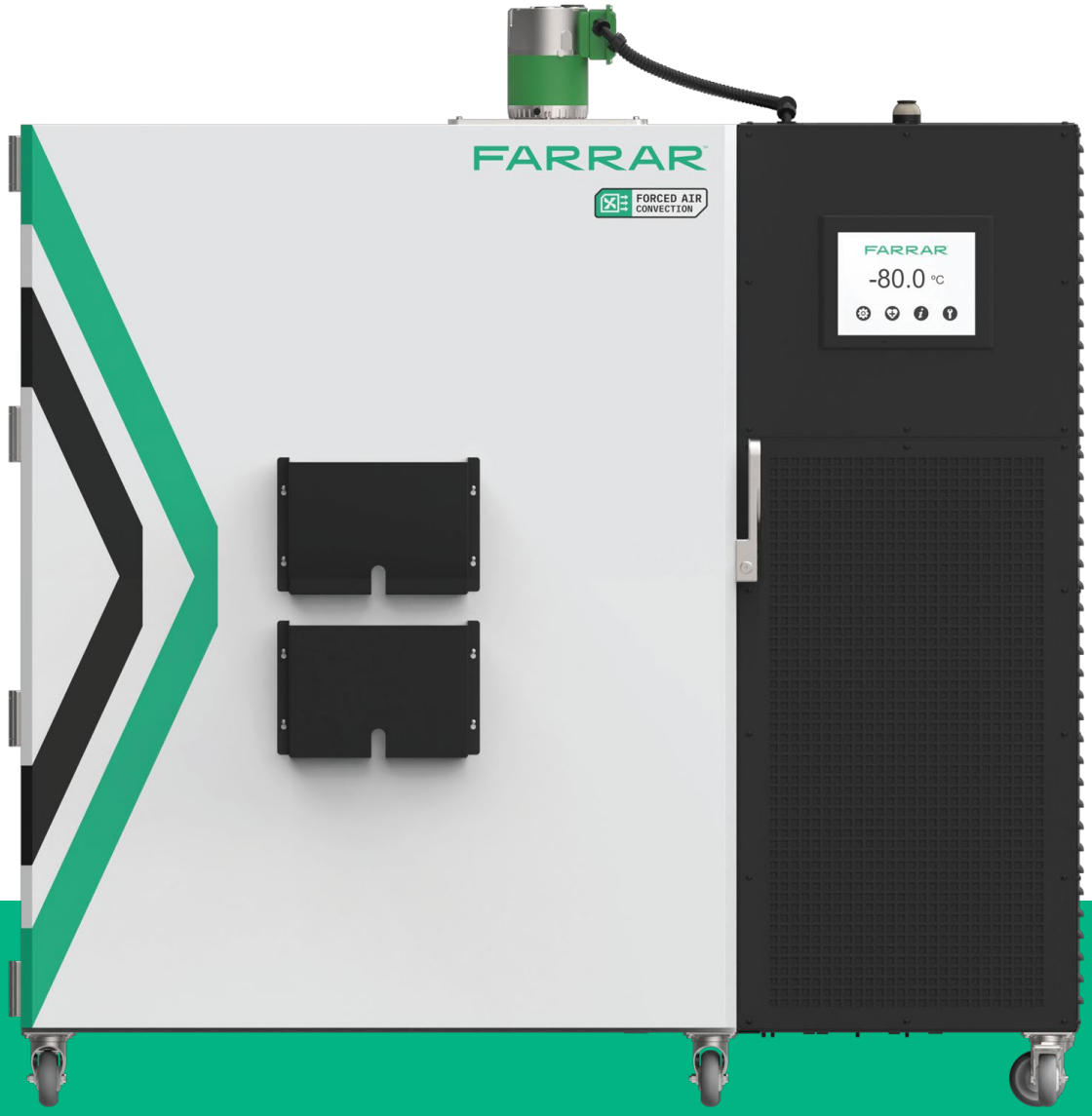
FARRAR™ | TRANE TECHNOLOGIES

4000-LC SERIES

CONTROLLED RATE CHAMBER

INSTALLATION, OPERATION, AND MAINTENANCE



READ THIS INSTRUCTION MANUAL

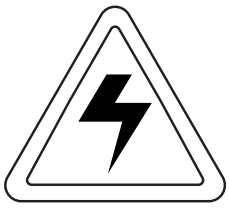
SAFETY PRECAUTIONS

User Advisory

Failure to read, understand, and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance.

CAUTION! All internal adjustments and maintenance must be performed by qualified service personnel.

Lock



Electrocution

When plugged in, there is high voltage present on terminals inside the machine space. Proper care must be taken if the electrical control panels are opened to perform any kind of maintenance.

The material in this manual is for information purposes only. Its contents and the product described are subject to change without notice. FARRAR makes no representations or warranties with respect to this manual. In no event shall FARRAR be held liable for any damages — direct or incidental — arising out of, or related to, the use of this manual.

Important operating and/or maintenance instructions. Read the accompanying text carefully. Maintained or serviced equipment must be turned off and locked out to prevent injury.

Do Not Touch

Always dissipate high or low temperatures, especially inside the control space before performing any maintenance on the unit.

Before performing maintenance, always do the following:

- Use the proper protective equipment (clothing, gloves, goggles, etc.).
- Dissipate extreme cold or heat and wear protective clothing.
- Follow good hygiene practices.

Each individual is responsible for their own safety.

4000-LC SERIES CONTROLLED RATE CHAMBER
INSTRUCTION MANUAL

4000-LC SERIES CONTROLLED RATE CHAMBER
INSTRUCTION MANUAL

INTRODUCTION

The FARRAR™ 4000-LC Series Controlled Rate Chamber is purpose-built for precision temperature-controlled rapid freeze +40°C to -80°C bioprocessing applications. Designed for biologic and material preservation, the unit provides repeatable, precise, rapid, and uniform freezing and thawing of bulk materials and samples before cold storage.

Engineered to freeze or thaw drug substance or drug product quickly or at a controlled rate, the unit helps to reduce freeze/thaw conditioning times, measured in hours, instead of days or weeks. The controller can be configured to ramp up or down in temperature and maintain a steady state for a specific length of time. Multiple profiles can be created and adjusted to meet specific product requirements.

FARRAR's 4000-LC Series Controlled Rate Freeze/Thaw Chamber leverages forced air convection technology and incorporates scroll refrigerator compressors, hot gas, and electric resistance heaters to maintain temperature control. Available in air or water-cooled options, the 4000-LC Series Controlled Rate Chamber can be configured for all batches, sizes, bags, bottles, and shells and benefits from universal container acceptance that can be used for any application.

The energy-efficient design offers improved sustainability and helps lower operating costs. It also offers best-in-class density, which reduces the amount of storage/warehouse space required. Good Manufacturing Practice (GMP) requirements are maintained across all models, without sacrificing performance.

Eight models are available for purchase. This manual covers the 4000-LC Series Controlled Rate Chamber which features a 12-inch HMI screen with a graphical display of the chamber and product temperature. There are four LC models including:

- 4002-LC
- 4102-LC
- 4005-LC
- 4105-LC

For more information on these models, refer to the Specifications section of this manual.

Features

The FARRAR 4000-LC Series Controlled Rate Chamber consists of three core features:

- Heating and cooling system
- Blower
- Control system

The user can adjust various settings to suit specific product requirements. Instructions for adjusting unit settings are described in the *Operation* section of this manual.

Heating and Cooling System

The 4000-LC Series Controlled Rate Chamber's cooling system consists of the following components:

- Compressors (move heat)
- Evaporator (absorbs heat)
- Condenser (rejects heat)
- Expansion valve (controls flow of refrigerant)

The Controlled Rate Chamber creates heat using hot refrigerant gas and resistive heaters embedded in the evaporator assembly.

Blower

The 4000-LC Series' Controlled Rate Chamber blower produces an air flow of 1,000 CFM at a rate of one air change per second. This forced convection moves energy from the surface of the chamber to the surrounding air. The circulation that follows moves energy to the evaporator coil, which absorbs the resulting heat and achieves equilibrium.

Conventional freezers rely on natural convection, which is efficient but easily disrupted when the door is opened. In comparison, forced convection enables temperatures to reach equilibrium faster, even after the door is opened and shut.

Control System

The 4000-LC Controlled Rate Chamber is controlled through the panel-mounted touch screen display. Use of the human-machine interface (HMI) enables approved users to adjust the temperature control set point between +40°C and -80°C. All functions and set points can be accessed via the HMI.

Control components of the 4000-LC Series Controlled Rate Chamber include the following:

- A controller
- Resistance temperature detector (RTD) temperature sensors
- A solid state relay
- Stepper motor controls
- Hot gas controls

User Access

The 4000-LC Series Controlled Rate Chamber is delivered with factory default settings. FARRAR recommends granting proper access control to each user through an assigned username provided by the facility administrator or operator. If a user does not have sufficient privilege or access control, then set points and values cannot be changed within the HMI; instead, a warning acknowledgment will display.

The HMI will offer a view-only mode to non-authorized users. A username and password for non-authorized users will be designated and programmed by the facility administrator. The username and password should be maintained and controlled according to company protocols.

Alarms

The 4000-LC Series Controlled Rate Chamber is supplied with remote, non-powered, alarm-signaling dry contacts. Connections are made to a terminal strip in the plastic enclosure on the back of the unit. Each pair of contacts is electrically isolated from other contacts.

There are three sets of dry contacts, as shown in Figure 1. Terminals 1-5 are dry contact connections. Terminal 6 is unpowered. Terminals 7-10 are retransmit connections that signal for probe temperatures. Individual connection signals are as follows:

- 1 (General Alarm): Contacts close when any alarm condition occurs. Contacts open when the alarm condition ends.
- 2 (Profile Complete): Contacts close when a profile starts. Contacts open when the profile is ended by the user.
- 3 (Profile Running): Contacts close when a profile starts. Contacts open when the final step in the profile is reached; this is typically a Hold at Temperature step type.
- 4 (Door Open): Contacts close when the door is opened while a profile is running. Contacts will open when the door is closed.
- 5 (Common): This terminal serves as a common connection for terminals 1-4.
- 7 (+) and 8 (-) (Chamber Control Probe): These terminals serve as a retransmit signal for the chamber control probe temperature.
- 9 (+) and 10 (-) (Product Probe): These terminals serve as a retransmit signal for the product probe temperature.

Linear scaling for terminals 7-10 is as follows:

- 0 VDC = -100°C
- +10 VDC = +100°C

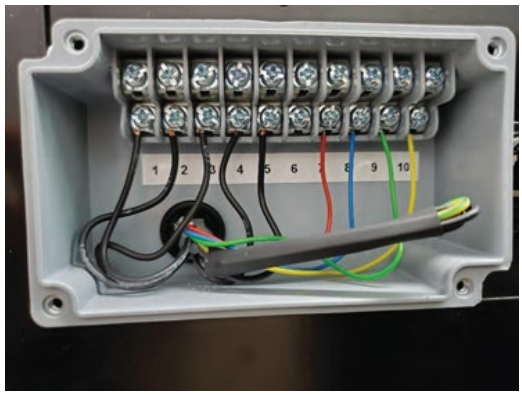


Figure 1: Remote contact terminal box with cover removed

Refer to the *Terminal Positions and Descriptions* table for more information on the various operational states of the 4000-LC Series Controlled Rate Chamber unit.

Terminal Positions and Descriptions

Terminals 1-5	Terminals 2-5	Terminals 3-5	Terminals 4-5	Terminal 5	4000-LC Series Dry Contact-Controlled Rate Chamber
Door Open					Contacts close when the door is opened while a profile is running. Contacts will open when the door is closed.
	Profile Complete				Contacts close when a profile is started. Contacts will open when the final step of the profile is reached (typically a "Hold at Temperature" step type).
		Profile Running			Contacts close when a profile is started. Contacts will open when the profile is ended by the customer and the unit returns to Standby (OFF) mode.
			General Alarms		Contacts close when any alarm condition is occurring. The contacts will open when the alarm condition ends. See below alarm conditions.
				Common	Electrically connected as a common connection for each of the dry contacts 1 to 4.

General alarms

- Power fail to rate chamber.
- Phase monitor (lack of 3-phase).
- Chamber temperature higher than +45°C. Non-adjustable.
- Evaporator temperature higher than +65°C. Non-adjustable.
- Manual mode – chamber temperature outside of high and low set parameters for more than two minutes. Parameters are adjustable.
- Hold segment of a Profile – chamber temperature outside of high and low set parameters for more than two minutes.
- Parameters are adjustable.
- Door open too long – chamber door is open longer than 15 seconds while a Profile is running. Non-adjustable.
- Heat exchanger too warm or Heat exchanger too cold (Indicates capacity issue in the refrigeration system).

Chamber Temp 7-8	Product Temp 9-10	4000-LC Series 0-10 VDC Output Controlled Rate Chamber
Chamber Temperature		7 (+) & 8 (-) are a 0-10VDC re-transmit signal for the chamber control probe temperature. Linear Scaling is: 0 VDC = -100°C, +10 VDC = +100°C
	Product Temperature	9 (+) & 10 (-) are a 0-10VDC re-transmit signal for the product probe temperature. Linear Scaling is: 0 VDC = -100°C, +10 VDC = +100°C

Sensor Validation

The 4000-LC Series Controlled Rate Chamber includes an independent control/display sensor. Calibration of the sensor is conducted by removing the sensor mounting plate, undoing the hook and loop fastener, and extending the sensor cable. Refer to the Location and Placement section of this manual for more information on sensor placement.

Sample Probe

The 4000-LC Series Controlled Rate Chamber is capable of reading a 100-ohm RTD probe inserted into product samples. The probe may be used during a temperature reading to monitor and achieve more definite product temperatures. Refer to the Location and Placement section of this manual for more information on probe installation. Refer to the Probe Calibration section of this manual for more information on sensor calibration.

Note: If the sample probe is not installed or fails to monitor properly, an error message will appear on any screen in which the sample probe is utilized.

4000-LC Series Controlled Rate Chamber Specifications

Storage Capacity and Dimensions

Exterior Dimensions	
Width	75 (in.) 1,901.5 (mm)
Depth	38 (in.) 960.4 (mm)
Height	80 (in.) 2,028.8 (mm)
Interior Dimensions	
Width	34 (in.) 863.6 (mm)
Depth	27.5 (in.) 698.5 (mm)
Height	43 (in.) 1,092.2 (mm)
Unit Weight	
lbs.	1,010
kg	459
Shipping Weight	
lbs.	1,597 lbs.
kg	726 Kg
Area Footprint	
sq. ft.	20.53 sq. ft.
m^2	1.09 m2
Total Volume	
cu. ft.	23
Liter	659
Chamber Floor Space	
sq. ft.	45.9 sq. ft. with door open
m^2	4.26 m2 with door open
Door Opening	52.25 in / 1,327 (mm)
Chamber Wall Thickness	4 in. / 101.6 (mm)
Ambient Conditions	+18°C to +30°C 70% RH Max NOTE: FOR INDOOR USE ONLY Pollution Degree II

Application and Electrical Requirements

Application	Pharmaceutical, Bioprocessing
Electrical Requirements	
North America	208/240 VAC, 3 Ø, 60Hz, 31 FLA (North America)
International	400 VAC, 3 Ø, 50Hz, 24 FLA (International)
Circuit Breaker	40 Amp, (North America)/30 Amp (International)
Temperature Control Range	+40°C to -80°C
Ambient Operating Temperature	+18°C to +30°C
Noise Level	72 dBA

Material Handling Solutions

Shelves	
Type	Qty 2
Size (in.)	33 5/8" (w) x 27 1/16" (d)
Size (mm)	854 (w) x 687 (d)
Positioning	Adjustable on .595 (in.) / 15 (mm) centers and at the bottom of chamber

Refrigeration Systems

Blower Motor	1,000 CFM
Refrigerant: High Stage	R-449A
Refrigerant: Low Stage	R-508B
Defrost	Defrost – Manual Start/Automatic Complete
Heat of Rejection – Air-Cooled	38,000 BTU/hr. (11 Kw/hr.)
Heat of Rejection – Water-Cooled	1,700 BTU/hr. (0.5 Kw/hr.)

Order Information

Model Number	Description	Voltage (Hz)	Amps (FLA) / Breaker
4002-LC	Controlled Rate Chamber, Air-Cooled	208/240VAC - 3 Phase - 60 Hz	26 FLA / 40A
4102-LC	Controlled Rate Chamber, Water-Cooled	208/240VAC - 3 Phase - 60 Hz	26 FLA / 40A
4005-LC	Controlled Rate Chamber, Air-Cooled	400VAC - 3 Phase - 50 Hz	24 FLA / 30A
4105-LC	Controlled Rate Chamber, Water-Cooled	400VAC - 3 Phase - 50 Hz	24 FLA / 30A

Performance Data

4000 Series Model	4000-LC
Temperature Control Range	Programmable +40°C to -80°C
Internal Air Exchanges	1 / sec.
Control IDEC	Ramp and soak controller
Control Method	Proportional hot gas and resistance heat
Refrigeration	Cascade scroll compressors 5hp and 3.5hp
Warranty, North America (U.S. and Canada)	1-year parts and labor
Warranty, International	1-year parts only

Construction

Chamber Exterior Material	Painted Galvanized Steel - Powdura Hybrid Powder Coat (Color: Snow)
Chamber Interior Material	304 Stainless Steel
Doorframe Inner Gasket Material	PVC
Doorframe Outer Gasket Material	Silicon
Door Interior Panel Material	Painted Galvanized Steel - Powdura Hybrid Powder Coat (Color: Snow)
Control Enclosure Materials	Cold rolled steel, stainless steel, aluminum powder coated black, drain tube stainless
Evaporator Fan Motor Mount Material	Aluminum

Controller

PLC Controller	IDEC ramp and soak
Control Method	Proportional hot gas and resistance heat
Temperature Sensor	RTD PT100 Din A
Displays	12" Display
Building Management System Connection	Standard: BACnet/IP | Optional: Modbus TCP/IP Network settings are customer configurable
Alarms	Alarms, dry contact per Terminal Positions and Descriptions on page 8
Dry Contacts	Standard (C, NO, NC)

Condenser

4000 Series Model	4000-LC
Water-Cooler Condenser	**Water Requirements**: 1. Pressure Differential ≈ 20 psi (1.38 bar) 2. Water Temperature ≤ (60°F/16°C) Water Supply Flow Rate = 6 gpm (22.7 LPM) 3. Water Connections are 1/2" FNPT For 4105 units, A 1/2" MPT x M20 x 1.5 Female Adapter is Provided 4. Flexible High-Pressure Hose Required
Thermal Room Load: Water-Cooled	1,760 Btu/hr. 0.5 kW/hr. Maximum **Drain**: External with heated evaporator pan (powered by cabinet)
Thermal Room Load: Air-Cooled	Heat Rejection to Atmosphere: Peak Heat Rejection=36,86-, Btu/hr=10.8 kWh Average Heat Rejection=19,5000, Btu/hr=5.7kWh

INSTALLATION

Unpacking and Setup

This item was item was thoroughly inspected and carefully packed prior to shipment. All necessary precautions were taken to ensure safe arrival. Immediately upon receipt, and before the unit is moved from the receiving area, carefully examine the shipment for loss or damage. Unpack the shipment and inspect both interior and exterior for any in-transit damage.

