

RCD JULY '89

INSTRUCTION MANUAL
BENCH TOP SHELL FREEZER
MODEL #77570, 77570-01
AND
OPTIONAL SHELL FREEZER
FOR CONSOLE MODELS

SERIAL #

193118

SERVICE ETC:

(800) 821-5525

Ext. (719) BRIAN YOUNG

10/18/89

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INTRODUCTION TO SHELL FREEZING

The Freeze Drying 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 used extensively in the area of pharmaceuticals (e.g., antibiotics) and 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 (1) the absorption of heat by the frozen sample in order to vaporize the water, (2) the use of a vacuum pump

to enhance the removal of water vapor from the surface of the sample, (3) the transfer and deposit of the water vapor onto a condenser, (4) the removal of heat, due to ice formation, from the condenser by means of a refrigeration compressor or a dry ice solvent bath. In essence the freeze drying process depends upon a balance between the heat absorbed by the sample to vaporize the water and the heat removed from the condenser to convert the vapor into ice.

Freeze Drying Rates

The efficiency of the freeze drying process is dependent upon (1) the surface area and thickness of the sample, (2) the condenser temperature and vacuum obtained, and (3) the melting temperature and solute concentration of the sample. These factors will be helpful in the efficient utilization of your freeze dryer. A listing of selected materials and their approximate drying times are shown below 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.

Surface Area and Thickness Of the Sample

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 lyophilization. This is based upon 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, if the sample is lyophilized the water vapor must travel through the layer of dried material. The thicker the sample, the greater

the chance that the dried layer can 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 only contains a few milliliters. However, for larger volumes, the samples should be shell frozen to maximize the the surface area and minimize the thickness of the sample. Volume of the freeze dry flask should be two times the volume of the sample.

Introduction

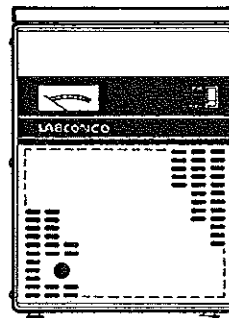
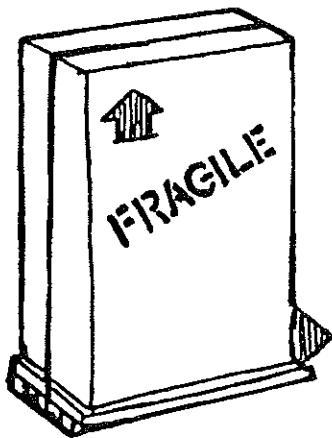
The Labconco Shell Freezer is designed to pre-freeze samples for laboratory lyophilization procedures. The design of the unit is compact and features a large shell freezing capacity for the counter space required. The unit has been designed for easy and convenient servicing by featuring excellent access to all components. The refrigeration

system and pan assembly have been designed into a single module, which is easily removed for servicing. Strict attention to detail on refrigeration processing procedures assures minimum down time and with proper maintenance, this unit will provide many years of trouble-free operation.

Installation

Your laboratory shell freezer has been shipped to you in one carton (optional equipment has been packaged separately).

Be sure to inspect the shell freezer thoroughly prior to installation. Report any damage that may have occurred in transit directly to the carrier.



Installation Factors

Once you have completed the unpacking of your Labconco Shell Freezer, check for any internal freight damage that may have occurred during transit. Once this is completed, you should also check the refrigeration components prior to installation and operation.

Check the refrigeration components as follows:

1. Inspect all refrigeration components for visible damage and check the condenser fan to insure unobstructed operation. Observe pre-rotation on the fan blade when the refrigeration side is switched on.

2. Locate the shell freezer in an area that provides an unobstructed flow of air around the cabinet. This air acts as cooling air to the refrigeration system. The refrigeration system draws the air through the grille on the front panel and exhausts it out the back. A minimum of -3" must be allowed between the cabinet grille openings on your benchtop unit and any adjacent wall surface. Restriction of airflow into these openings while the unit is in operation could adversely affect performance.

