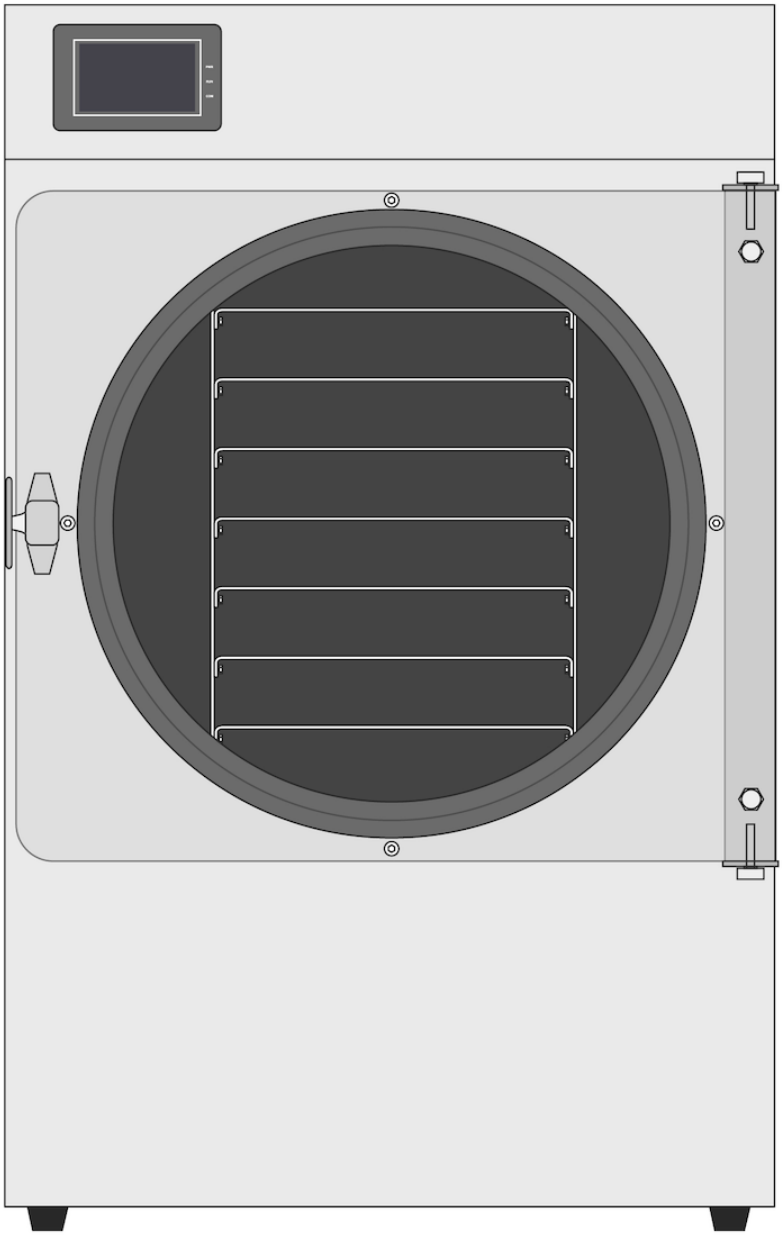
Stay Fresh Mega Freeze Dryer

MODEL 12H11560US



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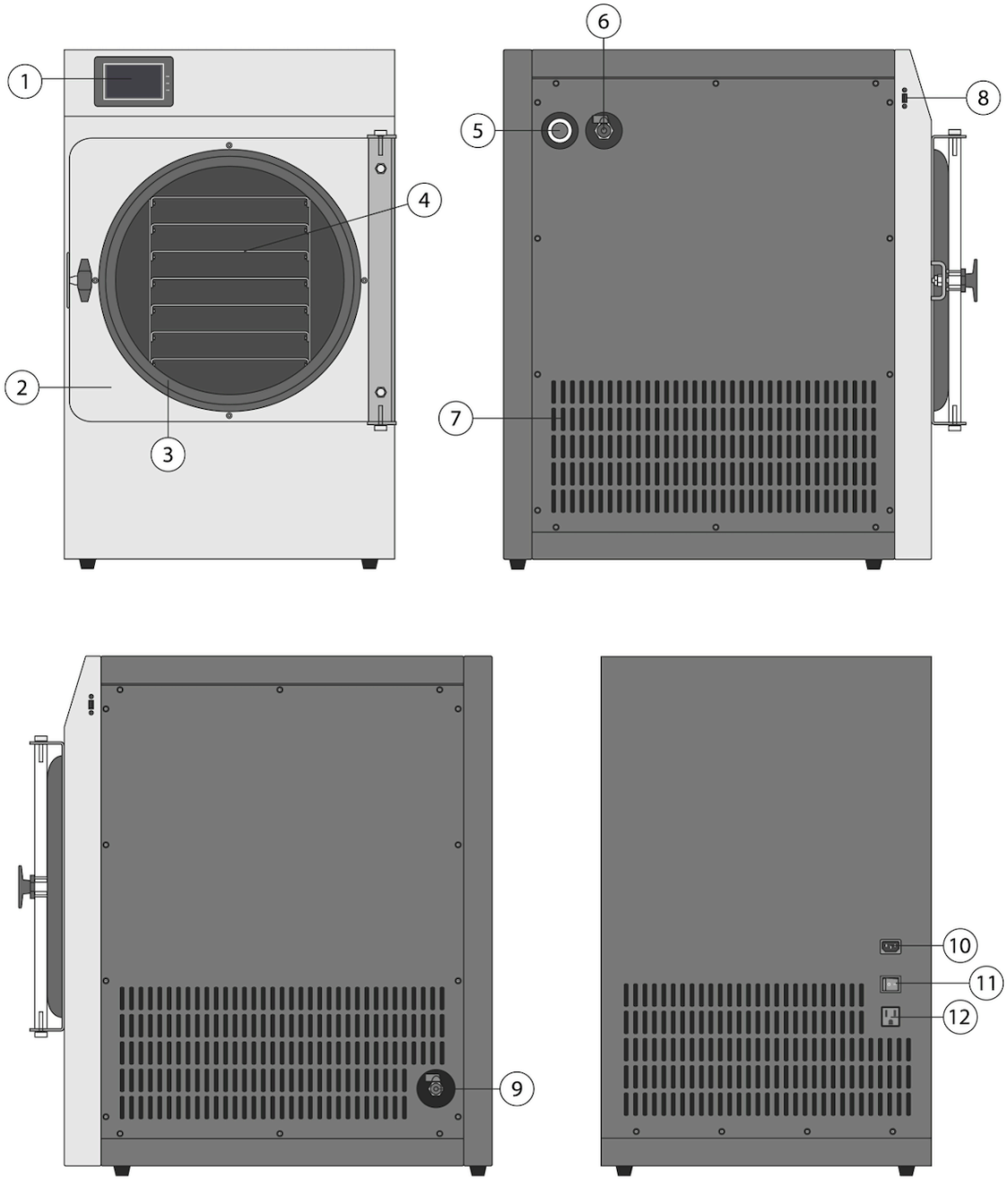
1. Specifications



① Touch screen controller
② Acrylic door
③ Door gasket
④ Tray shelf
⑤ KF25 vacuum port
⑥ Vacuum valve
⑦ Ventilation grille
⑧ USB port
⑨ Drain valve
⑩ Main power inlet
⑪ Main power switch
⑫ Vacuum pump power outlet

Inside the chamber, there are four bundles of cables: one for power (6pins, plug with a 'P' mark), one for shelf temperatures (6pins, plug with a 'S' mark) , one for the temperature probe (2pins, plug with a 'S' mark), and one for the fans (2pins, plug with a 'F' mark).

Avoid unplugging the power and sensor cables unless necessary to prevent damage.

Table 1 Technical specifications

Shelving unit	6 shelves
Shelving unit material	Aluminum
Tray size	W 10.5 in. x D 27.5 in. x H 0.75 in.
Tray material	304 Stainless Steel
Drum material	304 Stainless Steel
Exterior material	Aluminum
Cold trap temperature	-35F (unloaded)
Max ice capacity	40lb
Rated current	20A
Power	115v/60Hz
Weight	269 lbs.
Dimension	W 24.25 in. x D 33.5 in. x H 37.5 in.

2. Installation Guide

The freeze dryer is designed for indoor use only and performs best in a temperature-controlled room with temperatures ranging from 60F to 75F. Avoid using the freeze dryer in rooms where the temperature exceeds 80F. Proper ventilation is necessary when operating the freeze dryer.

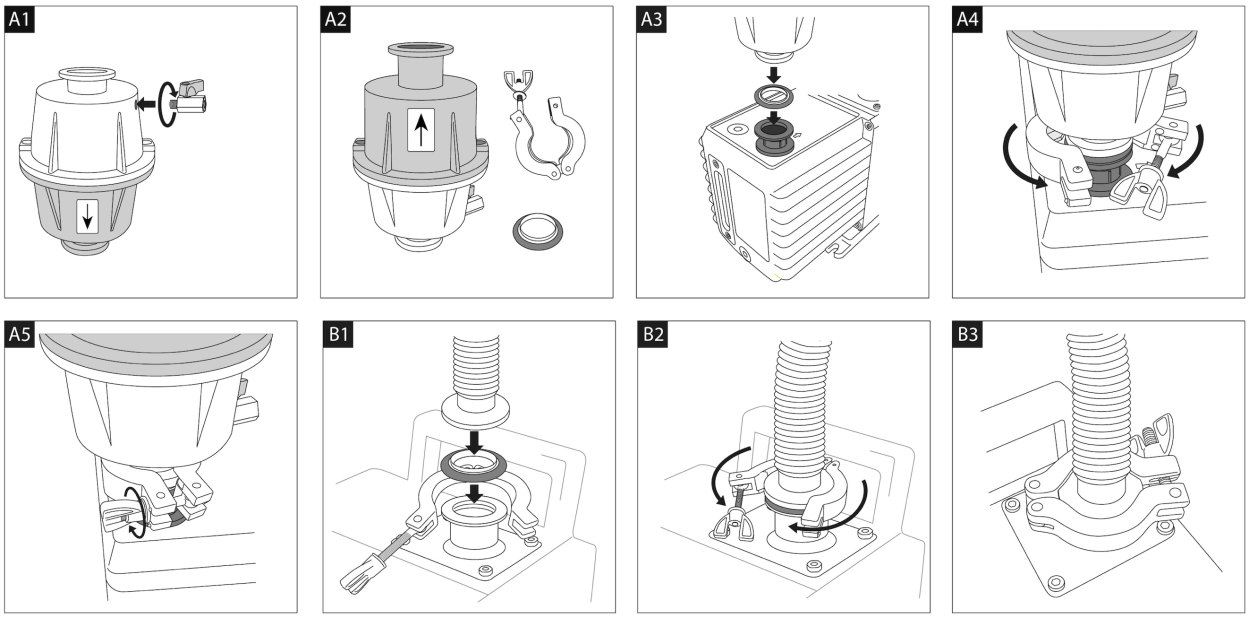
To ensure proper operation and safety, keep at least three inches of clearance between the back of the freeze dryer and the wall, and at least six inches of clearance between the freeze dryer and the walls on the left and right sides.

