

Biennial Review Form

SOP Title: Labconco Freeze Drier Operation

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BIENNIAL REVIEWS ^a

Date	EPA Reviewer (signature/title: PI, or project leader, or WACOR w/ WA#)
9/15/05	Claudia M. Wise

^a Signature documents the biennial review when no revisions are deemed necessary.

If a modified version of this SOP is being followed these revisions should be submitted for review and approval.

A. Signature Page

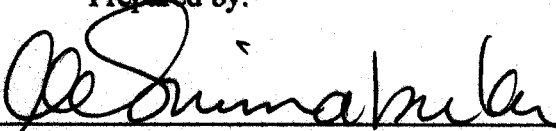
Labconco Freeze Drier Operation

SIP/EP.05
Version: 1.00

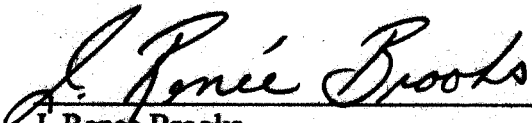
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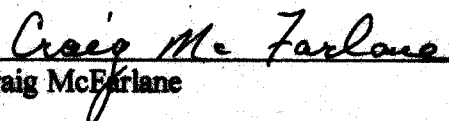
Prepared by:

 Date: 6/6/01
Ray Shimabuku

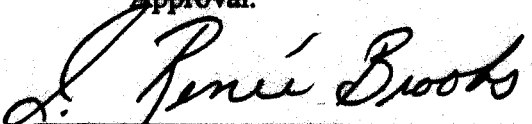
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 Date: 6/7/01
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Approval:

 Date: 6/7/01
J. Renee Brooks, ISIRF Director

Background

Samples analyzed by ISIRF may need to be preserved in order to maintain the samples until they can be analyzed for its stable isotope composition. Typically this can be accomplished by freezing, oven drying or freeze drying (lyophilization). The latter two preservation methods are especially useful if the samples will need to be ground to yield a homogenous sample. Oven drying at higher temperatures (e.g. 100 C +) effectively removes the moisture but may also result in loss of unacceptable levels of volatile organic constituents. Freeze drying reduces this problem but may have other unacceptable consequences. eg. leathery texture of freeze dried mushrooms make grinding very difficult (a food dehydrator have been more effective for these samples).

ISIRF maintains two Labconco Freezone 6 freeze driers. One is in the Plant Ecology Building Room 111 and is equipped with a 16 place drying port. The other one is in Greenhouse 8-2 and is equipped with a smaller 12 place drying port. **The GH 8 freeze drier is reserved for enriched/depleted samples.**

Video Tape

This experimental procedure is used in conjunction with an abridged version (less than 5 minutes) of Labconco's Freezone Freeze Dry System Operation video. A copy is available in main room 228.

Start-Up (also see Appendix A, page 19)

- Check vacuum pump oil level and oil color at least weekly. The oil should be clear and colorless. Avoid using the unit if the oil is reddish to black or has a white emulsion after the unit have reached vacuum equilibration. Check the oil mist trap level. ISIRF personnel routinely changes the vacuum pump oil on a quarterly basis or as needed. The vacuum pump oil is replaced and replenished with Edwards 19 oil kept in the chemical safety cabinet..
- Check that all valve stems are turned to "vent" position.
- Turn on power switch and press auto button.
- Once the temperature is below -40°C, the vacuum pump will automatically start.
- The unit is ready when both lowest indicating lights on the display panel are green. The display panel also indicates that the temperature is -40°C or less and the vacuum level is 133×10^{-3} mBar or lower.

Adding Sample (also see Appendix A, page 23)

- Add pre-frozen sample to the center stainless steel port chamber or the freeze dry glass containers (stored in the adjacent cabinet). Make sure the container is at least 2x the sample size. Samples can be placed in opened zip locked bags in the center well also. The walls of the bags can be folded over to keep the walls more upright and allowing greater exposure of the samples. Avoid completely blocking the opening in the bottom of the center well. Non-frozen samples can be freeze dried but will take longer and the sample composition may change since it is not in a stable storage condition.
- Connect the container to a valve on the freeze drier. **Caution: Use a pair of leather gloves or other suitable barrier when connecting the glass adapters.**
- Turn plastic valve stem to “vac” position to open the valve (bevel toward port).
- Allow system vacuum to return to $\sim 133 \times 10^{-3}$ mBar or lower before adding another sample
- Any combination of valves and sample sizes may be used as long as the temperature and vacuum remain in the recommended range.

Removal of Samples

- Duration of freeze drying is dependent on the type and size of samples with prior experience serving as an estimator to determine drying completion. Completeness can be verified by weighing samples to determine if moisture loss is complete. Appendix A Table 1 on page 7 gives approximate Freeze Dry Rates and on page 24 it discusses an indicator of completion as when external frost and cold spots have disappeared from the freeze dry containers.
- When samples are completely dry turn all valve stems to the closed position - $\frac{1}{2}$ way (90°) between on and vent position. Leaving the pump on, the containers may be removed one by one by turning the plastic valve stem to “vent” position

Shut Down

- Shut down the unit when all containers have been removed by depressing purge button then turning off the power switch after the vacuum pressure returns to ambient.

Defrosting

- Pull the condenser chamber drain hose out from the control panel and remove the drain plug. Place a bucket under the drain plug to catch water.

- Defrosting can be accomplished in 3 ways (or any combination).
 - 1) Leave power on and press defrost button.
 - 2) Let thaw overnight.
 - 3) Pour warm water over the collector coil.

- For warm water procedure, remove chamber lid and pour warm water over the collector coil. Do not fill the chamber above the coil as water might enter into the vacuum pump lines.

- When ice condensate is defrosted, flush chamber with water and wipe chamber dry
- Reinstall drain hose plug, and slide drain hose back into cabinet.
- Caution: the condensate liquid especially in the enriched/depleted freeze drier should be disposed of carefully down the lab sink. Please consider that this condensate should be treated as a potential source of contamination and good laboratory practices should be practiced.

Authorized Users:

The freeze driers are available for use only by users authorized and trained by ISIRF. The users must reserve unit as stipulated in separate training for ISIRF labs PEB 111 and the enriched/depleted complex in Greenhouse 8. The reservation/usage logs are kept with the respective units.

Appendix A

Labconco Freezone 6 Operational Manual

FreeZone® 6 Liter
Freeze Dry System
Models 77530, 77535

INSTRUCTION MANUAL

Product designs are subject to change without notice
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Form 75173 Rev B / ECO 9391
Printed in U.S.A.

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INTRODUCTION

Components Shipped

Carefully check the contents of the carton for damage that might have occurred in transit. Do not discard the carton or packaging material until all components have been checked against the following component list and the equipment has been installed and tested:

As shipped, the carton should contain the following:

Part Number	Description
77530-xx or 77535-xx	6 Liter Freeze Dry System 6 Liter Freeze Dry System with Shell Freezer
75173	Instruction manual
13364 or 13373	Power Cord 115V Power Cord 230V
12838	Plug (230V Models only)

INTRODUCTION

General Description

The Labconco FreeZone® 6 Liter Freeze Dry System is designed for laboratory lyophilization procedures. It 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. Shown below is a 6 liter unit that is equipped with a shell freezer and a purge valve.

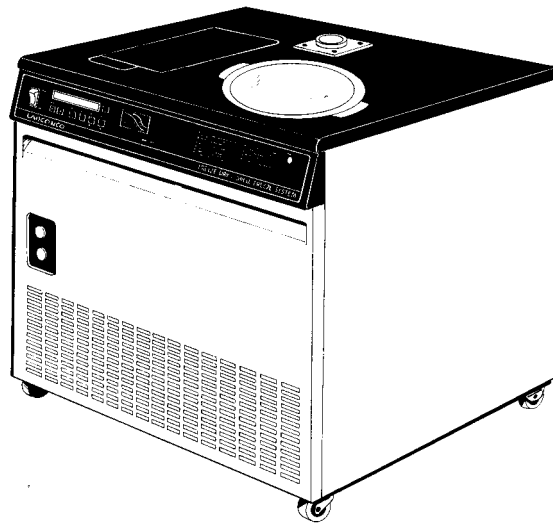


Figure 1

INTRODUCTION

Freeze Dry Process

Dehydration is an important process 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 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 water; the use of a vacuum pump to enhance the removal of water vapor from the surface of the sample; the transfer and deposit of water vapor onto a condenser; the removal of heat, due to ice formation, from the condenser by means of a refrigeration system. In essence, the freeze dry process is a balance between the heat absorbed by the sample to vaporize the water and the heat removed from the condenser to convert the water vapor into ice.