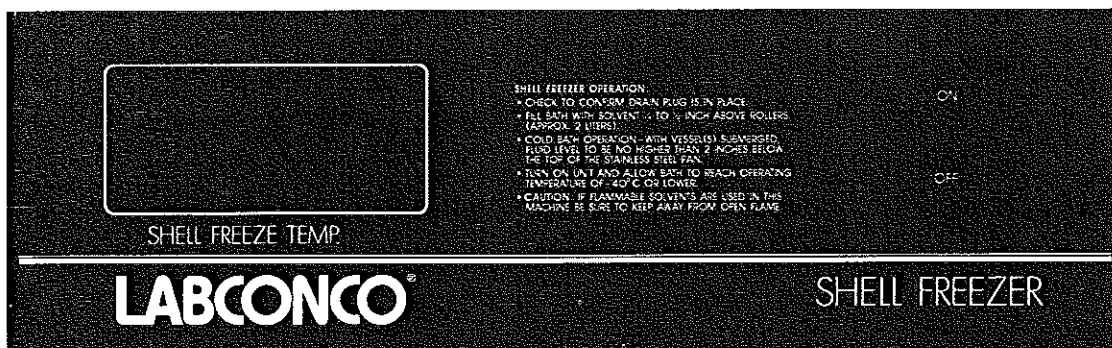
WARNING: Disconnect the shell freezer from the main power supply connection before inspection and maintenance procedures are performed on the unit.

Normal Operation

Once you have gone through the initial installation and check list for your shell freezer and have ascertained that it is in proper working condition, you are ready to proceed with the actual operation of the equipment.

The operating instructions for the unit are printed on the control panel.

Follow the steps as listed on the control panel each time you use the unit for optimum performance.



1. Check that shell freezer bath solvent drain plug on the front grille is securely in place.
2. Add solvent to bath compartment. commonly used solvents are methanol, ethanol, acetone, or alcohol. Recommended solvent depth is ¼ ½ inch above top of rollers (approximately 2 liters).
3. Turn on refrigeration and roller switch to cool bath. Bath temperature should reach -40°C or lower within 90 minutes, depending on depth of solvent.
4. Shell freezing is the process of distributing the frozen sample in a thin shell over the internal surface of the sample container. Shell freezing is obtained by rotating or swirling the liquid sample while the container is immersed in a cold bath. The Labconco Shell Freezer will freeze samples to -40°C or lower. The unit has two chain-driven rollers for flask rotation to facilitate shell freezing.
5. Labconco Flasks can be shell frozen in a horizontal position. Lay the flask on the rollers after placing a stopper in the flask top to prevent solvent contamination.
6. Place cover over bath during shell freezing or when not in use.
7. For cold bath operation, additional solvent may be added to submerge small flasks. Do not fill pan more than 2 inches below the top of the stainless steel pan with vessels submerged. allow additional time for larger volumes of solvent to pull down to -40°C.

Routine Maintenance

Cabinet Maintenance

1. To clean the shell freezer bath compartment, turn off the refrigeration and rollers switch. Pull the drain plug out of the control panel and extend drain hose out the front of the cabinet. Place the drain hose in a bucket or other container. Pull the drain plug out of the end of the hose and drain the solvent into the container. Wash the pan, rollers and tube with a non-corrosive cleaner and wipe dry with a soft cloth.
2. All rubber parts on your shell freezer will eventually deteriorate and will require replacement. The effective life of rubber parts will depend upon both their usage and the surrounding environment. It is recommended that all rubber hoses and gaskets be checked frequently and replaced when signs of hardness, permanent set, or deterioration occur.
3. To clean the exterior of your shell freezer cabinet, wash with a non-abrasive soap or detergent and water. Liquid spray cleaners and polishes may be used. Do not use solvents to remove the stains from the cabinet finish as the finish may be damaged.

Refrigeration System Maintenance/ Non-Routine Service Access

WARNING: Disconnect the benchtop shell freezer from its power supply prior to performing any maintenance work.

REFRIGERATION CONDENSER CLEANING— BENCH TOP SHELL FREEZER

Periodic maintenance is required to maintain the performance of your refrigeration system, to reduce the likelihood of failures and increase the life of the unit. The refrigeration system condenser should be cleaned once every 6 months. This aids in maintaining the proper air flow which is essential to long life and peak performance of the bench top shell freezer. Access to the condenser requires removal of the four top screws and the loosening of the lower screws which hold the front control panel in place. This allows the control panel to pivot downward and allows for cleaning of the condenser face. Cleaning on the condenser face is best accomplished through

the use of a vacuum cleaner with brush attachment. More frequent cleaning is required should your unit be operated in a dusty environment.