The freeze dryer requires a dedicated 110V 20amp circuit and a NEMA 5-20 outlet that must be within five feet of the machine. Please ensure that the outlet is in good working condition and meets electrical requirements before connecting the freeze dryer.

Installation steps:

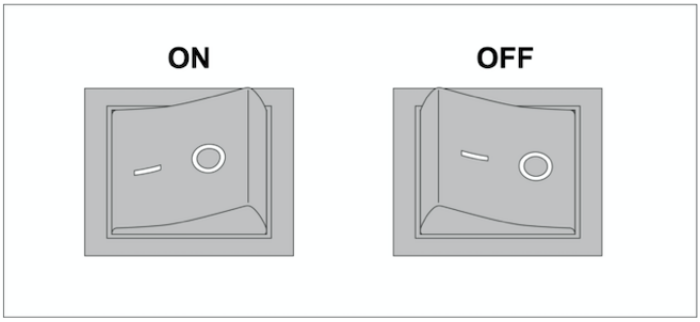
Step 1.
Unpack the delivery box and ensure that all items on the packing list are present.

Step 2.
Unbox the industrial pump. Place the pump to the left of the freeze dryer or below the freeze dryer. Check the oil level through the sight glass.

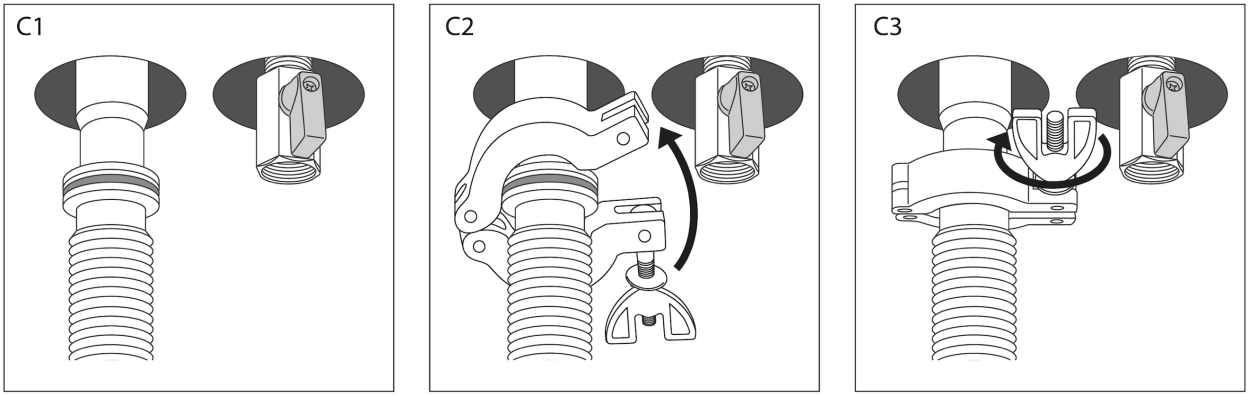


Screw the ball valve into the demister. Keep the valve closed. See step A1 in Figure 2. Install the demister on the vacuum pump. See steps A2-A5 in Figure 2. Use a KF25 clamp to connect the vacuum hose to the pump. Make sure an O-ring is used with the clamp.

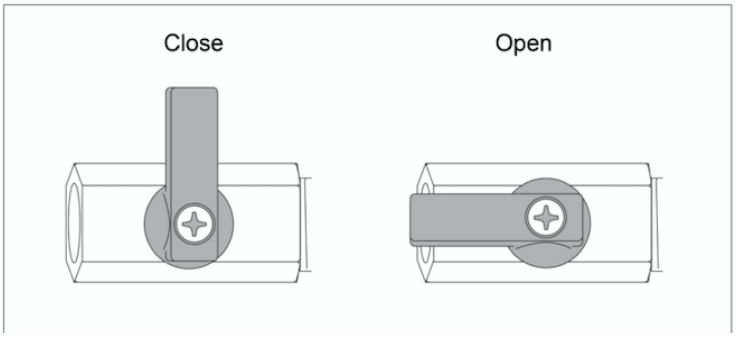
Step 3.
Connect the power cord to the wall outlet and the other end to the back of the freeze dryer (⑩ main power inlet on page 4). Plug the vacuum pump cord to the back of the freeze dryer (⑫ vacuum pump power outlet on page 4). Turn on the vacuum pump switch on the back of the vacuum pump. Refer to the following for the generic schematic of ON/OFF statuses for the switch.



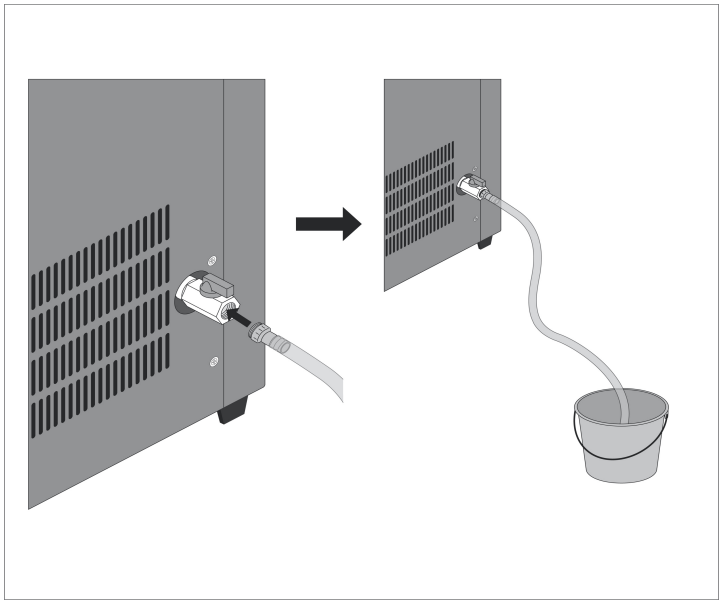
Step 4.
Connect the other end of the vacuum hose to the freeze dryer (⑤vacuum port on page 4). Make sure an O-ring is used with the clamp.



Step 5.
Close the vacuum valve (⑥vacuum valve on page 4) and the drain valve (drain valve on page 4). Refer to the following for the Open/Close statuses for the valve.



Step 6.
Connect the drain hose to the drain valve (⑨drain valve on page 4). Place the other end of the hose in a water bucket (not provided).



Step 7.
Turn on the power switch at the back of the freeze dryer (⑪ main power switch on page 4). The touch screen should light up and display the main menu. Assign a name to your freeze dryer by pressing the top left corner of the touch screen.

Allow the freeze dryer to settle for 24 hours before using it for the first time. Refer to Section 5 of the manual for instructions on how to run the automated freeze-drying process.

3. Freeze-Drying Process

The freeze-drying process is divided into three stages: freezing, main drying, and final drying.

Freezing

The freezing stage duration varies depending on the food's type, weight, and thickness, taking anywhere from 6-15 hours for unfrozen food and 2-4 hours for frozen food. During this stage, the cold trap temperature drops gradually to around -35F, and only the compressor runs. Frost may be visible on the interior chamber surface, and condensation may form on the acrylic door and gasket.

Main drying

The main drying stage begins automatically when the preset freezing time, shelf temperature, or food temperature is reached, as explained in the Auto-freeze-dry-setting in Section 10. Alternatively, you can start the drying process by pressing the 'Drying' button. The vacuum pump operates for a set duration at the beginning of this stage, and the chamber pressure drops to or below 550mTorr. The heater is then turned on to maintain the pressure at the initial target pressure, and the patented freeze-drying algorithm is initiated.

During the constant-pressure phase, the pressure remains constant, while the shelf temperature gradually increases. Once the target shelf temperature is reached, the algorithm enters the constant-temperature phase, during which the shelf temperature is maintained at a constant level. This cycle repeats until the maximum shelf temperature is reached.

The compressor, vacuum pump, and heater are all running continuously during the main drying stage, and ice rings may appear on the chamber's interior surface.

Final drying

The final drying stage begins when the maximum temperature is reached or when a preset food temperature measured by the temperature probe is reached (if the probe is in use). These indicators suggest that most of the moisture has been extracted from the food. The default final dry duration is seven hours. The drying algorithm adjusts the final dry time automatically when the temperature probe is in use. Extra final dry hours can be added manually if necessary.

During the final drying stage, the compressor, vacuum pump, and heater operate similarly to the main drying stage. When the drying is complete, the heater and vacuum pump are turned off, and the compressor continues running to keep the chamber cool.

4. Food Preparation

To prepare food for freeze-drying:

1. Wash the food thoroughly to remove any dirt or debris. Freeze drying won't kill bacteria in the food.

2. Cut the food into small pieces if possible, for better drying results. For solid foods, cut them into pieces that are less than half an inch thick.

3. For liquid or semi-liquid foods, pour them evenly onto the trays.

4. Ensure that foods of similar type and thickness are on each tray for even drying.

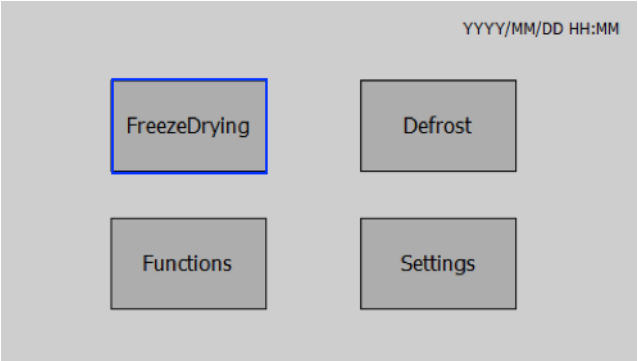
5. Avoid mixing frozen and unfrozen foods in the same batch.

6. Foods with high moisture levels should be in one batch for efficiency reasons, as the drying time will depend on the moisture level of the foods in the same batch.

7. Note that oily foods may not be suitable for freeze-drying, as the process only removes water from the food and the oil may go rancid after packaging in a mylar bag.

5. Automated Freeze-Drying

Press the ‘FreezeDrying’ button on the main menu to enter the automated freeze-drying mode.



The automated freeze-drying process may vary slightly depending on whether the food is pre-frozen or if you're using the temperature probe.

For a more detailed description of the automated freeze-drying process, refer to the following sections. Each section includes steps that require your action and information enclosed in boxes. Touch screen names may be underscored in each step, and you can find further details in Section 10. Touch Screen Info.

Freeze-drying unfrozen food without the temperature probe

Step 1.
Inspect and make sure there is no sign of ice or water in the bottom of the chamber and in the groove of the door gasket.

Step 2.
Load trays with unfrozen food, insert the trays onto the shelves, and close the acrylic door.

Step 3.
Close the vacuum valve. Remove any residual water in the drain pipe, using the brush (refer to Section 6 for more details) and close the drain valve.

