
10107002

Xiros Mikro

Freeze Dryer

# User Manual

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## II. Safety

**! DANGER (may cause serious damage to property and or casualties)**

1. Please carefully read this User Manual prior to operating the instrument and observe and verify that all connections are properly secured.
2. Utility requirements: Please ensure that the electrical connections meet the local standards and that the power supply is compatible with the Instrument nameplate. The power source must be properly grounded.
3. The chamber and shelves may be extremely cold or hot – please check temperature first before opening the chamber to avoid injury from frostbite or burns.
4. Only trained refrigeration engineers may service the refrigeration system.
5. When conducting maintenance and or operations inside the chamber, ensure the door is securely held open.
6. Ensure appropriate PPE is worn at all times. Unprotected hands are not to open or close the door.
7. It is prohibited to use flammable liquids or gas inside or around the instrument. The instrument is not explosion rated and should not be operated in the presence of flammable liquids or vapours.

**! WARNING (may cause property damage or personal injury)**

1. Do not place heavy objects on top of or stand on the instrument.
2. Prior to operating this instrument, all operators are required to fully read this manual. Only trained and qualified operators should use the instrument.
3. It is prohibited to install any non-manufacturer authorised software onto this instrument
4. Power ‘OFF’ the power supply for PLC and all electrical equipment before working on the instrument.
5. Confirm the main power is ‘OFF’ prior to opening the cabinet door.

**! ATTENTION (may affect operational performance or service life)**

6. The overall safe operation of the instrument is the responsibility of the owner of the instrument and their assigned operator(s), who in turn are responsible for ensuring the user manual guidance is applied to ensure the safety and protection of personnel and the instrument before, during and after freeze-drying operation.
7. Timely maintenance of the instrument MUST be conducted to ensure continued safe operation and optimise the instrument’s service life.
8. Only accredited and qualified professional repair technicians can open the instrument or conduct required repairs. Persons performing repairs on the instrument other than those selected or approved by the Company shall operate to void any warranty contained hereinabove for the product.

# III. Introduction

Users are advised to carefully read this manual prior to operating the freeze dryer so that they are aware of all precautions outlined and to ensure operation is in accordance with the instructions contained within this manual.

## 3.1 After Sales Support

If problems are encountered or technical support is required when installing or using the instrument, please contact ServiceUSA@hollandgreenscience.com

The company may provide technical assistance and information regarding the instrument or equipment or service without charge at its sole discretion. Buyer assumes sole responsibility for any reliance on or use of such assistance and information, and the company makes no warranty thereon.

Upon contact the following information is required:

- Product serial number (located on the instrument nameplate)
- Description of issue or problem
- Method and or operating steps you have undertaken towards resolution.
- Your contact details inclusive of telephone number and email address.

## 3.2 Proper Use

The instrument is designed for non-residential use and is to be used only in conjunction with accessories recommended within this manual and by the manufacturer.

## 3.3 Warranty

The warranty period for the Xiros Mikro freeze dryer is one (1) year from the date of shipping of the product.

## IV. Technical Specifications

| | |
|---|---|
| **Model** | 10107002 |
| **Product Name** | Xiros Mikro |
| **Product Weight** | 87 kg |
| **Rated Voltage** | 110 v +/-10% |
| **Rated Frequency** | 60 Hz |
| **Max Vacuum Pump Current** | 3 A |
| **Total Condenser Volume** | 11 L |
| **Ice Condenser Capacity** | 8 kg |
| **Ice Condenser Performance** | 4 kg per 24 hours |
| **Ice Condenser Temperature** | -40 °C |
| **Ultimate Vacuum** | 2.5 x $10^{-2}$ mbar |
| **Minimum Shelf Temperature** | -35 °C |
| **Maximum Shelf Temperature** | 60 °C |
| **Number of Trays** | 9 |
| **Shelf Stack Options** | 9, 7, 5, 3, 1 shelves |
| **Tray Size** | 9-shelf tray: 200 x 450 x 12 mm<br>7-shelf tray: 200 x 450 x 15 mm<br>5-shelf tray: 200 x 450 x 20 mm<br>3-shelf tray: 200 x 450 x 20 mm |
| **Shelf Distance** | 9 shelves: 21 mm<br>7 shelves: 28 mm<br>5 shelves: 40 mm<br>3 shelves: 68 mm<br>1 shelf: 208 mm |
| **Tray Spaces** | 9 shelves: 8.72 sq ft<br>7 shelves: 6.78 sq ft<br>5 shelves: 4.84 sq ft |
| **Shelf Stack Weight** | 9-shelf stack: 18.3 kg<br>7-shelf stack: 14.8 kg<br>5-shelf stack: 11.3 kg<br>3-shelf stack: 7.8 kg |
| **Typical Product Capacity** | 9.6 kg at 80% moisture |
| **External Dimensions (mm)** | 770 ) x 748 (W) x 507 (H) |

# V Inspection

## Packing List

Unpack the equipment carefully and check for any damage which may have arisen during transport. In the event of identified damage, please contact ServiceUSA@hollandgreenscience.com

The package includes the following items:

| Item Description | Quantity |
|---|---|
| Main Unit | 1 |
| Vacuum Hose | 1 |
| Clamps | 2 |
| Sealing Ring | 2 |
| Drain Hose | 2 |
| Tray | 9 |

**CAUTION:**

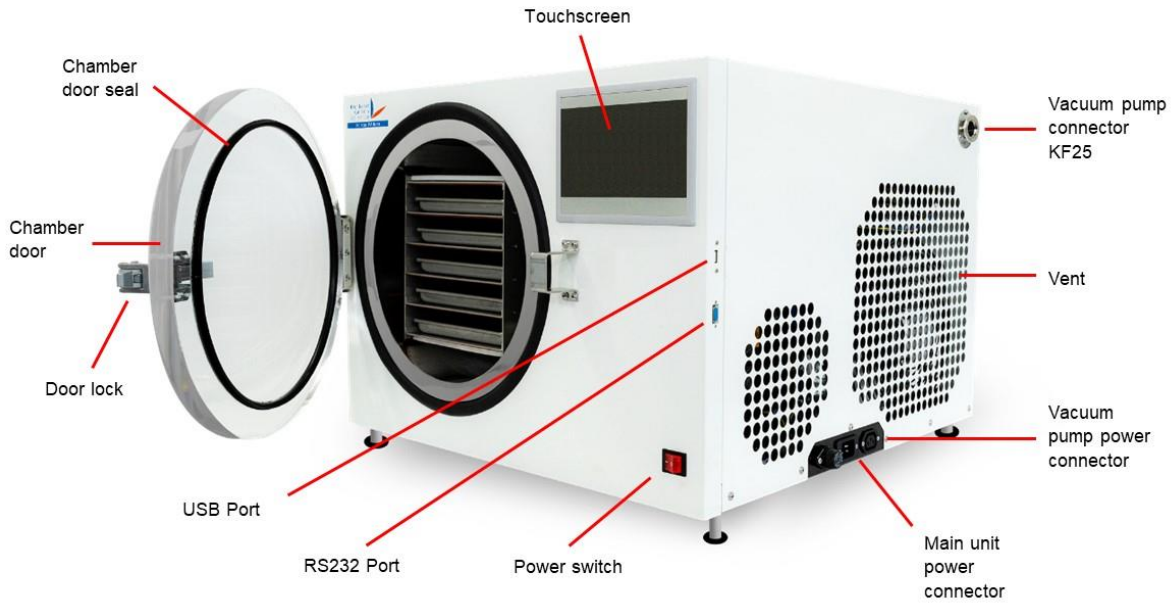
If there is any visible damage to the instrument, please do not connect the instrument to a power supply.

## VI. Precautions

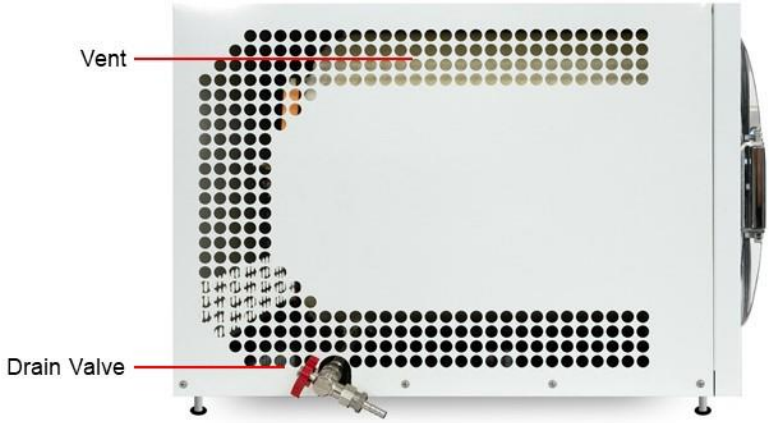
- The power supply should be connected to the electrical outlets safely. It is important that anyone using this equipment do so with dry hands and dry shoes to minimize the risk of electric shock.
- A 120VAC 60Hz power supply is required for the freeze dryer operation. Any alternative supply voltage or frequency may damage the freeze dryer reduce its working lifespan.
- The electrical power cord is designed to be connected to the power outlet without knots, sharp bends, or heavy materials placed on the cord.
- If the power cord is damaged, please contact the service department at ServiceUSA@hollandgreenscience.com for repair or replacement.
- The freeze dryer should be properly grounded according to local electrical codes. This will minimize the risk of electric shock and fire. It is important that all power outlets are properly grounded.
- Never operate the freeze dryer if the freeze dryer chamber door is open. Doing so may lead to equipment failure.
- No residual water or foreign matter should be present inside the chamber prior to freeze-drying.
- Never open the freeze-drying chamber door during the freeze-drying process. Doing so may cause personal injury or equipment failure.
- If an abnormal sound, excessive heat, smoke, etc., is detected, stop the process immediately, disconnect the instrument from the power supply and contact the service department. The freeze dryer operates with a minimal level of noise when running if any significant changes happen, please stop the processing and contact the service department.
- If a power outage occurs when operating the freeze-dryer, open the drain valve and let the chamber pressure return to normal before opening the door to retrieve the product.
- When the freeze-drying process has finished, first close the vacuum valve, open the drain valve to release vacuum of the chamber. Then open the vacuum valve and turn off the vacuum pump.
- Be sure to keep the sealing ring and the chamber door clean. Only clean with soapy water and avoid using solvents or other cleaning agents.
- Do not rapidly power on/off the freeze dryer. Please wait for at least 3 minutes after powering off the freeze dryer to power it back on again.
- It is recommended that the freeze dryer be unplugged from the wall outlet when not in use.

