

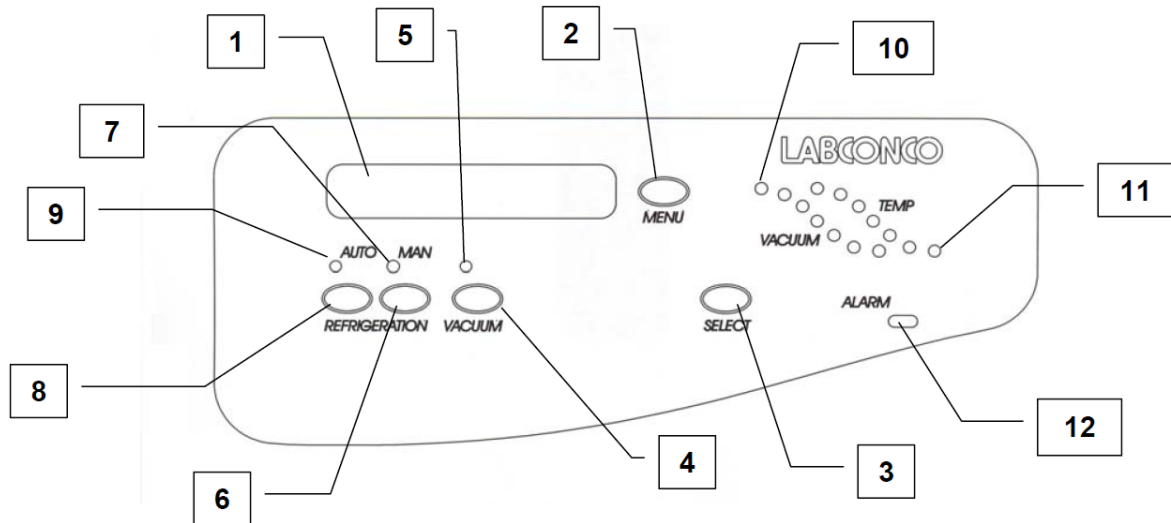
Freeze Dryer User Manual



Never work on the machine if you have not been trained to operate the machine.

Freeze Dryer Controls

The control panel for the Freeze Dryer is shown below with a description about its function.



1. LCD Display – Displays system operating parameters and set up parameters and alarm messages.
2. Menu Switch – This switch is used to change the display from operating system parameters to set up parameters.
3. Select Switch – Used to select set up parameters.
4. Vacuum Switch – Used to start or stop vacuum pump when operating in manual start-up mode.
5. Vacuum Indicator – This green LED indicates that power is being supplied to the vacuum pump receptacle on the back of the Freeze Dryer.
6. Manual Refrigeration Switch – Used to start only refrigeration module.
7. Manual Operation Indicator – When lit, the green LED indicates the Freeze Dryer is being controlled manually by the operator. Each function must be started by the operator.
8. Auto Mode Switch – Used to start or stop the refrigeration and the Auto Mode process.
9. Auto Mode Indicator – When lit, the green LED indicates that the Freeze Dryer is in the Auto Mode. In this mode, the vacuum pump will start when collector temperature reaches -40°C .
10. Vacuum Graph Display – This display indicates the relative system vacuum level. The highest LED indicates that the vacuum level is above 2.0 mBar. The indicators will

sequence down when the vacuum level reaches 2.0, 1.0, 0.8, 0.6, 0.45, 0.12 mBar. The lower green LED flashes when the system vacuum level is 0.45 to 0.12 mBar and illuminates steadily below 0.133 mBar.

11. Collector Temperature Graph Display – This display indicates the temperature of the collector. The highest LED indicates the collector temperature is warmer than 10°C. The indicators will sequence down when the temperature reaches 10, 0, -10, -20, -30, -40°C. When the collector temperature is -40°C or lower the green indicator will light.
12. Alarm Indicator – This red LED indicates that a system alarm has occurred. Press the Menu Switch to display the alarm message on the LCD display and inform about problem Michal Urban.
13. Main Power Switch – Turns the Freeze Dryer on or off. (Not Shown, located on the right side of the cabinet.)

Step 1: Operation Checklist

The following checklist should be followed prior to each use of your Freeze Dryer:

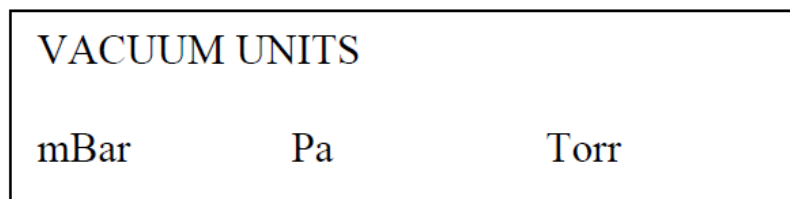
- a) Wipe the interior of the collector chamber with a soft cloth or paper towel to remove any accumulated moisture.
- b) Check the collector chamber drain hose to ensure that the hose is free of moisture and that the drain plug is securely installed. The freeze dryer will not start if moisture is detected.
- c) Using a soft, lint-free cloth or paper towel, wipe the collector chamber lid gasket to remove any dirt and contaminants that could cause a vacuum leak. Vacuum grease is not required on the lid gasket to obtain a proper vacuum seal.
- d) Remove the accessory drying chamber or manifold from the connection port and using a soft, lint-free cloth or paper towel, wipe the port gasket and sealing surfaces of the drying chamber/manifold to remove any dirt and contaminants that could cause a vacuum leak. Reinstall the drying chamber or manifold on the port. Vacuum grease is not required on the port gasket to obtain a proper vacuum seal.
- e) Check that each sample valve is closed or in the “vent” position.