Step 4.
Press the 'FreezeDrying' button on the touch screen to go to the Auto-freezedry-start screen. Then press the 'Settings' button to go to the Auto-freezedry-setting screen. Adjust trigger conditions that automatically triggers drying to begin. Use the default setting for beginners. Press the 'Back' button to return to the Auto-freezedry-start screen.

Step 5.
If you freeze-dry very lightweight items, such as leafy greens, press the 'Fan On' button to turn off the fans on the shelving unit, as they might blow the leaves off the trays.

Press the 'Start' button to go to the Auto-freezedry-freezing screen and the compressor will be turned on.

Note that the 'Drying' button will be disabled for one minute after pressing the 'start' button. You can still adjust freezing drying parameters using the 'Settings' button on the right bottom during the freezing stage.

Once the default trigger conditions are met or the 'Drying' button is pressed, the freeze dryer will automatically start the drying process and transition to the Auto-freezedry-maindry screen.

Upon completion of the main drying stage, the freeze dryer will proceed to the final dry stage and switch to the Auto-freezedry-finaldry screen. During this stage, you have the option to increase or decrease the final dry hours. For beginners, it is recommended to use the default setting.

Step 6.

After the final dry stage is finished, the vacuum pump will stop and the motorized ball valve will close automatically. The screen will switch to the Auto-freezedry-complete screen and beep for 30 seconds. In case you're not around when the drying process is

finished, the trays might get excessively cold since the compressor will still be running. If needed, use the 'Warm Tray' button to heat up the trays.

When the final dry stage is completed, do not hit the ‘exit’ button on the touch screen yet. Open the vacuum valve to normalize the pressure, then open the acrylic door. Check if the food is completely dry on each tray.

All pieces of food should be warm immediately after drying is complete if the default maximum shelf temperature is used. Press the ‘Back to Final Dry’ button to go to the Auto-freezedry-finaldry-pause screen if more final dry hours are needed. Use the up arrow to add extra final dry hours to enable the ‘Final Dry’ button. Then press the ‘Final Dry’ button to restart the drying process.

If the food is completely dry, press ’Exit’ to stop the compressor, seal the freeze-dried food in the bags as soon as possible. Otherwise, read section ‘What to do after drying is complete’ and follow the steps.

Step 7.
Remove ice in the chamber. Read Section 6 for defrosting.

Step 8.
Change/filter vacuum pump oil if needed. Check section 9 for details.

Freeze-drying unfrozen food with temperature probe

Step 1.
Inspect and make sure there is no sign of ice or water in the bottom of the chamber and in the groove of the door gasket.

Step 2.
Load trays with unfrozen food, insert the trays onto the shelves.

If the food consists of solid pieces, pick the largest piece on the middle tray, and insert the temperature probe into the center of the piece. Place the piece back on the tray. If the food is liquid/semi-liquid, immerse the temperature probe in the food.

Close the acrylic door.

Step 3.
Close the vacuum valve. Remove any residual water in the drain pipe using the brush (refer to Section 6 for more details) and close the drain valve.

Step 4.
Press the 'FreezeDrying' button on the touch screen to go to the Auto-freezedry-start screen. Then press the 'Probe in use' button.

Press the 'Settings' button to go to the Auto-freezedry-setting screen. Adjust the trigger conditions that automatically triggers drying to begin. Use the default setting for beginners. Press the 'Back' button to return to the Auto-freezedry-start screen.

Step 5.
If you freeze-dry very lightweight items, such as leafy greens, press the 'Fan On' button to turn off the fans on the shelving unit, as they might blow the leaves off the trays.

Press the 'Start' button on the Auto-freezedry-start screen to enter the freezing stage.

Note that the 'Drying' button will be disabled for one minute after pressing the 'start' button. You can still adjust freezing drying parameters using the 'Settings' button on the right bottom during the freezing stage.

Once the default trigger conditions are met or the 'Drying' button is pressed, the freeze dryer will automatically start the drying process and transition to the Auto-freezedry-maindry screen.

Upon completion of the main drying stage, the freeze dryer will proceed to the final dry stage and switch to the Auto-freezedry-finaldry screen. During this stage, you have the

option to increase or decrease the final dry hours. For beginners, it is recommended to use the default setting.

Step 6.

After the final dry stage is finished, the vacuum pump will stop and the motorized ball valve will close automatically. The screen will switch to the Auto-freezedry-complete screen and beep for 30 seconds. In case you're not around when the drying process is finished, the trays might get excessively cold since the compressor will still be running. If needed, use the 'Warm Tray' button to heat up the trays.

When the final dry stage is completed, do not hit the 'exit' button on the touch screen yet. Open the vacuum valve to normalize the pressure in the chamber, then open the acrylic door. Check if the food is completely dry on each tray.

All pieces of food should be warm if the default maximum shelf temperature is used. Press the 'Back to Final Dry' button to go to the Auto-freezedry-finaldry-pause screen if more final dry hours are needed. Use the up arrow to add extra final dry hours to enable the 'Final Dry' button. Then press the 'Final Dry' button to restart the drying process.

If the food is completely dry, press 'Exit' to stop the compressor, seal the freeze-dried food in the bags as soon as possible. Otherwise, read section 'What to do after drying is complete' and follow the steps.

Step 7.

Remove ice in the chamber. Read Section 6 for defrosting.

Step 8.

Change/filter vacuum pump oil if needed. Check section 9 for details.

Freeze-drying frozen food without temperature probe

Step 1.
Pre-freeze the food on the trays in a deep freezer for over 24 hours to make sure the food is completely frozen.

Step 2.
Inspect and make sure there is no sign of ice or water in the bottom of the chamber and in the groove of the door gasket.

Step 3.
Close the vacuum valve. Remove any residual water in the drain pipe using the brush (refer to Section 6 for more details) and close the drain valve.

Step 4.
Press the 'FreezeDrying' button on the touch screen to go to the Auto-freezedry-start screen. Then press the 'Frozen Food' button to let the control algorithm know the food is frozen.

Press the 'Settings' button to go to the Auto-freezedry-setting screen. Adjust the trigger conditions that automatically triggers drying to begin. Use the default setting for beginners. Press the 'Back' button to return to the Auto-freezedry-start screen.

Step 5.
If you freeze-dry very lightweight items, such as leafy greens, press the 'Fan On' button to turn off the fans on the shelving unit, as they might blow the leaves off the trays.

Press the 'Start' button on the Auto-freezedry-start screen to enter the freezing stage.

The screen will jump to Auto-freezedry-freezing and the compressor will be turned on. Note that the 'Drying' button will be disabled for one minute. You can still adjust freezing drying parameters using the 'Settings' button on the right bottom during the freezing stage.

Step 6.
After allowing the freeze dryer to run for 1-2 hours, check the shelf temperature. Once it reaches below -5F, proceed to load the freeze dryer with trays containing frozen food. Close the acrylic door and then press the 'Food in Chamber' button.

The freeze dryer will start the drying process and jump to the Auto-freezedry-maindry screen when any of the default trigger conditions are met or the 'Drying' button is pressed.

When the main drying stage is completed, the freeze dryer will enter the final dry stage and the screen jumps to Auto-freezedry-finaldry. You can increase or decrease the final dry hours during the final dry stage.

Step 7.

After the final dry stage is finished, the vacuum pump will stop and the motorized ball valve will close automatically. The screen will switch to the Auto-freezedry-complete screen and beep for 30 seconds. In case you're not around when the drying process is finished, the trays might get excessively cold since the compressor will still be running. If needed, use the 'Warm Tray' button to heat up the trays.

When the final dry stage is completed, do not hit the 'exit' button on the touch screen yet. Open the vacuum valve to normalize the pressure, then open the acrylic door. Check if the food is completely dry on each tray.

All pieces of food should be warm if the default maximum shelf temperature is used. Press the 'Back to Final Dry' button to go to the Auto-freezedry-finaldry-pause screen if more final dry hours are needed. Use the up arrow to add extra final dry hours to enable the 'Final Dry' button. Then press the 'Final Dry' button to restart the drying process.

If the food is completely dry, press 'Exit' to stop the compressor, seal the freeze-dried food in the bags as soon as possible. Otherwise, read section 'What to do after drying is complete' and follow the steps.

Step 8.

Remove ice in the chamber. Read Section 6 for defrosting.

Step 9.

Change/filter vacuum pump oil if needed. Check section 9 for details.

Freeze-drying frozen food with temperature probe

Step 1.
Disconnect the temperature probe in the chamber.

If the food is of solid pieces, pick the largest piece and insert the temperature probe into the center of the piece. Place the piece back on the tray. If the food is liquid/semi-liquid, immerse the temperature probe in the food.

Pre-freeze the food on the trays with the temperature probe in a deep freezer for over 24 hours to make sure the food is completely frozen.

Step 2.
Inspect and make sure there is no sign of ice or water in the bottom of the chamber and in the groove of the door gasket.

Step 3.
Close the vacuum valve. Remove any residual water in the drain pipe using the brush (refer to Section 6 for more details) and close the drain valve.

Step 4.
Press the 'FreezeDrying' button on the touch screen to go to the Auto-freezedry-start screen. Then press the 'Probe in Use' button and the 'Frozen Food' button to let the controller know the food is frozen and the temperature probe is being used.

Press the 'Settings' button to go to the Auto-freezedry-setting screen. Adjust the trigger conditions that automatically triggers drying to begin. Use the default setting for beginners. Press the 'Back' button to return to the Auto-freezedry-start screen.

Step 5.
If you freeze-dry very lightweight items, such as leafy greens, press the 'Fan On' button to turn off the fans on the shelving unit, as they might blow the leaves off the trays.

Press the 'Start' button on the Auto-freezedry-start screen to enter the freezing stage.

The screen will jump to Auto-freezedry-freezing and the compressor will be turned on. Note that the 'Drying' button will be disabled for one minute. You can still adjust freeze-drying parameters using the 'Settings' button on the right bottom during the freezing stage.

Step 6.
After allowing the freeze dryer to run for 1-2 hours, check the shelf temperature. Once it reaches below -5F, proceed to load the freeze dryer with trays containing frozen food. Reconnect the temperature probe in the chamber, ensuring that the female and male

connectors are clean and dry before connecting. Place the piece with the temperature probe on the second tray from the top.

Close the acrylic door and then press the 'Food in Chamber' button.

The freeze dryer will start the drying process and jump to the Auto-freezedry-maindry screen when any of the default trigger conditions are met or the 'Drying' button is pressed.

When the main drying stage is completed, the freeze dryer will enter the final dry stage and the screen jumps to Auto-freezedry-finaldry. You can increase or decrease the final dry hours during the final dry stage.

Step 7.

After the final dry stage is finished, the vacuum pump will stop and the motorized ball valve will close automatically. The screen will switch to the Auto-freezedry-complete screen and beep for 30 seconds. In case you're not around when the drying process is finished, the trays might get excessively cold since the compressor will still be running. If needed, use the 'Warm Tray' button to heat up the trays.

When the final dry stage is completed, do not hit the 'exit' button on the touch screen yet. Open the vacuum valve to normalize the pressure in the chamber, then open the acrylic door. Check if the food is completely dry on each tray.

