> | Relative Humidity Process Value |
| <input checked="" type="radio"/> | Relative Humidity Set Point     | <input type="radio"/> | Relative Humidity Set Point     |

**Table 14**

**Storage Space** available is the amount of space on the installed SD card. The HMI is sent out with a 32 GB capacity SD Card. This is the maximum allowed size. This amount of storage should provide years of data log data collected every minute, with many ramp / soak programs.

**USB Installed** lets the user know USB flash drive is installed at the chamber and files can be downloaded to it.

**Download to CSV to FTP site button** converts current file to comma separated value document that can be opened in a spreadsheet program. This can be accessed via browser or setting up an FTP file location on your PC.

**Download to CSV to USB Drive** converts current file to comma separated value document that can be opened in a spreadsheet program. Be sure the USB installed indicator is illuminated before proceeding.

**Email .db File** sends current file to all users in the group B email list. The file is in an encrypted format that will need to be opened by Easy Convertor Tool to open the files.

**Email Auto button** will send the log files daily to email group B. Then every Sunday email will be sent for the past seven days. Files will be encrypted and need to use the Easy Convertor Tool to open the files.

**Data Table** button opens a new screen that shows the current selected file in a spreadsheet format.

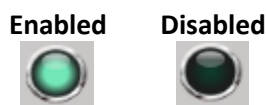


Figure 73

### *Historical log*

Historical log looks and acts like a spreadsheet. Users can scroll up and down and scroll right and left. Using the  in the upper right-hand corner the Option list to narrow the search by dates. The date is in Year, month, day format. i.e., 4 July 2020 would be 20200704

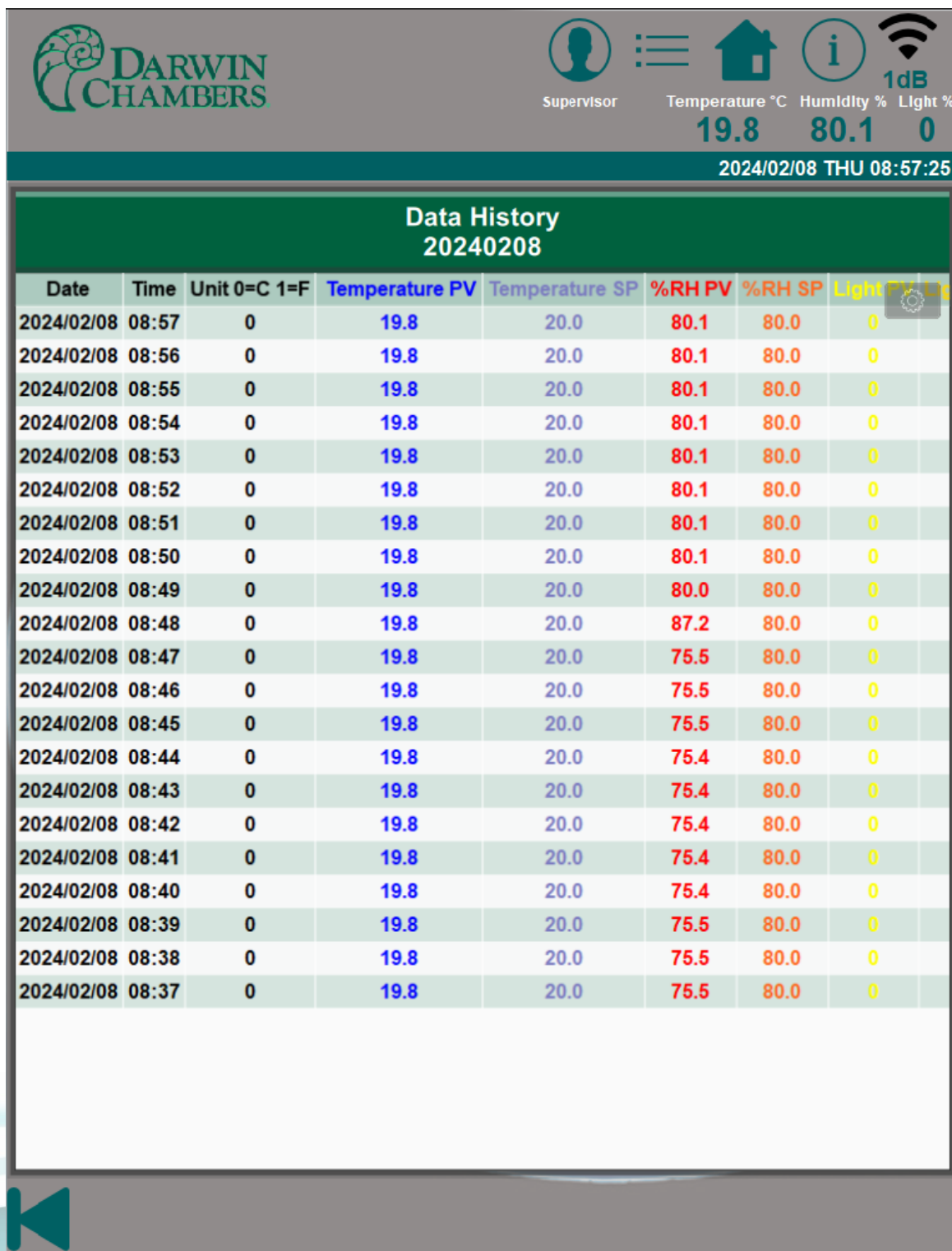


Figure 74

### Option list

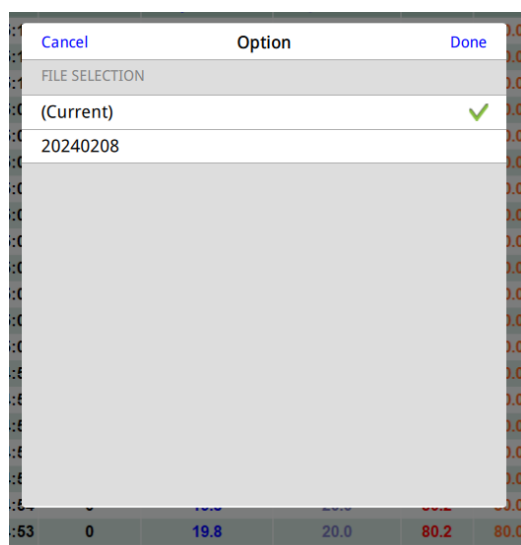


Figure 75

## Security

The security screen is used to create new users, see current logged in users, and past logged in users.

The **Auto Logout** time can be adjusted using the drop-down text box.

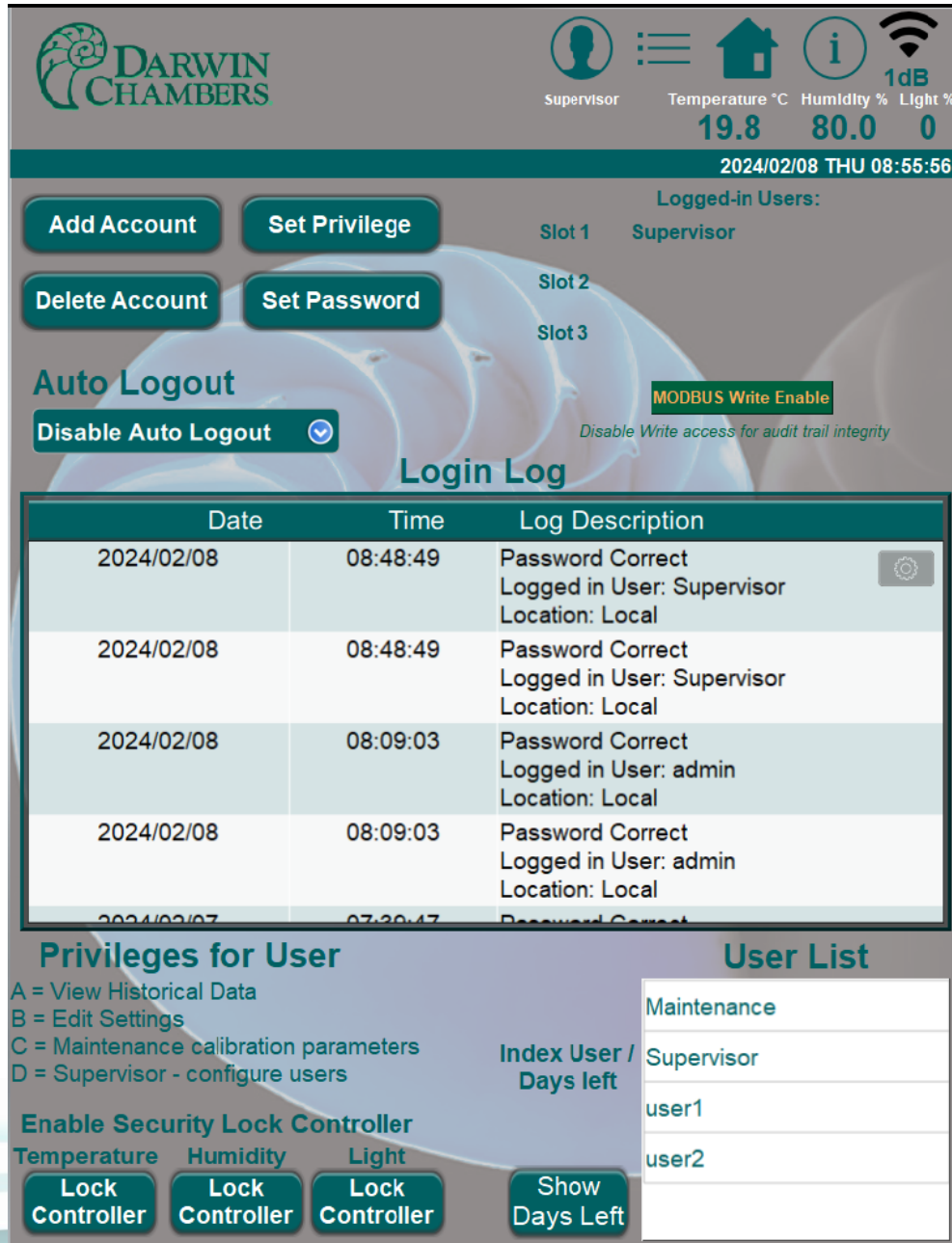
**User list** shows all the available users on the HMI and the privilege they have.

The **Security lock** on the controller will lock the controller on the chamber face. A small red key will display on the controller.



Figure 76

This prevents users from changing the settings without logging in to be documented. An email warning will be sent when the controller is unlocked. This will also occur when unlocked and the system is just turned on. Users who are savvy to the Fuji controller may know how to unlock controller at the face. The HMI will still send email to alert group A by email if / when disabled.



**DARWIN CHAMBERS**

Supervisor: [User Icon] | Temperature °C: 19.8 | Humidity %: 80.0 | Light %: 0 | 1dB

2024/02/08 THU 08:55:56

**Logged-in Users:**

Slot 1: Supervisor  
Slot 2:  
Slot 3:

**Buttons:** Add Account, Set Privilege, Delete Account, Set Password

**Auto Logout:** Disable Auto Logout [✓]

**MODBUS Write Enable**  
Disable Write access for audit trail integrity

**Login Log**

| Date       | Time     | Log Description                                                   |
|------------|----------|-------------------------------------------------------------------|
| 2024/02/08 | 08:48:49 | Password Correct<br>Logged in User: Supervisor<br>Location: Local |
| 2024/02/08 | 08:48:49 | Password Correct<br>Logged in User: Supervisor<br>Location: Local |
| 2024/02/08 | 08:09:03 | Password Correct<br>Logged in User: admin<br>Location: Local      |
| 2024/02/08 | 08:09:03 | Password Correct<br>Logged in User: admin<br>Location: Local      |
| 2024/02/07 | 07:30:17 | Password Correct                                                  |

**Privileges for User**

A = View Historical Data  
B = Edit Settings  
C = Maintenance calibration parameters  
D = Supervisor - configure users

**Enable Security Lock Controller**

Temperature: Lock Controller | Humidity: Lock Controller | Light: Lock Controller

**User List**

Maintenance  
Supervisor  
user1  
user2

**Index User / Days left**  
Show Days Left

Figure 77

## Login & Logout

Default Users and Password. These are sent preprogrammed as examples of users. Highly recommend creating your own users and passwords. Usernames and passwords can have up to 16 alphanumeric characters. Usernames and passwords are both case sensitive.

| Username    | Password | Class |
|-------------|----------|-------|
| user1       | 1        | A     |
| user2       | 2        | AB    |
| Maintenance | 3        | C     |
| Supervisor  | 4        | ABCD  |

Table 15

**Note:** When entering any data in a text box, press enter to accept the new data. Using touch or mousing over to another text box will result in error.

| Class   | Description                                               |
|---------|-----------------------------------------------------------|
| Class A | Download Data                                             |
| Class B | Change settings                                           |
| Class C | Maintenance – calibration adjustments                     |
| Class D | Create and assign users. Setup email and network settings |

Table 16



Use this Icon on any screen to login. The below image is of the pop-up window that will appear. When typing in the username and/or password, the enter button must be pressed to accept the name or password.

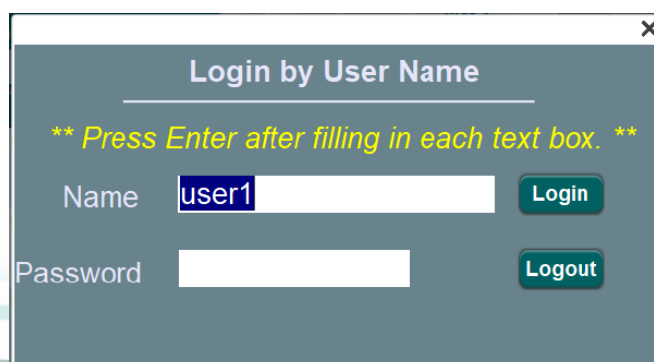


Figure 78

### Add an account

Used to add a new user to the HMI. Press on the privilege icons to assign the capabilities for that user. Item turns orange when enabled and gray when disabled.

**Add Non-Expire User** the user stays until deleted.

**Add Expiring User** will expire when delete once duration has ended. 0 is not excepted.

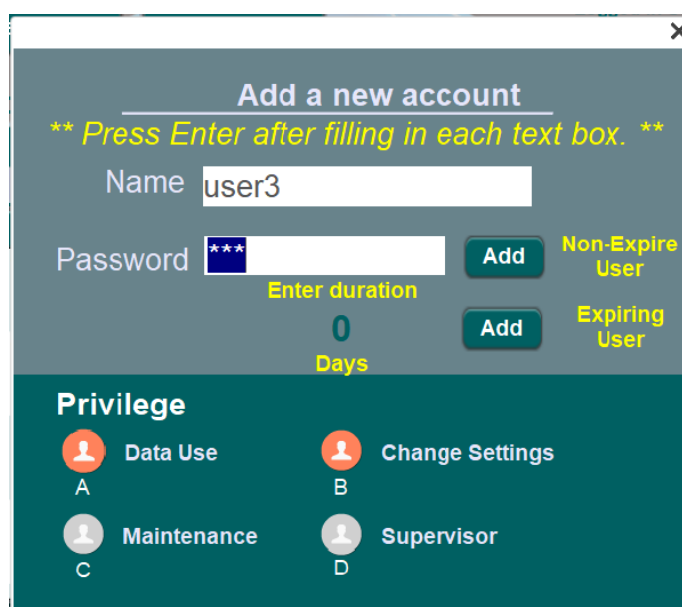


Figure 79

### Delete Account

Select a user from the index to delete.

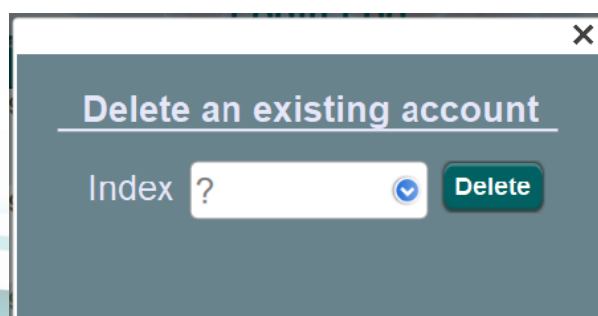


Figure 80

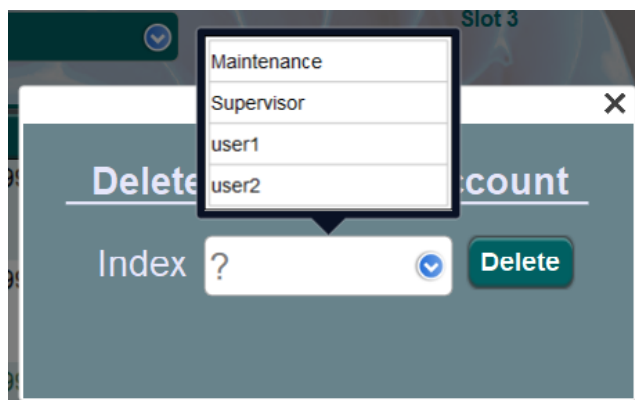


Figure 81

### ***Set Privilege***

Select a user from the index, then add or remove privileges for that user.

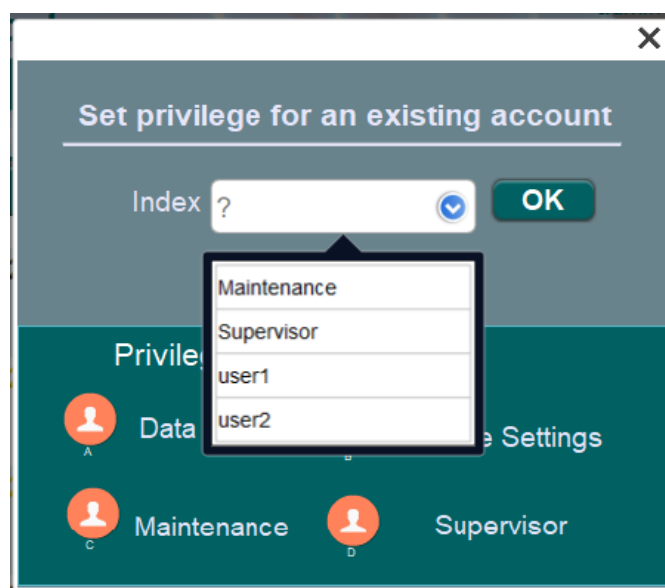


Figure 82

### ***Set Password***

Select User from the index. Allow users to change their password.

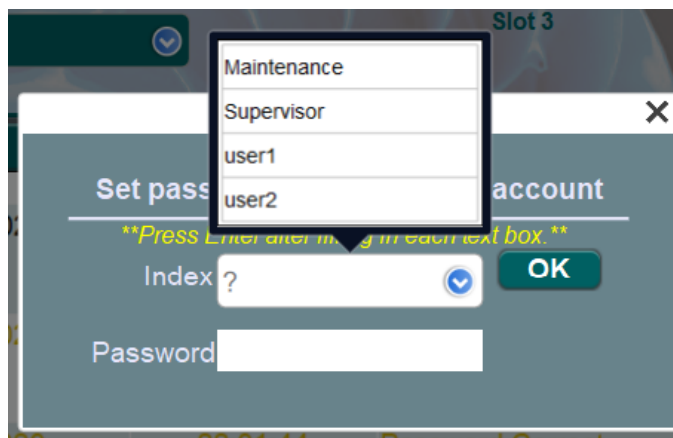


Figure 83

### User List

User List is used to show users that have been saved and privilege they have. Select a user and the index number of that user will display to the left. Press **Show Days Left** to show days left on expiring users. If no value is displayed that is a non-expiring user.

**Note:** Expiring users will delete upon expiration date.

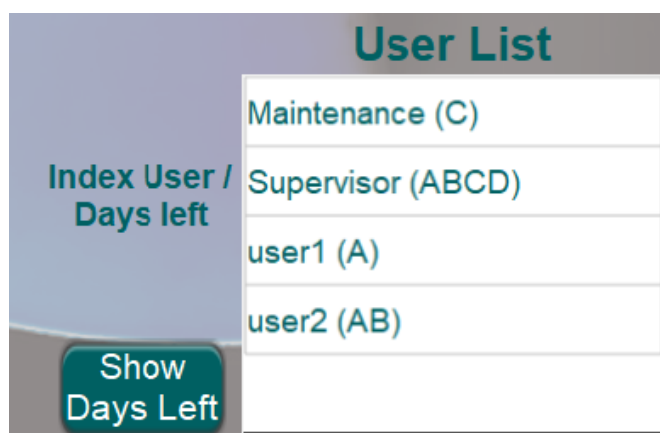
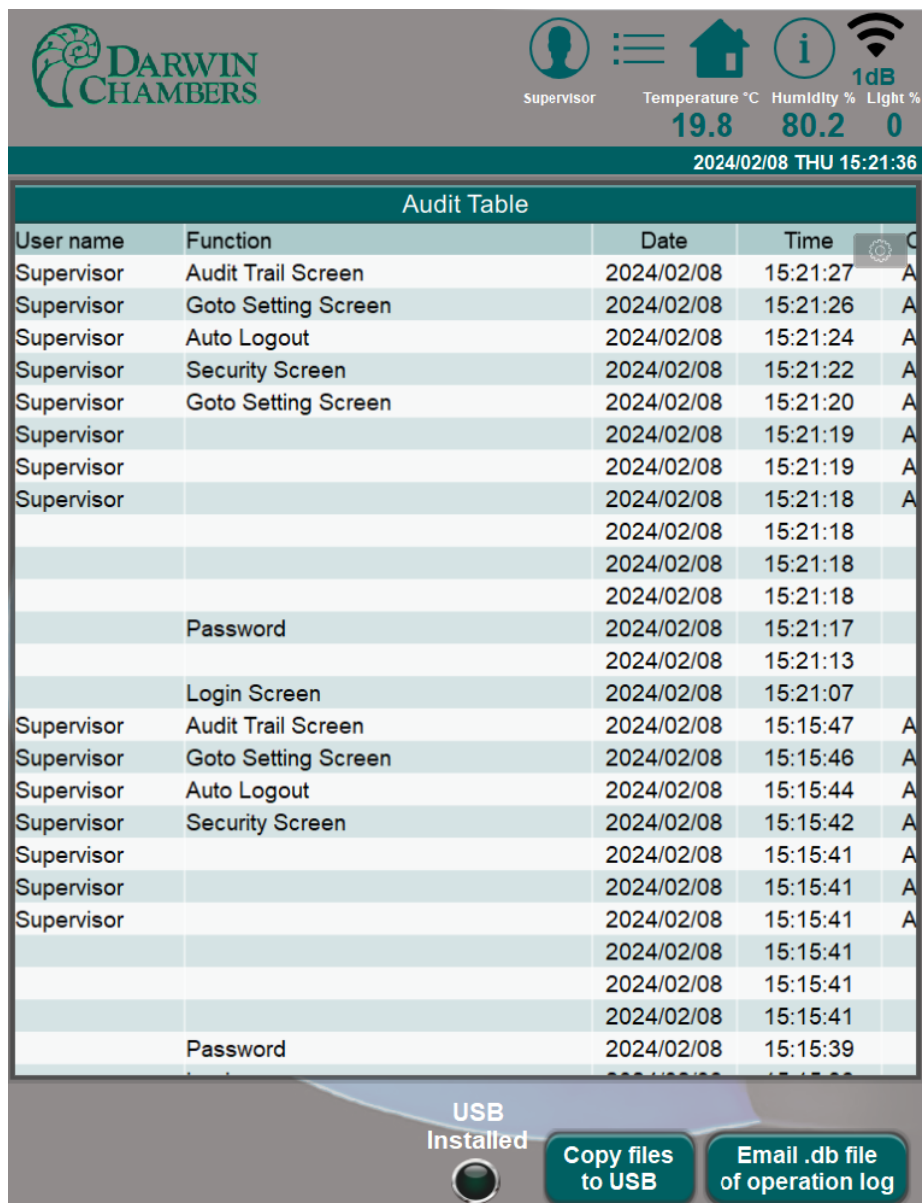


Figure 84

### Audit Trail

The Audit trail shows what user pressed a button or changed a setting. Not all buttons are recorded like navigation buttons from screen to screen. The audit file can be copied to a USB flash drive. The indicator next to button will indicate when USB is plugged in, or the Audit file can be emailed to email group A. The file is in a .db file format. The easy converter tool must be used to unencrypt the data. See using the Easy Converter Tool.



| Audit Table |                     |            |          |   |
|-------------|---------------------|------------|----------|---|
| User name   | Function            | Date       | Time     |   |
| Supervisor  | Audit Trail Screen  | 2024/02/08 | 15:21:27 | A |
| Supervisor  | Goto Setting Screen | 2024/02/08 | 15:21:26 | A |
| Supervisor  | Auto Logout         | 2024/02/08 | 15:21:24 | A |
| Supervisor  | Security Screen     | 2024/02/08 | 15:21:22 | A |
| Supervisor  | Goto Setting Screen | 2024/02/08 | 15:21:20 | A |
| Supervisor  |                     | 2024/02/08 | 15:21:19 | A |
| Supervisor  |                     | 2024/02/08 | 15:21:19 | A |
| Supervisor  |                     | 2024/02/08 | 15:21:18 | A |
|             |                     | 2024/02/08 | 15:21:18 |   |
|             |                     | 2024/02/08 | 15:21:18 |   |
|             | Password            | 2024/02/08 | 15:21:17 |   |
|             |                     | 2024/02/08 | 15:21:13 |   |
|             | Login Screen        | 2024/02/08 | 15:21:07 |   |
| Supervisor  | Audit Trail Screen  | 2024/02/08 | 15:15:47 | A |
| Supervisor  | Goto Setting Screen | 2024/02/08 | 15:15:46 | A |
| Supervisor  | Auto Logout         | 2024/02/08 | 15:15:44 | A |
| Supervisor  | Security Screen     | 2024/02/08 | 15:15:42 | A |
| Supervisor  |                     | 2024/02/08 | 15:15:41 | A |
| Supervisor  |                     | 2024/02/08 | 15:15:41 | A |
| Supervisor  |                     | 2024/02/08 | 15:15:41 | A |
|             |                     | 2024/02/08 | 15:15:41 |   |
|             |                     | 2024/02/08 | 15:15:41 |   |
|             | Password            | 2024/02/08 | 15:15:39 |   |

USB Installed

Copy files to USB

Email .db file of operation log

Figure 85

## Alarm Screen

The Alarm screen is used to set audible / email alarms to notify when the chamber Process value deviates from the set point. The alarms sound with the chamber alarm. The Alarm silence button does not silence it on the HMI nor does the HMI silence at the chamber.

The elapsed time will count when process value has deviated from set point greater than configured here. Once the elapsed time has reached the same time as the delay time, the audible on the HMI will beep and an email notifying chamber alarm will be sent. When conditions have cleared another email will be sent notifying users as such.

Use the following icons to navigate to the impacted control loop.

- The **Temperature Output** icon will navigate to the output screen. Here user can see what components have or will be disabled based on how outputs configured.
- The **Humidity Output** icon will navigate to the output screen. Here user can see what components have or will be disabled based on how outputs configured.

The **Alarm History Button** opens the Alarm History screen. The alarm history screen appears as a spreadsheet.

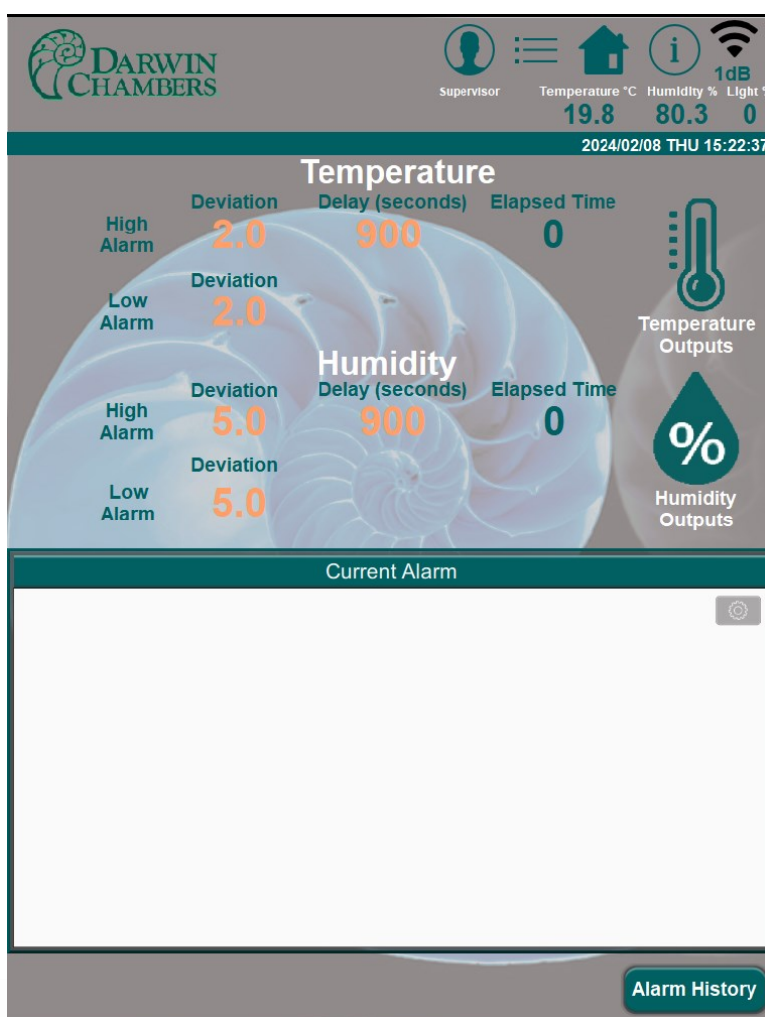


Figure 86

### Alarm History

The alarm history screen displays the data in spreadsheet format. The first column is the event message, event trigger time, event trigger date (YYYY/MM/DD), and the elapsed time.

The event will be listed in ascending order.

Events in **Red** are currently in alarm and have not been acknowledged.

Events in **Gold** are alarms that have been acknowledged.

Events in **Dark Green** have returned within specification.

**Download files to USB** will download the alarm history to USB flash drive. Ensure the USB installed indicator is illuminated before pressing the button.

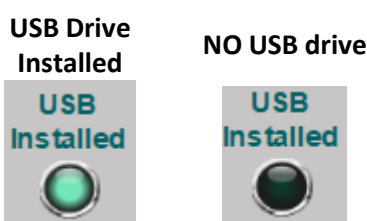


Figure 87

| DARWIN CHAMBERS                                 |                |            |         |
|-------------------------------------------------|----------------|------------|---------|
| Supervisor                                      | Temperature °C | Humidity % | Light % |
|                                                 | 19.8           | 80.3       | 0       |
| 2024/02/08 THU 15:25:26                         |                |            |         |
| Alarm History                                   |                |            |         |
| Low Temperature Alarm 17.2 Set Point 20.0       | 14:28:18       | 2024/02/05 | 19      |
| Low Temperature Alarm 17.2 Set Point 20.0       | 14:28:18       | 2024/02/05 | 19      |
| Low Temperature Alarm 17.2 Set Point 20.0       | 14:28:01       | 2024/02/05 | 8       |
| Low Temperature Alarm 17.2 Set Point 20.0       | 14:28:01       | 2024/02/05 | 8       |
| Temperature Controller Communication Error # 23 | 13:22:50       | 2024/02/01 | 0       |
| Temperature Controller Communication Error # 23 | 13:18:59       | 2024/02/01 | 0       |
| Temperature Controller Communication Error # 8  | 12:54:57       | 2024/02/01 | 197     |
| Humidity Controller Communication Error # 8     | 12:35:45       | 2024/02/01 | 0       |
| Light Controller Communication Error # 8        | 12:35:43       | 2024/02/01 | 0       |
| Light Controller Communication Error # 8        | 12:35:43       | 2024/02/01 | 0       |
| Temperature Controller Communication Error # 8  | 12:35:42       | 2024/02/01 | 0       |
| Temperature Controller Communication Error # 8  | 12:35:42       | 2024/02/01 | 0       |
| Humidity Controller Communication Error # 8     | 12:09:06       | 2024/02/01 | 0       |
| Light Controller Communication Error # 8        | 12:09:04       | 2024/02/01 | 0       |
| Light Controller Communication Error # 8        | 12:09:04       | 2024/02/01 | 0       |
| Temperature Controller Communication Error # 8  | 12:09:03       | 2024/02/01 | 0       |
| Temperature Controller Communication Error # 8  | 12:09:03       | 2024/02/01 | 0       |

Figure 88

### Alarm History Options

| Cancel                | Option | Done                     |
|-----------------------|--------|--------------------------|
|                       |        |                          |
| Include Categories    |        | 0 - 0                    |
|                       |        |                          |
| Begin Date            |        | <input type="checkbox"/> |
|                       |        |                          |
| Ended Date            |        | <input type="checkbox"/> |
|                       |        |                          |
| EVENT DISPLAY SETTING |        |                          |
| Show triggered events |        | ✓                        |
| Show confirmed events |        | ✓                        |
| Show recovered events |        | ✓                        |
|                       |        |                          |

Figure 89

The Alarm History Option list can be used to narrow down a specific alarm event by date, triggered events, confirmed events, and recovered events.

### Begin / Ended data Calendar.

| Cancel | Begin Date |     |     |     |     |     |  | OK |
|--------|------------|-----|-----|-----|-----|-----|--|----|
| 2020   |            |     |     | Jan |     |     |  |    |
| Sun    | Mon        | Tue | Wed | Thu | Fri | Sat |  |    |
|        |            |     | 1   | 2   | 3   | 4   |  |    |
| 5      | 6          | 7   | 8   | 9   | 10  | 11  |  |    |
| 12     | 13         | 14  | 15  | 16  | 17  | 18  |  |    |
| 19     | 20         | 21  | 22  | 23  | 24  | 25  |  |    |
| 26     | 27         | 28  | 29  | 30  | 31  |     |  |    |

Figure 90

The Begin and End data Calendar can be used by turning on the option then selecting the date.

|            |                                     |
|------------|-------------------------------------|
| Begin Date | <input checked="" type="checkbox"/> |
| 2020-05-21 |                                     |

Figure 91

The days that can be selected will be highlighted in blue.