Freeze Dry Rates

The efficiency of the freeze drying process is dependent upon: the surface area and the thickness of the sample; the condenser temperature and vacuum obtained; the eutectic point and solute concentration of the sample. It is important to remember these three factors when trying to obtain efficient utilization of your freeze dry system. A listing of selected materials and their approximate drying times are shown in Table 1 for your reference.

SAFE TEMPERATURE AND DRYING TIMES FOR SELECTED MATERIALS			
Material 10MM Thick	Safe Temperature °C	Condenser Temperature °C	Hours (Approx)
Milk	-5	-40	10
Urea	-7	-40	10
Blood Plasma	-10 to -25	-40	16
Serum	-25	-40	18
Vaccinia	-30 to -40	-50	22
Influenza Vaccine	-30	-50	24
Human Tissue	-30 to -40	-50	48
Vegetable Tissue	-50	-80	60

*Total sample quantities are contingent on various freeze dryer capacities.

Table 1

INTRODUCTION

Freeze Dry Rates (Con't)

Up to the point of overloading the system, the greater the surface area of the sample, the greater the rate of freeze drying. By contrast, for a given surface area, the thicker the sample the slower the rate of freeze drying. This is based on the fact that the heat of sublimation is usually absorbed on one side of the frozen sample and must travel through the frozen layer to vaporize water at the other surface. In addition, as the sample is freeze dried, the water vapor must travel through the layer of dried material. The thicker the sample, the greater the chance that the dried layer may collapse which would cause an additional decrease in the rate of freeze drying.

The surface area and thickness of the sample can usually be ignored when each sample contains only a few milliliters. However, for larger volumes, the samples should be shell frozen to maximize the surface area and minimize the thickness of the sample. The volume of the freeze dry flask should be two to three times the volume of the sample.

In order for lyophilization to occur, ice must be removed from the frozen sample via sublimation. This is accomplished by the condenser and the vacuum pump. The condenser, which should be at least 10 to 15°C colder than the eutectic temperature (melting temperature) of the sample, traps water vapor as ice. Since the vapor pressure at the condenser is less than that of the sample, the flow of water vapor is from the sample to the condenser. Since this vapor diffusion process occurs very slowly under normal atmospheric conditions, a good vacuum is essential to maintain an efficient rate. In most applications, the maintenance of a vacuum of 133×10^{-3} mBar or less is required for freeze drying to occur.

The rate of freeze drying is directly proportional to the vapor pressure, and the vapor pressure is dependent upon both eutectic temperature and solute concentration of the sample. For example, a solution of sodium chloride would freeze dry at a slower rate than pure water. The eutectic temperature of a sodium chloride solution is about -21°C and at this temperature the vapor pressure is about 1/16 that at 0°C. Although the eutectic temperature is not dependent upon the concentration of sodium chloride, the vapor pressure of the water would decrease as the concentration of sodium chloride increased. This is due to the fact that as the solute concentration increases, less of the surface area of the frozen sample is occupied by water. In general, most solutions or biological samples will have a eutectic temperature of -10 to -25°C. However, if there is a simple sugar such as a glucose or if the sample is animal or plant tissue, the eutectic temperature may be as low as -30 to -50°C.

Freeze Dry Capacity

The volume of a sample that can be freeze dried at one time is related to factors discussed previously and the size and design of the freeze dry system. With any given instrument, the capacity is based on: the surface area of the sample; the eutectic

INTRODUCTION

Freeze Dry Capacity (Con't)

temperature and concentration of the sample; and the rate and amount of heat transferred to the frozen sample. Of these factors, the eutectic temperature is the most important factor in determining the amount of sample that can be freeze dried at one time, particularly when flasks are used. This is because, as the eutectic temperature decreases, the vapor pressure decreases but the rate of heat absorption by the sample does not change. This tends to promote melting of the sample which leads to a marked increase in vapor pressure and ultimately overloads the condenser and vacuum pump. Samples that have eutectic temperatures of -20°C or lower should be placed on the freeze dry system one flask at a time so that the vacuum in the system may recover before adding another sample to the system. If the vacuum does not recover to less than $133 \times 10^{-3}\text{mBar}$ the capacity of the freeze dry system has been exceeded and the sample should be removed.

If there is a problem with a particular type of sample melting when placed on the freeze dry system, dilution of the sample with more water or providing some insulation around the flask to decrease the rate of heat absorption by the sample may help. If the eutectic temperature of the sample is -40 to -60°C , the freeze dry system selected for use must be equipped with cascade type refrigeration so that the condenser temperature can be cooled to below -75°C , or a dry ice/solvent trap can be used between the condenser and the vacuum pump.

Samples Containing Volatile Substances

In certain cases the solvent in a sample to be freeze dried may contain volatile components such as acetic acid, formic acid, or pyridine. In addition to these substances having an effect on the eutectic temperature, they may enhance the vapor pressure at the surface of the sample. Also, compared to water, they will require the absorption of less heat for sublimation to occur. Hence, freeze drying samples that contain volatile substances will have a greater tendency to melt, particularly when placed in flasks or exposed to room temperature. If a sample containing a volatile substance tends to melt when placed on a freeze dry system, dilution of the sample with more water will help keep the sample frozen. For example, a 0.2M solution of acetic acid is much easier to freeze dry than a 0.5M solution.

INTRODUCTION

Component Identification (See Figure 2)

- (1) **Cabinet.** The cabinet is mounted on four casters for moving and relocating the unit.
- (2) **Side Panels.** These panels are removable to provide access to inside of cabinet.
- (3) **Front Panel.** This panel is removable to provide access to inside of cabinet.
- (4) **Cabinet Top.** The cabinet top is corrosion resistant and smooth.
- (5) **Control Panel.** The control panel contains readouts for vacuum and temperature and contains all control switches. The control panel also contains a recorder jack.
- (6) **Connection Port.** The port is designed to accept any of Labconco's drying chambers or manifolds or the Labconco Stoppering Tray Dryer.
- (7) **Condenser Chamber Lid.** The lid is clear acrylic so that the amount of condensate may be visually monitored.
- (8) **Condenser Chamber Lid Gasket.** Molded of neoprene, the gasket forms a leak tight seal between condenser chamber and lid.
- (9) **Condenser Chamber.** Constructed of type 304 stainless steel, it contains the stainless steel collector coil and vacuum stand pipe.
- (10) **Condenser Chamber Drain Hose.** The drain hose extends from the cabinet front panel for draining condensate.
- (11) **Drain Plug.**
- (12) **Refrigeration Module - Freeze Dry.** The system is a mechanical, capillary tube system.
- (13) **Junction Box.** The junction box contains the electrical receptacle for vacuum pump connection, circuit breaker and power connectors.
- (14) **Purge Valve (if so equipped).** When activated, it isolates the vacuum pump from freeze dry system so that small amounts of contaminants can be purged from vacuum pump oil.
- (15) **Vacuum Hose with clamps.** The hose connects the vacuum pump to the freeze dry unit.

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- (16) **Shell Freezer Drain Hose - (Model 77535).** The drain hose extends from the cabinet front panel for draining the shell freezer bath.
- (17) **Bath Lid (Model 77535 only).** The lid covers and insulates shell freezer bath.
- (18) **Refrigeration Module - Shell Freezer (Model 77535 only).** The system is a mechanical, capillary tube system.

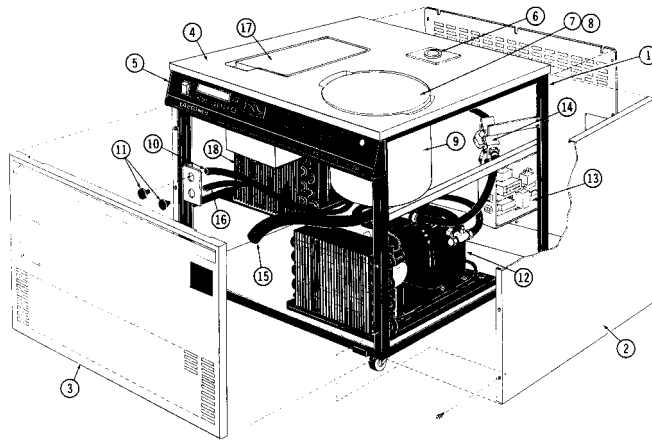


Figure 2

INSTALLATION

Location

The freeze dry unit should be located in an area that provides an unobstructed flow of air around the cabinet. This air cools the refrigeration system. The refrigeration system draws air through the grill on the front panel and exhausts it out through the back of the cabinet. A minimum of 3" must be allowed between the back of the freeze dry unit and adjacent wall surface. Restriction of airflow into the unit during operation could adversely affect performance.