If any loss or damage is discovered, note any discrepancies in the delivery receipt and call the delivering carrier to request that their representative perform an inspection. Do not discard any of the packing material and do not move the shipment from the receiving area prior to its inspection. Document any problems in writing with photos.

For products shipped Free Carrier (FCA) from Marietta, Ohio, the responsibility of FARRAR™ ends when the merchandise is loaded onto the carrier's vehicle. For Free on Board (FOB) Destination shipments, the responsibility of FARRAR and the carrier ends when the receiving department personnel sign a free and clear delivery receipt.

Location and Placement

Once out of the crate, wheel the unit into place near the required power connection.

Unit clearance requirements are as follows:
To ensure proper air flow, ensure that the unit is (at minimum) the following distances from the nearest wall or ceiling:

Unit Clearance Requirements

Sides of unit:	6 in. (15.3 cm)
Top of unit	16 in. (40.6 cm)
Front of unit:	3 ft. (91.4 cm) 30 in. (76.2 cm)-wide working space Headroom at least the height of the unit
Back of unit:	6 in. (15.3 cm)

After placing the unit:

1. Remove the foam-wrapped shelves (2), shelf clips (10), and evaporator pan from the unit interior and unwrap the packaging.

2. Remove the spring feet (4) from the packaging. Install each spring foot on the bottom projections of the evaporator pan (small end first). Refer to Figure 2 for exact placement.

Figure 2: Evaporator pan

3. Screw the chamber drain tube onto the threaded cabinet drain connector as shown in Figure 3.

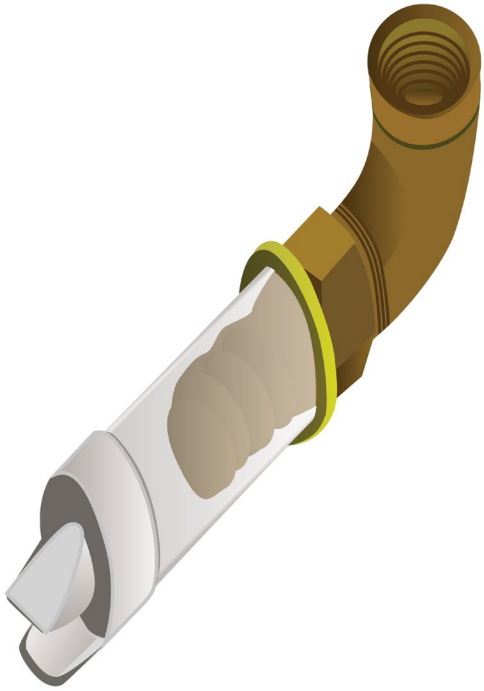


Figure 3: Drain tubing with duck bill

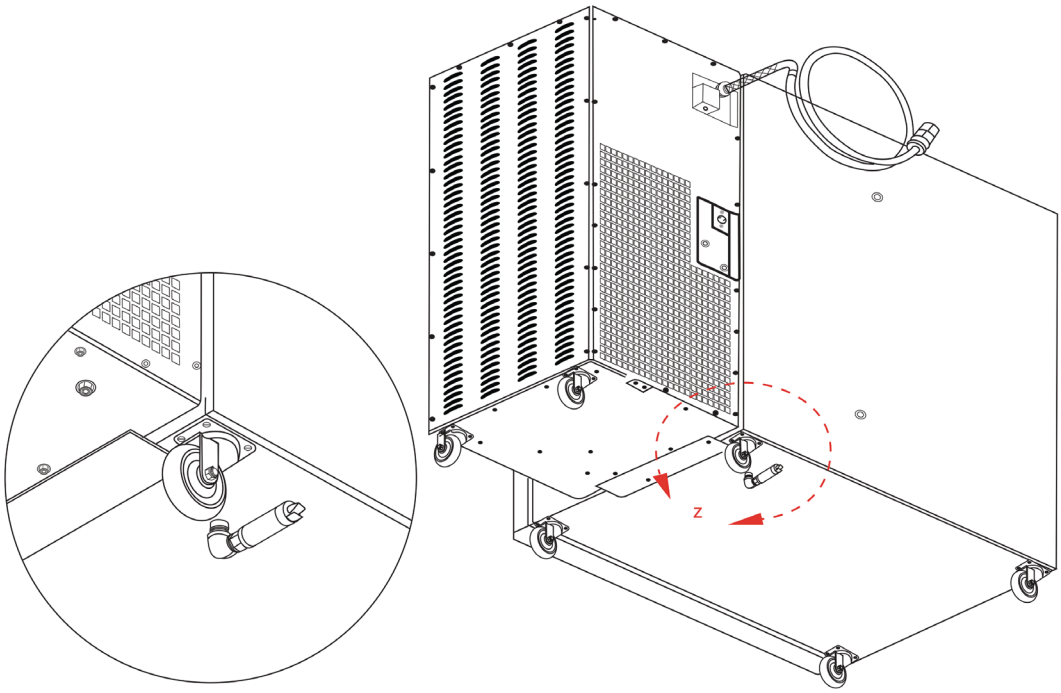


Figure 4: Threaded cabinet drain connector

4. Connect the supplied electrical cord to the evaporator pan receptacle.
5. Connect the other end of the electrical cord into the dedicated power receptacle on the back of the cabinet. See Figure 5 for exact placement.

Figure 5: Electrical cable and cabinet power receptacle

6. Place the evaporator pan underneath the drain tube.

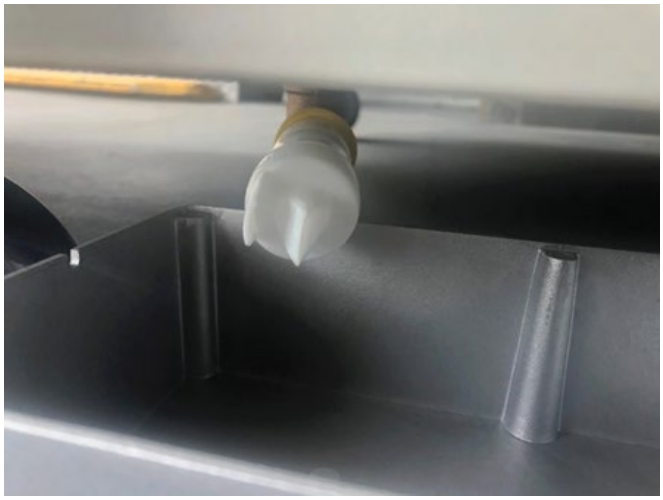


Figure 6: Drain tube connected to evaporator pan

7. For each shelf in the unit, install four shelf clips in the duct sheet. Install two shelf clips in the front and two in the back of the duct sheet at the desired height for the unit. Spacing measures approximately 5 in. (1.3 cm) for each shelf.

Figure 7: Shelf clip

8. Place one shelf on each set of shelf clips, orienting the shelf so that the down flange faces the door opening. Verify that each shelf is stable before placing product within the unit.

Figure 8: Shelf down flange

9. After installing unit shelves, note the locations of the two chamber access ports within the unit. One is located on the back of the unit; one is located on the left side of the unit.
Note: Sensors may be installed in the chamber access ports to monitor the status of the chamber or samples within the chamber. Each port is insulated and plugged to reduce moisture infiltration.

10. To install a sensor in a chamber access port, remove the screws (4) holding the sensor mount in place.

Figure 9: Sensor mounting plate with screws

11. After removing the sensor mounting plate, install the sensor using the instructions provided for that sensor. Refer to Figure 10 for examples of installed sensors.
Note: The sensor mount will accept sensors that measure 0.125 to 0.250 in. (3.2 mm to 6.4 mm) in diameter. Sensors must measure 3.0 in. (7.6 cm) in length at minimum.

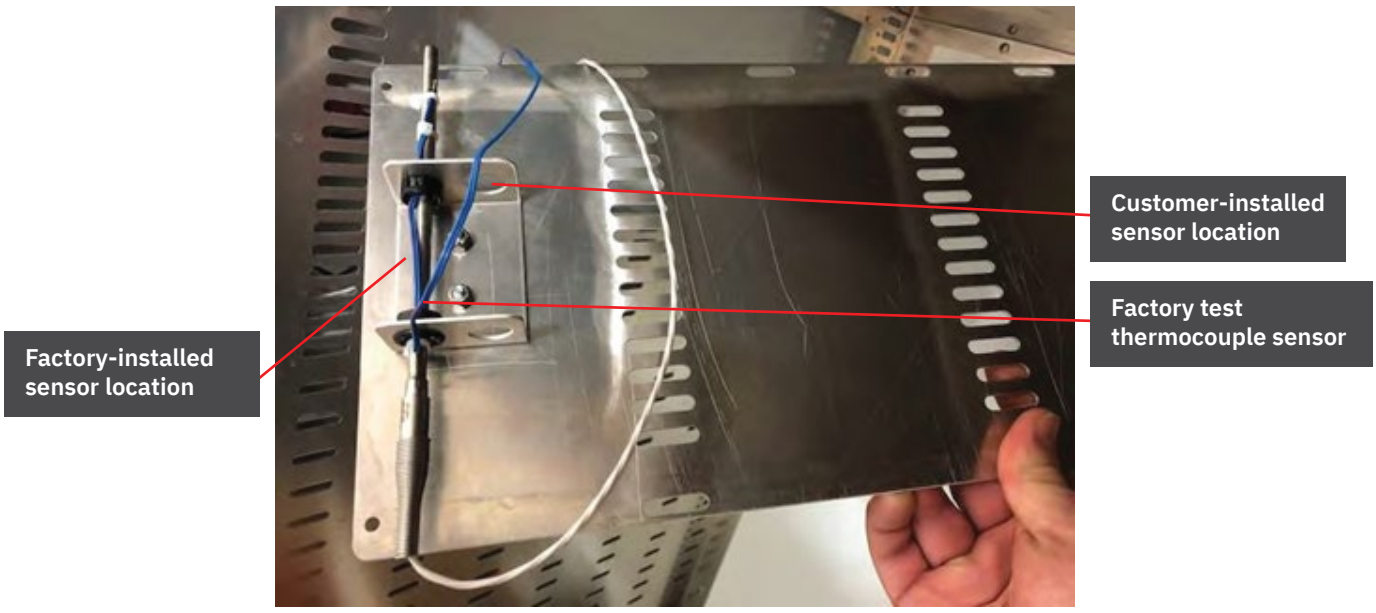


Figure 10: Sensors installed in the sensor mount

12. After the monitoring sensors are installed, reinstall the sensor mount, ensuring that the tip of each sensor points down.
13. Replace the insulation and seal the port both inside and outside of the cabinet.
14. To install a sample probe, connect the probe to the bulkhead connector at the top of the internal chamber area.

Figure 11: Sample probe

Mechanical

4000-LC Series Controlled Rate Chamber units with water-cooled systems include inlet and outlet water connections for chilled and tower water connections. Inlet and outlet connections are located on the back of the unit and are 0.5 in. female pipe tread (FTP).

FARRAR recommends using 0.5 in. industrial grade flexible hose, 8 ft. (2.5 m) in length, for connections. The use of flexible hose for the water inlet and outlet allows for easy movement of equipment during service and troubleshooting. Installation using hard piping is not recommended.

FARRAR strongly recommends installing a 0.5-in. ball valve at the water inlet, along with a strainer and pressure gauge, as shown in Figure 13. These additions will facilitate any servicing, testing, or troubleshooting.

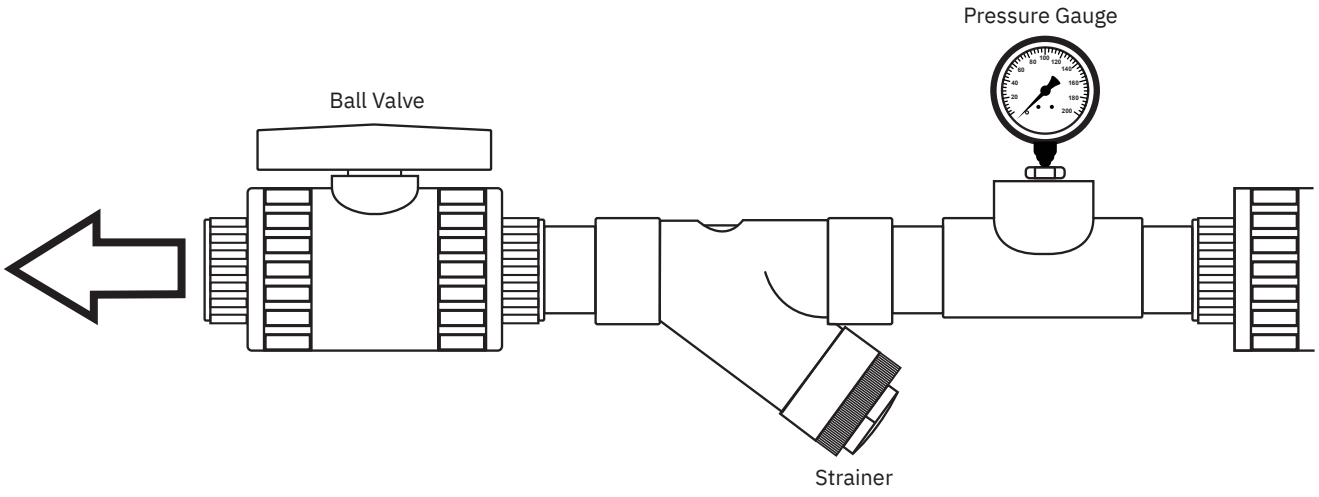


Figure 12: Ball valve, strainer, and pressure gauge

To connect the unit to a water source:

1. Turn off the water supply to the unit.
2. Install hose at the water inlet and outlet connections.
3. Apply Teflon tape to the inlet and outlet connections.
4. Tighten each connection firmly.
5. After each hose connection has been tightened, slowly turn on the water supply to the unit.
6. Check for leaks at all connections.
7. Verify that water pressure, nominal flow, and temperature requirements are adequate for equipment operation. Check connections for leaks regularly. Verify that the water differential pressure is adequate along with nominal flow and temperature requirements. Refer to the Specifications section of this manual for more information.

Electrical

The rate chamber is powered by a three-phase circuit and the refrigeration compressors are required to operate in a specific direction. The unit utilizes a phase monitor to protect the compressors. If the unit does not power on when the **POWER** switch is activated, switch two of the phase legs in the receptacle or power panel.

North America

North American models of the 4000-LC Series Controlled Rate Chamber come installed with a Hubbell Locking Plug (Hubbell part number: CS8365C). Connect the unit to a 50 Amp, 250 VAC, three-phase, four wire (3P4W) receptacle.

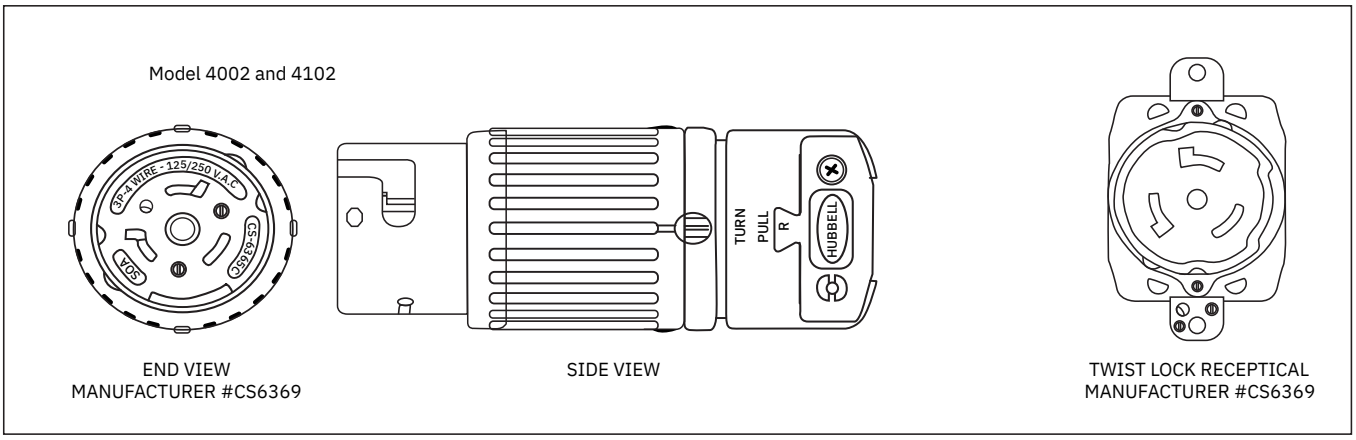


Figure 13: Hubbell Locking Plug

International

International models of the 4000-LC Series Controlled Rate Chamber come installed with an IEC 60309 Plug. Connect the unit to a matching IEC 60309 (6H), 30 Amp, 200/415V receptacle, such as an ABL Sursum F52S33A.

Figure 14: IEC 60309 Plug

OPERATION

Powering the Unit

Electrical power is provided via a power cord. Internally, power passes through a three-pole main circuit breaker, which is accessible inside the main control enclosure.

To turn off power to the unit, unplug the power cord from the wall receptacle.

Home Screen

After connecting the unit to a power source, the panel-mounted touch screen will turn on and display the **HOME** screen. The current interior chamber temperature will be displayed.

All system operations are performed using the panel-mounted touch screen display. A list of icons is available in *Appendix A: Icons*.

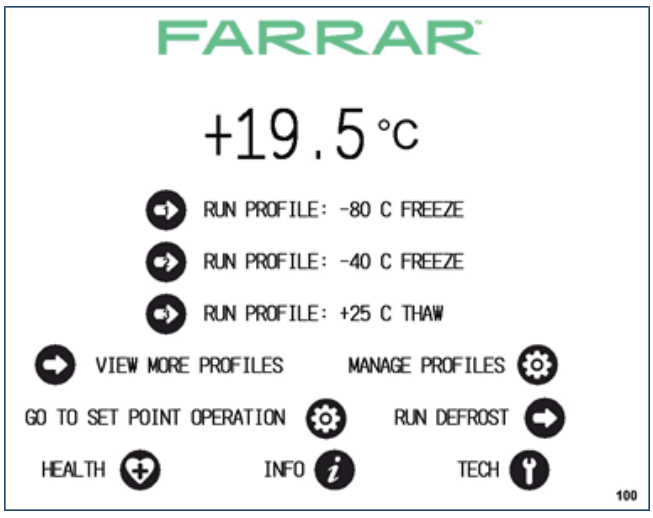


Figure 15: Home screen

Note: All settings may be returned to factory default settings.
Note: Operator privileges or higher are required to make changes to any of the controller settings. User access will return to view-only if the controller is left unattended for more than 5 minutes.

Running a Temperature Profile

The 4000-LC Series Controlled Rate Chamber is configured for six independent, programmable temperature profiles that can be selected via the HOME screen. The factory temperature profiles are programmed to bring the unit to a specific temperature (or set point) as quickly as possible and maintain that temperature until the user stops the profile.

The factory default set points for each temperature profile are as follows:

- **Profile 1**: -80°C
- **Profile 2**: -40°C
- **Profile 3**: +25°C
- **Profile 4**: Spare
- **Profile 5**: Spare
- **Profile 6**: Demo sample (-40°C and -80°C)

The unit can also perform controlled rate temperature ramp and soak processes over the course of several minutes, hours, or days, depending on product need.