## Temperature Outputs

The temperature output screen shows the control output for the heater and/ or hot gas. (Depends on chamber model for hot gas availability).

The **Duty Cycle** indicates the % call for output.

The **Proportional Band**, **Integration Time**, and **Differential Time** are all used in algorithm for the process control. To improve chamber performance, it is recommended to use the auto tune feature rather than adjust these values manually. **Auto Tune** should be used at initial setup or whenever a new set point is being set. For ramping and soaking function, it is best to auto tune at a temperature in between the minimum and maximum temperatures the chamber will experience. Note when refrigeration / cooling is enabled / disabled.

The **Output Cycle** indicates the amount of time to pass before calculation for demand will be corrected. Chamber with a hot gas will have a minimum of a 7 second Cycle time. This prevents rapid activation of the solenoid. A shorter time will shorten the life of solenoid and refrigeration system.



Figure 92

**DO1** is the alarm output for high and low temperature alarm. This output will sound the audible alarm at the chamber and trigger BMS relay.

- **Low** – main setpoint for alarm event (can be a high or low alarm, check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.

- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

**DO2** is the alarm output for High temperature alarm. This output will enable / disable the heating circuit on the chamber.

- **Low** – main setpoint for alarm event (can be a high or low Alarm, check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

**DO3** is the heat only mode output. This output will enable / disable the cooling unit on the chamber for better performance and efficiency of the chamber. When the process value is lower than set point value by the low value for longer than the

duration in seconds the cooling unit will be disabled. When the process value is higher than the high value for longer than the duration in delay seconds the cooling unit will be disabled.

- **Low** – main setpoint for alarm event (can be a high or low Alarm, check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

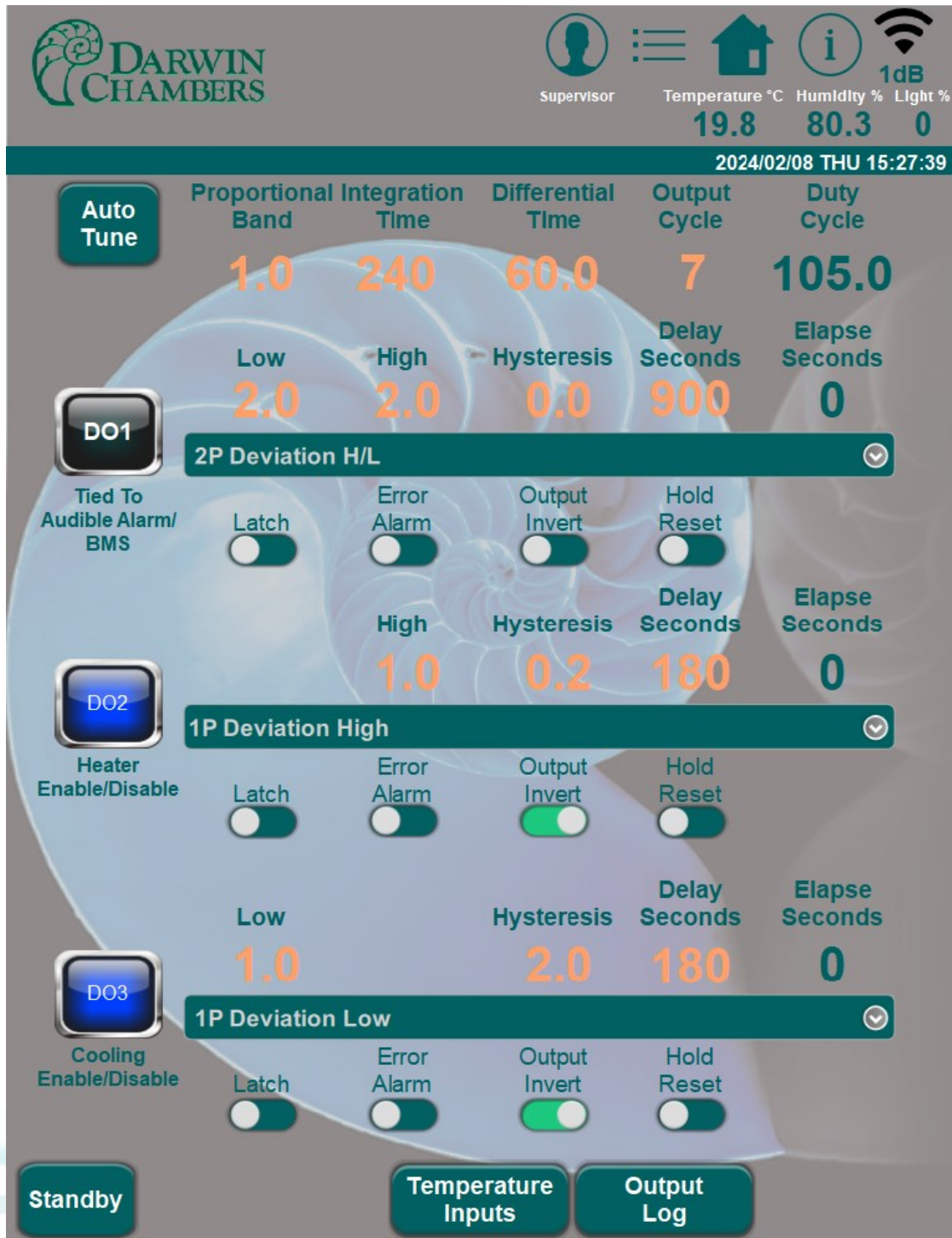


Figure 93

## Output Log

The output log retains when the output has changed. The data is in a spreadsheet format. The first column is the Event message, Trigger time and Trigger date. This is a useful tool to establish if Alarm event occurred disabling the component to cause or be the result of the alarm event. i.e., When the chamber alarms for high temperature, this log can be reviewed to know the chamber was in heat only mode, therefore cooling was disabled. This would mean no mechanical failure. No need for technical assistance.

|         |          |            |
|---------|----------|------------|
| DO1 OFF | 11:55:39 | 29/07/2020 |
| DO1 OFF | 11:55:39 | 29/07/2020 |
| DO1 OFF | 11:55:39 | 29/07/2020 |

Figure 94

## Temperature Inputs

The temperature input screen is mainly for reference. The control type, Input Type, process and set points can only be adjusted by administrator.

**Calibration input** is used at the lower and upper scale ranges. (-50.0 and 100.0C) Ensures the calibration standard has equal or greater accuracies than the Fuji PXF4 controller. While simulating a low signal use the adjust low for correction. When simulating a high signal use the adjust high for correction. Good calibration practice would be to check a value in the middle. Adjustments should only be made at the lower and upper scale range.

The **PV Offset** is used when mapping a chamber, with multiple sensors arranged throughout the chamber condition space. The average of the temperature sensors could be used as a correction in the Process value to read that average. An example would be 12 temperature sensors show an average of 25.7C when the process value holds at 25.0C. A 0.7 offset can be placed in the process value offset that should now bring the average of the chamber mapping sensors to 25.0C.

PV under range and overrange are indicators for a sensor / scaling failure. Under range the input value is lower than the PV low or not installed / properly terminated. The overrange indicates the input value is higher than the PV high value.

Controller Information is the model, serial number and software version of the controller installed.

The **Unit** will change reading from Fahrenheit to Celsius or vice versa. Indicator light next to the unit will illuminate while converting all readings to new setting. Please wait till the light has turned off before performing any other operation. In the History files the units will Change from a 0 for Celsius and to 1 for Fahrenheit.

Select C unit Changes and indicator light turns on then off.



is used to page back to the output screen.

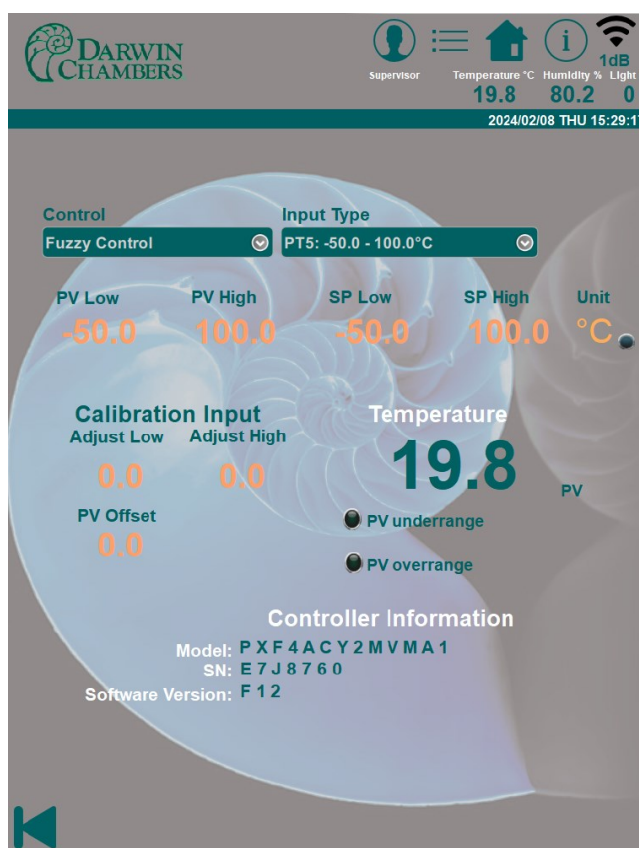


Figure 95

## Humidity Outputs

The Humidity output screen shows the control output for the humidifier.

The **Duty Cycle** indicates the % call for output.

The **Proportional Band**, **Integration Time**, and **Differential Time** are all used in algorithm for the process control. To improve chamber performance, it is recommended to use the auto tune feature rather than adjust these values manually.

**Auto Tune** should be used at initial setup or whenever a new set point is being set. For ramping and soaking function, it is best to auto tune at a humidity in between the minimum and maximum humidity the chamber will experience.

The **Output Cycle** indicates the amount of time to pass before calculation for demand will be corrected. Humidity output will have a minimum of 1 second Cycle time.



Figure 96

**DO1** is the alarm output for high and low Humidity alarm. This output will sound the audible alarm at the chamber and switch the BMS relay.

- **Low** – main setpoint for alarm event (can be a high or low Alarm check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

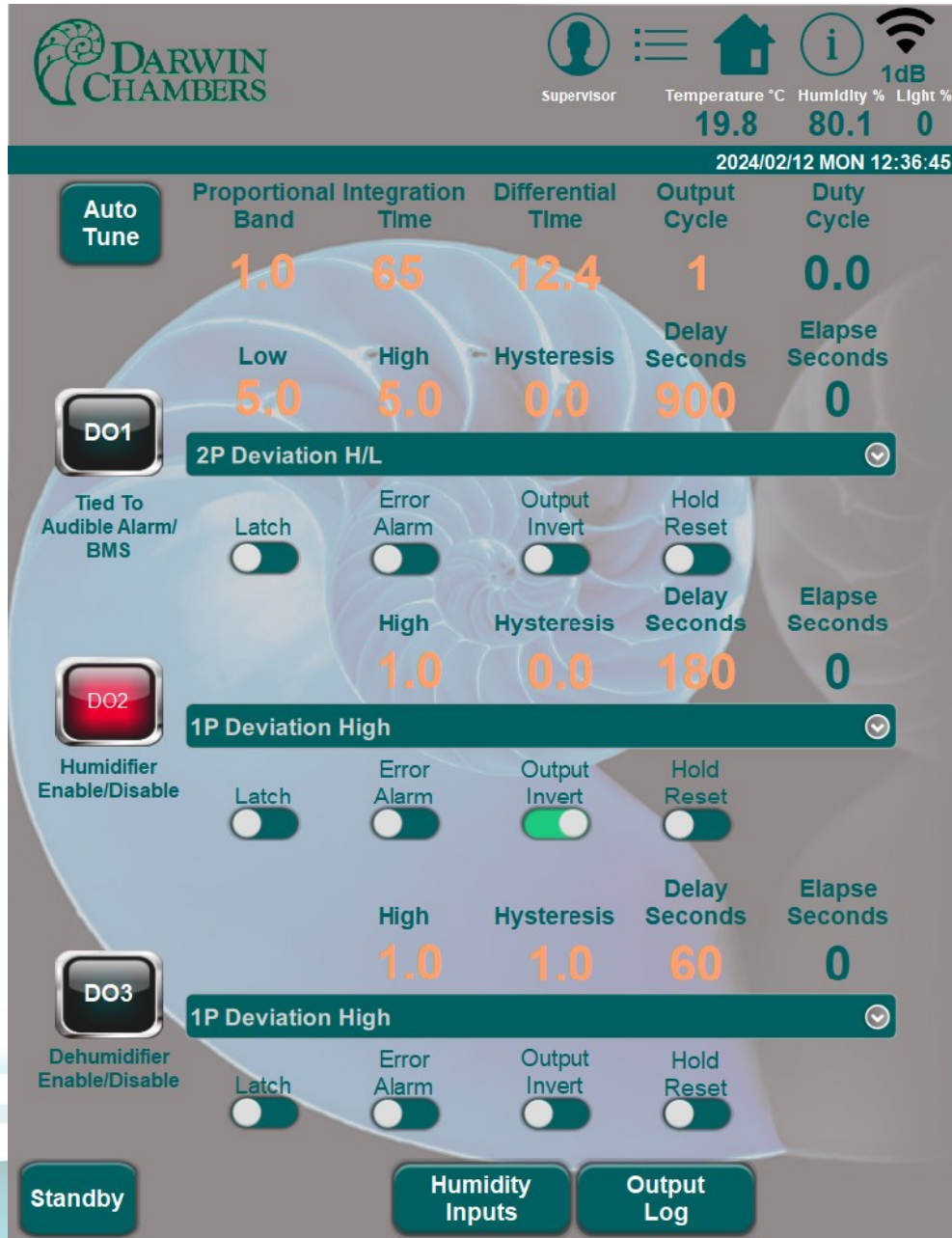
**DO2** is the alarm output for high humidity alarm. This output will enable / disable the humidifier on the chamber.

- **Low** – main setpoint for alarm event (can be a high or low Alarm check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

**DO3** enables the dehumidifier output. The dehumidifier can be dried compress air via Point of use dryer or building supplied dry air, and finally a desiccant wheel dryer. Two different modes of operation can be configured here. The first method is recovery mode from an overshoot in humidity. The second is a constant dry air purge. The dryer is kept on to a certain point and the humidifier humidifies against the dry air. This is used when the chamber dew point temperature is below the ambient dew point temperature. See main chamber manual for setup.

- **Low** – main setpoint for alarm event (can be a high or low Alarm check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.

- **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
- **Output Invert** – reverse the output from normally open to normally closed.
- **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.



The screenshot displays the Darwin Chambers control interface. At the top, the logo is on the left, and status icons (Supervisor, Temperature, Humidity, Light) are on the right. The date and time are 2024/02/12 MON 12:36:45. The main area shows three digital output (DO) settings: DO1, DO2, and DO3. Each DO has a setpoint, a deviation type, and various control options like Latch, Error Alarm, Output Invert, Hold Reset, Delay Seconds, and Elapse Seconds. DO1 is set to 1.0 with a 2P Deviation H/L. DO2 is set to 1.0 with a 1P Deviation High. DO3 is set to 1.0 with a 1P Deviation High. The interface also includes buttons for Auto Tune, Standby, Humidity Inputs, and Output Log.

| DO  | Proportional Band | Integration Time | Differential Time | Output Cycle | Duty Cycle | Low | High | Hysteresis | Delay Seconds | Elapse Seconds | 2P Deviation H/L | Latch                    | Error Alarm              | Output Invert                       | Hold Reset               | Delay Seconds | Elapse Seconds | 1P Deviation High | Latch | Error Alarm | Output Invert | Hold Reset | Delay Seconds | Elapse Seconds | 1P Deviation High |
|-----|-------------------|------------------|-------------------|--------------|------------|-----|------|------------|---------------|----------------|------------------|--------------------------|--------------------------|-------------------------------------|--------------------------|---------------|----------------|-------------------|-------|-------------|---------------|------------|---------------|----------------|-------------------|
| DO1 | 1.0               | 65               | 12.4              | 1            | 0.0        | 5.0 | 5.0  | 0.0        | 900           | 0              | 2P Deviation H/L | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |               |                |                   |       |             |               |            |               |                |                   |
| DO2 |                   |                  |                   |              |            |     |      |            |               |                |                  | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |               |                |                   |       |             |               |            |               |                |                   |
| DO3 |                   |                  |                   |              |            |     |      |            |               |                |                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |               |                |                   |       |             |               |            |               |                |                   |

Figure 97

## Output Log

The output log retains when the output has changed. The data is in a spreadsheet format. The first column is the Event message, Trigger time and Trigger date. This is a useful tool to establish if an Alarm event occurred disabling the component to cause or result of the alarm event.

|         |          |            |
|---------|----------|------------|
| DO1 OFF | 11:55:39 | 29/07/2020 |
| DO1 OFF | 11:55:39 | 29/07/2020 |
| DO1 OFF | 11:55:39 | 29/07/2020 |

Figure 98

## Humidity Inputs

The Humidity input screen is mainly for reference. The control type, Input Type, process and set points can only be adjusted by Darwin administrator.

Calibration input is used at the lower and upper scale ranges. (0 and 5VDC) Ensure the calibration standard has equal to or has greater accuracies than the Fuji PXF4 controller. While simulating a low signal use the adjust low for correction. When simulating a high signal use the adjust high for correction. Good calibration practice would be to check a value in the middle. Adjustments should only be made at the lower and upper scale range.

The PV Offset is used when mapping a chamber, with multiple sensors arranged throughout the chamber condition space. The average of the Humidity sensors could be used as a correction in the Process value to read that average. An example would be 4 Humidity sensors show an average of 60.7% when the process value holds at 60.0%. A 0.7 offset can be placed in the process value offset that should now bring the average of the chamber mapping sensors to 60.0C.

PV under range and overrange are indicators for a sensor/scaling failure. Under range the input value is lower than the PV low or not installed / properly terminated. The overrange the input value is higher than the PV high value.

Controller Information is the model, serial number and software version of the controller installed.



is used to page back to the output screen.

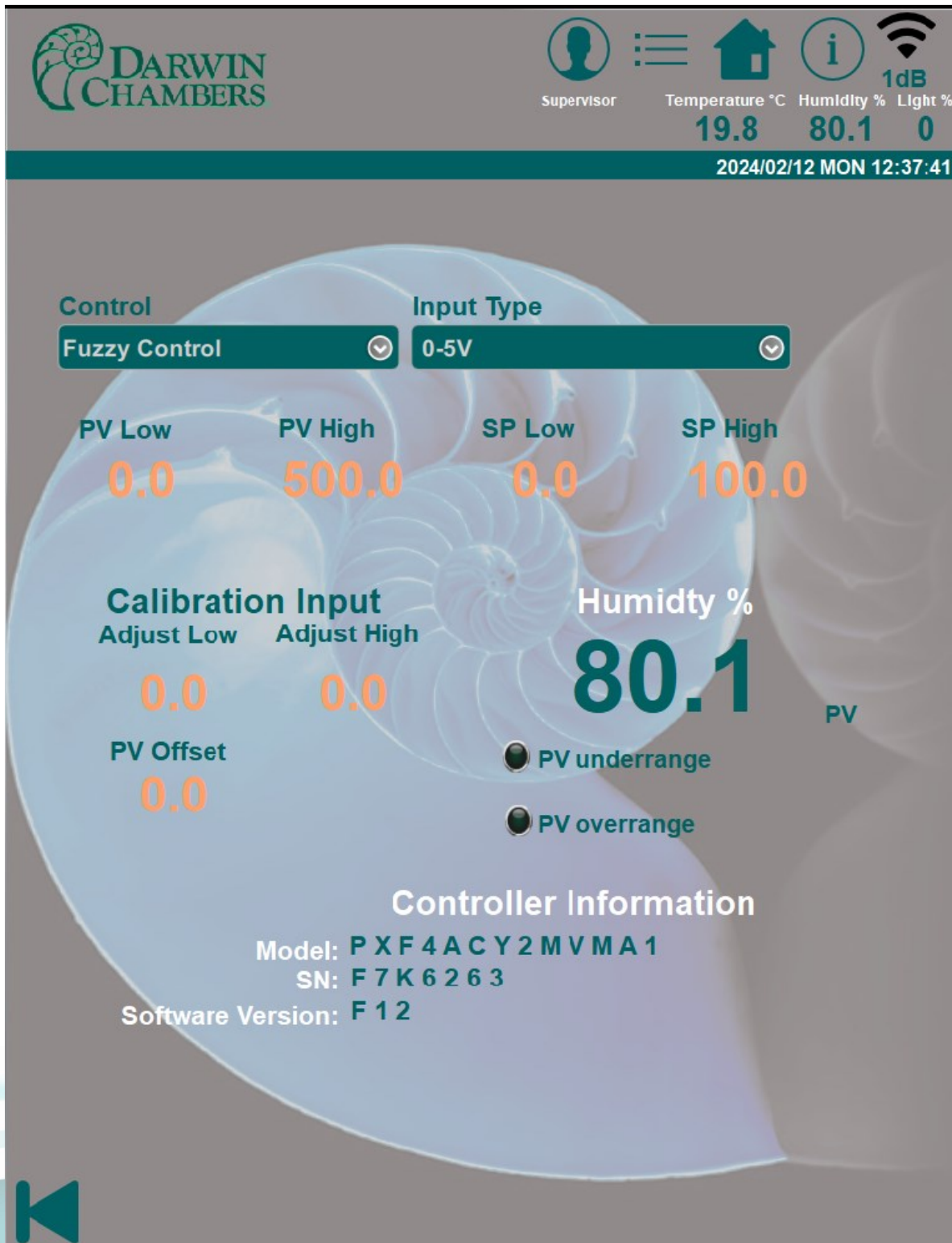


Figure 99

## Light Outputs

The Light output screen shows the control output for the lights.

The **Duty Cycle** indicates the % call for output.

### For Open loop Setup (Standard option.)

Chambers sold without a feedback sensor operate in an open loop. The duty cycle will be the amount of output and used in place of the Process value. The **Proportional Band** value should be set to 100.0, **Integration Time** set to 0.0. and **Differential Time** set to 0.0.

### For Closed loop setup (non – standard)

The **Proportional Band**, **Integration Time**, and **Differential Time** are all used in algorithm for the process control when feedback sensor is sold with the chamber. To improve chamber performance, it is recommended to use the auto tune feature rather than adjust these values manually. **Auto Tune** should be used at initial setup.

The **Output Cycle** indicates the amount of time to pass before calculation for demand will be corrected. Light output will have a minimum of 1 second Cycle time.

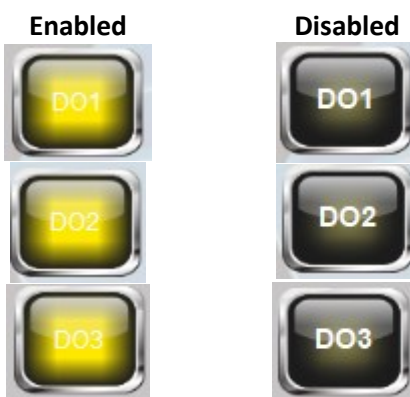


Figure 100

**DO1** is the event output for light to be enabled. Some LED drivers or fluorescent light ballast will blink or flicker at low output. DO1 is used to disable the lights to be off until the setting is passed the threshold of the blinking. The default setting for this is 5. Therefore, the lights will not be enabled at setpoints below 5.

- **Low** – main setpoint for alarm event (can be a high or low Alarm check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*

- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

**DO2** is currently not used for lights.

- **Low** – main setpoint for alarm event (can be a high or low Alarm check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.
- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

**DO3** is currently not used for light output.

- **Low** – main setpoint for alarm event (can be a high or low Alarm check type in drop down text box). For 2P (Two Point) alarms the value is for Low Alarm.
- **High** – is only used when Alarm Type is a 2P (two point) alarm type.

- **Hysteresis**- Used to prevent clearing the alarm at the threshold. i.e. *(If deviation set to 2.0 and hysteresis 1.0 then alarm will stay active until deviation is less than 1. If SP is 25.0, Dev is 2.0 Hyst 1.0 Alarm will clear once value is 26 or less. Leaving at 0.0 alarm clears at 27.0)*
- **Delay Seconds** - The time that has occurred since process has deviated from set point or exceeding an absolute value before activating output.
- **Elapsed Seconds** – The time that has occurred since the process has deviated from set point or exceeding an absolute value.
- **Drop Down Text box** is used to select Alarm Event type. This can only be changed by a Darwin Administrator User.
- **Dip Switch**
  - **Latch** Turn on to latch Alarm Event. SEL button on fuji controller would need to be used to clear alarm.
  - **Error Alarm** can be used when the alarm is not configured for Process Alarm. This will trigger output for sensor failure.
  - **Output Invert** – reverse the output from normally open to normally closed.
  - **Hold Reset** – Allows the event to be inhibited until the process value is in the window of the alarm from initial startup or set point change. Alarm type selected must have Hold feature. Only Darwin Administrator can change Alarm type.

**Lifetime Light in Hours** is an indicator for how long the lights have been enabled. The amount of time can be adjusted. In a power loss, the active counter will restart from 0 as counter is used in RAM. This prevents the counter from starting where it left off. The accumulated lifetime hours will retain after a power loss. This amount of time should be deducted from the overall time after a power loss. A Seconds counter is used to see where in the count the time on is. This also can be used to deduct from the original time for a more accurate estimate on the life of the light in use. (i.e. if 50000 hours is the overall lifetime of the lights and power loss occurs and the accumulated time is 15234.  $50000 - 15234 = 34766$ . Enter 34,766 as the new lifetime hours.)

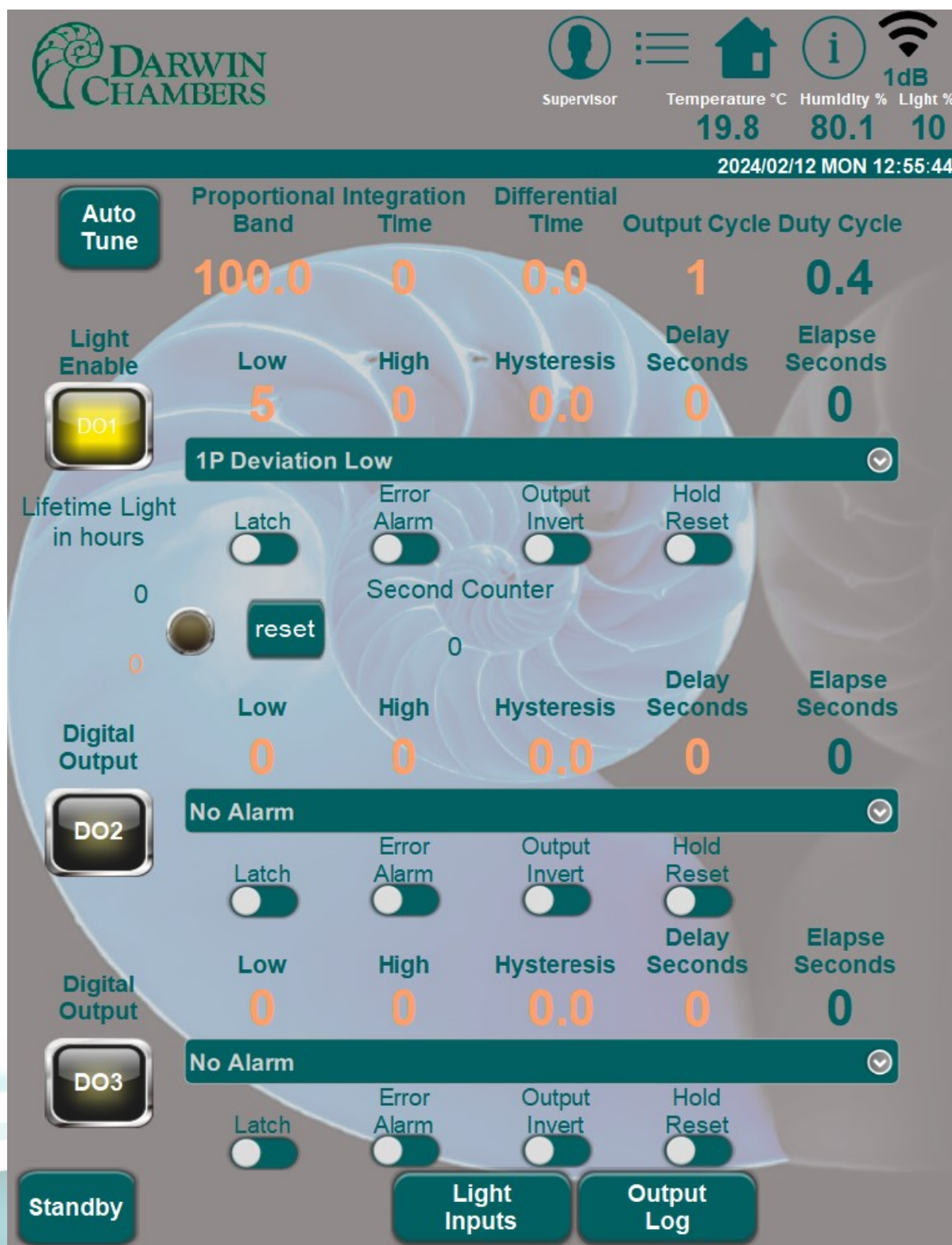


Figure 101

### ***Light Inputs***

The Light input screen is mainly for reference. The control type, Input Type, process and set points can only be adjusted by Darwin administrator.

The calibration input only needs adjusting if using in closed loop control. Calibration input is used at the lower and upper scale ranges. (0 and 5VDC) Ensure the calibration standard has equal to or has greater accuracies than the Fuji PXF4 controller. While simulating a low signal use the adjust low for correction. When simulating a high signal use the adjust high for correction. Good calibration practice would be to check a value in the middle. Adjustments should only be made at the lower and upper scale range.

The PV Offset is used when mapping a chamber. Mapping of the light source is not typically done.

PV under range and overrange are indicators for a sensor/scaling failure. PV Under range means the input value is lower than the PV low or not installed / properly terminated. PV overrange means the input value is higher than the PV high value. For open loop control the input signal is shunted.

Controller Information is the model, serial number and software version of the controller installed.



is used to page back to the output screen.

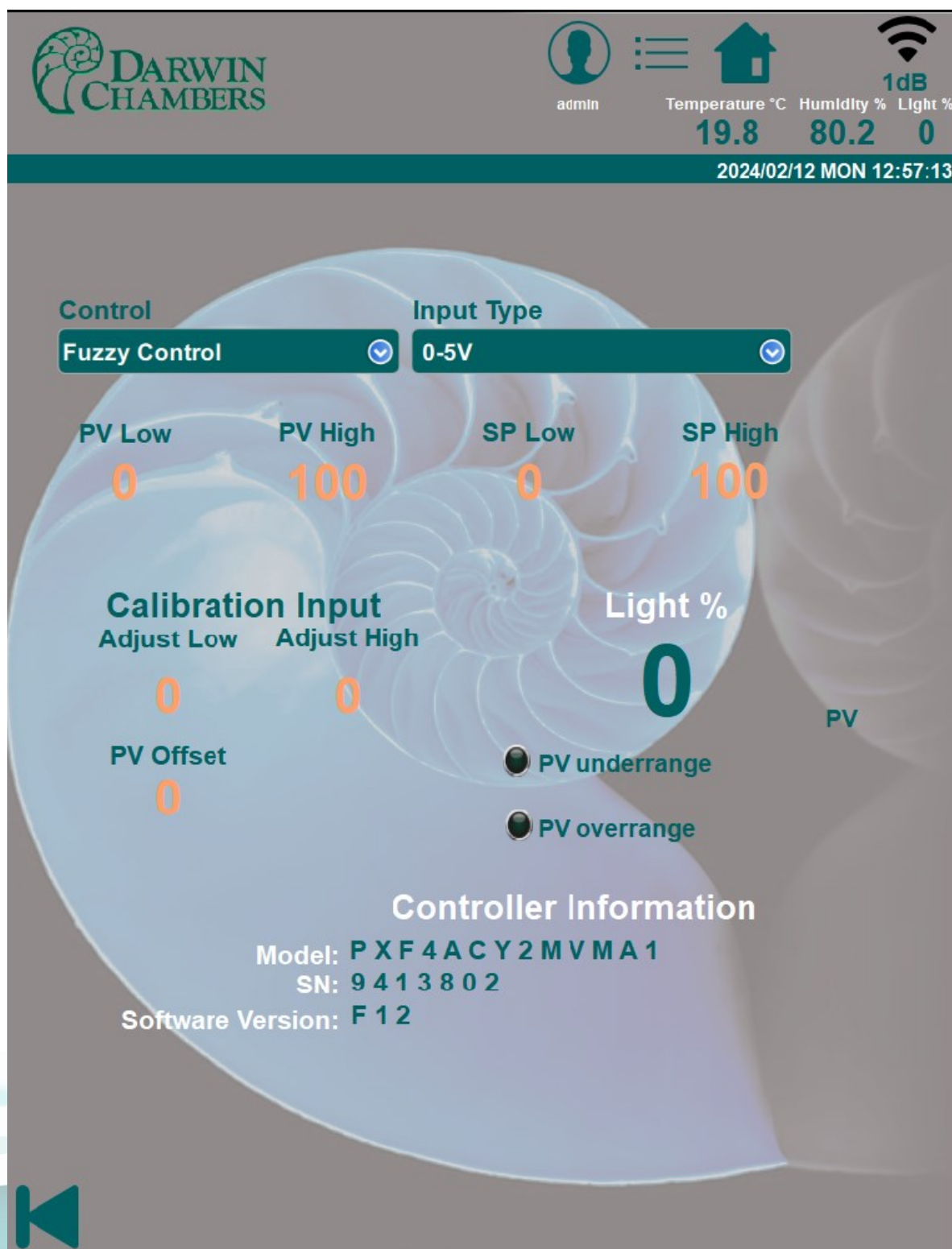


Figure 102

## Email

Emails can be sent for transfer of collected data or email alarm alerts. The email screen can be used to setup an email account and /or assign to an email Group. There are two email groups, A and B. Group A will receive the data files like data log, Audit trail, Alarm history. Group B will get alarm event emails. An email address can be assigned to both groups.