All pieces of food should be warm if the default maximum shelf temperature is used. Press the 'Back to Final Dry' button to go to the Auto-freezedry-finaldry-pause screen if more final dry hours are needed. Use the up arrow to add extra final dry hours to enable the 'Final Dry' button. Then press the 'Final Dry' button to restart the drying process.

If the food is completely dry, press 'Exit' to stop the compressor, seal the freeze-dried food in the bags as soon as possible. Otherwise, read section 'What to do after drying is complete' and follow the steps.

Step 8.
Remove ice in the chamber. Read Section 6 for defrosting.

Step 9.
Change/filter vacuum pump oil if needed. Check section 9 for details.

Freeze-drying candies

Step 1.
Inspect and make sure there is no sign of ice or water in the chamber, shelving unit, and in the groove of the door gasket.

Step 2.
Load trays with candies, insert the trays onto the shelves, and close the acrylic door.

Step 3.
Close the vacuum valve. Remove any residual water in the drain pipe, using the brush (refer to Section 6 for more details) and close the drain valve.

Step 4.
Press the 'FreezeDrying' button on the touch screen to go to the Auto-freezedry-start screen. Then press the 'Candy' button go to the setting screen. Adjust max shelf temperature and final dry hours if necessary.

Step 5.
Press the 'Start' button to go to the Auto-freezedry-freezing screen and the compressor will be turned on.

By default, the pump will start after 15 mins of compressor running, and the heater will be activated after 15 mins of pump running. Note that the 'Drying' button will be disabled for one minute after pressing the 'start' button.

Upon completion of the main drying stage, the freeze dryer will proceed to the final dry stage and switch to the Auto-freezedry-finaldry screen. During this stage, you have the option to increase or decrease the final dry hours. For beginners, it is recommended to use the default setting.

Step 6.

After the final dry stage is finished, the vacuum pump will stop and the motorized ball valve will close automatically. The screen will switch to the Auto-freezedry-complete screen and beep for 30 seconds. In case you're not around when the drying process is finished, the trays might get excessively cold since the compressor will still be running. If needed, use the 'Warm Tray' button to heat up the trays.

When the final dry stage is completed, open the vacuum valve to normalize the pressure, then open the acrylic door. Press the 'Back to Final Dry' button to go to the Auto-freezedry-finaldry-pause screen if you want more final dry hours or if you want back-to-back batch runs. Use the

up arrow to add extra final dry hours to enable the 'Final Dry' button. Then press the 'Final Dry' button to restart the drying process.

Step 7.
Remove ice in the chamber. Read Section 6 for defrosting.

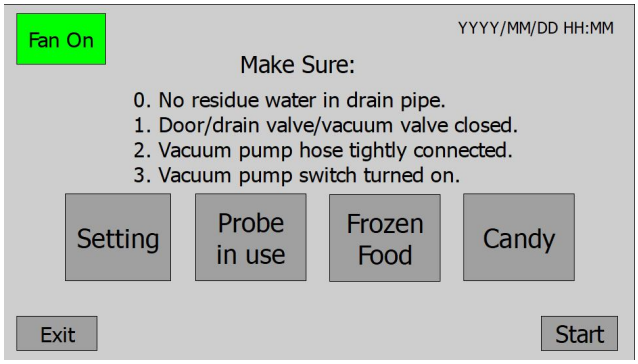
Step 8.
Change/filter vacuum pump oil if needed. Check section 9 for details.

Increase or decrease final dry hours

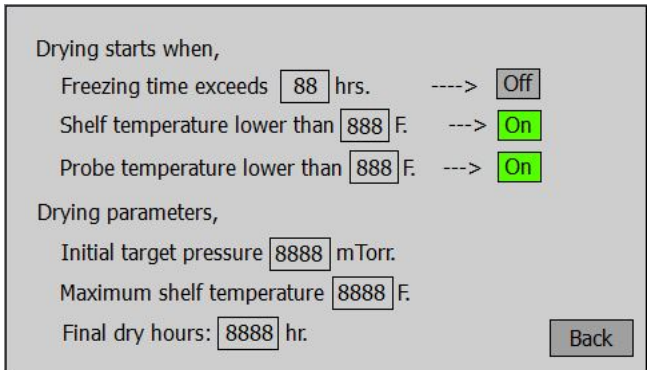
You may need to adjust the final dry hours in various scenarios. This can be done before initiating the freeze-drying process, during the freezing stage, or during the final dry stage.

1. Adjust before the freeze drying process.

   Press the 'Setting' button,



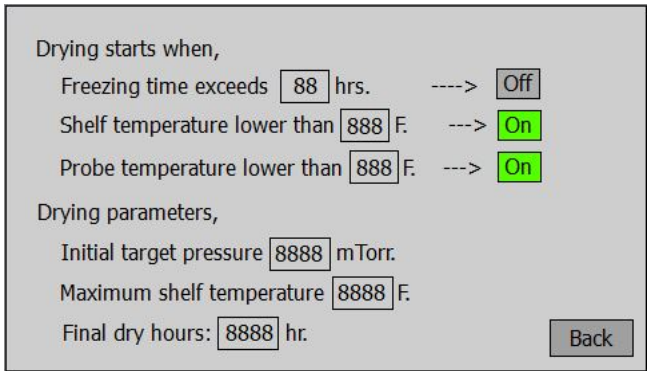
   Adjust the number in the 'Final dry hours' box.



2. Adjust during the freezing stage.

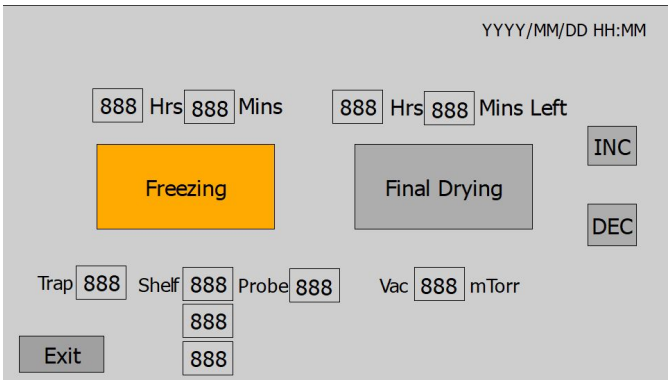
   Press the 'Setting' button on the bottom right corner,

Adjust the number in the ‘Final dry hours’ box.



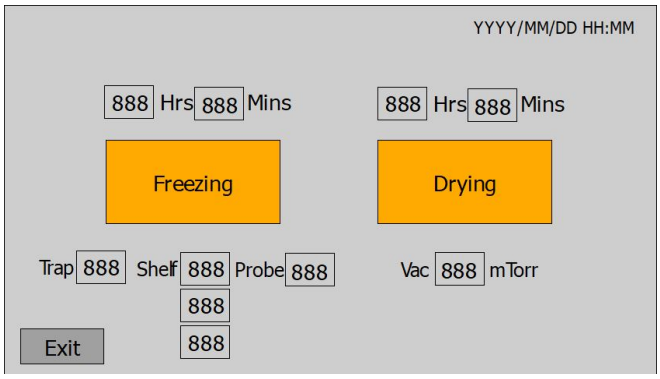
3. Adjust during the final dry stage.

   Press the ‘INC’ (‘DEC’) button to increase (decrease) final dry hours. If you input ‘1’, the final dry hours will be increased by 1 hour.

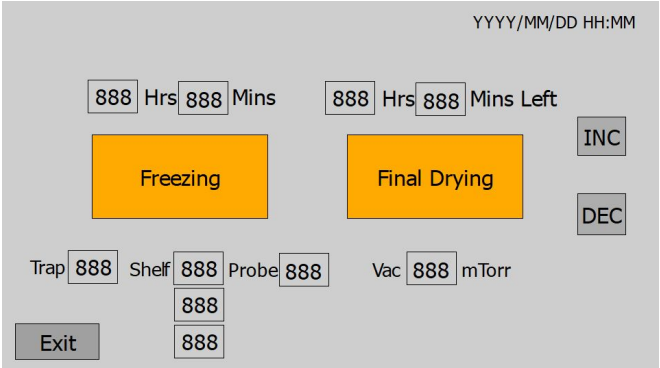


Pause and resume the drying process

If you need to check the food inside the chamber while the drying process is ongoing, you can pause the process by pressing the orange 'Drying' button during the main drying stage (shown below). This will turn the button grey and stop the vacuum pump. Open the vacuum valve to normalize the pressure in the chamber and then check if the food is dry. Once you're done, close the vacuum valve and press the grey 'Drying' button to resume the main drying process.

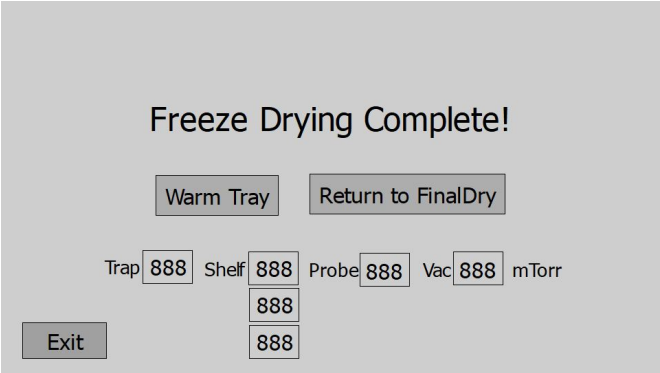


If you are in the final dry stage (shown below), you can temporarily halt the final drying process by pressing the orange 'Final Drying' button. This will cause the button to turn grey, and the pump will stop. You can then open the vacuum valve to normalize the pressure in the chamber and inspect the food. Once you're done, close the valve and press the grey 'Final Drying' button to continue with the final drying process.



What to do after drying is complete

The below screen will show up when the drying process is complete,

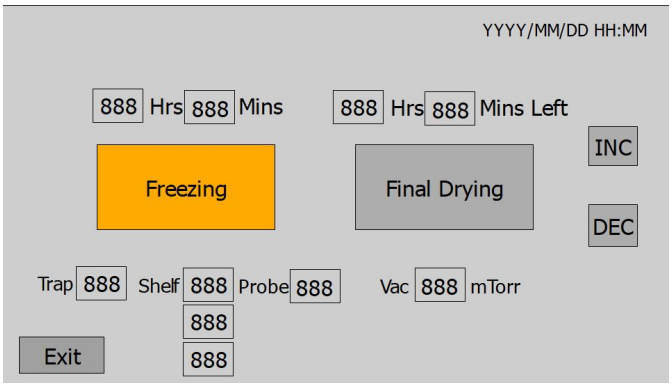


Follow the steps,

Step 1: After the drying process is complete, check the shelf temperature to ensure that the trays are still warm. If the shelf temperature is below the room temperature, indicating that the drying process was completed at least a few hours ago, press the 'Warm Tray' button to warm the trays. Wait for the shelf temperature to rise above the room temperature and press the 'Warm Tray' button again to stop it. Proceed to step 2.

Step 2: Open the vacuum valve and inspect the food to ensure it is completely dry. If the food is dry and no further drying is necessary, press the 'Exit' button and immediately seal the freeze-dried food. Otherwise, move to step 3.