Step 2: Operating the Freeze Dryer

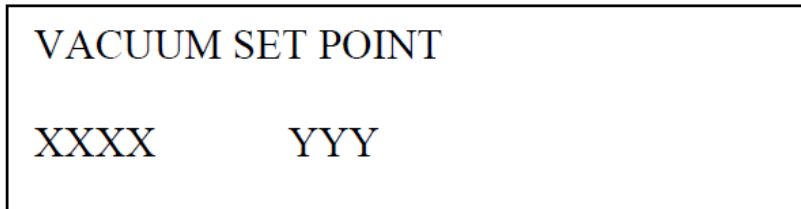
Set-Up

The Freeze Dryer may be configured to automatically start the vacuum pump when the collector temperature reaches -40°C . The display units for vacuum may be selected to be mBar, Pascal (Pa) or Torr and the temperature may be displayed as $^{\circ}\text{F}$ or $^{\circ}\text{C}$. The run time of the refrigeration system and the vacuum pump may be monitored.

To configure your Freeze Dryer, turn the main power switch ON and press MENU. The display will show:

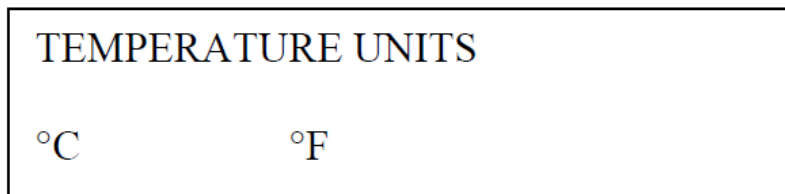


- a) Press **SELECT** until the desired units are flashing.
- b) Press **MENU**
- c) The display will show:



Where YYY is the units selected above.

- d) Press **SELECT** until the desired vacuum operating level is displayed.
- e) If "O" is selected, the vacuum control is disabled and the vacuum level in the Freeze Dry System will be determined by the capabilities of the vacuum pump.
- f) Press **MENU**.
- g) The display will show:



- h) Press **SELECT** until the desired units are flashing.

Automatic Start-Up

To run the Auto Mode:

Press the panel switch labelled REFRIGERATION AUTO. The green LED above the switch will illuminate. This will start the refrigeration system. When the collector reaches -40°C , the vacuum pump will start. The Temperature and Vacuum Graph will indicate collector temperature and system vacuum. The LCD display will show the actual temperature of the collector. When the vacuum in the system is above 20 mBar the vacuum display will indicate "HI." At 20 mBar and below, the display will show the actual vacuum.

When the system vacuum is between 0.450 and 0.133 mBar, the lower green vacuum graph LED will flash. When the system vacuum level is <0.133 mBar, the green LED will be lit steadily indicating that most samples may be added.

Manual Start-Up

To manually run the freeze dry process:

Press the REFRIGERATION MAN switch. This will start the refrigeration system. The green LED above the switch will illuminate. When the collector temperature reaches -40°C , the vacuum pump may be started by pressing the VACUUM switch. The Temperature and Vacuum Graph will indicate collector temperature and system vacuum. The LCD display will show the actual temperature of the collector. When the vacuum in the system is above 20 mBar the vacuum display will indicate "HI." At 20 mBar and below, the display will show the actual vacuum.

When the system vacuum is between 0.450 and 0.133 mBar, the lower green vacuum graph LED will flash. When the system vacuum level is <0.133 mBar, the green LED will be lit steadily indicating that most samples may be added.