**Optional:** Check with your email application for filtering emails to a dedicated folder for your chamber.

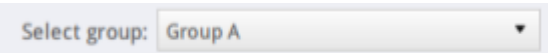
A Maximum of 256 contacts can be added.

Only two groups. Group A and Group B

UTF-\* characters are allowed in contact names.

Use the  button to create a new contact.

Use the  button to delete a contact.

Use the drop-down box  to select the group and assign or remove a user to or from the selected group.

Use the  to transfer the selected contact to the selected group.

Use the  to remove the selected contact from the selected group.

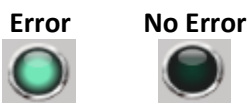


Figure 103

Failed email light will illuminate when the auto email for log file fails, or when an audit, log, or alarm file is sent manually.

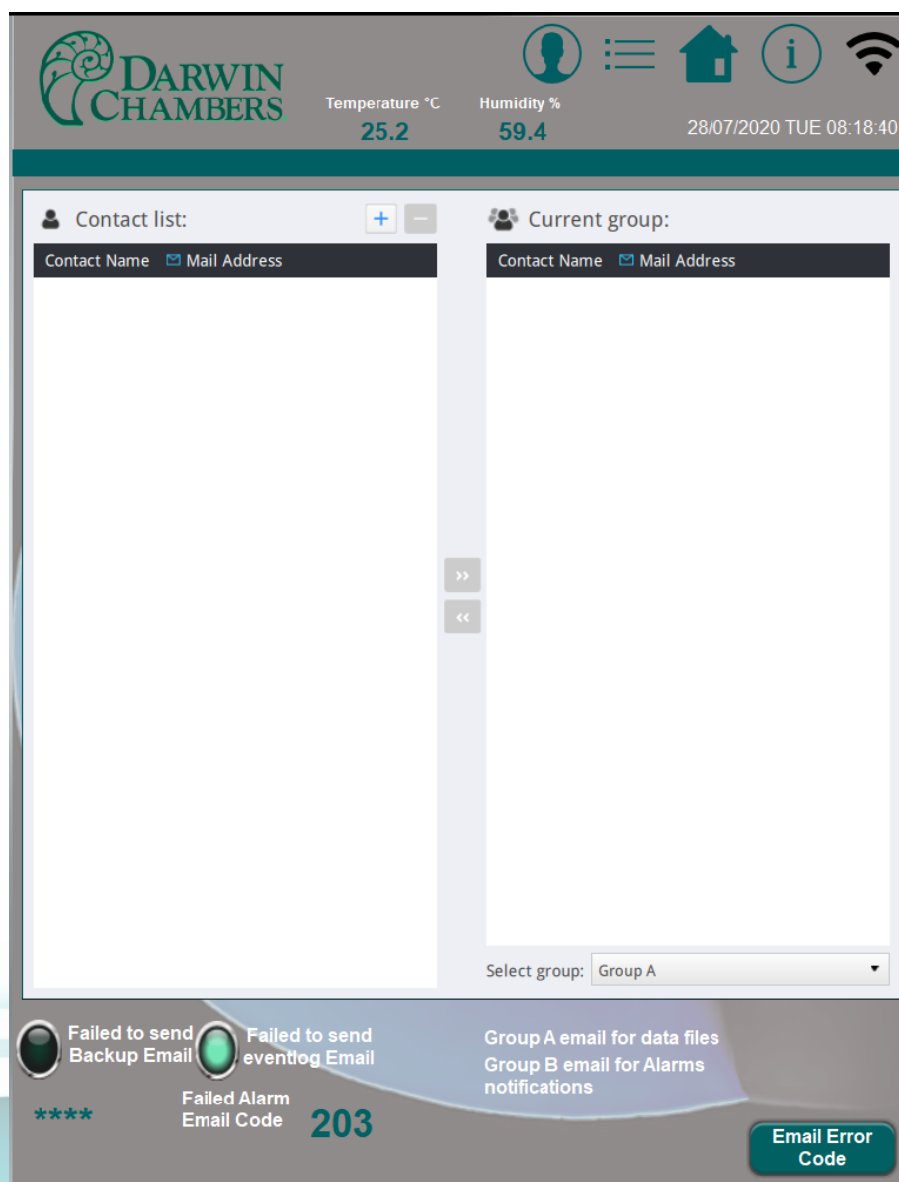
Check failed alarm code when email light is illuminated. Compare the code to the error codes located on the Email code error screen or see Table 17. Check with your network / email administrator for possible solutions to the error.

| Code | Cause of Error                              |
|------|---------------------------------------------|
| 0    | CSMTP_NO_ERROR                              |
| 100  | WSA_STARTUP = Unable to initialize winsock2 |
| 101  | WSA_VER = Wrong version of the winsock2     |

| Code | Cause of Error                                                               |
|------|------------------------------------------------------------------------------|
| 102  | WSA_SEND = Function send() failed                                            |
| 103  | WSA_RECV = Function recv() failed                                            |
| 104  | WSA_CONNECT = Function connect failed                                        |
| 105  | WSA_GETHOSTBY_NAME_ADDR = Unable to determine remote server                  |
| 106  | WSA_INVALID_SOCKET = Invalid winsock2 socket                                 |
| 107  | WSA_HOSTNAME = Function hostname() failed                                    |
| 108  | WSA_IOCTL_SOCKET = Function ioctlsocket() failed                             |
| 109  | WSA_SELECT                                                                   |
| 110  | BAD_IPV4_ADDR = Improper IPv4 address                                        |
| 200  | UNDEF_MSG_HEADER = Undefined message header                                  |
| 201  | UNDEF_MAIL_FROM = Undefined mail sender                                      |
| 202  | UNDEF_SUBJECT = Undefined message subject                                    |
| 203  | UNDEF_RECIPIENTS = Undefined at least one recipient                          |
| 204  | UNDEF_RECIPIENT_MAIL = Undefined recipient mail                              |
| 205  | UNDEF_LOGIN = Undefined user login                                           |
| 206  | UNDEF_PASSWORD = Undefined user password                                     |
| 207  | BAD_LOGIN_PASSWORD = Invalid user login or password                          |
| 208  | BAD_DIGEST_RESPONSE = Server returned a bad digest MD5 response              |
| 209  | BAD_SERVER_NAME = Unable to determine server name for digest MD5 response    |
| 300  | COMMAND_MAIL_FROM = Server returned error after sending MAIL FROM            |
| 301  | COMMAND_EHLO = Server returned error after sending EHLO                      |
| 302  | COMMAND_AUTH_PLAIN = Server returned error after sending AUTH PLAIN          |
| 303  | COMMAND_AUTH_LOGIN = Server returned error after sending AUTH LOGIN          |
| 304  | COMMAND_AUTH_CRAMMD5 = Server returned error after sending AUTH CRAM-MD5     |
| 305  | COMMAND_AUTH_DIGESTMD5 = Server returned error after sending AUTH DIGEST-MD5 |
| 306  | COMMAND_DIGESTMD5 = Server returned error after sending MD5 DIGEST           |
| 307  | COMMAND_DATA = Server returned error after sending DATA                      |
| 308  | COMMAND_QUIT = Server returned error after sending QUIT                      |
| 309  | COMMAND_RCPT_TO = Server returned error after sending RCPT TO                |
| 310  | MSG_BODY_ERROR = Error in message body                                       |
| 400  | CONNECTION_CLOSED = Server has closed the connection                         |
| 401  | SERVER_NOT_READY = Server is not ready                                       |
| 402  | SERVER_NOT_RESPONDING = Server not responding                                |
| 403  | SELECT_TIMEOUT =                                                             |
| 404  | FILE_NOT_EXIST = File does not exist                                         |
| 405  | MSG_TOO_BIG = Message is too big                                             |
| 406  | BAD_LOGIN_PASS = Bad login or password                                       |
| 407  | UNDEF_XYZ_RESPONSE = Undefined xyz SMTP response                             |
| 408  | LACK_OF_MEMORY = Lack of memory                                              |
| 409  | TIME_ERROR = time() error                                                    |
| 410  | RECVBUF_IS_EMPTY = RecvBuf is empty                                          |
| 411  | SENDBUF_IS_EMPTY = SendBuf is empty                                          |

| Code | Cause of Error                                                               |
|------|------------------------------------------------------------------------------|
| 412  | OUT_OF_MSG_RANGE = Specified line number is out of message size              |
| 413  | COMMAND_EHLO_STARTTLS = Server returned error after sending STARTTLS         |
| 414  | SSL_PROBLEM = SSL problem                                                    |
| 415  | COMMAND_DATABLOCK = Failed to send data block                                |
| 416  | STARTTLS_NOT_SUPPORTED = The STARTTLS command is not supported by the server |
| 417  | LOGIN_NOT_SUPPORTED = AUTH LOGIN is not supported by the server              |

Table 17



The screenshot shows the Darwin Chambers mobile app interface. At the top, there's a header with the Darwin Chambers logo, a user profile icon, a menu icon, a home icon, an info icon, and a Wi-Fi icon. Below the header, the status bar displays "Temperature °C 25.2", "Humidity % 59.4", and the date/time "28/07/2020 TUE 08:18:40".

The main content area is divided into two columns. The left column is titled "Contact list:" and has a "+" and "-" button. Below it, there's a table with headers "Contact Name" and "Mail Address". The right column is titled "Current group:" and also has a "+" and "-" button. Below it, there's a table with headers "Contact Name" and "Mail Address".

At the bottom, there's a footer section. On the left, there are two status indicators: "Failed to send Backup Email" and "Failed to send eventlog Email". In the center, there's a "Failed Alarm Email Code" field with the value "203". On the right, there's a "Group A email for data files" and "Group B email for Alarms notifications" section. At the bottom right, there's a button labeled "Email Error Code".

Figure 104

Email can be setup in the browser as well. Login in to the cMT-SVR via a browser. Once logged in select email from the list on the left side. Press Add Contact, a new generic contact name will be added. Select that contact and edit your new contact information.

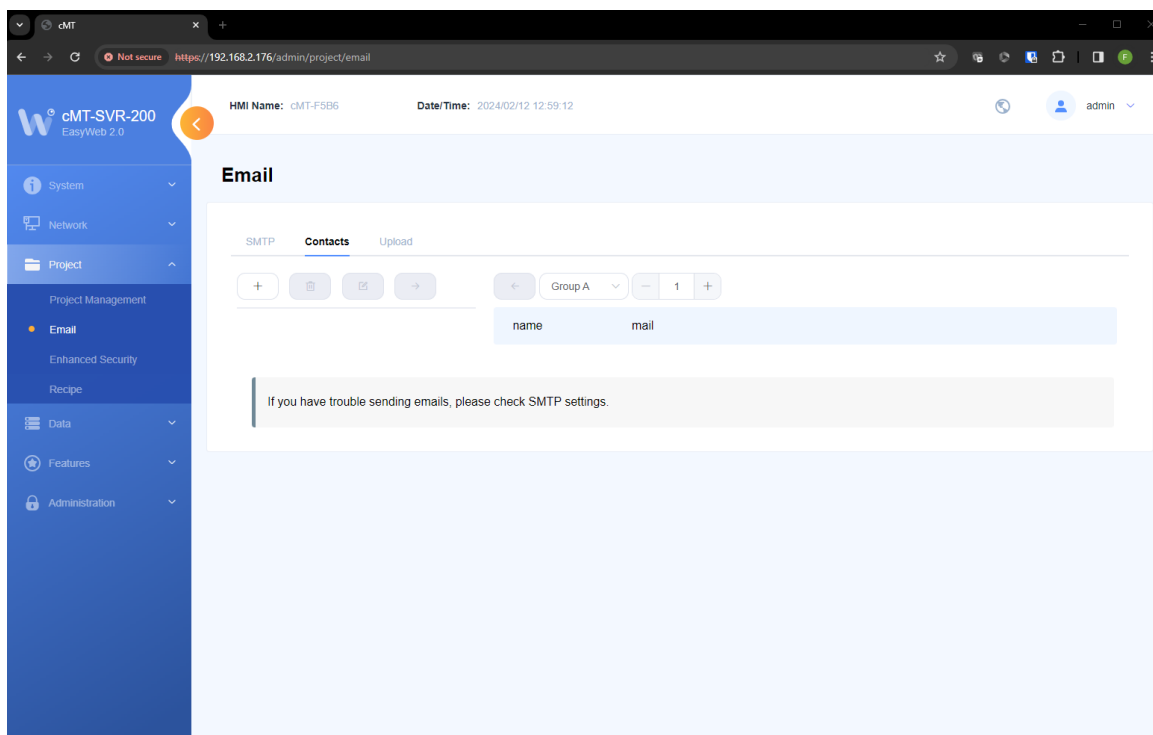


Figure 105

### **Email Error**

The following images show what error codes appear on the HMI. Also see Table 17 for Error codes.


**DARWIN  
CHAMBERS**


admin








1dB

Temperature °C  
**19.8**

Humidity %  
**80.1**

Light %  
**0**

**2024/02/12 MON 13:00:40**

| Code | Cause of Error                                                               |
|------|------------------------------------------------------------------------------|
| 0    | CSMTP_NO_ERROR                                                               |
| 100  | WSA_STARTUP = Unable to initialize winsock2                                  |
| 101  | WSA_VER = Wrong version of the winsock2                                      |
| 102  | WSA_SEND = Function send() failed                                            |
| 103  | WSA_RECV = Function recv() failed                                            |
| 104  | WSA_CONNECT = Function connect failed                                        |
| 105  | WSA_GETHOSTBY_NAME_ADDR = Unable to determine remote server                  |
| 106  | WSA_INVALID_SOCKET = Invalid winsock2 socket                                 |
| 107  | WSA_HOSTNAME = Function hostname() failed                                    |
| 108  | WSA_IOCTL_SOCKET = Function ioctlsocket() failed                             |
| 109  | WSA_SELECT                                                                   |
| 110  | BAD_IPV4_ADDR = Improper IPv4 address                                        |
| 200  | UNDEF_MSG_HEADER = Undefined message header                                  |
| 201  | UNDEF_MAIL_FROM = Undefined mail sender                                      |
| 202  | UNDEF_SUBJECT = Undefined message subject                                    |
| 203  | UNDEF_RECIPIENTS = Undefined at least one recipient                          |
| 204  | UNDEF_RECIPIENT_MAIL = Undefined recipient mail                              |
| 205  | UNDEF_LOGIN = Undefined user login                                           |
| 206  | UNDEF_PASSWORD = Undefined user password                                     |
| 207  | BAD_LOGIN_PASSWORD = Invalid user login or password                          |
| 208  | BAD_DIGEST_RESPONSE = Server returned a bad digest MD5 response              |
| 209  | BAD_SERVER_NAME = Unable to determine server name for digest MD5 response    |
| 300  | COMMAND_MAIL_FROM = Server returned error after sending MAIL FROM            |
| 301  | COMMAND_EHLO = Server returned error after sending EHLO                      |
| 302  | COMMAND_AUTH_PLAIN = Server returned error after sending AUTH PLAIN          |
| 303  | COMMAND_AUTH_LOGIN = Server returned error after sending AUTH LOGIN          |
| 304  | COMMAND_AUTH_CRAMMD5 = Server returned error after sending AUTH CRAM-MD5     |
| 305  | COMMAND_AUTH_DIGESTMD5 = Server returned error after sending AUTH DIGEST-MD5 |
| 306  | COMMAND_DIGESTMD5 = Server returned error after sending MD5 DIGEST           |
| 307  | COMMAND_DATA = Server returned error after sending DATA                      |
| 308  | COMMAND_QUIT = Server returned error after sending QUIT                      |
| 309  | COMMAND_RCPT_TO = Server returned error after sending RCPT TO                |
| 310  | MSG_BODY_ERROR = Error in message body                                       |
| 400  | CONNECTION_CLOSED = Server has closed the connection                         |
| 401  | SERVER_NOT_READY = Server is not ready                                       |
| 402  | SERVER_NOT_RESPONDING = Server not responding                                |
| 403  | SELECT_TIMEOUT =                                                             |
| 404  | FILE_NOT_EXIST = File does not exist                                         |
| 405  | MSG_TOO_BIG = Message is too big                                             |
| 406  | BAD_LOGIN_PASS = Bad login or password                                       |
| 407  | UNDEF_XYZ_RESPONSE = Undefined xyz SMTP response                             |
| 408  | LACK_OF_MEMORY = Lack of memory                                              |
| 409  | TIME_ERROR = time() error                                                    |
| 410  | RECVBUF_IS_EMPTY = RecvBuf is empty                                          |
| 411  | SEND_BUF_IS_EMPTY = SendBuf is empty                                         |
| 412  | OUT_OF_MSG_RANGE = Specified line number is out of message size              |
| 413  | COMMAND_EHLO_STARTTLS = Server returned error after sending STARTTLS         |
| 414  | SSL_PROBLEM = SSL problem                                                    |
| 415  | COMMAND_DATA_BLOCK = Failed to send data block                               |
| 416  | STARTTLS_NOT_SUPPORTED = The STARTTLS command is not supported by the server |
| 417  | LOGIN_NOT_SUPPORTED = AUTH LOGIN is not supported by the server              |

**Failed Alarm Email Code**  
**535      406**

Figure 106

## Communication

The communication screen is mostly for reference for HMI users. For a network system administrator is best to use the browser interface. This screen will also allow the HMI user to give access of the HMI interface to non-personnel to access the chamber interface, without giving them network access by enabling the Access Point (Hot Spot) WI Fi. The need for this could be used for maintenance or service groups. Also, when setting up a network with DHCP disabled, the network administrator can login here or browser preferably to update the network settings.

Default WI FI name (SSID): DCC\_WiFi

Default Password: 12345678

It is recommended to rename Wi Fi SSID to help segregate chambers when multiple chambers are in the same area. i.e., by serial number.

**Note:** *If Wi Fi is the only form of network access (no LAN connection), then no emails for alarms or logs can be sent while Hot spot is active.*



Figure 107

Wi Fi and LAN settings will be “grayed out” when DHCP is enabled. Select static to update IP address settings. Consult your network administrator before doing so.

Refresh  will reboot the HMI to update the new network settings. The chamber will continue to run.

**Note:** *When updating the IP address, the cMT viewer will also need updating by searching for the new address.*

**BACnet Device ID** is used for BACnet communication as read only. The  can be changed with class D Security level user. This can be changed to help identify items on the BACnet network. Items that can be seen on the BACnet network. Are process values and set points and High and low alarms.

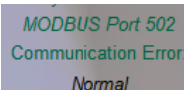


The icon opens the BACnet page to show the Object names and values as displayed on a BACnet interface. BACnet has some latency to display changes that are made on the controller from what is displayed. This should not take more than a moment or so.

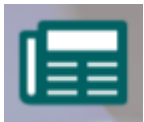
BACnet uses port 47808 and cannot be altered.

**MODBUS TCP** () is used to read and write values on the Fuji controller. Values that are based on the HMI like schedule timing are not available through MODBUS TCP. To enable Write access, this setting needs to be enabled on the security setting screen. This is due to the requirement of CFR 21-part 11 compliance. When MODBUS write is enabled, settings can be altered without recording the user doing so. Therefore, having write access enabled disqualifies the requirements to meet the needs of CFR 21 Part 11.

MODBUS TCP only works on port 502 and cannot be altered.



Communication error can be read here.



The icon opens the address mapping information for communicating via MODBUS TCP.





**admin**  
Temperature °C 19.8
Humidity % 80.3
Light % 0





1dB

2024/02/12 MON 14:45:20

Station Number      1 = Temperature Controller  
2 = Humidity Controller  
3 = Light Controller  
5 = output module

**MODBUS Table input register 3 Function Code**

| Name               | Function                | Register # | Read Data | Factory Set Value                                     |
|--------------------|-------------------------|------------|-----------|-------------------------------------------------------|
| PV                 | Display Process Value   | 2001       | Only      | N/A                                                   |
| SV                 | Display Set Point Value | 2002       | Only      | N/A                                                   |
| Digital out Status | Alarm Status            | 2007       | Only      | Bit_0 = Alarm 1<br>Bit_1 = Alarm 2<br>Bit_2 = Alarm 3 |

**MODBUS Table Holding register 4 Function Code**

| Name | Function      | Register # | Read / Write Data | Factory Set Value                  |
|------|---------------|------------|-------------------|------------------------------------|
| SV   | Set Value     | 2002       | Yes               | Customers desired SP value         |
| A1-L | Set Value     | 2044       | Yes               | 2.0 - 5.0 Temperature 5.0 Humidity |
| A1-H | Set Value     | 2047       | Yes               | 2.0 - 5.0 Temperature 5.0 Humidity |
| DLY1 | Alarm 1 Delay | 2053       | Yes               | 15 Minutes or 900 Seconds          |
| AL2  | Set Value     | 2045       | Yes               | 1.0 - 3.0 Temperature 5.0 Humidity |
| DLY2 | Alarm 2 Delay | 2054       | Yes               | 15 Minutes or 900 Seconds          |
| AL3  | Set Value     | 2046       | Yes               | 1.0 Temperature 1.0 Humidity       |
| A3HY | Set Value     | 2052       | Yes               | 2.0 Temperature 1.0 Humidity       |
| DLY3 | Alarm 3 Delay | 2055       | Yes               | 1 -5 Minutes or 60-900 Seconds     |

**\*\*To Write data, Write data must be enabled. Check Security screen.**  
For more commands see FUJI PXF4 communication manual



Figure 108


**DARWIN  
CHAMBERS**

 admin
 


 1dB

Temperature °C **19.8**
 Humidity % **80.1**
 Light % **0**

2024/02/12 MON 13:02:16

Wi-Fi Radio **Off**

**Wi-Fi Setting**

Connect Status Code **Stopped**

**DHCP**  **Static** 

Error Code **No Error**

Wi-Fi IP: **000 .000 .000 .000**

SSID

Mask: **000 .000 .000 .000**

Country Code **US**

Gateway: **000 .000 .000 .000**

Enable/Disable Wi-Fi HotSpot 

DNS: **000 .000 .000 .000**

Wi-Fi HotSpot SSID **DCC\_Wifi**

MAC: **C8 : DF : 84 : 70 : 3C : C9**

Wi-Fi HotSpot Password **12345678**

Refresh Wi-Fi HotSpot Setting 

**BACnet Device Id:**

**4194302**



**MODBUS Enabled**

Check Security screen for write Access.

MODBUS Port 502

Communication Error:

Normal



**LAN Setting**

**DHCP**  **Static** 

LAN IP: **192 .168 .002 .143**

Mask: **255 .255 .255 .000**

Gateway: **192 .168 .002 .001**

DNS: **192 .168 .002 .096**

MAC: **00 : 0C : 26 : 17 : 1E : 54**

Refresh LAN Setting 

Figure 109

## 24 Hour Ramp Soak Screen

The 24-hour ramp soak program has 24 steps, one for each hour. Each step is ramp and soak. Time is in minutes and seconds and can only be entered for ramp time. The soak time is automatically calculated for that hour / step. When the program is initiated the Loop controller will calculate from current process value to the set point set in that first step to start ramp or soak time, if the ramp time is set to 0. Time of day start and end the program is available. This way the user does not need to be there to initiate the program. The end of day program can be used to stop the program, and have the program start again the next day. The overrun-in time can be due to the Guarantee soak time being enabled, or the accuracy of the internal clock counter on the controller.

The **Loaded Program Number** is the program currently loaded in the loop controller.

The **Program off, run, hold** button along with the **status** and **timing** indicator can appear at bottom of the screen. Pressing the program button from off to run will start the current loaded program. Pressing the button again from run to hold will pause the program. Then finally pressing the program button from Hold to off will stop the program. The ramp / soak operation indicators when enabled on main screen will also appear on the monitor mode screen. The button cannot be manipulated in the monitor mode screen.

The **status** indicator reveals what stage the program is at currently.

The **Timing** indicator indicates when the time-of-day start is enabled.

**Show on the home screen** will have the **Program Button**, **Status**, and **Timing indicator** display on the home screen and monitor mode screen. This is for easy access to start a program or see the status of the program and to know the time of day is enabled.



The **Setting Calendar icon** opens the time of day (Figure 119) pop up window.

The **Step buttons 1 -24** are to quickly navigate to the step for that hour (not time of day). When using multiple loops on the chamber the other loop for the same step / hour will be available to edit.

**Program Count:** gives the amount of saved or stored programs

**Program Number:** Gives the index number for the program along with editable name for that program. The name can have up to 10 characters. The name can be shared over multiple programs and the index number used to segregate programs with same name.



**UP / Down Arrows** : used to scroll through the list of saved programs. This will increase or decrease the program Number and name until list end.



**Data Base icon** : used to open pop up window of all programs (24 Hour and 16 Step) see Figure 121 for preview. Programs can also be selected here as well. Scrolling up, down left and right is permitted to see full program.

**Program Result:** is status indicator to know the program has loaded for editing successfully or if there are any other errors.

- Command successfully executed.
- The selected record does not exist.
- Unknown command error
- Record reach limit (10000), no new records can be added.



**Add File** : used to create a new file. (Previous name will carry over, be sure to update by clicking name. Press the update icon to save.)



**Delete File** : Delete the current selected file.



**Update File** : Update current selected file in database.



**Upload File** : Upload the data base file to the loop controller. Status bar will appear below icon. Once the progress bar disappears from the screen, the program is loaded. If the progress bar turns red review program and try to upload again. When the program button is pressed this program will run.



**Progress Bar:** : Progress bar will appear when selected program is being uploaded. When the bar vanishes, programming is complete. If the progress bar turns red, a communication error occurs. This could be due to parameter value out of scale or other error.



Figure 110

## Edit Step in 24 Step

The edit step window appears at the bottom of the Ramp / Soak screen for either 24 hour or 16 step programs.

Select the set point and enter the new desired set point.

Select either the minute or second time to edit. The soak time will automatically calculate for the step to equal one hour. Entering 0 in both minute and second will be a soak only, for one hour.

Press the update button for that loop to save the new setting. If upload to is pressed before updating, the wrong parameters will be entered.



Use page back arrow  for previous step or back to main ramp soak screen.

Use page forward arrow  for next step in series or return to main ramp soak screen when reached the last step.

Use the exit  to return to the main ramp soak screen.

| Set Point 1                           | Set Point 1                           |
|---------------------------------------|---------------------------------------|
| 25.0                                  | 60.0                                  |
| Ramp 1                                | Ramp 1                                |
| Minute Second                         | Minute Second                         |
| 01 :02                                | 30 :00                                |
| Soak 1                                | Soak 1                                |
| Minute Second                         | Minute Second                         |
| 58 :58                                | 30 :00                                |
| <input type="button" value="Update"/> | <input type="button" value="Update"/> |

Navigation icons: Left arrow, Exit icon, Right arrow

Figure 111

## 16 Step Ramp / Soak Screen

The 16-step ramp soak program has 16 steps. Each step is ramp and soak. Time is in hours and minutes. When the program is initiated the Loop controller will calculate from current process value to the set point set in that first step to start ramp or soak time, if the ramp time is set to 0. Time of day start and end the program is available. This way the user does not need to be there to initiate the program. The end of day program can be used to stop the program and have the program start again the next day. The overrun in time can be due to the guaranteed soak time being enabled, or accuracy of the internal clock counter on the controller. Entering the ramp time and soak time to 0 will cause that step to be skipped. Make sure all steps are filled out. This is to prevent a value from previous program not being updated.

The **Loaded Program Number** is the program currently loaded in the loop controller.

The **Program off, run, hold** button along with the **status** and **timing** indicator can appear at bottom of the screen. Pressing the program button from off to run will start the current loaded program. Pressing the button again from run to hold will pause the program. Then finally pressing the program button from Hold to off will stop the program. The ramp / soak operation indicators when enabled on main screen will also appear on the monitor mode screen. The button cannot be manipulated in the monitor mode screen.

The **Status** indicator reveals what stage the program is at currently.

The **Timing** indicator indicates when the time-of-day start is enabled.

**Show on the home screen** will have the **Program Button**, **Status**, and **Timing indicator** display on the home screen and monitor mode screen. This is for easy access to start a program or see the status of the program and to know the time of day is enabled.



The **Setting Calendar icon** opens the time of day (Figure 119) pop up window.

The **Step buttons 1 -16** are to quickly navigate to the step. When using multiple loops on the chamber the other loop for the same step will be available to edit.

**Program Count:** gives the amount of saved or stored programs.

**Program Number:** Gives the index number for the program along with editable name for that program. The name can have up to 10 characters. The name can be shared over multiple programs and the index number used to segregate programs with same name.



**UP / Down Arrows** : used to scroll through the list of saved programs. This will increase or decrease the program Number and name until list end.



**Data Base icon** : used to open pop up window of all programs (24 Hour and 16 Step) see Figure 121 for preview. Programs can also be selected here as well. Scrolling up, down left and right is permitted to see the full program.

**Program Result:** is status indicator to know the program has loaded for editing successfully, or any other errors.

- Command successfully executed.
- The selected record does not exist.
- Unknown command error
- Record reach limit (10000), no new records can be added.



**Add File** : used to create a new file. (Previous name will carry over so be sure to update by clicking name. Press the update icon to save.)



**Delete File** : Delete the current selected file.



**Update File** : Update current selected file in database.



**Upload File** : Upload the data base file to the loop controller. Status bar will appear below icon. Once the progress bar disappears from the screen, the program is loaded. If the progress bar turns red, review the program, and try to upload again. When the program button is pressed this program will run.



**Progress Bar** : Progress bar will appear when selected program is being uploaded. When the bar vanishes, programming is complete. If the progress bar turns red, a communication error occurs. This could be due to parameter value out of scale or other error.



Figure 112

## Edit Step

The edit step window appears at the bottom of the Ramp / Soak screen for either 24 hour or 16 step programs.

Select the set point and enter the new desired set point.

Select either the Hour or minute time to edit. Enter 0 in the times will skip that step.

Press the update button for that loop to save the new setting. If upload to is pressed before updating, the wrong parameters will be entered.

Use page back arrow  for previous step or back to main ramp soak screen.

Use page forward arrow  for next step in series or return to main ramp soak screen when reached the last step.

Use the exit  to return to the main ramp soak screen.

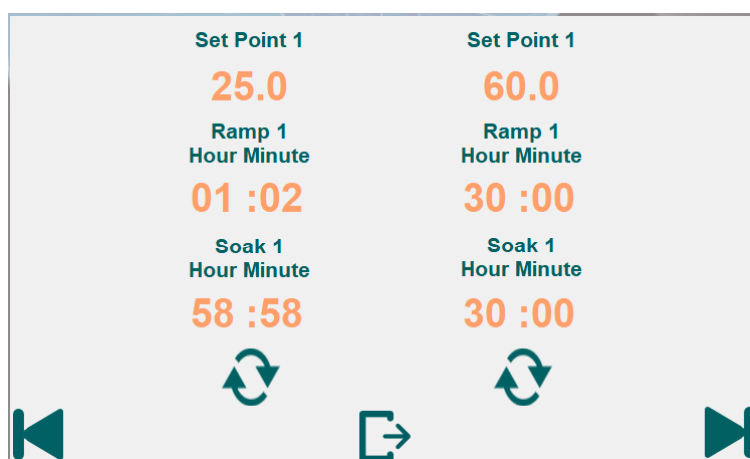


Figure 113

### ***Time of Day Start / End***

The time-of-day pop window allows for time of day start and many more ramp soak options. Time of day start will work on the 24 Hour or 16 Step program. Will enable or disable the current loaded program.

**Power on Start:** Allows for the program to startup when the chamber loop controller is powered on with the current PV.

**Ending Output:** Maintains the same state as at the end of ramp/soak when ramp/soak is complete. (Maintain Control or Standby)

**Off output:** Switches to the OFF state when ramp/soak is complete. (Maintain Control or Standby)

**Repeat:** Will repeat the current loaded program. This uses the internal time counter of the loop controller. This may cause the program to drift from the real time clock. This could mean day one the program started at 7AM. But loop controller clock has a 5 second daily error. This would have the program starting a minute after 7am when program has repeated for 12 days continuous.

**Restore Mode:** This tells the loop controller what to do in the event the loop controller loses power while a ramp soak program is running.

- **Restart** Starts the Ramp/Soak from the first step again.
- **Restore** Does not operate ramp soak.
- **Continue** Resumes the operation from the status of the time which power is turned off. (It can restore the state to five minutes before maximum.)

**Guarantee Soak:** This function guarantees the soak time. Soak time is counted down only when PV is in the range window of Lower and upper limit.

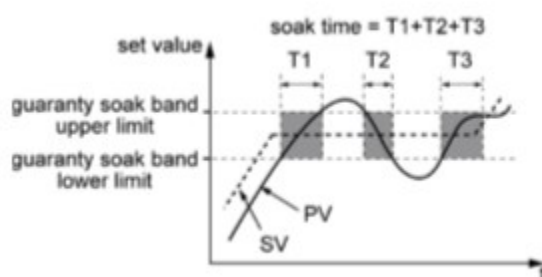


Figure 114

**Setting Range:**

|                                                    |                         |                                     |              |              |
|----------------------------------------------------|-------------------------|-------------------------------------|--------------|--------------|
| <input checked="" type="checkbox"/> Power On Start | <b>Restore Mode</b>     | <b>Guarantee</b>                    | <b>Lower</b> | <b>Upper</b> |
| <input type="radio"/> Ending Output                | <b>After Power Loss</b> | <b>Soak</b>                         | <b>Limit</b> | <b>Limit</b> |
| <input type="radio"/> Off Output                   | <b>Restart</b>          | <input checked="" type="checkbox"/> | 0.2          | 0.2          |
| <input checked="" type="checkbox"/> Repeat         |                         |                                     |              |              |

Figure 115

Use the radio buttons to enable Time of day start, enable termination Action, and Setting on individual day.

**Time of Day Start:** Must be the last step when entering a time-of-day start. If Start or End time or day selection edited after Time of day Start button is enabled the change will not take effect.