Step 3: If the food requires further drying, return the trays to the freeze dryer and close all valves. Press the 'Return to FinalDry' button to access the following screen. Press the 'INC' button to add additional drying hours (e.g., 4 hours). Once the 'Final Drying' button becomes available, press it to restart the drying process.



Follow the same steps above when the drying is complete again.

Troubleshoot vacuum error messages

The majority of vacuum error messages occur during the first 10 minutes after the vacuum pump is turned on. The controller checks for adequate vacuum levels at various points, and the pressure reading usually drops to 1000 mTorr or lower within 10 minutes.

If the vacuum pressure does not reach the required level at any of these points, the freeze dryer will stop the pump, beep, and switch to the Vacuum-not-reached-warning screen. Press the 'Exit' button, and return the screen to the Auto-freezedry-freezing screen.

At this point, the drying process must be manually started again. But check for causes of vacuum error before pressing the ‘drying’ button to start drying again,

1. Ensure that the room where the machine is located is properly ventilated, the compressor fan is not blocked, and the room temperature does not exceed 80F when it is running.
2. Ensure that the switch on the back of the vacuum pump is turned on if it's currently off.
3. Close the vacuum/drain valves if they're currently open.
4. If there is a gap between the door gasket and the door, open the door, pull the gasket halfway out, and then close the door to ensure a proper contact between the gasket and the door.
5. If there is a lot of condensation on the acrylic door, open the door, wipe dry the door gasket and the interior surface of the door. Pull the gasket halfway out, and then close the door to ensure no moisture trapped inside and a good contact between the gasket and the door.
6. If the shelving unit is blocking the door gasket, push it all the way in, leaving a gap of 1/2 to 3/4 inches between the shelving unit and the door gasket when the door is open.
7. Use a sponge applicator or a mini air pump to drain any water in the drain line if it's present.
8. Clean the gasket if there is any trapped water in the bottom of it. This typically happens after the defrost cycle.
9. Keep freezing the food if it's not yet completely frozen, and inspect each tray to ensure that the food is frozen.
10. Change the vacuum pump oil if it appears milky or cloudy, or if it has not been replaced in a long time.

Once you have identified and addressed any of the issues listed above that may have caused the vacuum error message, you can proceed by pressing the 'Drying' button again to initiate the drying process.

In case the freeze dryer fails to achieve the desired vacuum level for the second time, press the 'Exit' button to switch the screen back to Auto-freezedry-freezing, and then press the 'drying' button to initiate the drying process for the third time.

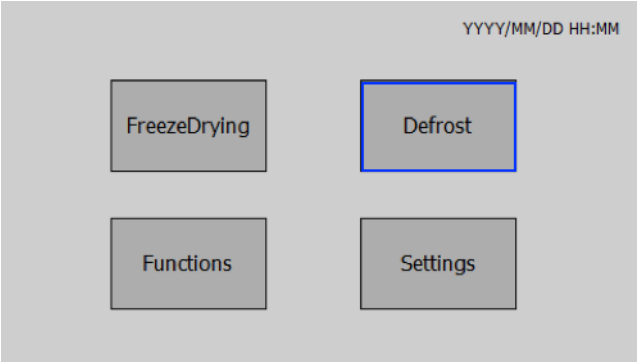
However, if the vacuum level target is still not met for the third time, press the 'Exit' button again. It is advisable to terminate the current freeze-drying session by pressing the 'Exit' button located at the bottom left corner and identify the underlying cause of the vacuum error message.

Follow the steps to check other potential causes of the vacuum error messages:

1. Press the 'function' button on the main menu and check the vacuum reading. If the reading is low even without the pump being turned on, it may indicate loose wiring in the vacuum sensor.
2. Press the 'function' button on the main menu and then press the 'ball valve' button. If you do not hear a buzzing noise from the motor, the motorized ball valve may be broken.
3. Perform a vacuum test by pressing the 'function' button on the main menu, followed by the 'compressor' button. Wait for 90 minutes and check if the cold trap temperature is below -30F and the shelf temperature is below 0F [Note if room temperature is higher than 85F, the cold trap may not be able to reach -30F]. If not, there may be a freon leak in the refrigeration system. If the temperature reading is normal, close all valves, press the 'ball valve' button and then press the 'pump' button to turn on the pump. Wait for 30 minutes and check if the vacuum reading drops to 300 or lower. If not, the pump may have failed.
4. Contact Stay Fresh's customer service for assistance in identifying the underlying cause of the error messages.

6. Defrosting

Press the 'Defrost' button on the main menu to enter the defrosting mode after the freeze-drying process is done.

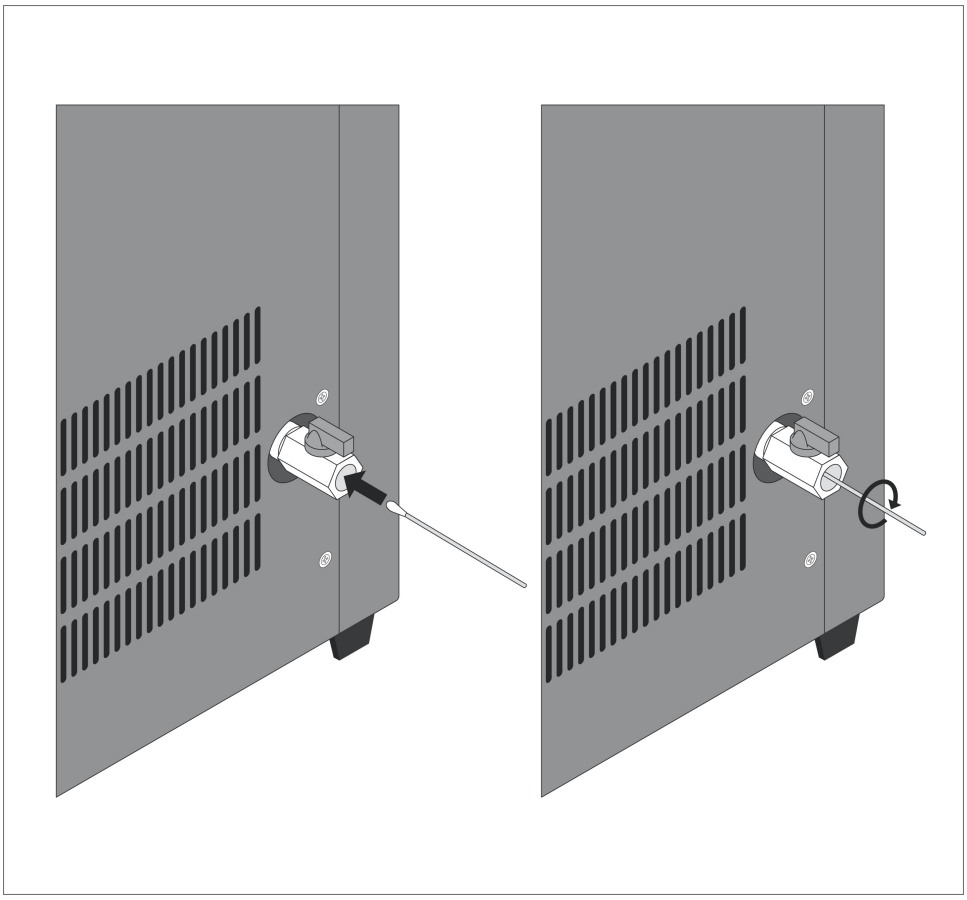


Once you have removed the freeze-dried food from the chamber, proceed to open the drain valve and close the acrylic door. Ensure that the drain hose is directed towards a water bucket. Next, navigate to the Defrosting-setting screen by selecting the 'Defrost' button on the main-menu screen.

On the Defrosting-setting screen, adjust the defrosting time and temperature to your desired settings. Typically, a defrosting time of two hours at 130F is recommended. Once you have set the parameters, press the 'Start' button to initiate defrosting. The Defrosting screen will display the current shelf temperature and time elapsed.

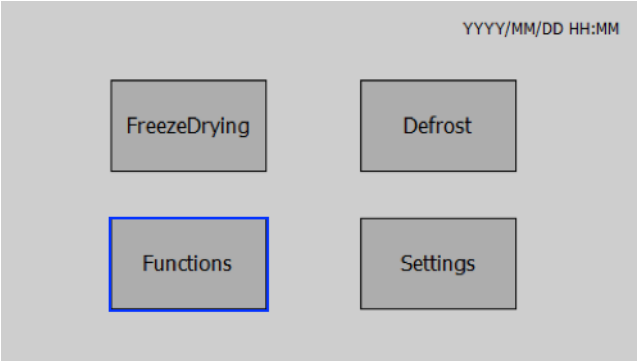
After defrosting is complete and the screen reads Defrosting-complete, press the 'Exit' button to return to the main-menu screen. Drain any remaining water from the bottom of the chamber and use the brush to remove any residual water in the drain pipe.

To remove the residual water in the drain pipe, start by disconnecting the drain hose and opening the drain valve. Use the brush as illustrated below and position the brush tip to collect water from the pipe. Squeeze the brush tip to extract water, repeating the process until the tip no longer collects any more water. Finally, reattach the drain hose to the drain valve.



7. Advanced Freeze-Drying

Press the 'Functions' button on the main menu to enter the advanced freeze-drying screen.



Manual freeze-drying

Manual freeze-drying is only for advanced users. Improper use will void the warranty on the vacuum pump.

The following is the typical manual freeze-drying process:

Step 1.
Turn on all switches. Load the freeze dryer with trays of food. Close all valves and the acrylic door. Make sure the vacuum hose is connected and sealed tightly.

Step 2.
Press the 'Functions' button to go to the function-test screen. Press the 'Compressor' button to turn on the compressor. Monitor the shelf temperature (and food temperature if the probe is inserted into the food). Move to Step 3 until the food is completely frozen. A good indicator is that the shelf or food temperature is below -5F.

Step 3.
Press the 'Valve' button to open the motorized ball valve.

Step 4.
Press the 'Pump' button to start the vacuum pump. Monitor the vacuum pressure reading. Move to Step 5 until the value is below 400 mTorr.

Step 5. Set the target temperature value in the input box to the right of the 'TS' button. Press the 'TS' button to turn on the temperature controller. Adjust the target temperature value as the drying process progresses.

Keep monitoring the vacuum pressure reading during the drying process. If the vacuum pressure is higher than 550 mtorr, lower the target temperature to avoid damage to the vacuum pump.

Step 6. When the drying is complete, press the 'Valve' button to close the motorized ball valve and then press the 'Pump' button to turn off the vacuum pump. Open the vacuum valve and then open the acrylic door to remove the freeze-dried food.

Press the 'Back' button to stop the freeze-drying process and go back to the main-menu.

Step 7.
Remove ice in the chamber. Read Section 6 for defrosting.

Pre-set curve freeze-drying

Preset temperature curve freeze-drying is only for advanced users. Improper use will void the warranty on the vacuum pump.