Complete the following steps to run a temperature profile:

1. From the **HOME** screen, press the right arrow labeled with the number that corresponds with the desired temperature profile.

2. The **RUN PROFILE** screen will display. The on-screen text will indicate whether the temperature profile is waiting to run or is running.

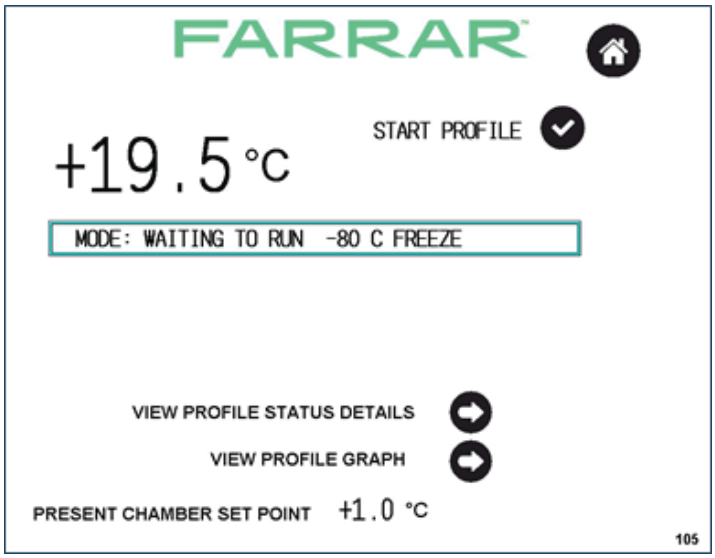


Figure 16: Run Profile screen

Press the checkmark to display the **BATCH NAME** menu. Use the on-screen keyboard to create a batch file name. This name will be used to create a data logging file. For more information on downloading data logs, refer to the **Download Data Logs** from the Unit section of this manual.

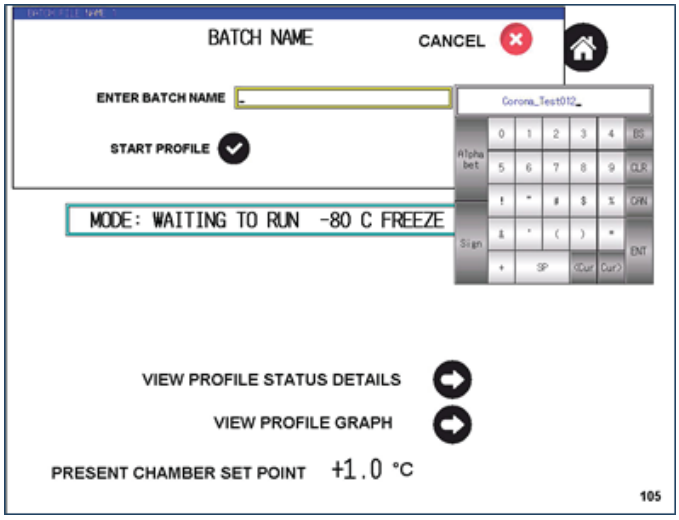


Figure 17: Batch Name menu

4. After naming the batch file, press the checkmark to start the temperature profile. To clear the file name and return to the **RUN PROFILE** screen, press the red **CANCEL** icon .

5. After starting the temperature profile, the **STOP PROFILE** screen will display. Press the red **STOP PROFILE** icon to cancel any process that is currently running, disable all refrigeration systems, and return the unit to the **OFF** state. A confirmation screen will display before the profile is terminated.

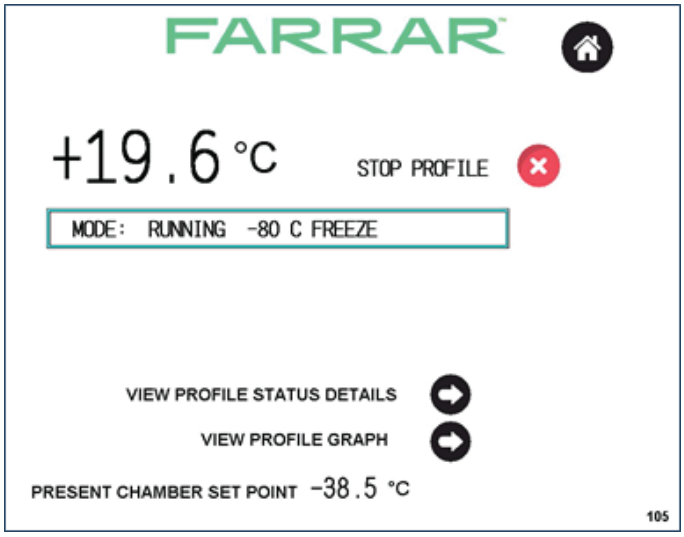


Figure 18: Stop Profile screen

6. Press the upper right arrow to view the **PROFILE STATUS DETAILS** screen. This screen will display information about the current temperature profile, including the current step, a description of the current step, and the current temperature of the sample (if a sample probe has been installed).

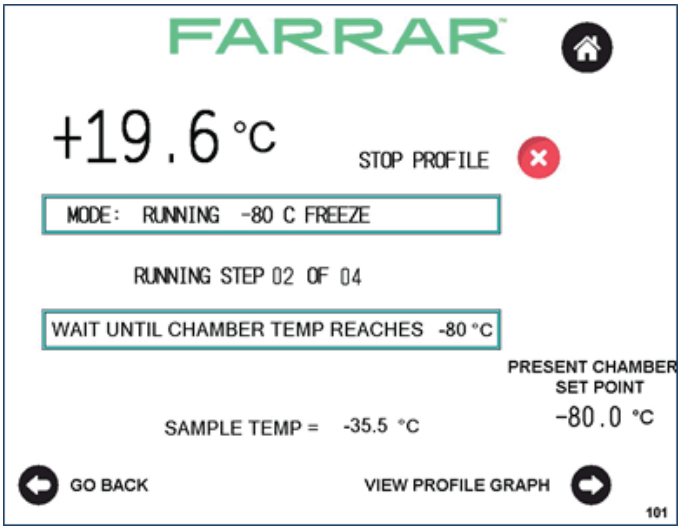


Figure 19: Profile Status Details screen

7. From the PROFILE STATUS DETAILS screen, press the right arrow to view the TREND GRAPH of the current profile. A line graph will display the following metrics:
    - Red line: The chamber temperature.
    - Green line: The product sample temperature (if a sample probe has been installed).
    - The length of time that has passed (in minutes) since the temperature profile started.
    - The batch name.

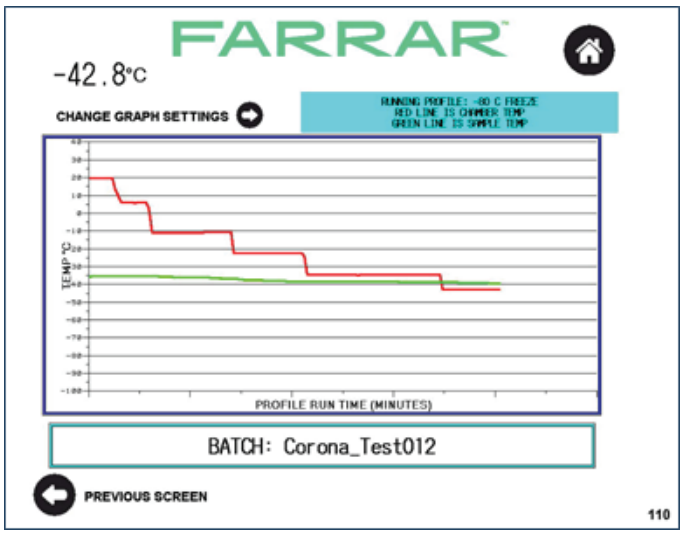


Figure 20: Trend Graph

8. Press the right arrow to display the **GRAPH SETTINGS** menu. From here, the user can change the horizontal and vertical scales of the graph.

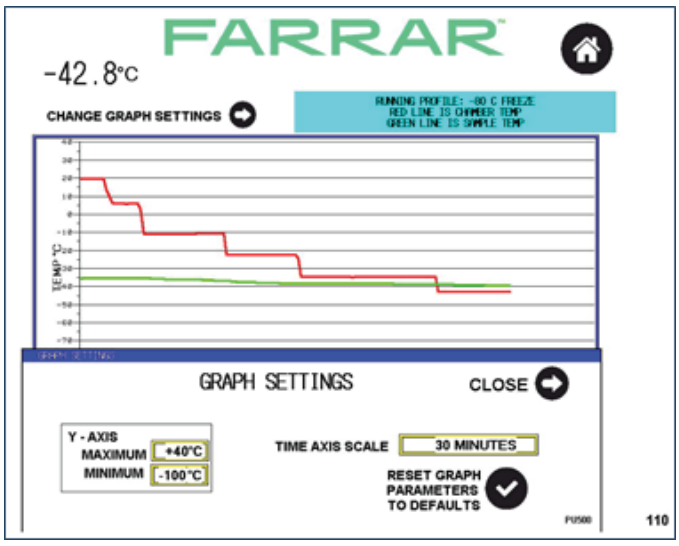


Figure 21: Graph Settings menu

9. Press the house icon to return to the HOME screen.

Running a Defrost Cycle

A defrost cycle is a specific profile that removes ice buildup on the surface of the evaporator coil. Defrosting the evaporator coil is only required after the unit completes a freeze cycle at a chamber temperature at or below 5°C.

Note: The defrost cycle only clears the evaporator coil. It does not defrost the chamber. Refer to the General Maintenance section for information on defrosting the chamber.

Complete the following steps to begin a defrost cycle:

1. Remove all product from the control space.
   From the **HOME** screen, press the right arrow labeled "Run Defrost."
2. The **START DEFROST** screen will display. The on-screen text will display the current temperature of the evaporator coil and the chamber.

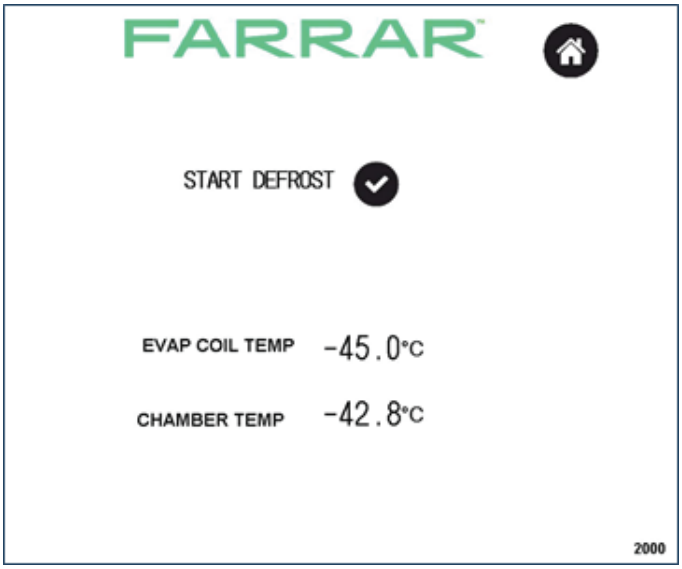


Figure 22: Start Defrost screen

4. Press the checkmark to start a defrost cycle. The defrost cycle will continue until the temperature of the evapo rator coil warms to +20°C.

5. After starting the defrost cycle, the **STOP DEFROST** screen will display. Press the red **STOP DEFROST** to immedi ately terminate the defrost cycle.

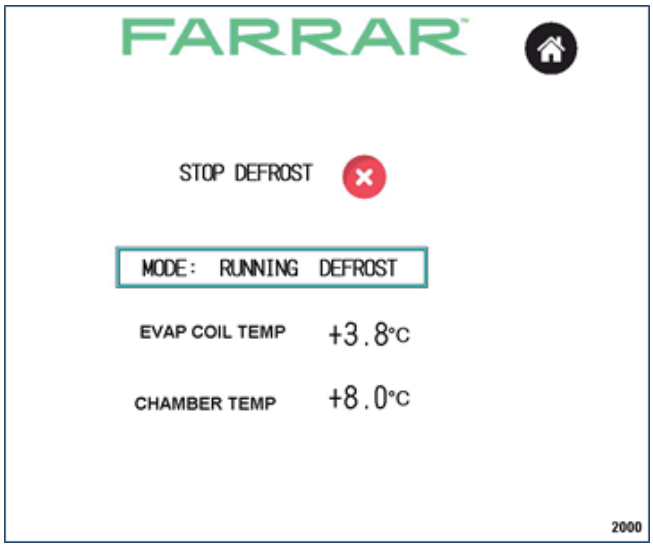


Figure 23: Stop Defrost screen

6. Press the house to return to the **HOME** screen.

Manual Set Point Operation

The 4000-LC Series Controlled Rate Chamber allows the user to manually change the set point of the chamber. When the set point is changed in this way, the unit will maintain the selected temperature until the operation is stopped.

Complete the following steps to manually change the set point of the chamber:

1. From the **HOME** screen, press the gear labeled "Go To Set Point Operation."

2. The **SET POINT OPERATION** screen will display. The on-screen text will display the current temperature of the chamber, the current set point, the high temperature alarm set point, and the low temperature alarm set point.

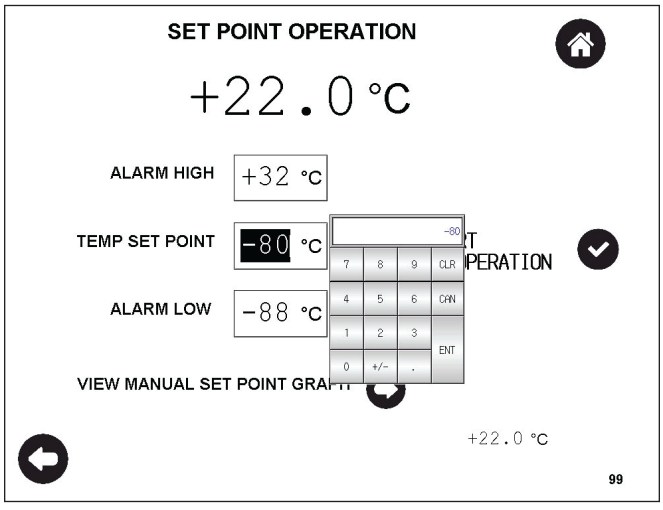


Figure 24: Set Point Operation screen

3. To edit the value of a set point, touch the box that contains the value. A numerical keypad will display. Enter the desired value and press ENT to save.

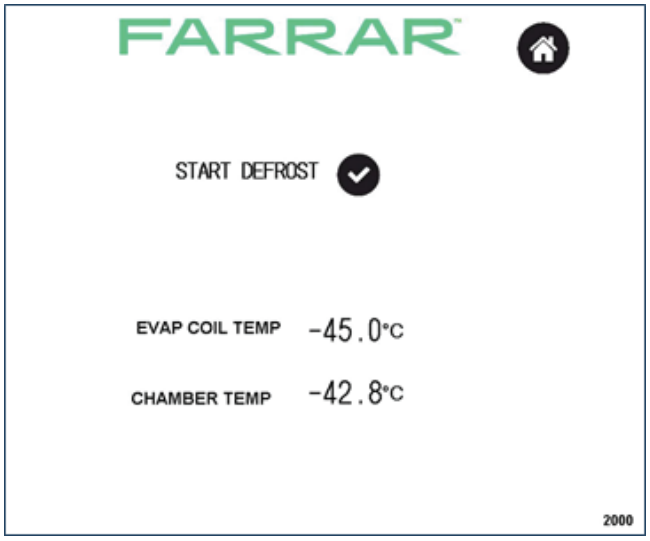


Figure 25: Set Point Operation screen with keypad

4. Press the checkmark to start the **SET POINT OPERATION** and change the temperature of the chamber.
5. Press the house to return to the **HOME** screen.

Customizing Temperature Profiles

A temperature profile is made by configuring sequential steps that either change the temperature set point of the air in the chamber or maintain a previously defined set point. Each profile begins with that profile's start step and ends with a step type that either turns the unit off or holds a specific temperature until a user causes the unit to cease operation.

Complete the following steps to customize temperature profiles and steps:

1. From the **HOME** screen, press the gear labeled "Manage Profiles."
2. The **MANAGE PROFILES** screen will display.

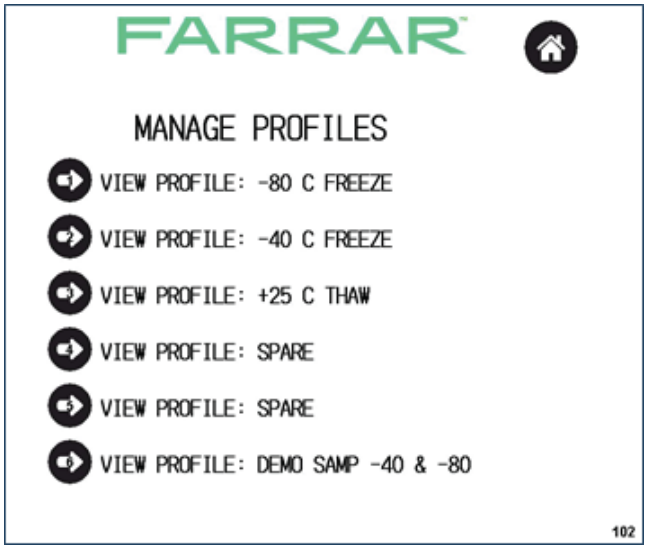


Figure 26: Manage Profiles screen

3. To view and edit a temperature profile, press the right arrow labeled with the number that corresponds with the desired temperature profile.

4. The STEP LIST for the selected temperature profile will display. This screen lists a step-by-step listing of the tempera ture profile.

   Note: There are a total of 20 steps per profile. To view additional steps, press the right arrow labeled "View More Steps."

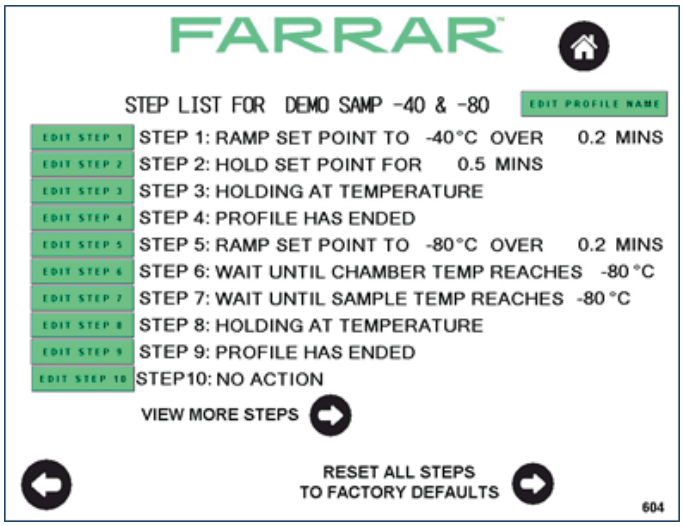


Figure 27: Step List (Profile 6)

5. To edit a step, press the corresponding **EDIT STEP** button for that step. The **EDIT STEP** menu will display.

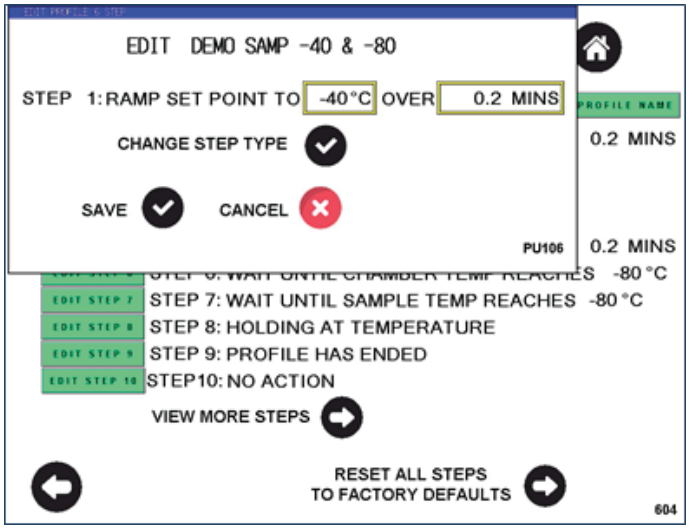


Figure 28: Edit Step menu

6. To edit a value of a step, touch the box that contains the value. A numerical keypad will display. Enter the desired value and press **ENT** to save.