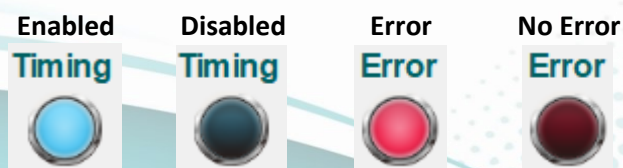


Table 18

**Enable Termination Action:** This will end the ramp soak program. This can be used to help repeat a 24-hour ramp soak program starting the same time every day, rather than use the repeat function above. This can be used to end a program, then a second or two later start programs again. Use with Setting on individual day.

**Setting on Individual day:** The same start time and end time can be assigned to different days of the week.

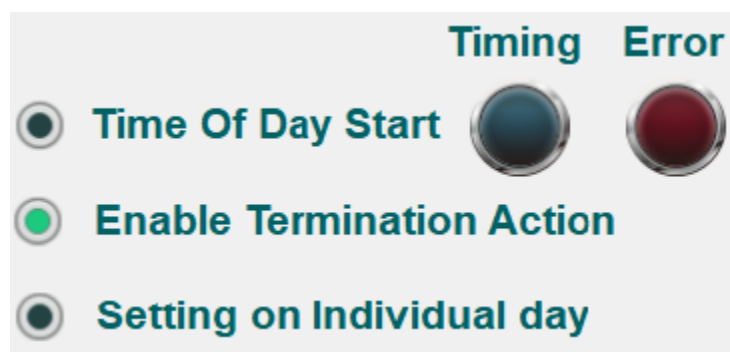


Figure 116

**To Temp** and **From Temp** copies or transfers the Start and End times from Humidity or to Humidity. This helps to reduce repeated data entry. Time of day start must still be selected to enable, however.



Figure 117

**To Hum** and **From Hum** copies or transfers the Start and End times from Temperature or to Temperature. This helps to reduce repeated data entry. Time of day start must still be selected to enable, however.

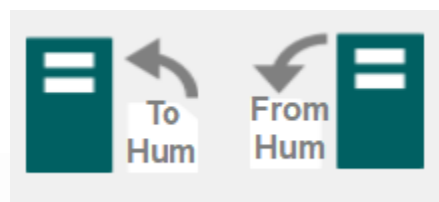


Figure 118

**Start Time:** Enter the time in 24-hour format. For instance, times in the afternoon add 12 to the 12-hour format. For 2PM 12 + 2 for 14 for the hour. Midnight would be hour 0 (zero).

**End Time:** Enter the time in 24-hour format. For instance, times in the afternoon add 12 to the 12-hour format. For 2PM 12 + 2 for 14 for the hour. Midnight would be hour 0 (zero).

Use the day radio buttons for the days you want the program to start or end.

| Start Time            |                       |                       |                       |                       |                       |                       | End Time |  |  |      |        |        |  |                       |                       |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|--|--|------|--------|--------|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Hour                  | Minute                | Second                |                       |                       |                       |                       |          |  |  | Hour | Minute | Second |  |                       |                       |                       |                       |                       |                       |                       |
| 07                    | 50                    | 02                    |                       |                       |                       |                       |          |  |  | 07   | 50     | 01     |  |                       |                       |                       |                       |                       |                       |                       |
| Sun                   | Mon                   | Tue                   | Wed                   | Thu                   | Fri                   | Sat                   |          |  |  |      |        |        |  | Sun                   | Mon                   | Tue                   | Wed                   | Thu                   | Fri                   | Sat                   |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |          |  |  |      |        |        |  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Figure 119

Temperature Scheduling

Power On Start

Ending Output

Off Output

Repeat

Restore Mode After Power Loss

Restart

Guarantee Soak

Lower Limit

Upper Limit

Timing

Error

Time Of Day Start

Enable Termination Action

Setting on Individual day

Start Time

Hour Minute Second

07:50:02

Sun Mon Tue Wed Thu Fri Sat

End Time

Hour Minute Second

07:50:01

Sun Mon Tue Wed Thu Fri Sat

Figure 120

**Preview or select program.**



Use the database icon to open window to show all stored programs for that loop. Programs can be selected by clicking on that row. Ability to search left, right, up, and down. Database is shared between the 16-Step and 24-hour step program. Make sure the proper program is selected for the correct step program to run.

| Humidity  |           |          |          |          |          |           |
|-----------|-----------|----------|----------|----------|----------|-----------|
| Name      | SetPoint1 | RampMin1 | RampSec1 | SoakMin1 | SoakSec1 | SetPoint2 |
| Humidity2 | 25.0      | 1        | 2        | 3        | 4        | 26.0      |
| Humidity1 | 25.0      | 1        | 2        | 3        | 4        | 26.0      |
| Humidity1 | 25.0      | 1        | 2        | 3        | 4        | 26.0      |

Figure 121

### FTP Viewing:

Apart from saving the history data from an HMI to your PC by using SD card, USB disk, the FTP Server can also do the backup. The FTP Server can be used to backup or update the history data and the recipe data, but not able to delete those data. Please disconnect from FTP before removing an SD card or USB disk, otherwise these external devices may not work when inserted next time.

**Optional:** Check with your computer operating system about setting up a FTP site as a map Network Drive for convenience.

### Steps to log in FTP Server

1. Before logging into FTP Server, please check the HMI IP address. Open an explorer window as shown below.

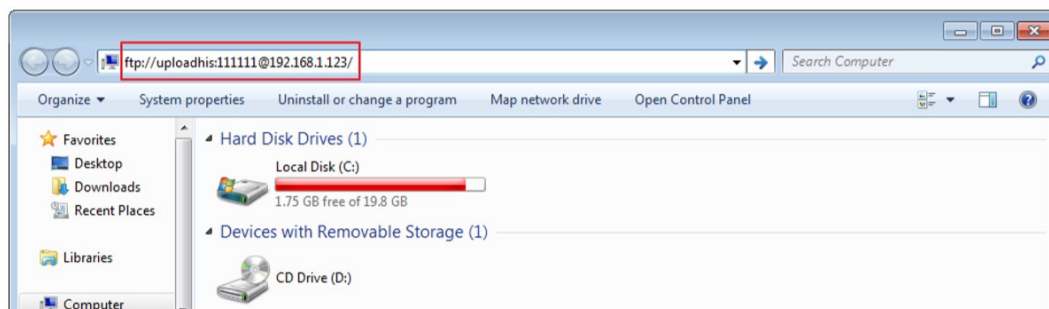


Figure 122

2. On PC, enter the HMI IP address: ftp://192.168.1.123/ (example), then log in by the username: uploadhis, and enter the HMI [history upload password] (if not changed, the default password is 111111). Or directly enter ftp://uploadhis:111111@192.168.1.123/
3. After entering the IP address, the ftp address: ftp://192.168.1.123 and its folders are shown as below:

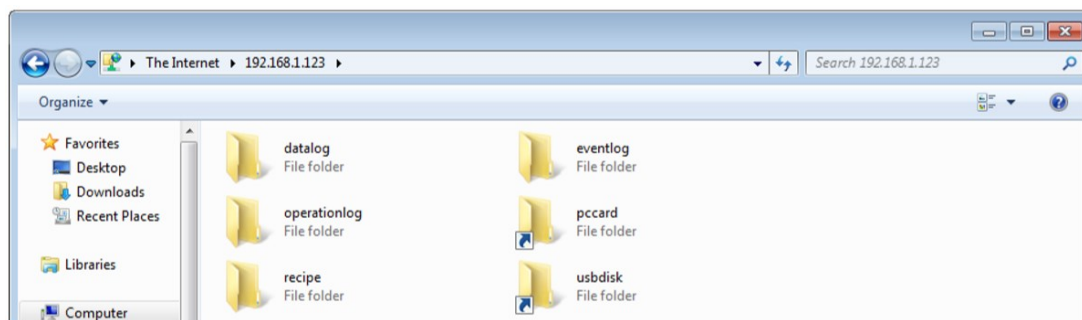


Figure 123

### Backup History Data and Update Recipe Data (Ramp/Soak)

- Steps to backup Data Sampling records
  - Click “datalog” folder to view the files.
  - Click the file to check the records.
  - Copy and Paste the needed files to your PC.



Figure 124

- Steps to backup Event (Alarm) Log records
  - Click “Eventlog” folder to view the files.
  - Copy and Paste the needed files to your PC.



Figure 125

- Steps to backup or update Recipe (Ramp/ Soak) records

- Click “recipe” folder to view the files.
- Copy and Paste the needed files to your PC

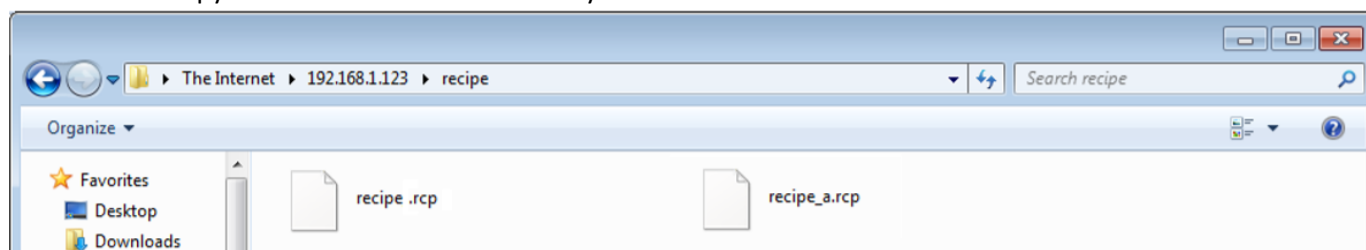


Figure 126

**Note:** Since the Recipe data is automatically saved per minute, after updating “recipe.rcp” or “recipe\_a.rcp”, the HMI must be rebooted within one minute or the saving will fail.

## Easy Access 2.0

EasyAccess 2.0 is Remotely monitor and control your Chamber.

### Overview

Traditionally, accessing a remote HMI is a convoluted job. Security concerns and tricky network parameters setup makes it difficult for many HMI users. And even with proper setup, access is still quite limited, allowing connection to only one HMI within the remote network. However, with EasyAccess 2.0, this has all changed.

EasyAccess 2.0 provides a new way for accessing an HMI from anywhere in the world. With EasyAccess 2.0, it becomes very easy to monitor and troubleshoot HMI and PLC that are at a remote location if Internet connection is available. As EasyAccess 2.0 already takes care of network settings and addresses security issues, the user can connect easily to the HMIs as if they were on the local network. Moreover, it is possible to have access to multiple HMIs within a network.

EasyAccess is also a remote supporting service. Consider the case in which a chamber has a cMT Server HMI installed, and the chamber is nonlocal or even overseas to Darwin Chambers or the end user. The local user is reporting a problem, which may or may not require inspection by an engineer. Darwin Chambers or your maintenance department can remotely connect to the HMI through EasyAccess 2.0 to investigate the problem. The Chamber needs no extra network configuration, just Internet connection. In addition, Darwin Chambers can also update the HMI project, or even update the Fuji Controller program.

### Features

- Secure connections
- Little PC setup required; no router setup required.
- User friendly administrator and client UI
- Supports pass-through and proxy server.
- Mobile support

For further information on setting up EasyAccess refer to the Weintek EasyAccess 2.0 Startup guide located on the included flash drive.

On the HMI settings like Hardware Key can be found on the Settings screen. Press on the EasyAccess logo.



Figure 127

## Easy Convertor Tool

### Overview

EasyConverter reads the Data Log file, Event Log file, and Operation Log file in HMI and convert the files to Excel format.

- From Utility ManagerEX click [Data Conversion] » [EasyConverter].
- From EasyBuilder Pro menu select [Tool] » [Data/Event Log Converter].

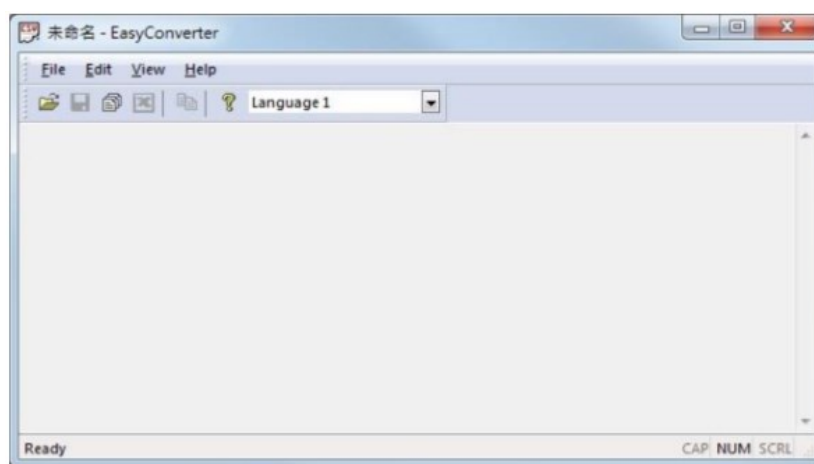


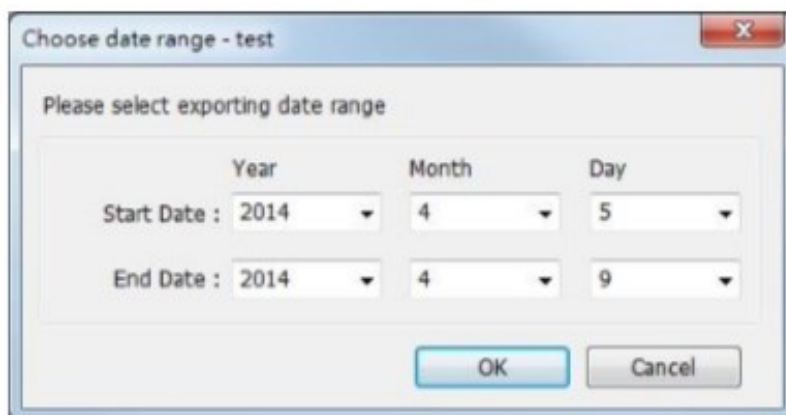
Figure 128



Click the icon to watch the demonstration film. Please confirm your internet connection before playing the film.

### Converting Data Log File to Excel File

1. If the Data Log file format is .db, and the file includes data of more than one day, the data to be viewed can be specified by selecting a date range. (If the file format is, .dtl, please skip this step.)



Choose date range - test

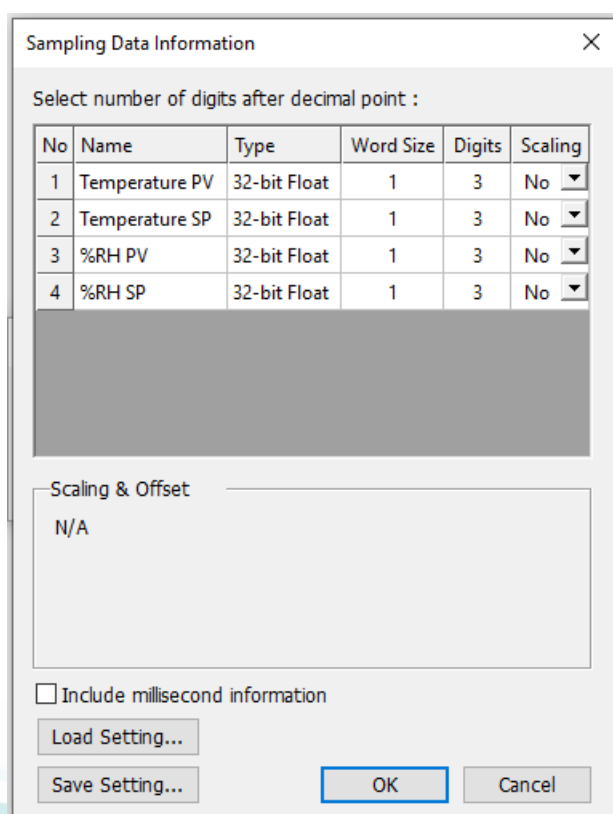
Please select exporting date range

|              | Year | Month | Day |
|--------------|------|-------|-----|
| Start Date : | 2014 | 4     | 5   |
| End Date :   | 2014 | 4     | 9   |

OK Cancel

Figure 129

- The following is the setting dialog box, please set based on actual needs.



Sampling Data Information

Select number of digits after decimal point :

| No | Name           | Type         | Word Size | Digits | Scaling |
|----|----------------|--------------|-----------|--------|---------|
| 1  | Temperature PV | 32-bit Float | 1         | 3      | No      |
| 2  | Temperature SP | 32-bit Float | 1         | 3      | No      |
| 3  | %RH PV         | 32-bit Float | 1         | 3      | No      |
| 4  | %RH SP         | 32-bit Float | 1         | 3      | No      |

Scaling & Offset  
N/A

☐ Include millisecond information

Load Setting... Save Setting... OK Cancel

Figure 130

- Click [OK], the Data Log layout is shown in the following figure. Click [Export to Excel]. The file will be converted to Excel format.

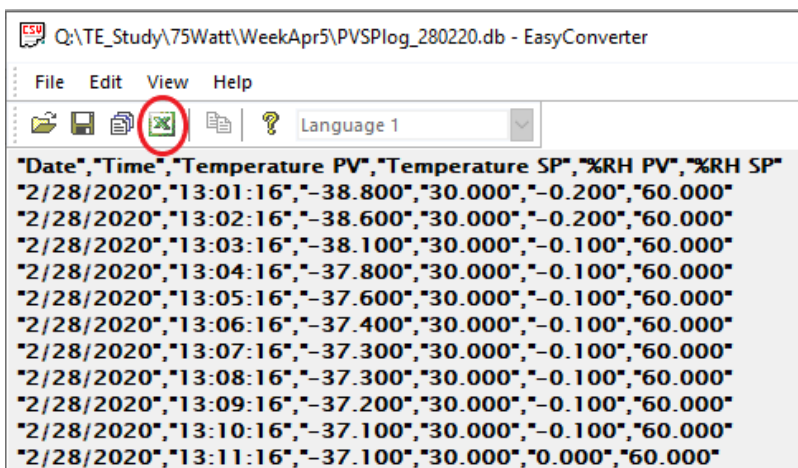


Figure 131

4. The Excel layout is shown in the following figure.

|    | A         | B        | C              | D              | E      | F      |
|----|-----------|----------|----------------|----------------|--------|--------|
| 1  | Date      | Time     | Temperature PV | Temperature SP | %RH PV | %RH SP |
| 2  | 2/28/2020 | 13:01:16 | -38.79999924   | 30             | -0.2   | 60     |
| 3  | 2/28/2020 | 13:02:16 | -38.59999847   | 30             | -0.2   | 60     |
| 4  | 2/28/2020 | 13:03:16 | -38.09999847   | 30             | -0.1   | 60     |
| 5  | 2/28/2020 | 13:04:16 | -37.79999924   | 30             | -0.1   | 60     |
| 6  | 2/28/2020 | 13:05:16 | -37.59999847   | 30             | -0.1   | 60     |
| 7  | 2/28/2020 | 13:06:16 | -37.40000153   | 30             | -0.1   | 60     |
| 8  | 2/28/2020 | 13:07:16 | -37.29999924   | 30             | -0.1   | 60     |
| 9  | 2/28/2020 | 13:08:16 | -37.29999924   | 30             | -0.1   | 60     |
| 10 | 2/28/2020 | 13:09:16 | -37.20000076   | 30             | -0.1   | 60     |
| 11 | 2/28/2020 | 13:10:16 | -37.09999847   | 30             | -0.1   | 60     |
| 12 | 2/28/2020 | 13:11:16 | -37.09999847   | 30             | 0      | 60     |

Figure 132

#### Note:

- If the file requires over six million cells in Excel format, only partial data will be shown in EasyConverter. (The complete data will still be exported to xls / xlsx file.)
- The file will be automatically separated into different sheets in the xls / xlsx file under these conditions:
  - Exceeds 60 thousand rows in a single sheet.
  - Exceeds 1.5 million cells in a single sheet.

### Converting Event Log File to Excel File

1. If the Event Log file format is .db, and the file includes data of more than one day, the data to be viewed can be specified by selecting a date range. (If the file format is, .evt, please skip this step.)

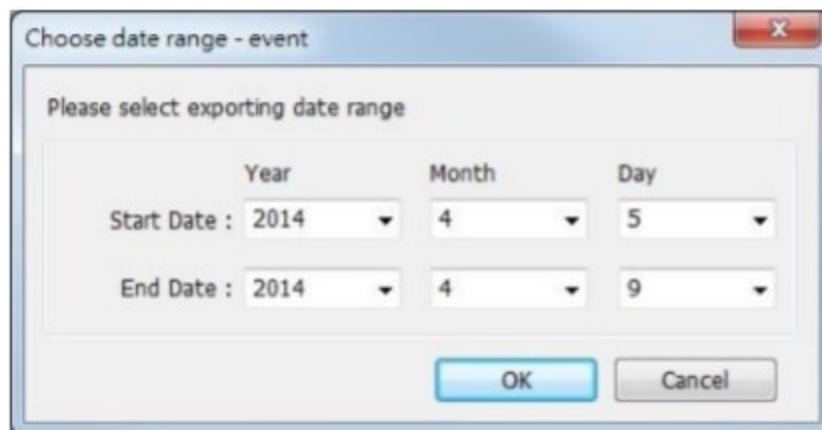


Figure 133

2. If the .db file of Event Log contains multiple languages, the language to be viewed can be specified. (If the file format is, . evt, please skip this step.)

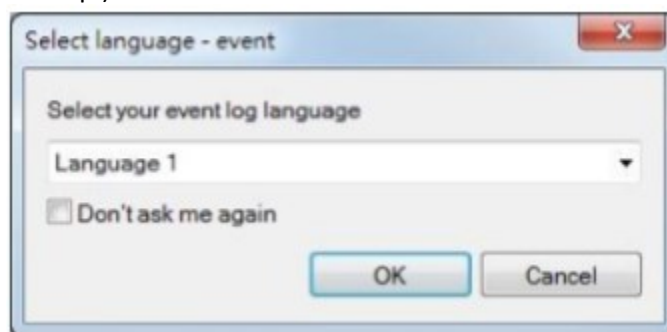
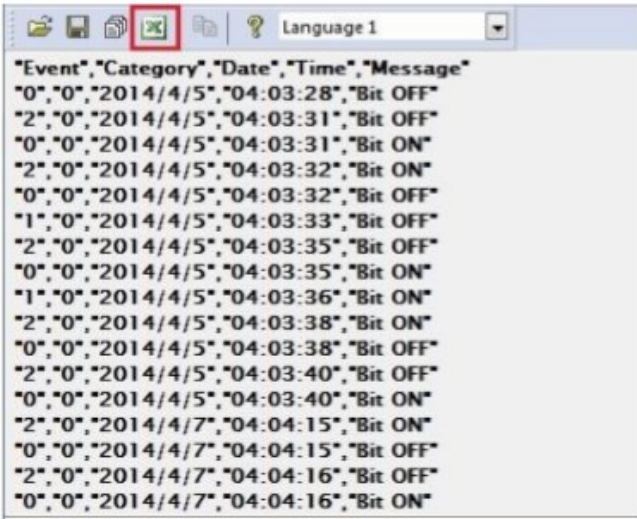


Figure 134

3. Click [OK], the Event Log layout is shown in the following figure. Click [Export to Excel]. The file will be converted to Excel format.



```

"Event","Category","Date","Time","Message"
"0","0","2014/4/5","04:03:28","Bit OFF"
"2","0","2014/4/5","04:03:31","Bit OFF"
"0","0","2014/4/5","04:03:31","Bit ON"
"2","0","2014/4/5","04:03:32","Bit ON"
"0","0","2014/4/5","04:03:32","Bit OFF"
"1","0","2014/4/5","04:03:33","Bit OFF"
"2","0","2014/4/5","04:03:35","Bit OFF"
"0","0","2014/4/5","04:03:35","Bit ON"
"1","0","2014/4/5","04:03:36","Bit ON"
"2","0","2014/4/5","04:03:38","Bit ON"
"0","0","2014/4/5","04:03:38","Bit OFF"
"2","0","2014/4/5","04:03:40","Bit OFF"
"0","0","2014/4/5","04:03:40","Bit ON"
"2","0","2014/4/7","04:04:15","Bit ON"
"0","0","2014/4/7","04:04:15","Bit OFF"
"2","0","2014/4/7","04:04:16","Bit OFF"
"0","0","2014/4/7","04:04:16","Bit ON"

```

Figure 135

4. The Excel layout is shown in the following figure.

|    | A     | B        | C        | D       | E       | F |
|----|-------|----------|----------|---------|---------|---|
| 1  | Event | Category | Date     | Time    | Message |   |
| 2  | 0     | 0        | 2014/4/5 | 4:03:28 | Bit OFF |   |
| 3  | 2     | 0        | 2014/4/5 | 4:03:31 | Bit OFF |   |
| 4  | 0     | 0        | 2014/4/5 | 4:03:31 | Bit ON  |   |
| 5  | 2     | 0        | 2014/4/5 | 4:03:32 | Bit ON  |   |
| 6  | 0     | 0        | 2014/4/5 | 4:03:32 | Bit OFF |   |
| 7  | 1     | 0        | 2014/4/5 | 4:03:33 | Bit OFF |   |
| 8  | 2     | 0        | 2014/4/5 | 4:03:35 | Bit OFF |   |
| 9  | 0     | 0        | 2014/4/5 | 4:03:35 | Bit ON  |   |
| 10 | 1     | 0        | 2014/4/5 | 4:03:36 | Bit ON  |   |
| 11 | 2     | 0        | 2014/4/5 | 4:03:38 | Bit ON  |   |
| 12 | 0     | 0        | 2014/4/5 | 4:03:38 | Bit OFF |   |
| 13 | 2     | 0        | 2014/4/5 | 4:03:40 | Bit OFF |   |
| 14 | 0     | 0        | 2014/4/5 | 4:03:40 | Bit ON  |   |
| 15 | 2     | 0        | 2014/4/7 | 4:04:15 | Bit ON  |   |

Figure 136

### Note

- The "Event" column can be found. 0-> Event triggered; 1-> Event acknowledged; 2-> Event returns to normal.
- If the file requires over six million cells in Excel format, opening the file in EasyCoverter only partially shows the data. (The complete data will be exported to xls / xlsx file.)
- The file will be automatically separated into different sheets in the xls / xlsx file under these conditions:
  - Exceeds 60 thousand rows in a single sheet.
  - Exceeds 1.5 million cells in a single sheet.

## Converting Operation Log File to Excel File

1. If the Operation Log file includes data of more than one day, the data to be viewed can be specified by selecting a date range.

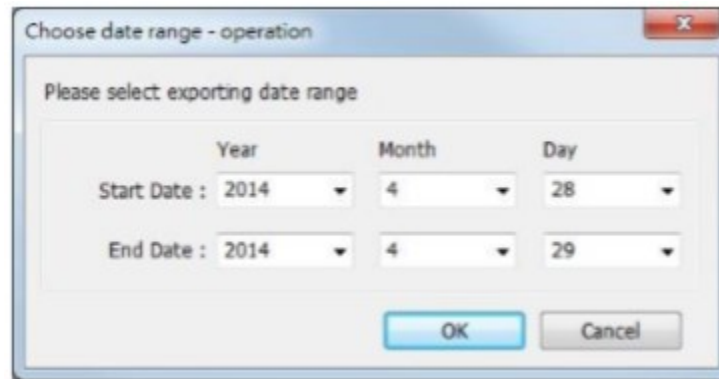


Figure 137

2. Click [OK], the Operation Log layout is shown in the following figure. Click [Export to Excel]. The file will be converted to Excel format.

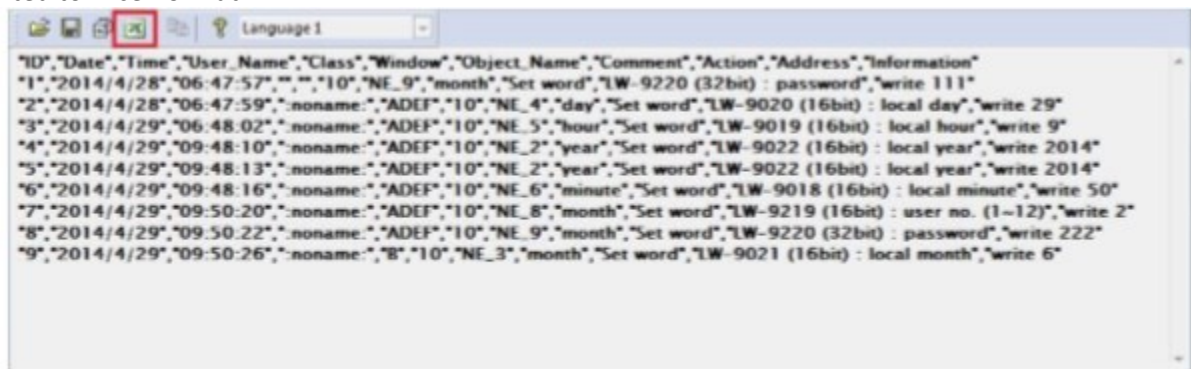


Figure 138

3. The Excel layout is shown in the following figure.

|    | A  | B         | C       | D         | E     | F       | G           | H        | I                                 | J          | K           | L |
|----|----|-----------|---------|-----------|-------|---------|-------------|----------|-----------------------------------|------------|-------------|---|
| 1  | ID | Date      | Time    | User_Name | Class | Window  | Object_Name | Comment  | Action                            | Address    | Information |   |
| 2  | 1  | 2014/4/28 | 6:47:57 |           |       | 10 NE_9 | month       | Set word | LW-9220 (32bit) : password        | write 111  |             |   |
| 3  | 2  | 2014/4/28 | 6:47:59 | .noname:  | ADEF  | 10 NE_4 | day         | Set word | LW-9020 (16bit) : local day       | write 29   |             |   |
| 4  | 3  | 2014/4/29 | 6:48:02 | .noname:  | ADEF  | 10 NE_5 | hour        | Set word | LW-9019 (16bit) : local hour      | write 9    |             |   |
| 5  | 4  | 2014/4/29 | 9:48:10 | .noname:  | ADEF  | 10 NE_2 | year        | Set word | LW-9022 (16bit) : local year      | write 2014 |             |   |
| 6  | 5  | 2014/4/29 | 9:48:13 | .noname:  | ADEF  | 10 NE_2 | year        | Set word | LW-9022 (16bit) : local year      | write 2014 |             |   |
| 7  | 6  | 2014/4/29 | 9:48:16 | .noname:  | ADEF  | 10 NE_6 | minute      | Set word | LW-9018 (16bit) : local minute    | write 50   |             |   |
| 8  | 7  | 2014/4/29 | 9:50:20 | .noname:  | ADEF  | 10 NE_8 | month       | Set word | LW-9219 (16bit) : user no. (1-12) | write 2    |             |   |
| 9  | 8  | 2014/4/29 | 9:50:22 | .noname:  | ADEF  | 10 NE_9 | month       | Set word | LW-9220 (32bit) : password        | write 222  |             |   |
| 10 | 9  | 2014/4/29 | 9:50:26 | .noname:  | B     | 10 NE_3 | month       | Set word | LW-9021 (16bit) : local month     | write 6    |             |   |
| 11 |    |           |         |           |       |         |             |          |                                   |            |             |   |
| 12 |    |           |         |           |       |         |             |          |                                   |            |             |   |

Figure 139

## Note

- If the file requires over six million cells in Excel format, opening the file in EasyConverter only partially shows the data. (The complete data will be exported to xls / xlsx file.)
- The file will be automatically separated into different sheets in the xls / xlsx file under these conditions:
  - Exceeds 60 thousand rows in a single sheet.
  - Exceeds 1.5 million cells in a single sheet.

## Converting Multiple Files

1. Click [Multi-File] to open the following dialog box.

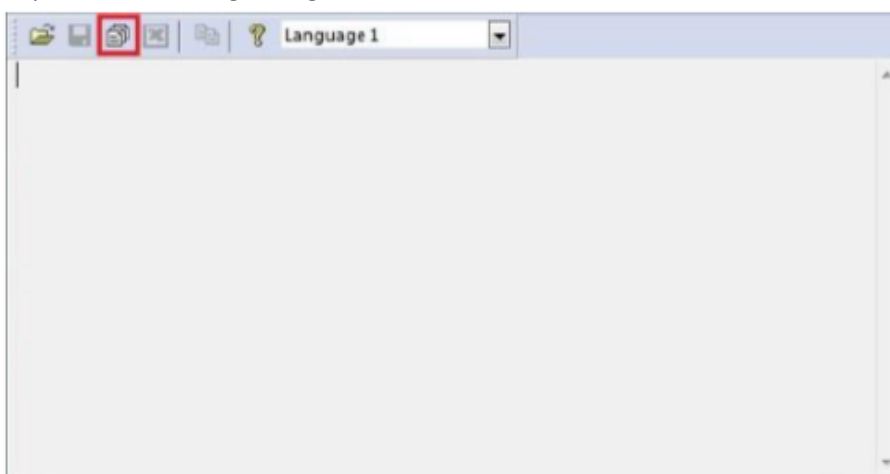


Figure 140

2. Click [Add File...] to add the files to be converted. If click [OK] without selecting [Combine to a file], the files will be exported to separate Excel files.