Vacuum Pump Connection

A vacuum pump with a rated capacity of 150 liters per minute is required to operate your freeze dry system properly. The unit is provided with a 3/4" I.D., heavy wall, vacuum hose for connecting the vacuum pump to the condenser chamber on the unit.

Remove the rear panel from the freeze dry unit and place the vacuum pump on the floor of the cabinet next to the refrigeration module. Connect the vacuum pump power cord to the receptacle on the junction box labeled "vacuum pump". Connect the vacuum pump inlet port to the condenser chamber with the vacuum hose and clamp provided. Cut the hose to proper length to allow for gentle bends without kinks.

Utility Connections

Models 77530-00,-03,-10,-13, and models 77535-00,-03,-10,-13 should be plugged into an electrical outlet rated at 115 VAC, 60 Hz, single phase 20 amps.

Models 77530-01, -11 should be plugged into an electrical outlet rated at 230 VAC, 50 Hz, Single Phase, 10 Amps.

Models 77535-01, -11 should be plugged into an electrical outlet rated at 230 VAC, 50 Hz, Single Phase, 12 Amps.



SAFETY PRECAUTIONS

Utilization of acid requires immediate cleaning and neutralization after defrost or physical damage to the condenser chamber will result.

Do not attempt to chip ice off of the collector coil as serious damage to the refrigeration module may result. The release of refrigerant could injure your eyes.

Solvents used in the shell freezer may be flammable. Use extreme caution and keep sources of ignition away from the solvents.

NORMAL OPERATION

Notes

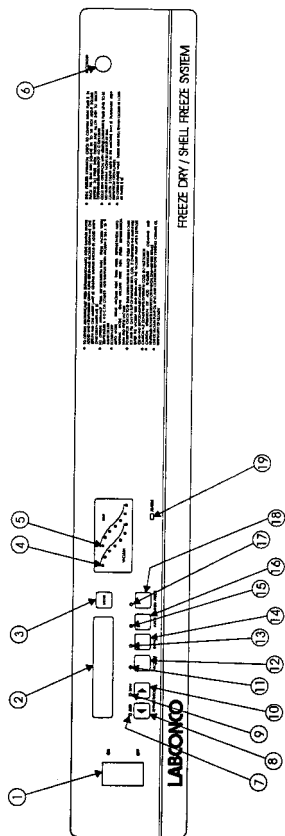
NORMAL OPERATION

Operation Checklist

The following checklist should be followed prior to each use of your freeze dry unit:

- (1) Wipe the interior of the condenser chamber with a soft cloth or paper towel to remove any accumulated moisture.
- (2) Check the condenser chamber drain hose to insure that the hose is free of moisture and that the drain plug is securely installed.
- (3) Using a soft, lint free cloth or paper towel, wipe the condenser 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) Inspect each sample valve on the drying chamber or manifold and check for any visible damage and for improper installation that might cause a vacuum leak. Also check that each sample valve is closed or in the "vent" position.

NORMAL OPERATION



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Figure 3

NORMAL OPERATIONS

Control Panel Identification (See Figure 3)

- (1) **Main Power Switch.** Turns the unit on or off.
- (2) **LCD Display.** Displays system parameters and alarm messages. Parameters displayed are system vacuum (10^{-3} mBar), collector temperature ($^{\circ}\text{C}$), and shell freezer bath temperature ($^{\circ}\text{C}$). Displays type of alarm when an alarm has occurred.
- (3) **Menu Switch.** This switch is used to change the display from system parameters to alarm messages.
- (4) **Vacuum Graph Display.** This display indicates the relative system vacuum level. The highest LED indicates that the vacuum level is above 2000×10^{-3} mBar. The indicators will sequence down when the vacuum level reaches 2000, 1000, 800, 600, 450, 133×10^{-3} mBar. The lower green LED will flash when the system vacuum level is 450 to 133×10^{-3} mBar and illuminates steady below 133×10^{-3} mBar.
- (5) **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.
- (6) **Recorder Jack.** This standard 8 pin DIN connector allows the user to monitor the system parameters with a remotely connected instrument. Signal outputs from this jack are 1.) collector temperature; 2) vacuum level; 3) shell temperature (if this option installed); and 4) RS232 data stream.
- (7) **Auto Mode Annunciator.** When lit, the green LED indicates that the Freeze Dry unit is in the Auto Mode. In this mode the vacuum pump will start when the collector temperature reaches -40°C . If the unit is equipped with the purge option, the vacuum pump will start at the same time the refrigeration starts and the purge valves will be opened when the collector reaches -40°C .
- (8) **Auto Mode Switch.** Used to start or stop the refrigeration and the Auto Mode process.
- (9) **Manual Operation Annunciator.** When lit, the green LED indicates the Freeze Dry unit is being controlled manually by the operator. Each function must be started by the operator.
- (10) **Manual Refrigeration Switch.** Used to start only the refrigeration module.

NORMAL OPERATION

- (11) **Vacuum Annunciator.** This green LED indicates that the vacuum pump receptacle on the junction box has power applied.
- (12) **Vacuum Switch.** Used to start or stop the vacuum pump.
- (13) **Defrost Annunciator.** This green LED indicates that the Defrost Heater is on.
- (14) **Defrost Heater Switch.** Used to turn on or off the Defrost Heater.
- (15) **Purge Valve Annunciator.** This green LED indicates the Purge Valves are closed.
- (16) **Purge Valve Switch.** Used to open or close Purge Valves.
- (17) **Shell Freezer Bath Annunciator.** This green LED indicates the Shell Freezer is operating.
- (18) **Shell Freezer Switch.** Used to start or stop the Shell Freezer.
- (19) **Alarm Annunciator.** This red LED indicates that a system Alarm has occurred. Depress the Menu Switch to display the alarm message on the LCD display.

NORMAL OPERATIONS

Automatic Start-Up

To run the Auto Mode press the panel switch labeled REFRIGERATION AUTO. The green annunciator above the switch will illuminate. This will start the refrigeration compressor. 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 2000×10^{-3} mBar the vacuum display will indicate "HI". At 2000×10^{-3} mBar and below, the display will show the actual vacuum.

If the unit is equipped with the purge valve option, the vacuum pump will start two seconds after the refrigeration compressor starts. The purge valves will be closed when the AUTO switch is pressed. When the collector temperature reaches -40°C the purge valve will be opened.

When the system vacuum is between 450 and 133×10^{-3} mBar, the lower green vacuum graph LED will flash. When the system vacuum level is $<133 \times 10^{-3}$ mBar, the green LED will be lit steadily indicating that samples may be added.

Manual Start-Up

To manually run the freeze dry process press the REFRIGERATION MAN Switch. This will start the refrigeration compressor. The green LED above the switch will illuminate. When the collector temperature reaches the desired temperature the vacuum pump may be started. If the unit is equipped with a purge valve, the vacuum pump may be started when the refrigeration is started. The purge valve must be shut. (The green purge valve annunciator will be lit). When the collector temperature reaches -40°C or the desired temperature, press the PURGE valve switch to open the valve which connects the vacuum system to the vacuum pump.

Alarms & Informational Messages

If any of the following events should occur during a run, the alarm LED will illuminate to notify the user.

1. Power Interruption

If the power to control system is interrupted either by a power failure or by turning the main power switch off during a freeze dry process, the alarm will be set. When power is restored, the freeze dryer will continue to run, and the alarm indicator will flash. The display will continue to show the operating parameters of the system. Press MENU to display the alarm "POWER FAIL". Pressing MENU multiple times will identify other alarms if they had occurred. The alarm indicator can be cancelled by turning the REFRIGERATION off.

NORMAL OPERATION

2. Power Line Voltage Out of Range

If the voltage to the freeze dryer drops or raises beyond a safe level, the alarm indicator will FLASH. Press MENU to display the alarm 'LINE VOLTAGE ERROR'. Pressing MENU multiple times will identify other alarms if they had occurred. This alarm self cancels when proper voltage is restored.

3. Temperature Out of Range

If the temperature of the collector rises above -36°C , the alarm indicator will flash. Press MENU to display the alarm "COLLECTOR TEMP ERROR". Pressing MENU multiple times will identify other alarms if they had occurred. The alarm indicator can be cancelled by turning the REFRIGERATION off.