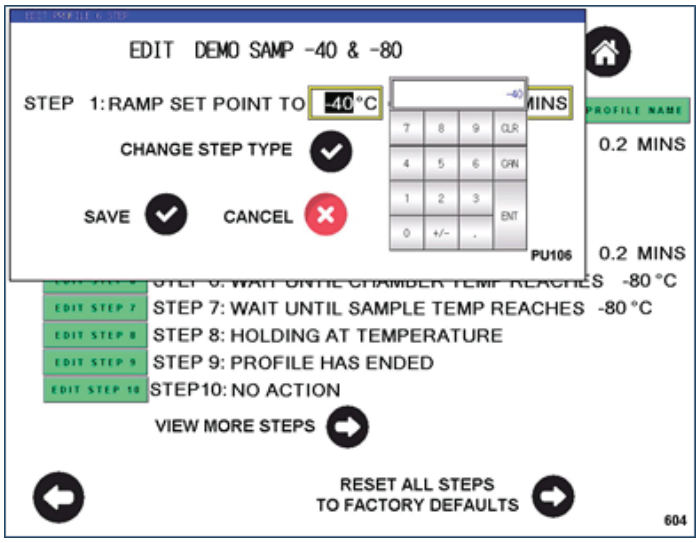


Figure 29: Edit Step menu with keypad

7. To change the function of a step, press the checkmark labeled "Change Step Type." The **CHANGE STEP TYPE** menu will display.

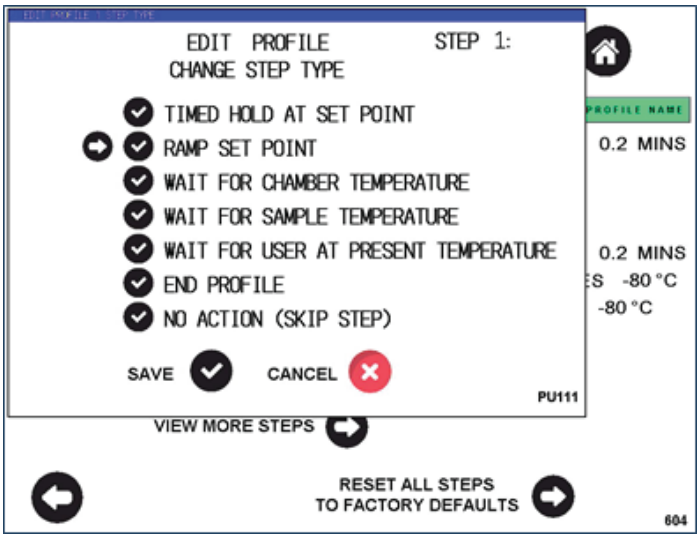


Figure 30: Change Step Type menu

8. Press the checkmark next to the desired step type (see step options listed under "change step type" in Figure 31).

9. Press the checkmark labeled "Save" to confirm the change and return to the **STEP LIST**.
To reset all steps to their factory default, return to the **STEP LIST** and press the right arrow labeled "Reset All Steps to Factory Defaults."

10. Press the house icon to return to the HOME screen.

System Health

The SYSTEM HEALTH screen displays the operating status of the unit.

Complete the following steps to check the operating status of the unit:

1. From the **HOME** screen, press the heart icon labeled “Health.”
2. The **SYSTEM HEALTH** screen will display.

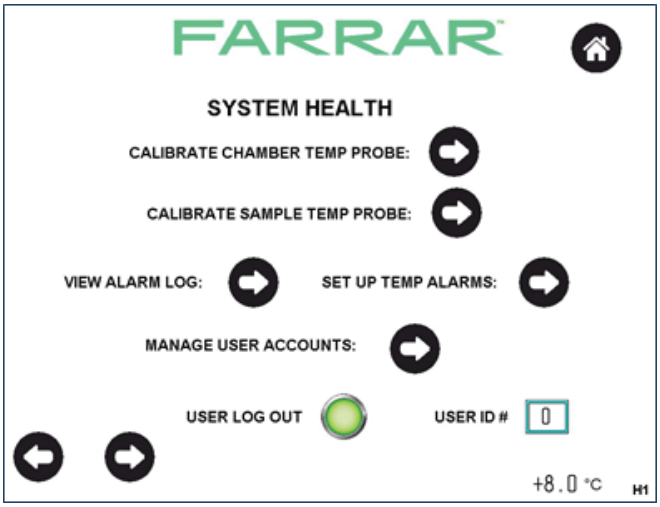


Figure 31: System Health screen

3. Touch the right arrow labeled “View Alarm Log” to view a list of all the alarms that have occurred on the system. Refer to the View Alarm Log section of this manual for more information.
4. Press the house icon to return to the **HOME** screen.

Alarms and Security

The 4000-LC Series Controlled Rate Chamber is programmed with two automatic over-temperature alarms:

- **Control Probe Alarm**: Shuts down the unit if the control probe reaches or exceeds 45°C.
- **Evaporator Alarm**: Shuts down the unit if the evaporator reaches or exceeds 65°C.

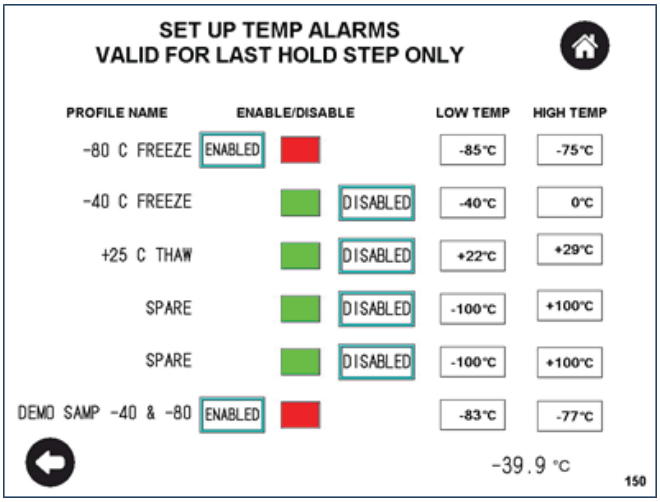


Figure 32: Temperature Alarm screen

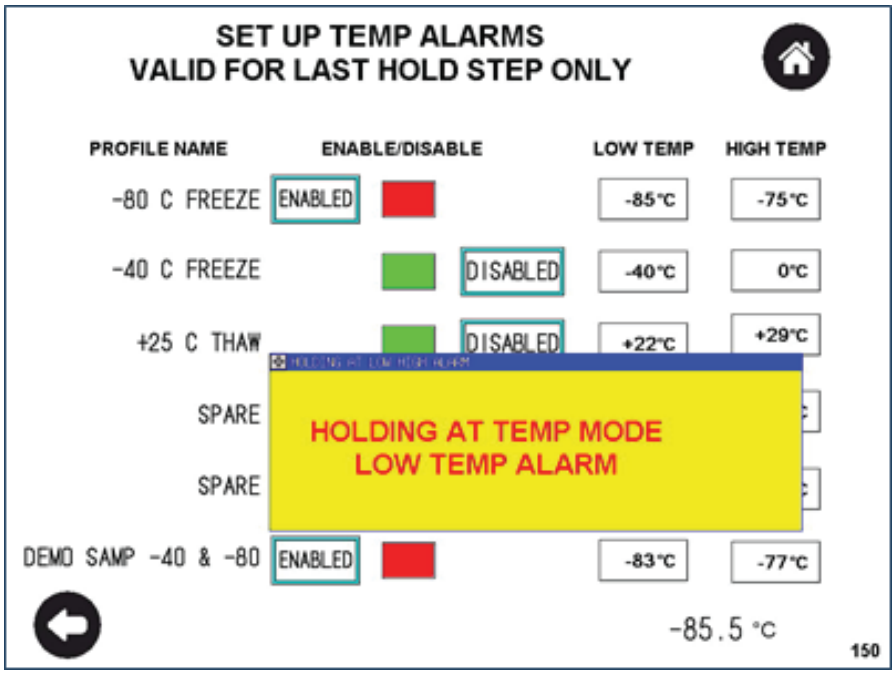


Figure 33: Control Probe (Low Temperature) Alarm screen

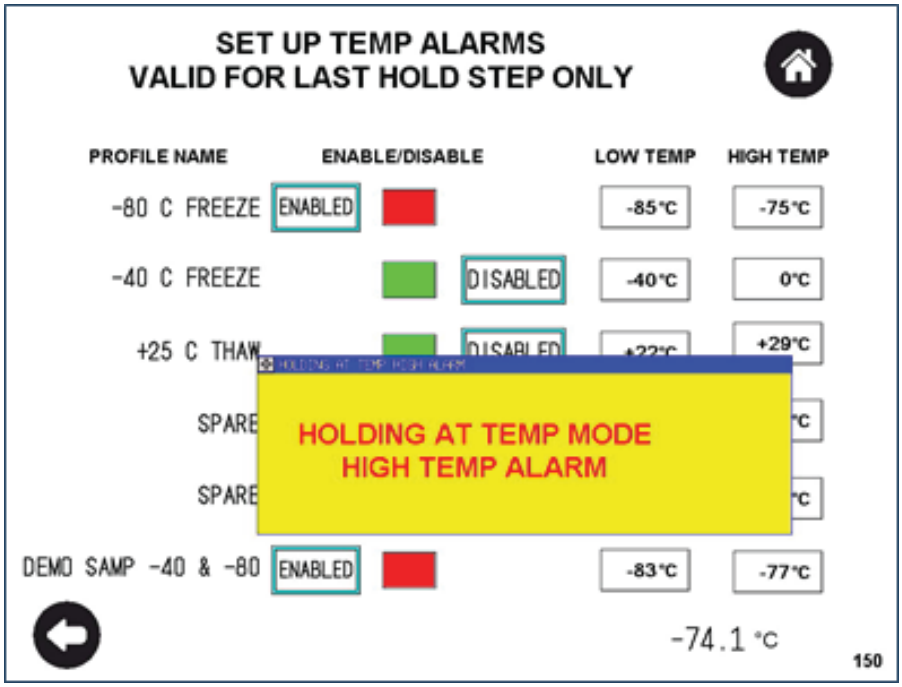


Figure 34: Evaporator (High Temperature) Alarm screen

Door Open Alarm Setup

The 4000-LC Series Controlled Rate Chamber will sound an alarm if a door is opening while a profile or defrost cycle is running.

Viewing the Alarm Log

The **ALARM LOG** screen shows all current and previous alarm conditions detected by the control system.

1. From the **HOME** screen, press the heart icon labeled “Health.”
2. The **SYSTEM HEALTH** screen will display.

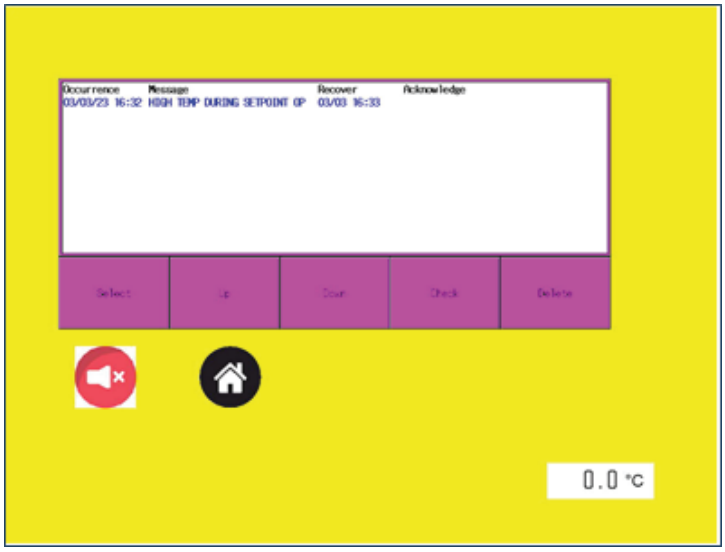


Figure 35: Alarm Log

Information logged with each alarm includes:

- **Occurrence**: Shows the date and time when the alarm occurred.
- **Message**: Lists the specific alarm that occurred.
- **Recover**: Shows the date and time that the alarm stopped.
- **Acknowledge**: Shows the date and time that the alarm was acknowledged by an operator.

The icons below the alarm list allow the operator to manage the alarm log as follows:

- **Select**: Touch this icon to begin the selection of a specific alarm item.
- **Up**: Touch this icon to scroll up the list of alarms.
- **Down**: Touch this icon to scroll down the list of alarms.
- **Check**: Touch this icon to acknowledge a specific alarm. The Acknowledge column will populate with the current date and time.
- **Delete**: Touch this icon to delete the specific alarm item that is selected.

The remaining two buttons on this screen have the following functions:

Silence Audible Alarm. Silences any current audible alarm.

Home Screen. Closes the **ALARM LOG** screen and returns to the **HOME** screen.

Probe Calibration

The chamber and sample temperature probes can be calibrated to maintain accuracy.

Complete the following steps to calibrate the chamber temperature probe:

1. From the **SYSTEM HEALTH** screen, press the right arrow labeled “Calibrate Chamber Temp Probe.”
2. The **CHAMBER TEMPERATURE CALIBRATION** screen will display. The on-screen text will indicate the current temperature of the chamber, the desired temperature of the probe, and the present offset.

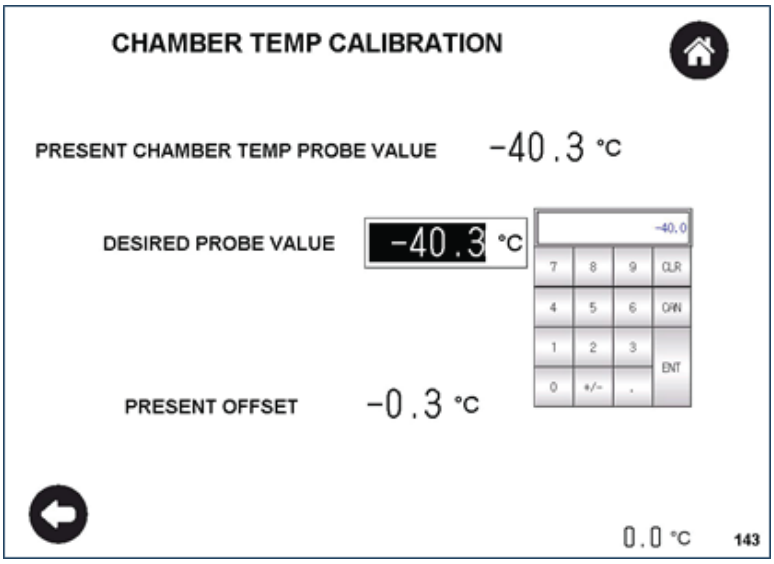


Figure 36: Chamber Temperature Calibration screen

3. To edit the desired probe value, touch the box that contains the value. A numerical keyboard will display. Enter the chamber actual temperature per your independent temperature standard and press **ENT**.
4. The present offset will recalculate and indicate the difference between the current chamber temperature and the desired temperature of the probe.
5. Press the house icon to return to the **HOME** screen.

Complete the following steps to calibrate the sample temperature probe:

1. Ensure that a sample temperature probe is installed prior to calibration.
2. From the **SYSTEM HEALTH** screen, press the right arrow labeled “Calibrate Sample Temp Probe.”
3. The **SAMPLE TEMPERATURE CALIBRATION** screen will display. The on-screen text will indicate the current temperature of the sample temperature probe, the desired temperature of the probe, and the present offset.

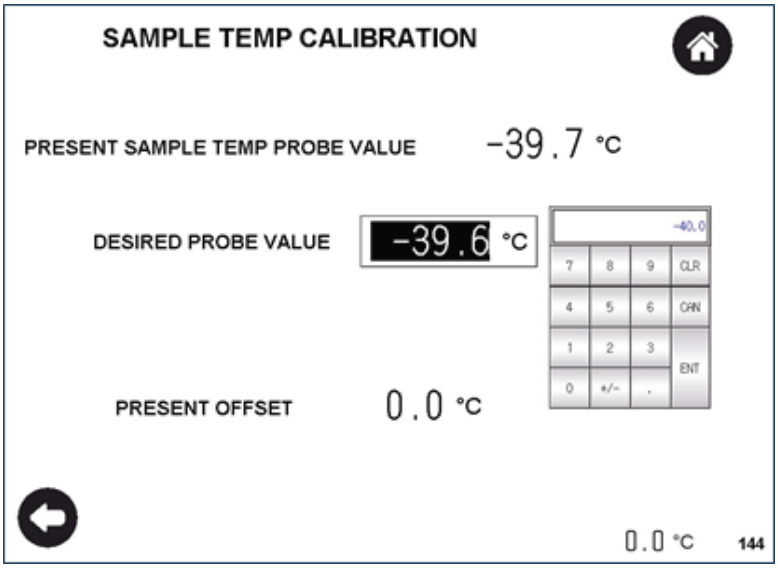


Figure 37: Sample Temperature Calibration screen

4. To edit the desired probe value, touch the box that contains the value. A numerical keyboard will display. Enter the chamber actual temperature per your independent temperature standard and press **ENT**.

.

5. The present offset will recalculate and indicate the difference between the temperature being read by the sample probe and the desired temperature reading.

6. Press the house icon to return to the **HOME** screen.

Managing User Accounts

Virtually all functions of the unit will require the user to log in with a username and password. Selecting any function that requires a security login will cause the **SECURITY LOGIN** screen to display.