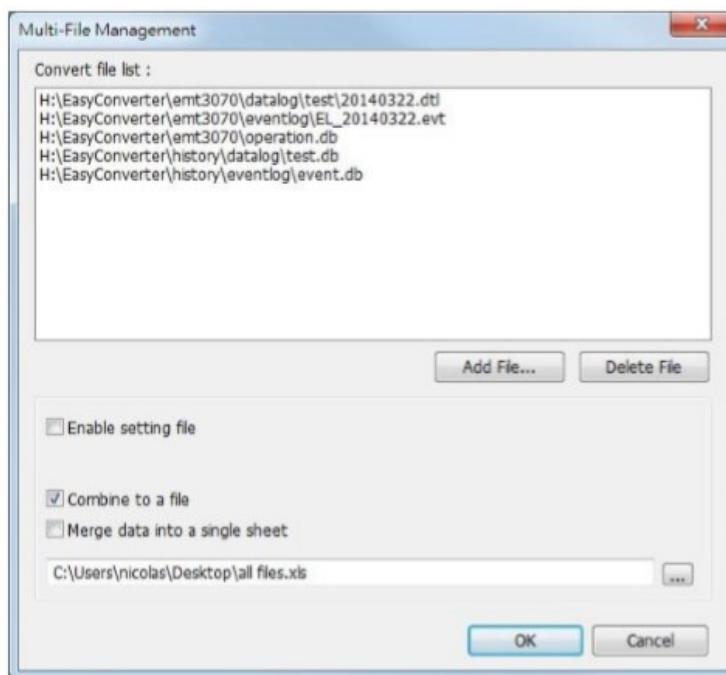


Figure 141

- If [Combine to a file] is selected, the files will be separated into different sheets of one Excel file as shown in the following figure.

|    | A         | B       | C           | D           | E        | F | G |
|----|-----------|---------|-------------|-------------|----------|---|---|
| 1  | Date      | Time    | Millisecond | temperature | humidity |   |   |
| 2  | 2014/3/22 | 6:36:52 | 260         | 2           | 1        |   |   |
| 3  | 2014/3/22 | 6:36:55 | 250         | 6           | 3        |   |   |
| 4  | 2014/3/22 | 6:36:58 | 250         | 10          | 6        |   |   |
| 5  | 2014/3/22 | 6:37:01 | 300         | 13          | 8        |   |   |
| 6  | 2014/3/22 | 6:37:04 | 280         | 17          | 10       |   |   |
| 7  | 2014/3/22 | 6:37:07 | 250         | 21          | 13       |   |   |
| 8  |           |         |             |             |          |   |   |
| 9  |           |         |             |             |          |   |   |
| 10 |           |         |             |             |          |   |   |
| 11 |           |         |             |             |          |   |   |
| 12 |           |         |             |             |          |   |   |
| 13 |           |         |             |             |          |   |   |
| 14 |           |         |             |             |          |   |   |
| 15 |           |         |             |             |          |   |   |

20140322 EL\_20140322 operation test event

Figure 142

**Note** The files cannot be combined when the total size of the files exceeds 32MB.

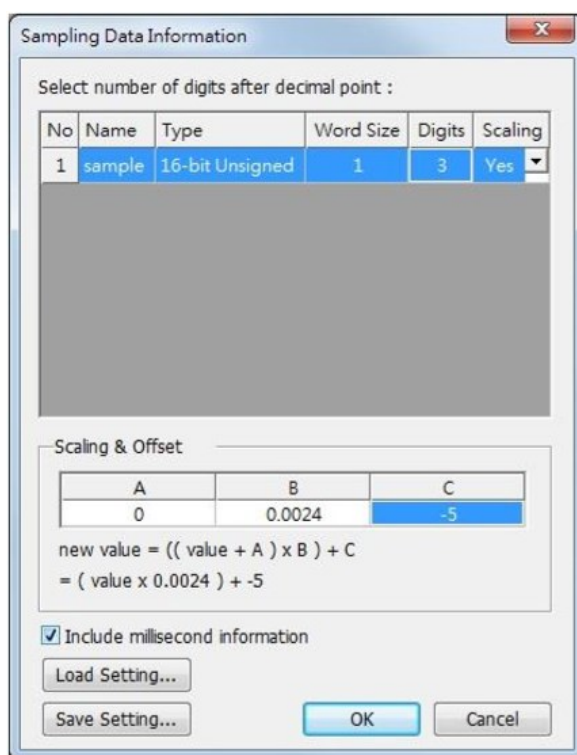
## Scaling Function

When opening a Data Log file, the scaling function can be set.

The equation of scaling new value =  $[(\text{value} + A) \times B] + C$ , and users can set the values of A, B, and C.

A -> lower limit of the value; B ->  $[(\text{scaled max}) - (\text{scaled min}) / (\text{upper limit}) - (\text{lower limit})]$ ; C -> scaled min.

For example, here is a voltage data with a format of 16-bit unsigned (range: 0 ~ 4096). To convert the data to volt, range form -5V to +5V, the new value =  $[(\text{value} + 0) \times 0.0024] + (-5)$ .



Sampling Data Information

Select number of digits after decimal point :

| No | Name   | Type            | Word Size | Digits | Scaling |
|----|--------|-----------------|-----------|--------|---------|
| 1  | sample | 16-bit Unsigned | 1         | 3      | Yes     |

Scaling & Offset

| A | B      | C  |
|---|--------|----|
| 0 | 0.0024 | -5 |

new value =  $((\text{value} + A) \times B) + C$   
=  $(\text{value} \times 0.0024) + -5$

☒ Include millisecond information

Load Setting... Save Setting... OK Cancel

Figure 143

Before scaling:

```

"Date","Time","Millisecond","sample"
"2014/06/30","23:02:50","80","0"
"2014/06/30","23:02:54","30","0"
"2014/06/30","23:02:57","990","55"
"2014/06/30","23:03:02","70","55"
"2014/06/30","23:03:06","20","89"
"2014/06/30","23:03:10","20","159"
"2014/06/30","23:03:14","30","530"
"2014/06/30","23:03:18","20","898"
"2014/06/30","23:03:22","40","1024"
"2014/06/30","23:03:26","0","2055"
"2014/06/30","23:03:30","30","2055"

```

After scaling:

```

"Date","Time","Millisecond","sample"
"2014/06/30","23:02:50","80","-5.000"
"2014/06/30","23:02:54","30","-5.000"
"2014/06/30","23:02:57","990","-4.868"
"2014/06/30","23:03:02","70","-4.868"
"2014/06/30","23:03:06","20","-4.786"
"2014/06/30","23:03:10","20","-4.618"
"2014/06/30","23:03:14","30","-3.728"
"2014/06/30","23:03:18","20","-2.845"
"2014/06/30","23:03:22","40","-2.542"
"2014/06/30","23:03:26","0","-0.068"
"2014/06/30","23:03:30","30","-0.068"

```

Figure 144

The settings described above can be saved as a settings file in \*.lgs format, and then loaded next time if needed.

## Batch File

EasyConverter command line can execute batch file (.bat) and convert .dtl or .evt files into .xls or .csv files for export. In the batch file, the user can define the format of the exported file (ex: ASCII, Unicode, or UTF-8), and decide whether to include millisecond information or load settings file.

The following explains how to create batch file (.bat) and provides some relevant notes.

Parameters:

```
[/c{a,8,u}] [/t{0,1}] [/s "Format file"] ["Src file"] ["Dest file"]
```

## Example:

```
EasyConverter.exe /ca /t1 /s "C:\Format.lgs" "C:\Src.dtl" "C:\Dest.csv" EasyConverter.exe /t1 /s "C:\Format.lgs"
"C:\Src.dtl" "C:\Dest.xls"
```

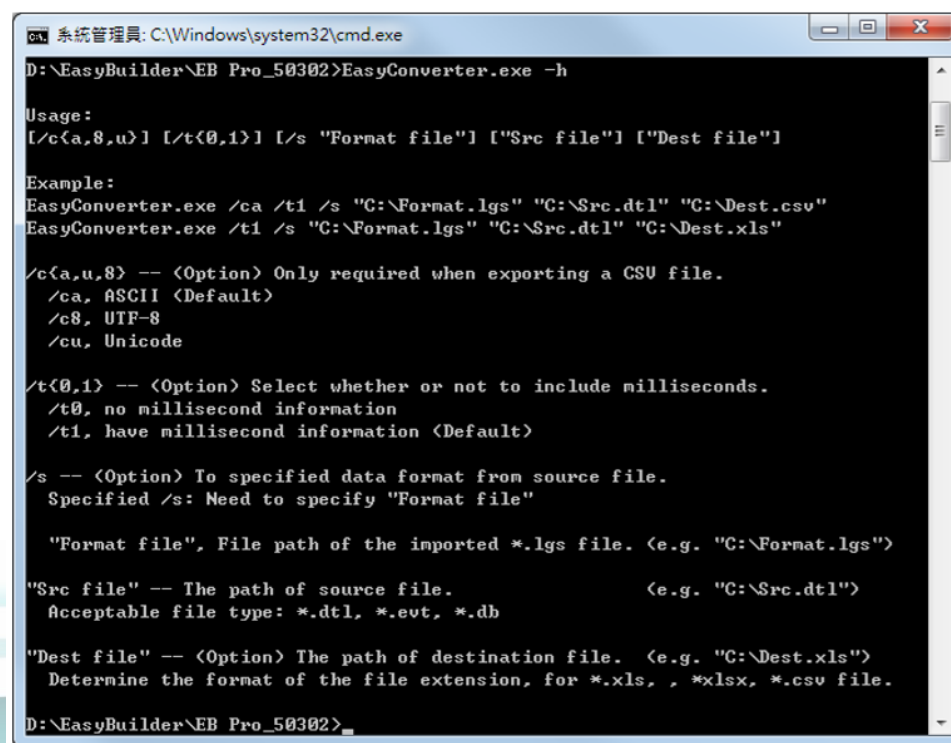
| Parameter  | Description                                                                                                                          |
|------------|--------------------------------------------------------------------------------------------------------------------------------------|
| /c {a,8,u} | Optional, specifies encoding method, only required when exporting a .csv file.<br>/ca: ASCII (Default)<br>/c8: UTF-8<br>/cu: Unicode |

| Parameter   | Description                                                                                                                                                   |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| /t {0,1}    | Optional, specifies whether to include millisecond information.<br>/t0: Excludes millisecond information.<br>/t1: Includes millisecond information. (Default) |
| /s          | Optional, specifies whether to import settings file. To import settings file, specify the path of .lgs file following /s. For example: /s "C:\Format.lgs"     |
| "Src file"  | Specifies the source file path, and the file format should be: .dtl, .evt, or .db                                                                             |
| "Dest file" | Specifies the destination file path, and the file format can be: .xls or .csv. See Note.                                                                      |

Table 19

**Note** If the file name and path of "Dest file" is not specified in command line, the system will export the file to the same path as "Src file".

You can also find the commands above by entering the file path of EasyConverter.exe in Windows cmd.exe as shown in the following window. Example: Enter "D:\EasyBuilder\EB Pro>EasyConverter.exe -h"



```

C:\Windows\system32\cmd.exe
D:\EasyBuilder\EB Pro_50302>EasyConverter.exe -h

Usage:
[/c{a,u,8}] [/t{0,1}] [/s "Format file"] ["Src file"] ["Dest file"]

Example:
EasyConverter.exe /ca /t1 /s "C:\Format.lgs" "C:\Src.dtl" "C:\Dest.csv"
EasyConverter.exe /t1 /s "C:\Format.lgs" "C:\Src.dtl" "C:\Dest.xls"

/c{a,u,8} -- <Option> Only required when exporting a CSV file.
/ca, ASCII <Default>
/c8, UTF-8
/cu, Unicode

/t{0,1} -- <Option> Select whether or not to include milliseconds.
/t0, no millisecond information
/t1, have millisecond information <Default>

/s -- <Option> To specified data format from source file.
Specified /s: Need to specify "Format file"

"Format file", File path of the imported *.lgs file. (e.g. "C:\Format.lgs")

"Src file" -- The path of source file. (e.g. "C:\Src.dtl")
Acceptable file type: *.dtl, *.evt, *.db

"Dest file" -- <Option> The path of destination file. (e.g. "C:\Dest.xls")
Determine the format of the file extension, for *.xls, *.xlsx, *.csv file.

D:\EasyBuilder\EB Pro_50302>

```

Figure 145

## Example

To convert the file 20150919 stored in "D:\EasyBuilder\EB Pro\HMI\_memory" from .dtl to .xls, and then save the file to the desktop, you can use the following command lines.

**Scene 1:** If the .bat file is placed in the same directory as EasyConverter, then the command line is:

EasyConverter.exe "D:\EasyBuilder\EB Pro\HMI\_memory\20150919.dtl" "C:\Users\Desktop\20150919.xls"

**Scene 2:** If the .bat file is placed in a different directory from EasyConverter, the directory to store EasyConverter.exe. must be specified, and the command line will be:

"D:\EasyBuilder\EB Pro\EasyConverter.exe" "D:\EasyBuilder\EB Pro\HMI\_memory\20150919.dtl"  
"C:\Users\Desktop\20150919.xls"

## Error Codes:

### Email Error Codes

See Email Error

### Loop Controller communication Error

Error Code Cause of Communication Error

0 Normal

1 The device is busy and not yet ready to process a command.

2 Communication error due to unexpected reason.

3 The device does not exist.

4 The device using the specified station number does not exist.

5 Incorrect address format.

6 Read/Write unsupported address.

7 The driver of the device does not exist.

8 The COM port does not exist.

9 Incorrect IP address or unable to connect the device.

10 Checksum error.

11 Unidentified command.

12 Ignore

20 The USB device is improperly connected.

21 The CAN Bus device is improperly connected.

22 No reply from the device.

23 Insufficient data read from the device before timeout.

24 The Conversion Tag used by the object does not exist or the content is incorrect.

25 HMI is not accepting any commands from a remote HMI.

251 Read/Write exceeding number of words from/to the register of the MODBUS device.

252 MODBUS device replies incorrect data format.

253 MODBUS device checksum error.

## Sequence of Operation / Alarm Output Functions.

This section describes the sequence of operation / alarm output functions by chamber series, meaning what is enabled and disabled by the alarms after power is applied to the chamber. This does not describe any indicators or how to change the alarms. This is because of different controller types. Refer to Table 1 for the controller type to select the correct controller manual for operation.

When able, all alarms follow an order of Temperature then Humidity in high then low alarms audible alarms sequence. Some alarms are not audible but either enable or disable components for better operation or performance. See section "Putting the Thermoelectric to Use" for the Thermoelectrics and see section "Refrigeration in Use" for chambers with a mechanical condensing unit. This will give better guidance when the cooling capabilities are on or off. For Chamber with a dehumidifier or dry air solenoid see section "Dehumidification Controller operation" for operation of these outputs.

The follow tables indicate when output types are enabled or disabled based on the Alarm output of the controller. Heaters, hot gas, and humidity are enabled by the outputs listed below but will be "on" based on the control output. This will be indicated on the controller by indicator light or duty cycle level. The heater, hot gas or humidity will be "on" when the controller calls for heat or humidity and the heater, hot gas or humidity is in the on (enabled) state. The Fuji Controls use EV1 as a High low Audible alarm. These are deviation alarms that can be set independently but share the same time duration.

## Heated Series Alarm Outputs

| Output Type           | Controller Type                                                                        |         |      |                  |         |         |                                |         |         |                                |         |         |
|-----------------------|----------------------------------------------------------------------------------------|---------|------|------------------|---------|---------|--------------------------------|---------|---------|--------------------------------|---------|---------|
|                       | Fuji PXF                                                                               |         |      | West EC44        |         |         | MCT-CM                         |         |         | MCT4                           |         |         |
| <b>Audible Alarm</b>  | High/low alarm deviation independently set However shares the same delay on output EV1 |         |      | See Tables Below |         |         | Sounds on HMI see tables below |         |         | Sounds on HMI see tables below |         |         |
| <b>Heater</b>         | Output                                                                                 | Audible | Name | Output           | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                       | Off                                                                                    | No      | EV2  | Off              | Yes     | Alarm 1 | Off                            | No      | Alarm 1 | Off                            | Yes     | Alarm 1 |
| <b>Evaporator Fan</b> | Output                                                                                 | Audible | Name | Output           | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                       | Off                                                                                    | No      | EV2  | Off              | Yes     | Alarm 1 | Off                            | No      | Alarm 1 | Off                            | Yes     | Alarm 1 |
| <b>Humidifier</b>     | Output                                                                                 | Audible | Name | Output           | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                       | Off                                                                                    | No      | EV2  | Off              | Yes     | Alarm 3 | Off                            | Yes     | Alarm 3 | Off                            | Yes     | Alarm 4 |
| <b>Dehumidifier</b>   | Output                                                                                 | Audible | Name | Output           | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                       | On                                                                                     | No      | EV3  | Off              | Yes     | Alarm 4 | Off                            | Yes     | Alarm 4 | Off                            | Yes     | Alarm 5 |
|                       |                                                                                        |         |      | On               | No      | Alarm 6 | On                             | No      | Alarm 7 |                                |         |         |

Table 20

## Thermoelectric Series Alarm Outputs

| Output Type           | Controller Type                                                                           |               |             |                  |                |                 |                                |                |                 |                                |  |  |
|-----------------------|-------------------------------------------------------------------------------------------|---------------|-------------|------------------|----------------|-----------------|--------------------------------|----------------|-----------------|--------------------------------|--|--|
|                       | Fuji PXF                                                                                  |               |             | West EC44        |                |                 | MCT-CM                         |                |                 | MCT4                           |  |  |
| <b>Audible Alarm</b>  | High/low alarm deviation independently set<br>However shares the same delay on output EV1 |               |             | See Tables Below |                |                 | Sounds on HMI see tables below |                |                 | Sounds on HMI see tables below |  |  |
| <b>Heater</b>         | Output<br>Off                                                                             | Audible<br>No | Name<br>EV2 | Output<br>Off    | Audible<br>Yes | Name<br>Alarm 1 | Output<br>Off                  | Audible<br>Yes | Name<br>Alarm 1 | N/A                            |  |  |
| <b>Evaporator Fan</b> | Output<br>Off                                                                             | Audible<br>No | Name<br>EV2 | Output<br>Off    | Audible<br>Yes | Name<br>Alarm 1 | Output<br>Off                  | Audible<br>Yes | Name<br>Alarm 1 | N/A                            |  |  |
| <b>Cooling</b>        | Output<br>Off                                                                             | Audible<br>No | Name<br>EV3 | Output<br>Off    | Audible<br>Yes | Name<br>Alarm 2 | Output<br>Off                  | Audible<br>Yes | Name<br>Alarm 2 | N/A                            |  |  |
|                       |                                                                                           |               |             | Output<br>Off    | Audible<br>No  | Name<br>Alarm 5 | Output<br>Off                  | Audible<br>No  | Name<br>Alarm 5 |                                |  |  |
|                       |                                                                                           |               |             |                  |                |                 | Output<br>Off                  | Audible<br>No  | Name<br>Alarm 6 |                                |  |  |
| <b>Humidifier</b>     | Output<br>Off                                                                             | Audible<br>NO | Name<br>EV2 | Output<br>Off    | Audible<br>Yes | Name<br>Alarm 3 | Output<br>Off                  | Audible<br>Yes | Name<br>Alarm 3 | N/A                            |  |  |
| <b>Dehumidifier</b>   | Output<br>On                                                                              | Audible<br>No | Name<br>EV3 | Output<br>Off    | Audible<br>Yes | Name<br>Alarm 4 | Output<br>Off                  | Audible<br>Yes | Name<br>Alarm 4 | N/A                            |  |  |
|                       |                                                                                           |               |             | Output<br>On     | Audible<br>No  | Name<br>Alarm 7 | Output<br>On                   | Audible<br>No  | Name<br>Alarm 7 |                                |  |  |

**Table 21**

## Refrigerated Series Alarm Outputs

| Output Type    | Controller Type                                                                           |         |      |                   |         |         |                                |         |         |                                |         |         |
|----------------|-------------------------------------------------------------------------------------------|---------|------|-------------------|---------|---------|--------------------------------|---------|---------|--------------------------------|---------|---------|
|                | Fuji PXF                                                                                  |         |      | West EC44         |         |         | MCT-CM                         |         |         | MCT4                           |         |         |
| Audible Alarm  | High/low alarm deviation independently set<br>However shares the same delay on output EV1 |         |      | See Tables Below  |         |         | Sounds on HMI see tables below |         |         | Sounds on HMI see tables below |         |         |
| Heater         | Output                                                                                    | Audible | Name | Output            | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                | Off                                                                                       | No      | EV2  | Off               | Yes     | Alarm 1 | Off                            | Yes     | Alarm 1 | Off                            | Yes     | Alarm 1 |
| Hot Gas        | Output                                                                                    | Audible | Name | Output            | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                | Off                                                                                       | No      | EV2  | Off               | Yes     | Alarm 1 | Off                            | Yes     | Alarm 1 | Off                            | Yes     | Alarm 1 |
|                | Off                                                                                       | No      | Ev3  | Off               | Yes     | Alarm 2 | Off                            | Yes     | Alarm 2 |                                |         |         |
|                |                                                                                           |         |      | Off               | No      | Alarm 5 | Off                            | No      | Alarm 5 |                                |         |         |
|                |                                                                                           |         |      |                   |         |         | Off                            | No      | Alarm 6 |                                |         |         |
| Evaporator Fan | N/A (see Defrost)                                                                         |         |      | N/A (see Defrost) |         |         | N/A (see Defrost)              |         |         | N/A (see Defrost)              |         |         |
| Cooling        | Output                                                                                    | Audible | Name | Output            | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                | Off                                                                                       | No      | EV3  | Off               | Yes     | Alarm 2 | Off                            | Yes     | Alarm 2 | Off                            | Yes     | Alarm 2 |
|                |                                                                                           |         |      | Off               | No      | Alarm 5 | Off                            | No      | Alarm 5 |                                |         |         |
|                |                                                                                           |         |      |                   |         |         | Off                            | No      | Alarm 6 |                                |         |         |
| Humidifier     | Output                                                                                    | Audible | Name | Output            | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                | Off                                                                                       | No      | EV2  | Off               | Yes     | Alarm 3 | Off                            | Yes     | Alarm 3 | Off                            | Yes     | Alarm 4 |
| Dehumidifier   | Output                                                                                    | Audible | Name | Output            | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                | On                                                                                        | No      | EV3  | Off               | Yes     | Alarm 4 | Off                            | Yes     | Alarm 4 | Off                            | Yes     | Alarm 5 |
|                |                                                                                           |         |      | On                | No      | Alarm 6 | On                             | No      | Alarm 7 |                                |         |         |

Table 22

## Cycling Series Alarm Outputs

|                | Controller Type                                                                           |         |      |                   |         |         |                                |         |         |                                |         |         |
|----------------|-------------------------------------------------------------------------------------------|---------|------|-------------------|---------|---------|--------------------------------|---------|---------|--------------------------------|---------|---------|
| Output Type    | Fuji PXF                                                                                  |         |      | West EC44         |         |         | MCT-CM                         |         |         | MCT4                           |         |         |
| Audible Alarm  | High/low alarm deviation independently set<br>However shares the same delay on output EV1 |         |      | See Tables Below  |         |         | Sounds on HMI see tables below |         |         | Sounds on HMI see tables below |         |         |
| Evaporator Fan | N/A (see Defrost)                                                                         |         |      | N/A (see Defrost) |         |         | N/A (see Defrost)              |         |         | N/A (see Defrost)              |         |         |
| Cooling        | Output                                                                                    | Audible | Name | Output            | Audible | Name    | Output                         | Audible | Name    | Output                         | Audible | Name    |
|                | Off                                                                                       | No      | EV2  | Off               | Yes     | Alarm 2 | Off                            | Yes     | Alarm 2 | Off                            | Yes     | Alarm 2 |

Table 23

## BMS (Building Monitor System) Alarm Outputs

Building Monitor system alarm output is a dry contact for the chamber in an alarm condition. Dry contact has no electrical potential from the chamber. The dry contact will consist of a common connection along with a normally open and closed contact in reference to common. Therefore, the personnel/company managing your BMS system can trigger an alarm in a closed or open state. Best practice is to use an energized normally closed state. This way you will know whether a problem has occurred with the chamber or the BMS system when checking an alarm.

Most Chambers come standard with a BMS output. The alarms may be tied to the high and low alarm of the controller. Some controllers the setting will be separate from the high and low alarms of the controller to either give earlier or later warning of chamber alarm. The alarms will be labeled as such for BMS. This is due to some alarms turning off components to prevent run away performance or extended door openings for loading the chamber causing the BMS monitor to check on the chamber. Looking at the rear of the chamber you will find a barrier style terminal block. Some chambers will have temperature and humidity alarms tied together on one output and some chamber may separate them. Regardless of the output there is no indication if the alarm is high or low for temperature or humidity.

|                                                                                   |                 |
|-----------------------------------------------------------------------------------|-----------------|
|  |                 |
|                                                                                   | Normally Open   |
|                                                                                   | Common          |
|                                                                                   | Normally Closed |

Table 24

## Chamber Heating

Darwin Chamber has two methods of heating a chamber. At times both methods may be used.

The first method is electric heating using a heating element. The heating element may be a rod style heater in a ceramic coating, other heaters are positive temperature coefficient (PTC) heating elements. All control heaters are thermally protected with a thermal switch and a thermal fusible link. The thermal switch is used to open the circuit if the heating element gets too hot. This thermal switch will return after a cool down of the heating element. The thermal fusible link is a redundant safety to the thermal switch. If the fusible link has tripped, the link must be replaced for heating to be restored. Fusible links keep the evaporator box from overheating. This could be caused by a failed fan or door left open and chamber struggling to get to temperature.

The second method is the use of hot gas from the condensing unit. After the refrigerant is compressed in the compressor. The hot gas is traditionally condenses in the condensing coil. Darwin Chamber bypasses the condenser coil and hot gas goes to the evaporator coil heating the coil. This in turn heats the air in the chamber rather than cooling. When near the chamber a clicking sound may be heard. This is the hot gas solenoid actuating. This is normal. The click sound should never be heard closer than 7 seconds. If so, a setting in the controller needs updated to prevent premature ware on the hot gas solenoid. Some chamber may have the Hot gas and heater hitting at the same time. Wide range chambers may have a heater disabled. This is to have the chamber perform better at lower temperatures when trying to maintain a temperature a heater not needed with the hot gas.

## High Temperature Safety

The high temperature safety is an adjustable temperature safety switch. When properly set, the high temperature safety will disable the chamber's heaters in the event the chamber's process value reaches the threshold/limit that is dictated by the user and the device's dial. The designed intent is to provide a reliable backup to the chamber's alarms to ensure that the samples within the chamber are not jeopardized in the event the chamber deviates from its set value.

**NOTE:** The factory preset setting is 42.0°C, unless a higher intended chamber set value has been indicated during the time the order was placed.



**Figure 146**



**Figure 147**

### Setting the High Temperature Safety

To set the high temperature safety, the user should determine the maximum allowable chamber temperature threshold that does not jeopardize the product placed within the chamber. A safe rule of thumb to follow is to adjust the high temperature safety 2.0°C above the chamber's set value. When the ideal temperature threshold has been determined, the safety can be adjusted through clockwise and counterclockwise adjustments of the black dial. Utilize the scale on the dial to locate the appropriate temperature setting.

**Please Note:** If it is desired to decontaminate the chamber, this can be achieved through operation at 60.0°C. For operation at 60.0°C, the High Temperature Safety will require a higher temperature to ensure that the maximum SV is achieved.

## Fan Motor(s)

### Fan Speed control

Some chambers are equipped with a fan speed control or governor. This speed module can help with chamber uniformity correction and or to achieve lower temperatures on chamber with thermoelectrics. The chamber Fan speed module will be located on the rear face plate of the chamber. The dial is used to adjust the speed from 0- 100%. The knob can also be pressed to turn off the fans. Above the dial is an indicator light to let the user know the output for the fans is enabled. If this light is off the evaporator fans are off and the temperature and humidity control may not be achievable.

A good start setting for the fan speed is between 50 to 65% range. After fan speed adjustment the controllers should be autotuned to improve chamber performance.



Figure 148

## Evaporator Fan motors

Darwin Chamber uses various styles of evaporator fan motors. On model sizes 030, 055 and 084 an energy saving axial fan module is used. These size chambers move air from front to back when facing the chamber doors. A ceiling plenum is used on the chamber to distribute the conditioned air down the back wall.

Models 03, 011, and 034 and custom models will typically use an axial style fan motor. These units will flow air from the front of the chamber down the back wall through the condition space. Multiple fans may be utilized.

Thermoelectric series chambers will have the evaporator fan disabled during a high alarm. Thermoelectrics do not have substantial heat removal capabilities. Therefore, they are disabled in high alarm as they have likely failed. This will prevent the chamber from heating to much to save the product load.

Refrigerated series will have the evaporator fan on all the time with couple exceptions. The refrigerated series chamber will disable fans during a defrost. When the defrost is complete the evaporator fan may either be on a time delay (FZ and TH Series) or enabled when evaporator coil has reached a certain temperature. (FS Series) the fan may be controlled by an on-delay relay or the second stage on a two stage Dwyer controller. Door opening on freezer model chambers will also disable the evaporator fan. This is to help keep as much of the cooled air in the chamber while the door is open. Door opening should be kept to a minimum on freezers.

Evaporator fan motors should be inspected on a regular basis for debris build up, leaking of oil, and/or abnormal noises or vibrations. Chambers with humidity will be susceptible to mineral build up on the fans. Chambers with humidity should be inspected more regularly.

## Condenser Fan Motor

Condenser fan motors use axial style fan motors. Condenser fan motors will be mounted on the condensing coil. At initial start up the fan motor will blow air through coil. Then reverse direction and pull air into the coil. This is to clear and remove any dust that may have accumulated on the coil. Air will be pulled in through the coil during normal operation. Direction of flow relative to the chamber may vary by model size. The air flow will either be left to right or front to back. Direction of air flow should be noted when setting up multiple chambers. Air from one condensing unit could inhibit the performance of another condensing unit down wind.

Condensing fan motors should be inspected on a regular basis for debris build up, leaking of oil, and/or abnormal noises or vibrations.

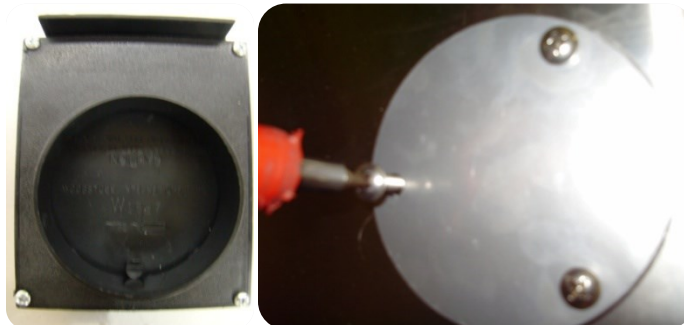
**Centrifugal Fan motor**

**Axial Fan motor**

**Figure 149**

## Damper System

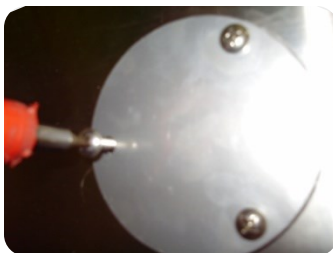
The HT and HH chambers incorporate a damper system. The damper system consists of two components; a damper that is located on the top rear of the chamber (pictured below to the left) and an access port (pictured below to the right). The damper system is designed to utilize the chambers ambient to remove excess heat. This allows for quick cooling to sub-40.0°C set points. The damper system can be utilized at any set value less than 40.0°C providing the ambient conditions meet Darwin Chambers Co.'s ambient requirements.


**Figure 150**

## Operating the Damper System

**At temperatures less than 40.0°C:** In this scenario it is recommended that the damper system is utilized. To use the damper system, the following needs to be done:

1. Remove the cover from the access port.



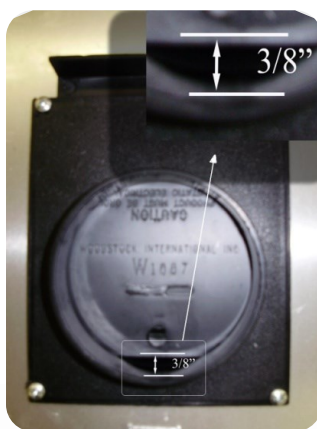
**Figure 151**

2. Remove the foam plug from the access port.



**Figure 152**

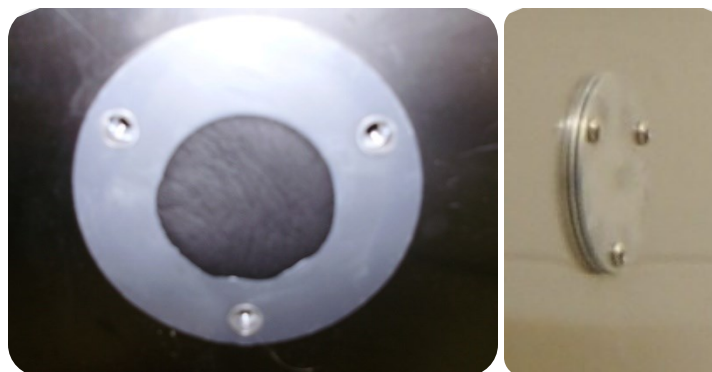
3. Using a ladder, climb above the damper and adjust the damper open  $\frac{3}{8}$ " (Figure 153).



**Figure 153**

**At temperatures 40.0°C or greater:** The damper system is not necessary at this condition. Before operating the chamber, please ensure that the following two prerequisites are met:

1. The access port should be plugged in and have its cover in place.



**Figure 154**

2. The damper needs to be fully closed.

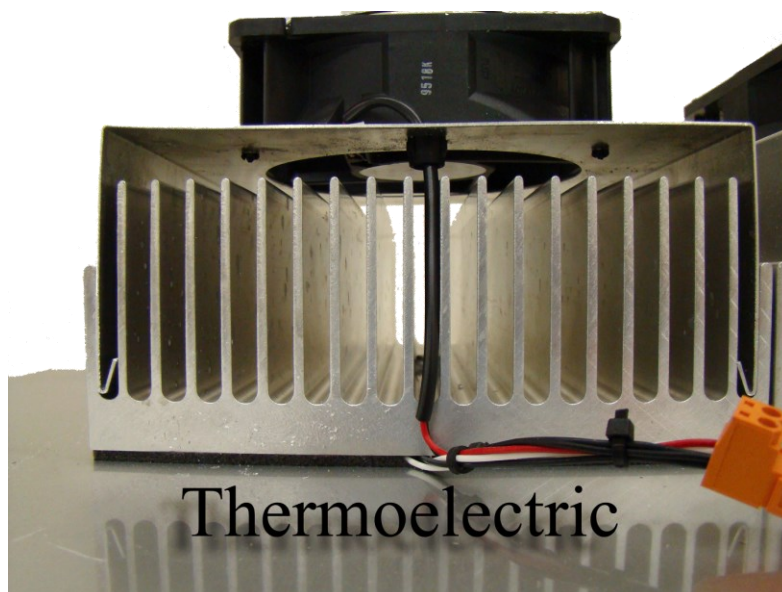


**Figure 155**

## Thermoelectric Operation

### Thermoelectric Introduction

Darwin Chambers Co. employs the use of thermoelectric cooling to condition the chambers product storage area. Thermoelectric cooling involves the use of heat sinks, Peltier Junctions (a solid-state active heat pump that transfers heat from one side of the device to the other.), a DC Fan, and a DC power supply to remove heat from within the chamber. The collection of the heat sinks, Peltier Junctions, DC fan, and the DC power supply is referred to as a thermoelectric assembly.