CAUTION: The following service should only be performed by qualified service personnel.

With the control panel in the pivoted downward position, you now have access to repair and/or replace the unit switch and/or gauge.

To clean the refrigeration condenser face of the optional shell freezer on console models, remove the front panel to expose the shell freezer condenser. Vacuum with a brush attachment as above.

Refrigeration System Leak Detection

Should repair of any refrigeration component be required, contact a laboratory supply dealer immediately. If satisfaction is not obtained through the dealer service network, please contact Labconco Corp. directly. Repairs should only be undertaken by a competent refrigeration technician or through an authorized Labconco service agency.

Normal performance under no load conditions, the bath temperature will reach -40°C or lower. If the temperature is not -40°C within 90 minutes, the system is not functioning properly. All performance ratings represented in this manual are given for ambient temperature of $24^{\circ}\text{C}/75^{\circ}\text{F}$ at 115 Volts and 60 HZ electrical service.

Work Surface Removal Bench-Top Model

CAUTION: The following service should only be performed by qualified service personnel. Non-routine service to the refrigeration system within the cabinet can be accomplished by removing the unit work surface.

Work Surface Removal

1. Remove cabinet back by removing the 8 screws which hold it to the cabinet structure.
2. Pivot the control panel down by removing the four top screws and loosening the lower screws on the panel itself. The panel will then pivot downward to allow access to the condenser assembly.
3. Remove the four 1/4" diameter hex bolts located inside the front portion of the cabinet which are screwed into the underside of the work surface.
4. Remove the four 1/4" diameter hex bolts located inside the rear portion of the cabinet which are screwed into the underside of the work surface. The bolts at the rear sides have a nut spacing the work surface and cabinet structure which must be held while turning the bolt from the inside.
5. Lift the work surface free from the cabinet assembly.

Refrigeration System - Pan Assembly Module Removal - Bench Top Model

CAUTION: The following service should only be performed by qualified service personnel.

The refrigeration system and condenser chamber can be removed as a separate module from the cabinet when required.

1. Remove the work surface as described on page 5 of this manual.
2. Disconnect the thermocouple leads from the temperature gauge.

3. Remove the drain plug from the drain hose and feed the hose through the control panel.
4. Remove the 5/16" diameter nuts and bolts which secures the refrigeration system base to the cabinet.
5. Lift the refrigeration system pan assembly module out of the cabinet. Slight springing of the cabinet may be required to remove this assembly.
6. After service has been performed on this component, reinstall using the instructions required for its removal.

Refrigeration System - Pan Assembly Removal - Optional Console Unit

CAUTION: The following service should only be performed by qualified service personnel.

The refrigeration system and pan assembly can be removed as a separate module from the console model cabinet when required.

1. Remove the front panel and L.H. side panel from the cabinet.
2. Disconnect the thermocouple leads from the temperature gauge.
3. Remove the drain plug from the drain hose and feed the hose through the drain hose panel.
4. Unplug the refrigeration system power cord from the main wire harness junction box.
5. Remove the four 1/4" hex bolts which secure the shell freezer pan to the underside of the work surface.
6. Remove the bolts which secure the refrigeration base to the cabinet structure.
7. Lift the refrigeration system pan assembly module out of the cabinet.
8. Service should be performed on this component and reinstalled using the instructions required for its removal.