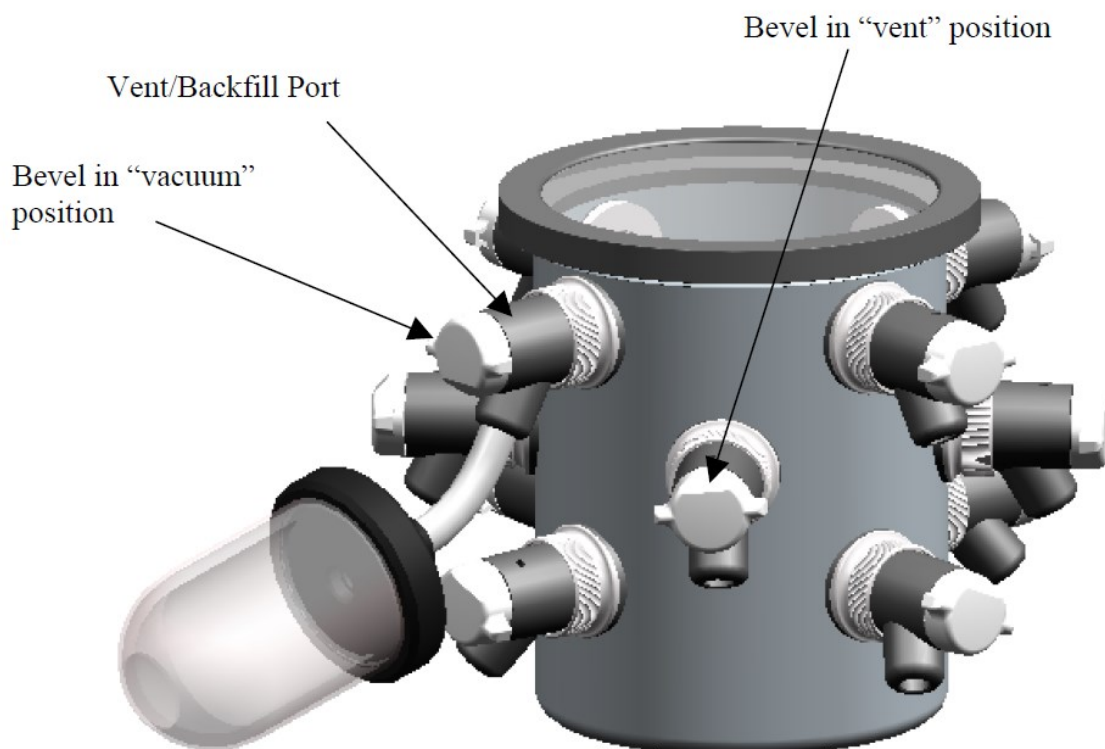
Step 3: Pre-Freezing Samples

Appropriate containers for freeze drying include ampules, serum bottles, and wide mouth freeze drying flasks. Shell freezing of samples is recommended for wide mouth freeze drying flasks. Smaller samples in ampules and serum bottles may be frozen in a freezer or in the center of the collector chamber. The sample container size should always be at least two to three times the sample size (i.e., 40 ml samples should be prepared in 80 ml containers or larger). The temperature required for pre-freezing is dependent on the characteristics of the sample. Pre-freezing temperature typically is at least 10° to 20°C below the eutectic or collapse temperature of the sample.

Step 4: Adding Sample

The following procedure should be followed when using sample valves in the freeze dry process:

- a) Connect a pre-frozen sample to a sample valve on the drying chamber or manifold using an adapter. After connecting a pre-frozen sample to a valve, turn the plastic valve knob to the “VACUUM” position to open the valve, which connects the attached sample to system vacuum. The bevel on the knob should be positioned toward the sample port.



- b) Before adding another sample, allow system vacuum to return to 0.133 mBar or lower. Any combination of valves and sample sizes may be utilized at one time provided that the system vacuum and collector temperature remain sufficiently low to prevent melting of the frozen sample.
- c) When all the frost has disappeared from the outer surface of the sample container and no cold spots can be detected by handling the container, the sample is nearly dry. To be certain of low final moisture content, dry the sample for several hours past this point.
- d) To remove a container after drying is complete, turn the plastic knob on the valve to the “VENT” position, which closes the valve and vents the container. Should backfilling with an inert gas be required, connect the gas supply line to the vent port on the valve before turning the plastic knob on the valve to vent position. The sample container may now be removed. In the vent position the bevel on the knob should point away from the sample port.

Step 4: Shut Down

At the end of a run or when a sufficient amount of condensate accumulates on the collector coil to obstruct the flow of vapor to the collector chamber, the Freeze Dryer should be defrosted. First, release system vacuum by turning the plastic knob on a valve to the open position or by pulling the collector chamber drain plug out of the drain hose. Now press the vacuum switch on the control panel to turn the vacuum pump OFF. Press the Refrigeration Switch next to the illuminated LED to turn OFF the refrigeration system. Turn OFF the main power switch on the right hand side of the cabinet

Step 4: Defrosting

The following procedure should be followed when defrosting the collector coil:

- a) Pull the collector chamber drain hose out from the left hand side of the Freeze Dryer and remove the drain plug. Place the drain hose in a suitable container to collect the condensate that will melt off the collector coil.
- b) Remove the collector chamber top and allow ambient room air to melt the ice. Dispose of the liquid appropriately.
- c) Flush the collector chamber with water and wipe chamber dry.

- d) Reinstall the drain hose plug and slide drain hose back into the side of the cabinet.
Dispose of the liquid appropriately.

IMPORTANT

The utilization of acid requires immediate cleaning and neutralization after defrost or physical damage to the collector chamber and collector coil will result.

Do not attempt to chip ice from the collector coil as damage may occur to the coil.

Never attempt to start the vacuum pump when there is liquid in the collector chamber. This could result in damage to the vacuum pump.