



Laboratory Equipment Manufacturer
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**INSTRUCTION MANUAL FOR
Freeze Dry Systems**

FDL-18N-70 series



PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION

3, Hagavish st. Israel 58817 Tel: 972 3 5595252, Fax: 972 3 5594529 mrc@mrclab.com

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CHAPTER 1

INTRODUCTION

Congratulations on your purchase of our Freeze Dry System, which is designed for laboratory lyophilization procedures. The refrigerant used in the refrigeration system is CFC-free so it will not endanger the environment. The unit is easy to install and maintain. Proper care and maintenance of this product will result in many years of dependable service.

Freeze Dry Process

Freeze drying is an important process in sample prep procedures and for the preservation and storage of biologicals, pharmaceuticals and foods. Of the various methods of dehydration, freeze drying (lyophilization) is especially suited for substances that are heat sensitive. Other than food processing (e.g., coffee, whole dinners), freeze drying has been extensively used in the development of pharmaceuticals (e.g., antibiotics) and preservation of biologicals (e.g., proteins, plasma, viruses and microorganisms). The nondestructive nature of this process

has been demonstrated by the retention of viability in freeze dried viruses and microorganisms.

Freeze drying is a process whereby water or other solvent is removed from frozen materials by converting the frozen water directly into its vapor without the intermediate formation of liquid water. The basis for this sublimation process involves the absorption of heat by the frozen sample in order to vaporize the ice; the use of a vacuum pump to enhance the removal of water vapor from the surface of the sample; the transfer of water vapor to a collector; and the removal of heat by the collector in order to condense the water vapor. In essence, the freeze dry process is a balance between the heat absorbed by the sample to vaporize the ice and the heat removed from the collector to convert the water vapor into ice.

About This Manual

This manual is designed to help you learn how to install, use, and maintain your Freeze Dryer. Instructions for performing routine maintenance and making minor modifications to your Freeze Dryer are also included.

CHAPTER 2

PREREQUISITES

Before you install your Freeze Dryer, you need to prepare your site for installation. Carefully examine the location where you intend to install your Freeze Dryer. You must be certain that the area is level and of solid construction. An electrical

source must be located near the installation site.

Electrical Requirements

The Freeze Dryer requires a dedicated electrical outlet. This outlet requires a 15 Amp circuit breaker or fuse is required for models rated at 230V (50 Hz). The power cord on 230V models are equipped with a plug on the power cord. It will be necessary to change a plug to match the available receptacle.

Unpacking Your Freeze Dryer

Carefully unpack your Freeze Dryer and inspect it for damage that may have occurred in transit. If your Freeze Dryer is damaged, notify the delivery carrier immediately and retain the entire shipment intact for inspection by the carrier.

Setting Up Your Freeze Dryer

After you verify receipt of the proper components, move your Freeze Dryer to the location where you want to install it. Then, follow the steps listed below.

Component Orientation

The refrigeration system in the Freeze Dryer draws air in through the bottom of the cabinet and exhausts air out through the rear sides. A minimum of 2" should be allowed between the back and sides of the Freeze Dryer and the adjacent wall surface. Restriction of the airflow through the cabinet during operation could adversely affect performance.

Vacuum Pump Connection

A vacuum pump is required to operate your Freeze Dry System properly. The Freeze Dryer is equipped with a 25mm ID, heavy wall, vacuum hose for connecting the collector chamber to the vacuum pump.

Make certain that the oil in the vacuum pump is at the proper level.

Place the vacuum pump near the benchtop Freeze Dryer models, or place the vacuum pump on the floor.

Connect the vacuum pump power cord to the receptacle on the rear side of the cabinet labeled “vacuum pump” , If the vacuum pump has an off/on switch, turn the switch on. The vacuum pump will be controlled by the Freeze Dryer. Connect the vacuum pump inlet port to the vacuum tube on the right side of the cabinet with the vacuum hose and clamps provided. If necessary, cut the hose to proper length to allow for gentle bends without kinks.