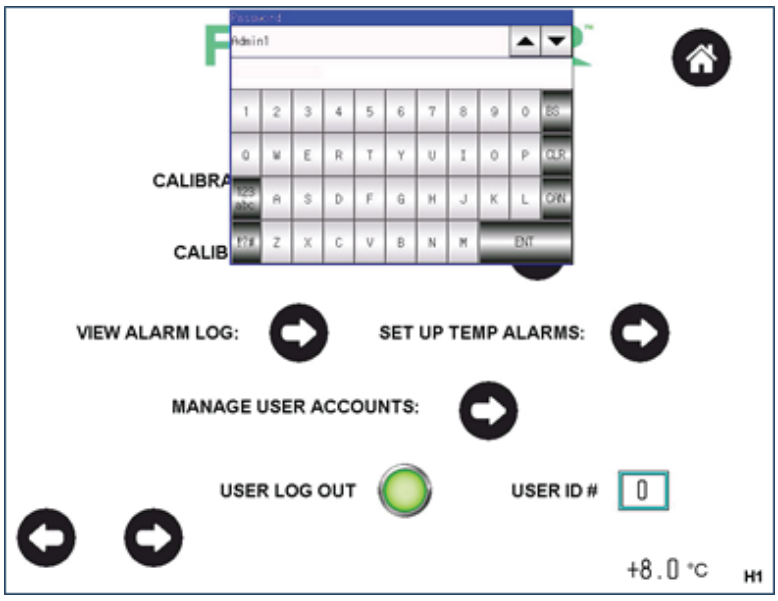


Figure 38: Security Login screen

From the **SECURITY LOGIN** screen, the user must use the up and down arrow keys to locate their username. The user must then enter their personal password and press ENT.

Note: Only users who could potentially have access to the selected function will be included in the list of usernames.

A valid login will only accept the user as the current operator of the unit. After a successful login, the user must press the selected function a second time to navigate to or perform the selected action.

Note: A maximum of 15 user accounts may be stored in each unit.

Each user account must be assigned one of three security levels: Operator, Supervisor, and Administrator. Refer to the Security Levels and Functions table to learn more about the general functions of each security level.

Security Levels and Functions

Blower Motor	Operator	Supervisor	Administrator
View and acknowledge alarms	✓	✓	✓
Start and stop	✓	✓	✓
Manual control		✓	✓
Navigate HMI	✓	✓	✓
Navigate trends	✓	✓	✓
Start and stop manual defrost control		✓	✓
Change unit settings			✓
Perform administrative functions			✓

In addition to the general security levels, numbered security levels (see these shown on Figure 39) are available for each temperature profile. These security profiles are named PROFILE n OP (where “n” is the profile number) and allow the user to start and stop the indicated temperature profile.

Complete the following steps to manage user accounts:

1. From the **SYSTEM HEALTH** screen, press the right arrow labeled “Manage User Accounts.”
2. The **USER ACCOUNT** screen will display.

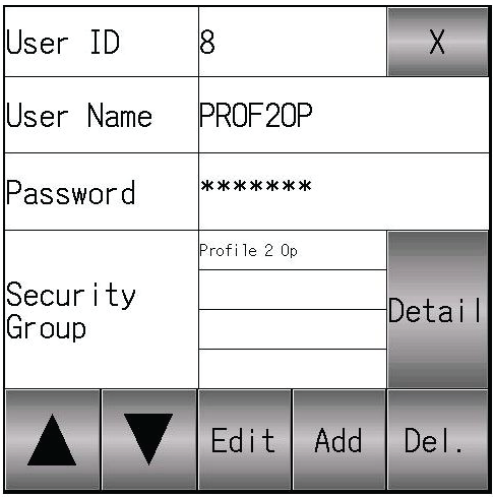


Figure 39: User Account screen

Updating an Existing User Account

1. To edit an existing account, press the up and down arrow keys to scroll to that account and press **Edit**. The account information will be displayed.
2. After opening a specific account, make changes to the account as required. For example, to change the account's **Security Group**, press **Change**.
3. The **SECURITY GROUPS** screen will display. Select the security groups required for the account and press **Close**.
4. After selecting the appropriate security group, press **OK**. A message will indicate that the changes have been saved.
5. Press **OK** to return to the **USER ACCOUNT** screen.

Adding a New User Account

1. To add a new user account, press **ADD** on the **USER ACCOUNT** screen. A blank user account will display.
2. To create a username, press the **USERNAME** field.
3. A keypad will display. Enter the new account username and press **ENT** to return to the account.
   Note: Selection buttons are located on the left side of the keypad for lowercase letters, numbers, and symbols.
4. To create a password, press the **PASSWORD** field. A keypad will display. Enter the password and press **ENT** to return to the account.
5. To assign security levels to the account, press the Change field. The **SECURITY GROUPS** screen will display.
6. Select the **Security Group** for the user as previously described. After selecting the **Security Group**, press **Close** to return to the account.
7. After all the account information has been entered, press **OK**.
8. A confirmation message will display, confirming that the account has been saved. Press OK to return to the **USER ACCOUNTS** screen.

Unit Information

Unit information, such as the electrical requirements, refrigerant types and amounts, serial number, operating pressure, date of manufacture, and software version can be accessed via the **INFORMATION** screen.

To view the **INFORMATION** screen, press the info icon on the **HOME** screen.

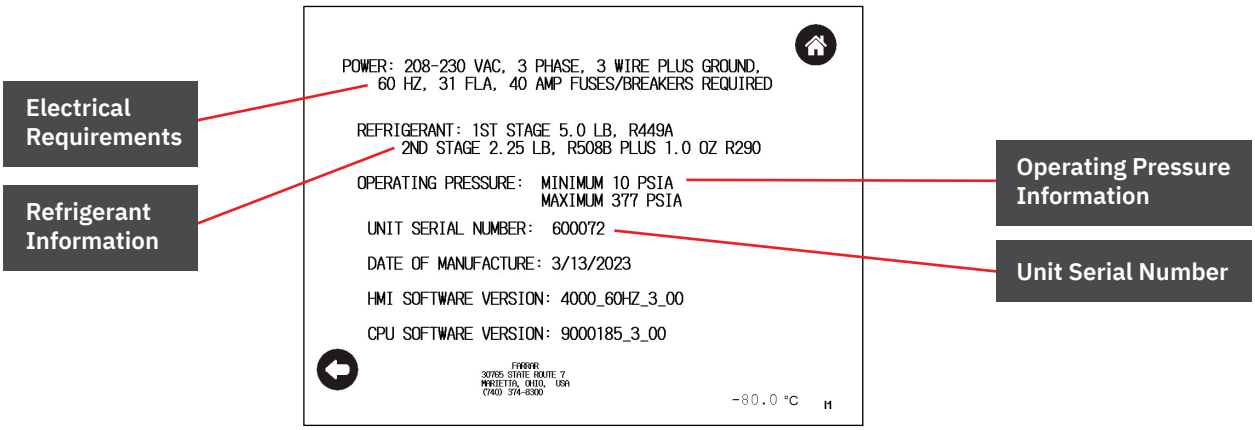


Figure 40: Information screen

Changing System Settings

Note: Administrator privileges are required to change system settings.

1. To access the system settings, press and hold the upper left corner of any screen on the HMI for at least five seconds. The hidden **MAINTENANCE** screen will be displayed.

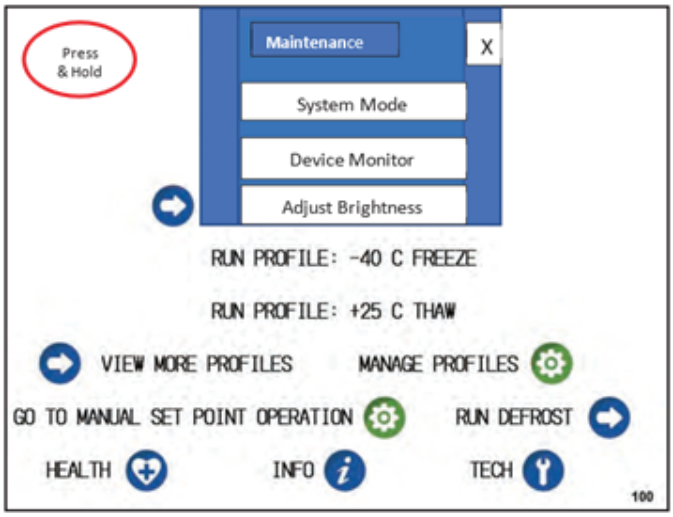


Figure 41: Maintenance screen

2. Touch the **SYSTEM MODE** icon to display a login screen. Enter your username and password and select **ENT**.

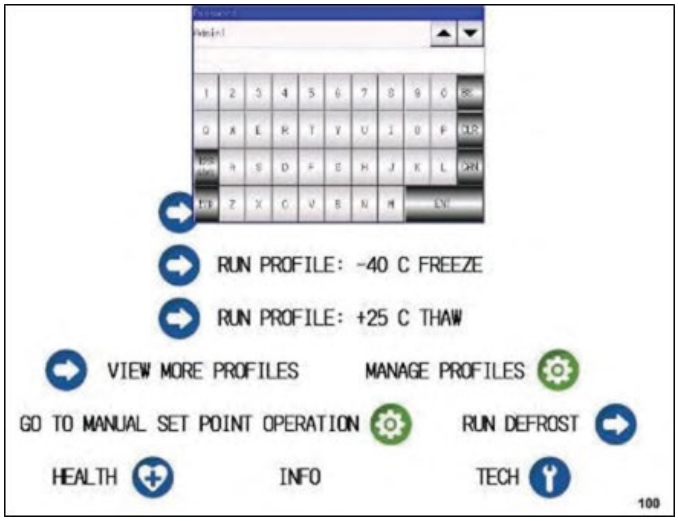
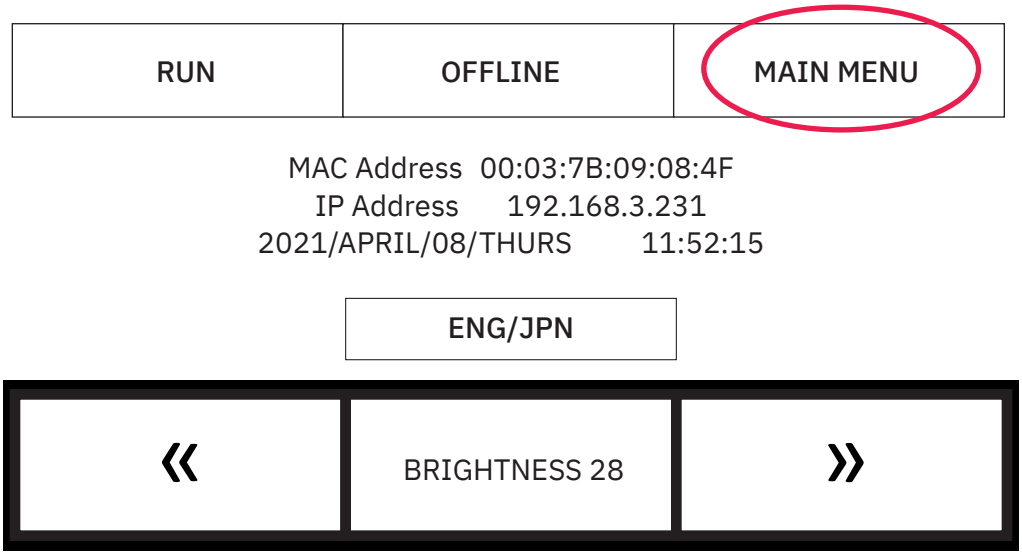


Figure 42: Maintenance login screen

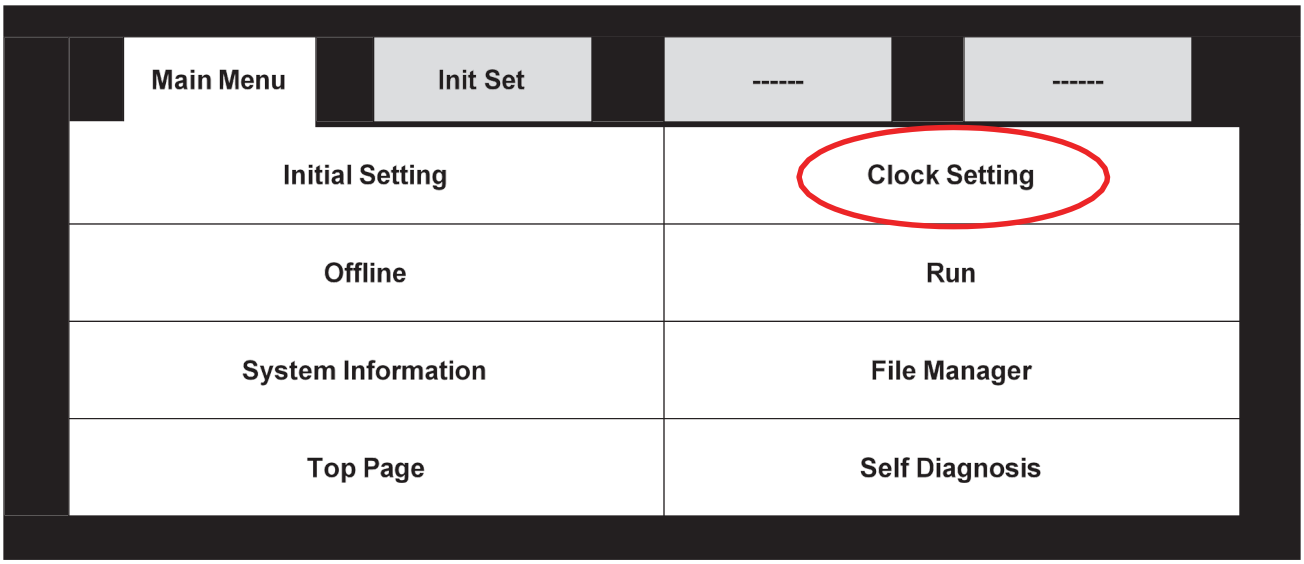
3. After a successful login, the **SYSTEM MODE** screen will display. Press the **MAIN MENU** icon.

SYSTEM MODE TOP PAGE



Changing the System Clock

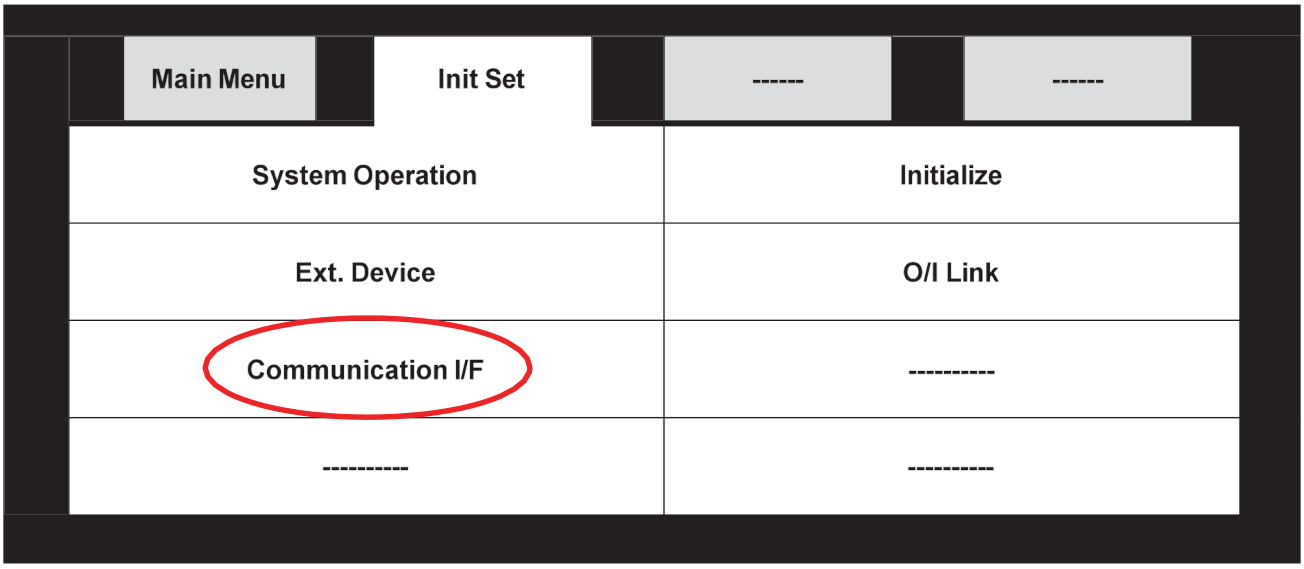
1. From the **MAIN MENU** screen, press **CLOCK SETTING**.



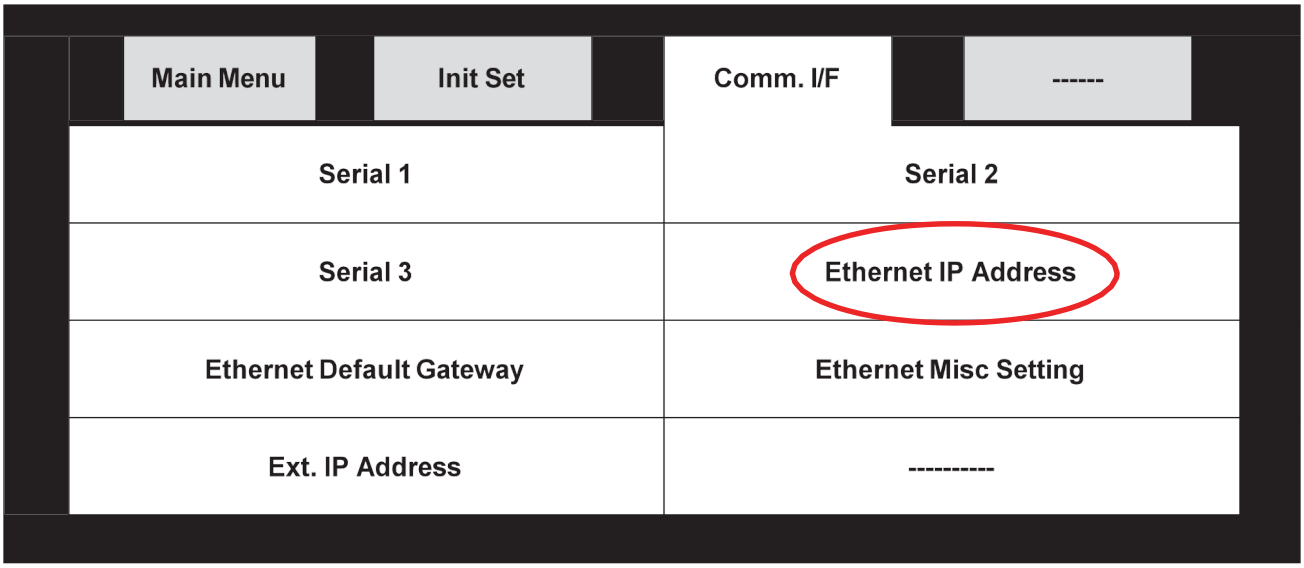
2. Use the keypad and left and right arrow keys to enter the desired date and time.
3. Press **SAVE** to return to the **MAIN MENU** screen.

