

CENTRIVAP™

CONCENTRATOR

78100-00 (115V)

78100-01 (230V)

COLD TRAP

78110-00 (115V)

78110-01 (230V)

INSTRUCTION MANUAL

Product designs are subject to change without notice

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79549

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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:

Concentrator

Part Number	Description
78100-00 or 78100-01	CentriVap Benchtop Concentrator (115 V/60 Hz) CentriVap Benchtop Concentrator (230 V/ 50 Hz)
78264	Instruction Manual

Cold Trap

Part Number	Description
78110-00 or 78110-01	CentriVap Cold Trap (115 V/60 Hz) CentriVap Cold Trap (230 V/50 Hz)
78264	Instruction Manual

INTRODUCTION

General Description

Concentrator

The CentriVap Concentrator, when combined with the CentriVap Cold Trap, uses centrifugal force with vacuum to rapidly evaporate and condense solvents from biological or analytical samples. Centrifugation eliminates bumping and foaming as vacuum is applied and also concentrates the solute in the bottom of the vial. This allows recovery of solutes from sample volumes as small as a few microliters. The unit is equipped with a 300 watt heater to speed evaporation by warming the chamber during processing to 40°C. A timed outlet for the vacuum pump connection delays the start of the pump for 5 minutes when heat is selected. This delay allows heat to be conducted to the samples more efficiently than when the chamber is under vacuum. A safety switch prevents the unit from starting when the lid is in the open position and a latch prevents the lid from being opened while the rotor is turning. The unit also has a wide gasket which provides positive sealing between the acrylic top and the raised portion of the chamber. This gasket is easily removed for replacement. The compact, low profile design allows the concentrator to be placed on a bench top or other laboratory work surface. Available rotors utilize a quick-locking system. Shown below is a CentriVap Concentrator.

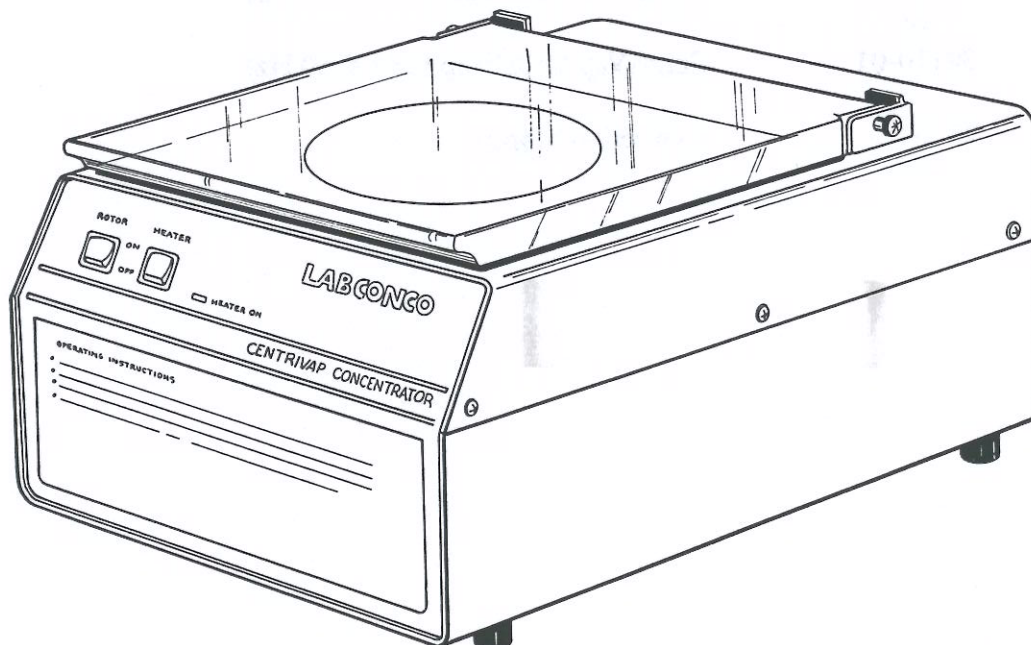


Figure 1

R 13B1
"

AT AMBIENT 75°F
" " 75°F

3-4 INCHES VACUUM
160 PSIG
STANDBY
SUCTION
PRESSURE

INTRODUCTION

General Description

Cold Trap

As the companion to the Concentrator, the CentriVap Cold Trap protects the vacuum pump by trapping moisture, vapors and corrosive fumes as they evaporate from the samples. The high speed condensing unit and low temperature refrigerant reduce the temperature of the Cold Trap to -60°C in 30 minutes. The stainless steel trap is used for aqueous and organic applications. For corrosive applications, the optional glass trap insert should be used. Shown below is a CentriVap Cold Trap.

