HARVESTRIGHT



SCIENTIFIC FREEZE DRYER

OWNER'S MANUAL

The Essential Guide for Every
Scientific Freeze Dryer Owner

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UNPACKING

UNPACKING YOUR FREEZE DRYER

You should have taken the box off the freeze dryer and inspected for damage at the time you received your unit, before you signed the Shipper's Bill.

You should have received the following items:

- Harvest Right Freeze Dryer
- Vacuum Pump
- Power Cord
- Vacuum Hose
- Shelving Unit
- Trays
- Owner's Manual
- Insulator Door Pad
- Other materials, not listed here, may have been included

1. Remove Harvest Right Freeze Dryer, vacuum pump, vacuum hose, and power cord from packaging.
2. Inspect all items.
3. Remove the vacuum pump from its packaging and place it beside or behind the freeze dryer.
4. If there is a problem, call Harvest Right Customer Support at **1-800-865-5584.**

> ⚠ **CAUTION:** Do not lift the freeze dryer from the bottom of the door. Doing this may cause misalignment and inability to achieve proper vacuum, and voids the warranty. Always lift the freeze dryer from the base.

IMPORTANT INFORMATION ABOUT YOUR FIRST BATCH

Before using your freeze dryer, please note the following:

1. New freeze dryers need to have a one batch burn in period. That means, you should fill the freeze dryer with moist bread slices and freeze dry it. After the bread is finished, test it for dryness and throw it away. This way you can make sure your freeze dryer is working properly and it will help remove any manufacturing smell that is kind of like or similar to a "new car" smell.

2. Please check each batch of food to make sure it is completely dry. If just a few pieces are not dry, when you package the food, they will spoil the whole batch; everything in the bag will turn soft.

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IMPORTANT SAFEGUARDS

SAFETY INFORMATION

Read all instructions carefully before using your Harvest Right Freeze Dryer. Following these instructions will help prevent injuries, damage to the freeze dryer, and will ensure that you have the best possible experience with your freeze dryer. Save these instructions.

When using this appliance always exercise basic safety precautions, including the following:

- Use this product only for its intended purpose as instructed in this Owner's Manual.

⚠ **WARNING** Do not use an extension cord when plugging your freeze dryer into your power source. Many extension cords cannot handle a sufficient draw of power and may melt or deform causing a fire or other damage.

- Do not use surge protectors or plug your freeze dryer into a GFI outlet. These sources are very sensitive and may cause your freeze dryer to unnecessarily trip the power breaker.
- Do not allow children to climb, stand on the freeze dryer, or hang on the door or shelves. They could damage the freeze dryer and injure themselves.
- After your freeze dryer is in operation, do not touch the cold surfaces during the freezing cycle, particularly when hands are damp or wet. Skin may adhere to these extremely cold surfaces.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of the freeze dryer.
- Keep fingers out of "pinch point areas". Clearances between the doors and closing mechanism are necessarily small. Be careful closing doors when children are in the area.
- Unplug your freeze dryer before cleaning or making repairs. We strongly advise that service be done by a qualified individual.
- Refrigerants: All refrigeration products contain refrigerants, which under federal law must be removed prior to product disposal. If you choose to dispose of an old refrigeration product, check with the company handling the disposal about what to do.
- This appliance is not intended for use by small children or infirm persons without capable, adult supervision. Children should be supervised when using the appliance.

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- Do not use a wet or damp cloth when cleaning the plug at the end of the power cord. Remove any dust or foreign matter from the power plug pins. A dirty power plug can increase the risk of fire.

- Do not block vent air holes. If the air holes are blocked, the freeze dryer could overheat. Keep vents clean.

- Never unplug your freeze dryer by pulling on the power cord. Always grip the power plug firmly and pull straight out from the outlet. Pulling on the power cord could cause a fire and/or electric shock. A damaged power cord must be replaced by the manufacturer, a certified service agent or qualified certified service personnel.

- Use caution when putting your hands under the appliance. Any sharp edges may cause personal injury.

- Do not insert the power plug with wet hands. It may cause electric shock. In general, power consumption will average 8-10 amps of power and spike near 16 amps. Usage of a dedicated 20 amp circuit will help prevent power outages and allow for proper freeze drying (Power consumption will vary between models).

- Do not defrost your freeze dryer with a blow dryer or other heating device. There is a thermal cutoff that protects the machine and the material inside the chamber from overheating. If the thermal cutoff gets too hot, it will eliminate all power to your shelf heaters until the appropriate parts have been replaced.

NEVER OPERATE THE FREEZE DRYER IF IT APPEARS DAMAGED

If it is dropped or damaged in any way, call Harvest Right Customer Support immediately at 1.800.865.5584 for examination, repair, electrical or mechanical adjustment, or possible replacement of parts.

BE CAREFUL ABOUT WHAT YOU PUT IN YOUR FREEZE DRYER

The freeze dryer is designed to freeze dry materials or products that contain water. Freeze drying other materials may void the warranty and could damage the freeze dryer.

VACUUM PUMP RUNS HOT

Use caution when running your freeze dryer as the vacuum pump that sits external can reach 160˚F during operation. Keep your vacuum pump out of the reach of children as it may cause injury if touched. Your vacuum pump is built to run hot. Use care and caution in order to prevent injury.

RECOMMENDED OPERATING TEMPERATURES

Your Harvest Right Freeze Dryer is designed to work in a wide variety of environmental temperatures, but extreme heat and cold will affect performance. The recommended temperature range for operation is 35-90°F. The most efficient temperature range is between 45-75°F. Although safe, operating your freeze dryer

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in temperatures above 90˚F will increase batch times and have an adverse effect on the condensing unit (freezer). As the temperature rises where your freeze dryer operates, so does the length of time it takes to finish. This happens because with hotter operating temperatures it is harder to reach the extreme cold required for freeze drying.

For example: a batch that normally takes 24 hours to finish in a 75°F environment could take over 40 hours to complete in hot temperatures.

OIL-FREE VACUUM PUMP

For optimum performance of your vacuum pump DO NOT reduce the freeze time or bypass the freezing cycle of your freeze dryer! For shorter freezing cycles you may pre-freeze the products until they are frozen solid before placing them in the freeze dryer but STILL DO NOT bypass the freezing cycle of your freeze dryer! Freeze drying products that have even a little non-solid moisture in them will reduce the performance and the life of the vacuum pump.

DO NOT overload the trays in the freeze dryer. Too much product will produce too much evaporated moisture which may exceed the ice capacity inside the vacuum chamber and cause the vacuum pump to suck in the excess moisture. This may affect the performance and shorten the life of the vacuum pump.

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GENERAL INFORMATION

MAJOR COMPONENTS

Harvest Right Scientific Freeze Dryer

Power Switch: Located on the back of the freeze dryer ("0" is off, "I" is on).

Vacuum Chamber: This circular chamber includes a shelving unit for the trays.

Trays: These hold the product to be freeze dried. Do not overload trays or batch times will be extra long.

Power and Display: The freeze dryer is powered by plugging the power cord into the back of the freeze dryer (one receptacle is for the power cord and one is for powering the vacuum pump) and a functioning 110-120 volt power outlet in the wall of your house or garage (a dedicated 20 amp circuit is recommended for Medium freeze dryers and required for Large freeze dryers).

Vacuum Pump: Connect the vacuum hose to the connection on the side of the freeze dryer and to the appropriate fitting on the vacuum pump. The vacuum hose should be tight. Be sure to tighten both ends of the vacuum hose to properly connect the freeze dryer to the vacuum pump. Plug the vacuum pump power cord into the receptacle on the back panel of the freeze dryer. Make sure the vacuum pump "on/off" switch is set to the "ON" position ("O" is off, "I" is on). It will not receive power until the freeze dryer completes the circuit at the appropriate time in the freeze drying process.

Drain Line: This is a clear tube, located on the side, toward the bottom-back of the freeze dryer. This tube should be un-coiled and the open end placed in a drain or a 5-gallon bucket (or similar container) to collect the water removed during freeze drying (collects as ice on the sides of the vacuum chamber). Don't open the drain valve with the open end of the clear hose in water or the water will be sucked into the freeze dryer.

Before you start a freeze drying cycle make sure the valve on the drain tube is closed. The small handle on the valve should be perpendicular to the tube (See Figure 1).

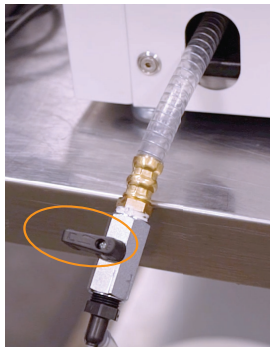


FIGURE 1

FREEZE DRYER ASSEMBLY & VACCUM TEST

Wait 24 hours before running your freeze dryer in order to facilitate proper settling of the refrigerant within the condensing unit.

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1. The ideal location for operating your freeze dryer is a cool, dry, clean location. Dirty air will clog the cooling fins in the condensing coil and reduce the life and efficiency of the refrigeration system.

2. Place the freeze dryer on a level, stable surface and adjust the leveling feet so that the front end of the freeze dryer is about ¼ to ½ inch taller than the rear. This allows the ice water from the freeze dryer to exit through the drain hole in the rear of the vacuum chamber. Make sure the translucent (clear) drain line is placed in a 5-gallon bucket, drain or equivalent container to catch the water.

3. Make sure the inside surface of the acrylic door is clean. Use only dry cotton cloth and warm water, no cleaners. Check rubber door gasket and make sure it's clean.

4. Connect the large hose to the vacuum pump and to the freeze dryer, and tighten (See Figure 2). Do not add any additional Teflon tape, or any type of adhesive, when installing the vacuum hose. Doing this almost always creates a vacuum leak.



FIGURE 2

5. Connect the freeze dryer power cord to the receptacle on the rear panel and to a 110 to 120 volt ac outlet (power may vary between models). A dedicated 20 amp circuit is recommended for Medium freeze dryers and required for Large freeze dryers.

6. Connect the power cord on the vacuum pump to the receptacle on the rear panel of the freeze dryer.

7. Make sure the power switch on the vacuum pump is in the "ON" position. ("O" is off, "I" is on). The power button is located on the rear of the vacuum pump.

8. Pull out your drain hose. Make sure it is in the 'OFF' position (the small handle on the valve should be perpendicular to the direction of the drain tube). Place the open end in a 5-gallon bucket, drain, or similar container, to collect the water that is removed during freeze drying. It is best to keep the hose out of the water.

9. Ensure that the acrylic door makes contact with the rubber gasket by

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examining the door in the fully closed position. You will see a thin line in the middle of the gasket as it presses up against the door. For the first couple batches, when the pump turns on, make sure the door fully seals around the gasket. The door has a two-staged handle. Stage 1 latches the door and Stage 2 compresses the door against the rubber gasket. Make sure it is turned all the way to the right.

10. Turn on freeze dryer (On/Off switch is located on the back of your freeze dryer. Press the switch to the "ON" position ("0" is off, "I" is on). Next, in order to perform a quick test and assure that your freeze dryer is set up properly, please complete the following steps. To accomplish this task, your freeze dryer chamber must be free of any damp or wet material such as water or condensation. It needs to be completely dry.

- Tap the "List" button and select the user HR, then tap the password box and type in 3, then press enter, then select the "Continue" button.