Changing the IP Address

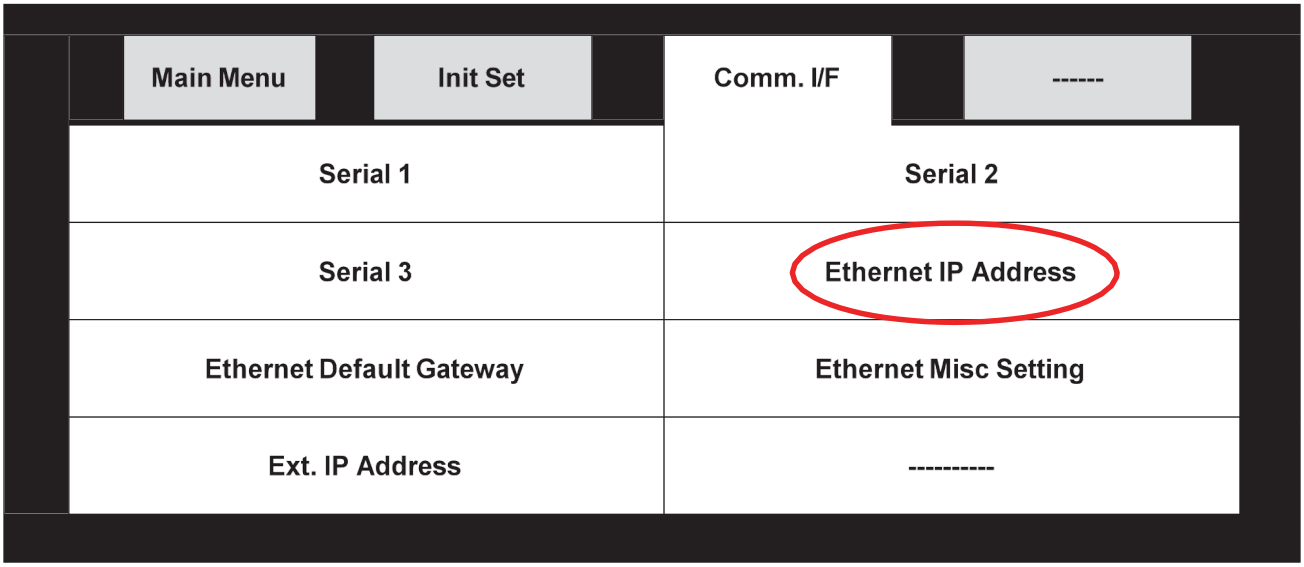
1. From the **MAIN MENU** screen, press the **INIT SET** tab. The Initial Setting menu will be displayed.



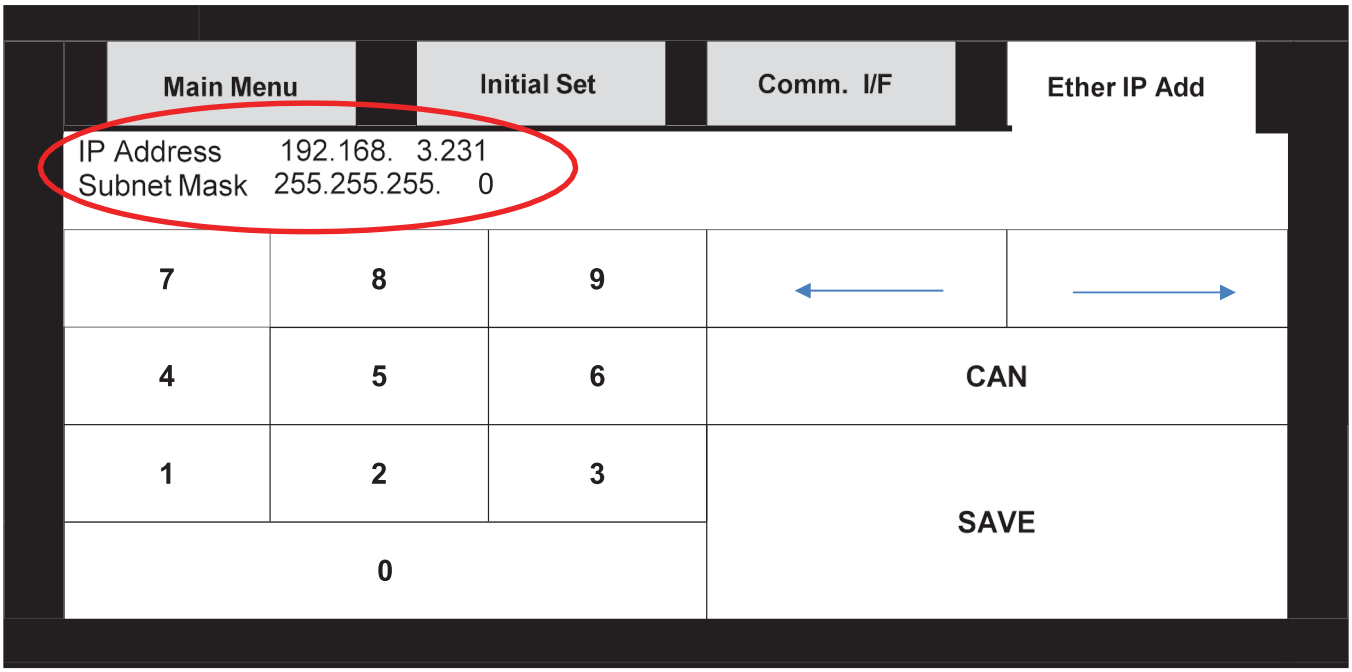
2. Press the **COMMUNICATION** I/F button to open the Communication I/F menu.



3. Press **ETHERNET IP Address** to open the Ethernet IP Address page.



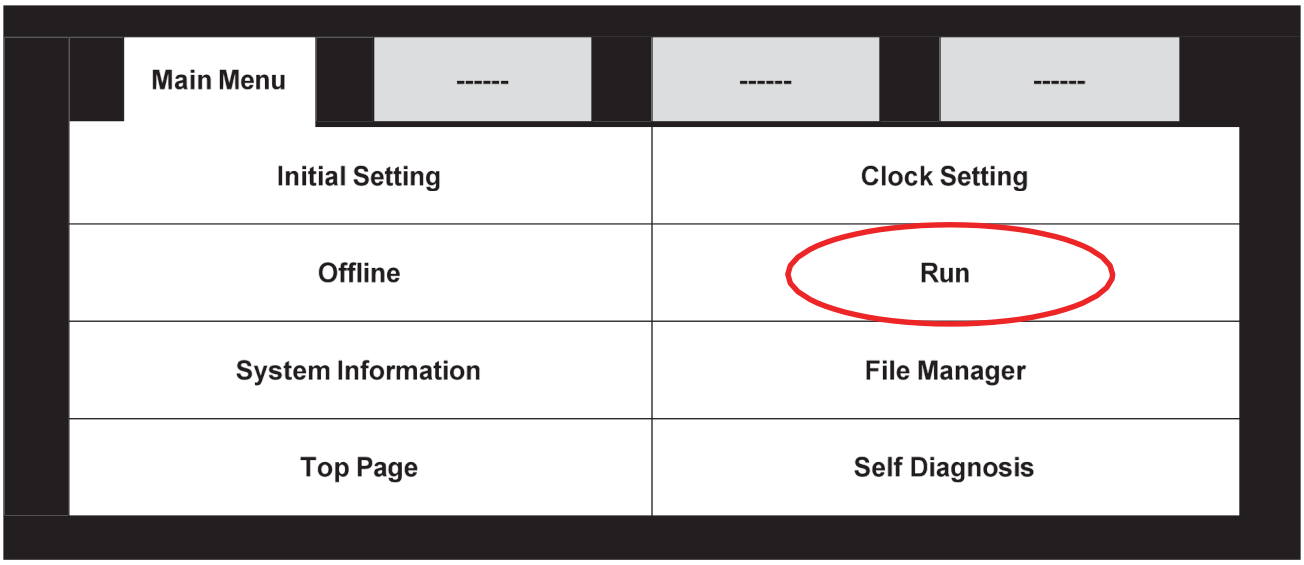
4. On the Ethernet IP Address page, use the keypad to enter the desired IP address and press **SAVE**.



Note: The chosen IP address must fall within the 192.168.3.xxx subnet to allow for proper communication with the PLC CPU. The IP Address for the CPU is 192.168.3.252, and this address cannot be used by any other device on the network, including the display. Please contact FARRAR tech support if a different IP address subnet is required.

Returning to Normal Operation

1. To return to normal operation from any hidden screen, press **MAIN MENU**.
2. From the **MAIN MENU** screen, press **RUN**. This will return the display to the HOME screen.



INTERFACING WITH THE 4000-LC SERIES CONTROLLED RATE CHAMBER

The 4000-LC Series Controlled Rate Chamber can interface with computers and network devices. The computer or network device must have ethernet access. In addition, a Cat 5 ethernet cable or better is required.

Before interfacing with the unit, connect the computer to the RJ-45 jack located on the back of the unit (next to the remote alarms contact box).

Figure 43: RJ-45 jack

Setting the BACnet and Modbus Parameters

The 4000-LC can communicate with external devices, such as Building Automation Systems (BAS), using either BACnet/IP or Modbus TCP protocols. An Ethernet connection is available on the back of the unit for connection to the customer network.

The customer can set up the parameters required for connection to these devices within the Technical screens. Note that the user must have Administrator, Engineer, or Supervisor security privileges to change any of the connection settings.

First, navigate through the technical screens to “Technical Screen” #4. (See figure below.)

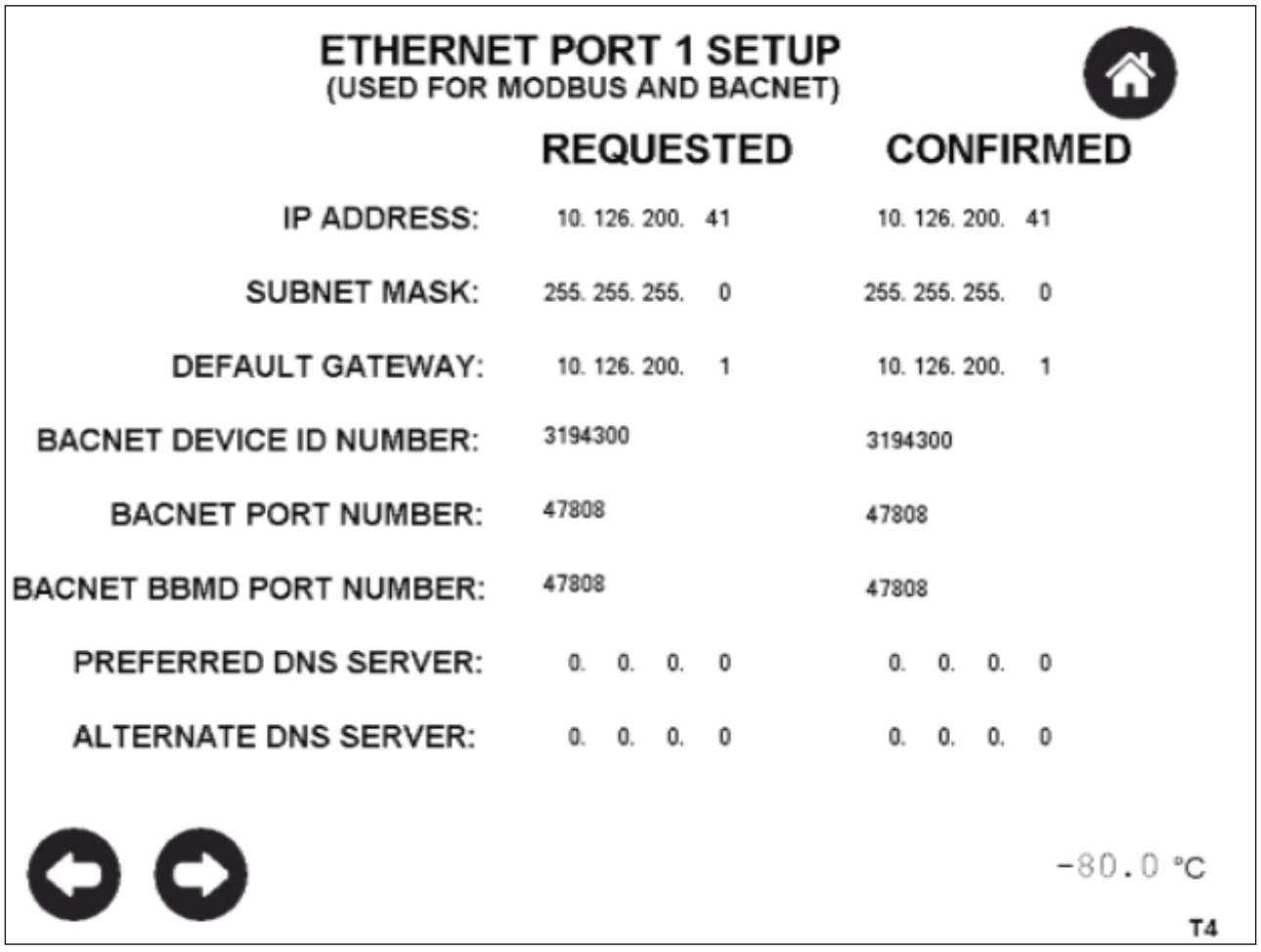
On this screen, change the IP address, Subnet mask, and Default Gateway (if any) to match the subnet of the network that the unit is connecting to. These selections should be made under the “Requested” column of the screen. The values in the “Confirmed” column verify that the settings were properly stored by the unit.

For BACnet communication, customers may set the BACnet Device ID and BACnet Port Number to any valid number, as defined by the BACnet standard. The unit is shipped with default values as shown in the figure below.

The BACnet protocol also allows the unit to act as a “Foreign Device,” using BBMD. The IP Address will be the same as that set up previously, but a different Port Number can be selected for BBMD operation, although this can be the same as the direct Port Number.

All BACnet points are preloaded into the firmware. These points can be automatically discovered by the appropriate external interface application.

For Modbus communication, each point must be manually created within the Modbus application being used by the customer. Contact FARRAR Technical Support for more details on the available points and registry list for the Modbus protocol.



Downloading Data Logs from the Unit

To download data logs from the unit, the utility application Data File Manager must be installed on the connected computer. The USB flash drive included with the unit contains installation files for Data File Manager. The installation files are also available via FARRAR technical support.

Note: Administrator privileges or higher are required to download data logs from the unit.

Complete the following steps to download files from the unit:

1. After connecting the unit to the computer, open the Data File Manager application on the computer. A new window will open.

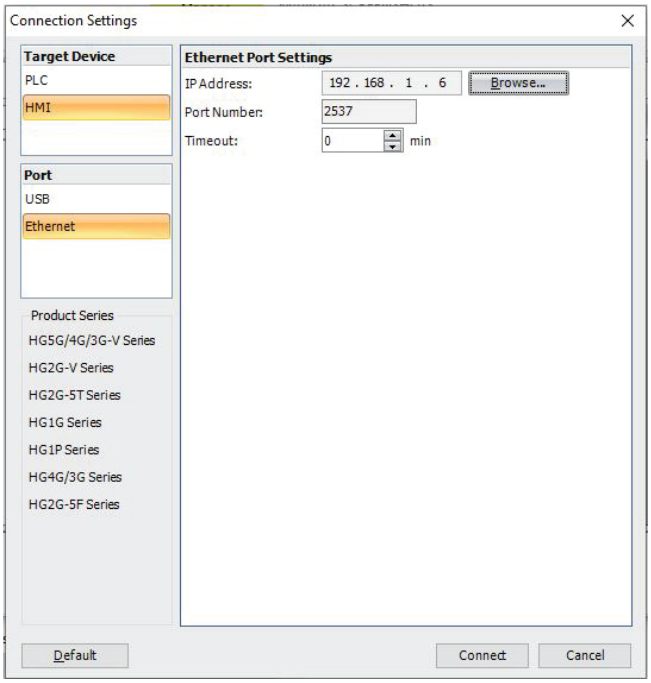


Figure 44: Data File Manager application

2. Note the IP address in the Data File Manager window. The default IP value will match the address of the unit the user is connecting to. If the IP address of the HMI is different than this, click on the “Browse” button.
A window will appear which lists all the saved IP addresses.

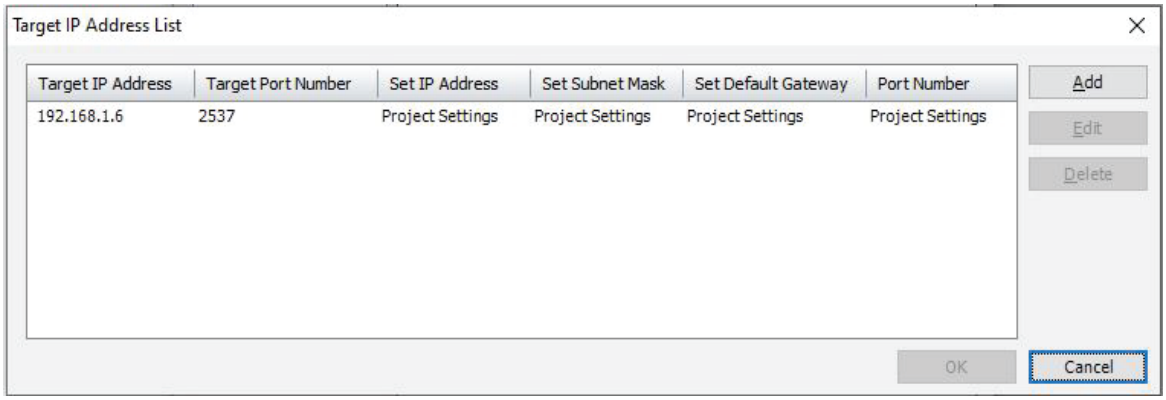


Figure 45a: List of all Saved IP Addresses

3. If the IP address of the HMI is shown, proceed to step 5 below.
   If the IP address of the HMI is not shown, click on the “Add” button.
   A window will appear on which you can add the IP address of the HMI. Note that you should only change the “Target IP Address” settings. Leave the rest of the settings in this window as they are. After entering the IP address, click on “OK.”

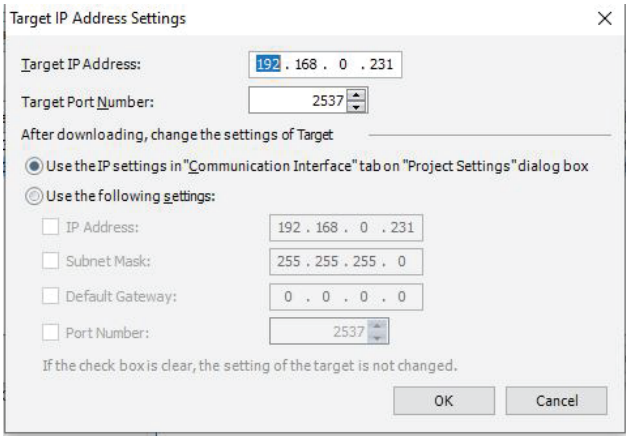


Figure 45b: Adding a new IP address

4. After entering the IP address, click on “OK.” The list of saved IP addresses will appear.

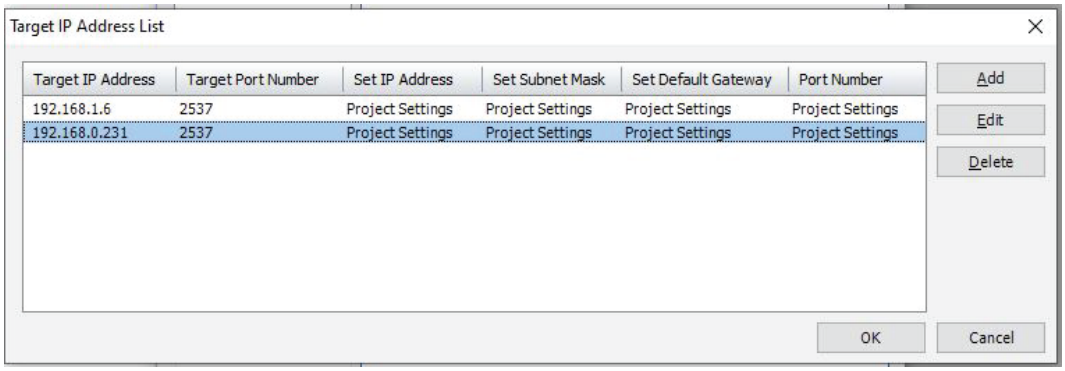


Figure 45c: List of all Saved IP Addresses with new address added.