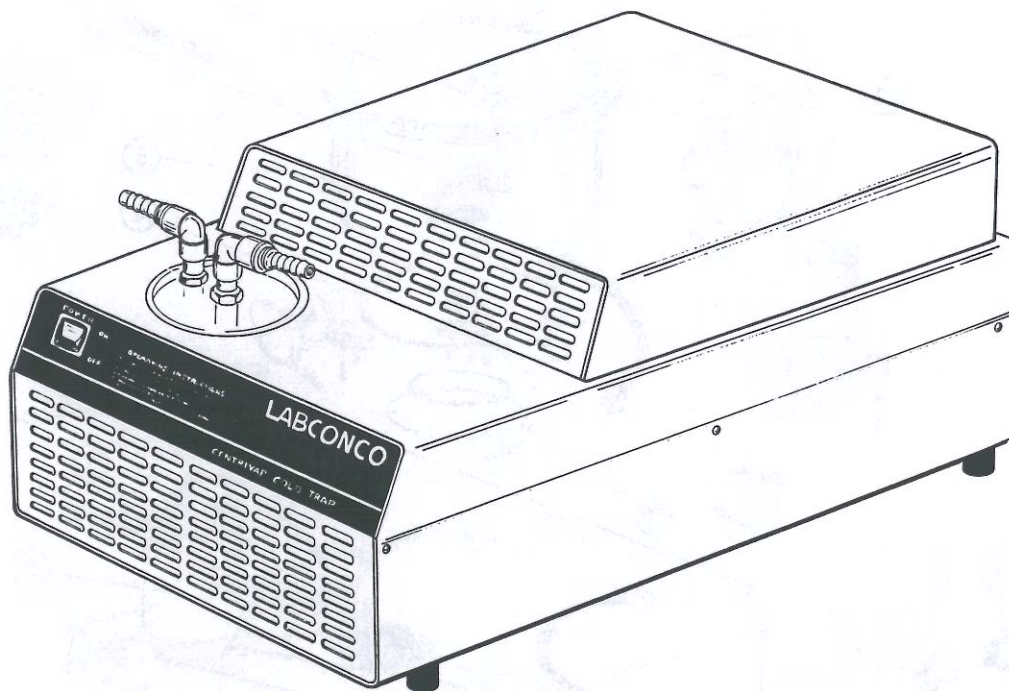


Figure 2

INTRODUCTION

Component Identification - Concentrator

*Lid assembly special#
5383200*

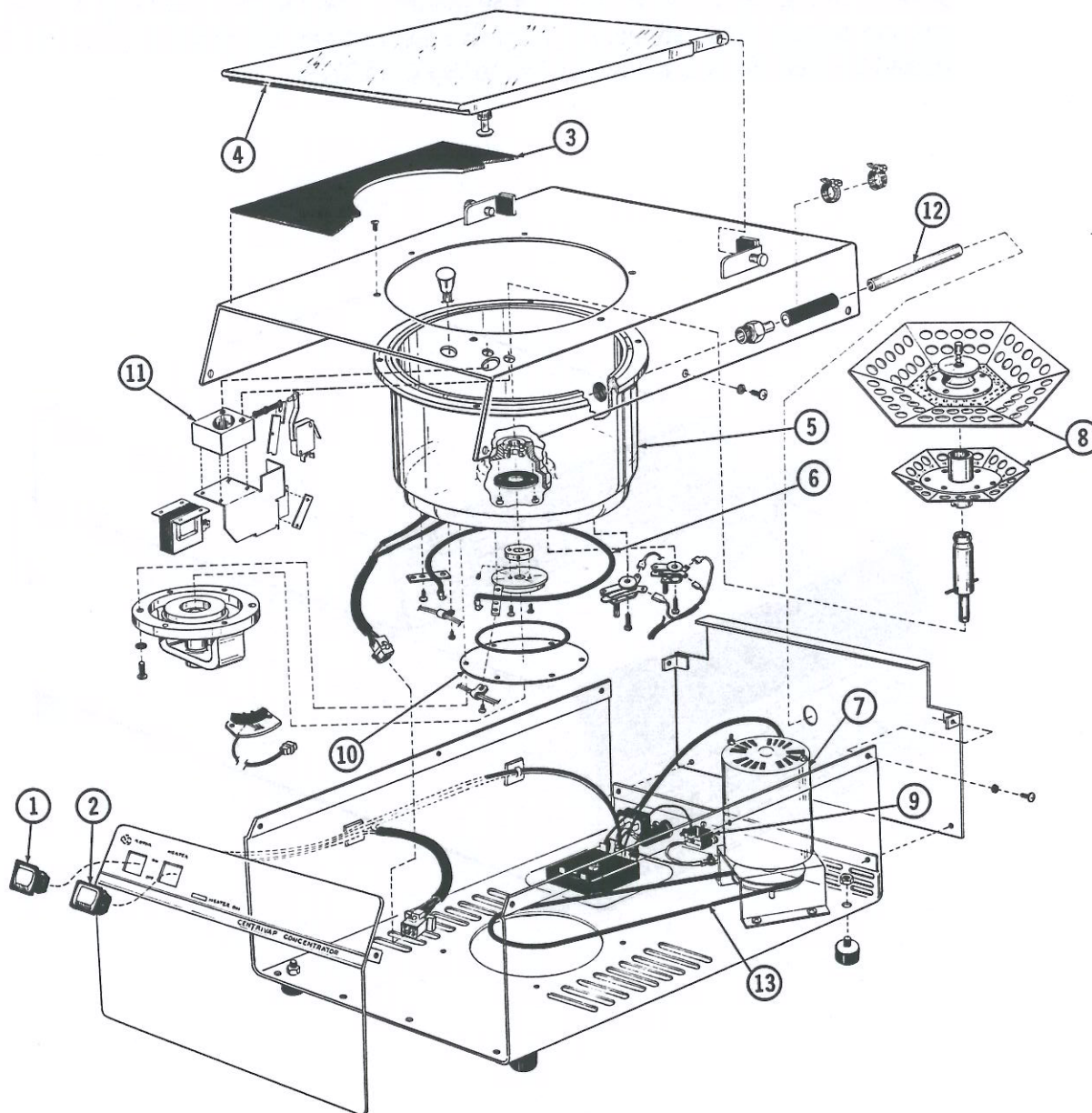


Figure 3

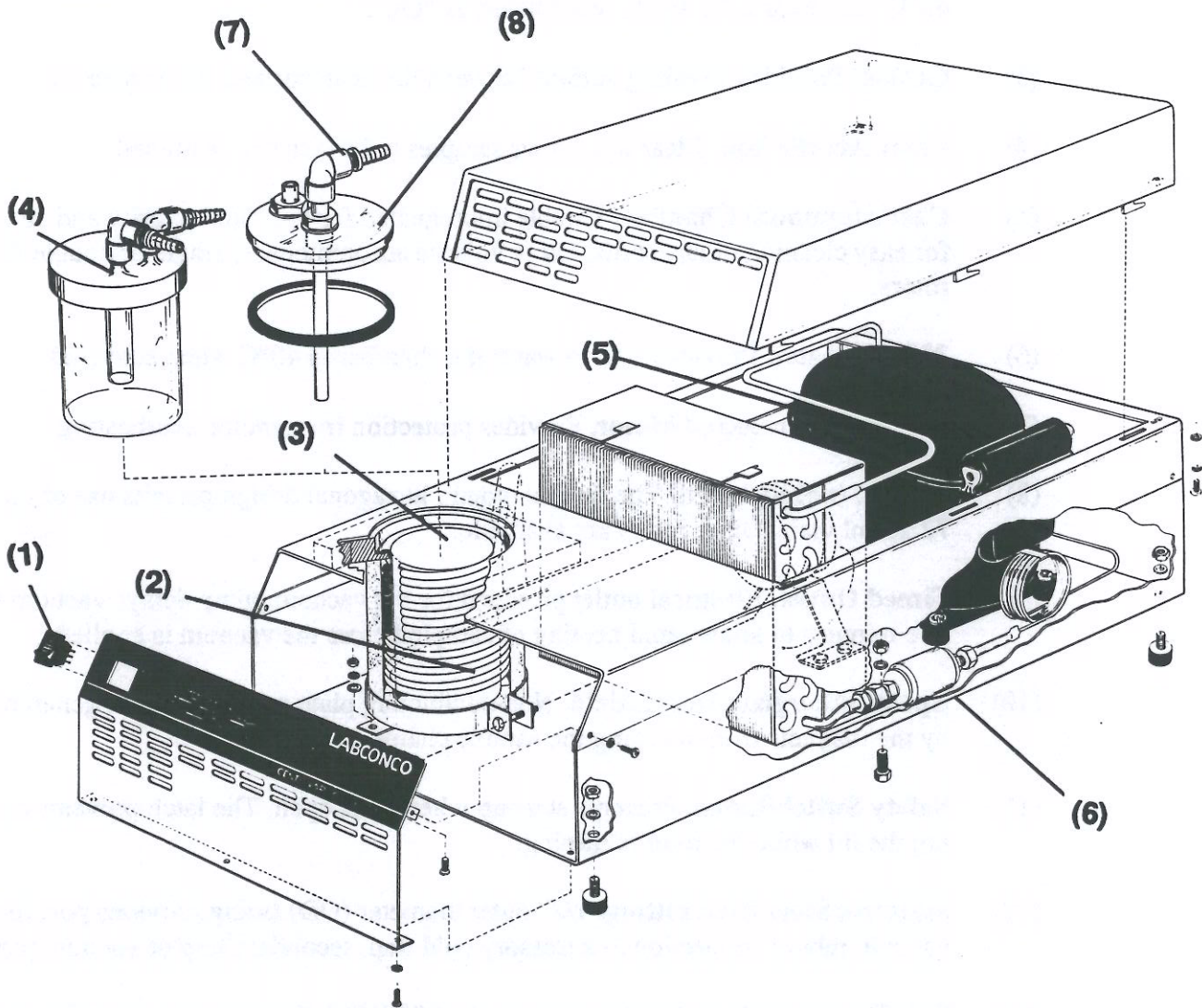
Component Identification

Concentrator

- (1) **Rotor Switch.** In the "On" position, the rotor turns at speeds up to 1800 RPM.
- (2) **Heater Switch.** Activates the 300 W heater to control chamber temperature at 40°C. Indicator lamp lights when heater is "On".
- (3) **Gasket.** Provides a sealing surface between the chamber and the acrylic top.
- (4) **Clear Acrylic Top.** Clear top allows samples to be visually examined.
- (5) **Cast Aluminum Chamber.** Double impregnated for vacuum integrity and coated for easy cleaning of any spills. Large volume accommodates single or double deck rotors.
- (6) **300 W Heater.** Provides heat to warm the chamber to 40°C when activated.
- (7) **Thermally Protected Motor.** Provides protection from motor overheating.
- (8) **Rotors. (not included)** The double mount, hexagonal design permits use of up to 72 1.5ml vials. Other rotors are available.
- (9) **Timed Outlet.** Electrical outlet provided for the vacuum pump delays vacuum for five minutes to allow rapid heating of sample before the vacuum is applied.