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• Located at the top of the screen are three buttons. One is red and says "Menu", the next two are"Chiller" and "Vacuum". These two button are for manual control of the cooling system and the vacuum pump. Tap the "Chiller" button. A box will appear, select Yes. Tap "Vacuum", then tap Yes.



• When the vacuum pump first turns on, the display will read a 4-digit number. Within 10-20 minutes the displayed pressure will begin to drop. This number represents the vacuum pressure inside the freeze dryer. A lower number represents a stronger vacuum pressure.

• Eventually, the pressure will go from the initial 4-digit number down to 500 mTorr and lower. If you see that this is the case, it means that your freeze dryer has been set up properly and you are ready to start your first batch. If you are unable to achieve a vacuum of 500 mTorr or lower after 20 minutes (or if the screen still displays the same 4-digit number) check steps 3-11 of this quick start guide to assure that there are no air leaks at any location of your freeze dryer.

• Once you are able to see a pressure of 500 or lower, you are ready to start your first batch!

• Turn off the "Chiller" and "Vacuum" by tapping the same buttons as before and selecting Yes, then open the drain valve (located on the left side of your freeze dryer). This will release the pressure and allow the door to be opened

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so that you can begin freeze drying your desired materials! Now that the pressure has been released, close the drain valve again (or we will not be able to achieve a vacuum when the freeze dryer is running.)

If 500 mTorr or lower is not reached, check for air leaks and repeat the test.

1. Door must be properly closed.
2. Hose connecting the vacuum pump to the freeze dryer should be securely tightened on both ends.
3. Drain valve must be closed

Once you are able to see a pressure of 500 mTorr or lower, you are ready to start your first batch. Turn off your freeze dryer and open the drain valve. This will release the pressure and allow the door to be opened.

If you are unable to successfully complete this test because the vacuum pressure won't go below 500 mTorr, please call **Customer Support: 800-865-5584.**

11. You are now ready to load freeze drying material onto trays.

12. Prepare the material that you want to freeze dry and place it on the trays, one layer thick, so that it can be uniformly warmed by the shelving unit. Product that is prepared in uniform thickness will dry quicker.

13. Place trays in the shelving unit inside the freeze dryer. Insert insulator pad. Close the acrylic door and turn the door latch clockwise as far as it will go, compressing the door against the rubber gasket. Visually check to make sure the door is sealed properly to the gasket. If the door is not latched tight, there will be a vacuum leak.

14. Close the drain valve. In the closed position, the drain valve is perpendicular to the hose. If the material profile is already selected, press and hold the "Start Profile" button at the bottom right of the screen until it begins. If this profile is not selected. Tap Menu > Load a Profile then tap Food, then tap the green "Start Profile" button. If this profile doesn't exist, follow the instructions beginning on page 11 for complete detailed instructions.

15. It will then begin the profile by freezing the material for a set time. The vacuum pump will turn on automatically once the freeze step is complete. The buttons pressed before during the test will turn on and off automatically during the profile and do not need to be changed manually. If the vacuum pump doesn't turn on, make sure it is plugged into the back of the freeze dryer. Make sure the switch is turned "on" on the back of the vacuum pump.

16. When the vacuum pump comes on then it should reduce the pressure in the vacuum chamber within about 10 minutes. If you can still open the door after

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30 seconds turn off the vacuum pump, release the pressure in the vacuum chamber by opening the drain valve, open the door and check the cleanliness of the rubber gasket. Close the door again and turn the vacuum pump "on". Wait for 1 minute and verify that the door cannot be opened.

17. Once the material being freeze dried is frozen and when adequate vacuum pressure is reached (500 mTorr depending on set points), the heaters on the shelves turn on to hold the temperature at the set point, then they will turn off when the pressure raises to the upper limit (600 mTorr depending on set points). This on and off cycle can repeat over and over if the rate of sublimation exceeds what the pump can pull. This freeze dryer is designed to maintain the set temperature as long as it doesn't exceed the upper pressure limit.

18. At the end of the freeze dry cycle, the heaters will stay on at the last set point temperature until the profile is ended or the defrost cycle is started. Before the profile is either ended or the defrost cycle is started, turn off the vacuum pump manually be tapping the "Vacuum" button. Once off, open the drain valve and check whether the product is completely freeze dried. If not, place the product back inside, insert insulation pad, close and latch door, close drain valve, then turn the vacuum pump back on by selecting the "Vacuum" button. Make sure the door will not open after the vacuum pump is turned back on. It will continue to freeze dry at the last set point temperature until turned off by the user. Check the product again after a few hours. Once complete, either tap "Just End Profile" or change the temperature for defrost to 120°F if not set already and tap "Run Defrost".

- Immediately package your freeze dried material so that it doesn't rehydrate from the natural humidity in the air. When packaging, you can use cans, Mylar bags, and glass jars. Always use an appropriate oxygen absorber.

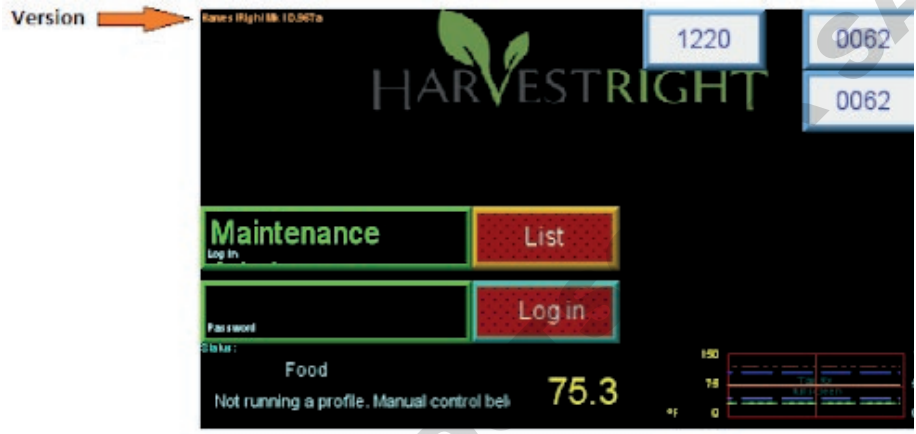
- Make sure all of the ice and water are removed from the vacuum chamber before starting a new batch. Pressing the "Run Defrost" button turns on the heaters in the shelving unit and accelerates melting the ice. Ambient air can also melt the ice over time.

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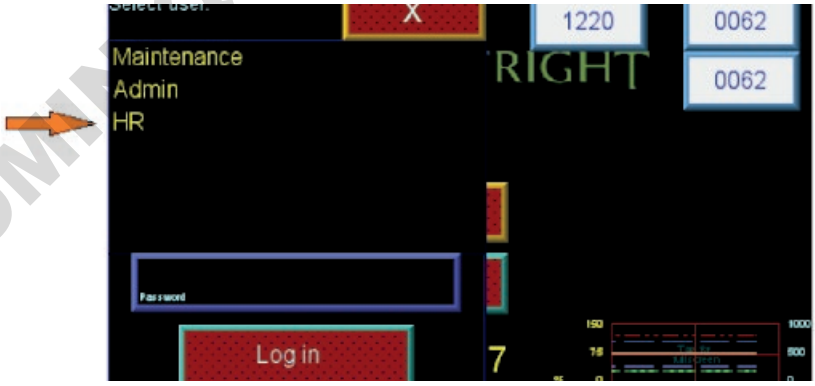
OPERATIONAL OVERVIEW

1. LOGIN SCREEN

The login screen is the first screen to appear once the Scientific Freeze Dryer is turned on. On this screen, the version is listed on the upper left of the screen. For example, the version of the Scientific Freeze Dryer in this operations manual is 10.967a.



In order to login, a user needs to be selected. This can be done by tapping either the green writing in the Log in box, in this case “Maintenance”, or the red button “List”.

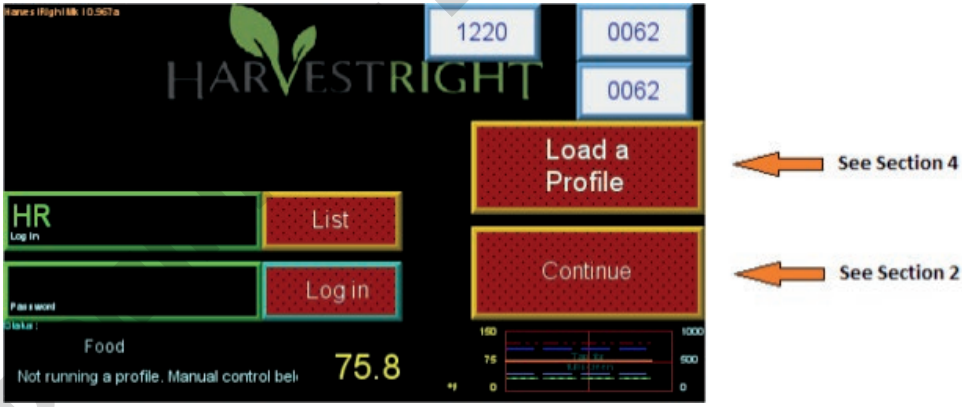


User: HR
Password: 3

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Select the user **HR**, then tap the Password box below and type the password **3.** Select Enter and then select the red "Log in" box to log in. Selecting "Continue" will bring up the main operations screen, see **Section 2.** Selecting "Load a Profile" will bring up the profile selection screen, see **Section 4.**



2. MAIN OPERATIONS SCREEN

After selecting “Continue” from the Log in screen, the main operations screen appears.



The vacuum pressure reading will display a 4-digit number from atmospheric pressure until it reaches this 4-digit number. Once reached, it will begin to drop. *The recommended range for freeze drying is between 500 and 600 mTorr.

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The temperature reading in yellow is the current Control temperature at the location of the thermocouple which is located on the shelving unit, not the vacuum chamber. The box underneath the current temperature is the “Set Point” temperature. Once set, the Shelf Unit will be powered on with variable power to keep the Shelf Unit at the target “Set Point” temperature. A small bar graph is located between the current Control temperature and the Vacuum Pressure. A bar will appear with this bar graph showing how much power is applied. See **Section 5.3.5** for more details.

On the right of the main operations screen, there is a customizable graph displaying the current readings. Selecting this graph will enlarge it. The colors of the lines on the graph correspond to the colors of the numbers on the main operations screen.



The upper and lower limits of the displayed temperature and vacuum pressure can be adjusted based on preference. Using the buttons and the bar at the bottom of the screen, the graph can be moved backward and forward to view different points in time. Only a short elapsed period is displayed on this graph. To see the full data, the datalogs can be extracted through the USB port on the front right side of the freeze dryer. See **Section 5.6** for details on saving datalogs. The data can be opened using a spreadsheet software like Microsoft Excel or similar.

Selecting “Legends/settings” brings up the legend for the graph. See **Section 5.4** for more details.