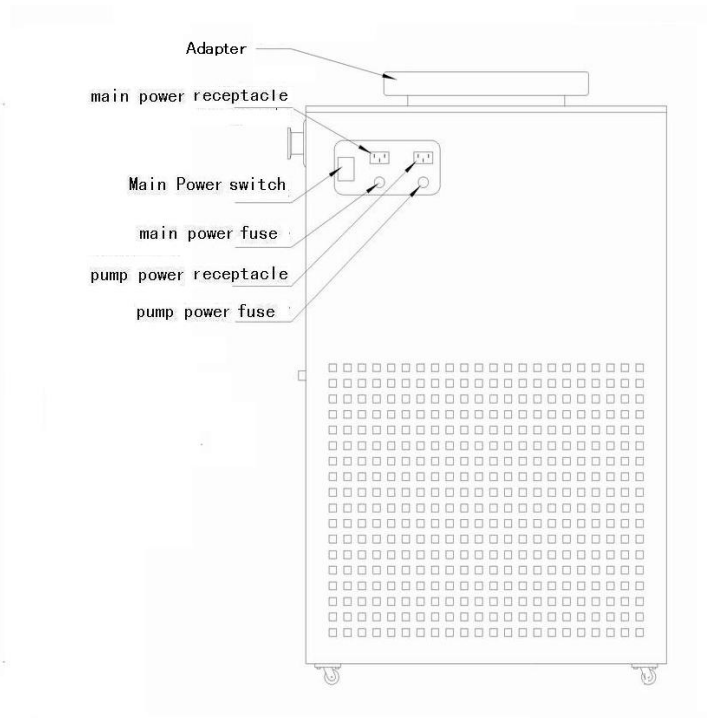
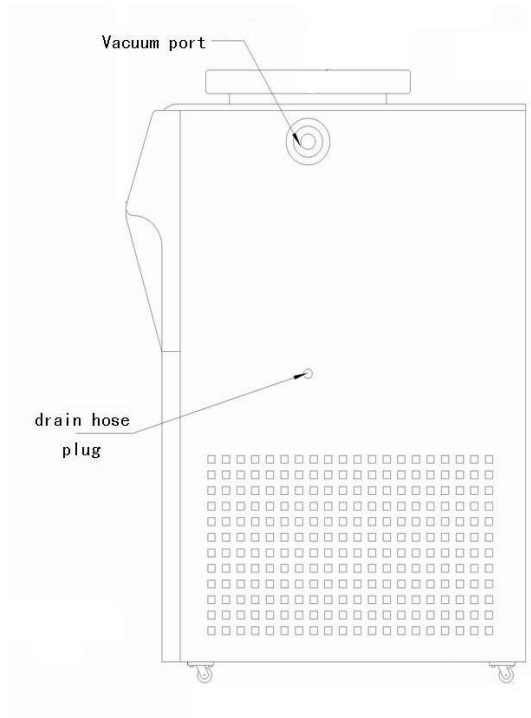
Electrical Connection

Plug the power cord into the receptacle on the right side of the Freeze Dryer and plug the other end into a suitable power receptacle.

Drying Chamber or Drying Manifold Installation

The drying chamber or drying manifold, purchased separately, may be positioned directly above the 3-inch hole in the collector chamber lid. When vacuum is applied to the system, the chamber will be held securely in place.

The installation and setup of your Freeze Dryer is now complete.



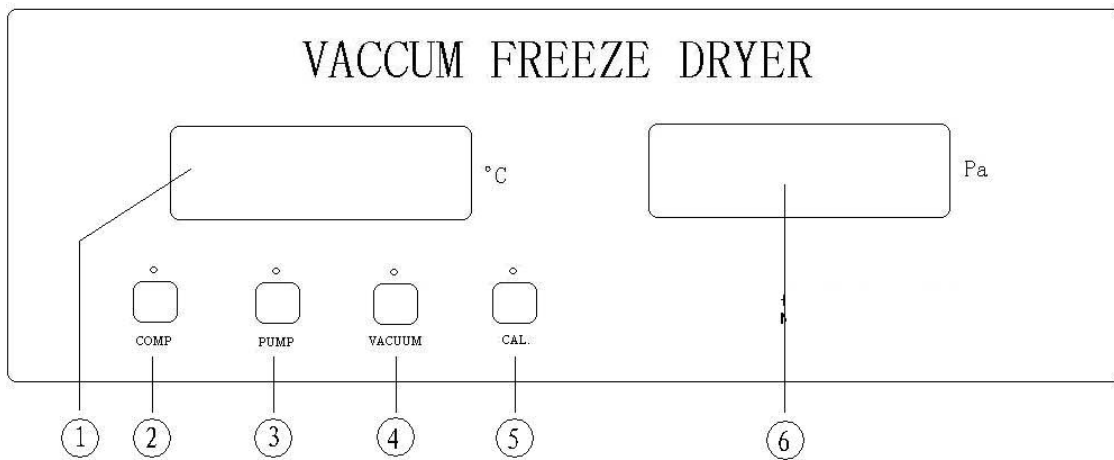
CHAPTER 3

USING YOUR FREEZE DRYER

After your Freeze Dryer has been installed, you are ready to begin using your Freeze Dryer.