The following is the typical freeze-drying process with preset temperature curve:

Step 1.
Turn on all switches. Load the freeze dryer with trays of food. Close all valves and the acrylic door. Make sure the vacuum hose is connected and sealed tightly.

Step2.
Press the 'Functions' button to go to the function-test screen and then press the 'Preset Curves' button on the bottom left to go to the Preset-curve-drying screen.

Fill the temperature curve in the 'Temp' (first row below) and 'Time' (second row below) arrays. There are nine slots for each array. Fill the desired shelf temperature in the 'Temp' array and desired time period in minutes in the 'Time' array starting from the left. Below is the example if you want to start with 0F and raise 10F every other 60 minutes,

0	10	20	30	40	50	60	70	80
60	60	60	60	60	60	60	60	60

When the drying process starts, the shelf temperature will be kept at 0F for 60 minutes, and then at 10F for 60 minutes, and so forth. After 9 hours if the drying process is not stopped and the shelf temperature will stay at 80F.

Step 3.
Press the 'Compressor' button to turn on the compressor. Monitor the shelf temperature (and food temperature if the probe is inserted into the food). Move to Step 4 until the food is completely frozen. A good indicator is that the shelf (or food) temperature is below -5F.

Step 4.
Press the 'Valve' button to open the motorized ball valve.

Step 5.
Press the 'Pump' button to start the vacuum pump. Monitor the vacuum pressure reading and the temperature readings. Move to the Step 6 until the vacuum pressure is low, e.g., 450 mTorr.

Step 6.
Press the 'Run' button to start the drying process. A green bar above the 'Temp' array indicates where the current drying time and target temperature is.

Keep monitoring the vacuum pressure reading during the drying process. If the vacuum pressure goes above 550 mtorr, lower the temperature in current slot to avoid damage to the vacuum pump.

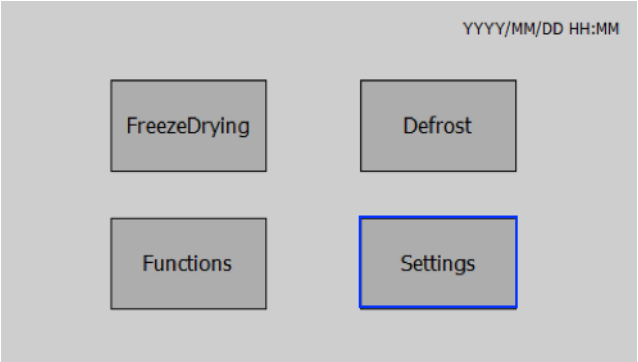
Step 7.
When the drying is complete, press the 'Valve' button to close the motorized ball valve and then press the 'Pump' button to turn off the vacuum pump. Open the vacuum valve and then open the acrylic door to remove the freeze-dried food.

Press the 'Back' button to stop the freeze-drying process and go back to the main-menu.

Step 8.
Remove ice in the chamber. Read Section 6 for defrosting.

8. Freeze-Dryer Settings

Press the ‘Settings’ button on the main menu to enter the system and freeze-drying setting screen Settings.



There are six main buttons on the Settings screen,

Set parameters

Press the button ’FreezeDrying Setting’ to go to the freeze-drying parameter screens. The default settings work for most the of the freeze-drying scenarios. Consult the manufacturer before resetting any parameters.

Download data

To download data from the freeze dryer, first insert an empty memory stick into the USB port. Ensure that the light on the memory stick blinks; if not, try a different memory stick. Next, press the 'Download Data' button, which will prompt a pop-up window. Wait for the transfer to complete and the pop-up window to disappear. If the touch screen controller reboots, try using a different memory stick.

Set temperature

Press button ‘Set EnvTemp’ to set the actual room temperature, which will help recalibrate the freeze-drying algorithm and improve its performance.

System reboot

Press the ‘System Reboot’ button to reboot the touch screen controller.

Touch calibration

If the touch screen response is not accurate, press the 'Touch Calibrate' button to calibrate the touch screen response. Use your finger to press the centers of all crosses following the numeric order.

Reset time

Press the 'Set Time' button to adjust Year/Month/Day/Hour/Minute/Second and day of the week.

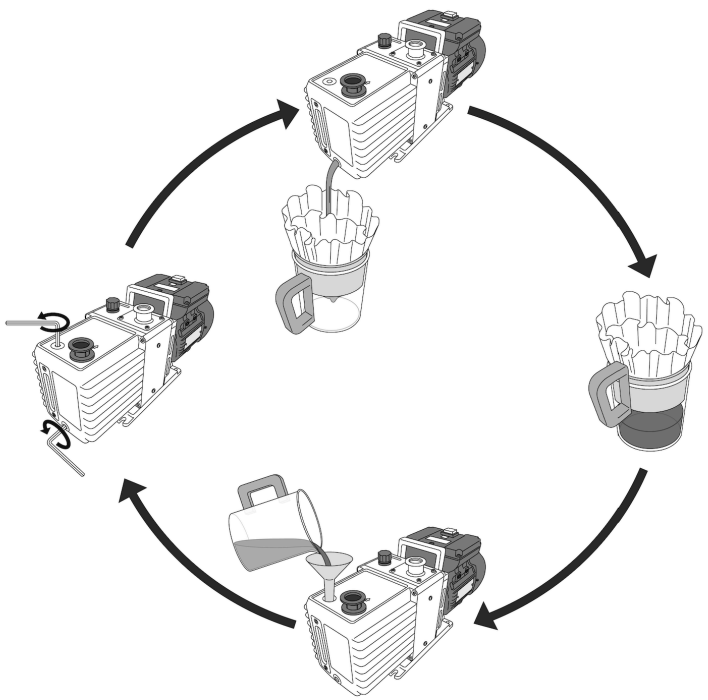
9. Vacuum Pump Oil Change

For the industrial vacuum pump, oil needs to be filtered after 20 cycles of freeze-drying or when it becomes murky in the sight glass. If there is no moisture present in the oil, you can reduce the frequency of oil changes.

Step 1.
Place a paper filter on the top of the plastic pitcher and add multiple layers of tissue paper on the paper filter. Remove the bolt on the drain hole and allow the oil to flow through the filter. To speed up the process, open the oil fill cap and tilt the vacuum pump forward while shaking it gently to ensure all the oil is released.

Step 2.
Wait for all the oil to pass through the filter. If the filtered oil at the bottom is clear with no water, pour the oil back into the vacuum pump through a funnel. However, if the filtered oil is murky or contains water, pour it into a separate container, replace the tissue paper, and repeat the filtering process.

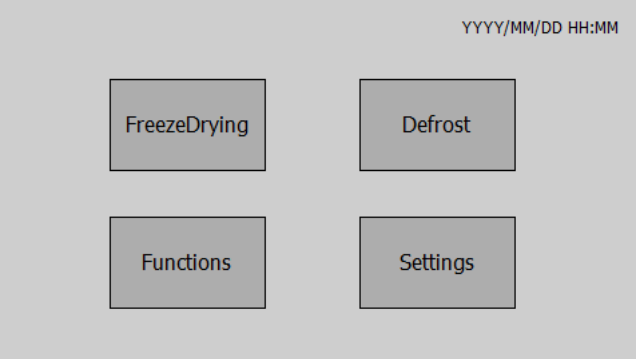
Step 3.
If the oil level in the vacuum pump is below the MIN level, add new oil to raise the level between MIN and MAX.



10. Touch Screen Info

In the context that follows, screen names are indicated by an underscore, button names are enclosed in quotes, a displayed number '888' is a placeholder for actual values, and a timestamp 'YYYY/MM/DD HH:MM' is a placeholder for the actual date and time.

Main-menu



There are four buttons on the main-menu screen:

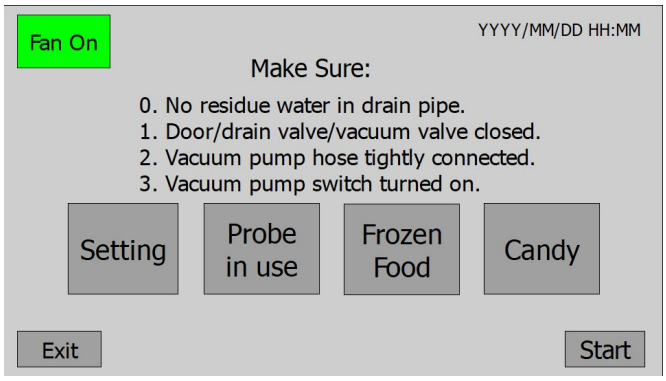
1) 'FreezeDrying' is the entrance to the patented automated freeze-drying process. The screen will jump to auto-freezedry-start when this button is pressed.

2) 'Defrost' is the entrance to the defrosting process in order to remove the ice inside the chamber when the freeze-drying run is completed. The screen will jump to defrosting-setting when this button is pressed.

3) 'Functions' is the entrance to run tests on the condensing unit, the heater, the vacuum pump, and the motorized ball valve. It also provides more options for advanced freeze-drying: a manual freeze-drying process, a pre-set curve freeze-drying process. The screen will jump to function-test when this button is pressed.

4) 'Settings' is the entrance to system settings and input parameters. The screen will jump to settings when this button is pressed.

Auto-freezedry-start



Press the 'Settings' button to access the auto-freezedry-setting screen and configure the drying process. You can set parameters and trigger conditions for the drying process to start.

If you want to use the temperature probe, press the 'Probe in use' button, which will enable the system to:

1. Determine when to initiate the drying process during the freezing stage. The trigger condition, based on the probe temperature, will be displayed in the auto-freezedry-setting screen.
2. Decide when to transition to the 'Final Dry' stage during the main drying stage. By default, if the probe temperature is above 50F, the program will switch to the final dry stage.

Insert the probe into the largest food piece's center during use when the probe is being used. If you don't press the 'Probe in use' button, you can still use the probe to monitor the temperature.

Press the 'Frozen food' button if the food was frozen before being loaded into the freeze dryer. This button suspends all trigger conditions in the auto-freezedry-setting screen, which will be reactivated when the 'Food in Chamber' button is pressed in the auto-freezedry-freezing screen.

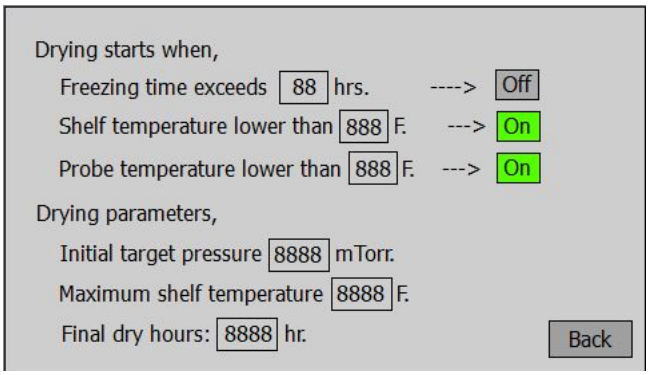
If you freeze-dry very lightweight items, such as leafy greens, press the 'Fan On' button to turn off the fans on the shelving unit, as they might blow the leaves off the trays. Otherwise, keep the 'Fan On' status.