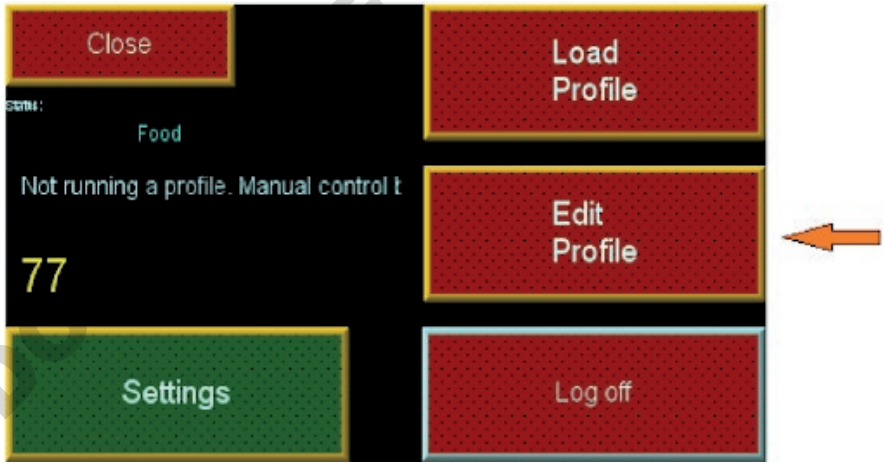
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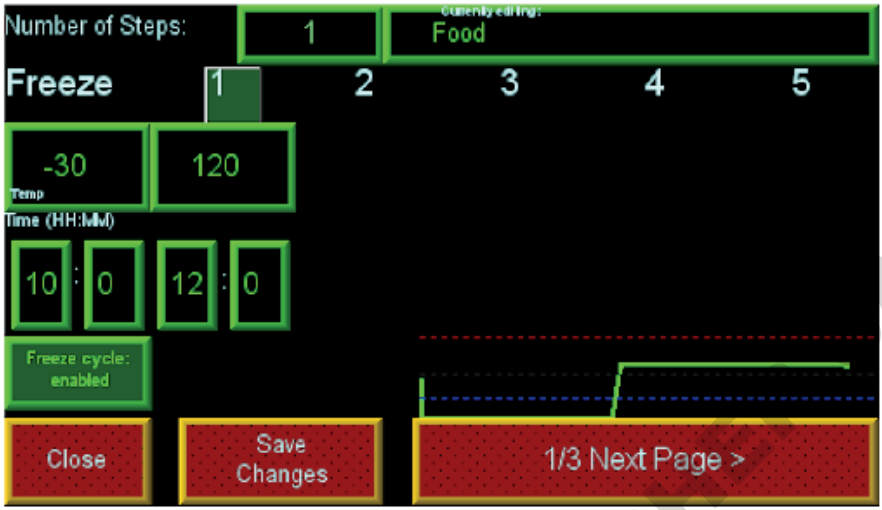
3 – CREATING/EDITING A PROFILE

The Harvest Right Scientific Freeze Dryer operates primarily through the use of profiles. A profile is a freeze drying process where the process can be completely customized.

Starting from the main operations screen, a profile can be created or edited by selecting “Menu” on the upper left of the screen then selecting “Edit Profile” on the right.



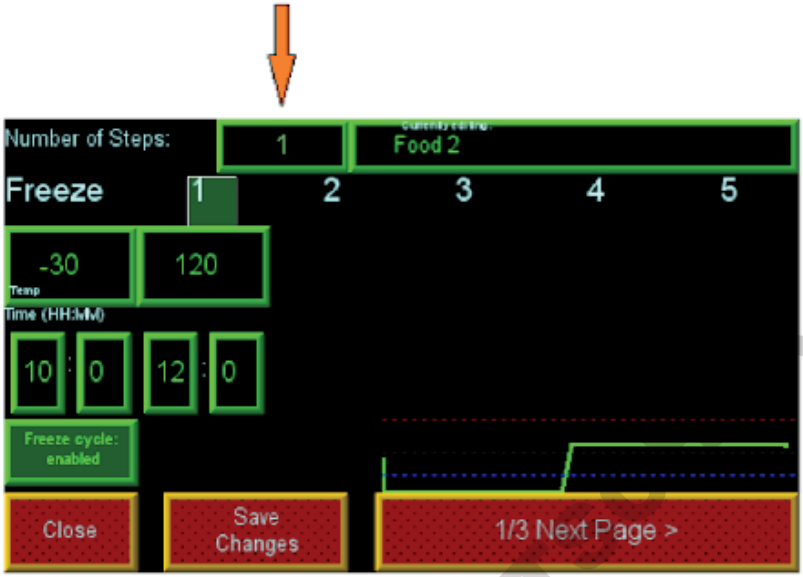


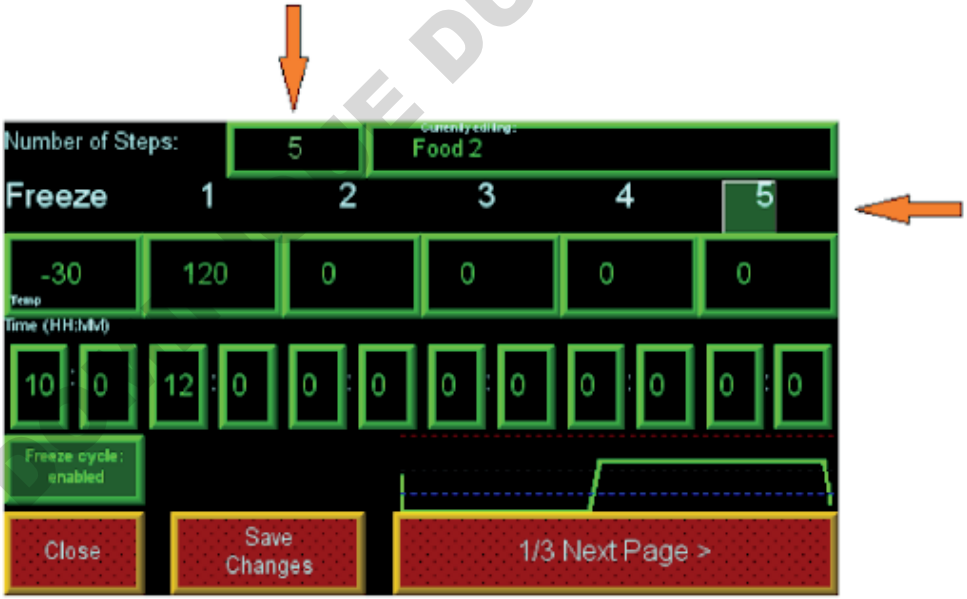


On this Scientific Freeze Dryer, a custom profile is already created called Food. The name of the profile can be seen within the box labeled “Currently editing” at the top of the screen. The name can be changed by selecting the box and typing in a new name, then pressing enter once done.



The number of steps can be changed from 0 (Freeze only) up to 5 by selecting the box to the right of “Number of Steps” or by tapping the step numbers. The steps are indicated by the white numbers and letters from “Freeze” and “1” through “5”.



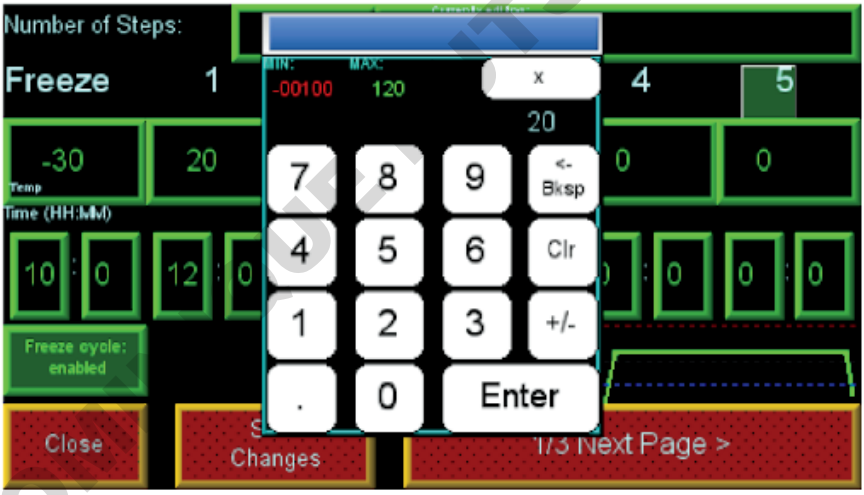


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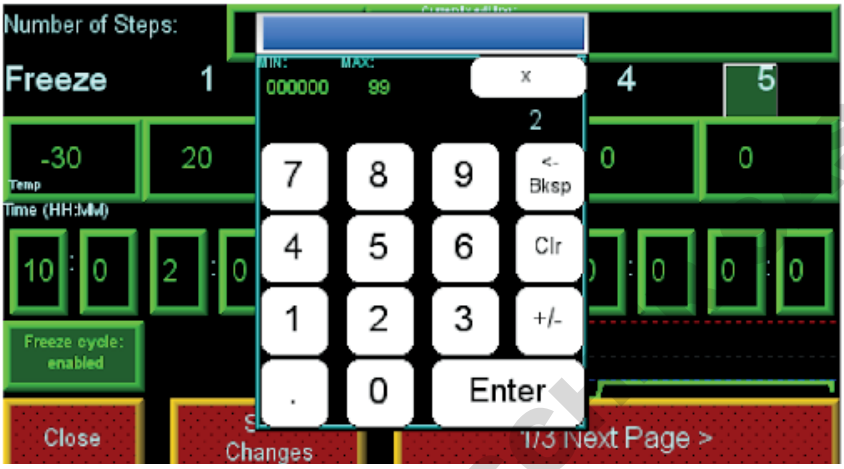
The upper set of green boxes are the “Set Point” temperatures for that step. The units for temperature are in °F. The lower green boxes are the elapsed time for that step where the left box is for hours and the right box is for minutes.

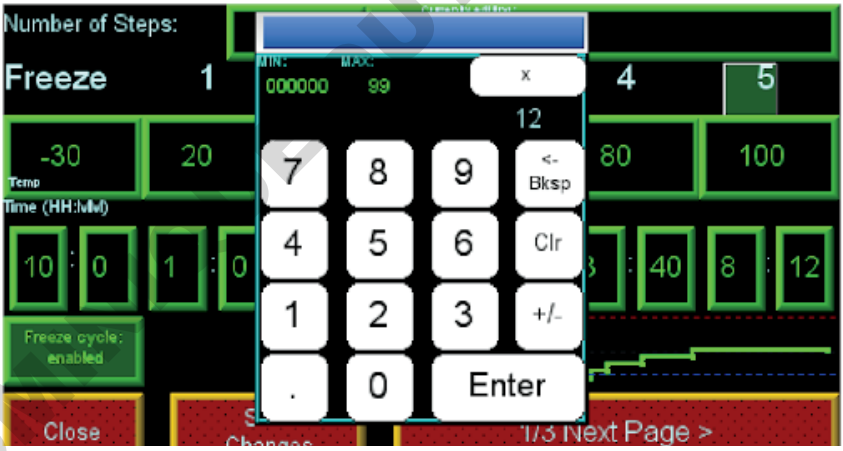


To customize steps, simply tap the green boxes for each step and change the temperatures and times.



*It is recommended that the Freeze Temperature Setpoint is set to between -20°F to -30°F. At approximately -15°F, water will change phase from solid to vapor at around 500 mTorr. If the water is above this temperature when the vacuum is pulled, the solid water will prematurely vaporize and could also cross into liquid phase change, if warm enough, and could splatter throughout the inside of the chamber and also cause some product to get inside the vacuum pump.


Number of Steps:
Freeze
1
4
5
-30
Temp
20
0
0
Time (HH:MM)
10
0
2
0
0
0
0
Freeze cycle:
enabled
Close
Changes
1/3 Next Page >
MIN:
MAX:
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99
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2
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Number of Steps:
Freeze
1
4
5
-30
Temp
20
80
100
Time (HH:MM)
10
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40
8
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Selecting the “1/3 Next Page >” button will change the page to page 2.