4. Service Vacuum Pump

The vacuum pump normally plugs into the vacuum pump receptacle in the freeze dryer. When the freeze dryer has accumulated a total of 1000 operating hours, the alarm indicator will flash. Press MENU to display the alarm "CHANGE VACUUM PUMP OIL". Pressing MENU multiple times will identify other alarms if they had occurred. This alarm can be cancelled by pressing MENU until the display says "CHANGE VACUUM PUMP OIL" and then pressing VACUUM button and holding until the message disappears. This will reset the 1000 hour timer. It may be necessary to service the vacuum pump more frequently than every 1000 hours depending on the operation of the freeze dryer. The pump oil should be regularly monitored to verify that it is clean.

Recorder Jack

The system vacuum, collector temperature and shell freezer bath temperature (if so equipped) can be recorded during operation by connecting an appropriate device to the recorder jack on the control panel. The recorder jack is a DIN 8 pin connector. The pin configuration is as follows:

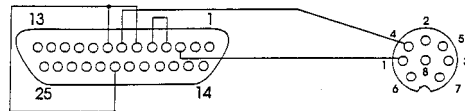
- Pin 1 - RS 232 Transmit Data
- Pin 2 - RS 232 Receive Data
- Pin 3 - Signal Ground for Recorder
- Pin 4 - Analog Ground for RS 232
- Pin 5 - System Vacuum
 - Output: 10×10^{-3} mBar = 0VDC
 - 1024×10^{-3} mBar = 1VDC
- Pin 6 - Collector Temperature
 - Output: -96°C = 0 VDC
 - $+32^{\circ}\text{C}$ = 1 VDC
- Pin 7 - Shell Freezer Temperature
 - Output: -96°C = 0 VDC
 - $+32^{\circ}\text{C}$ = 1 VDC
- Pin 8 - Blank

NORMAL OPERATIONS

Connection diagrams for RS232 interface from Labconco equipment to a computer that supports either a 25 pin D-sub male connector or 9 pin D-sub male connector for serial communication.

Check your computer to see which type of serial port is provided, then wire a connecting cable according to the appropriate diagram below:

1. Computer with a 25 pin male serial connector.



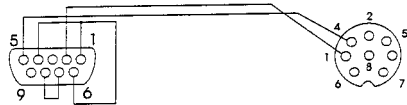
View from back of computer

View from front of Labconco Freeze Dry equipment

- 2 - TX (Transmit Data)
- 3 - RX (Receive Data)
- 4 - RTS (Request to Send)
- 5 - CTS (Clear to Send)
- 6 - DSR (Data Set Ready)
- 7 - GND (Signal Ground)
- 8 - DCD (Data Carrier Detect)
- 20 - DTR (Data Terminal Ready)

- 1 - TXD (Transmit Data)
- 4 - AGND (Analog Ground)

2. Computer with a 9 pin male serial connector



View from back of computer

View from front of Labconco Freeze Dry equipment

- 1 - DCD (Data Carrier Detect)
- 2 - RX (Receive Data)
- 3 - TX (Transmit Data)
- 4 - DTR (Data Terminal Ready)
- 5 - GND (Signal Ground)
- 6 - DSR (Data Set Ready)
- 7 - RTS (Request to Send)
- 8 - CTS (Clear to Send)

- 1 - TXD (Transmit Data)
- 4 - AGND (Analog Ground)

NORMAL OPERATION

The purpose of the RS 232 interface is to send data to a data collection computer to monitor the state of and activity of the freeze dryer.

This data is half duplex data and is only transmitted from the freeze dry unit. The data rate and format are listed below.

1. Data Rate 2400 Baud
2. 8 Bit word length
3. 1 Start bit, 1 Stop bit
4. No parity is transmitted
5. Standard ASCII Character set

The data content of the transmitted message is as follows:

1. The following data will be sent with each field separated by a space character.

Freeze Dry Base Status

BASE:<COLLCTR=41 VAC=0018 SHELL=43 RFG=ON VAC=ON PRG=OFF SHL=ON DFRST=OFF>

Description:

COLLCTR=41 - indicates the temperature of the collector in degrees Celsius.

VAC=0018 - indicates the vacuum level of the collection system is mBAR x 10⁻³.

SHELL=43 - indicates the temperature of the shell freezer if the option is present.

RFG=ON - indicates the state of the refrigeration compressor.

VAC=ON - indicates the state of the vacuum pump.

PRG=OFF - indicates the state of the purge valves if the option is present.

SHL=ON - indicates the state of the Shell Freezer compressor if the option is present.

DFRST=OFF - indicates the state of the defrost heater if the option is present.

If a Stoppering Tray Dryer is used with the Base unit, the status from the Tray Dryer will be issued with Base units status also. See Tray Dryer manual for details on status contents.

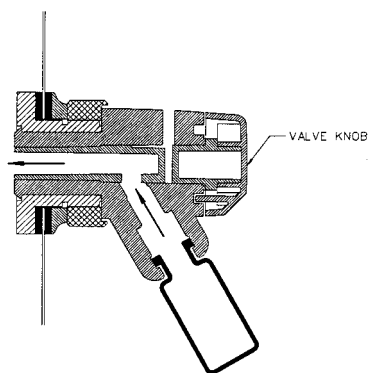
There are several commercially available software packages which can read this RS 232 data and enter the data into a computer program such as a word processor (to create a text file) or spreadsheet (to tabulate and plot the data). Consult your laboratory supply catalog regarding the latest software available.

NORMAL OPERATIONS

Adding Sample

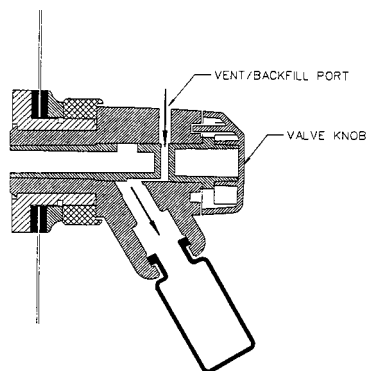
The following procedure should be followed when freeze drying samples with a drying chamber or manifold:

- (1) Pre-freeze samples; shell freezing of samples is recommended. Appropriate containers for freeze drying include ampules, serum bottles, and wide mouth freeze drying flasks. Proper sample container size should always be at least two to three times the sample size (i.e., 150 ml samples should be prepared in 300 ml containers or larger).
- (2) Connect a pre-frozen sample to a valve on the drying chamber or manifold. 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.



NORMAL OPERATION

- (3) Before adding another sample, allow system vacuum to return to 133×10^{-3} 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.
- (4) 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.
- (5) 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, simply connect the gas supply line to the vent port on the valve. The sample container may now be removed. In the vent position the bevel on the knob should point away from the sample port.



- (6) Ampoules 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.

NORMAL OPERATIONS

Shut Down

When a sufficient amount of condensate accumulates on the collector coil, the collector temperature will not remain below -40°C. At this point the unit should be defrosted. First, release system vacuum by turning the plastic knob on a valve to the "vacuum"/open position or by pulling the condenser chamber drain hose plug. Now turn the vacuum and refrigeration switches on the control panel to "off". When operating in the automatic start-up mode, the vacuum automatically shuts off when the refrigeration switch is turned to "off".

Defrosting

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

- (1) Pull the condenser chamber drain hose out from the front panel of the unit and remove the drain plug. Place the drain hose in a suitable container to collect the condensate that will be defrosted off the collector coil.
- (2) Press the DEFROST switch on the control panel. The green annunciator above that switch will illuminate. Allow unit to operate in this condition until all condensate is defrosted from the collector coil. Dispose of the liquid appropriately.
- (3) Flush the condenser chamber with water and wipe chamber dry.
- (4) If rapid defrost is desired, pour warm water over the collector coil. **Do not fill the condensing chamber above the collector coil as water will enter the vacuum stand pipe and drain into the vacuum pump.**
- (5) Press the DEFROST switch. The green annunciator will be off. Reinstall the drain hose plug, and slide drain hose back into cabinet through the front panel.

Shell Freezer

Follow the steps below each time you use the shell freezer to obtain optimum performance:

- (1) Check that the solvent bath drain plug is securely installed in the drain hose.
- (2) Remove bath compartment cover and add solvent to bath compartment. Commonly used solvents are methanol or ethanol. Recommended solvent depth is 1/4" to 1/2" above the top of the rollers (approximately 2 liters).

CAUTION: If flammable solvents are used in this machine, be sure to keep away from open flames.

NORMAL OPERATION

Shell Freezer (Con't)

- (3) Press the SHELL FREEZE switch on the control panel to "on" and the shell freezer refrigeration module and bath rollers will start. A green annunciator above the shell freezer switch will light to indicate operation. The display will show the shell freezer bath temperature. Above 32°C the display will indicate "HI".
- (4) Fill a freeze dry container with a sample and stopper container top. Lay the container on the rollers in a horizontal position. Replace bath compartment cover during shell freezing.
- (5) When sample is completely frozen in the container, remove container from bath compartment and freeze dry or place in suitable storage freezer for future freeze drying.
- (6) Press the SHELL FREEZE switch to "off" and replace bath compartment cover.