5. Click on the IP address of the HMI to be accessed. Then click “OK.”
6. The connection screen will appear, with the selected IP address shown.

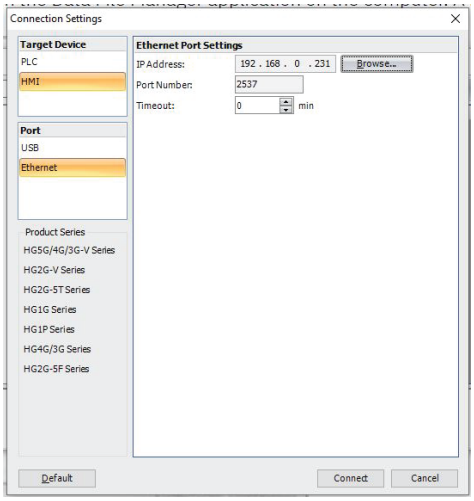


Figure 45d: Connection Settings

7. Select “Connect.” This will connect the computer to the unit.

Right select the data log and select “Upload File or Folder.” A new window will open and request a location to upload the data log to. Select a file path that can be accessed by the computer.

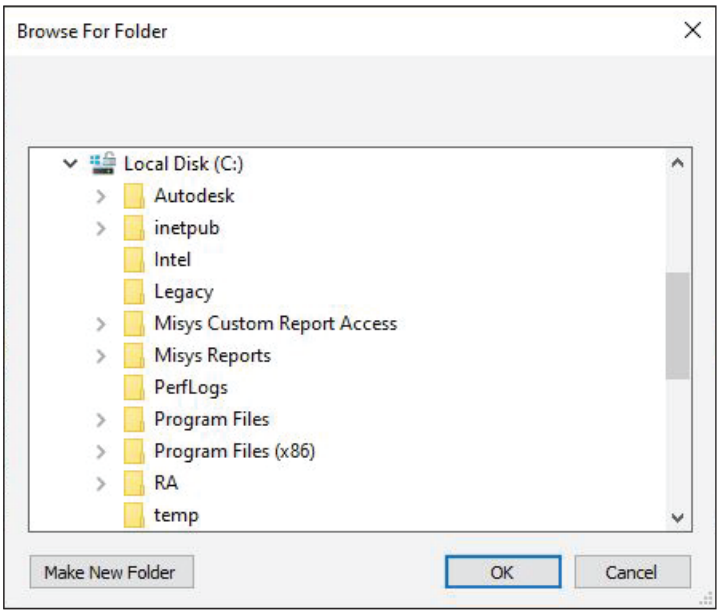


Figure 46: Data File Manager Upload Location

8. Select the desired file upload path and select “OK.” A new window will open and request a username and password.

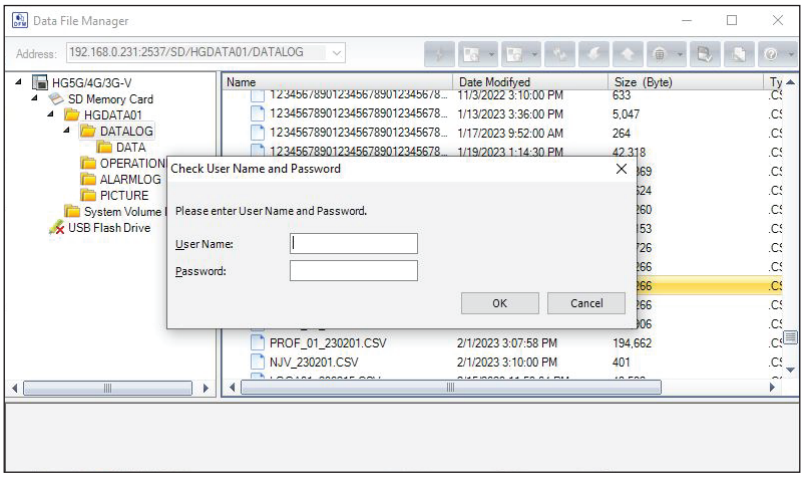


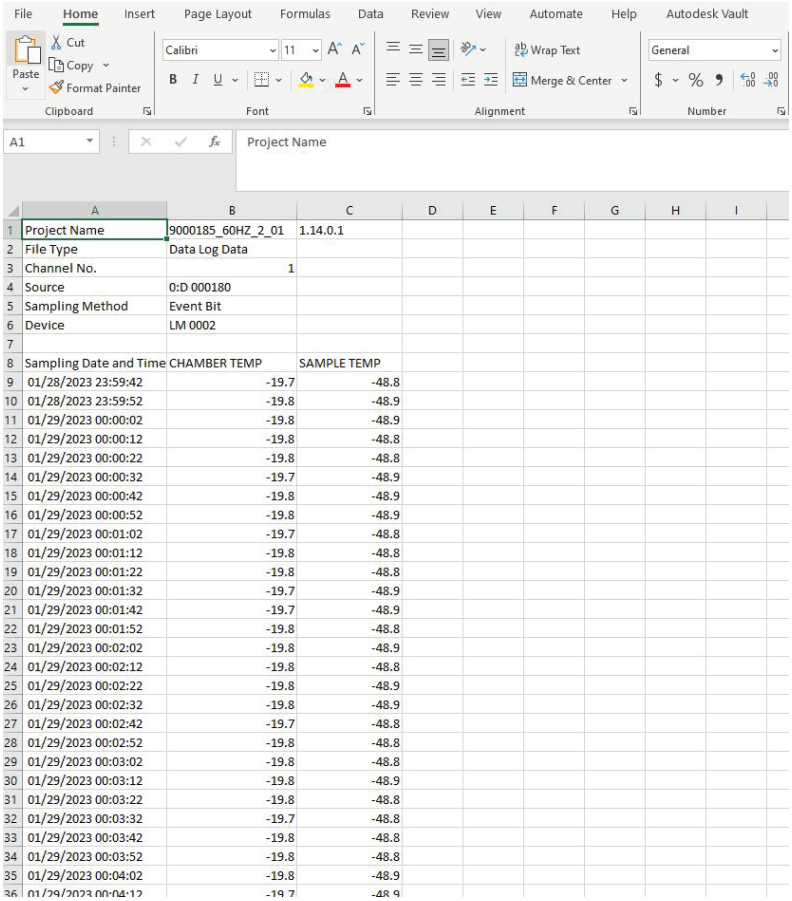
Figure 47: Data File Manager Login Window

9. Enter your username and password and select “OK.” The user must have Administrator level security privileges to enable file downloads.

10. A new window will open, indicating the progress of the upload.

11. The data log will upload to the selected location in a .csv file format. This file type can be opened in Microsoft Excel, Google Sheets, or other programs that accept CSV formatting. The data log will contain information gathered during the selected temperature profile, such as chamber temperature and sample temperature at the listed date and time intervals.

12. Data log files names are formatted as “filename_yymmdd.csv”.



	A	B	C
1	Project Name	9000185_60HZ_2_01	1.14.0.1
2	File Type	Data Log Data	
3	Channel No.	1	
4	Source	0:D 000180	
5	Sampling Method	Event Bit	
6	Device	LM 0002	
7			
8	Sampling Date and Time	CHAMBER TEMP	SAMPLE TEMP
9	01/28/2023 23:59:42	-19.7	-48.8
10	01/28/2023 23:59:52	-19.8	-48.9
11	01/29/2023 00:00:02	-19.8	-48.9
12	01/29/2023 00:00:12	-19.8	-48.8
13	01/29/2023 00:00:22	-19.8	-48.8
14	01/29/2023 00:00:32	-19.7	-48.9
15	01/29/2023 00:00:42	-19.8	-48.9
16	01/29/2023 00:00:52	-19.8	-48.9
17	01/29/2023 00:01:02	-19.7	-48.8
18	01/29/2023 00:01:12	-19.8	-48.8
19	01/29/2023 00:01:22	-19.8	-48.8
20	01/29/2023 00:01:32	-19.7	-48.9
21	01/29/2023 00:01:42	-19.7	-48.9
22	01/29/2023 00:01:52	-19.8	-48.8
23	01/29/2023 00:02:02	-19.8	-48.9
24	01/29/2023 00:02:12	-19.8	-48.8
25	01/29/2023 00:02:22	-19.8	-48.9
26	01/29/2023 00:02:32	-19.8	-48.9
27	01/29/2023 00:02:42	-19.7	-48.8
28	01/29/2023 00:02:52	-19.8	-48.8
29	01/29/2023 00:03:02	-19.8	-48.8
30	01/29/2023 00:03:12	-19.8	-48.9
31	01/29/2023 00:03:22	-19.8	-48.8
32	01/29/2023 00:03:32	-19.7	-48.8
33	01/29/2023 00:03:42	-19.8	-48.8
34	01/29/2023 00:03:52	-19.8	-48.8
35	01/29/2023 00:04:02	-19.8	-48.9

Figure 48: Sample data log

13. In addition to profile data logs, operation log files may be downloaded from the OPERATIONLOG folder. These files record every action performed on the HMI and include a time stamp of the action.

    Note: Operation logs are organized by date. All actions that occurred in the same day will be contained in a single file.

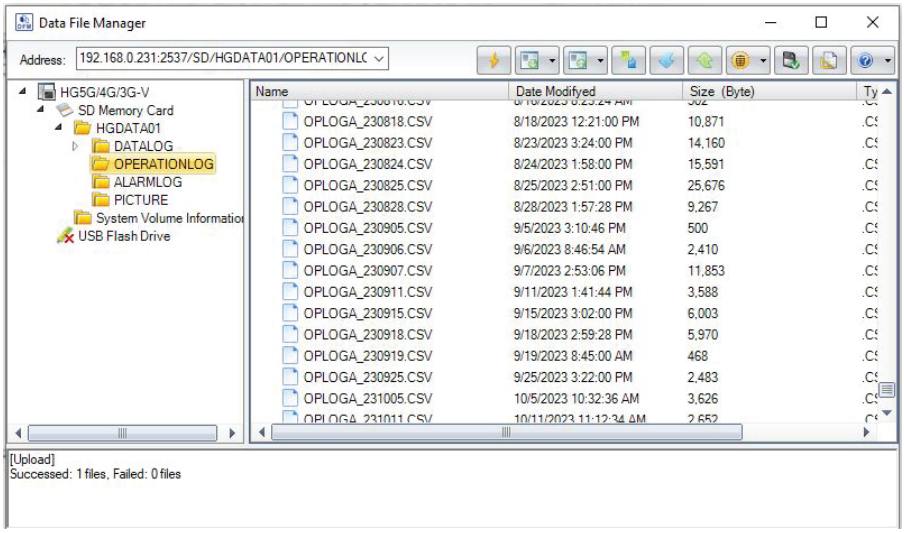


Figure 49: List of operation logs

14. Operation log file names are formatted as “OPLOGA_yymmdd.csv”.

	A	B	C	D	E	F	G	H	I	J
1	Project Name	4000_60HZ_3_10_03	1.16.0							
2	File Type	Operation Log Data								
3										
4	Sampling Time	User Name	Screen No.	Event Name	Part Name	Device Address	Changed to			
5	09/25/2023 15:02:35	-	Base 100	Change Users	-	-	Tom1			
6	09/25/2023 15:02:35	Tom1	Base 100	Switch to Base Screens	-	-	Base 100			
7	09/25/2023 15:02:38	Tom1	Base 100	Press buttons	OPEN B112	-	-			
8	09/25/2023 15:02:38	Tom1	Base 100	Switch to Base Screens	-	-	Base 112			
9	09/25/2023 15:04:22	Tom1	Base 112	Press buttons	GO TO HOME SCREEN	-	-			
10	09/25/2023 15:04:22	Tom1	Base 112	Switch to Base Screens	-	-	Base 100			
11	09/25/2023 15:04:32	Tom1	Base 100	Press buttons	OPEN B105	-	-			
12	09/25/2023 15:04:32	Tom1	Base 100	Switch to Base Screens	-	-	Base 105			
13	09/25/2023 15:04:36	Tom1	Base 105	Press buttons	VIEW PROF 1 STATUS	-	-			
14	09/25/2023 15:04:36	Tom1	Base 105	Switch to Base Screens	-	-	Base 101			
15	09/25/2023 15:04:37	Tom1	Base 101	Press buttons	MultiButton1	-	-			
16	09/25/2023 15:04:38	Tom1	Popup 501	Press buttons	MultiButton1	-	-			
17	09/25/2023 15:04:38	Tom1	Base 101	Write Data to any Device Addresses	-	00:M 595	1			
18	09/25/2023 15:04:38	Tom1	Base 101	Write Data to any Device Addresses	-	00:M 31	1			
19	09/25/2023 15:04:38	Tom1	Base 101	Write Data to any Device Addresses	-	LM 0	1			
20	09/25/2023 15:04:38	Tom1	Base 101	Write Data to any Device Addresses	-	00:M 595	0			
21	09/25/2023 15:04:38	Tom1	Base 101	Write Data to any Device Addresses	-	00:M 31	0			
22	09/25/2023 15:04:38	Tom1	Base 101	Write Data to any Device Addresses	-	LM 0	0			
23	09/25/2023 15:09:39	Tom1	Base 101	Change Users	-	-				
24	09/25/2023 15:09:39	-	Base 101	Switch to Base Screens	-	-	Base 101			
25	09/25/2023 15:14:55	-	Base 101	Change Users	-	-	Tom1			
26	09/25/2023 15:14:55	Tom1	Base 101	Switch to Base Screens	-	-	Base 101			
27	09/25/2023 15:15:02	Tom1	Base 101	Press buttons	CONTINUE PROFILE	-	-			
28	09/25/2023 15:15:02	Tom1	Base 101	Write Data to any Device Addresses	-	00:M 51	1			
29	09/25/2023 15:15:02	Tom1	Base 101	Write Data to any Device Addresses	-	00:M 51	0			
30	09/25/2023 15:20:02	Tom1	Base 101	Change Users	-	-				
31	09/25/2023 15:20:02	-	Base 101	Switch to Base Screens	-	-	Base 101			
32										

Figure 50: Sample operation log

15. In addition to profile data logs and operation logs, alarm log files may be downloaded from the ALARMLOG folder. **Note**: Alarm logs are organized by date. All alarms tripped in the same day will be contained in a single file.

16. Alarm log file names are formatted as “ALMHTA_yymmdd.csv”.

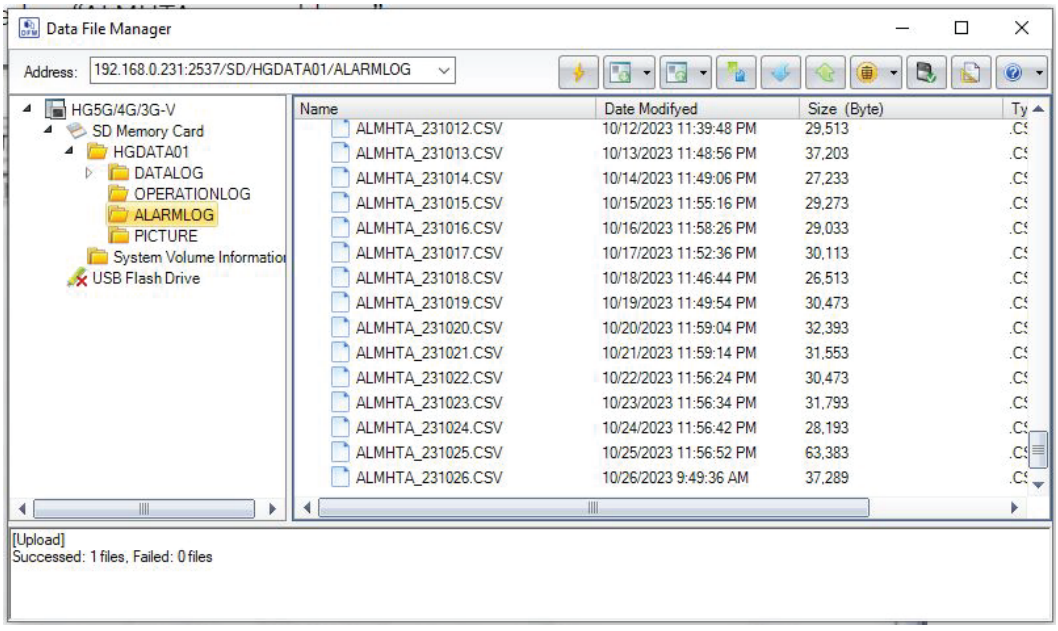


Figure 51: List of alarm logs

Controlling the Unit Remotely via Ethernet

The 4000-LC Series Controlled Rate Chamber can be controlled remotely via ethernet.

Note: Before operating the unit remotely, care should be taken to ensure that all equipment and personnel are in a safe position and are aware of the impending remote operation.

Electrical Hazard | Extreme Cold Temp | Hot Touch | Hand Injury | Sharp Object

Note: Supervisor privileges or higher are required to control the unit remotely.

Complete the following steps to control the unit remotely via ethernet:

1. After connecting the unit to the computer, open the web browser on the computer.
2. Enter the IP address of the unit in the web browser address bar. The default IP address of the unit is 192.168.3.231.
3. After the connection is made, the unit will request a username and password.

Figure 52: IP address login

4. Enter your username and password and select “OK.”
5. After the login is accepted, a new window will open and display the screen that is currently active on the unit. You will be able to see the screen that is currently active on the unit.
6. Select the “Control” command on the left-hand side of the computer screen to gain control access of the unit.