**Figure 156**

### Thermoelectric Requirements

Thermoelectric assemblies (TEC) do not require any refrigerants. The thermoelectric assemblies (TEC) need to be cleaned on a regular basis. (Every 6 months) from dust and debris. When placing the chamber ensure the building HVAC does not blow air directly on the TEC. Or that one chamber does not blow air on another chamber. With AC air blowing on the TEC, this can cause fluctuations in humidity within the chamber. Heated air blowing on the TEC can cause insufficient cooling of the condition space of the chamber.

### Putting the Thermoelectric to Use

Each thermoelectric assembly is designed to operate automatically at set values less than 32.0°C. At set values greater than 32.0°C, the temperature controller will disable thermoelectric cooling and then the chamber will go into Heat-Only Mode. Heat Only Mode also occurs when the process value falls to or exceeds 1.0°C less than the set value. This is only applicable to chambers that include electrical heat (PH, IN, and TE Series). For more information regarding "Heat Only Mode" please, refer to "Table 21" section of this product manual.

### Special Considerations

- Ambient conditions may have a dramatic effect on the operation of your chamber. Due to the large heat sinks on thermoelectric chambers, a thermoelectric based chamber can operate at lower set values in cooler environments. In environments above the recommended ambient, thermoelectric units will lose cooling capacities and may have difficulties reaching ambient-like temperatures such as 25.0°C.

**NOTE:** The operation of a chamber in ambient conditions that are extreme in nature may render the chamber inoperable and should be avoided.

- All thermoelectric systems rely on the ability to remove heat. Throughout the course of normal operation, a chamber may accumulate dust upon its thermoelectric components. Large accumulations of dust upon a thermoelectric system will limit a chamber's ability to remove/transfer heat. In addition, dust will affect moving components by limiting the means heat can escape thus resulting in components running hot and at a greater risk for failure. To ensure that your chamber lasts a normal life cycle and remains within warranty, preventive maintenance should be performed on a regular basis. This should involve routine cleaning and thermoelectric system checks to ensure that the system is operating as intended. The recommended preventive maintenance routine for a thermoelectric chamber should involve the removal of dust from the heat sinks, heat sink fans, and power supplies.

## Refrigeration Operation

### Refrigeration Systems Introduction

Darwin Chambers Company uses mechanical refrigeration to condition the product storage area of certain chambers. Mechanical refrigeration utilizes a condensing unit (i.e., compressor, condenser, and condenser fan) and an evaporator assembly (i.e., evaporator and evaporator fans) to cool the product area. The Refrigerated Series of chambers also utilizes a hot-gas bypass system to stabilize the chamber's temperature. A hot-gas bypass involves transferring high pressure, high temperature gas directly into the chamber's evaporator to heat the chamber. The hot-gas bypass system is controlled by a temperature controller and a (normally) closed solenoid that opens when heat is required to increase the chamber's process value.



Figure 157

### Refrigerant Charge Requirements

Mechanical refrigeration relies solely on refrigerants and their ability to change from a gas to a liquid and back again for the removal of heat within the chamber. Refrigerant types and amounts vary depending on the condensing unit

size and the chambers intended use. To determine the correct refrigerant type and charge amount needed for your chamber, please refer to the chamber's data label.

Please note that the use of refrigerants is regulated by the EPA (Environmental Protection Agency) and requires certification for the purchase and handling of. In addition, refrigeration systems require the use of hot pressurized gas to efficiently remove heat. To avoid injury and/or damage to your system, only qualified/licensed technicians should open, reclaim, or charge the refrigeration system. Failure to adhere to the EPA may result in government fines. Furthermore, failure to utilize a qualified technician may damage and/or void the chamber's warranty.

### Refrigeration in Use

The refrigeration system is set up to operate automatically. The standard setup has each mechanical refrigeration system designed to consistently operate/stay on at set values less than 32.0°C. At set values greater than 32.0°C and/or when the process value is  $\leq 1.0^\circ\text{C}$  of the set value, An Alarm output (see "Table 22") on the temperature controller will disable the refrigeration and place the chamber into "Heat Only Mode." This is only applicable to chambers that are intended to operate at temperatures greater than 32.0°C and chambers that include electrical heat.

### Special Considerations

- Ambient conditions have a dramatic effect on the operation of your chamber. If a chamber is placed in an area outside of the recommended ambient, it will cause the refrigeration systems' operating pressures to vary with the ambient temperature. Changes in ambient pressures will also result in variances in a chamber's energy usage and functionality (i.e., operational range)."

**NOTE:** *Ambient conditions that are extreme in nature may render a chamber inoperable and should be avoided.*

- All refrigeration systems rely on the ability to remove heat. Any chamber may accumulate dust on its refrigeration components during normal operation. It is important to check for dust buildup regularly, as large amounts of dust can limit a refrigeration system's ability to remove or transfer heat. Dust buildup may also affect a chamber's moving components by limiting the ability of heat to escape, thus resulting in components running hot and increasing the risk for failure. The recommended preventive maintenance for a chamber with a mechanical refrigeration system should include the removal of dust from the compressor, condenser, and condensing unit fan. In addition, a qualified technician should perform system leak testing regularly to prevent unexpected refrigerant losses.

### Defrost Operation

#### TSXT Defrost Timer

The Series TSXT Digital Temperature Switch is designed with many refrigeration applications in mind. Darwin utilizes the controller for defrost only. It accepts up to 3 temperature inputs of either PTC or NTC temperature probe types and can control the compressor, defrost, fan, alarm, and light in a refrigeration system. Darwin uses only one sensor in the evaporator coil. Darwin utilizes the defrost feature to use/override the hot gas and heaters to control the coil temperature to get above freezing. The fan delay/Drip allows time for coil to cool down before blowing air across coil. This is to keep warm air from the defrost to reach the conditioned space. The Series TSXT programming is performed by the front keypad, the TS2-K programming key, or by RS485 module communication. Standard features include capacitive buttons, real time clock, HACCP alarm logging, temperature alarms, and password protected parameter settings.

The TSXT is located on the rear face plate on the chamber. Some chambers will have 2 condensing units. Therefore, these chambers will also have 2 TSXT controllers. One for each condensing unit. The defrost will be setup in a staggered defrost from condenser 1 vs condenser 2 This is to help from the condition space from going out of specification.



**Figure 158**

## Parameter Programming

**Note:** Set Point and the time programming are the only parameters accessible without access code.

### *Set Point*

- Press SET. Set Point value will appear on the display.
- Press SET again. The real value is shown on the display and can be modified with the UP and DOWN arrows.
- Press SET to confirm any new values.
- Press SET and DOWN simultaneously to quit programming or wait one minute for the display to automatically exit programming mode.

### *Real Time Clock*

- Press SET. The Set Point value will appear on the display.
- Press the UP or DOWN arrow to change to Hour or Minute.
- Press SET to see the assigned value. • Use the UP and DOWN arrows to set the desired value. • Press and hold SET for 8 seconds to program value. The word “Pro” should appear on the screen if the value has been programmed correctly.
- Press SET and DOWN simultaneously to exit or wait for the timeout.

### *Protected Parameters*

- Press and hold SET for 8 seconds. The access code value 00 is shown on the display. • Using the UP and DOWN arrows, set the code (factory-set code is 00).
- Press SET to enter the code. If correct, the first parameter label will be shown on the display (SP).
- Use the UP and DOWN arrows to move to desired parameter and SET to view parameter value.
- While viewing a parameter value, use the UP and DOWN arrows to modify parameter value. Use SET to enter value and exit parameter.
- The display will blink when there is an error recording a parameter in memory or when awaiting confirmation of a value.
- Press SET and DOWN simultaneously to quit programming or wait one minute to automatically exit programming mode.

### LED Indication and Display Messages:



Indicates if the load is connected. If a continuous cool cycle is being performed, this LED flashes (90% ON, 10% OFF). If the unit is waiting the stopping time value stored in c0 to start a cool cycle the LED flashes (10% ON, 90% OFF). :



Indicates if defrosting is active. :



Indicates an active alarm. The LED will flash if the alarm is cleared, but the alarm condition persists.



Indicates when fan control relay is active. Either H7 or H8 must be set to one of the fan control modes (FAN or FAI).

HACCP: Indicates HACCP alarm recording feature is active.

If an alarm or error occurs, the following messages will be shown, and an internal buzzer will sound.

The alarm can be cleared, and buzzer silenced by pressing the SET and DOWN buttons simultaneously. The alarm message will not be shown, but the alarm LED will flash while the alarm condition persists.

- Err = Memory error
- ErP1 = Probe 1 error
- ErP2 = Probe 2 error
- ErP3 = Probe 3 error
- Eri = Internal parameter error. In this case enter the factory default configuration, as described in the Resetting to Factory Defaults section.
- ALH = High temperature alarm
- ALL = Low temperature alarm
- ALE = External alarm
- AEH = High temperature and external alarm
- AEL = Low temperature and external alarm
- ooo = Open probe error
- - - - = Short circuit probe error
- DON = Defrosting activated
- DOF = Defrosting deactivated or cannot be done
- CON = Continuous cold cycle activated
- COF = Continuous cold cycle deactivated
- -d- = Defrosting (when d5 set to -d-)

### Setting Keyboard Code to Zero

- Turn unit off and back on. Press and hold SET for 8 seconds. Value 00 should flash on the display.
- Set the code to 123 using the UP and DOWN arrows.
- Press SET to confirm the code. The code is now set to 00.

### Activating and Deactivating Manual Defrost Cycle

Press and hold the AUX button for 2 seconds to activate defrosting. Repeat this process to stop the defrosting. If a cool cycle is activated, the defrosting is disabled.

### ***Activating and Deactivating Cool Cycle***

Press and hold the DOWN arrow for 8 seconds to activate a continuous cool cycle. Repeat this process to stop the cool cycle. If defrosting is activated, the cool cycle is disabled.

### ***Fault Cycle***

If the probe fails, the load is connected for the time set in c2 and then disconnected for the time set in c3. In case of memory error, the load is connected for 5 minutes and then disconnected for 5 minutes.

### ***On/Off Mode***

This option is used to turn the control into an OFF or standby mode, disabling the display and outputs.

- Press and hold SET and DOWN for 8 seconds. The display will read OFF.
- Press and hold SET and DOWN for 8 seconds to return the control to normal operation.

### ***On/Off Light***

The 2nd or 3rd relay can be configured as a lighting switch by setting the H7 or H8 parameter to Li. To activate or deactivate the light relay, press, and hold AUX and UP for 3 seconds.

### ***Probe View***

To view the probe not chosen in P5, press the SET and UP buttons.

### ***HACCP***

If this option is activated, the thermostat registers up to 5 high, low, and power loss alarms. These alarms can be seen in the menu Registry of Alarms (HAC). To access this menu, proceed to the parameter's menu.

The first value (nAt) that appears is the number of registered alarms. Next, the value of the temperature (Adx) and the time of each alarm that exists (tdx) are displayed. For the disconnection alarm, the temperature when returning the connection is registered, as well as the time until the correct value is reached. (Probe<Set+A1-A0)

When the elapsed time is shown it will appear dxx (days). Pressing UP, hxx (Hours) will be shown, and pressing UP again, nxx (Minutes) will be displayed. When located over a temperature of alarm or time, pressing AUX + UP for 3 seconds, both recorded data of the alarm (time and temperature value) are deleted.

In the HAC menu, pressing AUX + UP keys for 3 seconds, all the recorded alarm data is deleted.

### ***Resetting to Factory Defaults***

- Access to parameter H0 as explained in parameter programming.
- Choose desired configuration.
- For Series TSXT-xx1: H0 is set to 0
- For Series TSXT-xx2: H0 is set to 1
- For Series TSXT-xx3: H0 is set to 2

- Press SET for 8 seconds, and the thermostat will be reset.

### List of Parameters

| COn | Description                                            | Units   | Range          |
|-----|--------------------------------------------------------|---------|----------------|
| SET | Set point                                              | Degrees | r1 to r2       |
| r0  | Differential or hysteresis                             | Degrees | 0.1 to 20      |
| r1  | Minimum value for set point                            | Degrees | -99.9 to r2    |
| r2  | Maximum value for set point                            | Degrees | r1 to 302      |
| r6  | Fan operation                                          | Option  | off/on/con     |
| F0  | Fan stoppage temperature                               | Degrees | -99.9 to 302   |
| F1  | Stop compressor & fan with door open                   | Option  | no/yes/con/fan |
| c0  | Minimum compressor stoppage time                       | Minutes | 0 to 240       |
| c1  | Continuous cycle time                                  | h - m   | 0.0 to 18      |
| c2  | ON time of fault cycle                                 | Minutes | 0 to 999       |
| c3  | OFF time of fault cycle                                | Minutes | 0 to 999       |
| c4  | Minimum ON time of the compressor                      | Minutes | 0 to 240       |
| c5  | Minimum time between two connections of the compressor | Minutes | 0 to 240       |
| dEF | Description                                            | Units   | Range          |
| d0  | Cool/Heat mode (ST13)                                  | Option  | re/in          |
| d0  | Type of defrosting (ST23 & 33)                         | Option  | re/in          |
| d1  | Temperature at which defrosting will stop              | Degrees | -99.9 to 302   |
| d2  | Maximum defrosting time                                | Minutes | 0 to 240       |
| d3  | First hour of day for defrosting                       | h - m   | 00.0 to 18.0   |
| d4  | Delay of first defrosting                              | Minutes | 0 to 999       |
| d5  | Display on defrosting                                  | Option  | off/on/-d-     |
| d6  | Display return limit                                   | Minutes | 0 to 240       |
| d7  | Compressor drip time                                   | Minutes | 0 to 240       |
| d8  | Interval between defrosting                            | h - m   | 00.0 to 99.0   |
| d9  | Fan works on defrosting                                | Option  | no/yes         |
| d10 | Fan drip time                                          | Minutes | 0 to 240       |
| d11 | Minimum defrosting time                                | Minutes | 0 to 240       |
| d12 | Fan/defrosting control probe                           | Option  | sd1/sd2/sd3    |
| d14 | Units to count the defrosting cycle                    | Option  | rt/ct          |
| Pro | Description                                            | Units   | Range          |
| P0  | Temperature scale                                      | Option  | °C/°F          |
| P1  | Ambient probe 1 calibration                            | Degrees | -20.0 to 20.0  |
| P2  | Defrosting probe 2 calibration                         | Degrees | -20.0 to 20.0  |
| P3  | Product probe 3 calibration                            | Degrees | -20.0 to 20.0  |
| P4  | Decimal point                                          | Option  | no/yes         |
| P5  | Probe to display                                       | Option  | sd1/sd2/sd3    |
| P6  | Probe 2 present                                        | Option  | no/yes         |
| P7  | Probe 3 present                                        | Option  | no/yes         |
| ALA | Description                                            | Units   | Range          |
| A0  | Fan and alarm differential                             | Degrees | 0.1 to 20.0    |
| A1  | Maximum alarm temperature                              | Degrees | 0.1 to 99.9    |
| A2  | Minimum alarm temperature                              | Degrees | 0.1 to 99.9    |
| A3  | Time validation open door or external alarm            | Minutes | 0 to 999       |
| A4  | Time without alarm after defrosting                    | h - m   | 0.0 to 18.0    |
| A5  | Time without alarm after opening the door              | h - m   | 0.0 to 18.0    |
| A6  | Time without alarm after connection                    | h - m   | 0.0 to 18.0    |
| A7  | Alarm verification time                                | h - m   | 0.0 to 18.0    |
| A8  | Probe for alarm                                        | Option  | sd1/sd2/sd3    |

| Ini | Description              | Units   | Range               |
|-----|--------------------------|---------|---------------------|
| Hor | Hour                     | Hours   | 0 to 23             |
| Min | Minutes                  | Minutes | 0 to 59             |
| E0  | Configure digital input  | Option  | all/Al/In/def/ndf   |
| H0  | Factory settings         | Option  | 0 to 3              |
| H1  | Master slave             | Option  | Mst/Slv             |
| H2  | Keypad protection        | Option  | no/yes              |
| H3  | Delay time on connecting | Seconds | 0 to 240            |
| H5  | Keyboard code            | Numeric | 0 to 999            |
| H6  | Type of probe            | Option  | PTC/NTC             |
| H7  | Relay 2 setup            | Option  | lit/FAn/ALA/dEF/FAI |
| H8  | Relay 3 setup            | Option  | lit/FAn/ALA/dEF/FAI |
| H10 | HACCP activated          | Option  | no/yes              |
| HdE | Next defrost time        | Hours   | (only read)         |
| MdE | Next defrost time        | Minutes | (only read)         |

## Parameter Descriptions

### Compressor (COn)

SET = Working Set Point. Temperature the system tries to maintain. Variable between r1 and r2.

r0 = Differential. When primary probe temperature  $\geq$  Set+r0 Compressor ON When primary probe temperature  $\leq$  Set Compressor OFF

r6 = Fan operation on regulation.

- Off = Fan does not connect on regulation.
- On = Fan is always connected on regulation.
- Con = Fan linked to compressor start-up. (Fan ON if allowed by the temperature set in F0)

F0 = Fan temperature limit.

Direct mode. Relay selected as FAN. Fan OFF on regulation when probe temperature set in d12 is  $\geq$  F0. Fan ON on regulation when temperature is  $\leq$  F0 - A0.

Reverse mode. Relay selected as FAI. Fan OFF on regulation when probe temperature set in d12 is  $<$  F0. Fan ON on regulation when temperature is  $\geq$  F0 + A0.

F1 = Stop compressor and Fan if door opened (Circuit closure between input terminal 5 and common terminal 4)

- No = the fan and compressor do not stop on regulation and continuous cycle when opening the door.
- Yes = the fan and compressor stop on regulation and continuous cycle when opening the door.
- Con = the compressor stops but the fan does not stop on regulation and continuous cycle when opening the door.
- Fan = the fan stops but the compressor does not stop on regulation and continuous cycle when opening the door.

c0 = Minimum compressor stop time. Minimum time since compressor stops until it starts again.

c1 = Continuous cycle time. Duration of a continuous cold cycle.

c2 = ON time of fault cycle when ambient probe is broken

c3 = OFF time of fault cycle when ambient probe is broken

c4 = Minimum time since compressor starts until it stops.

c5 = Minimum time since compressor starts until it starts again.

### Defrost (dEF)

d0 = Cool / Heat mode (ST13). re = cool; In = heat

d0 = Type of defrosting (ST23, ST33)

- re = defrosting without connecting the compressor.
- in = defrosting by connecting the compressor.

d1 = End of defrosting temperature. When this temperature is reached the defrosting will end.

d2 = Maximum defrosting time. The defrosting will stop when this time is reached. If it is zero, there will be no defrosting.

d3 = First hour defrosting of the day. From 00:00 hours the first defrosting is at d3 hours. Until this time no defrosting is performed.

d4 = Delay first defrosting. Time to carry out the first defrosting if d3 = yes.

d5 = Display during the defrosting. Off = the current temperature will be shown during defrosting. On = the temperature at defrost beginning is frozen on display until the end of defrosting and until the current temperature is equal or lower than the initial one, or until d6 time elapses. -d- = Label -d- is displayed during defrosting, until the end of defrosting and until the current temperature is equal or lower than the initial one, or until d6 time elapses.

d6 = Display return limit. Maximum time before viewing the current temperature again after defrosting.

d7 = Compressor drip time. Time since defrosting ends until the compressor can be connected.

d8 = Interval between defrosting. Time between the start of a defrosting and the start of the following one. If it is zero defrosting is not done automatically by time.

d9 = Fan operation during defrosting time. It determines if the fan is connected or not during defrosting.

d10 = Fan drip time. Time since defrosting ends until fan can be connected.

d11 = Minimum Time duration defrosting. Once defrosting begins it stays at least during this time

d12 = Fan & defrosting control probe.

- sd1 = primary probe
- sd2 = defrosting probe
- sd3 = product probe
- d14 = Units to count the defrosting cycle.
- rt = according to the working time of the controller
- ct = according to the working time of the compressor

### **PROBES (Pr0)**

P0 = Temperature scale. Select between °F and °C.

P1 = Primary probe calibration. Degrees shift of the primary probe display value.

P2 = Defrost probe calibration. Degrees shift of the defrosting probe display value.

P3 = Product probe calibration. Degrees shift of the product probe display value.

P4 = Decimal point

P5 = Probe to display. Probe to be viewed normally on the display.

P6 = Probe 2 present. If there is a probe 2 connected to thermostat.

P7 = Probe 3 present. If there is a probe 3 connected to thermostat.

### **ALARMS (ALA)**

A0 = Fan & alarm differential. This is the temperature difference between the on and off cycle of the alarms and fan.

A1 = Maximum alarm. High alarm ON at Set+A1. High alarm OFF at Set+A1-A0.

A2 = Minimum alarm. Low alarm ON at Set-A2. Low alarm OFF at Set-A2+A0.

A3 = Time validation open door or external alarm. If an open door or external alarm is maintained during this time, alarm will be indicated. (Depending on the E0 configuration of digital input).

A4 = Alarm exclusion time after defrosting. During the defrosting and this time after it, temperature alarms will be ignored.

A5 = Alarm exclusion time after opening the door. While the door is open (if A5>0) and time A5 after closing it, alarms will be ignored.

A6 = Alarm exclusion after connection. Until this time has elapsed since the connection, temperature alarms will be ignored.

A7 = Temperature alarm time validation. Time since the alarm situation occurs, until it is given.

A8 = Probe Alarm.

- sd1 = primary probe
- sd2 = defrosting probe
- sd3 = product probe

### **INITIALIZATION (Ini)**

Hor = Hour

Min = Minutes

E0 = Digital input configuration.

- Off = Digital input disabled.

- AI = External alarm. There is an alarm if input is short-circuited.
- In = Door open if input is short-circuited.
- def = Order to initiate a defrost if input is short-circuited.
- ndf = No defrosting will be made if input is short-circuited.
- H0 = Factory Configuration. Record Factory Configuration.
- H1 = Master/Slave
- H1 = Master. The thermostat issues defrosting orders to slave connected thermostats through the digital input.
- H1 = Slave. The thermostat performs defrosting ordered by the master connected to its digital input.
- In both cases the input must be E0=def.
- H2 = Keyboard protection.
- Yes = Keyboard protected. To modify Set, activate/de-activate defrosting and activate/de-activate continuous cycle we must enter the code and then quit. The protection is removed momentarily. It is activated again 1 minute after the last key is pressed.
- No = Keyboard not protected.
- H3 = Delay time on connecting. Until this time has elapsed since turning-on power, the compressor will not start-up.
- H5 = Input code to parameters. This code is set to 0 from factory.
- H6 = Type of Probe. PTC or NTC.
- H7 = Configuration Relay 2.
- H8 = Configuration Relay 3. We can choose that it is light (Li), fan (Fan), alarm (ALA), defrosting (dEF), or reverse fan (FAI).
- H10 = HAACP activated. Yes or no.
- HdE = Hours (HdE) portion of the time the defrost will begin at.
- MdE = Minutes (MdE) portion of the time the defrost will begin at.
- HAACP (HAC): (Only appears when H10 is set to yes).
- nAt = # of recorded alarms.
- Adx = Temperature of alarm point where x can be 1 through 5.
- tdx = Time of alarm point where x can be 1 through 5.
- dxx = days
- hxx = hours
- nxx = minutes

## **MAINTENANCE/REPAIR**

Upon final installation of the Series TSXT no routine maintenance is required. The Series TSXT is not field serviceable and should be returned if repair is needed. Field repair should not be attempted and may void warranty.

## **CLEANING & REPAIR**

Clean the surface of the display controller with a soft, damp cloth. Never use abrasive detergents, petrol, alcohol, or solvents.

## Controlled Light Operation

Chambers with controlled lights for either diurnal or plant growth will have several possible operation methods. The methods that could be used are on/ off binary control and dimmable lights with multiple staged or linear control.

Chambers using just on, and off control of lights will use a 24 hour or digital timer to turn lights on and off. Some controllers like the nCompass and MCT4 may use an event output to control the lights. See the event output section for the appropriate controller in the separate controller manual for your chamber to know how to set up events. See “Digital Timerco Timer - Lighting Operation (Optional)” section for 24 hour and digital light timer operation.

Chambers using just on, and off control of lights will use a 24 hour or digital timer to turn lights on and off. Some controllers Chambers having dimmable lights will either use a toggle/rocker switch for multiple stage lighting, a manual turn dial for linear control of light output or a proportional loop controller for automatic or manual linear control of lights. **Note** that some manual only dimmable lights may work in conjunction with a light timer for maximum light output when on. Only lights controlled with a proportional loop controller will have automatic dimming using the ramp soak feature in the controller. To adjust the light output on these controllers, the set point value must be changed for the output desired. Note that the process value may read 0.0 or nothing is displayed at all. This is because the light output is not measured to give feedback like temperature or humidity sensor would.

**NOTE:** Proportional loop-controlled lights will not enable lights until  $\geq 5\%$  output is requested via set point. This is due to the characteristics of LED and light Ballast. Lights are known to flicker at a low output. Some LED drivers and light ballast will not turn off or go below 3% output. Therefore, lights are not enabled by the controller until 5% or more is demanded at the set point value.

For Light replacement bulbs or LED strips refer to spare parts list.

### Digital Timerco Timer - Lighting Operation (Optional)



Figure 159

### *Programing the timer:*

First, using a pointed object (paper clip) push the reset button to clear all settings. The reset button is just above the “MIN” dark gray button.

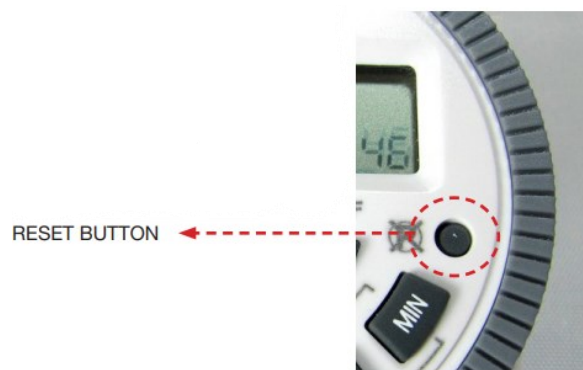


Figure 160

### *Setting the Clock:*

- Press and hold the CLOCK BUTTON.
- Press the DAY KEY until the correct day is displayed.
- Do the same with the HOUR AND MIN. Now you have the clock set.

### *Setting the Timer:*

There is 15 DAILY PROGRAM SETTING BUILT INTO THE TIMER.

Press the “DAY” key to scroll through these settings.

1. MO TU WE TH FR SA SU
2. MO
3. TU
4. WE
5. TH
6. FR
7. SA
8. SU
9. MO TU WE TH FR
10. SA SU
11. MO TU WE TH FR SA
12. MO TU WE
13. TH FR SA
14. MO WE FR
15. TU TH SA

These can be used to simplify programming. All times must be the same for the days chosen. Let's say you want to turn on the lights Monday through Sunday at the same time. Select # 1 and you've got the days set.

If you want the timer to turn on and off on days selected from the 15 different programs, press the "DAY" key, and select one of the 15 programs.

Press the "TIMER" key and the display will show "1 ON" set the timer you want the lights to turn on by pressing the "HOU" and "MIN" button respectively. To set the turn off time, press the "TIMER" key again and the "1 OFF" will show in the display. Again, set the "HOUR" and "MIN" time. If you want more than 1 on/off per day press the timer key again and set "2 ON", "2 OFF" until you reach the maximum of 8 on/off per day.

If you only want 1 on/off per day or if you have more on/off per day, when you are done programming then in, press the "CLOCK" key again and you are almost done. The timer is now set, but you need to push the manual button until the line is over the "AUTO".

If you want to check what you have programmed in, press the "TIMER" button and it will display the settings you have programmed.

If you wish to change any or all on/off times, you must "RESET" the timer. You cannot change just one setting.

The light timer does have a feature to randomly turn lights on and off. By pressing and holding the "DAY" button and then pressing the "MIN" button a small symbol in the left corner of the display will appear. The timer will now stop all programs and will randomly turn on once every 10-120 minutes. To resume standard programming, press and hold the "DAY" button and then push the "MIN" button. Original programming is now returned!

## Multipurpose ports

Multipurpose ports are found either on the top of the chamber, on the lid to the evaporator box, or on the back of the chamber. These ports may be used for many reasons. They may be used for dryer connections either compressed dry air or desiccant wheel dryer. They may also be used for fresh (ventilation) air fan or exhaust. If your chamber was ordered without these features this allows these features to be added later. Please follow the instructions for installation when adding features using the multipurpose port.



Figure 161

## Humidity Controller Operation (Optional)

Darwin Chambers Co. achieves precise humidity control using the PID Controller coupled with the Humidity Sensor. Together, the controller and RH Sensor simultaneously measures the %RH within the chamber and calculates the humidifier output that is required to ensure accurate, consistent, and stable control of the chamber's humidity.

### Changing the humidity/%RH

To change the set value of the humidity, refer to the controller manual section for set point adjustment. Once the SV has been set, allow the chamber's process value (PV) to reach the SV and stabilize before performing any testing or auto tuning of the controls.

### Humidity Alarms

The humidity controller utilizes three different alarms. The humidity controller has a high/low Audible alarm, a high alarm to disable humidifier, and a high alarm that is used to activate/deactivate the optional dehumidification. Dehumidification can be handled by a desiccant wheel dryer or compressed dry air. Darwin Chambers recommends using compressed dry air with a dew point of -40 to achieve the lowest humidity levels.

**EXAMPLE:** A humidity controller with deviation alarms set at  $\pm 5.0\%$  is set to control at 60.0% RH. In this configuration, High Alarm would be equivalent to 60.0% + 5.0% or 65.0% RH. Low Alarm would equal 60.0% - 5.0% or 55.0% RH. With the alarms set at these values, High Alarm will go into alarm if the humidity level reaches 65.0% RH and above. If the humidity level goes below 55.0% RH and below, Low Alarm will go into alarm.

By default, on the %RH controller, the Dehumidification alarm parameter is utilized to send 24 Volts DC to the dryer terminations on the chamber. Chamber has also been factory configured for the optional desiccant wheel dehumidifier then the Dehumidification Alarm parameters are utilized to create continuity on the dryer circuit through the dryer terminations. Typically, the Dehumidification Alarm on the humidity controller is set as a high deviation alarm.

**EXAMPLE:** If a chamber has been controlling at 40.0°C and 75.0% RH and is then set to control at 40.0°C and 60.0% RH, the dehumidification Alarm would be triggered due to the humidity being greater than 1.0% higher than the set value (SV).

To change the factory preset alarms, go to **"Error! No bookmark name given."** To determine the name of alarm by the controller type on your chamber. Set the value to the desired setting (1.0% RH is the factory preset) by reference to the correct controller manual.

**NOTE:** Setting dehumidification alarm to a negative value will always keep dehumidification active except for the %RH falling to low (lower than the alarm parameter setting). When utilizing a heat regenerative desiccant dryer, it is not recommended to set dehumidification alarm to a negative value during operation at high temperatures with a high %RH. Operation with a heat regenerative desiccant dryer at high temperatures and high relative humidity may result in condensation occurring within the dryer piping that could result in damage to the dehumidification system.

## Humidifier Ultrasonic (Optional)



**Figure 162**

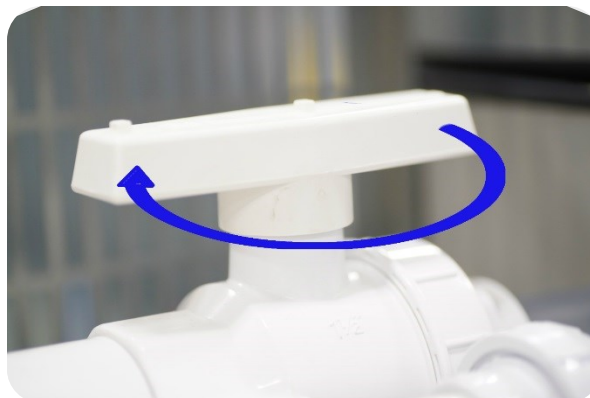
### *Humidifier Introduction*

The ultrasonic humidifier system affixes to the top of the chamber. An external water source supplies the system upon which a float valve then regulates the humidifier's water level. The humidifier is powered through a transformer located in the overhead mechanical area and controlled by a dedicated microcontroller. The humidifier supplies a cool mist born water vapor on demand as predetermined by customer set value.

### *External Humidifier Operation*

After the initial setup of the humidifier, the temperature needs to stabilize at the set value (SV). When the temperature has stabilized, adjust the humidity controller to the desired set value and allow it to stabilize. During normal operation, the Fuji Microcontroller will request more humidity as the PV begins to dip below the SV. When this happens, the OUT1 light on the top left of the Fuji controller will illuminate green. Simultaneously, an LED on the ultrasonic transducer will illuminate bright red. With each flash of the red LED, an ultrasonic frequency will pulse throughout the humidifier's tank atomizing the water into a fine mist to supply the chamber.

Each humidifier is equipped with a ball valve that allows airflow adjustments to be made to the humidifier, increasing the flexibility of the unit. At the set value 25.0°C 60.0% or any %RH less than 60.0%, residual humidity may be introduced into the chamber through the air passing over the humidifier reservoir. In these circumstances, valving the humidifier down may help. To adjust the humidifier's airflow, first locate the humidifier's supply inlet (a dry pipe with a white or red ball valve) and then adjust the handle until the ball valve is approximately 75% closed.