ROUTINE MAINTENANCE SCHEDULE

Under normal operation, your freeze dry unit will require little routine maintenance. The following maintenance schedule is recommended:

Weekly

- (1) Check the condition and level of the vacuum pump oil. If the oil level is low, then add oil. If the oil contains excessive amounts of moisture, detected by a cloudiness in the oil, it will be necessary to change the oil. For further information regarding procedures for changing the vacuum pump oil, refer to the vacuum pump manufacturer's instructions. To expel small amounts of water that may have accumulated in the pump oil, periodically operate the vacuum against a dry, tight system or close the purge valve. The gas ballast must be open.

Monthly

- (1) The rubber components on the freeze dry unit may eventually deteriorate and require replacement. The effective life of rubber parts will depend upon both their usage and the surrounding environment. Check all rubber hoses and gaskets and replace any that show signs of hardening, permanent set, or deterioration.
- (2) Using a soft cloth, sponge or chamois and a mild, non-abrasive soap or detergent, clean the acrylic condenser chamber lid.
- (3) Using a soft cloth, sponge, or chamois and a mild, non-abrasive soap or detergent, clean the top, side, and front panels of the unit. Liquid spray cleaners and polishes may be used on the side and front panels. Do not use solvents to remove stains from the panels as they may damage the finish.
- (4) All weekly activities.

Semi-Annually

- (1) Using a vacuum cleaner with brush attachment, clean the refrigeration module condenser to ensure proper air flow for peak performance. More frequent cleaning may be required if the freeze dry unit is operated in a dusty environment.
- (2) All monthly activities.

VACUUM LEAK DETECTION

The freeze dry unit should achieve a vacuum of 133×10^{-3} mBar within 10 minutes and should achieve an ultimate vacuum of 33×10^{-3} mBar within 18 hours. This extended time interval may be necessary to allow all the components in the system to out-gas. After components have outgassed, the pull down time will decrease. To achieve sufficient vacuum, all joints and connections must be tight, the vacuum pump must be operating properly, and the collector temperature must be -40°C or lower. If your freeze dry unit does not obtain a satisfactory vacuum, the following procedure should be used to locate and correct any vacuum problems.

- (1) Check each sample valve on the drying chamber or manifold and look for visible damage and for proper installation. To isolate a suspect valve, remove the valve and insert a rubber plug in its place. If the valve proves to be leaking, the plug can be left in place so the drying chamber/manifold can be used until a replacement valve can be obtained.
- (2) Check vacuum pump oil sight glass. Replace the oil if it is dirty or cloudy; add oil to the pump if the level is low. Close the pump gas ballast valve. Refer to the vacuum pump manufacturer's instructions for further information.
- (3) Check the condenser chamber lid gasket for indentions, cracks, or tears. Also clean the gasket using a soft, lint free cloth or paper towel.
- (4) Check all vacuum hoses and lines for cracks.
- (5) Check all vacuum connections and joints and tighten any loose hose clamps or fittings.

If any repairs are required on your freeze dry system, contact your local laboratory supply dealer. If satisfaction is not obtained through the dealer service network, please call Labconco at (800) 821-5525 or (816) 333-8811. Repairs should only be undertaken by a competent technician or through an authorized Labconco service agency.

REFRIGERATION MODULE

Under a no-load condition, your freeze dry unit can achieve a collector temperature of -40°C or lower, depending on ambient temperature and humidity. If the collector temperature does not reach -40°C within 20 minutes, then the refrigeration module is not functioning properly.

Your shell freezer can lower the solvent bath temperature to -40°C , when the solvent depth is $1/2$ " above the rollers and the ambient temperature is $21^{\circ}\text{C}/70^{\circ}\text{F}$. If the bath temperature does not reach -40°C within 120 minutes, then the refrigeration module is not functioning properly.

If any repairs are required on the refrigeration module, contact your local laboratory supply dealer. If satisfaction is not obtained through the dealer service network, please call Labconco at (800) 821-5525 or (816) 333-8811. Repairs should only be undertaken by a competent refrigeration technician or through an authorized Labconco service agency.

FREEZE DRY UNIT SERVICE

Front Panel

- (1) Using a screwdriver loosen the fasteners in the upper corners of the front panel.
- (2) Tilt the front panel forward and lift it off the support/catches on the bottom of the cabinet.

Side Panels

- (1) Remove the front panel as described above.
- (2) While supporting the side panel, loosen and remove the six screws securing the side panel to the cabinet.

Control Panel Removal

- (1) Unplug the unit or disconnect it from power.
- (2) Remove the front and side panels as described above.
- (3) Loosen and remove the top two screws at each end of the control panel which secures it to the cabinet.
- (4) Loosen the bottom screw at each end of the control panel and tilt the panel down.
- (5) Disconnect the power harnesses from the junction box and the vacuum sensor harness and the temperature sensor harness from the back of control panel.
- (6) Remove the screw at each end of the control panel and lift control panel away from unit.

Junction Box Removal

- (1) Unplug the unit or disconnect it from power.
- (2) Remove the right hand side panel as described above.
- (3) Remove the rear panel.
- (4) Disconnect all connectors from the junction box.
- (5) Loosen nuts and remove the chassis grounding wires.
- (6) Remove the screws securing the junction box to the back corner post of the cabinet and the R.H. support. Remove the junction box from the unit.

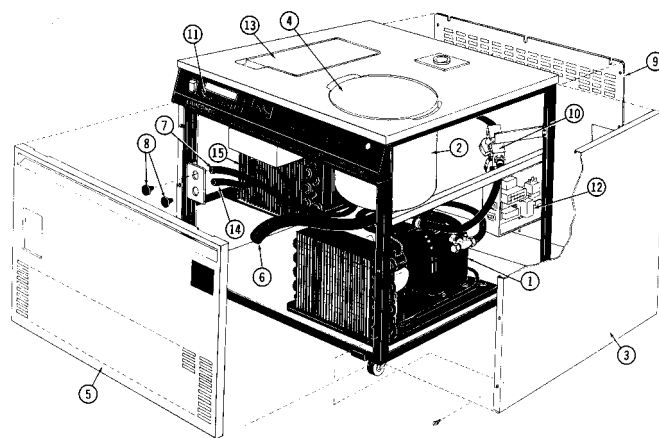
REPLACEMENT PARTS

ITEM	QTY	PART NO.	DESCRIPTION	MODEL	
				77530-xx	77535-xx
1	1	79455-00	Condensing Module	77530-00 & -10	77535-00 & -10
1A	1	79455-01	Condensing Module	77530-01 & -11	77535-01 & -11
1B	1	79455-02	Condensing Module	77530-03 & -13	77535-03 & -13
2	1	77783	Condenser Chamber	77530-00 & -10	77535-00 & -10
2A	1	77783	Condenser Chamber	77530-01 & -11	77535-01 & -11
2B	1	78018	Condenser Chamber	77530-03 & -13	77535-03 & -13
3	2	77804-10	Side Panel	All	All
4	1	76899	Condenser Lid	All	All
4A	1	76908	Gasket	All	All
5	1	75166	Front Panel	All	All
6	1	76460	Vacuum Hose	All	All
7	1	76459	Drain Hose - Chamber	All	All
8	1-2	77280	Drain Plug	All	All
8A	1-2	16436	O Ring	All	All
9	1	75123	Rear Panel	All	All
10A	1	78421	Valve Assy	77530-10	77535-10
10B	1	78422	Valve Assy	77530-11	77535-11
10C	1	78421	Valve Assy	77530-13	77535-13
11	1	13023	Switch	All	All
12	1	75134	Electrical Enclosure	77530-00 & 03	
		75134-01	Electrical Enclosure	77530-01	
		75159-01	Electrical Enclosure	77530-10 & 13	
		77159-02	Electrical Enclosure	77530-11	
		77159-03	Electrical Enclosure		77535-00 & 03
		77159-04	Electrical Enclosure		77535-01
		77159-05	Electrical Enclosure		77535-10 & 13
		77159-06	Electrical Enclosure		77535-11