Page 2 is where each step can be customized to whether the Vacuum Pump and/or the Condensing Unit (or Chiller) is On or Off for each step. For a normal freeze drying process, the Vacuum Pump is Off for the Freeze Cycle and On for the remaining Steps, and the Chiller is On throughout the entire process, as shown below.

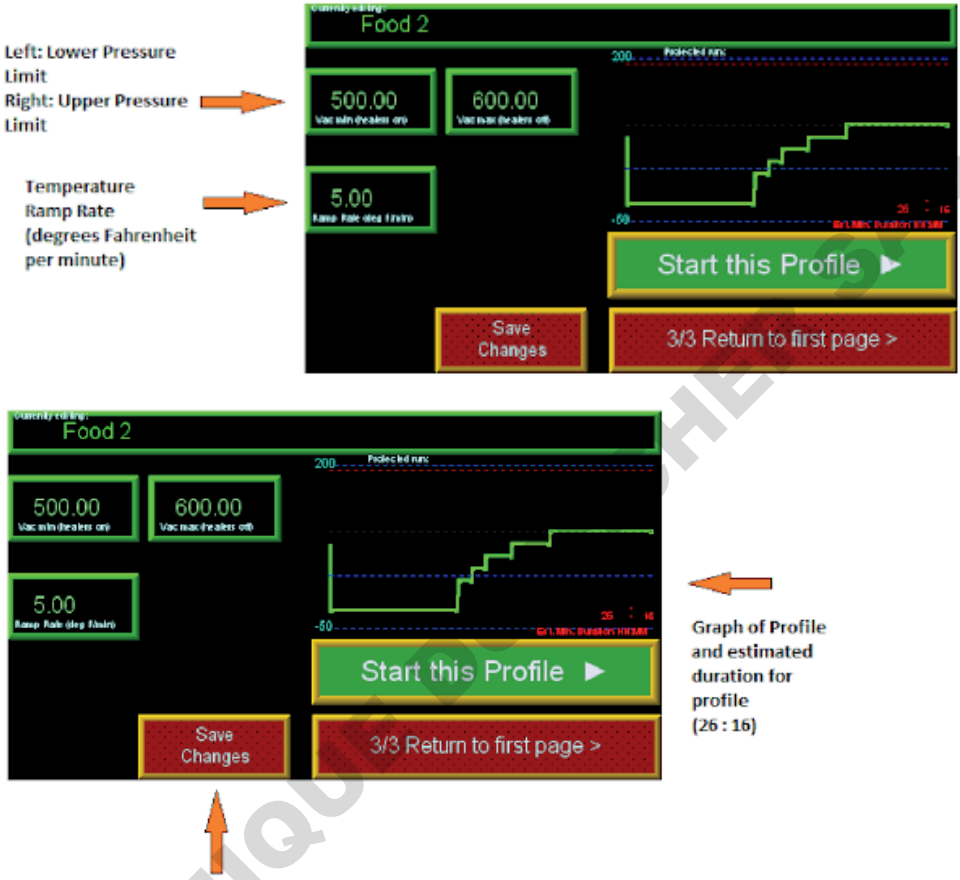


Selecting the “2/3 Page >” button will change the page to page 3.

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Page 3 is where the upper and lower vacuum pressure limits can be set. The units for pressure are in mTorr.

It is also where the temperature ramp rate is set.

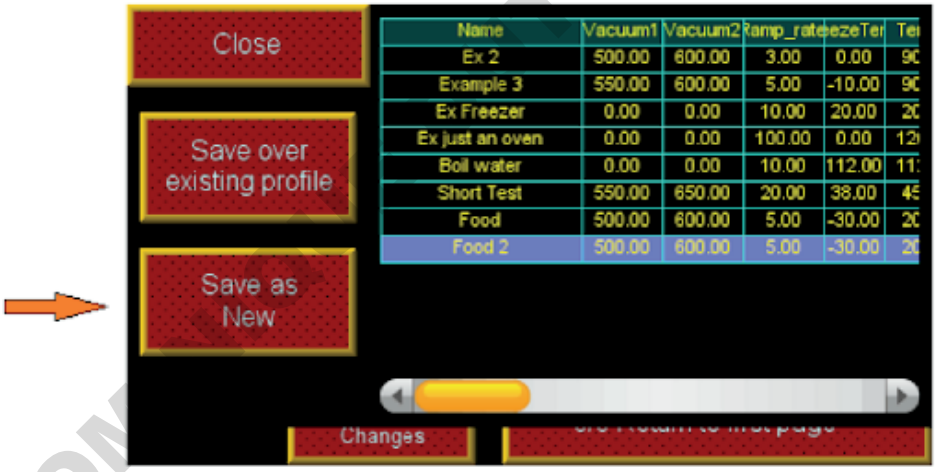


To save the profile, select the “Save Changes” button.

*The estimated duration of the profile is based on the Ramp Setpoint temperature which is the linear equation based on the ramp rate in which the Control Temperature follows. The lower the ramp rate, the closer the actual Control Temperature follows the Ramp Setpoint temperature. In this case, the temperature starts at room temperature, then ramps down to -30°F. The actual temperature will drop much slower from room temperature to the Freeze Temperature Setpoint because the freezing within this system is mainly radiation heat transfer. It also takes time for the condensing unit to cool the chamber’s inside walls down to approximately -40°F. The estimated duration begins once the first set point temperature is reached (-30° F in the example above).



When editing and making changes to a profile, select the "Save over existing profile" button. When creating a new profile, select the "Save as New" button.

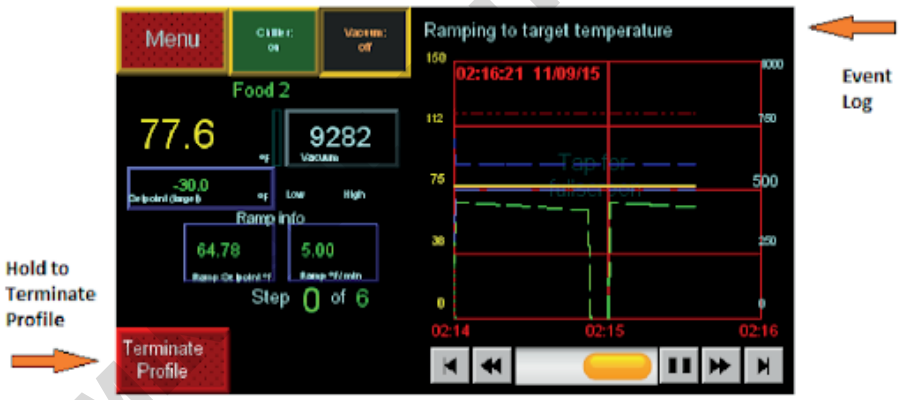


Next, press "Close", then either start the profile indicated by the green "Start this Profile" button or press the "3/3 Return to first page >" button to return to page 1 and press "Close" to return to the Menu screen then "Close" again to return to the main operations screen. The profile can either be started from the "Edit Profile" pages, the main operations screen, or using the Load Profile Button, see **Section 4** for details.

From the main operations screen, to start the profile, hold the green “Start Profile” button until the profile starts.



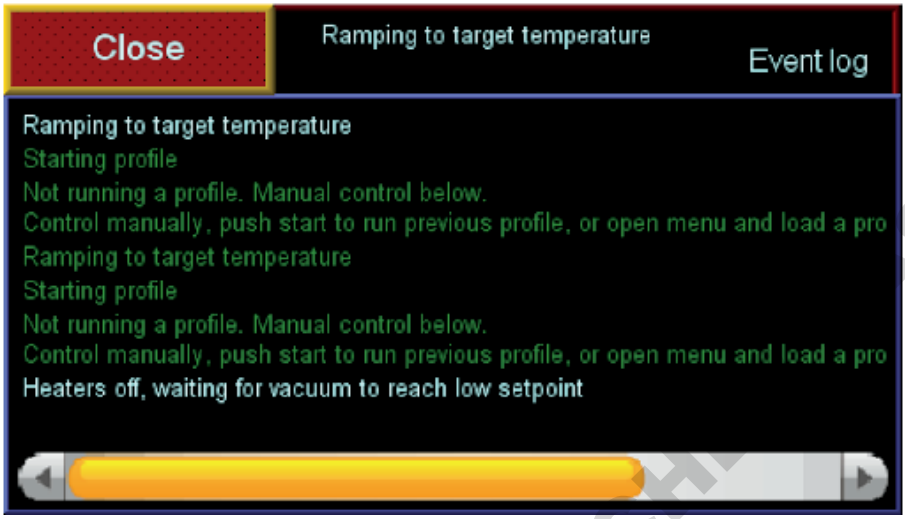
These turn On/Off automatically during a Profile. The Chiller and Vacuum Pump can be controlled manually.



The current step is shown underneath the “Ramp info” boxes. Step 0 is the Freeze Cycle step and steps 1 through 5 are the Drying Process steps. Step 6 is the finish step where the profile can be ended or a Defrost cycle can begin.

*The Chiller and Vacuum buttons will remain as they are when the freeze dryer is turned off then back on. To change this, they need to either be left on or off for about 1 minute before the freeze dryer is turned off to save in memory their last state.

Tapping the writing on the upper right of the screen, in this case “Ramping to target temperature”, above the graph will open the Event Log.



Once a profile has finished, the profile can either be ended or a Defrost cycle can be ran.

*The product can be checked **before** selecting one of the options by tapping the green Vacuum button to turn off the vacuum pump. Once off, the drain valve needs to be opened. If the product is not completely freeze dried, the drain valve should be closed, the door insulation pad in place, and the door shut, then tap the Vacuum button again to turn on the vacuum pump and the freeze dryer will continue the profile on the last step that it is currently running until the “Just end profile” or “Run Defrost” button is tapped.