# VII. Components

## 7.1 Main Unit

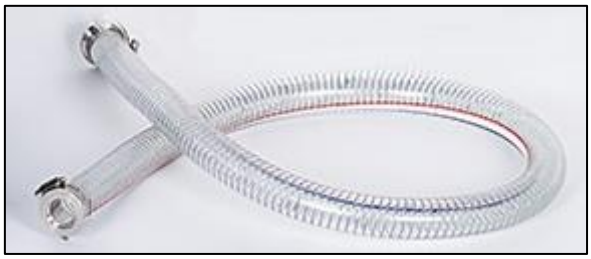



The USB port is used to update the Display and download log data. The RS232 is used to update the Logic Controller. When updating the instrument, often both the Logic and Display need to be updated.



## 7.2 Other Components

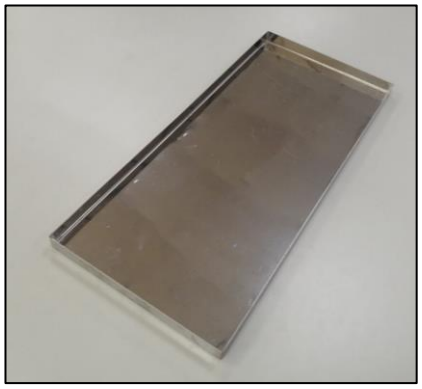
- Vacuum hose and KF 25 connectors



- Clamps and sealing rings

- Vacuum pump


- Tray



- Drain hose

## 7.3 Assembling the Freeze Dryer

### 7.3.1 Connect the vacuum pump to the freeze dryer

- The connector for the vacuum pump is located at the upper right corner at the back of the freeze dryer (Figure 1).

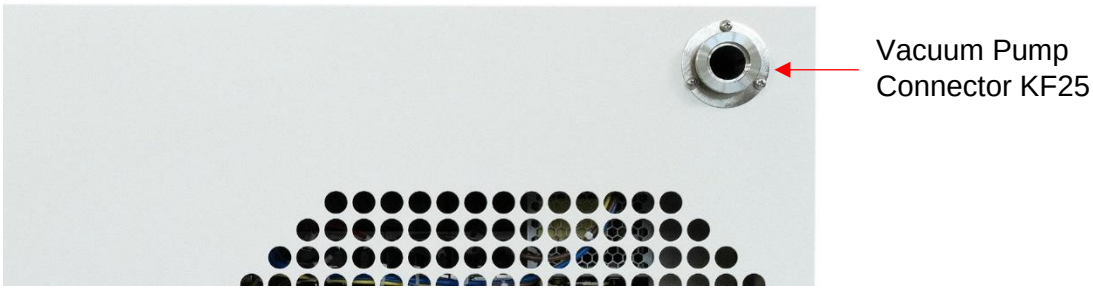



Figure 1

- Insert the sealing ring into the vacuum pump connector (Figure 2). Align the vacuum hose to the sealing ring (Figure 3).

Figure 2

Figure 3

- Wrap the clamp around the sealing ring and close the clamp (Figure 4). Tighten the wing nut as shown in Figure 5. Please note that the clamp only needs to be done up finger tight – excessive tightening may cause damage to the fittings.

Figure 4

Figure 5

- Connect the vacuum pump hose to the vacuum pump as shown in Figure 6.

Figure 6

### 7.3.2 Connect the water drain hose to the freeze dryer

- The connector for the drain hose is located to the left side of the freeze dryer (Figure 7).

Figure 7

- Connect the drain hose to the connector and as shown in Figures 8, The other end should be placed in either a bucket or near a drain. It must be placed lower than the instrument to allow water to flow out.

Figure 8

### 7.3.3 Connect the freeze dryer to the power supply

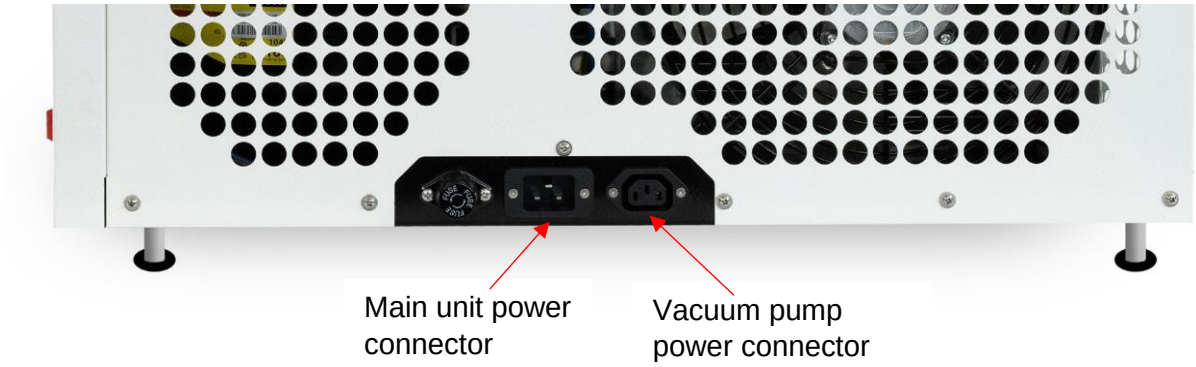



Figure 9

- Locate the power connectors for the main unit and the vacuum pump at the right side of the freeze dryer (Figure 9).
- Connect the vacuum pump power plug to the vacuum pump power connector. Ensure the power switch on the vacuum pump is switched to “on” position.
- Connect one side of the main unit power cord to the power connector and connect the other side to the electrical power outlet.

Figure 10

- Locate the main unit power switch under the touch screen.
- Turn the power switch to “ON”. A red light will appear to indicate the power switch is “ON” as shown in Figure 10. The touch screen should also turn on.

# VIII. Operation

Before running the freeze dryer, please check and ensure that:

- There is no residual water or foreign matter inside the chamber.
- The drain valve is closed.
- The vacuum pump is connected to the freeze dryer correctly.
- The freeze dryer main unit is connected to the power supply and the vacuum pump is connected to the freeze dryer main unit.
- The product that needs to be freeze dried has been placed on the trays.

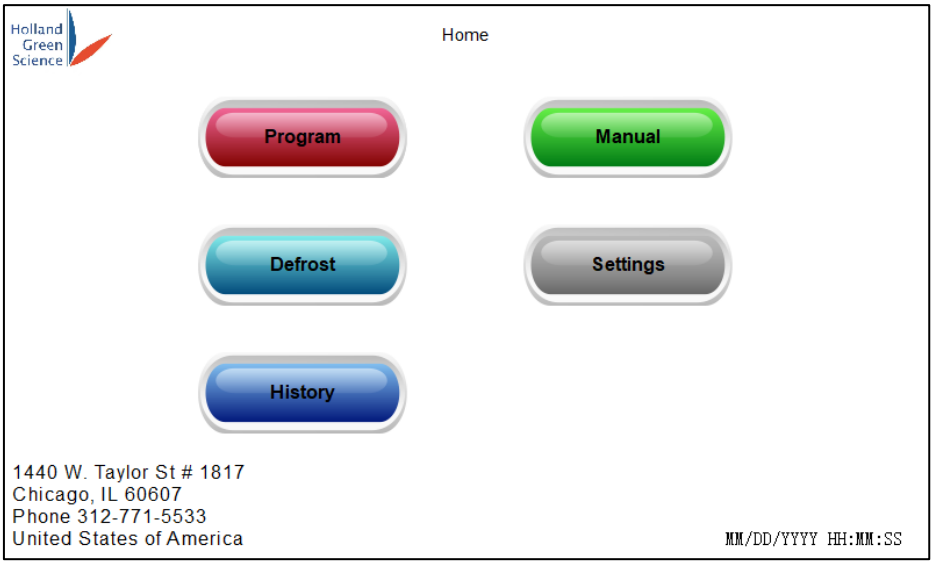



Figure 11

The home screen is shown once the touchscreen is powered on (Figure 11). There are five visible control buttons on the touchscreen: Manual, Program, Defrost, Settings, and History.

To go back pages, click on  that's present in most screens (Figure 13).

## 8.1 Manual freeze-drying mode

To enter the “Manual Control” page, click on the “Manual” button (Figure 12).