**Figure 163**

### *Special Considerations*

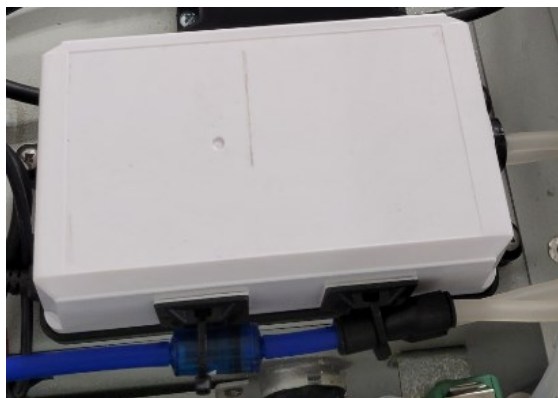
- It is crucial to have water quality that falls within Darwin Chambers water quality specifications. Poor water quality is the leading cause of a humidifier failing to operate correctly.
- Tap water should not be utilized within the humidifier for any purpose other than troubleshooting. Over time, atomized tap water may leave behind an assortment of mineral deposits that cling to walls of humidifier, that accumulate onto floor of the humidifier, and mineral deposits that ultimately cover the ultrasonic ceramic discs and the conductivity sensor (crossbeam), leading possibly to future humidification complications.
- After the initial start-up and for day-to-day operations you should use either distilled, Reverse Osmosis (R.O.), or water from a Darwin Chambers brand DI water filtration system (10 psi max preferred).
- Softened water should never be utilized with the ultrasonic humidifier.

### 03 Humidifier (Optional)

The 03 Humidifier utilizes several components to humidify the condition space of the chamber. The first component is a reservoir to maintain the water level in the second component the mister reservoir. An electric bellows style pump (third component) is used to push ambient air in the water tower when the loop controller calls for humidity.



Water Reservoir. The water should be cleaned and expected every 3 to 6 months.



**Bellow Pump:** used to push ambient air in the water tower to be humidified and pumped into the condition space in the chamber.



Water and dry air inlet. Water Quality is the same as the ultrasonic humidifier. The dry air supply will be the determining factor for the lowest humidity achievable. A point of use dryer can be put in series with the compressor for dry air.

## Dehumidification Controller operation

Darwin Chambers utilizes multiple dryers from different dryer manufactures. There are two types of dryers. Heated regenerative desiccant wheel dryer and point of use pneumatic dryer. Heated regenerative dryers will require a separate power source than the chambers power source/ outlet. A pneumatic dryer (point of use dryer) will require compressed air and a separate power source. See Pneumatic dryer for specification or contact technical support with the dryer information. Some chambers will come with just a flow meter to regulate incoming dry air from the facility. See the facility Maintenance department for dry air capabilities and what the regulated PSI is. Darwin chamber recommends 70 to 90 PSI. A psi rating any higher than 90 PSI can cause catastrophic failure of the flow meter and injure or damage nearby objects.



Located on front of chamber.



Located on the back or behind sign shield.

**Figure 164**

There are **three modes** of operation for dehumidification. The first two modes can be configured on how the parameters are set for the dehumidification outputs using the alarm set point, delay, and hysteresis settings.

The **first mode** of operation set from factory is recovery mode. This only allows the dryer to come on to bring down the humidity level after an overshoot in humidity. This is a deviation high alarm. Set higher than the humidity set point. Delays are put in to keep solenoid from short cycling (rapid on and off).

The **second mode** of operation is a dry air purge or constant dry air. This is where absolute humidity levels are lower than the ambient and requires constant dry air to either displace (dry air Purge) or continuous running of the heated regenerative dryer. This is a deviation high alarm. Set lower deviation or no deviation and a hysteresis to keep dryer from short cycling. This will keep the dryer on during normal operation and turn off the dehumidification if the humidity level gets too low.

The **third mode** of operation is heated controlled dryers. This mode only utilizes heated regenerative dryers. The humidity control will be configured to control the heater in the dryer rather than a mister. These are drying chambers for archival purposes. This design is specific to that application to preserve products stored on the chamber. There will not be a way for the unit to add moisture. Where added moisture in a failure situation would ruin or permanently damage the product. Dryers configured in this mode can be subjected to condensation build up when the condition space is cold. Regular inspection of the dryer is advisable. Buildup of water in the dryer will shorten the life and warranty of the dryer.

Dryers are enabled or disabled by the dehumidification output of the controller. Low Humidity alarms will disable the dryer. Pneumatic dryers will have a flow meter that needs to be manually adjusted for proper operation and efficient use of compressed air.

### *Desiccant Wheel Dryer*

#### **Electrical Requirements/Connections:**

Your Dryer will require a 120 VAC 60Hz 15A dedicated circuit. This will be a separate circuit from the chamber's circuit.

On the back of the chamber will be a connector for remote operation. Plug the cable into dryer and chamber when applicable. Note: Connector is keyed to only be installed one way. Twist the end of the connector to lock in place once connected. Care should be given to the remote cable as a power cord should have. Damage to this cable could cause electrical shock.



Figure 165

### Mechanical operation:

Desiccant Wheel: is used to absorb moisture from the air that passes through the veins of the wheel.



Figure 166

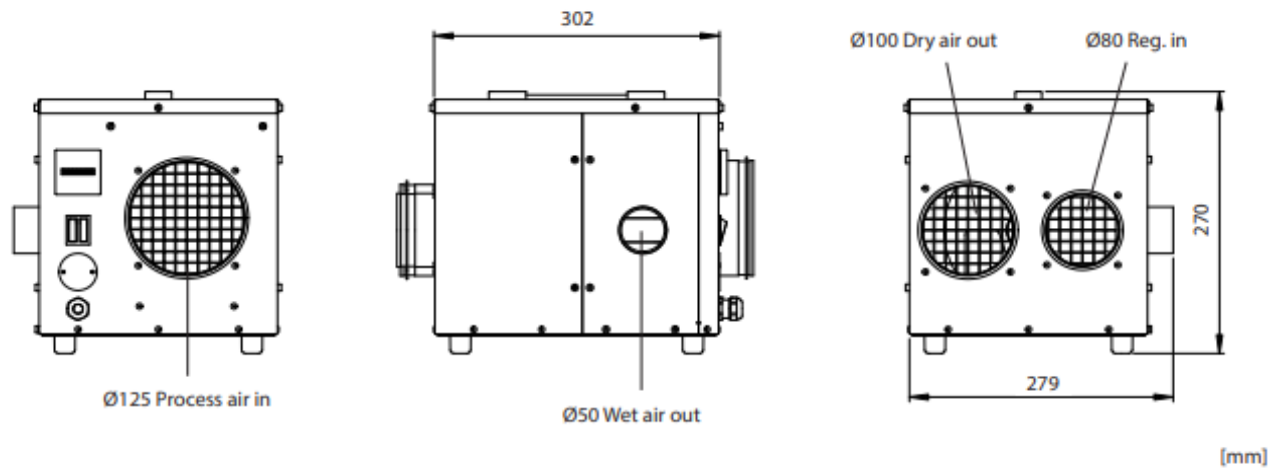


Figure 167

Process air in: is the air from the condition space of the chamber.

Wet air out: is the moisture that has been removed from the desiccant dryer wheel. The desiccant wheel is heated to remove moisture and is exhausted from the dryer.

Dry Air Out: is the dried air exhausted to the chambers condition space.

Regen air: air pulled from the ambient space to be heated and force moisture from the desiccant wheel. This replenishes the desiccant wheel to absorb more moisture. The dryer the ambient air the more effective the desiccant dryer. High humidity levels in ambient space will impact dryer performance.

### The function of the Dryer:

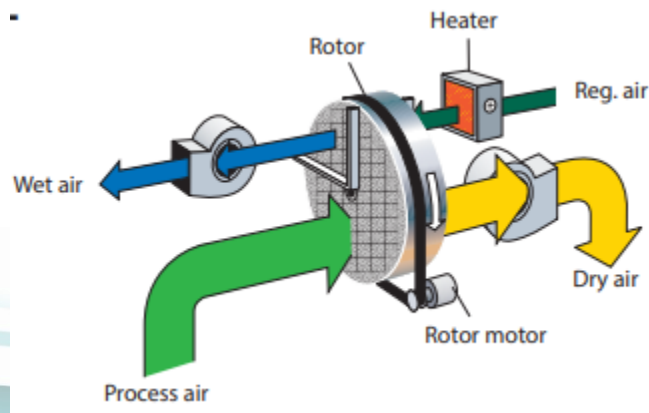


Figure 168

There are couple methods/ function of operation for the desiccant wheel dryer.

The first method is the open loop method. The ambient air is dried from the dryer and then forced into the chamber via multipurpose port. The second multipurpose port may be required to be open or shut off at port installed to maintain pressure in the chamber. This method is dependent on the ambient air for how low in humidity the chamber can achieve. This method is mostly used for the need of fresh air and lower than ambient humidity levels.

The second method is a closed loop method. Air is pulled from the condition space from the chamber via one multipurpose port, then the chamber's air passes through the dryer's process air inlet, then through the desiccant wheel, then passed through the fan. The fan will then exhaust the dried air back into the condition space of the chamber in the second multipurpose port. The air will then be conditioned by the chamber components then enter the condition space. This method is to provide the lowest achievable dry air using the desiccant wheel dryer. If the chamber struggles to reach low temperatures, then a short cycle valve may be needed or opened. See Figure 169 for example of valves. The short cycle valve is shown in this figure in the horizontal open position.

Pipe labeled "A" will be for the process air. The piping on the back of the chamber will be labeled "A" at the connection point for the hose from the dryer also labeled "A".

Process Air side of hose will connect to the process side of the dryer, labeled "Process Air".

Dry Air side of Dryer will connect to the "Dry Air" labeled hose. The other end of the hose should be connected to pipe labeled "B". Both hose and pipe should be labeled "B".

Wet air hose should be connected to the dryer and the other end of the hose should be exhausted to the outside air or the building HVAC return air. If outside air or HVAC return is not available, it is best to exhaust air as far as possible from the chambers ambient space.

## Valves

The valves on the back of the chamber are used to help chamber performance for cooling and drying. There is a Valve on the process air to limit the amount of air leaving the condition space.

The Valve on the Dry Air out limits the amount of dry air coming back into the chamber.

The Valve in the center is a short cycle valve. This helps to get the air dryer without adding more heat in the chamber. When drying the air, the desiccant wheel can be heated more than the chamber condition space. This added heat load can affect the lower temperature range the chamber is normally capable of achieving. Opening the short cycle valve may help to achieve the lower temperatures, while also achieving lower humidity levels. Opening the short cycle valve will also reduce the amount of the condition space air getting to dryer. This will increase the recovery times for achieving low humidity levels. The dryer is less effective with the short cycle valve open. For the best drying performance leave closed. Incrementally over time open valve only when low temperatures are not achievable while dryer is running.

Adjust valves for proper operation for desired set point. For Lower temperatures Dry Air return Valve may need to be closed incrementally to achieve desired low temperature, along with opening Short Cycle valve to reduce load on the dryer. Experimentation in adjusting the valves will be best to get ideal performance.

## Hose Connections

### Back of Chamber:

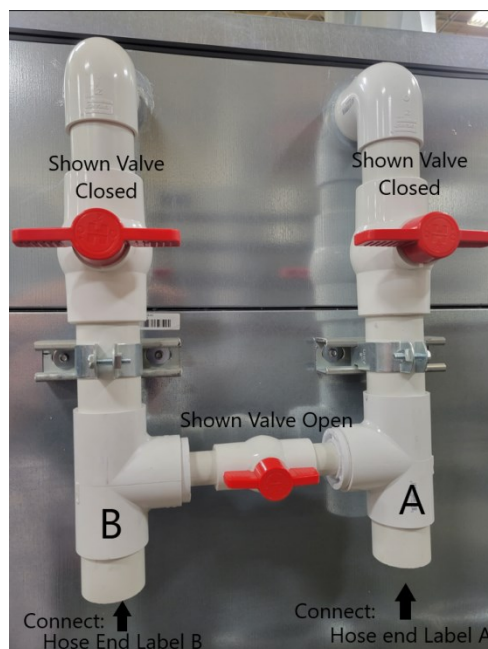


Figure 169

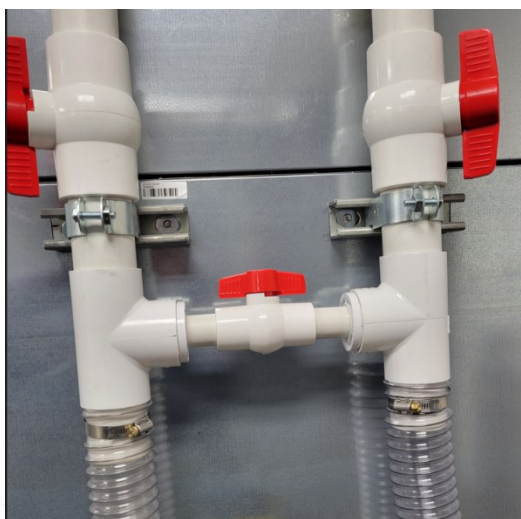


Figure 170

Connect hose to bottom of pipe. Fasten stainless steel strap to secure in place.

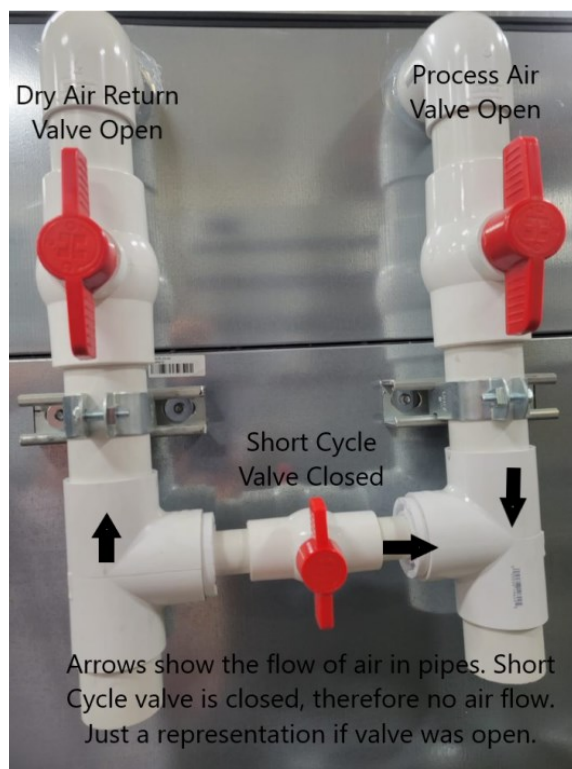


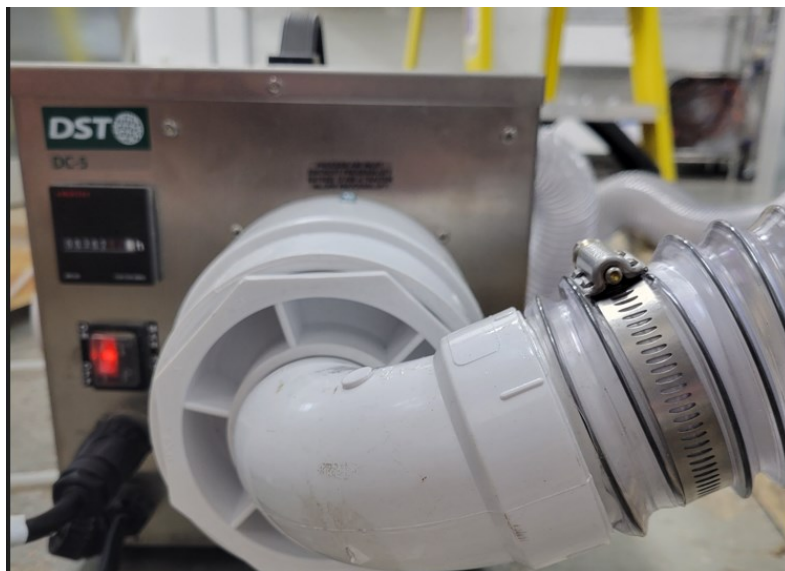
Figure 171

**Dryer hose connections:**



Figure 172

Pictured above is the Dry Air outlet and regen air inlet side of Dryer.



**Figure 173**

Pictured above is the Process air inlet side of Dryer. Note power switch (illuminated) and the Auto /Manual switch in black.



**Figure 174**

Pictured above is the Wet Air outlet. Connect the exhaust hose end to this pipe and the other end of hose should exhaust to outside air. If outside air is not available, then best to direct to air return on building HVAC system.

DO NOT have dryer connected for a chamber with a high set point in humidity. This will cause condensation in the hoses and Dryer. This will cause corrosion in the Dryer and subsequent malfunction. This would void the warranty on the Dryer. The best practice is to remove hoses and close the Dry Air Return and Process Air Valves.

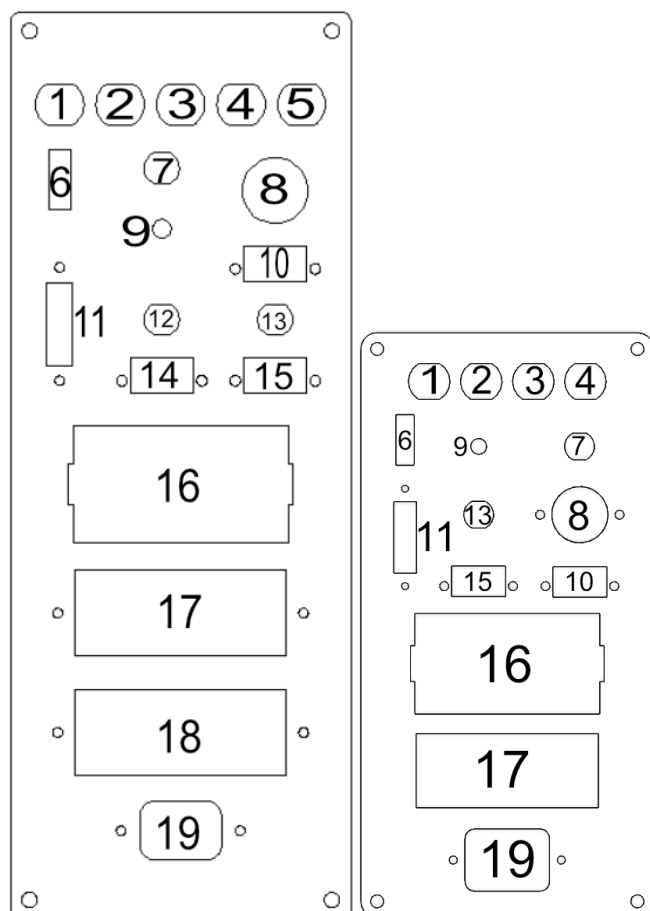
## Added Electrical Outlets

Additional Outlets may be installed on request. These outlets may be installed in or on the exterior of the chamber. Outlets will be limited to requirements to the warning label next to outlet. Exceeding the use of the warning label may cause electrical issues with the chamber and or the performance. Electrical devices placed in the chamber can also cause electrical noise that may interfere with the chamber sensors. Some outlets placed on the chamber will have a separate circuit needed for use. Refer to Darwin Chambers technical support team for requirements about your chamber.

Outlets placed in the chamber for lights or other specific devices should only have the lights or specified device that came with the chamber plugged into those outlets. Other manufacturers' lights or additional Darwin Chamber lights or devices may inhibit performance of the chamber.

## Rear Face plate designation

On the rear of the chamber are the breakers and connection to some components are made. These give the user easy access to remove components for servicing and or cleaning. Also included on the face plate are auxiliary power and the RS 485 MODBUS connection. The auxiliary power is limited to 24VDC and 500mA. This can be used to power options like the Virtual Touch Screen (VTS).



| Number | Description                                                    |
|--------|----------------------------------------------------------------|
| 1      | Perimeter Heater Breaker 5 Amp                                 |
| 2      | Heater Breaker 10 Amp                                          |
| 3      | Humidity Breaker 5 Amp                                         |
| 4      | #1 Cool Breaker 10 Amp (Thermoelectric or Condensing unit # 1) |
| 5      | #2 Cool Breaker 10 Amp (Condensing unit #2)                    |
| 6      | Perimeter Heater On / Off Switch                               |
| 7      | 24 VDC 500mA auxiliary DC output (VTS or other                 |
| 8      | Desiccant Wheel remote on off connection.                      |
| 9      | RS485 Modbus Connector or LAN Connection                       |
| 10     | Dry Air Solenoid Connection                                    |
| 11     | Building Management System (BMS) connection.<br>NO, COM, NC    |
| 12     | 24VDC 20mA UV light Accessory (Humidifier 2)                   |
| 13     | 24VDC 20mA UV light Accessory (Humidifier 1)                   |
| 14     | Humidifier Connection 2                                        |
| 15     | Humidifier Connection 1                                        |
| 16     | Evaporator Fan motor Speed adjustment Module                   |
| 17     | Defrost Controller system 2                                    |
| 18     | Defrost Controller system 1                                    |
| 19     | Power Input Module 120 VAC 60 Hz 15A                           |

## PREVENTIVE MAINTENANCE

### Cleaning the Chamber

Darwin Chambers Co. recommends cleaning your chamber with vinegar, club soda, or a mild germicidal soap with water that should be used for cleaning. Vinegar can be used to clean and polish the stainless steel. To use vinegar for this purpose, first moisten a cloth with undiluted white or cider vinegar. Then use the cloth to wipe the stainless-steel surface clean. Club soda can be used to remove streaks or heat stains from stainless steel. A mild, germicidal soap can be used with warm water for basic routine cleaning. Isopropyl alcohol can be used for chamber sterilization.

A chamber's stainless-steel components need to be cleaned not only for aesthetic purposes, but also to preserve corrosion resistance. Stainless steel is protected from corrosion by a thin layer of chromium oxide that forms because of oxygen from the atmosphere combining with the chromium in the stainless steel. Any contamination of the surface by dirt, or other materials, hinders this passivation process and traps corrosive agents, reducing corrosion protection.

**NOTE:** *If your chamber is heavily soiled and routine, cleansing with germicidal soap and/or vinegar cannot remove the stains, then it is suggested that an Oxalic Acid based cleanser is used to thoroughly clean and re-passivate the chamber. Re-passivating the chamber will renew the corrosion resistance of the stainless steel. When applying the cleaner, it is recommended that a soft cloth or synthetic sponge be used. Dry the chamber by drip drying the unit or rubbing the chamber in the direction of the finish with a soft cloth dry cloth.*

### Additional Preventive Maintenance

A thorough preventative maintenance routine should include the removal of sediment accumulation throughout the chamber and from the chamber's sensors. It is also imperative to remove any dust that has amassed on the chamber's instruments and/or cooling components. If dust accumulates on any of these areas, it may hinder the chamber's ability to effectively remove heat. Failure to perform preventive maintenance on your environmental chamber may result in mechanical difficulties and/or damage to the chamber's individual components. It could also void a chamber's warranty.

Darwin Chambers Company strongly recommends that a professional service team perform all additional preventative maintenance. For preventive maintenance, calibration, and validation services please call 877-783-6774 or email us at [calsandvals@darwinchambers.com](mailto:calsandvals@darwinchambers.com).

### Humidifier Preventive Maintenance

#### Humidifier Cleaning

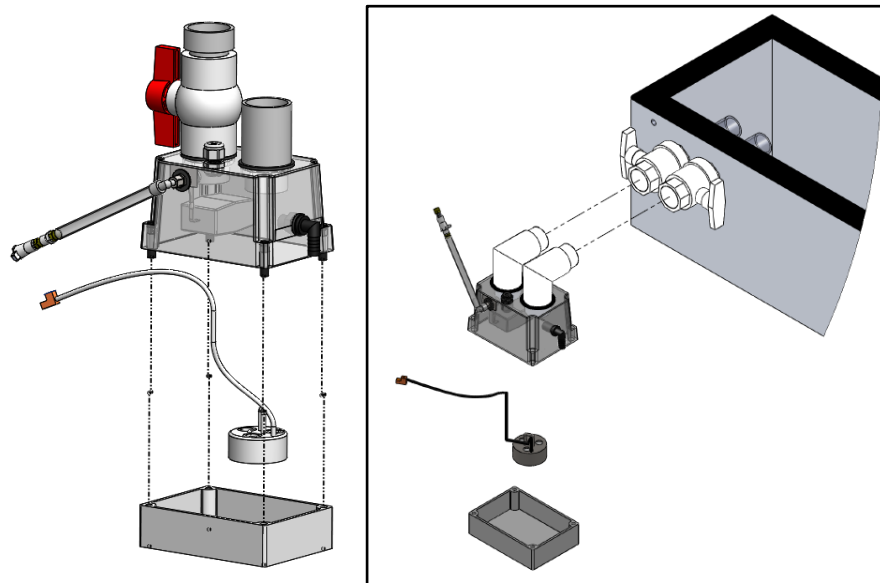
The ultrasonic humidifier is comprised of a transducer with ceramic discs that vibrate due to ultrasonic frequency. These ultrasonic vibrations create a fine mist because of water atomization. As the mist sprays into the chamber, particulates separated from the water supply during the atomization process may then accumulate upon the humidifier's components. Without a routine cleaning regiment, particulate accumulation (particularly on the ultrasonic transducer and ceramic discs) may lead to diminished humidifier performance over time. Darwin Chambers Co. recommends regular humidifier inspections and/or cleanings on a 3 to 6-month interval to help ensure against excessive accumulations and general mister wear.

**NOTE:** *The recommended periods between preventative maintenance, humidifier inspections, and cleanings are solely dependent upon the quality of the humidifier's water supply. All recommendations and generalizations*

*are intended for consumer awareness and as a reminder to customers that proper preventive maintenance is required to uphold the chamber's warranty.*

## Humidifier Cleaning Procedure

1. De-energize the humidifier unit by disconnecting power to the chamber. (Best practice is to turn off via front mounted switch then unplug chamber from outlet.)
2. Disconnect the water supply by separating the supply line from the inline quick connect shutoff fitting.
3. Remove the humidifier from the chamber and pour out the water.



**Figure 175**

Single door rear mounted  
humidifier

Two and Three door mechanical area  
mounted humidifier.

4. Loosen the cord grip securing the transducer power cord.
5. Use a #3 Phillips screwdriver to turn the four back plastic screws counterclockwise and then separate the top half of the humidifier from the bottom.
6. Separate the ultrasonic transducer from the humidifier's base.
  - The transducer is affixed to the humidifier base by Velcro.
  - Do not lift the transducer by the black conductivity sensor.
7. Set the cover with the ultrasonic transducer aside.
8. Discard any remaining water from the humidifier base.
9. Wipe down the interior of the humidifier with a 50/50 water and vinegar solution.
10. Gently clean the ultrasonic transducer and its ceramic discs with soft damp cloth or moist paper towel.
11. Use only water and a soft cloth to clean any individual parts (e.g., ultrasonic transducer and its ceramic discs) of the humidifier. Special care must be taken to remove any mineral deposits from the humidifier's floor, walls, and float valve.

**NOTE:** Do not use any household or industrial cleaners containing abrasives to clean the humidifier.

12. Rinse the humidifier and ultrasonic transducer with clean water, drain, and wipe dry.
13. Reassemble the humidifier.



Figure 176

## Filters

### MJ Series Filter

The MJ series will have a particulate filter to keep debris from building up on the evaporator coil. This filter will need to be replaced based on the chamber use and product loaded in the chamber.

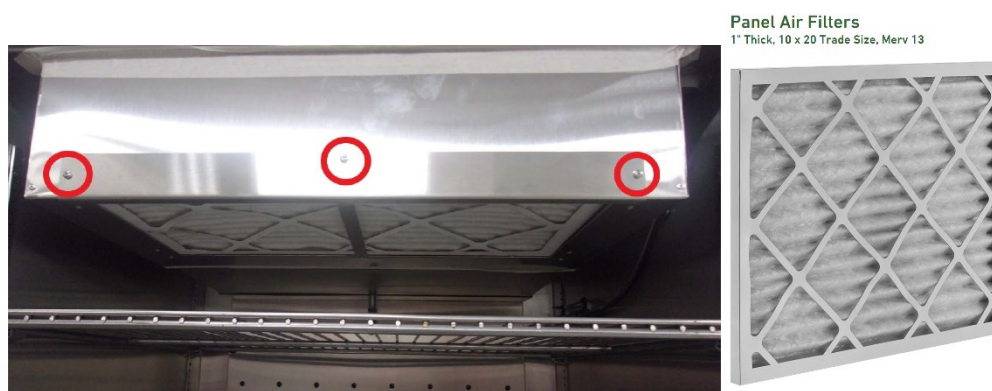


Figure 177

Remove the screws circled in red. Then remove the cover and pull-out filter. Be aware of filter getting caught on brackets to prevent any tearing of the filter. Replace filter with like for like filter. See your parts list for part numbers to get a Darwin Chambers replacement filter.

**NOTE:** The filter needs to be checked regularly. Clogged or using the wrong filter can inhibit the performance of the Cooling and Heating of the chamber.

## Dryer filters

Desiccant dryers require clean air to operate. Whether your dryer is using ambient air or conditioned air to circulate through the dryer, regular checks of the filter are required. This frequency of checking the filter will vary depending on chamber use and the ambient condition space. Check spare parts list for replacement filter part numbers. Note the dryer manufacture on your dryer when selecting the appropriate filter.

Some dryers are equipped with an ambient odor carbon filter. Replace when filter no longer contains the odor coming from the product loaded in the chamber. Check spare parts list for replacement filter part numbers. Note the dryer manufacture on your dryer when selecting the appropriate filter.

## Pneumatic Dryers

Pneumatic Dryers will have a water separator and oil filter. These should be checked on a regular basis. Typically, in conjunction with the air compressor maintenance. Check spare parts list for replacement filter part numbers. Note the dryer manufacture on your dryer when selecting the appropriate filter.

# MODEL NUMBER MATRIX

## Introduction

Currently several available options may be selected during the chamber ordering process. The Standard Chamber Configurations (Table 25) and Model Number Matrix (\* Formally *known has the 09 size*

Table 26) is a breakdown of the standard configurations and designations that references the installed options.

**Please Note:** Not all configurations may be applicable to your chamber.

| Standard Components | Mechanical Thermostat | Temperature Controller | Automatic Heat Only | Hot-gas bypass | Refrigeration System | Thermoelectric Cooling | %RH Controller | Exterior Humidifier | Internal Humidifier | Light Timer | Defrost Timer | Ramp/Soak Capabilities |
|---------------------|-----------------------|------------------------|---------------------|----------------|----------------------|------------------------|----------------|---------------------|---------------------|-------------|---------------|------------------------|
| Model               | S = Standard          |                        |                     |                |                      |                        | O = Optional   |                     |                     |             |               |                        |
| KB Series           |                       | S                      | S                   | S              | S                    |                        | S              | S                   |                     | O           | O             | O                      |
| PG Series           |                       |                        |                     |                |                      |                        |                |                     |                     |             |               |                        |
| TC Series           |                       |                        |                     |                |                      |                        |                |                     |                     |             |               |                        |
| MJ Series           |                       |                        |                     |                |                      |                        |                |                     |                     |             |               |                        |
| MC Series           |                       |                        |                     |                |                      |                        |                |                     |                     |             |               |                        |
| TH Series           |                       | S                      | S                   | S              | S                    |                        |                |                     |                     |             | S             | S                      |
| DB Series           |                       | S                      | S                   | S              | S                    |                        |                |                     |                     |             | O             | O                      |
| ST Series           |                       | S                      |                     | S              | S                    |                        |                |                     |                     |             |               | O                      |
| AR Series           |                       |                        |                     |                |                      |                        |                |                     |                     |             |               |                        |
| IN Series           |                       | S                      | S                   |                |                      | S                      | O              |                     | O                   | O           |               | O                      |
| INR Series          |                       |                        |                     |                |                      |                        |                |                     |                     |             |               |                        |
| PH Series           |                       | S                      | S                   |                |                      | S                      | S              | S                   |                     |             |               | O                      |
| TE Series           |                       | S                      | S                   |                |                      | S                      |                |                     |                     |             |               | O                      |
| DR Series           |                       |                        |                     |                |                      |                        |                |                     |                     |             |               |                        |
| HH Series           |                       | S                      |                     |                |                      |                        | S              | S                   |                     |             |               |                        |

|           |   |   |  |   |   |  |   |   |  |  |   |   |
|-----------|---|---|--|---|---|--|---|---|--|--|---|---|
| HT Series |   | S |  |   |   |  | O | O |  |  |   |   |
| FZ Series |   | S |  |   | S |  |   |   |  |  | S |   |
| FS Series |   | S |  | S | S |  |   |   |  |  | S | O |
| LT Series | S | S |  |   | S |  |   |   |  |  |   |   |

Table 25

## Model Number Matrix

| Chamber Matrix |                                            |                        |                       |                                                                      |                                 |
|----------------|--------------------------------------------|------------------------|-----------------------|----------------------------------------------------------------------|---------------------------------|
| Size           | Material                                   | Electrical             | Temperature           | Humidity (Humidity Only Chambers)                                    | Custom                          |
| 03             | AA= Aluminum Interior and Exterior         | CC = Custom Controller | CF = Custom Fan(s)    | CH = Custom Humidifier                                               | MA = Make up Air Requirement    |
| 011*           | SS = Stainless Steel Interior and Exterior | LT = Lights            | ER = Extended Range   | DD15 = Munters HC-150                                                | AP = Additional Access Port     |
| 030            |                                            | RC = Recorder Custom   | HV = Heater Variation | DA = Compressed Air (Flow Meter and Solenoid)                        | HN = Humidifier is not switched |
| 034            |                                            |                        |                       | DD = MG90/DD200                                                      | FD = Floor Drain                |
| 055            |                                            |                        |                       | DM = Compressed Membrane Dryer                                       | GD = Glass Door                 |
| 084            |                                            |                        |                       | IN = Interior Humidifier (Designate only on non IN Series Chambers)  | GF = GFCI                       |
|                |                                            |                        |                       | WR = Water Pressure Regulator                                        | ID = Interior Door              |
|                |                                            |                        |                       | MP = Microprocessor Control (Designate only on Nonstandard IN Units) | NP = No Access Port             |

\* Formally known has the 09 size

Table 26

## Custom Series

Darwin Chambers Co. also builds chambers to meet end user needs and specifications. These chambers will have a model series designation of **CU Series**. These chambers may use thermoelectrics or refrigeration for cooling. Sometimes cooling is provided by building chilled water. Please refer to this manual for general operation. If support is beyond the scope of this manual, please refer to technical support with chamber model name and company of original purchase.