- (10) **Epoxy-Fiberglass Heat Shield.** Non-conducting plate minimizes heat generated by the magnets from reaching the sample chamber.
- (11) **Safety Switch/Latch.** Prevents start-up when lid is open. The latch prevents opening the lid while the rotor is turning.
- (12) **Stainless Steel Hose Fitting.** 1/2" outer diameter (OD) fitting provides port for vacuum tubing connection to accessory cold trap, secondary trap or vacuum pump.
- (13) **Belt-Driven System.** Rotates rotor up to 1800 RPM. Ensures smooth, quiet operation and consistent, even braking action.

INTRODUCTION

Component Identification - Cold Trap



78140 starter kit.

Figure 4

C. Tubing Installation

The back of the Concentrator is equipped with a 1/2" O.D. (12.7mm) connector, to connect 1/2" ID (12.7mm) vacuum tubing to the CentriVap Cold Trap. The Cold Trap is equipped with polypropylene quick disconnects and the corresponding mate can be inserted into the 1/2" ID vacuum hose for easy connection and release.

To connect the vacuum hose to the traps, insert the barbed (gray) end of the fitting into the hose. (Clamp hoses to barbed fittings).

To empty the optional glass trap after a run, press in the dark gray collar connected to the glass while slowly pulling the fitting from the glass. No force is required since the quick disconnects are designed for smooth, easy operation.

NOTE:

- (1) To reconnect the fitting to the glass trap, slowly and gently push the connector on the fitting until it is seated (pushing too hard could break the glass fittings).
- (2) If a vacuum gauge is used, check fittings for proper installation by checking for leaks greater than 200 micron. A vacuum of 200 microns or better may not be achieved when evaporating samples.

INSTALLATION

D. Rotor Installation

- (1) Inspect the concentrator and clean any dust from the chamber or other components.
- (2) Unpack and clean the rotor(s). If the dual rotors are purchased, install the smaller rotor and rotate until the slots on the bottom of the rotor engage the pin in the shaft.
- (3) Place the top rotor over the shaft. Gently push down on the rotor button once to engage and hold the rotor (Figure 6).

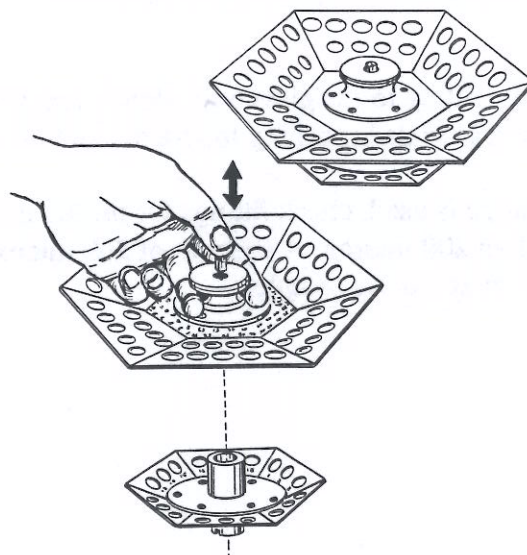


Figure 6

E. Concentrator Installation

- (1) Plug the Concentrator into an appropriate electrical outlet.
- (2) Install a vacuum hose to the 1/2" OD (12.7mm) tube extended out the back of the unit and tightly clamp in place. Connect the other end of the vacuum tubing to the bottom fitting of the vacuum bleed valve (optional accessory). Refer to the Tubing Installation section on Page 11.
- (3) Plug vacuum pump into the timed outlet on the rear of the Concentrator and turn the vacuum pump switch "On" if it is so equipped.