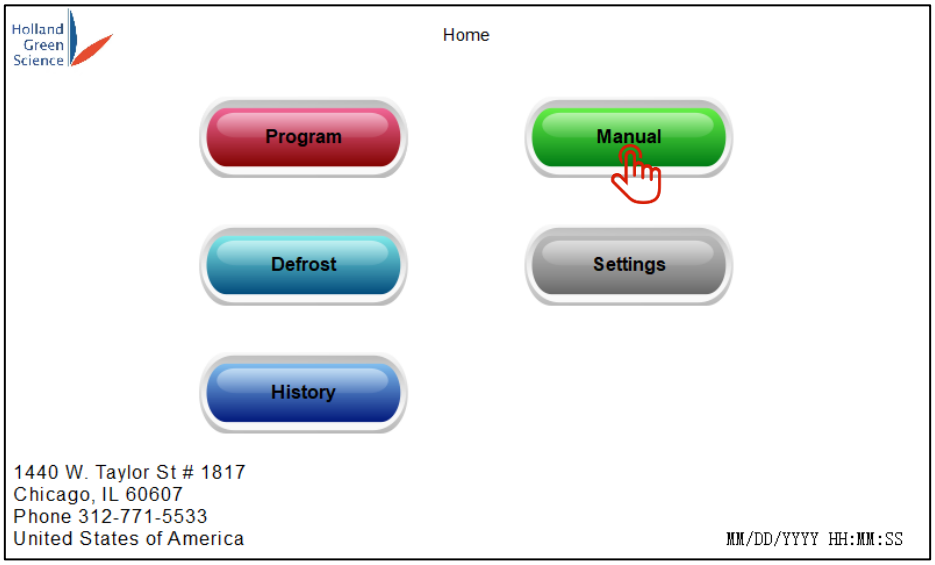



Figure 12

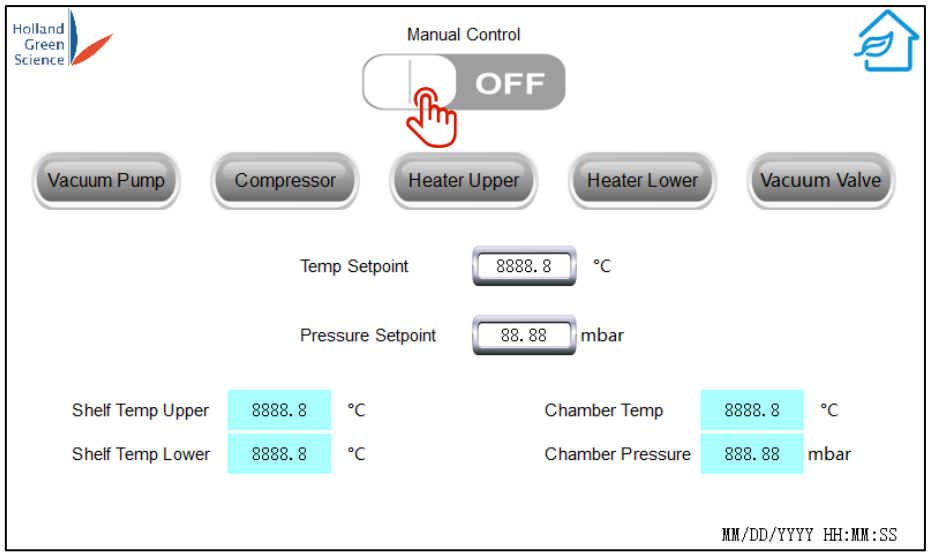



Figure 13

The “Manual Control” page has the flowing functions:

- Manual Control On/Off: click “On” to enter Manual Control Mode (Figure 13).
- There are five relay controls that can be turned on and off: Vacuum Pump, Compressor, Shelf Heaters (upper & lower), Vacuum Valve.

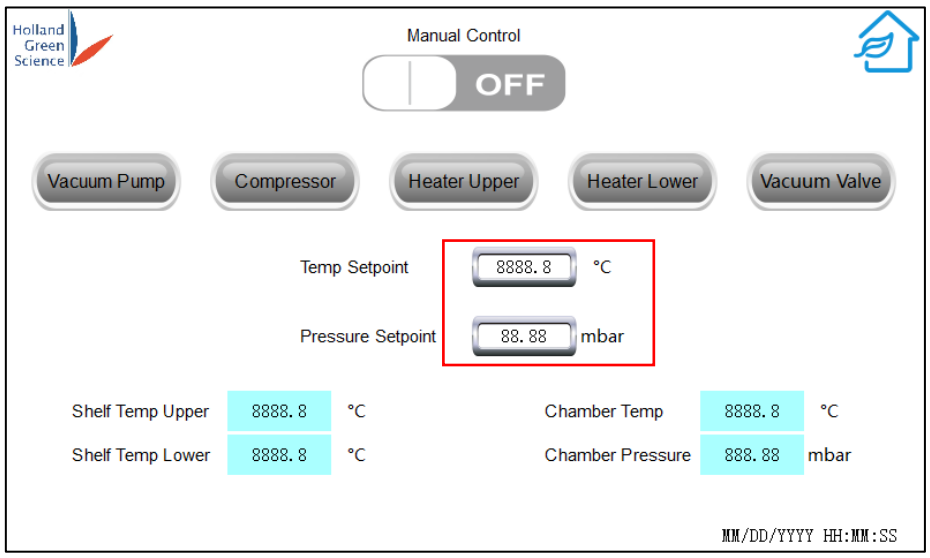



Figure 14

- Temperature and pressure setpoints can be specified for the freeze dryer to maintain (if enabled). Note, for the freeze dryer to maintain the pressure setpoints, enable with the Vacuum Pump and Vacuum Valve (Figure 14).

**Note**:

- When the freeze-drying process is finished, open the drain valve first and when the chamber is re-pressurized, open the door to retrieve the product.
- Shelf temperature, chamber temperature and chamber vacuum are displayed in real time.
- Please note: When operating in manual control mode, please ensure that product is fully frozen before opening the vacuum valve. Opening the vacuum valve while there is still liquid in the chamber may damage or cause premature wear to your vacuum pump.
- Note: the freeze-dryer will automatically start the compressor to cool the chamber and shelves when powering on the system. Disabling the compressor can only be done in the Manual Control mode.
- Please ensure that there are no liquids, and your product is fully frozen before opening the vacuum valve. Opening the vacuum valve while there is still liquid in the chamber may damage or cause premature wear to the vacuum pump.
- While operating the vacuum pump, it's good practice to occasionally open the ballast valve on the pump to remove any of the moisture buildup inside the pump.
- Warning: Do not open the vacuum valve while the pump is off, and the chamber is under vacuum. Allowing air to flow through the pump in the reverse direction will prematurely wear the pump and introduce pump material into the chamber.

## 8.2 Program Mode

Click on “Program” on the home screen to enter the “Recipe Selector” page (Figure 15).

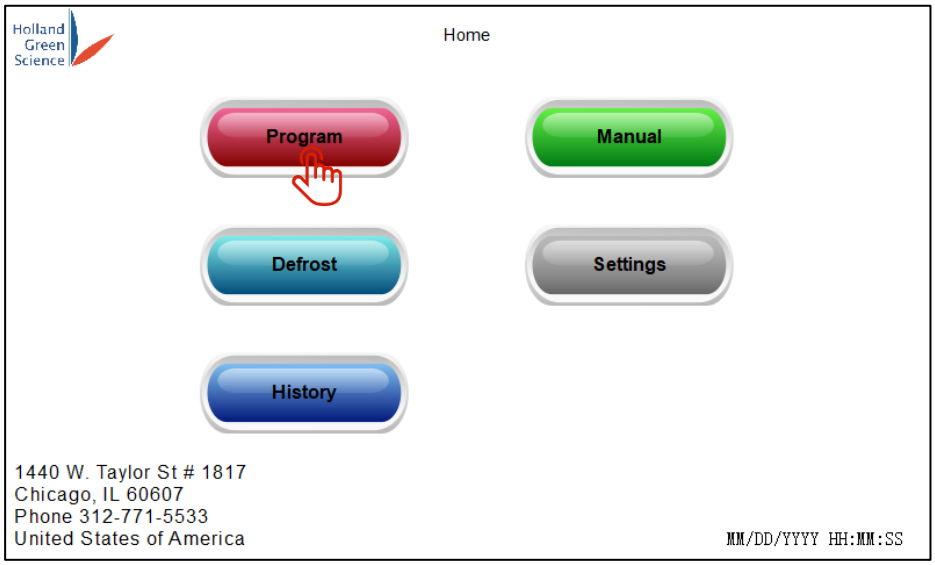



Figure 15

The “Recipe Selector” page has 4 programs available for the users to enter and store self-defined parameters (Figure 16).

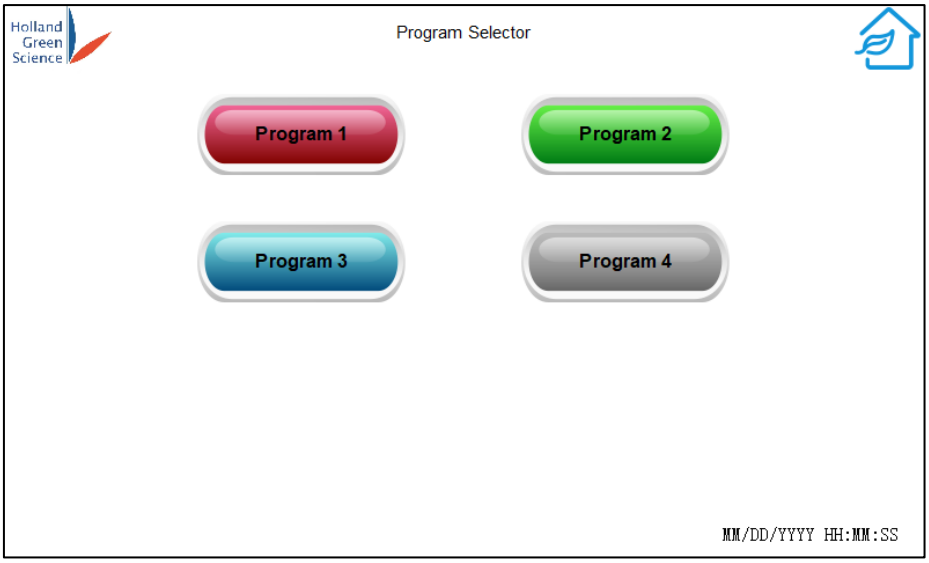



Figure 16

**Program Explained:**

A Xiros Mirko program is broken down into 4 stages. Freezing, Evacuation, Drying, and Storage. Here are the stages in more detail:

Freezing: This is the first stage of a program. This stage is used to cool the shelves and trays down enough to avoid risking product melting during evacuation and drying. This stage generally lasts for a few hours.

Evacuation: This stage reduces the pressure inside the chamber to the specified pressure. This stage generally lasts for up to a few minutes.

Drying: This stage involves the sublimation process where energy (heat) is transferred to the product under extremely low pressures. The Drying stage offers more granular control over exactly how the product is to be dried. This is the longest process of a freeze-drying run and is the most important stage.