## Heated series

Darwin Chamber Co.'s line of products includes stability chambers that operate by utilizing electric heat, and/or humidification. The primary method of stability control depends on the type of chamber.

## Heated Chambers

**The HT Series**, also known as heat, only chambers. The basic HT Series model utilizes effective control of temperature through the application of electric heat and a mechanical blower. The HT Series of chambers has a designed operating range of 5.0°C above ambient to 50.0°C.

**The HH Series** of stability chambers, also known as heat and humidity maintains the control of temperature by electric heat, a mechanical blower, and an ultrasonic humidifier. The HH Series of chambers have a designed operating range of 5.0°C above ambient to 50.0°C and ambient to 90.0% RH.

**The DR Series** of chambers is used for drying electrical components like integrated circuits. The basic DR Series model utilizes effective control of temperature through the application of electric heat and a mechanical blower. The DR Series of chambers has a designed operating range of 40.0°C above ambient to 150.0°C. With a humidity range of less 5% RH throughout the temperature range.

## Thermoelectric series

Darwin Chambers Co.'s line of products includes stability chambers that operate by utilizing thermoelectric assemblies, electric heat, and/or humidification. The primary method of stability control depends on the type of chamber model purchased.

### Thermoelectric Chambers

**The IN Series** of chambers uses thermoelectric cooling with the assistance of electric heat to achieve effective control of temperature. Through the addition of an optional ultrasonic humidifier, control of relative humidity can then be adjusted to suit your testing needs. The IN series of chambers have a designed at an operating range of 18.0°C to 50.0°C (12.0°C to 50.0°C for the IN011) and ambient absolute humidity to 90% RH (with optional humidifier).

**The PH Series** of chambers use effective control of both temperature and relative humidity through the application of traditional heating methods, thermoelectric cooling, and our exclusive ultrasonic humidification system. The PH Series of chambers have a designed operating range of 20.0°C to 50.0°C (12.0°C to 50.0°C for the PH011) and ambient to 90.0% RH (Relative Humidity) based upon a 52.0°F dew point. Please refer to your chamber's sales documentation for the applicable chamber operation range.

**The TE Series** of environmental chambers utilizes effective control of temperature through traditional heating methods and our super quiet thermoelectric cooling technology. The TE Series has a designed operating range of 20.0°C to 50.0°C.

## Refrigerated Series

Darwin Chambers Co.'s line of products includes stability chambers that operate by utilizing mechanical refrigeration, electric heat, and/or humidification. The primary method of stability control depends on the type of chamber.

### Refrigerated Units

**The AR Series** (Archival Chamber) of chambers controls temperature and relative humidity using a mechanical refrigeration system, a hot gas bypass, and a PID controlled heated regenerative desiccant

dehumidifier. The AR Series has a designed operating range of 0.0°C to 25.0°C and 10% to 60% RH as limited by a dew point range of -12°C to ambient.

**The KB Series** of chambers utilize control of both temperature and relative humidity through the application of traditional heating methods, mechanical refrigeration (that includes the use of a hot gas bypass), and an ultrasonic humidification system. The KB Series of chambers has a designed operating range of 2.0°C to 50.0°C (70.0°C as an extended range option) and ambient absolute humidity to 90.0% RH based upon a 52.0°F dew point.

**The DB Series** employs effective control of temperature through traditional electric heat and mechanical refrigeration with a hot gas bypass system. The DB Series has a designed operating range of 2.0°C to 50.0°C (70.0°C as an extended range option).

**The FS Series**, Darwin Chambers Co.'s line of stability Freezers maintains precise temperature control using a microprocessor controller, mechanical refrigeration in conjunction with a hot-gas bypass system, and a plenum that incorporates a special thermal mass, and digital defrost control. The thermal mass and digital defrost controller limit the temperature swings created by the defrost cycle in standard freezers. As a result of the special thermal mass and digital defrost controller, the FS can maintain very precise temperature control and an internal temperature of +/- 5.0°C during the defrost cycle. The FS has a designed operational range of -25.0°C to 15.0°C.

**The ST Series** of chambers controls temperature through the use of a mechanical refrigeration system and a hot gas bypass. The ST Series has a designed operating range of 2.0°C to 15.0°C.

**The TH Series** of chambers, also known as Freeze Thaw chambers. The basic TH Series chamber offers the same flexibility as the basic DB Series chamber in that they both control temperature using traditional heating methods and mechanical refrigeration in conjunction with a hot gas bypass system. However, the TH Series of chambers also use an R404a compressor, which enables the TH chambers to be used for freezing applications. The TH Series has a designed operational range of -25.0°C to 50.0°C.

**The MJ Series** of chambers, for drying marijuana leaves. The MJ Series chambers utilize control of both temperature and relative humidity through the application of traditional heating methods, mechanical refrigeration (that includes the use of a hot gas bypass), an ultrasonic humidification system, and controlled heated regenerative desiccant dehumidifier. The MJ Series of chambers has a designed operating range of 15.0°C to 30.0°C.

**The PG Series** of chambers used for plant growth in horticulture. The PG Series chambers utilize control of both temperature and relative humidity through the application of traditional heating methods, mechanical refrigeration (that includes the use of a hot gas bypass), and an ultrasonic humidification system. The PG Series of chambers has a designed operating range of 2.0°C to 40.0°C.

**The INR Series** of chambers uses a mechanical refrigeration system and a hot gas bypass with the assistance of electric heat to achieve effective control of temperature. Through the addition of an optional ultrasonic humidifier, control of relative humidity can then be adjusted to suit your testing needs. The INR series of chambers have a designed operating range of operating range is 2.0°C to 50.0°C and ambient absolute humidity to 90% RH (with optional humidifier).

**The MC Series** of chambers is used for concrete curing and other related industries. The construction of these units is what separates MC from other series like KB Series. They are designed to be more robust to take the abuse of heavy and coarse material. Chambers use a mechanical refrigeration system and a hot gas bypass with the assistance of electric heat to achieve effective control of temperature. Through

the addition of an optional ultrasonic humidifier, control of relative humidity can then be adjusted to suit your testing needs. The MC series of chambers have a designed operating range of operating range is 2.0°C to 50.0°C and ambient absolute humidity to 90% RH.

## Cycling series

Darwin Chambers Co.'s line of products includes stability chambers that operate by utilizing mechanical refrigeration and a Loop Controller. The primary method of stability control depends on the refrigerant and chamber type.

### Cycling Chambers

**The FZ Series** is Darwin Chambers Co.'s line of freezers. The basic FZ Series models maintain control of temperature by utilizing a microprocessor controller and an R404a mechanical refrigeration system. The FZ Series of chambers has a designed operational range of -25.0°C to -5.0°C.

**The LT Series** is our standard laboratory refrigerators. Each LT Series model utilizes effective control of temperature using highly sensitive electronic control and R134a mechanical refrigeration. The LT Series of chambers have a designed operating range of 2.0°C to 15.0°C.

In addition to the basic chamber models, Darwin Chambers Co. also offers numerous optional chamber additions. With the use of the additions, a chamber may be adapted to suit a testing environment. For more information, please visit [www.darwinchambers.com](http://www.darwinchambers.com) or email our sales team at [sales@darwinchambers.com](mailto:sales@darwinchambers.com).

**NOTE:** All operating ranges specified are for precautionary purposes to preserve the integrity of the chamber. Chamber operation outside of Darwin Chambers Co. specified operating range may result in damage to the unit, should be avoided, and may void the chamber's warranty.

## DEFINITIONS

Throughout the product manual, several key terms are employed. A basic knowledge of the terms discussed may help to clarify sections of the product manual. It is strongly recommended that each term be reviewed prior to proceeding to the next section of the product manual.

### Symbol Definitions

|                                                                                     |                |                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION</b> | Appears next to required safety related information in the manual.                                                                                                                                             |
|  | <b>WARNING</b> | PERSONAL INJURY WARNING: Meaning risk of electrical shock.<br><br>This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages that could result in serious injury or death can occur. |
| <b>TECH TIP O</b>                                                                   |                | Technical advice and special instructions are given wherever this symbol is found.                                                                                                                             |
| <b>NOTE</b>                                                                         |                | This symbol denotes special advice.                                                                                                                                                                            |

Figure 178

## Key Definitions

**Alarms** – Set parameters designed to alert the user of testing deviation that performs a timed component shut down to protect the environmental chamber from potential damage.

**Absolute Alarms** – A type of alarm that is dependent upon a fixed value or limit, that when reached/crossed indicates the process is out of tolerance by an audible/visual indicator.

**Absolute Humidity** – is the measure of water vapor (moisture) in the air, regardless of temperature. It is expressed as grams of moisture per cubic meter of air (g/m<sup>3</sup>).

**Deviation Alarms** – A type of alarm that has a set limit/range which automatically adjusts at a fixed value from a variable (Set Value) that when reached/crossed indicates the process is out of tolerance by an audible/visual indicator.

**Deionized Water (DI)** – Also known as demineralized water, is water that has had its mineral ions removed, such as cations from sodium, calcium, iron, copper, and anions such as chloride and bromide.

**Conductivity** – A measure of the ionic activity of a solution in terms of its capacity to transmit current.

**Dedicated Circuit** – A circuit that is designated specifically for a single item.

**Parts Per Million (PPM)** – The number of parts by weight of a substance per million parts of water.

**Polyvinyl Chloride (PVC)** – A white, water-insoluble, thermoplastic resin, derived by the polymerization of vinyl chloride; used chiefly for thin coatings, insulation, and piping.

**Polyurethane Tubing** – A flexible thermoplastic tubing that exhibits the properties of both plastic and rubber.

**Process Value (PV)** – The current / actual condition within the environmental chamber.

**Relative Humidity (RH)** – The amount of water vapor in the air, expressed as a percentage of the maximum amount that the air could hold at the given temperature, the ratio of the actual water vapor pressure to the saturation vapor pressure.

**Reverse Osmosis (R.O.)** – The process by which pure water is produced as a result of forcing waste or saline water through a semi permeable membrane.

**Set Value (SV)** – The user-determined set point of the environmental chamber.

**Total Dissolved Solids (TDS)** – An expression used to describe the combined content of all inorganic and organic substances contained in a liquid (which are present in a molecular, ionized, or micro-granular suspended form).

## FAQS

**My chamber has a dehumidification system on it, and I would like to control humidity more precisely. How is this accomplished?**

Control of humidity can be accomplished through the application of a dehumidification system. Darwin Chambers Company offers two types of dehumidification systems: electric heat regenerated desiccant or compressed air.

The electric heat regenerating type of dehumidification systems are typically controlled via PID loop Controllers. This type of dehumidification system can remove large amounts of humidity but can also cycle frequently. For this reason, Darwin Chambers Company recommends the following: Set the dryer to automatic mode and connecting the control wires to the dryer terminations (green and black wires terminated into a male green two pin quick connector) on the chamber. Utilizing the automatic mode allows the user to tighten the dryer's humidity control through using dehumidification output on the Fuji Micro Controller. An example of this method of operation AL3 is set on the controller at 1.0% (which is the factory-preset value) and 60.0% RH for the set value (SV). Since AL3 is a high deviation alarm, this would equate to  $SV+1.0\%$ . In other words, AL3 would equate to 61.0%. Each time the PV reaches 61.0%, the dehumidification becomes active until the PV falls below  $SV+AL3H$ .

To tighten the control of the %RH, AL3 can be adjusted lower. If AL3 is adjusted lower, the process value (PV) should be observed to determine if the dryer dehumidifies to a suitable level (suitability is strictly based upon user preference and testing requirements).

**NOTE:** *Through the lowering of the AL3 setting, additional wear may incur upon the dryer components and reduce the products life cycle. Care should be taken during adjustments of AL3 to avoid scenarios that result in continuous energizing and de-energizing of the dryer.*

**For example:** *Hypothetically if AL3 is set to 0.1% and the chambers %RH set value (SV) is 60.0%. The chamber has a desiccant wheel dryer. Without the dryer, the %RH fluctuates from 59.8 to 60.2% within a 25 second interval. As a result, when the dryer is utilized, the %RH fluctuates from 59.6 to 60.1%. In such a scenario, due to the AL3 setting of 0.1%, the dryer may power on for 10 seconds and then powers off as the PV reaches 60.0%. This results in dryer activations approximately 1 to 3 times a minute. Such a scenario may cause excessive wear on the dryer and may void any warranties associated with dehumidification system. In addition, many scenarios that result in control within  $\pm 0.2\%$  RH may possibly be resolved by performing an Auto-tune. By contrast AL3 can be set to a  $-1.0\%$  RH. In this configuration the dryer would always remain active, and the humidifier would humidify against the dehumidification system to maintain 60.0%. If the relative humidity falls lower than 1.0% (due to the  $-1.0\%$  parameter value) of the SV the dehumidification system would then disable.*

**NOTE:** *Care must be taken to set up the humidification and dehumidification systems to avoid "Hunting." "Hunting" occurs when the humidity level rapidly overshoots, then rapidly undershoots on a continuous basis. The best way to control this problem is to make sure the system moves slowly in each direction. Performing an Auto-tune should help alleviate the problem.*

On the desiccant wheel dryers, additional dehumidification control can be achieved through adjusting the ball valve on the "Dry Air Inlet" dehumidification pipe. If subtle amounts of dehumidification are required, it is recommended that the ball valve remains cracked (approximately 75% closed). This allows for a slower response time and may help eliminate over dehumidification.

Compressed air dryers are typically operated in a similar manner to a desiccant Wheel dryer. The difference between compressed air and a heated desiccant dryer is that compressed air dehumidification does not adversely affect the temperatures within the chamber. In addition, compressed air dryers do not degrade from being cycled on and off. To achieve finite control over the dehumidification rate, the supply flowing into the chamber can be modulated through the flow meter. Modulating the supply will allow the dryer to operate continuously at a low level while permitting active chamber dehumidification at higher %RH set values (for instance 60.0%).

**Which control setting(s) controls the temperature point at which the cooling ceases and the cabinet operates on heat alone?**

AL3L and AL3H are the parameters in the Fuji PXF4 that control the temperature switchover to “Heat Only Mode.” This sets the temperatures at which the cooling control ceases and the electric heaters control temperature alone. To determine if AL3L or AL3H is active, locate the Ev3 LED on the top right of the temperature controller, and then observe the Ev3 LED to determine if it is illuminated. If the LED is illuminated red, AL3L or AL3H is active.

**NOTE:** Some chambers do not utilize AL3L or AL3H to achieve “Heat Only Mode.” “Heat Only Mode” is only available on chambers that feature heaters and exclude most freezers (except the TH Series). To determine if your chamber features a heater, please locate the chamber’s data label plate.

**I would like to operate my chamber more precisely at a wider temperature/humidity. How can this be accomplished?**

This can be accomplished through selecting a mid-point value between the low and the high set values and then using the Auto-tune feature.

**What kind of water filtration does Darwin Chambers Co. recommend for use in the ultrasonic humidifier?**

Darwin Chambers Co. strongly recommends the use of an R.O., Distilled, a Darwin Chambers Co. brand DI system, or a Darwin Chambers brand R.O. D.I. water filtration system that meets the recommended water quality specifications.

**The humidity required has changed! (For example, 60.0% instead of the 75.0% RH the chamber was initially used for). However, when venting of the cabinet occurs (for instance, the door is opened), the humidity drops, and the controller overcompensates. Then, it fails to return to the set value. What can be done to correct this?**

First, the chamber needs to be set to the new SV. Then, it is recommended that the chamber be turned off and left with the door open for a period of at least four hours. Finally, power on the chamber and let stabilize. If the chamber fails to maintain set value, it may be necessary to perform an Auto-tune.

**There is not a drain near my cabinet.**

Purchase a condensate removal kit. Contact [parts@Darwinchambers.com](mailto:parts@Darwinchambers.com) to inquire about the purchase of a unit.

## TROUBLESHOOTING

**The chamber’s process value will not hold steady.****Temperature**

- Make certain the ambient conditions of the area in which the chamber is located are no more than 72.0°F and 50.0% RH.
- AUTO-TUNE the controller.
- Inspect the door gasket for possible leaks.
- Ensure that the product inside is not impeding the chamber’s airflow.

- Inspect the condensing unit fan(s) to determine if it is operational. This is not applicable to the chamber operation during “Heat Only Mode” (If the Ev3 LED on the temperature controller is illuminated, the chamber is in “Heat Only Mode”).
- Check the space around the exterior of the chamber to make sure there is a clearance of 12” from the top and 6” from each side.
- Make certain that no product has been placed lower than 3” from the floor, 2” from all sides, and no less than 4” away from the ceiling of the unit.

### **Relative Humidity (%RH)**

- Ensure the ambient conditions at the chamber’s location are no more than 72.0°F and 50.0% RH.
- Ensure that the chamber’s temperature process value (PV) is holding steady. A stable %RH process value will be nearly impossible to achieve without first having a stable temperature.
- Make certain that no product has been placed lower than 3” from the floor, 2” from all sides, and no less than 4” away from the ceiling of the unit.
- Inspect the door gasket for possible leaks.
- AUTO-TUNE the controller.
- Inspect humidifier’s ceramic disc for mineral deposits (to determine if it needs cleaning or an ultrasonic transducer replacement).
- Check humidifier tank water level to see if it is receiving an adequate supply of water. If it is not, determine if the water supply is reaching the humidifier. If the problem is within the humidifier itself, contact your customer support representative at [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).
- When the humidifier’s water supply is too pure, the ultrasonic transducer may not function properly. Conductivity problems can be identified by intermittent humidifier operation. One way to test the conductivity is to place an ounce (few centiliters) of tap water into the humidifier and then observe if the problem is alleviated.
- Check the AL3H parameter (Located within Operation Control Mode) on the temperature controller and ensure that it has been set to 32.0°C.
- At set values 60.0% RH or less, ensure that the humidifier’s ball valve on the dry pipe has been adjusted to approximately 75.0% closed.

### **My chamber is not cooling.**

- Check the Ev3 indicator on the temperature controller to see if AL3L or AL3H is active or not. If the alarm is active and the chamber’s PV is greater than 32.0°C, AL3H will need to be increased to a value greater than the current PV for the cooling to enable.
- Ensure that the chamber’s door is closed.
- Ensure that the chamber’s surrounding environment is approximately 72.0°F, 50.0% Relative Humidity (RH).
- Inspect the fans on the condensing unit fan(s) to determine if it is operational. This is not applicable to the chamber operation during “Heat Only Mode” (If the Ev3 LED on the temperature controller is illuminated, the chamber is in “Heat Only Mode”).
- Make certain that no product has been placed lower than 3” from the floor, 2” from all sides, and no less than 4” away from the ceiling of the unit. (Pictured below, the product is pressed against the wall. This will severely disrupt the chamber’s airflow and ability to condition the product within.)



**Figure 179**

- On the FS Series chamber ensure the chamber is not in a Defrost Cycle by inspecting the Defrost Controller for the code DEF.
- Have a qualified technician service the chamber.

**The chamber's controller parameters have been adjusted and the chamber does not operate properly.**

- Compare the controller parameters with the supplied factory parameter sheet that shipped with the chamber documentation. If any parameter outside the set value, PID settings (Proportional, Integral, and Derivative in Ch1), high alarms, and low alarms have been altered, the parameter(s) should be returned to their factory preset(s).
- If the controller parameters have been altered and the factory-supplied sheet cannot be located, please contact a Darwin Chambers Co. customer support representative at [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).

**The chamber set value is set to a temperature that is less than 0.0°C and the process value has been increasing/warming.**

**Chambers experiencing a quick temperature rise (< 2 hour)**

- Make certain all alarms have been cleared by widening out the alarm parameters (AL1 and AL2).
- Verify the chamber is not in a defrost cycle.
- Inspect the chamber door(s) to ensure they are fully closed.
- Ensure the chamber is not in a program (ramp/soak). Observing the OUT1 LED Indicator on the Fuji will indicate if the controller is requesting to add heat to the chamber. An illuminated OUT1 indicates the chamber heating.
- Inspect the compressor to verify the refrigeration system is operating.

**Chambers experiencing a lengthy temperature increase (>2 hour)**

- Ensure the chamber is not in an alarm condition.
- Verify the refrigeration system is operational.

- Inspect the product placement within the chamber to ensure airflow is not being impeded near the evaporator fans and sensors.
- The evaporator may be icing. Ensure that the defrost timer has been enabled.
- Inspect the doors to ensure they are fully closed and there are no leaks that could introduce moisture into the chamber. The introduction of moisture may result in icing on the evaporator.
- Inspect the evaporator to determine if it is iced up. Increase the number of defrost cycles by enabling additional trippers on the Paragon Defrost Timer may prevent icing. On the FS Series, the digital defrost termination (Dwyer Controller) may need to be adjusted to a warmer temperature. Locate Dwyer Controller and try adjusting the Set Point (SP1) a degree or two higher to see if there is any effect.  
**NOTE:** *Adjusting the defrost value higher may result in warmer process values during the defrost cycle.*
- If the evaporator is iced up, remove the product and perform multiple back-to-back defrost to ensure the coil is clear.

### **Power outages frequently affect my testing.**

- In many circumstances, a non-chamber related, unexpected power outage could warrant a retest. In some cases, providing the continued collection of data (process values), testing could still be deemed valid during an ensuing power failure. For such instances, Darwin Chambers Co. recommends purchasing an Uninterrupted Power Supply. Contact [parts@Darwinchambers.com](mailto:parts@Darwinchambers.com) for additional information.

### **It takes a very long time for the chamber to reach its %RH setting value.**

#### **For chambers that do not have a dehumidification system and that is operating high in %RH.**

- Ensure that ambient conditions at the chamber's location are no more than 72.0°F and 50.0% RH.
- Ensure that the temperature controller is not in low alarm (observe the Ev2 indicator).
- Check the AL3H parameter (Located within the Operation Control Mode) on the temperature controller and ensure that it has been set to 32.0°C.
- Inspect the door gasket for possible leaks.
- Ensure that the interior fan(s) are operational.
- Make certain that no product has been placed lower than 3" from the floor, 2" from all sides, and no less than 4" away from the ceiling of the unit.
- Inspect the condensing unit fan(s) to determine if they are operational. A non-working fan will affect the ability of the refrigeration to cool, thus affecting the dew point and the %RH. This is not applicable to the chamber operation during "Heat Only Mode" (If the Ev3 LED on the temperature controller is illuminated, the chamber is in "Heat Only Mode").
- On applications requiring 60.0% or less in %RH, adjust the humidifier's ball valve on the dry pipe so that it is approximately 75% closed.
- To determine whether a dehumidifier is needed, contact a Darwin Chambers Company customer service representative at [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).

#### **For chambers that do not have a dehumidification system and that is operating low in %RH.**

- Ensure that ambient conditions at the chamber's location are no more than 72.0°F and 50.0% RH.
- Check the AL3H parameter (located within the Operation Control Mode) on the temperature controller and ensure that it has been set to 32.0°C.
- Inspect the door gasket for possible leaks.
- Ensure that the interior fan(s) are operational.

- Make certain that no product has been placed lower than 3" from the floor, 2" from all sides, and no less than 4" away from the ceiling of the unit.
- Check the humidifier's indicator light to see if it is illuminated.
- Inspect humidifier's ceramic disc for mineral deposits (to determine if it needs cleaning or an ultrasonic transducer replacement).
- Check humidifier tank water level to see if it is receiving an adequate supply of water. If it is not, determine if the water supply is reaching the humidifier. If the problem is within the humidifier itself, contact your customer support representative at [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).
- Examine the humidifier's ultrasonic transducer. If the indicator light is not illuminated, the water may be too pure. To test the purity, place an ounce of tap water into the humidifier and see if the problem has been resolved.

**For chambers with (Optional) dehumidification which is operating high in %RH.**

- Ensure the dryer has been connected to the dryer terminations (green and black wires attached to the male quick connect) on the rear of the chamber.
- Ensure that the Ev3 (AL3) indicator on the %RH controller is active. If the LED indicator is not illuminated red, check the AL3 on the %RH controller (the factory preset is 1.0%). To make effective use of the dryer, it may be necessary to tighten/decrease the alarm to allow dehumidification to be enabled at process values closer than 1.0% above the set value or set the parameter value to a negative value.
- If applicable, ensure that the heated regenerative dehumidifier is plugged in to an outlet, set to automatic mode, and the chamber dehumidification pipes are fully opened.
- If applicable, ensure that the compressed air Dryer is plugged into the dryer termination on the top of the chamber. In addition, verify that the Dwyer flow meter indicates there is air pressure supplied to the unit. If air pressure is present, increase the airflow by adjusting the dial on the Dwyer flow meter.



**Figure 180**

- Ensure that ambient conditions at the chamber's location are no more than 72.0°F and 50.0% RH.
- Check the AL3H parameter (located within the Operation Control Mode) on the temperature controller and ensure that it has been set to 32.0°C.
- Inspect the door gasket for possible leaks.
- Verify that the chamber access port is closed.



**Figure 181**

- Ensure that the interior fan(s) are operational.
- Make certain that no product has been placed lower than 3" from the floor, 2" from all sides, and no less than 4" away from the ceiling of the unit.
- Inspect the fan(s) on the refrigeration system to determine if it is operational. A non-working fan will affect the ability of the refrigeration system to cool, thus affecting the dew point and the %RH. This is not applicable to the chamber operation during "Heat Only Mode" (If the Ev3 LED on the temperature controller is illuminated, the chamber is in "Heat Only Mode").
- On applications requiring 60.0% or less in %RH, adjust the humidifier's ball valve on the dry pipe so that it is approximately 75% closed.

**For chambers with (Optional) dehumidification which is operating low in %RH.**

- Ensure that the Ev3 (AL3) indicator on the %RH controller is active. If the LED indicator is not illuminated red, check the AL3 on the %RH controller (the factory preset is 1.0%). To make effective use of the dryer, it may be necessary to tighten/decrease the alarm to allow dehumidification to be enabled at process values closer than 1.0% above the set value or set the parameter value to a negative value.
- Ensure that ambient conditions at the chamber's location are no more than 72.0°F and 50.0 %RH.
- Check the AL3H parameter (Located within Operation Control Mode) on the temperature controller and ensure that it has been set to 32.0°C.
- Inspect the door gasket for possible leaks.
- Verify that the chamber access port is closed.
- Ensure that the interior fan(s) are operational.
- Make certain that no product has been placed lower than 3" from the floor, 2" from all sides, and no less than 4" away from the ceiling of the unit.
- Check the humidifier's indicator light to see if it is illuminated.
- Inspect humidifier's ceramic disc for mineral deposits (to determine if it needs cleaning or an ultrasonic transducer replacement).
- Check humidifier tank water level to see if it is receiving an adequate supply of water. If it is not, determine if the water supply is reaching the humidifier. If the problem is within the humidifier itself, contact your customer support representative at [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).
- Examine the humidifier's ultrasonic transducer. If the indicator light is not illuminated, the water may be too pure. To test the purity, place an ounce of tap water into the humidifier and see if the problem has been resolved.
- If applicable, ensure that the desiccant wheel dryer is in Automatic Mode.

**The humidifier is not working.**

- Verify the humidifier has been plugged into its power supply (female green clip with Red and White wires) on the exterior top of the chamber.
- Inspect humidifier's ceramic disc for mineral deposits (to determine if it needs cleaning or an ultrasonic transducer replacement).
- Check humidifier tank water level to see if it is receiving an adequate supply of water (requires approximately 0.75" of water above the conductivity sensor). If it is not, determine if the water supply is reaching the humidifier. If the problem is within the humidifier itself, inspect the mechanical float valve (white plastic rectangular block within the humidifier) to determine if it has been impeded by the transducer or the transducer's power cord. If the float has not been impeded, contact your Darwin Chambers Co. customer support representative at [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).
- Examine the humidifier's ultrasonic transducer. If the indicator light is not illuminated, the water may be too pure. To test the purity, place an ounce of tap water into the humidifier and see if the problem has been resolved.
- Open a chamber door(s) and observe the condensation levels inside. If there is moisture condensation throughout the chamber's interior and the %RH controller's PV is low, there could possibly be a %RH probe failure.
- Ensure that the chamber's door has been closed. The humidifier is designed to turn off when the chambers door has been opened. In addition, during the shipping process chamber doors may become unaligned and may not fully close the door switch. This can be verified by pressing the door switch(s) with a flat head screwdriver and observing if the %RH begins to rise. If the door switch is a problem, the chamber may need to be adequately leveled. If the problems persist, the doors may require alignment.
- Make certain that the ultrasonic transducer's indicator illuminates. If the transducer's LED does not illuminate, the transducer potentially does not have power. The humidifier's power supply is fused and should be inspected to determine if it has blown. Locate on the chamber's din rail located within the chamber's mechanical area there is a fused terminal block. Inspect the fuse located within the terminal block to determine if it is blown. If the fuse is blown, replace the fuse.



**Figure 182**

### **I am having water conductivity problems. Is there anything I can do?**

- When the humidifier's water supply is too pure, the ultrasonic transducer may not function properly. Conductivity problems can be identified by intermittent humidifier operation. One way to test the conductivity is to place one ounce of tap water into the humidifier and then observe if the problem has been alleviated.
- Finally, if the humidifier continues to have conductivity problems it may be necessary to change the humidifier's water supply. One cost-effective method is using a carboy filled with bottled R.O. water that

meets the water quality specifications. For more information on a carboy, contact [technicalsupport@darwinchambers.com](mailto:technicalsupport@darwinchambers.com).

### **My humidifier is displaying signs of germ/bacteria growth within the tank, how can I prevent this from taking place?**

- It may be necessary to increase the frequency of the humidifier preventive maintenance routine.
- Replace any expended filters on the water filtration system.

### **There is white powder within my chamber.**

- This is very common with ultrasonic transducers and R.O. systems to have small traces of white powder accumulate over a 6-month period. There are several possible causes for this. One potential cause is the need to replace the filters within water filtration system. Another possibility is that the water supply is too harsh for the filtration system to remove enough of the water's sediments. This may result in the need for a water filtration upgrade and/or some means of water pre-filtration.
- If large amounts of powder accumulate over a short time, the interval at which the R.O. system's filters are replaced may need to be increased.

Large amounts of powder can be defined as visibly being able to see powder in the air and/or significant measurable accumulation over a short time.

- If a D.I. filtration system is being utilized ensure that the resin bed is not due for replacement. In addition, if a water softener utilized in conjunction with a D.I. bed a possible scenario may occur where the salt from the softener overwhelms the D.I. bed and allows salts to pass through the D.I. system.
- A water softener is being utilized with the humidification system. Water softeners should not ever be utilized with an ultrasonic humidification system.

**NOTE:** To ensure proper chamber operation, the interval at which the chamber's preventive maintenance is performed may need to be increased to accommodate the harsh conditions.

### **My humidifier keeps blowing power supply fuses.**

- Make certain the fuse is securely in place.
- Replace the humidifier's ultrasonic transducer.
- Ensure that the humidifier's water supply meets Darwin Chambers Water Quality Requirements.

### **My humidifier will not fill with water.**

- Make sure the chamber has been connected to a water supply.
- Ensure that the water supply has been fully opened.
- Inspect the humidifier to determine if the ultrasonic transducer, or the transducer power cord has shifted during shipment and impeded the mechanical float valve.

### **There is a pool of water inside of the chamber.**

- Ensure the chamber is level.
- Make sure that the interior airflow has not been impeded by the product.

- Check the %RH controller to see if it is on the proper set value.
- Inspect the door gasket, access port, and chamber lid for leaks/condensation buildup.

**The chart recorder (optional) pens will not record dark enough.**

- Contact Darwin Chambers Co. to order replacement pens.

**I ordered a digital chart recorder (optional), why is the LED blank?**

- Darwin Chambers Company presets each digital chart recorder with the LED set to go blank after a few seconds. The intent of this is that the end data, that is often required to hand over to the FDA or any governing body, is the chart itself. Therefore, Darwin Chambers Company does not calibrate the LED. Only the recorder pens receive calibration. The advantage of purchasing the digital chart recorder is for the ease of the pen calibrations vs. the analogue recorders. This helps ensure that when capable personnel perform calibrations, the chart recorder is more likely to read correctly across the chamber's operation range. In addition, each chart recorder utilizes a separate temperature sensor than what the chamber uses. In addition, each sensor may operate a little differently. It is important to first observe the pens' readings before deciding if there is indeed a problem.

**My calibrated data logger/thermometer does not correspond to the chamber's controllers.**

- Inexpensive temperature/humidity reference devices (thermometers, data loggers, etc.) may have poor accuracies. A calibration refers to verifying a device against a known standard. Normally, if adjustments are performed during a calibration procedure, the device may be deemed within calibration if the reading(s) meet the manufacturer's stated accuracies. The problem with calibrations performed upon inexpensive equipment is that they may be limited by the components utilized to construct the sensor. For instance, if a certain manufacturer produces an inexpensive data logger with the stated accuracies of 0.5°C and 3.0%RH (common accuracy numbers for many data loggers) and the data logger have been calibrated, the data logger can be 0.5°C and 3.0%RH off the calibration standard and still be considered within calibration. This means the likelihood of a calibrated data logger or thermometer with an accuracy of 0.5°C and 3.0%RH not aligning with your new environmental chamber (that typically has an accuracy of 0.2°C and 0.8%RH @ 23°C) is very likely. To avoid skewed results, it is strongly recommended that only sensors with equal or better accuracies than the chamber's instrumentation are utilized.

**NOTE:** To determine the stated accuracies of a device please refer to the manufacturer's specification sheet and/or the calibration documentation.

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## REFERNECES USED IN THE MANUAL

- PXF Operation Manual
- Dwyer Instruments FR# 444246-00 Rev 1
- Timerco OEM Manual

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