F. Cold Trap Installation

- (1) If your application involves corrosive chemicals proceed to Step 5. If your application does not involve corrosive chemicals, connect a vacuum hose from the vacuum bleed valve to the quick disconnect fitting in the center of the acrylic cover.
- (2) Connect a vacuum hose to the other fitting on the acrylic cover and connect its other end to the vacuum pump.
- (3) Place the acrylic cover along with its gasket over the stainless steel trap.
- (4) Plug the Cold Trap into an appropriate electrical outlet.
- (5) If using corrosive chemicals it is recommended that the optional glass trap insert is used.
- (6) Remove the 2 barb fittings and the 90° elbows from the acrylic lid assembly. This is done by pressing in the gray ring next to the white elbow and simultaneously pulling on the elbow.
- (7) Install a vacuum hose from the vacuum bleed valve to one of the barb fittings that was removed in Step 6.
- (8) Install a vacuum hose from the vacuum pump to the other barb fitting.
- (9) Measure approximately 200ml ethanol (ethyl alcohol) as a heat transfer medium into the stainless trap.
- (10) Immerse the glass trap into the ethanol filled trap. The glass trap should be at least 2/3 immersed in the ethanol. If not, add ethanol until this levels reached.
- (11) Fit the glass trap insulation tightly around the top opening of the stainless steel trap to hold the glass securely in place.
- (12) Push the 90° elbow attached to the hose coming from the vacuum bleed valve carefully onto the center tube of the glass trap.
- (13) Push the 90° elbow attached to the hose coming from the vacuum pump carefully onto the other tube of the glass trap.
- (14) Plug the Cold Trap into an appropriate electrical outlet.

INSTALLATION

G. Secondary Trap (Optional Accessory)

Labconco offers a polypropylene Secondary Trap as well as disposable inserts for trapping excess organic, acid, water or radioactive vapors.

- (1) Check to make sure you have both the empty trap cannister and the appropriate insert for your applications.
- (2) Unscrew and remove the top of the trap cannister.
- (3) Press the neck of the insert into the top of the trap until both O-rings are inserted.
- (4) Thread the bottom portion of the trap to the top.
- (5) Connect the hose from the Cold Trap to one side of the Secondary Trap, making sure that the arrow is pointing toward the Cold Trap.
- (6) Connect the other end of the hose to the vacuum pump.
- (7) Check to make sure tubings are tightly fitted to prevent leakage.

H. Vacuum Gauge (Optional Accessory)

- (1) Insert tee in the line between the concentrator and the vacuum bleed valve.
- (2) Attach the hose to the third port and insert the gauge pick-up sensor into the hose.
- (3) Plug vacuum gauge into the appropriate outlet.

Concentrator And Cold Trap

- (1) Re-check to see that all fittings are securely sealed before operating the CentriVap Concentrator.
- (2) Make sure the optional manual valve, which is a part of the Starter Kit, is positioned for vacuum operation.
- (3) Turn the CentriVap Cold Trap "On" for at least 30 minutes to cool down to operating temperatures. Do not turn on the vacuum or rotor at this time.
- (4) If heat is desired, turn the heater switch to the "On" position before turning on the rotor switch. If heat is chosen, the vacuum pump will be delayed for 5 minutes to provide adequate heating to the samples prior to evacuation. If heat is not chosen, the vacuum pump will start when the rotor switch is turned on. If the delayed outlet is not used, allow the rotor to accelerate fully before turning on your vacuum pump. **CAUTION: Do not operate Concentrator with an unbalanced rotor.**
- (5) At the end of a run, vent the Concentrator by turning on the optional manual valve before turning the rotor "Off." **CAUTION: Do not lift Concentrator cover until rotor stops completely.**

APPLICATIONS

A. Hazardous Materials

Hazardous Solvents/Ammonium Hydroxide. Most of these will condense into the Cold Trap. Install a secondary trap with the insert for organic solvents (P/N 78152) to capture any vapors and protect the pump.

Hazardous Solutes. These stay completely in the centrifuge tubes. Handle these tubes with care.

B. Radioactive Substances

When evaporating radioactive substances, install an activated carbon insert (P/N 78150) in the secondary trap and use in conjunction with the Cold Trap. The carbon insert is intended to protect the vacuum pump from traces of radioactive materials that may have passed through the Cold Trap. It does not meet NRC filter design recommendations. After operating, properly dispose of the insert as a radioactive waste.

C. Volatile Organics

Organic solvents, such as acetone and chloroform, are very volatile. The Cold Trap operating at -60°C might not be sufficient to collect 100 percent of the vapor; therefore, use of a diaphragm pump which will produce 29" Hg vacuum to evaporate these solvents is required.

CAUTION: When corrosive or volatile organics are used, a secondary trap must be placed between the diaphragm vacuum pump and Cold Trap to protect the pump.

D. Corrosive Solvents

As a precaution, install an acid insert (P/N 78148) in the secondary trap (P/N 78152) to minimize any acid vapors from entering the pump.

E. Pump Exhaust Filter

Install a pump exhaust filter (P/N 14722) on the pump to eliminate any mists. This installs on pumps P/N 14721, 14677, 77394 and 77394-01.

F. Clean Room Applications

To ensure all exhaust from the pump is eliminated from the room, attach tubing to the oil mist eliminator and route to a vented hood.