Storage: This is the final stage of the freeze-drying process. This determines a safe pressure and temperature to leave the product at until it gets removed from the instrument.

**Writing a Program & Parameters Explained**

The user can enter self-defined parameters with any of the 4 programs. Below is an example of how to set up a custom program.

- Click on “Program 1” on the “Recipe Selector” page to enter the “Program 1” page (Figure 17, 18).

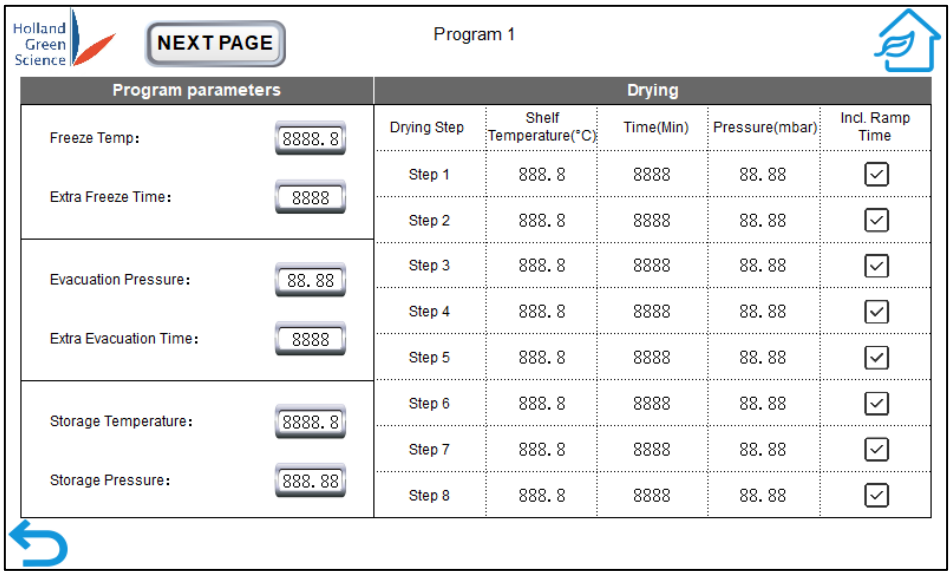



Figure 17

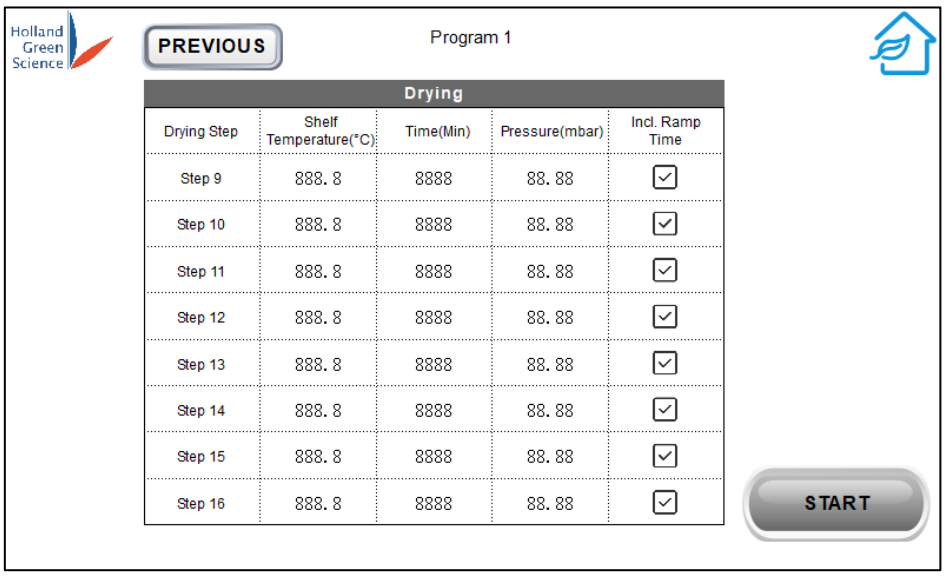



Figure 18

- Click on individual parameter that you wish to change, enter the new value.
- There are a total of 16 steps available. Even though not all steps need to have values, all steps are done in sequence. No blank step should be left between steps (A blank step would indicate the process is finished).
- Ramp Selector OFF (no tick): The software will exclude ramp times from the step time counter. For example, if the step timer is set to 120 minutes and it takes the freeze dryer 30 minutes to reach set point, then the counter will start counting for 120 minutes after the set parameters are reached. This mode will ensure ultimate control over dwell times at set points; however, this means the total process time will vary.
- Ramp Selector ON (tick box showing): The software will include ramp times into the step time counter. This mode will ensure the total process time equals the sum of all step times independent from how long it takes the freeze dryer to ramp from step to step.

Before starting the program, please ensure the following:

- The product that needs to be freeze dried is evenly distributed between each tray for optimal drying.
- The drain valve is closed.
- The chamber is defrosted.
- Chamber door contact surface is clear of ice, and the door is closed.

- Click on “START” when you finish entering the parameters to enter the “Process Start” page (Figure 19). Note, when Program Mode is entered, the manual control mode will be disabled, and all the parameters set in manual control mode will be reset. If the Manual Mode is still active, an alarm page will appear (Figure 20).

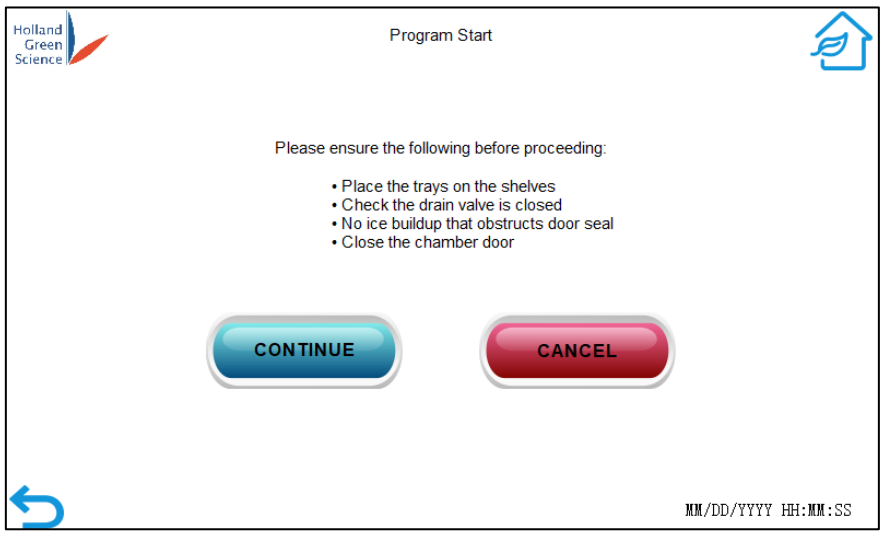



Figure 19

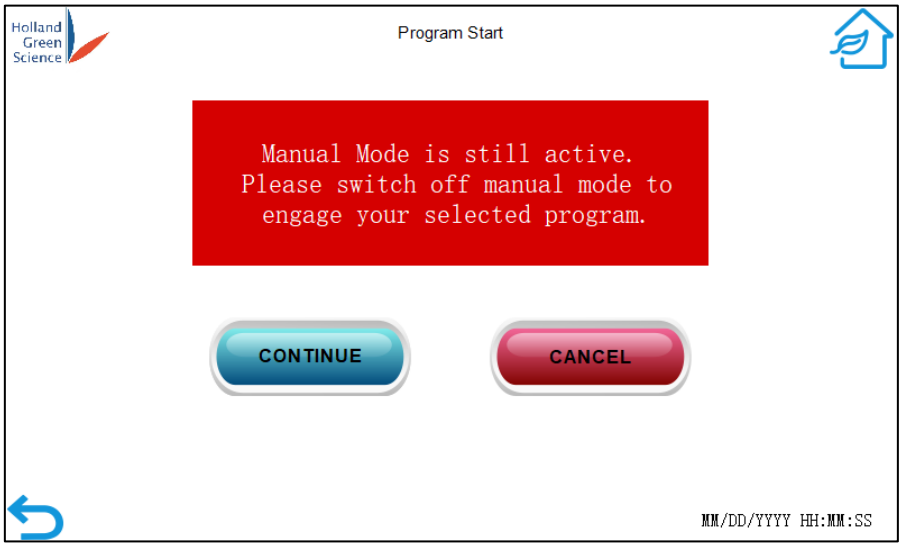



Figure 20

Please note, it's important to defrost the instrument before conducting another run. In addition, occasionally opening the ballast valve on the pump to release moisture build up is recommended.

### Freezing Stage

The freezing stage (Figure 21) is controlled by Freeze Temperature & Extra Freeze Time. For a successful run, the product must be frozen. It's good practice to always allow additional freezing time after reaching the Freeze temperature. Specify the Freeze Temperature to around -20°C to -30°C and use 4-6 hours extra freezing time. Note: Specifying the Freeze Temperature doesn't maintain the temperature. It's only for when the freezer timer should start.