Freeze Dryer Controls

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



The Freeze Dryer is being controlled manually by the operator. Each function must be started by the operator.

Main Power Switch – Turns the Freeze Dryer on or off. (Not shown, located on the right side of the cabinet).

1. Temperature LED Display – This display indicates the temperature of the collector.

2. COMP – Manual refrigeration switch ,Used to start or stop the refrigeration compressor.

3. PUMP – Used to start or stop the vacuum pump, The power is being supplied to the vacuum pump receptacle on the right side of the Freeze Dryer. You can start the vacuum pump when the collector temperature reaches -40°C or lower.

4. Vacuum –Vacuum gauge power, This key is used to start or stop vacuum display.

5. CAL. –Calibration, service use only.

6. Vacuum LED Display –Vacuum display, This display indicates the relative system vacuum level.

Operation Checklist

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

1. Wipe the interior of the collector chamber with a soft cloth or paper towel to remove any accumulated moisture.

2. 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.

3. 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.

4. 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.

5. Check that each sample valve is closed or in the “upwards” position.

Vacuum Pump Ballast Setting

Most vacuum pumps are equipped with a gas ballast mechanism. The freeze dry process requires high vacuum. Therefore, it is recommended that the gas ballast be closed during the operation of the Freeze Dry System. If the gas ballast is left open for extended periods of operation, the oil can be pumped out the exhaust, causing the pump to fail.

Operating the Freeze Dryer

To manually run the freeze dry process, Turns the Freeze Dryer on by Main Power Switch. (Not shown, located on the rearward side of the cabinet), Temperature LED Display indicates the actual temperature of the collector. Press the VACUUM switch, Vacuum LED Display will indicate system vacuum level, When the vacuum in the system is above 999 Pa, the vacuum display will indicate "999" ,At 999 Pa and below, the display will show the actual vacuum.

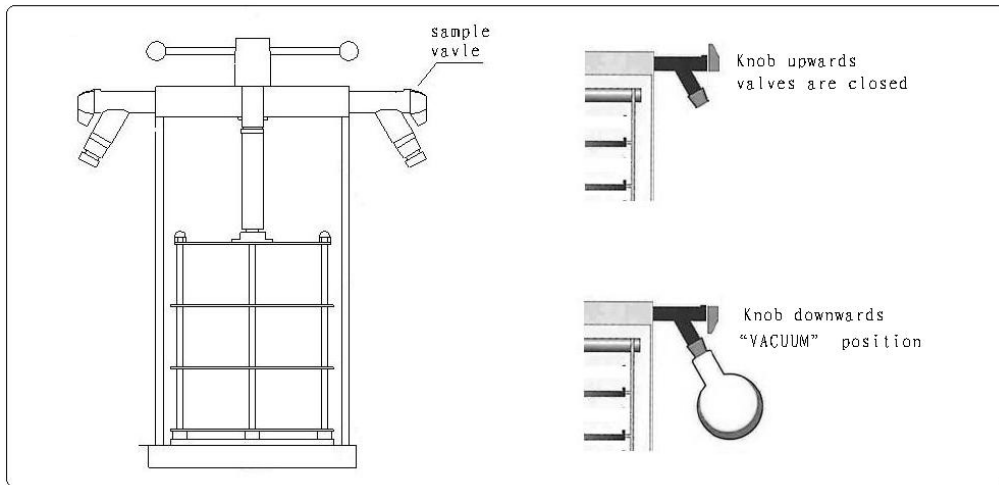
Press the COMP switch, This will start the refrigeration system. The red LED above the switch will illuminate. When the collector temperature reaches -50°C or lower, the vacuum pump may be started by pressing the PUMP switch.

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.