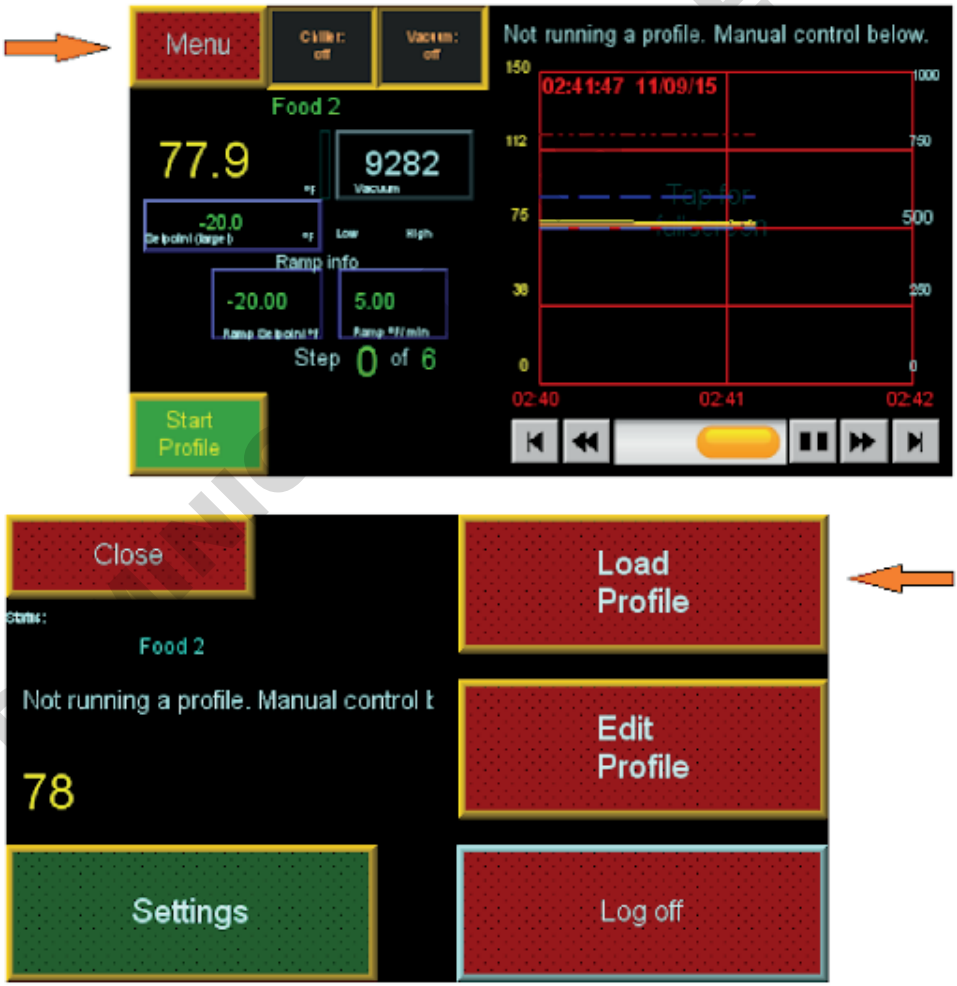


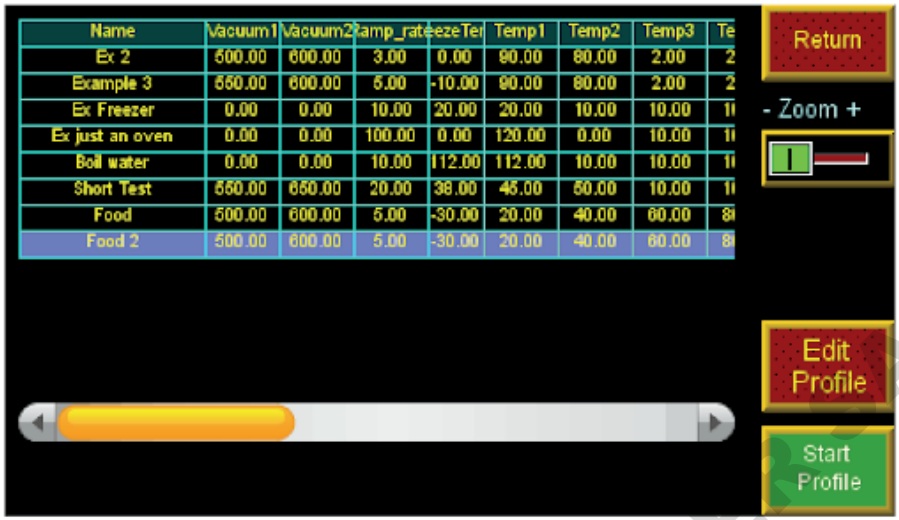
By selecting the green “Defrost target temperature” box, a temperature can be set for defrost, 120°F is recommended. Once set, select “Run Defrost” to begin defrosting the chamber. Select and hold “Just end profile” to end the profile without running a defrost cycle.

If “Just end profile” was selected, but it was realized that the defrost cycle should be ran, there are two ways to defrost the chamber. 1) manually set the “Set point” temperature to 120°F on the main operations screen. This will ramp the heaters up the 120°F. Make sure that the Chiller and Vacuum Pump are off. 2) select Menu > Settings > Watlow RM configuration and on the right side of the screen a Defrost (Manual) option is available, see **Section 5.3** for more details.

4 – LOADING A PROFILE

To load a Profile, select the “Menu button, then select “Load Profile”.

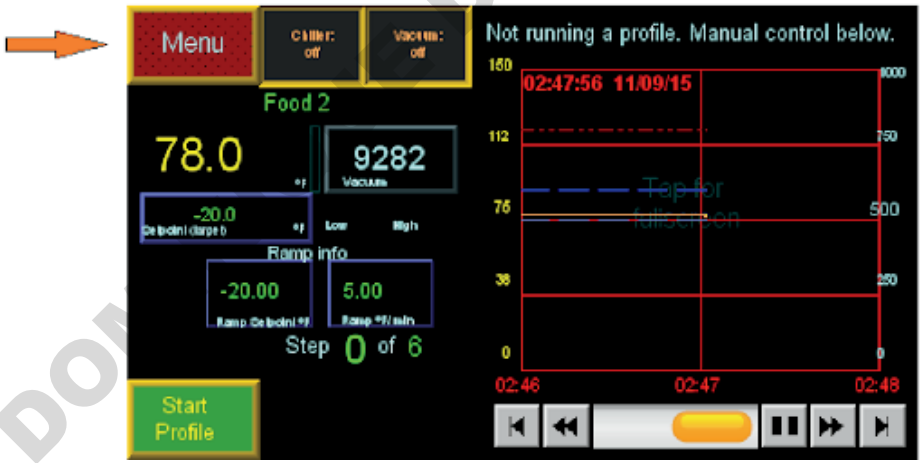




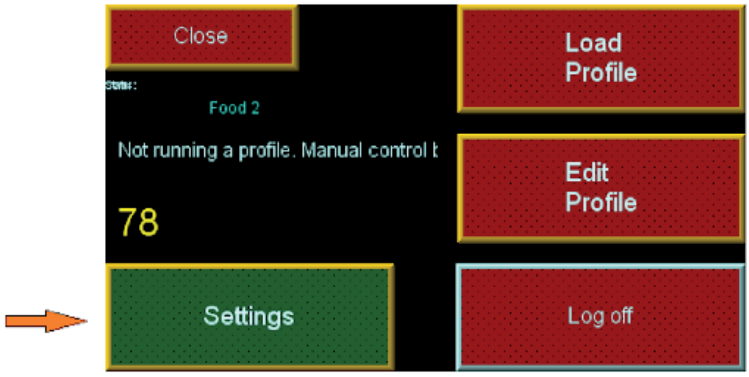
Profiles can be selected, started, or edited from this menu. Select “Return” to return to the previous page.

5 – SETTINGS

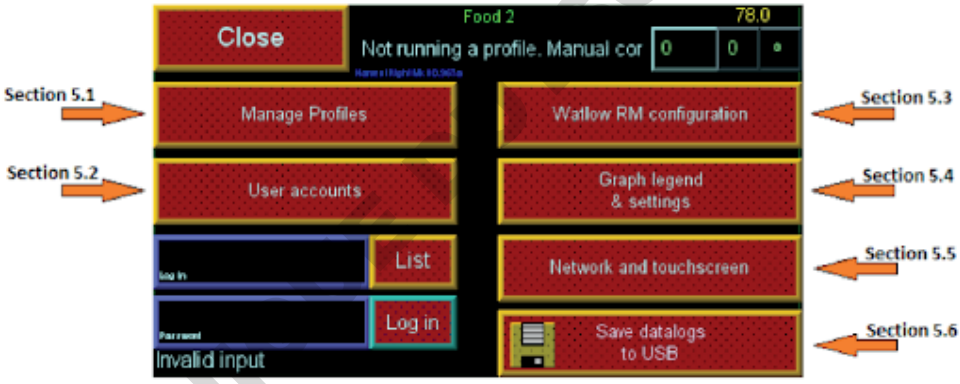
To access Settings, select the green “Settings” button from the Menu Screen.



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This is the main settings menu:



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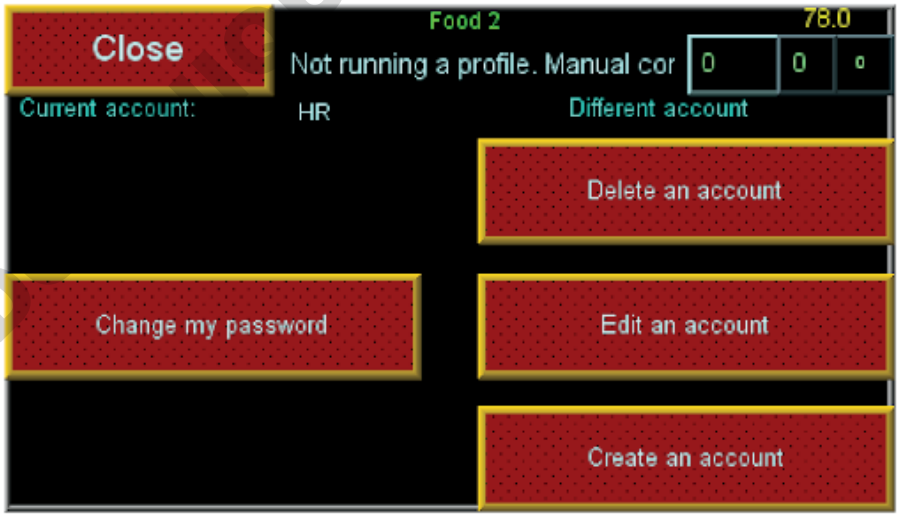
5.1 – SETTINGS – MANAGE PROFILES

Selecting “Manage Profiles” brings up the menu where all profiles are listed. Profiles can be deleted, edited, and cloned from this menu.



5.2 – SETTINGS – USER ACCOUNTS

Selecting “User Accounts” brings up this menu. Login accounts can be deleted, edited, and created, and passwords can be changed from this menu.

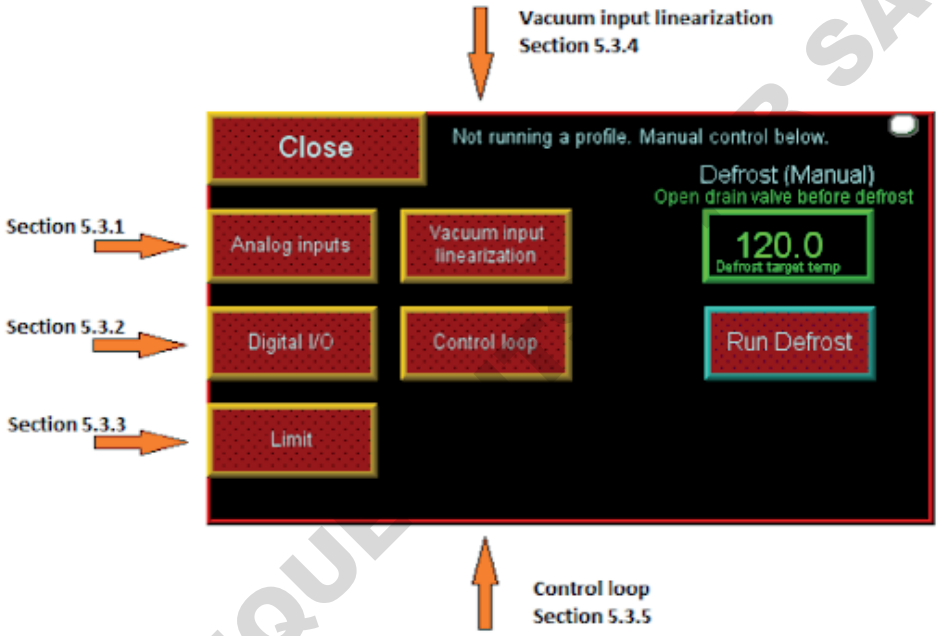


DO NOT CONTINUE PUTSO

*Be careful when changing the password. If it is canceled when changing the password, the password could be erased with no way to log in to the freeze dryer. It is recommended to create a backup account to be safe. The software will need to be reinstalled to reset it back to default. Contact Harvest Right Technical Support for assistance if this has occurred.