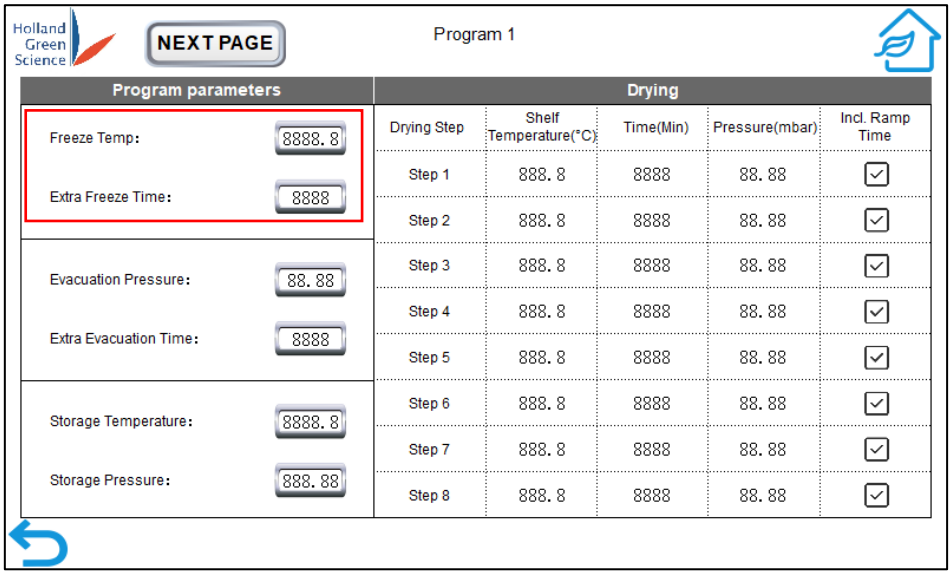



Figure 21

### Evacuation Stage

The evacuation stage (Figure 22) is controlled by Evacuation Pressure and Extra Evacuation Time. The evacuation pressure should align with Drying step 1's pressure. Use extra evacuation time to evacuate to a low pressure if required. Otherwise in most cases using 0 is sufficient.

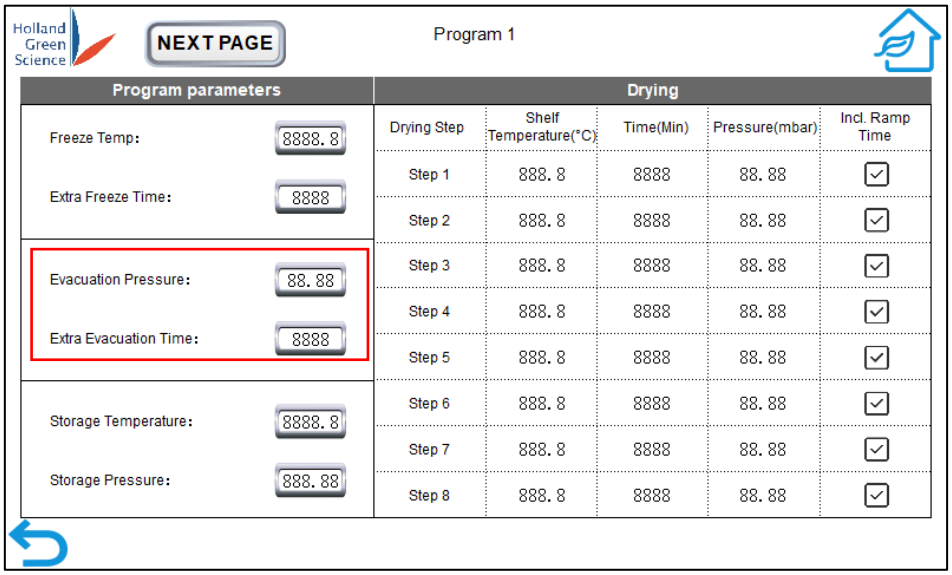



Figure 22

### Driving Stage

In the drying stage (Figure 23), up to 16 drying steps can be specified. They run sequentially, composed of a temperature and pressure setpoint, time, and the option of 'Including ramp time'.

Including Ramp Time: This changes when the timer will start for the drying step. When the checkbox is checked, the timer will immediately start for the drying step. This means that the total process time equals the sum of all drying steps independent from how long it takes the instrument to 'ramp' from step to step. When the checkbox is unchecked, the timer will only start once when the shelves reach the temperature setpoint. For the most part, this checkbox can be left unchecked.

Setting the time to 0 will skip the step, however, it's good practice to keep the programs as clean as possible.

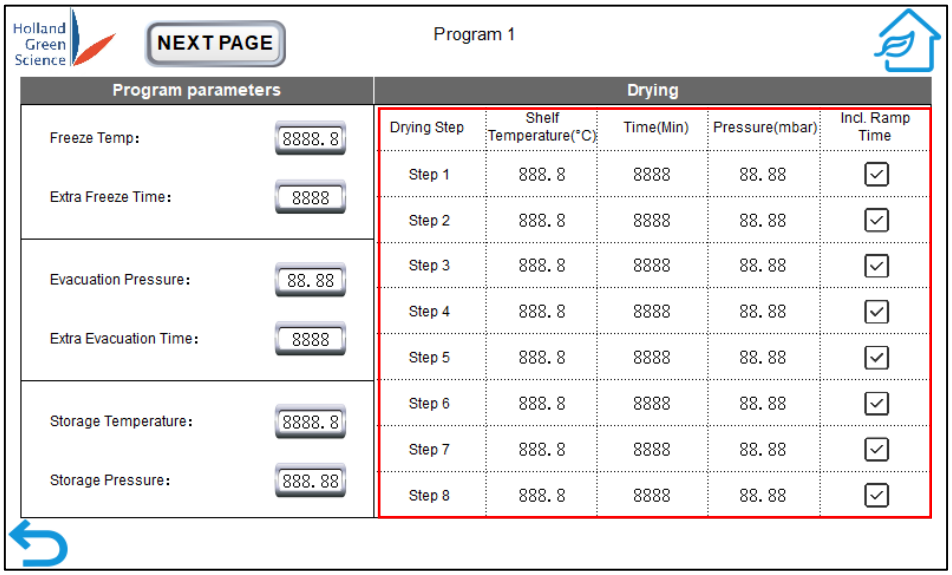



Figure 23

### Storage Stage

Finally, there is the storage stage (Figure 24). In this stage, the temperature and pressure are specified for the temperature and pressure condition the product will be left at once the run has finished. Specify pressure a little high such as 3-5 mbar to avoid additional drying (if preferred) and use a temperature closer to room temperature like 25°C to prevent the product from absorbing moisture.

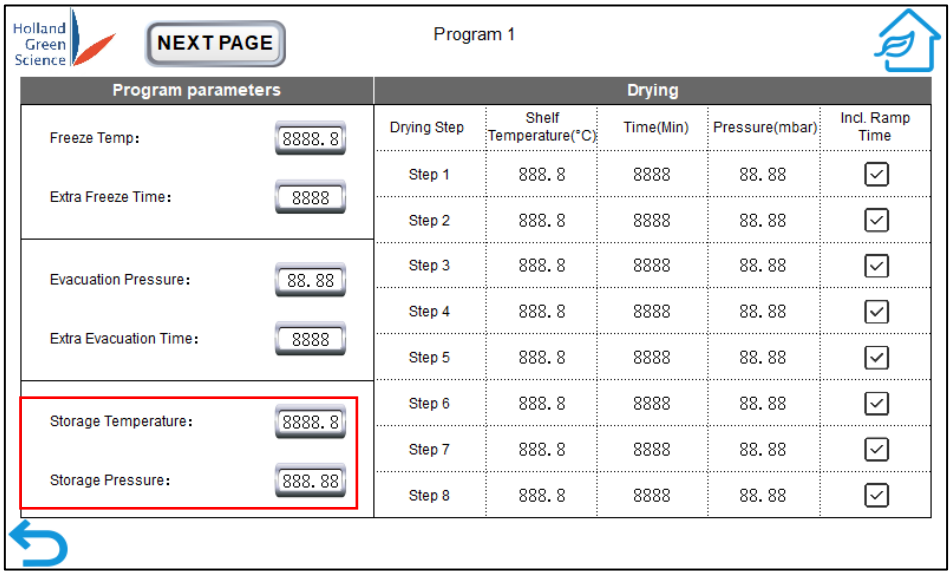



Figure 24

Verify the program is running by the sound of the compressor starting and the "Program Progress" screen appearing (Figure 25).

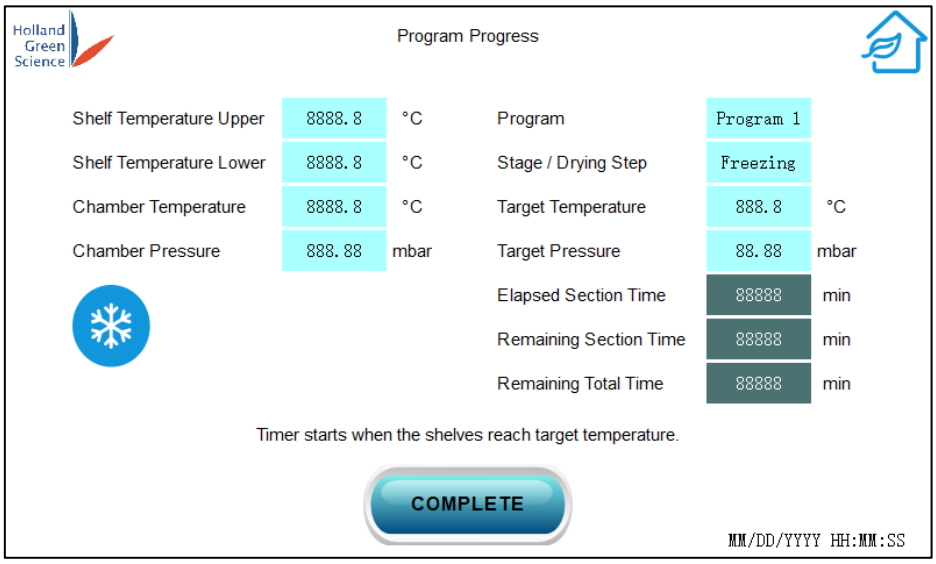



Figure 25

The "Program Progress" screen displays real-time values of the operation of the current program (Figure 25). Some of the readings are as follows:

- Elapsed Section Time: The timer of the current stage / drying step.
- Remaining Section Time: The timer for how much time is left on the current stage / drying step.
- Remaining Total Time: The accumulative total of all the times from each stage and drying steps. This is not the estimated remaining time, but rather the remaining timer time.
- Note: The timers don't start unless the preconditions are met (including ramp time checked, or temp / pressure setpoint reached).