G. Routine Aqueous Applications

Install a secondary insert for water vapor (P/N 78149) to protect the pump.

NOTE: Dispose of all chemicals and hazardous materials in compliance with local codes.

Labconco is not responsible for illegal dumping of any chemicals or materials.

Concentrator And Cold Trap

Before any maintenance is performed, all power switches should be "Off" and units unplugged from electrical outlets.

- (1) Do not use any material around or on top of any CentriVap unit. Proper air ventilation is essential.
- (2) Clean any spills immediately to prevent solvents from accumulating on rotors and inside the chamber.
- (3) Check oil level of the pump. It should be between "MIN" and "MAX". If the oil level is less than an inch (25.4mm) above "MIN", add oil to proper level.
- (4) If oil shows cloudiness, particles or discoloration, drain the pump and replace with fresh oil.
- (5) Check the Cold Trap for condensed or frozen solvents and dispose of appropriately. Completely empty the trap before the next run. If solvents are frozen in the glass trap, run it under cold water immediately after operating.
- (6) If the glass trap is used, check to see that the ethanol in the stainless steel trap is free of ice or water. Aspirate or pipet the ethanol and replace it with 200 ml or fresh ethanol.
- (7) If the media in the secondary trap has completely changed color, discard and replace with a new insert. For the activated carbon insert used in radioactive applications, no indicator exists; therefore, it should be discarded after each use. In radioactive applications, the system should be monitored with a Geiger counter.

NOTE: The user is solely responsible for any radioactive leak.

- (8) Recheck all connections for a secure fit to prevent leakage.

SPECIFICATIONS

A. CONCENTRATOR

Heater:	300W, built-in tubular heater controlled at 40°C with over-temperature protection
Power Input:	115 VAC, 1 phase, 60 Hz, 3.1 amp (Model 78100-00) 230 VAC, 1 phase, 50 Hz, 1.6 amp (Model 78100-01) (Current ratings without vacuum pump)
Drive:	Belt drive coupled with magnetic drive
Controls:	Rocker switch for rotor; rocker switch and indicating lamp for heater
Motor Rotation:	Up to 1800 RPM
Lid:	Abrasion resistant acrylic
Chamber:	Double impregnated, epoxy coated aluminum casting
Cabinet:	Epoxy coated steel
Dimensions:	13"W x 17-1/2"D x 8-3/4"H (33.02cm x 44.5cm x 22.2cm)
Shipping Weight:	40 lb. (18.1 kg)

B. PRIMARY COLD TRAP

Temperature:	-60°C $\pm$ 5°C at 75°F ambient
Refrigeration:	1/4 HP condensing unit
Stainless Steel:	
Trap:	Fluid capacity 1250 ml, ice capacity 500 ml
Glass Trap (optional):	Fluid capacity, 750 ml, ice capacity 375 ml
Power Input:	115 VAC, 60 Hz, 1 phase, 5 amp (Model 78110-00) 230 VAC, 50 Hz, 1 phase, 2.5 amp (Model 78110-01)
Control:	One (1) rocker switch to control power ON/OFF
Dimensions:	14-1/2"W x 24"D x 10-3/4"H (36.8cm x 60.96cm x 27.3cm)
Shipping Weight:	95 lb. (43.1 kg)

\$38,3200
bid assy. complete

This exploded view diagram illustrates the assembly of a Centri-Vap Concentrator. The main components are shown in their relative positions, with dashed lines indicating the assembly path. The parts are numbered as follows:

- 1: Power switch
- 2: Power cord
- 3: Top cover
- 4: Top cover gasket
- 5: Motor housing
- 6: Motor housing gasket
- 7: Motor housing screw
- 8: Motor housing cap
- 9: Motor housing cap gasket
- 10: Motor housing cap screw
- 11: Motor housing cap gasket
- 12: Motor housing cap screw
- 13: Motor housing cap gasket
- 14: Motor housing cap gasket
- 15: Motor housing cap gasket
- 16: Motor housing cap gasket
- 17: Motor housing cap gasket
- 18: Motor housing cap gasket
- 19: Motor housing cap gasket
- 20: Motor housing cap gasket
- 21: Motor housing cap gasket
- 22: Motor housing cap gasket
- 23: Motor housing cap gasket
- 24: Motor housing cap gasket
- 25: Motor housing cap gasket
- 26: Motor housing cap gasket
- 27: Motor housing cap gasket