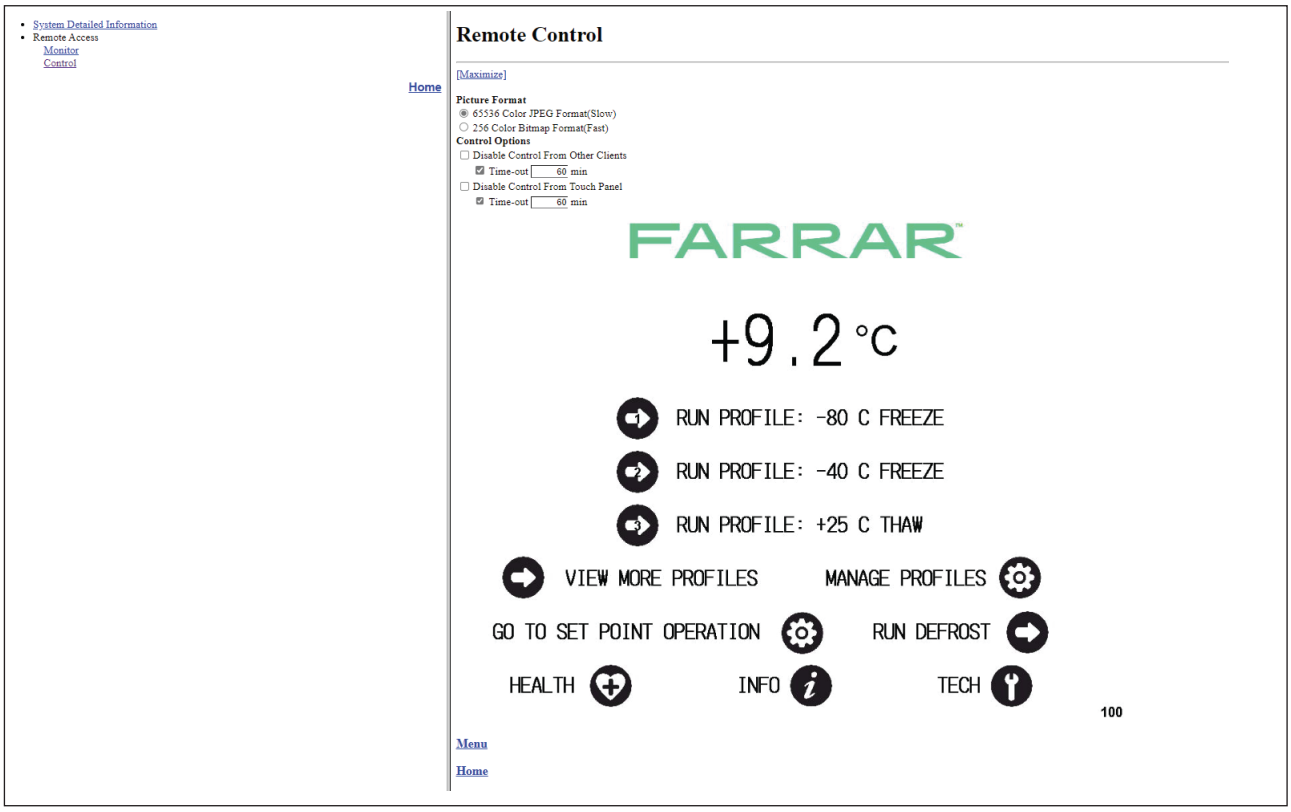


Figure 53: 4000-LC Series Controlled Rate Chamber Remote Control

7. After selecting "Control," you will have full control of all functions of the unit. Use the left mouse button to select icons on the screen as if you were touching the HMI directly.
   Note: Having remote control does not disable local, front panel control of the unit. It is possible to control the unit locally during a remote connection. Any changes made locally will be displayed on both the HMI and the connected computer screen.

8. To relinquish remote control of the unit but monitor the unit's HMI, select the "Monitor" command on the left-hand side of the computer screen. You will continue to view the same screens and operations displayed on the HMI in real-time.

CONTROL SYSTEM AND CABINET USE

Complete the following steps to run the unit:

1. Power on the unit.
2. Load the product to be conditioned within the unit.
3. Close and latch the front door of the unit.
4. To run a temperature profile:
   - In a default or customized temperature profile: From the **HOME** screen, press the right arrow labeled with the number that corresponds with the desired temperature profile and follow the subsequent prompts.
   - Manually: From the **HOME** screen, press the gear labeled "Go To Manual Set Point Operation" and follow the subsequent prompts.

GENERAL MAINTENANCE

The unit must be **turned off and unplugged** during any and all maintenance/service to avoid the following hazards. Note that maintenance should be performed by a qualified technician:


Electrical Hazard


Extreme Cold Temp


Hot Touch


Hand Injury


Sharp Object

Periodic Cleaning

Beginning with the initial installation, the exterior surfaces of the 4000-LC Series Controlled Rate Chamber should be periodically wiped down with a solution of warm water and laboratory detergent. This solution will remove any odors that result from spillage. The detergent should be removed using distilled water, followed by a wipe down with isopropyl alcohol. The exterior of the cabinet should also be cleaned frequently with a laboratory detergent solution followed with a distilled water rinse.

All surfaces (internal and external) should be cleaned using isopropyl alcohol. Cleaners containing acetone can damage and remove the paint and powder coat finish on the exterior of the cabinet and should be avoided.

Please refer to the site standard operating procedures (SOPs) for further periodic cleaning instructions.

Note: All moving parts have been permanently lubricated and will require no maintenance.

Gasket Maintenance


Extreme Cold Temp

Periodically check the gaskets around the door of the unit for punctures or tears. Leaks are indicated by a streak of frost, which forms at the point of gasket failure. Keep the door gaskets clean and free of frost by wiping gently with a soft cloth. Verify that the cabinet is level.

Defrosting the Chamber

Defrost the chamber on a regular basis. To defrost, complete the following steps:

1. Remove all products from the chamber.
2. Turn the freezer off and disconnect power from the system.
3. Open the freezer doors and place absorbing towels on the floor of the cabinet.
4. Let the freezer stand with doors open for at least 12 hours. This allows the interior to warm to room temperature and causes frost and ice to melt and become loose.
5. Place blowers in front of the chamber to speed up the process if necessary.
6. Dispose of fallen ice and wipe off any standing water in the bottom of the cabinet.
7. Dry the chamber.
8. Clean the interior and exterior of the unit with a solution of laboratory detergent and warm water.
9. Rinse with distilled water.
10. Dry the chamber again.
11. Close the doors and reconnect power to the system.
12. Allow the freezer to run overnight before reloading product.

Evaporator Inspection


Hand Injury


Hot Touch


Extreme Cold Temp

The evaporator should be visually inspected every six months. To inspect the evaporator:

1. Turn off the freezer.
2. Unplug the evaporator cable.
3. Open the outer door of the unit.
4. Remove the evaporator cover plate with a Phillips screw driver.
5. Visually inspect the blower wheel to check for any debris and remove it if necessary. Check the balance of the blower wheel by manually turning and inspecting the wheel.
6. Inspect the evaporator coil. Use a vacuum cleaner to remove any particles attached to the fins.
7. Inspect heater rods for damaged wires that may need to be replaced.
8. Inspect general area of evaporator coil for debris that may be need to be removed or damage that may need repair.
9. Re-install the evaporator cover plate, ensuring that all ductwork is aligned with its mating piece.

Cleaning the Condenser (Air-Cooled Units Only)


Sharp Object

For air-cooled units, the condenser should be cleaned monthly. Consistent cleaning will increase the efficiency of the refrigeration system and aid with heat transfer. Failure to keep the condenser coil clean and free of obstructions may result in temperature loss and damage to the compressor. To clean the condenser:

1. Remove the condenser cover grill.
   Note: The grill is sealed with 16 screws. Ensure that all screws are kept in a sealed container until ready for reinsertion.
2. Use a wire brush or a brush with stiff bristles to loosen any particles that are attached to the fins.
3. Use a vacuum cleaner to remove any loose particles.
4. Re-install the condenser cover grill and screws.

Flushing the Water-Regulating Valve (Water-Cooled Units Only)


Hand Injury


Hot Touch


Electrical Hazard

For water-cooled units, the water-regulating valve should be visually inspected and tested every six months. To inspect and flush the water-regulating valve:

1. Deactivate power to the freezer.
2. Remove the side panel cover of the refrigeration section to access the compressor area.
   Note: The panel is sealed with 20 screws. Ensure that all screws are kept in a sealed container until ready for reinsertion.
3. To flush the valve, insert screwdrivers under both sides of the valve spring guide and lift upwards. Refer to Figure 58 for more information.
   Note: Manually flush the valve and piping before and after installing, repairing, or replacing a valve to remove filings, chips, or other foreign matter. Manual flushing does not affect valve adjustment.

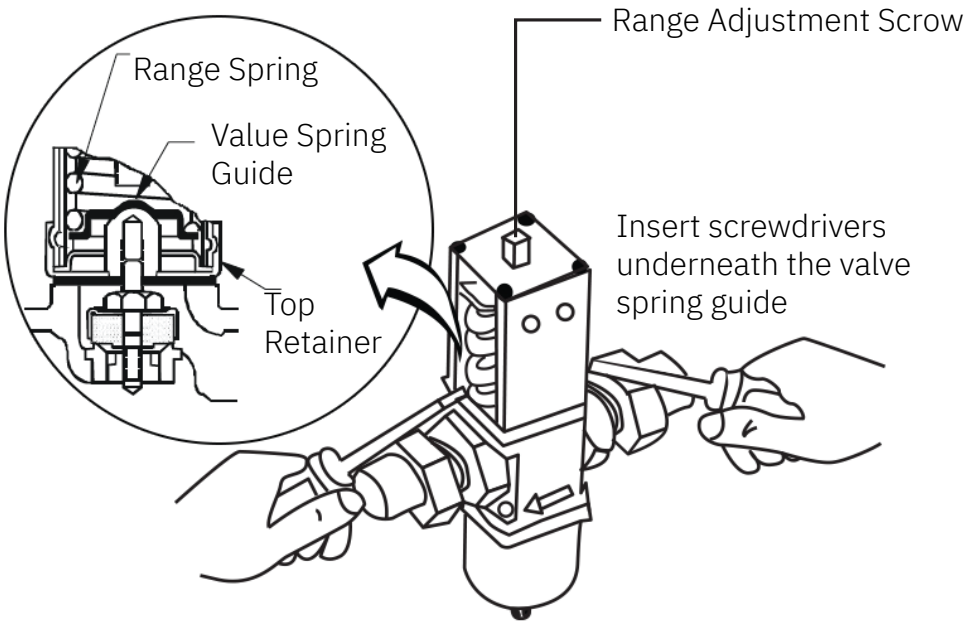


Figure 54: Manual flushing

TROUBLESHOOTING

Unit connected to power source, display not powered on:

1. On initial startup, qualified service personnel should verify the input voltage on all three-phase legs.
2. Confirm that the main circuit breaker is not tripped.
3. To access the circuit breakers, use a Phillips head screwdriver to remove the front sheet metal that protects the display. The main input breaker is located in the upper right corner of the electrical controls.
4. Switch two of the phase wires at the receptacle or power panel.
   Note: The rate chamber monitors for the correct phase sequence.
5. Verify that the fuses are functional. Depending on the 4000-LC Series Controlled Rate Chamber model, certain fuses must be checked:
   - For models 4002 and 4102, check fuses F3, F4, and F5.
   - For models 4005 and 4105, check fuses F2, F3, and F4.

   Note: Fuses are 2.5 Amp, Class CC, and located on the back wall of the control enclosure.

Electrical Hazard

Reaching inside the machine section while the unit is energized can be dangerous. Always unplug the unit and lock out the power supply before performing maintenance inside the unit.

Display is on but indicates there is a Phase Monitor Failure:

Note: A loss of power during any phase can cause this error.

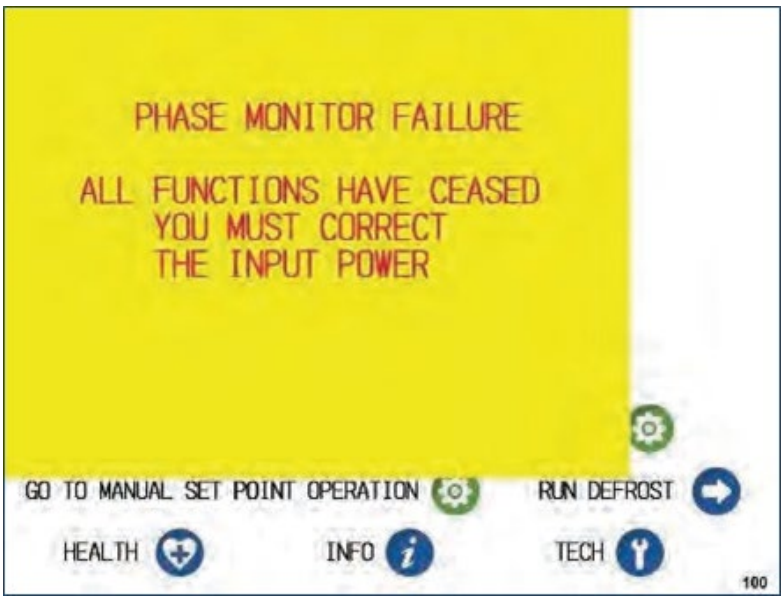


Figure 55: Phase Monitor Failure screen

1. On initial startup, qualified service personnel should verify the input voltage on all three-phase legs.
2. Switch two of the phase wires at the receptacle or power panel.
   Note: The rate chamber monitors for the correct phase sequence.

Electrical Hazard

Reaching inside the machine section while the unit is energized can be dangerous. Always unplug the unit and lock out the power supply before performing maintenance inside the unit.

Unit not cooling:

1. Confirm that a freeze profile is selected and running.
2. Confirm that the temperature control set point is lower than the actual chamber temperature and that a cooling step is running in the profile.
3. Verify that the unit door is closed. The door switch turns off the internal circulation fan, heat, and refrigeration.
4. Verify that the evaporator is not encased in ice (this may occur if the unit has been run cold repeatedly).
5. If the evaporator is encased in ice, initiate a defrost cycle.
5. Verify that the evaporator fan fuses (F1 and F2) are functional.

Electrical Hazard

Reaching inside of the cabinet while the unit is energized can be dangerous. Always unplug the unit and lockout the power supply before performing maintenance inside of the unit.

Unit not warming at normal rate:

1. Confirm that a warming profile is selected and running.
2. Confirm that the temperature control set point is higher than the actual chamber temperature and that a warming step is running in the profile.
3. Verify that the unit door is closed. The door switch turns off the internal circulation fan, heat, and refrigeration.
4. Verify that the evaporator fan fuses (F1 and F2) are functional.

Electrical Hazard

Reaching inside the machine section while the unit is energized can be dangerous. Always unplug the unit and lock out the power supply before performing maintenance inside the unit.

WARRANTY

FARRAR's warranty does not cover damage or misuse. Repair costs resulting from negligence, or costs associated with equipment damage, theft, loss, and/or misuse will be the responsibility of the customer. Non-warranty-related costs are to be paid by the customer.

The warranty protection extends to any subsequent owner during the warranty period. Installation and calibration are not covered by this warranty agreement.

The FARRAR Technical Services Department must be contacted for warranty determination and directions prior to any work being performed. Expendable items, i.e., glass, filters, pilot lights, light bulbs, and door gaskets are excluded from this warranty.

Replacement or repair of component parts or equipment under these warranties shall not extend the warranty to either the equipment or to the component part beyond the original two years' warranty period. The Technical Services Department must give prior approval for the return of any components or equipment.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY.

FARRAR shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

The following sections outline the differences between North America and International warranties. All other terms and conditions follow the above.

North America

Every FARRAR™ 4000-LC Series Controlled Rate Chamber is backed by a comprehensive 1-year parts and labor warranty. An extended 3-year parts and labor warranty is also available for purchase. Please contact FARRAR or your local FARRAR distributor for more information.

International

Every FARRAR 4000-LC Series Controlled Rate Chamber is backed by a 1-year parts warranty. An extended 3-year parts warranty is also available for purchase. Please contact FARRAR or your local FARRAR distributor for more information.

CONTACTING FARRAR

When contacting FARRAR or local FARRAR distributors, please have the following information readily available if service is required:

Model Number:	
Serial Number:	
Date of Purchase:	
Purchase Order:	

FOR CUSTOMER ASSISTANCE:

The FARRAR products support team is ready to answer any questions. In addition to technical support, FARRAR offers various accessories, extended warranty programs, and validation services. Please contact FARRAR at:

Corporate HQ
800-B Beaty Street, Davidson, NC 28036

Manufacturing HQ
30765 State Route 7, Marietta, OH 45750

Europe HQ
Lenneke Marelaan 6, 1932 Sint-Stevens-Woluwe Belgium

800-242-7197 | 740-374-8300 | sales@FARRARscientific.com | www.FARRARscientific.com

DOCUMENT REVISION TABLE

Revision	Description	Approval	Date
A	Rebranded document and general copy updates.	Mitch Donnelly	11-9-2023
B	Changed CPU/HMI software to include BACnet and Modbus interface (p.39).	Mitch Donnelly	11-13-23
C			
D			

APPENDIX A: ICONS

The following is a list of the icon symbols used throughout this manual.

Icon	Description*	Additional Information, if applicable
	Home Screen*	Takes you back to Home Screen.
	Previous Screen*	Takes you back to the prior screen.
	Next Screen*	Advances you to the next screen.
	Manage Profiles / Set Point Operation	Manage Profiles: Displays the screen for editing and managing user profiles. Set Point Operation: Displays the screen for operating the chamber at any desired temperature within operational range.
	System Health	Displays the system health screen for calibrating the chamber temperature probe, calibrating the sample probe, viewing the alarm log, and managing user profiles.
	System Information	Displays general information concerning the unit, such as serial label information, software revisions, and support contact information.
	Technical Service	Allows access to the technical and service functions of the unit. These functions will typically be under log-in security protection and should only be accessed by qualified service personnel.
	Acknowledgment	Accepts the action.
	Cancel Action	This cancels the action.
	Alarm Silence	Displays during an active alarm. Touching this icon will silence the audible alarm for a period of time set up by the user. Should the alarm condition remain active, the audible will sound again at the end of the delay period.
	Warning	Displays during an active warning and is visible when a warning message is active. Touching this button displays the active warning message(s). A warning informs users that an Alarm Condition may occur if the warning conditions are not resolved within the programmed delay period. Warning example: Door opens with system in a defrost mode.
	Alarm	Displays during an active alarm and is visible when an alarm condition is active. Touching this button will display the active alarm condition(s). Action is required by the end user to resolve the alarm condition. Alarm examples: door open, system failure.
	Service	Displays to indicate the system is due for maintenance or calibration.

APPENDIX B: HAZARD SYMBOLS

 Important Alert	This symbol alerts the user to important operating and/or maintenance instructions. It may be used alone or with other safety symbols. Read the accompanying text carefully.
 Electrocution	Potential electrical hazards. Only qualified service personnel should perform the instructions and procedures associated with this symbol.
 Electrical Hazard	Potential electrical hazards. Only qualified service personnel should perform the instructions and procedures associated with this symbol.
 Lock	Potentially hazardous energy. Equipment being maintained or serviced must be turned off and locked out to prevent possible injury. Reference OSHA Regulation 1910-147.
 Do Not Touch	Extreme temperature hazards, hot or cold. Instructions associated with this symbol should only be carried out when using special handling equipment or when wearing special, protective clothing.
 Hot Touch	Extreme hot temperature hazards. Instructions associated with this symbol should only be carried out when using special handling equipment or when wearing special, protective clothing.
 Extreme Hot Temp	Extreme hot temperature hazards. Instructions associated with this symbol should only be carried out when using special handling equipment or when wearing special protective clothing.
 Extreme Cold Temp	Extreme cold temperature hazards. Instructions associated with this symbol should only be carried out when using special handling equipment or when wearing special protective clothing.
 Pinch Point	Potential hazard “Pinch Point.” Keep hands clear during operation.
 Sharp Object	Potential hand injuries from sharp objects. Instructions associated with this symbol should only be carried out when wearing special protective clothing.
 Hand Injury	Potential hand injury. Instructions associated with this symbol should only be carried out when wearing special protective clothing.

FARRAR™ | TRANE TECHNOLOGIES™

800-B Beaty Street, Davidson, NC 28036 | T: 800.242.7197 | LSSinfo@tranetechnologies.com