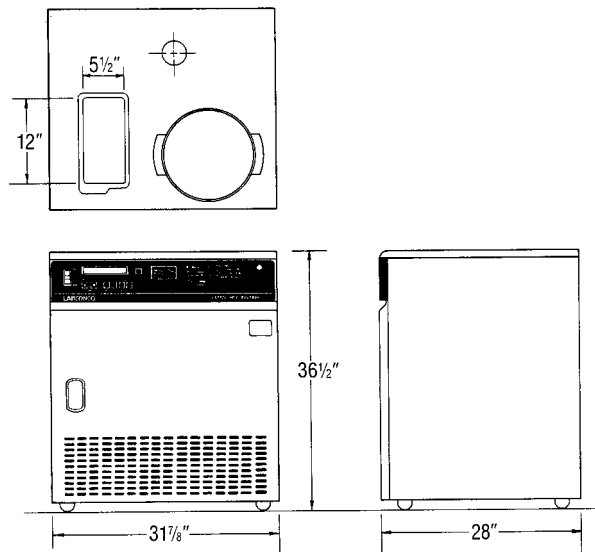
REPLACEMENT PARTS

ITEM	QTY	PART NO.	DESCRIPTION	MODEL	
				77530-xx	77535-xx
13	1	77368	Lid (Shell Freezer)	NR	All
14	1	76241	Drain Hose (Shell Freezer)	NR	All
15	1	77342-03	Condensing Module	NR	77535-00 & -10
15A		77342-04	Condensing Module	NR	77535-01 & -11
15B		77342-03	Condensing Module	NR	77535-03 & -13

REPLACEMENT PARTS



FREEZE DRY UNIT DIMENSIONS



ELECTRICAL DATA TABLE

MODEL NUMBER	ACCESSORIES	ELECTRICAL REQUIREMENTS
7753000	None	115 VAC - 60 Hz 1 Phase - 17 Amp
7753001	None	230 VAC - 50 Hz 1 Phase - 10 Amp
7753003	None	115 VAC - 60 Hz 1 Phase - 17Amp
7753010	Purge Valve	115 VAC - 60 Hz 1 Phase - 18 Amp
7753011	Purge Valve	230 VAC - 50 Hz 1 Phase - 9 Amp
7753013	Purge Valve	115 VAC - 60 Hz 1 Phase - 18 Amp
7753500	Shell Freezer	115 VAC - 60 Hz 1 Phase - 20 Amp
7753501	Shell Freezer	230 VAC - 50 Hz 1 Phase - 11 Amp
7753503	Shell Freezer	115 VAC - 60 Hz 1 Phase - 20 Amp
7753510	Shell Freezer & Purge Valve	115 VAC - 60 Hz 1 Phase - 20 Amp
7753511	Shell Freezer & Purge Valve	230 VAC - 50 Hz 1 Phase- 12 Amp
7753513	Shell Freezer & Purge Valve	115 VAC - 60 Hz 1 Phase, - 20 Amp

All electrical specifications include vacuum pump electrical requirements. The vacuum pump maximum power requirements should be 115V, 7.5A or 230V, 4.5A.

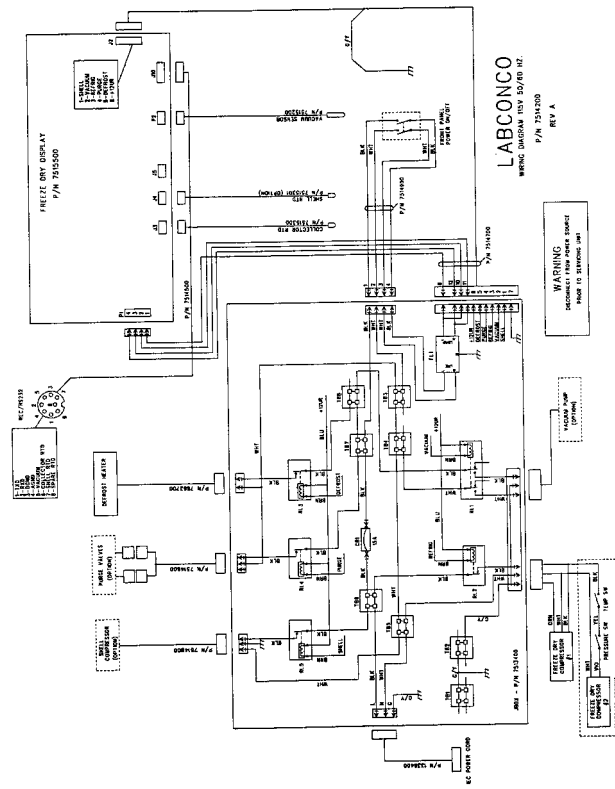
ENVIRONMENTAL CONDITIONS

The Freeze Dryer is designed to operate safely under the following conditions:

- Indoor use
- Altitude up to 2000M (6562 Ft.)
- Temperature 5°C to 40°C (41°F to 104°F) (Refrigeration will meet specs as stated on page 27)
- Maximum relative humidity 80% for temperatures up to 31°C (88°F) decreasing linearly to 50% relative humidity at 40°C (104°F)
- Mains supply voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage
- Transient over voltages according to installation category II (over voltage categories per IEC 1010)
- Pollution degrees 2 in accordance with IEC 464

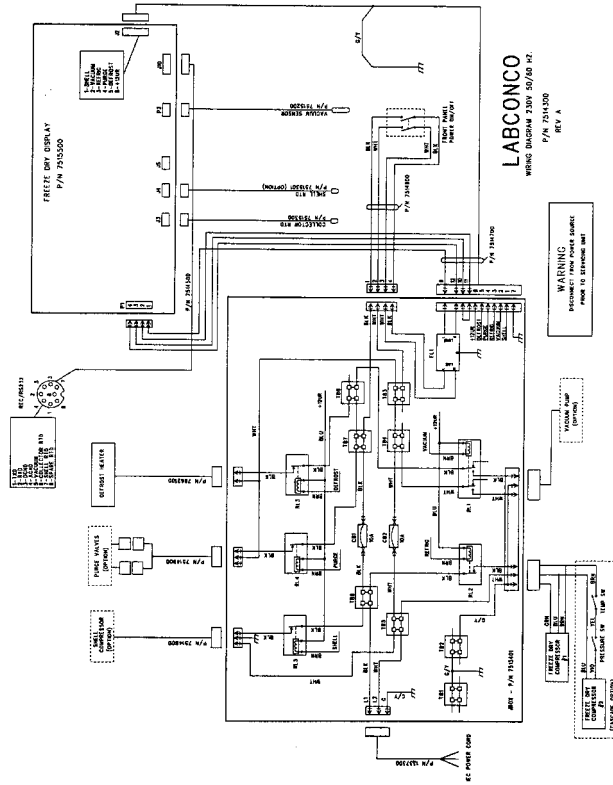
WIRING DIAGRAMS

Models 77530-00, -03, -10, -13, Models 77535-00, -03, -10, -13
(115 VAC, 60 Hz, 1 Phase)



WIRING DIAGRAMS

Model 77530-01, -11 and 77535-01, -11
(230 VAC, 50 Hz, 1 Phase)



TROUBLESHOOTING

PROBLEM	CAUSES	CORRECTIVE ACTION
Unit will not operate No vacuum	Unit not connected to electrical power	Connect unit to proper electrical power
	Pump not on	Turn on pump
	Pump not connected to unit	Connect pump to unit
	Drain hose plug not installed	Install drain hose plug
	Sample valve open	Close sample valve
	Purge valve closed	Open purge valve
	Break or opening in vacuum lines or connections	Locate and repair
Poor Vacuum (greater than 500 x 10⁻³mBar)	Vacuum pump oil level low	Add vacuum pump oil
	Excessive moisture in vacuum pump oil	Replace vacuum pump oil
	Vacuum pump gas ballast valve open	Close vacuum pump gas ballast valve
	Leaks in vacuum lines or connections	Locate and repair
	Foreign material on lid gasket	Clean gasket and lid
	Damaged sample valve	Locate and replace

If you are having problems with the operation of your freeze dry unit, call Labconco at (800) 821-5525 or (816) 333-8811.

WARRANTY

We are committed to providing our customers with quality equipment and service after the sale. Part of this objective involves keeping you informed of changes and new product additions. We therefore request that you take a moment to fill out the product registration card so we may know your location as well as some of the reasons that prompted you to purchase our products.

Labconco Corporation warrants products of its manufacture for one year, from receipt of the equipment by the purchaser, against defects in materials and workmanship. This limited warranty covers parts and labor but not transportation and insurance charges. In the event of a warranty claim contact the dealer who sold you the product. If the cause is determined to be a manufacturing fault, the dealer or Labconco Corporation will repair or replace all defective parts to restore the unit to operation. Under no circumstance shall Labconco Corporation be liable for indirect, consequential or special damages of any kind. This statement of warranty may be altered by a specific published amendment. No individual has authorization to alter the provisions of this warranty policy or its amendments. Lamps and expendable items such as filters are not covered by this warranty. Damage due to corrosion or accidental breakage are also not covered.