Press the 'Exit' button to go back to the main-menu.

Press the 'Start' button to start the compressor to cool the chamber. The freeze dryer will enter the freezing stage, and the screen will jump to the auto-freezedry-freezing screen. Note that the 'Start' button may be disabled in certain situations, such as when the compressor has been

turned off or the temperature probe is not plugged in when using the ‘Probe in use’ button. In such cases, the button will be re-enabled after a specified time or when the probe is plugged in.

Auto-freezedry-setting



This screen shows two sets of settings: conditions that trigger main drying, and the drying parameters.

There are three conditions that trigger main drying:

1. Hours of freezing, which is turned off by default.

2. Shelf temperature, which measures the temperature of the silicone heater under the second tray. The default temperature is -5F, and this condition is turned on by default.

3. Probe temperature, which measures the food temperature where the probe is inserted. The default temperature is 5F, but this condition is shown and turned on only when the 'Probe in use' button is pressed in the auto-freezedry screen.

if any of the above conditions is turned on and met, the drying process will be triggered, and the vacuum pump starts. You can adjust the parameters or turn on/off (green/grey) any conditions by pressing the off/on button to the right of the arrows. Here are the three examples of the setting,

1. If you want to start drying only when the shelf temperature reaches -20F, you can set the temperature to -20 and press the green button to turn off the probe temperature.

2. If you want to start drying only when a certain amount of freezing time has elapsed, such as 15 hours, you can set the freeze time to 15 and press the adjacent button to turn it on (green), while turning off any other green buttons.

3. If you want to start drying when the probe temperature reaches -20F or the freezing time exceeds 13 hours, you can set the probe temperature to -20 and the freeze time to 13, turn off the green button for the shelf temperature, and turn on the button for the hours.

If all the conditions are turned off, you will need to manually press the 'Drying' button to start the drying process in the auto-freezedry-freezing screen.

You can adjust three parameters for the drying process: the initial target pressure, max shelf temperature, and final dry hours.

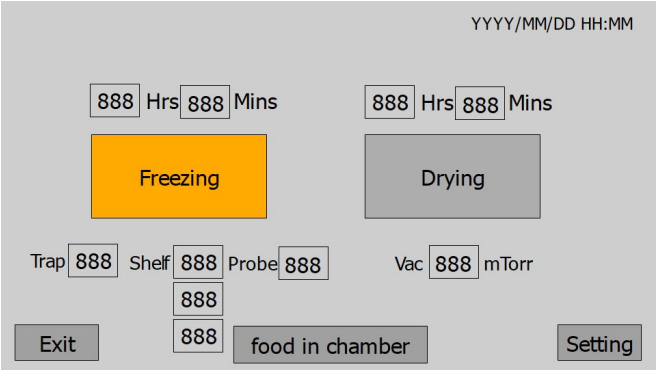
The initial target pressure is the pressure level that the heater will maintain when the main drying begins. The max shelf temperature is the highest temperature allowed for the silicone heater under the second tray. The default settings are 550 mtorr and 120F, respectively.

Usually, higher initial target pressure and max shelf temperature result in a faster freeze-drying process, but this also increases the risk of water vapor entering the vacuum pump or the food being thawed or shriveled.

The default setting for final dry hours is seven hours. The longer the final dry hours, the higher the likelihood that the food will be completely dry.

Auto-freezedry-freezing

This screen indicates the freeze dryer is in the freezing stage.



The 'Auto' sign in the top left indicates that trigger conditions set in the auto-freezedry-setting screen are active. When any of the conditions are met, the drying process will be started, and the screen will jump to the auto-freezedry-drying screen. If the 'Auto' sign is not shown (in the cases where 1) no trigger condition is selected, or 2) the main drying is interrupted and you come back to this screen again), you have to manually press the 'Drying' button to start the drying process.

In the center are two buttons 'Freezing' and 'Drying.' The 'Freezing' button highlighted in orange indicates the compressor is running. The 'Drying' button is in grey, indicating that drying has yet to start. If you are an advanced user, you can manually start drying by pressing the 'Drying' button when you know the food is ready for drying. In the case that all trigger conditions are turned off, meaning that you plan to start drying manually, make sure the food is completely frozen before pressing the 'Drying' button.

Below the two buttons are three temperature readings: 'Trap' (evaporator coil, indicates cold trap temperature), 'Shelf' (temperature of the top, middle, and bottom shelves that are holding the trays), and 'Probe' (food temperature when inserted in the food, otherwise the temperature where the probe is located), and a vacuum pressure reading.

The cold trap temperature should reach -20F quickly and then slowly decrease to around -40F during freezing. The shelf temperature slowly decreases from room temperature to below 0F during the freezing stage. The probe temperature depends on the location of the probe. If it is inserted in the food, it should show a slightly higher value than the shelf temperature but follow the same trend.

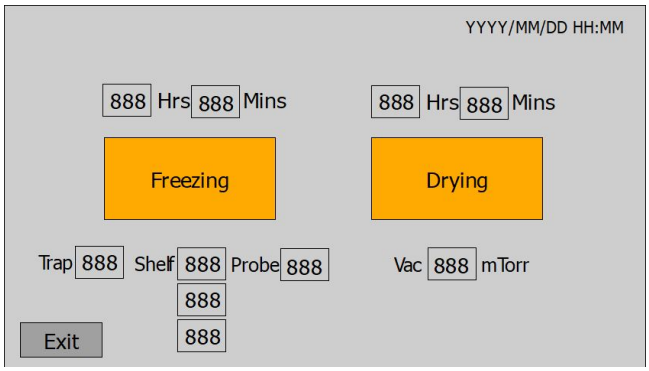
The vacuum reading shows the vacuum pressure in the chamber. The pressure reading is capped at 2000 mTorr. The number does not change until the pump starts and pulls the vacuum below 2000 mTorr.

Press the bottom-left 'Exit' button to stop the freezing process and go back to the main-menu. When you press the 'Frozen food' button in Auto-freezedry screen, the 'food in chamber' button will show up in the bottom. After the frozen food is loaded on the trays in the chamber and all valves are closed, press 'Food in chamber' to un-mask the trigger conditions set in Auto-freezedry-setting screen.

Press the 'Settings' button to make changes to the freeze-drying settings same as seen in Auto-freezedry-setting screen.

Auto-freezedry-maindry

This is the main drying screen.



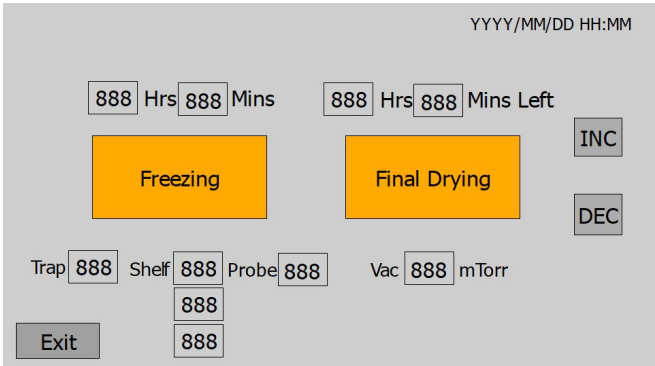
At the center of the screen, you will see two buttons labeled 'Freezing' and 'Drying.' The 'Freezing' button, highlighted in yellow, indicates that the compressor is currently operating to cool the chamber. This button is purely an indicator. On the other hand, the 'Drying' button, also highlighted in yellow, indicates that the vacuum pump is in operation, and the control algorithm will turn the heater on and off as necessary.

Pressing the 'Drying' button will pause the drying process by turning off the vacuum pump, causing the screen to switch to auto-freezedry-freezing. The time stamps above the two buttons display the elapsed time for the freezing and drying stages.

Below the two buttons are the temperature readings and vacuum pressure mentioned in auto-freezedry-freezing.

Once the primary drying stage is complete, the screen will automatically switch to Auto-freezedry-finaldry.

Auto-freezedry-finaldry



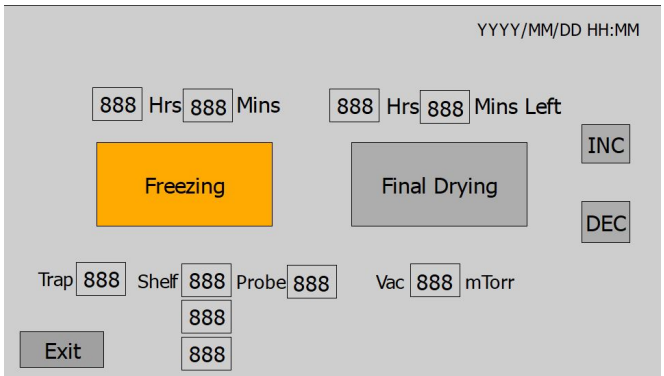
The final dry screen is similar to the auto-freezedry-maindry screen. The main differences here are:

1) The button name becomes ‘Final Drying’ instead of ‘Drying.’

2) There are two extra buttons, ‘INC’ and ‘DEC’ to increase and decrease the final dry hours.

3) The displayed time above the ‘Final Drying’ button is the countdown of the final dry time.

Auto-freezedry-finaldry-pause

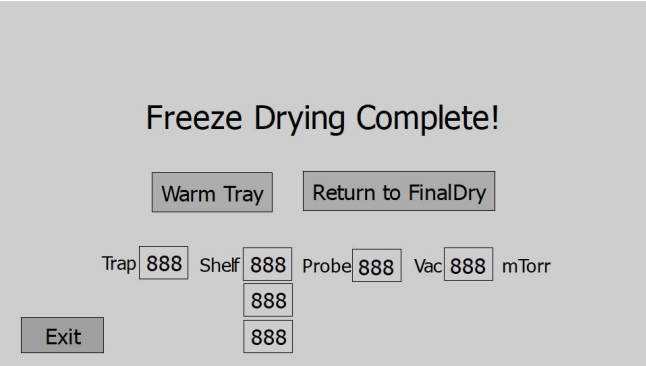


This screen is akin to the Auto-freezedry-finaldry screen, and you will see a 'Final Drying' button that appears greyed out, indicating that the drying process is currently paused. Simply press the 'Final Drying' button to resume the process.

It's essential to keep in mind the following points: 1) When the countdown timer shows a negative value, the 'Final Drying' button will be disabled. To enable the button, press the 'INC' button to increase the final drying hours. 2) Before pressing the 'Final Drying' button, ensure that all valves are securely closed.

Auto-freezedry-complete

This screen pops up and the vacuum pump stops when the drying is complete.

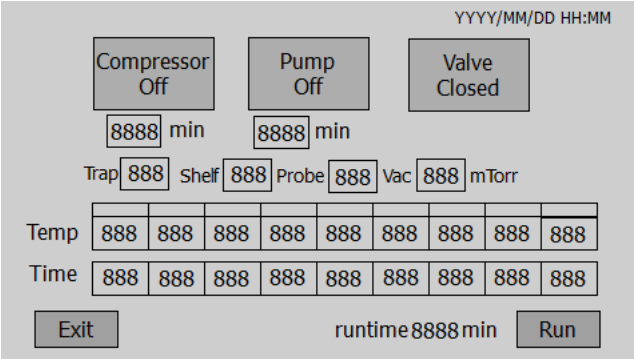


Open the vacuum valve and wait for the pressure to be normalized in the chamber. Open the door to check if the food on each tray is completely dry. If not completely dry and the food is still frozen, put the trays back, close the door and press 'Return to FinalDry.' The screen will jump to Auto-finaldry-pause screen. Follow the instructions on Auto-finaldry-pause screen to resume drying.