The “Program Progress” screen also displays the current processing step. As mentioned in earlier sections, there are four stages in a Program, and they are “Freezing” (Figure 25), “Evacuating” (Figure 26), “Drying” (Figure 27) and “Storage” (Figure 28).

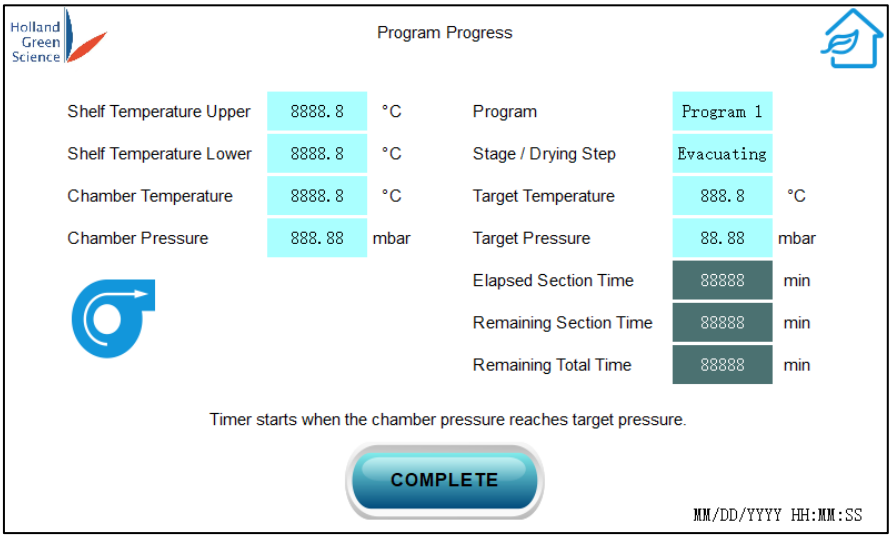



Figure 26

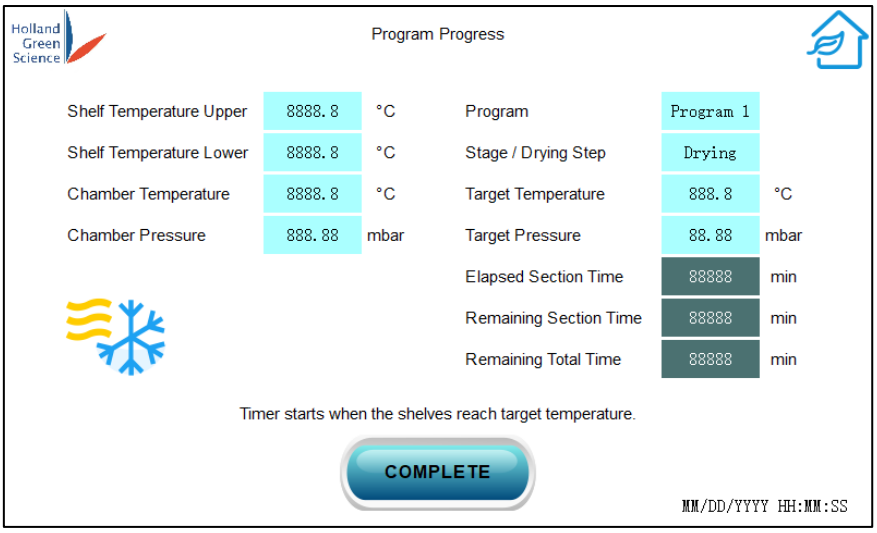



Figure 27

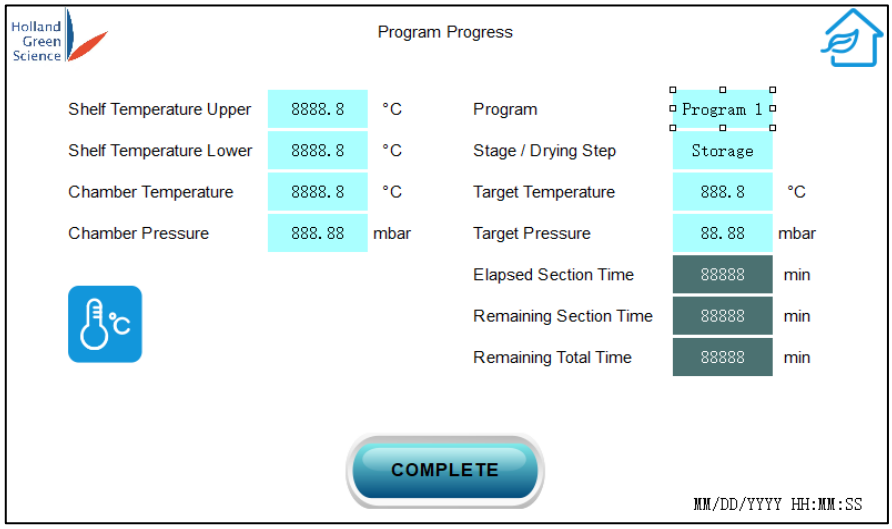



Figure 28

- When the “Stage / Drying step” displays “Storage” (Figure 28), the Program is finished, and it will maintain temps and pressure based on the storage parameters. Tap on “Complete” to stop the Program. A popup will appear to confirm the stoppage of the program (Figure 29).
- Tap on “Confirm” to stop the Program. Open the drain valve and wait for the chamber pressure to return to normal before opening the chamber door to retrieve the product.

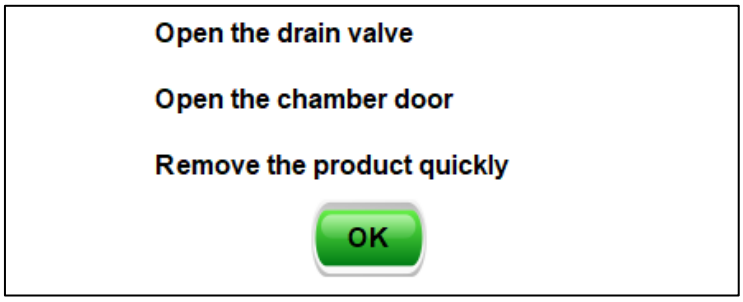



Figure 29

- During a program run, the run can be stopped by tapping “Cancel Run”. A confirmation box will appear to confirm the action (Figure 30).

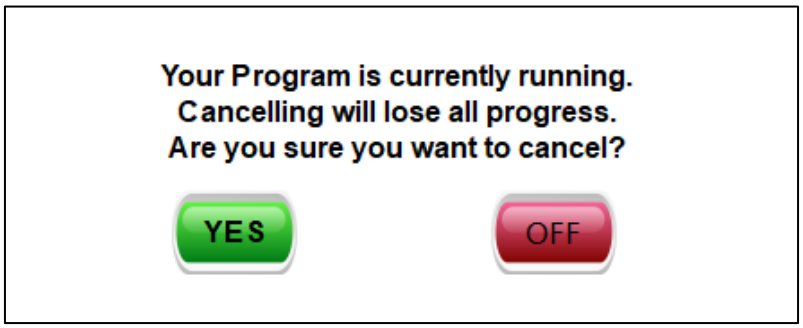



Figure 30

## 8.3 Defrost Mode

When the freeze-drying process is finished, the user can click “Defrost” on the home screen to enter “System Defrost” page (Figure 31). Note, the user can also use the “Defrost” function before any freeze-drying process to defrost the chamber if needed.

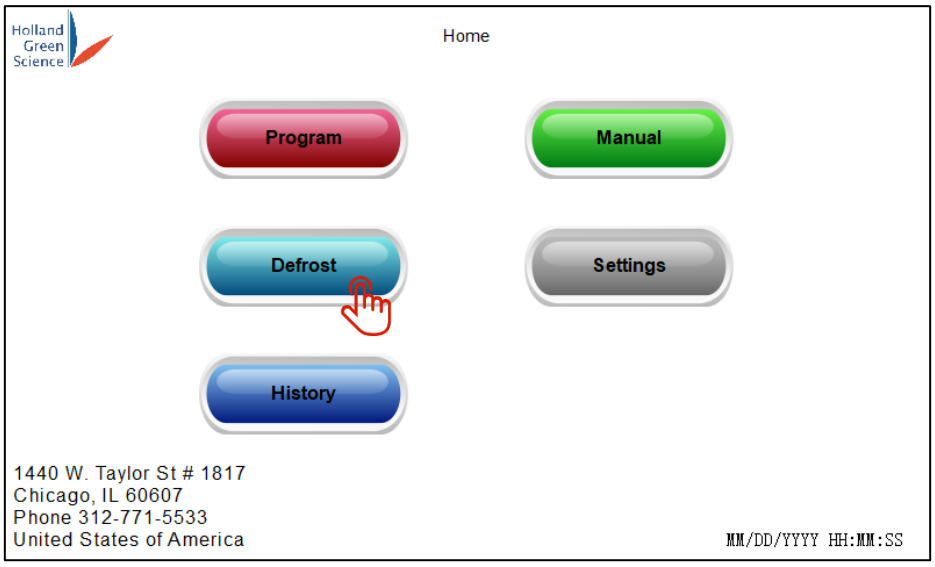



Figure 31

Before starting the “Defrost” process, please confirm:

- Product has been taken out.
- Drain valve is open.
- Chamber door is closed.

Users may set the defrost temperature and defrost time as desired (Figure 32). For 3 to 4 kg (6.6 to 8.8 lbs) ice, we recommend setting the defrost temperature at 40°C and defrost time at 2 hours. Please adjust the defrost temperature and defrost time according to your applications.

The main difference between the Manual screen and Defrost screen, is that in the Defrost screen, a timer is available for the shelves. Once the shelves reach the “Defrost Temperature”, the shelves will hold that temperature specified in the “Hold Time” before turning off.

- Click on “START” to start the defrost process. The “System Defrost” page will display the real-time values of the temperature for the lower and upper shelf chamber temperatures (Figure 32).

- Click on “CANCEL” to stop the defrosting process (Figure 33). This will cause the system to return to the home screen.