5.3 – SETTINGS – WATLOW RM CONFIGURATION

Selecting “Watlow RM configuration” brings up the menu where the Freeze Dryer can be calibrated and customized.



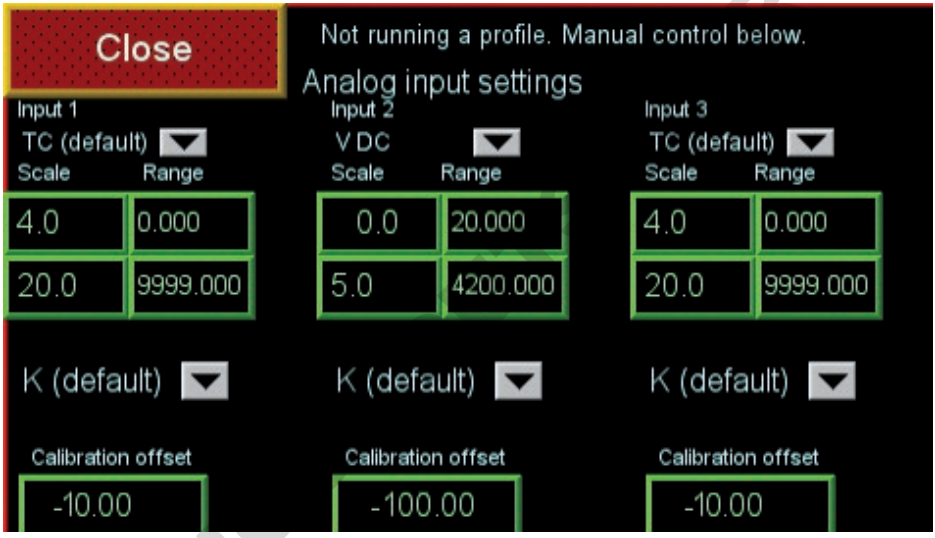
In case a profile has ended and the Defrost cycle was not initiated, the Defrost can be ran manually from this menu. Select a temperature, 120°F is recommended, using the green “Defrost target temp” box then select “Run Defrost”.

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5.3.1 – SETTINGS – WATLOW RM CONFIGURATION – ANALOG INPUTS

Analog inputs is where the thermocouples and the vacuum pressure reading are calibrated. “Input 1” is for the control temperature thermocouple (yellow numbers on the main operations screen and graph, and in the Control loop menu, see Section 5.3.5). “Input 2” is for the vacuum tube gauge sensor reading (white numbers on the main operations screen and graph). “Input 3” is for the second fail-safe thermocouple (red numbers in the Control loop menu and orange line on the graph).

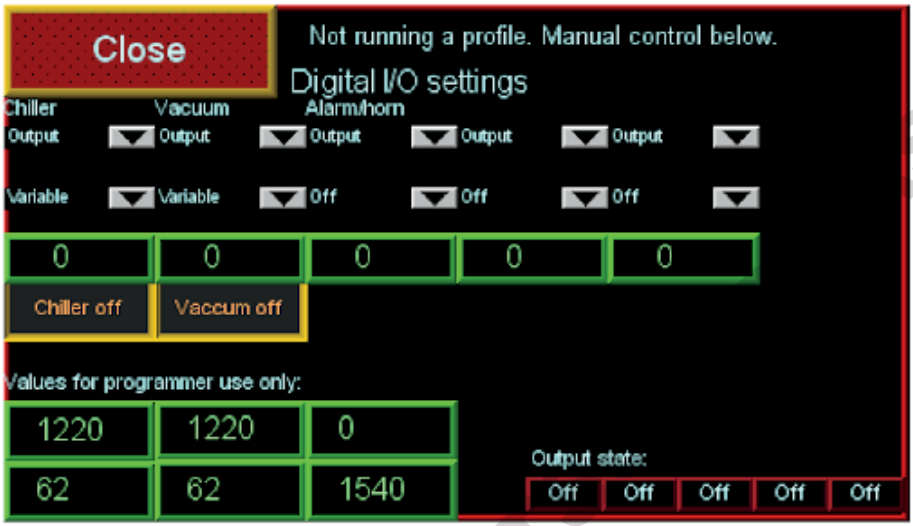
*The values set on this screen should not be changed unless instructed to do so by an employee of Harvest Right Technical Support or Engineering .



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5.3.2 – SETTINGS – WATLOW RM CONFIGURATION – DIGITAL I/O

Digital I/O is where the digital I/O settings are located and are for programming purposes.

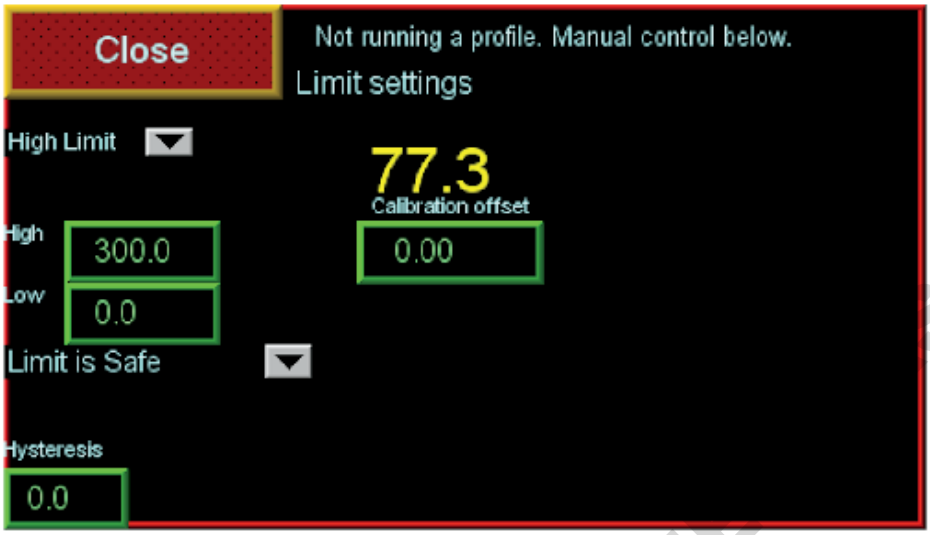


5.3.3 – SETTINGS – WATLOW RM CONFIGURATION – LIMIT

Limit is where the limits can be set for the high temperature limits. The temperature on this screen is the second thermocouple (in red on the Control Loop menu, see Section 5.3.5) and is the fail safe limit temperature. These settings are set by default and will display error messages and prevent the heaters from being powered on if a thermocouple is disconnected or temperatures read by the thermocouples get too high.

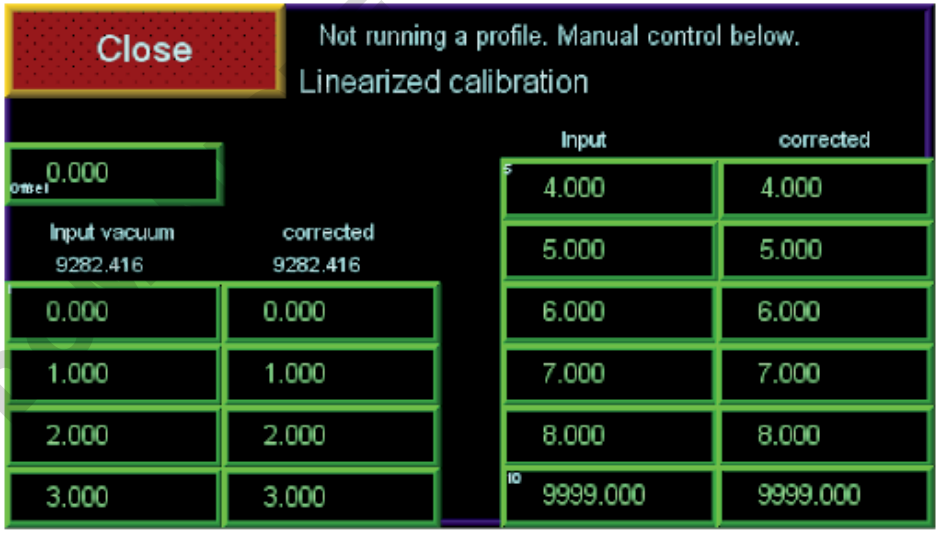
*If the high limit exceeded error message appears on the main operations screen and in the event log, a thermocouple is disconnected. Check the connections on the back of the shelf unit and/or on the top of the Watlow Controller (black box with green connectors on the top). The thermocouples are connected to the right side, toward the condensing unit, of the two green connectors at the right side of the freeze dryer. They are two wires that split into two wires (red on the left and yellow on the right). If the error message occurs, call Harvest Right Technical Support for assistance.

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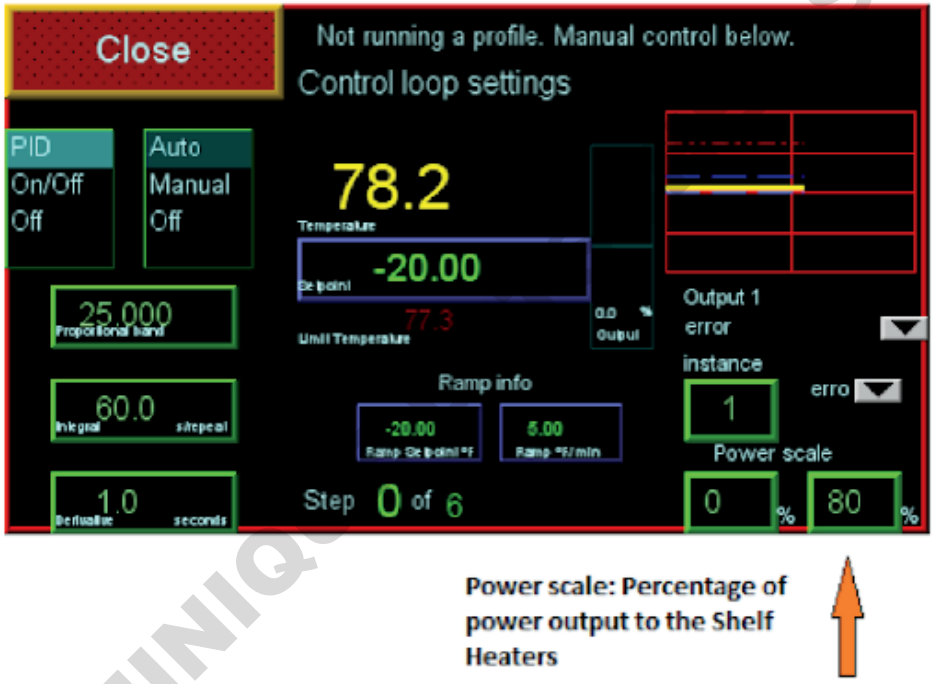
5.3.4 – SETTINGS – WATLOW RM CONFIGURATION – VACUUM INPUT LINEARIZATION

Vacuum input linearization is where the linearization of the vacuum pressure can be viewed and an offset set.