20

REPLACEMENT PARTS

CENTRIVAP

ITEM	QTY	MODEL 78100-00 PART NO.	MODEL 78100-01 PART NO.	DESCRIPTION
1	1	13015	13015	Switch, Power
2	1	13015-01	13015-01	Switch, Heater
3	1	78513	78513	Gasket
4	1	78511	78511	Cover
5	1	78292	78292	Chamber
6	1	78230	78230	Heater
7	1	78545	78545	Motor Assy.
8	1	78164	78164	Rotor 54 x 1.5 ml Microcentrifuge
	1	78169	78169	18 x 1.5 ml Microcentrifuge (lower tier)
	1	78141	78141	12 x 75 mm
	1	78142	78142	5 x 50 ml conical
9	1	13338	13338	Receptacle - Lower Inlet
10	1	78218	78218	Plate, Magnet Cover
11	1	78258-01	78258-01	Hinge (LH)
12	1	78286	78286	Hose - 4 ft.
13	1	78252	78252	Belt
14	1	78512	78512-01	Solenoid
15	1	13019	13019	Switch - Lid
16	1	78528	78528	Switch - Magnetic Reed — LID MAGNET INCLUDED
17	1	78370	78370	Speed Sensor
18	1	78255	78255	Thermostat - Temperature Controller
19	1	78254	78254	Thermostat - High Temperature Limiter
20	2	14888	14888	Hose Clamp
21	1	78250	78250	O-Ring
22	1	78102	78102	Post Support Assembly
23	1	78295	78295	Capacitor - Motor
24	1	78290	78290	Timer Delay
25	1	13444	N/A	Fuse 15A
	2	N/A	13493	Fuse 8A
26	1	13339	13339	Receptacle - Vacuum Pump
27	1	78258	78258	Hinge (RH)

\$383200

78290

LID ASSY.

PC BOARD ASSEMBLY

COLD TRAP

ITEM	QTY	MODEL 78110-00 PART NO.	MODEL 78110-01 PART NO.	DESCRIPTION
1	1	13015	13015	Switch, Power
2	1	78117	78119	Condensing Module As'y. (Inc #5, 6, 13)
3	1	78118	78118	Cold Trap - Stainless Steel
4	1	78156	78156	Cold Trap - Glass
5	1	77343	77344	Condensing Unit
6	1	14895	14895	Refrigeration Filter
7	2	15445-01	15445-01	Elbow - Union
8	2	15481-01	15481-01	Stem
9		15486-03	15486-03	Stem Adapter
10	1	78197	78197	Insulator
11	1	78506	78506	Lid
12	1	78505	78505	Gasket
13	11 oz.	76222-01	76222-01	Refrigerant 13 B1
		78113-00P		Lid Assy.