After the completion of drying, the stainless-steel trays may be very cold to the touch. To prevent injury and avoid attracting moisture, it is recommended to press the 'Warm Tray' button, which will heat the trays to the max temperature.

Preset-curve-drying

This screen shows the operation and setting input for drying with a pre-set temperature curve.



The top three buttons control the compressor, the vacuum pump, and the motorized ball-valve. The compressor and the pump buttons have a minute counter below. In the middle are the temperature sensor readings and the vacuum pressure reading.

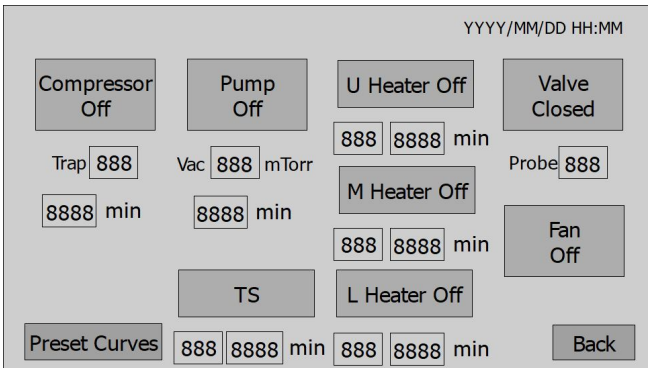
The 'Temp' and 'Time' arrays represent the target shelf temperatures and the duration in minutes that each temperature should be maintained. For instance, in the hypothetical example below, the shelf temperature is set to 50F for 60 minutes, then 55F for 120 minutes, followed by 60F for 120 minutes, and ultimately 65F for 60 minutes, and so on. The final segment is set to 110F for 60 minutes. Once the time for the last segment has elapsed, the

control will maintain the shelf temperature at 110F until the 'Run' button is turned off. The 'Runtime' displays the number of minutes that the drying process has been in operation.

50	55	60	65	70	80	90	100	110
60	120	120	60	60	60	60	60	60

Press the ‘Exit’ button to go back to the function-test screen.

Function-test



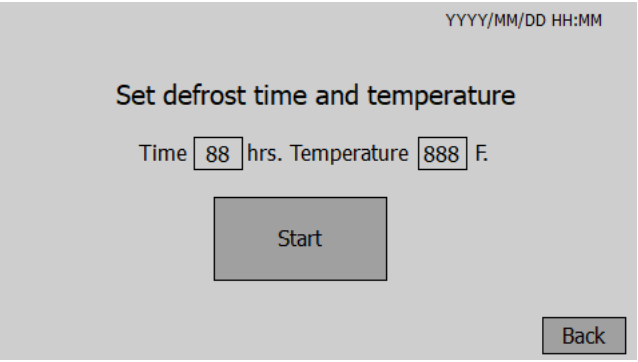
On this screen, you can access the function to test each component of the freeze dryer, such as the compressor, the vacuum pump, the heaters (Upper (U), Middle (M), Lower (L) heating zones), the fans, and the motorized ball-valve. Along with the buttons for these components, there are temperature readings and vacuum pressure displayed. Additionally, there is a minutes counter for each component that records the runtime.

Moreover, this screen also serves as the control panel for manual freeze-drying. The 'TS' button allows you to set the target shelf temperature during the drying process. Under the 'TS' button, you can see the time that 'TS' is pressed for drying.

Press the ‘Preset Curves’ button to enter the Preset-curve-drying screen.

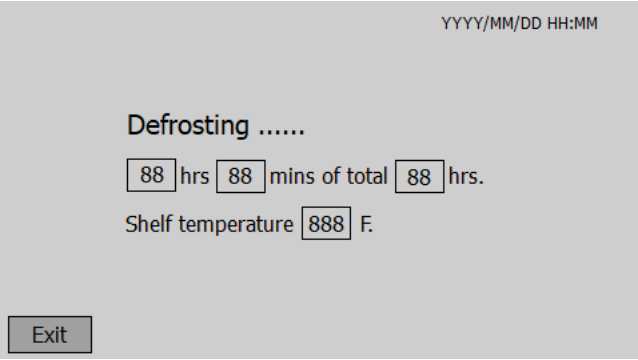
Press the ‘Back’ button to go back to the main-menu.

Defrosting-setting



In the Defrosting-setting screen you can reset the time and target shelf temperature. Click the ‘Start’ button to start defrosting.

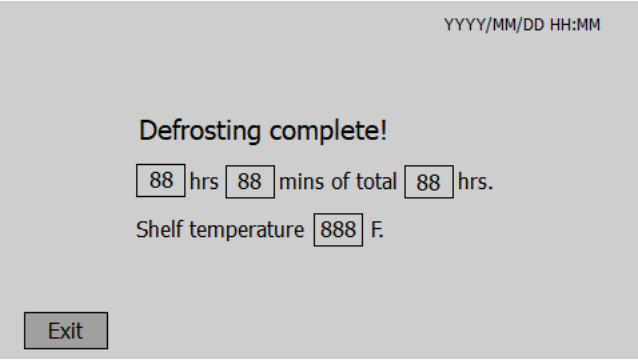
Defrosting



This screen indicates the freeze dryer is in the defrosting mode and and it displays the amount of time the freeze dryer has been in this mode, the preset defrosting time, and the current temperature of the shelf.

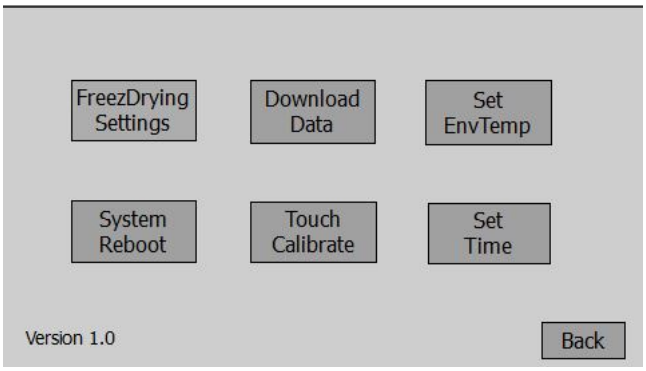
Press the 'Exit' button to go back to the main-menu.

Defrosting-complete



This screen pops up when the defrosting is complete. Press the 'Exit' button to return to the main-menu.

Settings



There are six main buttons on the screen:

1) 'FreezeDrying Settings' - Press this button to adjust all the default parameters for freeze-drying.

2) 'Download data' - This button is used to download the recorded freeze dryer status and sensor readings.

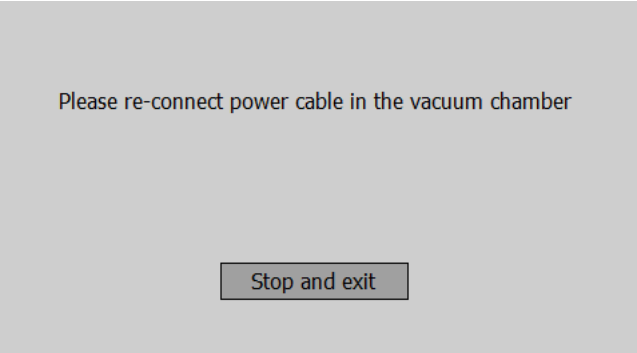
3) 'Set EnvTemp' – Press this button to set the actual room temperature.

4) 'System reboot' - Press this button to reboot the touch screen.

5) 'Touch calibrate' - Press this button to recalibrate the touch screen if you have inaccurate response using touch.

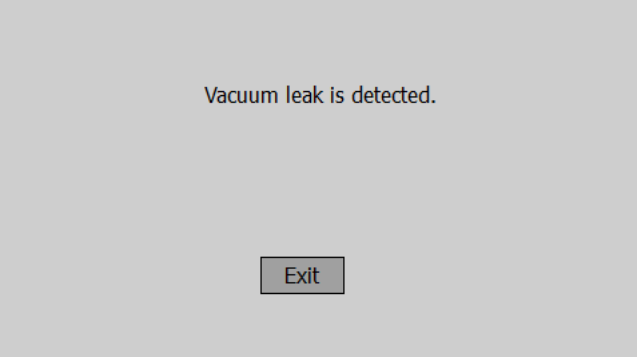
6) 'Set time' - Press this button to reset time.

Cable-connection-warning



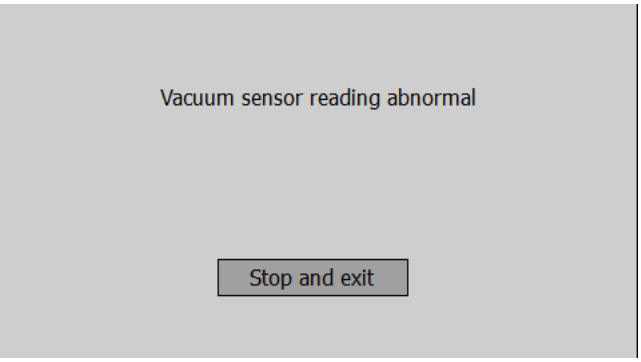
This warning pops up when the cable connecting the heater and shelf temperature sensor is disconnected. Press the 'Stop and exit' button to return to the main menu.

Vacuum-leak-warning



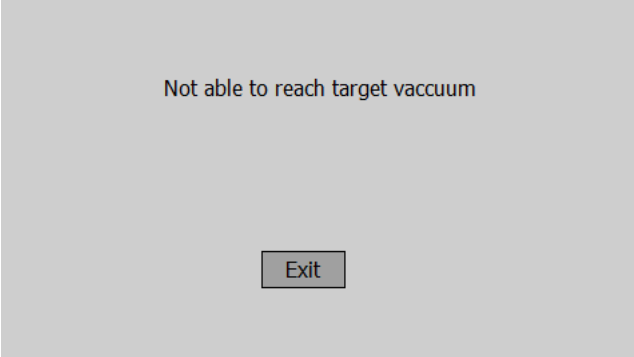
This warning pops up during drying when the sensor detects an unusual drop in the vacuum pressure. The vacuum pump stops as result of this warning. Press the 'Exit' button to return to the freezing mode screen.

Vacuum-pressure-abnormal



This warning pops up when the vacuum pressure reading is abnormal. Press the ‘Stop and exit’ button to the freezing mode or main menu screen.

Vacuum-not-reached-warning



If the vacuum pressure reading does not reach the benchmark values at different points, a warning will appear when the vacuum pump is started. To return to the freezing mode screen, press the 'Exit' button.

If you have any questions, contact us via info@stayfreshfreezedry.com, or visit stayfreshfreezedry.com.

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