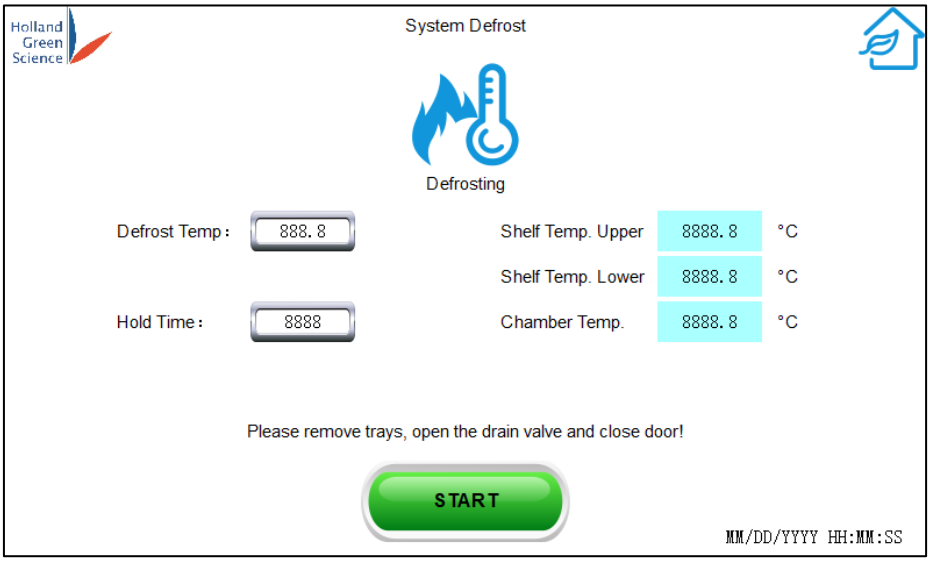



Figure 32

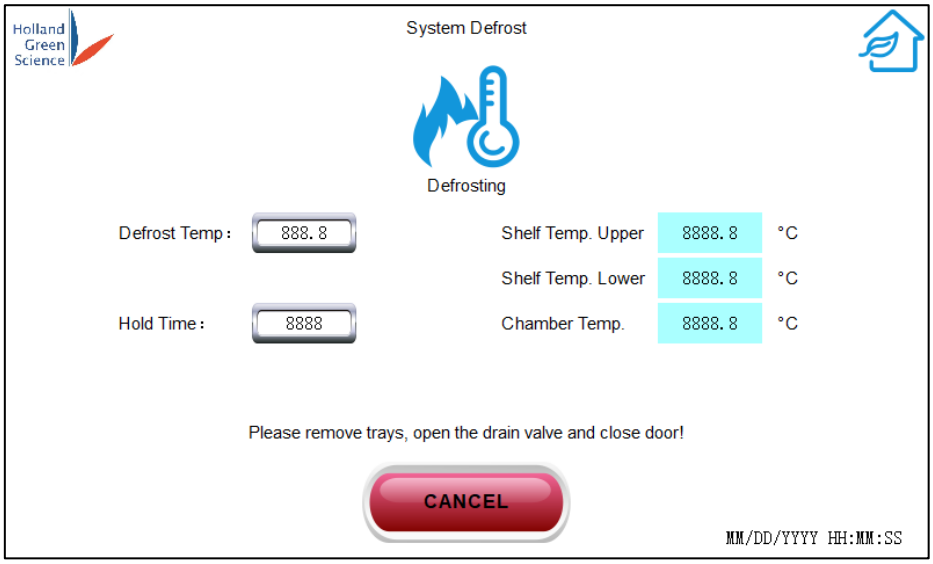



Figure 33

## 8.4 System settings

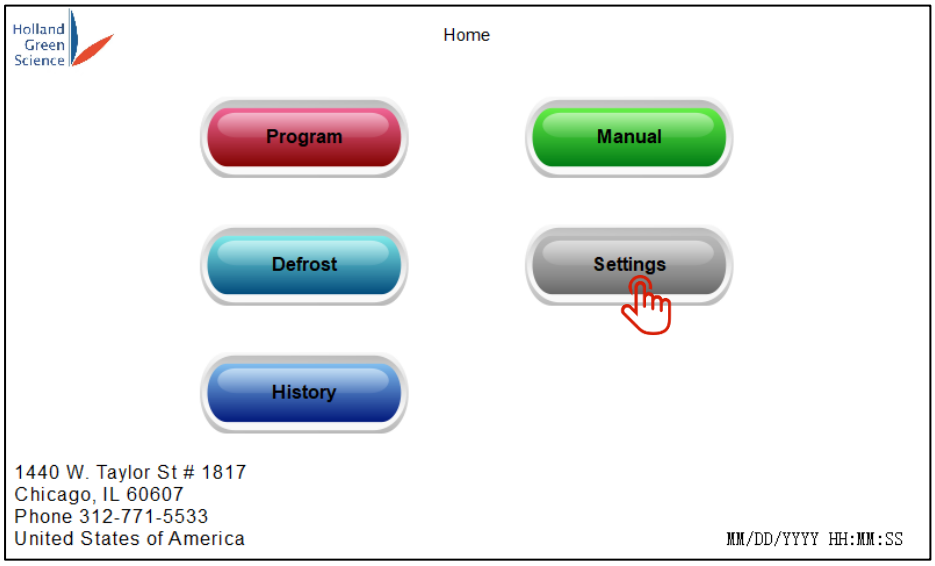



Figure 34

Click “Settings” on the home screen (Figure 34).The following settings can be defined by the user: password, time setting and, screen save (Figure 35).

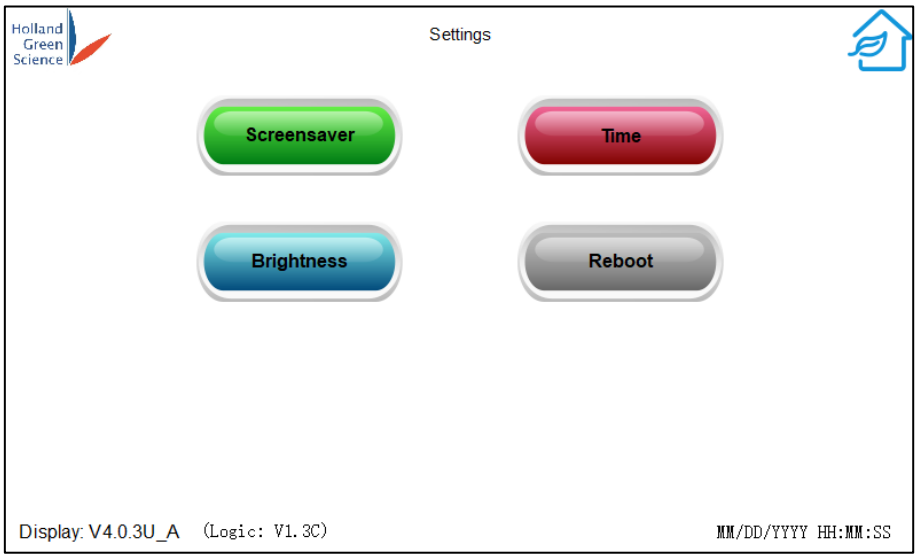



Figure 35

The screen save will display the following system state (Figure 36).

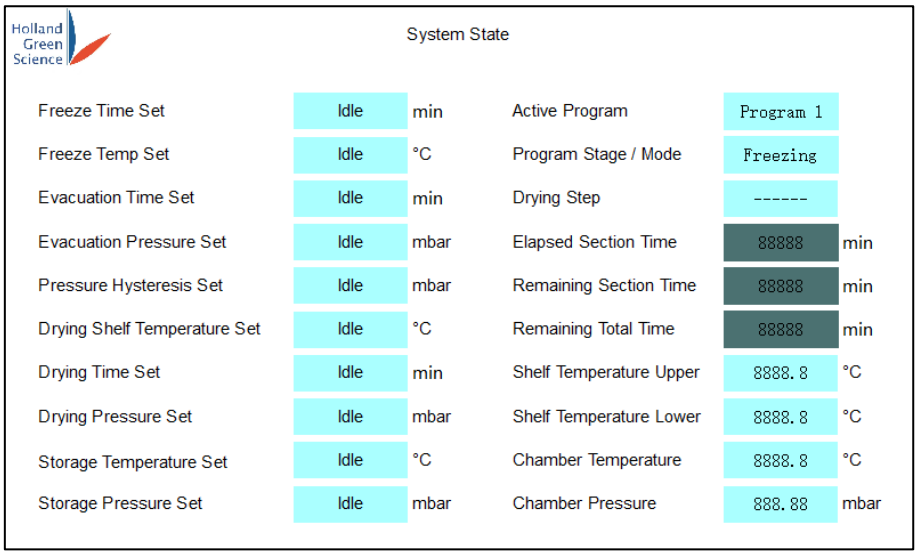



Figure 36

## 8.5 History data

To recover process history, insert a USB flash drive formatted with FAT32 and click “History” on the home screen (Figure 37).

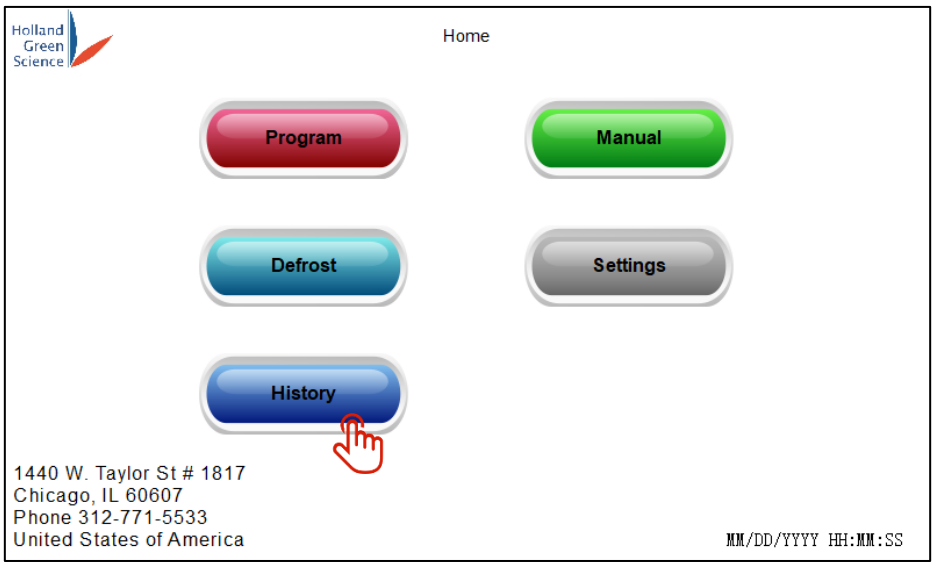



Figure 37

Then click “PAGE UP” and “PAGE DOWN” to view the history data (Figure 38).