Adding Sample

The following procedure should be followed when using sample valves in the freeze dry process(For **FDL-18N-70**):



1. 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 downwards position to open the valve, which connects the attached sample to system vacuum. The bevel on the knob should be positioned downwards.

2. Before adding another sample bottle, allow system vacuum to return to 40Pa 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.

3. 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.

4. To remove a sample bottle after drying is complete, turn the plastic knob on the valve to the upwards position, which closes the valve and vents the container. The sample bottle may now be removed.

5. Ampules may be flame sealed while connected to a valve by using a sealing torch. Care must be taken not to burn the valve. An insulation material placed between the valve and the torch is recommended.

Shut Down

At the end of a run or when a sufficient amount of condensate accumulates on the collector 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 plugging 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.

Defrosting

The following procedure should be followed when defrosting the collector:

1. Install the drain hose plug from the side of the Freeze Dryer. Place the drain hose in a suitable container to collect the condensate that will melt off the collector .
2. Remove the collector chamber top and allow ambient room air to melt the ice. Dispose of the liquid appropriately.
3. Flush the collector chamber with water and wipe chamber dry.
4. If rapid defrost is desired, pour warm water over the collector . **Do not** allow the liquid to enter the vacuum port on the upper rear of the chamber.

5. Pulling the drain hose plug out, and put drain hose back into the side of the cabinet. Dispose of the liquid appropriately.

CHAPTER 4

MAINTAINING YOUR FREEZE DRYER

Under normal operation, the Freeze Dryer requires little maintenance. The following maintenance schedule is recommended:

As needed:

1. Clean up all spills; remove liquids from the chamber.
2. Clean lid and gasket using soft cloth, sponge or chamois and a mild, non-abrasive soap or detergent.
3. Check oil level of the vacuum pump. It should be over the middle line of oil mirror, If the oil level is lower, add oil to proper level.
4. If oil shows cloudiness, particles or discoloration, drain the pump and replace with fresh oil.
5. Utilization of acids requires immediate cleaning and neutralization after a run or physical damage to the collector chamber and collector coil will result.
6. Check the collection chamber for condensed or frozen solvents and dispose of appropriately. Completely empty the collector chamber before the next run or before starting the vacuum pump.
7. If chamber or manifold valves leak or stems become difficult to turn, pull the stem out of the rubber valve body and apply a thin coat of vacuum grease to the stem. Reinsert the stem into the valve body.

CHAPTER 5

TROUBLESHOOTING

Refer to the following if your Freeze Dryer fails to operate properly. If the suggested corrective actions do not solve your problem, contact us for additional assistance.

Freeze Dry Systems should reach a vacuum of 999Pa or lower within 10 minutes, and should achieve an ultimate vacuum of 20Pa or lower within 30 minutes when the refrigeration is operating. If the Freeze Dryer does not obtain a satisfactory vacuum, perform the following maintenance tests.

I. Vacuum Pump

First make sure that the vacuum pump operates. If it fails to operate, check the electrical connections of the Freeze Dryer to the power source and then check the electrical connection of the vacuum pump to the Freeze Dryer. If the vacuum pump has a power switch, make sure that it is turned on. If the vacuum is not adequate when the vacuum pump is operating, proceed with the following steps:

1. Check the oil and ensure it is clear and clean. If the oil looks cloudy or has any particulates, replace the pump oil. Sometimes it may be necessary to flush the pump with clean oil several times. To flush the pump, run the pump 5 to 10 minutes to allow the oil to warm up. Drain the oil and refill with clean oil. Repeat as necessary.
2. Check the oil level in the pump. Ensure it is filled to the correct level.
2. Check vacuum hose connections from the pump to the Freeze Dryer and try running the unit.

II. Gaskets, Tubing, Connections, Sample Valves

1. Inspect gasket(s) for cracks or defects. Ensure the gasket is clean. Apply a thin coat of vacuum grease to the gasket. Keep in mind, too much vacuum grease can actually cause leaks

2. Check the drain line and ensure the drain plug is installed and the tube appears to be in good condition.

3. Check all rubber vacuum tubing for signs of deterioration or cracking.

4. Check all connections and make sure they are secure and leak tight.

5. Check all sample valves on the drying chamber/manifold and ensure all valves are closed or in the vent position. Check to ensure all fittings are tight and sealed properly against the chamber. Inspect valves for cracks or cuts.