5.3.5 – SETTINGS – WATLOW RM CONFIGURATION – CONTROL LOOP

Control Loop is the menu where a closer look at the temperatures within the heated shelving unit can be viewed. On the bottom right of the screen, the power output to the shelf heaters can be adjusted. The power scale has two boxes. The left box is the percentage of power that is always on and should be set to 0%. The right box is the maximum amount of power applied to the heaters when the Control Temperature is ramped to 100%, as displayed in the percentage output bar graph to the right of the yellow Control Temperature. 80% to 90% is recommended. The higher it is, the closer it will stay to the Ramp Setpoint.



Power scale: Percentage of power output to the Shelf Heaters

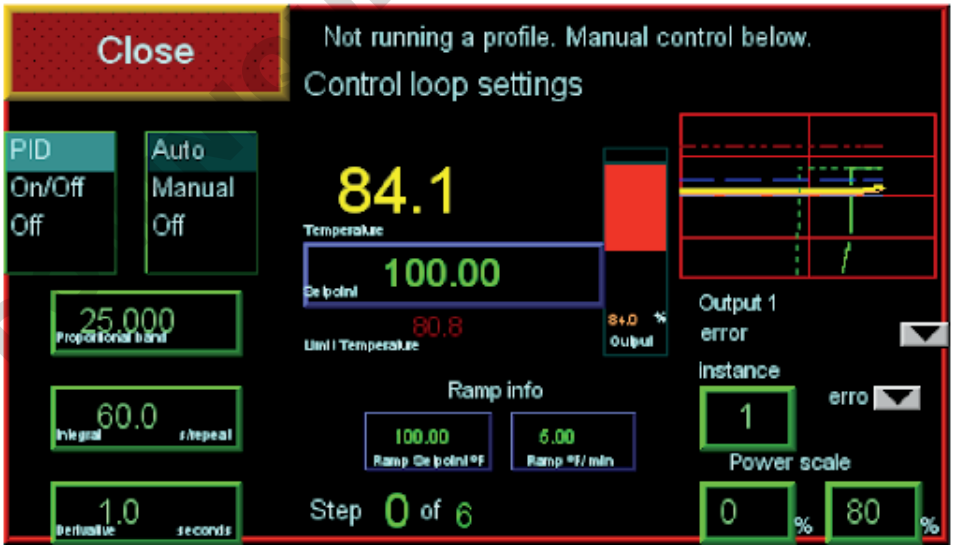
The small bar graph shown on the main operations screen between the Control temperature and the Vacuum Pressure can also be seen larger in this menu to the left of the graph. The main control temperature is shown in yellow, which is the same temperature as on the main operations screen. The box underneath the yellow temperature is the "Set point", which is the same as the "Set point" box on the main operations screen.
Underneath this box is the temperature reading of the second fail-safe limit thermocouple, which is also located on the Shelf Unit at a different location than the first. The temperature "Set point" can only be viewed on this screen and will revert back to what is set at on the main operations screen. It will revert back at a speed dependent of the ramp rate, shown in the "Ramp °F/min" box. To control temperature on this screen, change the ramp rate to 0°F/

min, set the set point temperature, then under Ramp info, set the “Ramp Setpoint °F” to the same temperature as the “Setpoint” temperature.The “Ramp Setpoint °F” box displays the temperature based on the linear equation that increase or decreases based on the ramp rate. This is the linear equation that causes the heaters to turn on in order for the Control Temperature to attempt to rise and follow the Ramp Setpoint. The lower the ramp rate, the closer the actual temperature can follow the Ramp Setpoint temperature.

The “Ramp Setpoint °F” can also be seen on the main operations screen and the graph as the green long dashed line (Control Setpoint).

Once the “Set point” becomes larger than the current Control Temperature (yellow), the heaters will turn on at the output power shown in the bar graph. The percentage is shown underneath the bar in the graph and will vary to keep the temperature at the target “Set point”. This is based on the PID controls to the left of this menu.

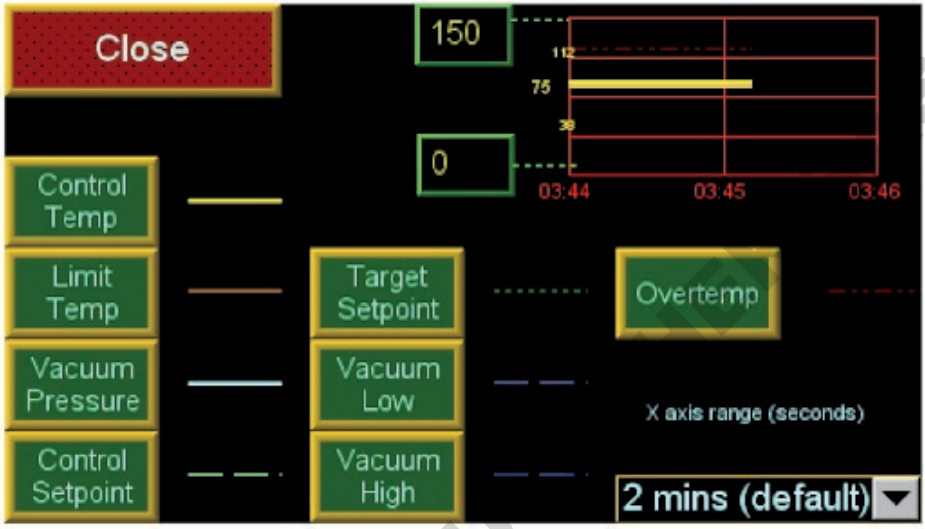
The PID controls should not be changed. The top left two boxes should be set to PID and Auto. PID causes the heaters to be powered at a percent power in order for the heaters to ramp and hold at the Setpoint temperature.
Auto causes the power to be automatically applied based on the Setpoint value.
The values in the three boxes below should not be changed, which are set by default at 25.000 for proportional band, 60.0 for integral, and 1.0 for derivative (PID).



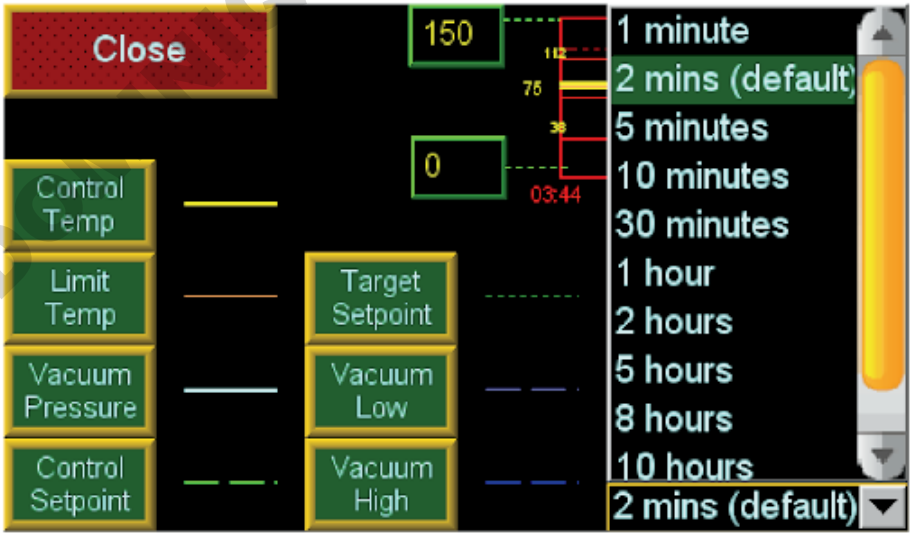
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5.4 – SETTINGS – GRAPH LEGEND AND SETTINGS

Selecting “Graph legend & settings” will bring up the settings menu for the graph on the main operations screen. These settings can also be accessed from the main operations screen by tapping the graph to increase to full screen, then selecting the green “Legend/settings” button.



The x-axis of the graph can be changed by selecting the pop-up menu at the lower right of the screen. This will bring up the menu to select the displayed time range for the graph. Each line on the graph can be turned on or off by tapping its corresponding green box to the left of the line (for example, by tapping the “Control Temp” green box to the left of the solid yellow line).

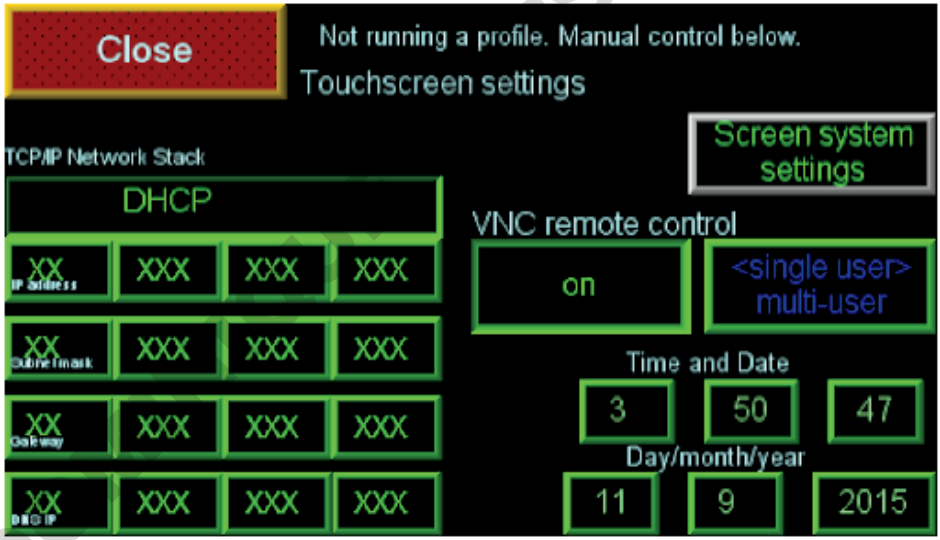


When accessed through the Settings menus, selecting “Close” returns to the main Settings menu. When accessed through tapping the graph from the main operations screen, to close, select “Close”, then tap the screen to exit full screen of the graph and return to the main operations screen.

5.5 – SETTINGS – NETWORK AND TOUCHSCREEN

The Maple Systems HMI Graphic Touchscreen Display is equipped with an Ethernet port. To connect the Harvest Right Scientific Freeze Dryer to a network, plug an Ethernet cable from the freeze dryer to an Ethernet port on a wall, then turn the VNC remote control to “on”. The IP address, Gateway, etc. will update automatically after the cable is connected properly. Once this is turned on, the freeze dryer can now be accessed remotely using a VNC Viewer program such as VNC Viewer for Google Chrome or similar. Once the viewer is downloaded and installed, use the IP address listed separating the numbers with a period (XX.XXX.XXX.XXX). The password to access the freeze dryer remotely is by default 111111 (six 1’s).

The date and time can also be changed from this menu.



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5.6 – SETTING – SAVE DATALOGS TO USB

Select “Save datalogs to USB” to access this menu. The datalogs can be saved to a USB memory stick using this menu. To save the datalogs, connect a USB memory stick to the USB port and select the “Save datalogs to USB” button.