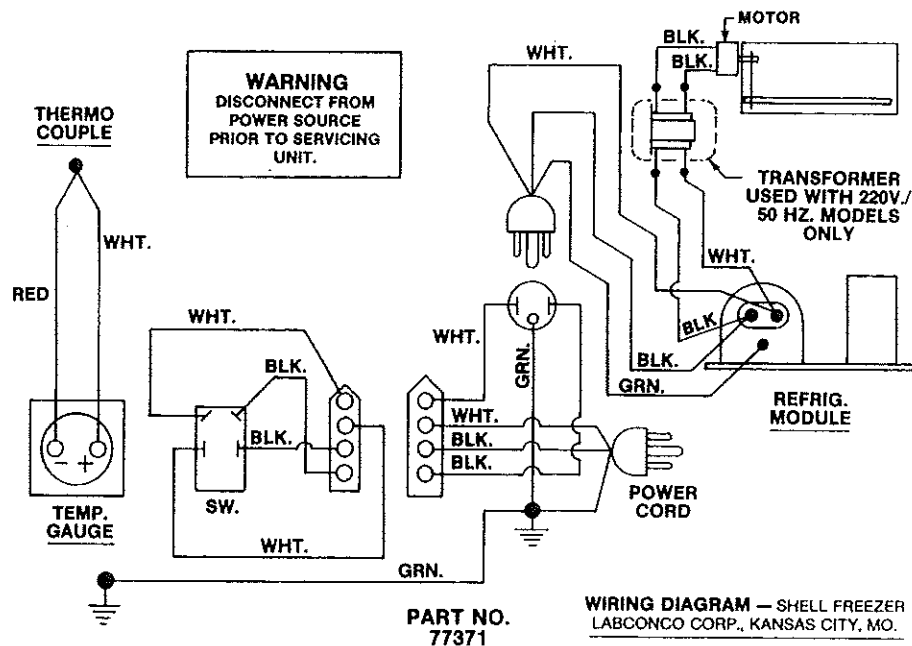
Instrumentation

The instrumentation on your shell freezer consists of a thermocouple temperature indicator for the bath temperature. Repair and maintenance suggestions on this indicator follows.

1. The thermocouple is iron constantan and is located in the bath compartment. The gauge is a dual-scale ($^{\circ}\text{F}$ and $^{\circ}\text{C}$) indicating meter. Erratic temperature indication, high temperature indication, or fluctuation of the indicating needle is possibly due to a loose connection in the thermocouple circuit.

CAUTION: Prior to checking loose connections on your thermocouple gauge, disconnect the main power to the shell freezer. Check to see that the lead connections on the back of the meter are clean and tight. Also check to see if the thermocouple is making positive contact on the refrigeration coil. Failure of the meter to show any change in temperature is an indication of a damaged meter. Repair of a damaged meter is not feasible and the meter must be replaced. continuous indication of a temperature at or near room temperature is an indication of either an open or short circuit in the thermocouple wire.

WIRING DIAGRAM



REPLACEMENT PARTS

P/N 77570 Bench Top Shell Freezer, 115 V., 60 Hz.

P/N 77570-01 Bench Top Shell Freezer 220 V., 50 Hz.

Optional Shell Freezer as used on

Console Models (P/N 77535, 77535-01, 77545, 77545-01,
77555, and 77555-01)