WARNING: The disposal and/or emission of substances used in connection with this equipment may be governed by various federal, state or local regulations. All users of this equipment are urged to become familiar with any regulations that apply in the user's area concerning the dumping of waste materials in or upon water, land or air and to comply with such regulations.

SHIPPING CLAIMS

If a shipment is received in visibly damaged condition, be certain to make a notation on the delivering carrier's receipt and have his agent confirm the damage on your receipt. Otherwise, the damage claim may be refused.

If concealed damage or pilferage is discovered, notify the carrier immediately and retain the entire shipment intact for inspection. Interstate Commerce Commission rules require that the claim be filed with the carrier within 15 days after delivery.

NOTE: Do not return goods. Goods returned without prior authorization will not be accepted. Labconco Corporation and its dealers are not responsible for shipping damage. Claims must be filed directly with the freight carrier by the recipient. If authorization has been received to return this product, by accepting this approval, the user assumes all responsibility and liability for biological and chemical decontamination and cleansing. Labconco reserves the right to refuse delivery of any products which do not appear to have been properly cleaned and/or decontaminated prior to return.

ACCESSORIES

Accessory Part #	Description
14677	Vacuum Pump Two stage direct drive pump, 195 liters/minute. 115 VAC, 50/60 Hz single phase, 7.2 amps.
77394-01	Vacuum Pump Two stage direct drive pump, 195 liters/minute. 230 VAC, 50/60 Hz, single phase, 4.0 amps.
14721	Vacuum Pump Two stage direct drive pump, 117 liters/minute. 115 VAC, 50/60 Hz, single phase, 4.6 amps.
77394	Vacuum Pump Two stage direct drive pump, 117 liters/minute. 230 VAC, 50/60 Hz, single phase, 2.4 amps.
79480	Stoppering Tray Dryer (115 V, 60 Hz) Three shelves, 600 square inches of area, provides temperature control and stoppering under vacuum.
79480-01	Stoppering Tray Dryer (220 V, 50 Hz) Three shelves, 600 square inches of area, provides temperature control and stoppering under vacuum.
14722	Pump Inlet Filter Disposable filter that prevents oil back streaming and protects vacuum pump from submicron particles.
14723	Pump Exhaust Filter Disposable filter that removes visible oil mist from vacuum pump exhaust.
77720	Soda Acid Trap Secondary trap that prevents migration of corrosive chemicals into vacuum pump.
77721	Replacement Soda Salt Media For Soda Acid Trap
77725	Charcoal Solvent Trap Secondary trap that prevents migration of organic solvents into vacuum pump.

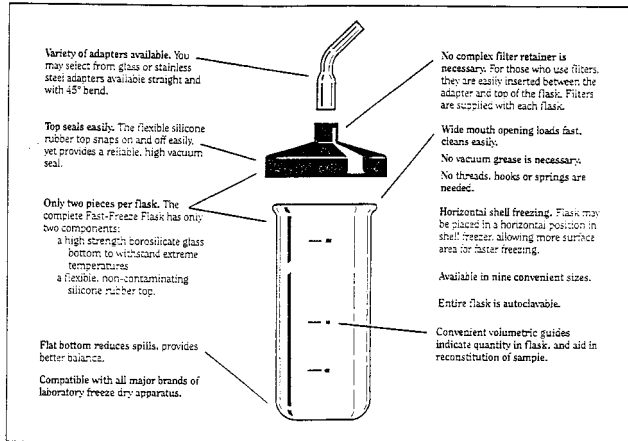
ACCESSORIES

77726	Replacement Activated Charcoal Media For Charcoal Solvent Trap
75380	Secondary Vacuum Trap 9-3/4" high x 7-7/8" diameter, 304 stainless steel with 3/4" vacuum connections.
75382	Secondary Vacuum Trap 9-3/4" high x 7-7/8" diameter, 304 stainless steel with 1/2" vacuum connections.
75384	Secondary Vacuum Trap 7-7/8" high x 6-5/8" diameter, 304 stainless steel with 1/2" vacuum connections
75096	Sample Valve Kit Includes Neoprene valve body, knob and installation parts.
75228	12 Port Chamber 9-3/4" High x 7-7/8" Diameter, 304 stainless steel with 12 freeze dry valves.
75229	16 Port Chamber 13" High x 13" Diameter, 304 stainless steel with 16 freeze dry valves.
78670	Clear Drying Chamber 13" High x 13" Diameter clear acrylic chamber with clear acrylic end caps
75210	Heated Drying Chamber 10-1/2" High x 9" Diameter type 304 stainless steel. The 3 shelf product heaters heat to 43°C (110°F). 115V
75210-01	Heated Drying Chamber 10-1/2" High x 9" Diameter type 304 stainless steel. The 3 shelf product heaters heat to 43°C (110°F) 230V
75092-00	Product Heater For use in chamber 75228. Provides 3 heated shelves operating at 43°C (110°F). 115V

ACCESSORIES

75093-00	Product Heater For use in chamber 75229. Provides 3 heated shelves operating at 43°C (110°), 115V
75093-01	Product Heater For use in chamber 75229. Provides 3 heated shelves operating at 43° (110°) 230V
75094-00	Product Heater with Variable Heat For use in chamber 75229. Provides variable heat up to 43°C (110°) 115V
75094-01	Product Heater with Variable Heat For use in chamber 75229. Provides variable heat up to 43°C (110°) 230V
75224	12 Port Manifold 10" High x 29" Wide x 11-3/8" Deep. Type 304 stainless steel manifold with 12 freeze dry valves and support shelf.
75225	24 Port Manifold 10" High x 29" Wide x 19-5/8" deep. Type 304 stainless steel manifold with 24 freeze dry valves and 2 support shelves.
75223	24 Port Manifold 10" High x 27-1/2" Wide x 8-5/8" Deep. Type 304 stainless steel manifold with 24 freeze dry valves.
75226	6 Port Manifold for use with Stoppering Tray Dryer Mounts between the Stoppering Tray Dryer and the base unit and provides 6 freeze dry valves.
75340	Cable to connect the RS 232 output from the Freeze Dryer (or Freeze Dryer/Tray Dryer combination) to an IBM compatible computer with a 9-pin serial data port.
75341	Cable to connect the RS 232 output from the Freeze Dryer (or Freeze Dryer/Tray Dryer combination) to an IBM compatible computer with a 25 pin serial data port.

Fast-Freeze® Flasks simplify freeze drying.



How to select Fast Freeze Flasks for your Freeze Dry System.

Select the Fast Freeze Flasks based on your sample sizes. Flasks should be filled to no more than one-third of their volume so that maximum surface area is achieved and efficient lyophilization is assured. A complete Fast Freeze Flask includes a rubber top, glass bottom and a supply of filter paper and retainer rings. Tops, bottoms and filter paper are available separately as replacement components.

Flask Size	Complete Flask	Flask Bottom	Flask Top	Flask Top/Adapter Diameter	Dimensions: Flask Bottom H x I.D.
40 ml	75400	75420	75440	1/8"	76 mm x 34 mm
80 ml	75402	75422	75440	1/4"	115 mm x 34 mm
120 ml	75403	75423	75442	3/8"	68 mm x 59.2 mm
150 ml	75404	75424	75442	1/2"	85 mm x 59.2 mm
300 ml	75406	75426	75442	3/4"	145 mm x 59.2 mm
600 ml	75408	75428	75444	1"	138 mm x 90.2 mm
900 ml	75409	75429	75444	1 1/4"	190 mm x 90.2 mm
1200 ml	75410	75430	75444	1 1/2"	210 mm x 90.2 mm
2000 ml	75412	75432	75444	2"	380 mm x 90.2 mm

Accessories

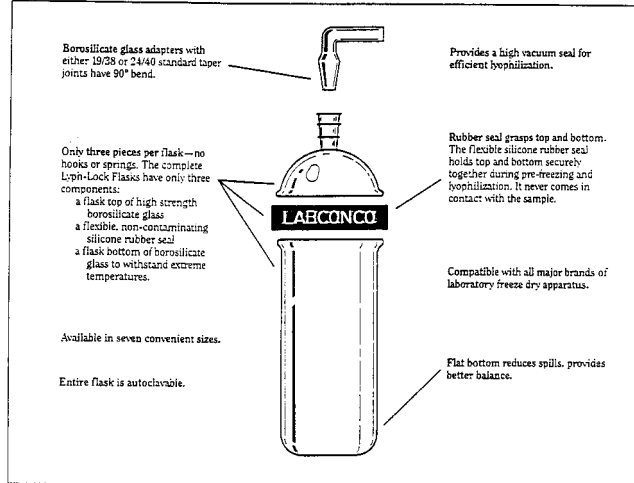
Add the Adapters for connecting the Fast-Freeze Flasks to the valve ports on your drying chamber or manifold. Choose borosilicate glass or stainless steel adapters in 1/2" and 3/4" diameters.