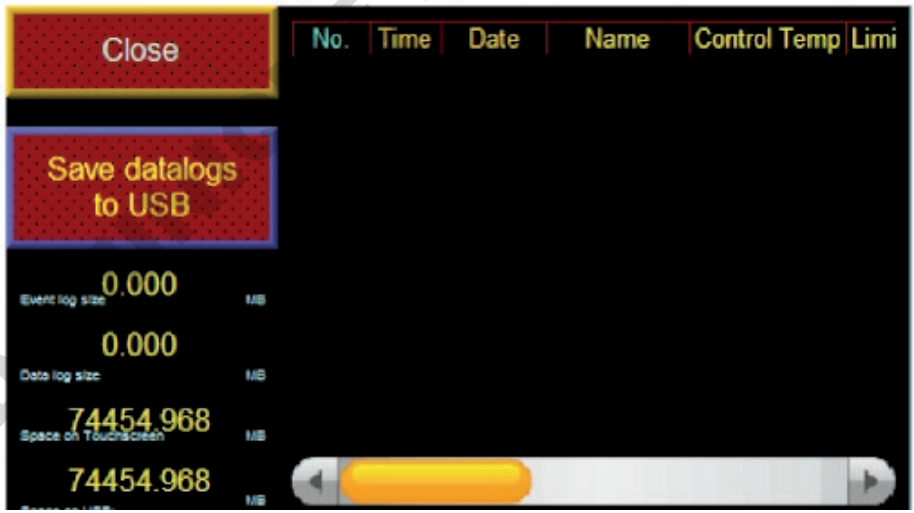
Step by step instructions:
1. Plug the USB flash drive in, (a menu will pop up, disregard it and close it)

2. Go to “Save datalogs to USB” from the main operations screen by selecting Menu > Settings > Save datalogs to USB
Note: Be sure the freeze dryer can read the USB memory stick and that there is enough space available on the USB memory stick.

3. Click the “Save datalogs to USB” button. On the bottom left of the screen, the Space on USB numbers will drop indicating that the data is being downloaded to the USB flash drive.

4. The USB flash drive can be removed once the Space on USB has finished dropping.

5. Once the USB flash drive is placed into a computer, and the folder for it opened, select the datalogs folder. The datalogs are sorted by days and will start a new datalog file at the beginning of each if the freeze dryer is powered on. Multiple files can be created for one batch, depending on how many days the batch took to finish. The data is saved as .csv files and can be opened in Microsoft Excel or similar spreadsheet program and should be opened with the comma separator option.



Note about the OEM USB prompts:

If the OEM USB prompt comes up, it can be used instead, but it can be difficult to navigate.

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A CLOSED SYSTEM

WHAT IS A CLOSED SYSTEM

In order to freeze dry items, your machine will use a vacuum pump that removes the air and creates a vacuum environment. In order to achieve adequate vacuum pressure, it is VERY IMPORTANT to ensure that all valves are closed tightly. If there is a leak somewhere in the system, the freeze drying process will not occur.

⚠ **WARNING:** You may think there is not an air leak in your machine because the door will not open (a sign that you are pulling a vacuum). However, it is possible to achieve less than suitable vacuum pressure, yet have enough vacuum to hold the door closed. Initially, >4000 is displayed. Within 10-20 minutes you should see the number 4000 begin to decrease. Drying occurs when the vacuum pressure descends to 500 mTorr (also displayed). If after 30 minutes 500 mTorr has not been reached, checking for leaks is a logical next step. Make sure the drain valve is closed and the door gasket is sealing properly (clean the gasket in warm water, let dry, and reinstall—do not wipe dry because lint may prevent a good seal).

While every precaution has been made to ensure that there are no leak points in your vacuum system, a situation could arise where there is a leak point. It is important to check the following possible leak spots in order to achieve optimal freeze drying.

POSSIBLE LEAK POINTS ON THE VACUUM PUMP

- Vacuum pump hose connections
- Gaskets in the vacuum hose are damaged

For additional information about your vacuum pump, review the instruction manual that came with your vacuum pump.

POSSIBLE LEAK POINTS ON THE FREEZE DRYER

- Drain valve is open
- Vacuum pump hose not connected properly or tightly
- Door not properly shut (2 stages of closing, latch and compression against gasket)
- Door gasket not clean inside and out
- Door needs adjustment

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CARE AND CLEANING

CLEANING CAUTIONS

Do not use stiff bristled brushes or abrasive cloths/pads to clean the freeze dryer, interior or exterior, as this will dull or scratch the surface.

Do not use Benzene, Thinner, or Clorox for cleaning. They may damage the surface of the appliance and may even cause fires.

MOVING OR LONG ABSENCES

If you have a long vacation planned, empty the freeze dryer and keep it turned off. Wipe any moisture from the inside and leave the chamber door open to keep odor and mold from developing. Drain the pump and fill with fresh oil.

TROUBLESHOOTING

WHY HAS THE FREEZE DRYER BEEN RUNNING FOR OVER 46 HOURS AND THE PROCESS IS NOT COMPLETE?

There are a number of factors that can contribute to longer cycle times. Some of which may be a combination of the following:

1. Some items are more challenging to freeze dry than others. Because of their cellular structure, sugar, and moisture content, oranges, pineapple, strawberries, blueberries, and other foods/meals with high amounts of sugary liquid will take longer to freeze dry. The freeze dryer is measuring the removal and moisture and knows when the process is complete.

2. There is so much water in the material being dried that the condensed ice on walls of chamber has begun to encroach on the trays. While rare, if this occurs, the freeze dryer cannot recognize that the process is complete because it will sublimate the ice that is coming onto the trays. If this happens, remove the trays and put them in the freezer, defrost the ice in the freeze dryer, put the trays back in the freeze dryer, and allow it to finish the process.

3. The vacuum pump oil should be changed and filtered after every batch. As the oil in your pump gets older, the cycle time for the food may increase.

4. The freeze dryer is working properly if during the drying portion of the

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freeze dry cycle, the vacuum is reading between 200-800 mTorr.

AFTER MY FREEZE DRY CYCLE FINISHED AND I RELEASED THE DRAIN VALVE, WATER CAME RUSHING INTO MY VACUUM CHAMBER. WHAT HAPPENED?

Make sure to empty the container that your freeze dryer drains into. If the drain hose is sitting in water when the vacuum is released by opening the drain valve, water will suck through the drain hose and into the freeze dryer vacuum chamber like a giant straw.

WHEN THE PROCESS IS COMPLETE, SOMETIMES THE SHELVES ARE WARM AND SOMETIMES THEY ARE COLD. WHY?

The shelf heaters will remain at the last step setpoint temperature when the profile ends. If the last temperature is too warm to touch, allow them to cool before before handling. If too cold to touch, warm them to room temperature by changing the setpoint temperature.

If the trays are at -40°F, because there is no water in the product to freeze and make it cold, the material will seem to be at room temperature on -40°F trays.

Test that the product is 100% complete by breaking the thickest piece. If it is cold or wet in the middle, there may be a bit of moisture left in it, and it should be placed back in the shelf and freeze dried for more time.

I PACKAGED MY MATERIAL AND IT WAS VERY DRY WHEN IT CAME OUT, BUT NOW IT IS NOT DRY. WHY?

1. Properly packaging the freeze-dried material is vital. It is important to promptly package your freeze-dried product. When packaging food, you can use Mylar bags (in order to seal thoroughly, we recommend you seal the bags twice to be safe), #10 cans, or mason jars. Always use the appropriate oxygen absorber. To ensure long shelf life, store in a cool, dry location.
2. Occasionally all of the product will be perfectly freeze dried with the exception of a couple of pieces. This can happen if you cut a few pieces of your product much thicker than the rest. If packaged, one wet piece will re-hydrate and ruin the whole batch. When a batch is complete, it is a good idea to break the thickest piece on your trays in half and test it in order to be sure that the product has completed the drying process. If you find that the material is not completely dry, simply put it back in the freeze dryer and allow more time. The freeze dryer will then finish the pieces that weren't quite complete.

PUMP ISN'T TURNING ON DURING THE DRY CYCLE:

Make sure your pump is plugged into the back of the freeze dryer and is switched to the "ON" position. The freeze dryer controls the pump turning on and off, but it cannot do so unless the pump is switched on (switch is located on the back of the pump) and plugged into the freeze dryer.

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WARRANTY INFORMATION

3-YEAR LIMITED WARRANTY

All sales of Harvest Right Freeze Dryers after February 1, 2019, are covered by this warranty.

Full One-Year Warranty (only includes the U.S. continental 48 states)
Warranty Period: For one year from original purchase date.
Exclusion: Oil vacuum pump has 6 months warranty.
Harvest Right will be responsible for: Repair or, at our option, replace any part of this freeze dryer which proves to be defective in workmanship or material.
Consumer will be responsible for: Costs of service calls and parts for consumer misuse and neglect of product. See Normal Responsibilities of the Consumer listed below.

Limited 3-Year Warranty
Warranty Period: For the second and third year from the original purchase date.
Harvest Right will be responsible for: Repair or, at our option, replace any part of the sealed refrigeration system (compressor, condenser, evaporator, tubing) which fails because of defective workmanship or material.
Consumer will be responsible for: Diagnostic charges for determining defects, and any costs for transportation and delivery of the appliance required because of service.

Limited Warranty (Alaska, Hawaii, Canada and Puerto Rico)
Time periods listed above.
Exclusion: Oil vacuum pump has 6 months warranty.
Harvest Right will be responsible for: All provisions of this limited warranty are the same as listed above except that service will be provided by the customer or a qualified local service provider that is approved by Harvest Right.
Consumer will be responsible for: Cost of transportation of the product to the shop or the travel cost of the technician to the consumer's location.

Limited International Warranty (includes all countries not described above)
Warranty Period: For one year from original purchase date.
Exclusion: Oil vacuum pump has 6 months warranty.
Harvest Right will provide: Support through telephone and e-mail only. At our option, all parts deemed necessary will be provided by Harvest Right.
Consumer will be responsible for: Costs of local service and cost of parts for consumer misuse and neglect of product. Costs for transportation and delivery of all parts, for any reason, from Harvest Right to Consumer.

Normal Responsibilities of the Consumer:
This warranty applies only to products used in clean environments. The consumer is responsible for the following items:

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1. Proper use of the appliance in accordance with the instructions provided with the product.
2. Proper installation in accordance with the instructions provided with the appliance and in accordance with all local electrical codes.
3. Proper connection to a grounded power supply of sufficient voltage, replacement of blown fuses, repair of loose connections or any defects in house wiring.
4. The appliance must be operated in a clean open area that has plenty of airflow and is not above 90°F (33°C) or below 35°F (2°C).
5. Damages to the appliance during or after installation. Do not lift the unit by holding onto the door.

Exclusions:

1. Any modifications or add-on after-market accessories.
2. Consequential or incidental damages such as, but not limited to, property damage and incidental expenses resulting from any breach of this written or any implied warranty.
3. Service calls which do not involve malfunction or defects in workmanship or material.
4. Damages caused by services performed by persons other than authorized by Harvest Right
5. Parts other than Harvest Right repair parts or parts obtained from suppliers other than Harvest Right personnel
6. External causes such as abuse, misuse, inadequate power supply, or acts of God.
7. Products with original serial numbers that have been removed or altered and cannot be readily determined.
8. Using an extension cord instead of direct line connection to power supply.

Service:

Since it is the responsibility of the consumer to establish the warranty period by verifying the original purchase date, keep your delivery slip or purchase receipt or some other appropriate payment record. This written warranty gives you specific legal rights. You may have other rights that vary from state to state. Service under this warranty must be obtained by contacting Harvest Right directly:

Harvest Right
95 North Foxboro Drive, Ste. 100
North Salt Lake, UT 84054
USA
1-800-865-5584

Returns

Within 30 days of ship date, customers may return their freeze dryers for a refund less shipping costs and less a restocking fee of 15%.

DOMINIQUE DUTSCHER SAS

DOMINIQUE PUTSCHER SAS