MDL. No. 77570-01
MDL. No. 77535-01
MDL. No. 77545-01
MDL. No. 77555-01

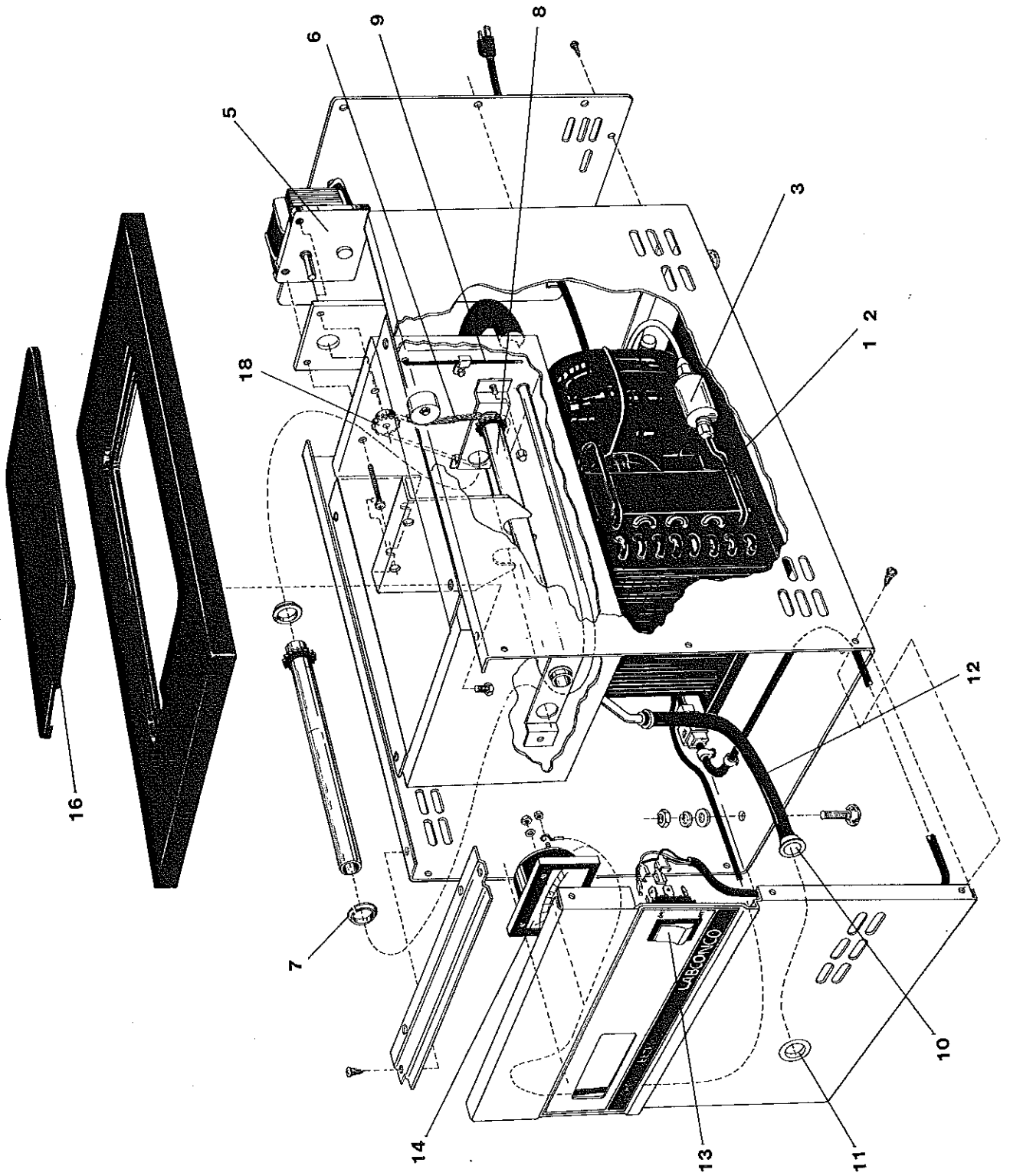
MDL. No. 77570
MDL. No. 77535
MDL. No. 77545
MDL. No. 77555

Description

Item
No.

1.	Refrigeration Module Assy.	77342	77342-01
2.	Condensing Unit	77343	77344
3.	Dryer	14895	14895
4.	Instruction Manual	77374	77374
5.	Drive Motor	12077	12077
6.	Drive Chain	18570 (1.25 ft.)	18570 (1.25 ft.)
7.	Bearing - Roller	18613	18613
8.	Roller with Sprocket	77349	77349
9.	Thermocouple Wire	19518 (6.25 ft.)	19518 (6.25 ft.)
10.	Drain Plug	77280	77280
11.	Drain Plug - O' Ring	16436	16436
12.	Drain Hose	76241	76241
13.	Switch	13257	13257
14.	Temperature Gauge	19509	19509
15.	Refrigerant R13B1	76222-01 (1 lb.)	76222-01 (1 lb.)
16.	Lid	77368	77368
17.	Cam-Chain	77346	77346
18.	Drive Sprocket	76293	76293

LABELED PARTS DIAGRAM



SHELL FREEZER SPECIFICATIONS

Cabinet: Epoxy Coated Steel

Work Surface: Chemical Resistant
 $\frac{3}{4}$ " Phenolic

Bath Compartment:

All Stainless Steel

12" Long, 5 $\frac{1}{2}$ " wide, 6 $\frac{1}{2}$ " deep

Capacity: 1 1200 ML. Flask

1 900 ML. Flask

1 600 ML. Flask

1 300 ML. Flask

2 150 ML. Flask

2 120 ML. Flask

2 80 ML. Flask

2 40 ML. Flask

Electrical Data: 115 V./60 Hz., 3.4A.
 22 Starting A.

240-220 V./50 Hz., 1.5A.
 11 Starting A.