Diameter	Straight Adapter	45° Bend Adapter
Borosilicate Glass		
1/2" flask top to 1/2" valve	75450	75456
3/4" flask top to 3/4" valve	75452	75458
1/2" flask top to 3/4" valve	75454	75460
3/4" flask top to 1/2" valve	75454	75460
Stainless Steel		
1/2" flask top to 1/2" valve	75470	75474
3/4" flask top to 3/4" valve	75472	75476

75448-10 FILTER PAPER
Package of 1000.

ACCESSORIES

Lyph-Lock® Flasks have easy-to-use features.



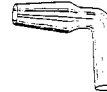
How to select Lyph-Lock Flasks for your Freeze Dry System.

Select the Lyph-Lock Flasks based on your sample sizes. Flasks should be filled to no more than one-third of their volume so that maximum surface area is achieved and efficient lyophilization is assured. A complete Lyph-Lock Flask includes a glass top and bottom and a rubber ring seal. Tops, bottoms and seals are available separately as replacement components.

Flask Size	Complete 19/38 STJ	Complete 24/40 STJ	Flask Top 19/38	Flask Top 24/40	Lyph-Lock Seal	Flask Bottom	Dimensions/Flask Bottom H x I.D.
25 ml	75500	75540	75520	75560	75590	75570	37 mm x 34 mm
50 ml	75502	75542	75522	75562	75592	75572	67 mm x 34 mm
100 ml	75504	75544	75522	75562	75592	75574	90 mm x 59.2 mm
250 ml	75506	75546	75522	75562	75592	75576	110 mm x 59.2 mm
500 ml	75508	75548	75524	75564	75594	75578	103 mm x 90.2 mm
750 ml	75509	75549	75524	75564	75594	75579	145 mm x 90.2 mm
1000 ml	75510	75550	75524	75564	75594	75580	187 mm x 90.2 mm

Accessories

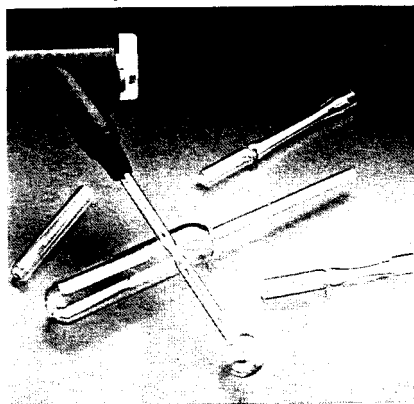
Add the Adapters for connecting the Lyph-Lock Flasks to the valve ports on your drying chamber or manifold.



90° Bend Adapter	Description
75680	Connects 19/38 STJ Flask Top to 1/2" valve
75682	Connects 19/35 STJ Flask Top to 3/4" valve
75684	Connects 24/40 STJ Flask Top to 1/2" valve
75686	Connects 24/40 STJ Flask Top to 3/4" valve

ACCESSORIES

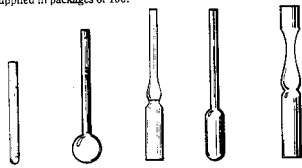
Ampules



Labconco Ampules are fabricated of highest quality borosilicate glass for strength and durability. They are available in five different configurations to provide the ideal ampule for your specific lyophilization requirements, from tray drying to flame sealing applications.

Ampules

Ampules are supplied in packages of 100.



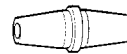
Size	Straight	Bulb-Type	Pre-Scored Flat Bottom	Round Bottom	Stopping
1 ml	75727-10	75700-10	75706-10		
2 ml			75708-10		75723-10
4 ml	75728-10				
5 ml		75702-10	75710-10		
10 ml			75712-10	75716-10	
25 ml				75718-10	
50 ml					75720-10

Accessories



Oxygen/Natural Gas Sealing Torch

75785 Torch specifically designed for flame sealing freeze dry ampules. Seals all types of heat-resistant glass. Shipping weight 3 lbs.



Adapter Valve

75934-01 Adapter connects ampules to 1/2" valves. Ten per package.



Stopper

75725-10 Stopper for stoppering ampules. 75723-10 100 per package.

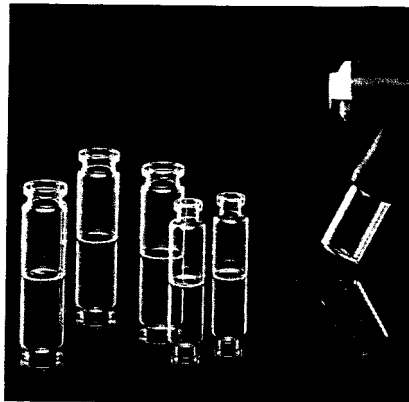


Trident Adapter

77627 3-way adapter permits attachment of 3 ampules to a single 1/2" valve. Ampules are attached using 1/4" surgical tubing (not provided). Cavity in adapter body for cotton filter media helps prevent contamination between samples.

ACCESSORIES

Serum Bottles and Vials



Perfect for long term storage of freeze dried samples, Labconco Serum Bottles and Threaded Vials are specifically designed for lyophilization applications. Their uniform thin wall construction insures even freezing and drying. Bottles and vials are ideal containers for use in the Stoppering Tray Dryer. Serum bottles also connect to valves on drying chambers and manifolds.

Serum Bottles

Serum Bottles, Stoppers and Seals are supplied in packages of 100.

Size	20 mm Corkage	13 mm Corkage	Split Stoppers	Aluminum Seals	Sieve-Type Stoppers
2 ml	75750-10	75760-10	75770-10		
3 ml	75752-10	75760-10	75770-10		
5 ml	75730-10		75762-10	75771-10	75775-10
10 ml	75732-10		75762-10	75771-10	75775-10
20 ml	75734-10		75762-10	75771-10	75775-10
30 ml	75736-10		75762-10	75771-10	75775-10
50 ml	75738-10		75762-10	75771-10	75775-10
100 ml	75740-10		75762-10	75771-10	75775-10
125 ml	75742-10		75762-10	75771-10	75775-10

Accessories



Seal Crimper

Seal crimper secures tear-away aluminum seals.

75780 Seal crimper for 13 mm corkage. Shipping weight 3 lbs.
75781 Seal crimper for 20 mm corkage. Shipping weight 3 lbs.



Vacuum Stoppering Adapter

75930 Adapter connects to valves for manual stoppering of 20 mm corkage serum bottles under original vacuum. Shipping weight 1 lb.

Threaded Vials

Stoppers and Threaded Vials with Screw Caps are supplied in packages of 200.



Size	Vials with Screw Caps	Stoppers
5 ml	77623	77622
10 ml	77626	77622



CONTACTING LABCONCO

If you have any questions that are not addressed in this manual, or if you need technical assistance, please contact Labconco's Sales Information Department at either (800) 821-5525, and Service Information at 800-522-7658 or (816) 333-8811, between the hours of 7:00 a.m. and 6:00 p.m. Central Standard Time.

Labconco's mailing address is:

Labconco Corporation
8811 Prospect Avenue
Kansas City, Missouri 64132

Visit Labconco through the Internet at:

<http://www.labconco.com>

or

[email:labconco@labconco.com](mailto:labconco@labconco.com)

Declaration of Conformity

Application Council Directive(s): 73/23/EEC, 89/336/EEC

Standard(s) to which conformity is declared: EN60950, EN55022, EN50082-1

Manufacturer's Name: Labconco Corporation

Manufacturer's Address: 8811 Prospect Avenue
Kansas City, MO 64132 USA

Importer's Name: See Shipping/Customs Documents*

Importer's Address: See Shipping/Customs Documents for your equipment

Type of Equipment: Laboratory Equipment - Freeze Dryer

Model No.: •775 followed by two digit number based on model size; followed by another two digit number based on options.
•77400 followed by two digit number based on options.
•79340 followed by two digit number based on options.

Serial No.: Various - See Individual Declaration

Year of Manufacture: 1995 and Subsequent

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Place: See individual Declaration of Conformity which will be signed by the importer for your country.
(Signature)

Date: _____
(Full Name)

(Position)