Click “DATA EXPORT” to export the history data. Data can be exported to a USB stick inserted in the USB port on the side of the freeze dryer.

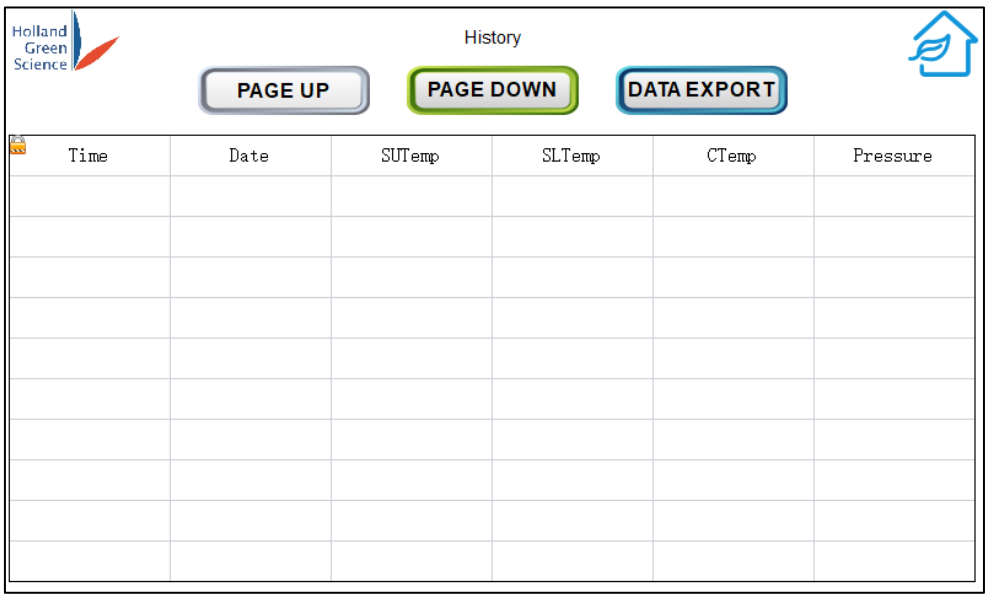

History
PAGE UP
PAGE DOWN
DATA EXPORT
Time
Date
SUTemp
SLTemp
CTemp
Pressure

Figure 38

## IX. Fault Diagnosis

| Error | Solutions |
|---|---|
| **Ultimate vacuum can't reach 0.5 mbar** | Check that the vacuum pump is correctly connected to the main unit with the clamp (tightly). |
| | Check that the drain valve is closed. |
| | Check that the sealing ring is installed correctly. |
| | Check that the vacuum pump functions correctly and the vacuum pump oil is clear (if oil sealed vacuum pumps are used). |
| | If the error remains, contact the service department. Replacement parts may be required. |
| **Vacuum pump oil leakage (only if oil sealed vacuum pumps are used)** | Check that the drain valve is closed, and the chamber is vacuum sealed. |
| | Check the vacuum oil level from the viewing window and confirm it is not excessive. |
| | Check whether the vacuum oil has begun to solidify. If this does occur, change the oil. |
| | Make sure that the temperature inside the chamber is not excessive (>80°C). Wait until the temperature inside the chamber is below 40°C before starting the pump. |
| **The Freeze Dryer chamber isn't cold** | Check the chamber temperature on the HMI screen to make sure that cooling is working. |
| | Check that "Defrost" is not running. |
| | Make sure the compressor is running. |
| | If compressor is "ON" but the temperature inside the chamber is still high, check the air-cooled condenser and to make sure it is not clogged. |
| | Ensure that there is enough clearance around the vents and that ambient temperature of the room is below 30°C |

# X. Cleaning and Maintenance

## 10.1 Cleaning

- Condensation from the product may collect inside of the chamber, please be sure to clean the inside of the chamber periodically by wiping off any the chamber walls. Clean the trays after every freeze-drying process with detergent. Wipe dry afterwards.

## 10.2 Maintenance

- Check the sealing ring regularly to make sure it is not damaged or worn.
- Check the vacuum oil after every 100-hours of operation and replace the vacuum pump oil if the level is low or the oil is dirty.

## XII. Removing/Installing Shelf Stack

**Step 1**

- Open the chamber door and confirm there is no ice build-up that will prevent removing the shelf stack. Carefully pull out the shelf stack.
- Place the stack on the table next to the freeze dryer (see Figure 40). Ensure the connecting cable is not strained. (See Figure 41)

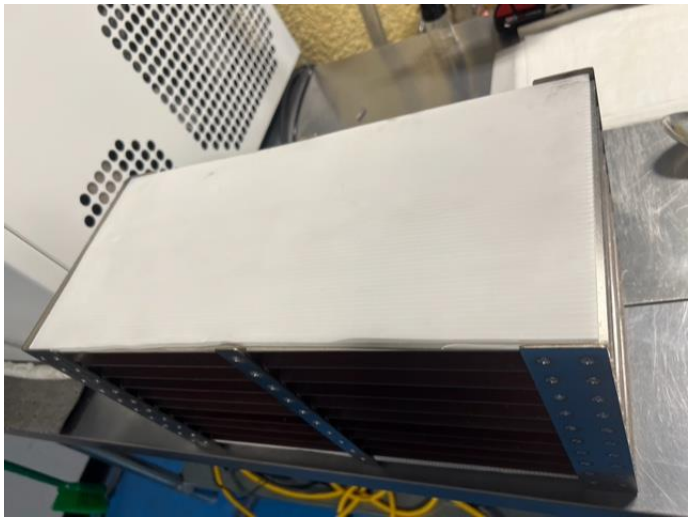


Figure 40

Figure 41

**Step 2**

- Locate the plug assembly and press the release tabs to unplug the shelf stack from the freeze dryer. (See Figure 42)

Figure 42

**Step 3**

- When installing the shelf stack, identify the top and bottom of the plug before attempting to plug it in. Make sure to remove any moisture from the connection points.
- Figure 43 and Figure 44 demonstrate the male plug.

Figure 43

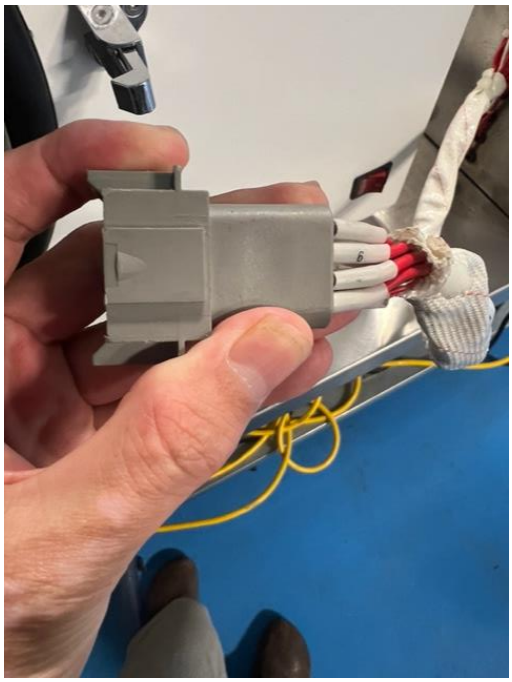


Figure 44

- Figure 45 demonstrates the inside of a male plug.

Figure 45

- Figure 46 demonstrates the female plug.

Figure 46

**Step 4**

- When reinstalling the shelf stack, ensure the connecting cable is not coiled underneath as in Figure 47.

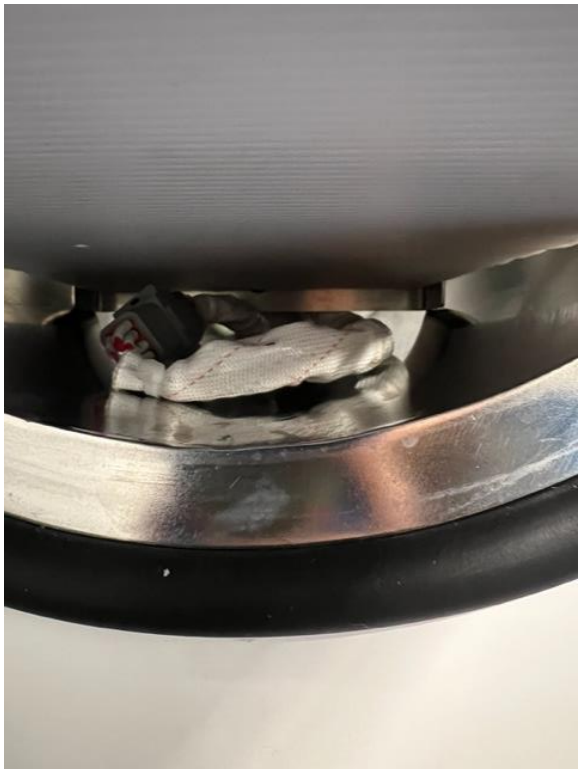


Figure 47

**Step 5**

- When reinstalling the shelf stack, gently push the shelving stacks halfway and ensure the connecting cable is behind the shelf stack, in a coiled format, so as to not affect the ice condensers efficiency (see Figure 48 and 49).

Figure 48

Figure 49