DIMENSIONS

CONCENTRATOR

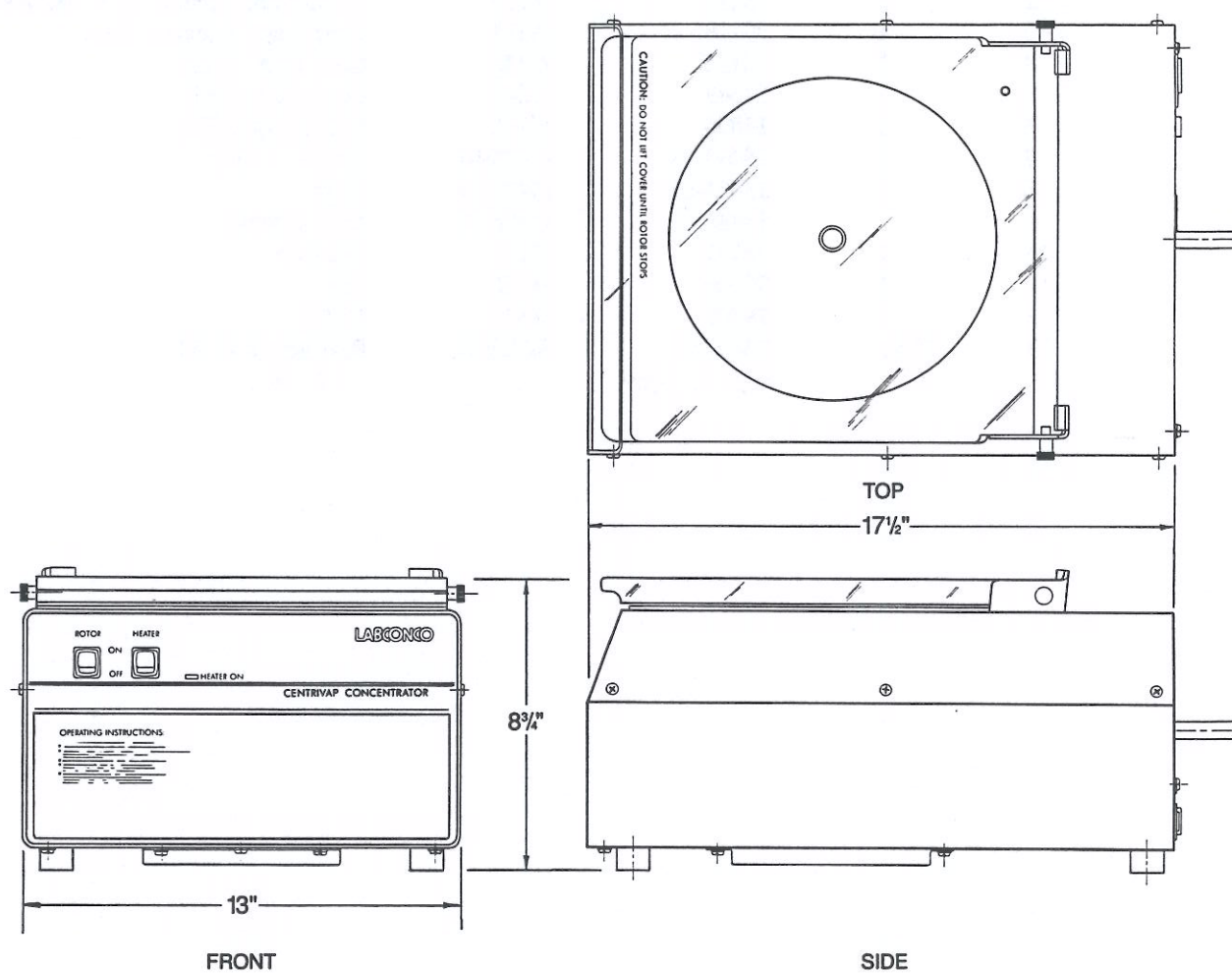


Figure 9

COLD TRAP

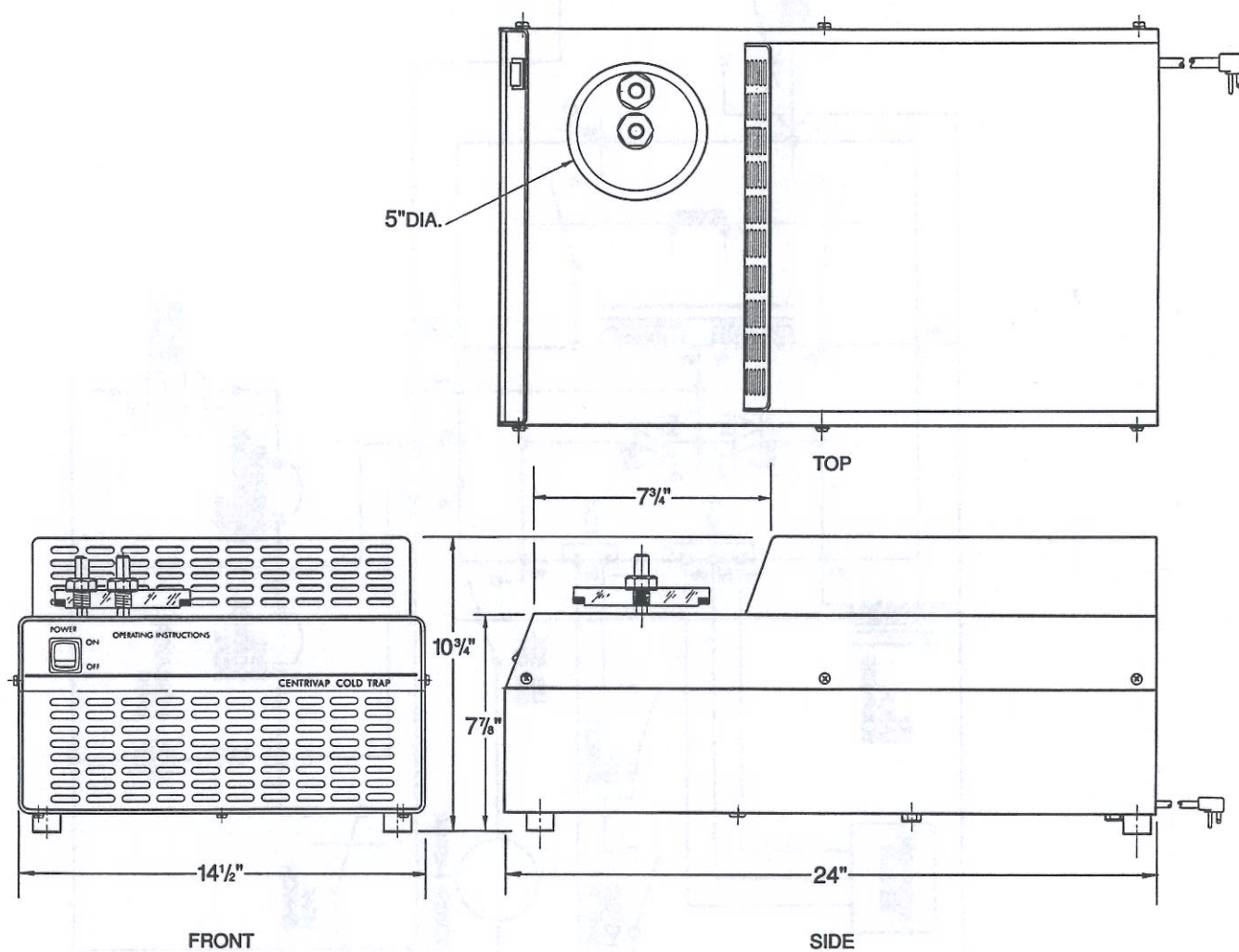
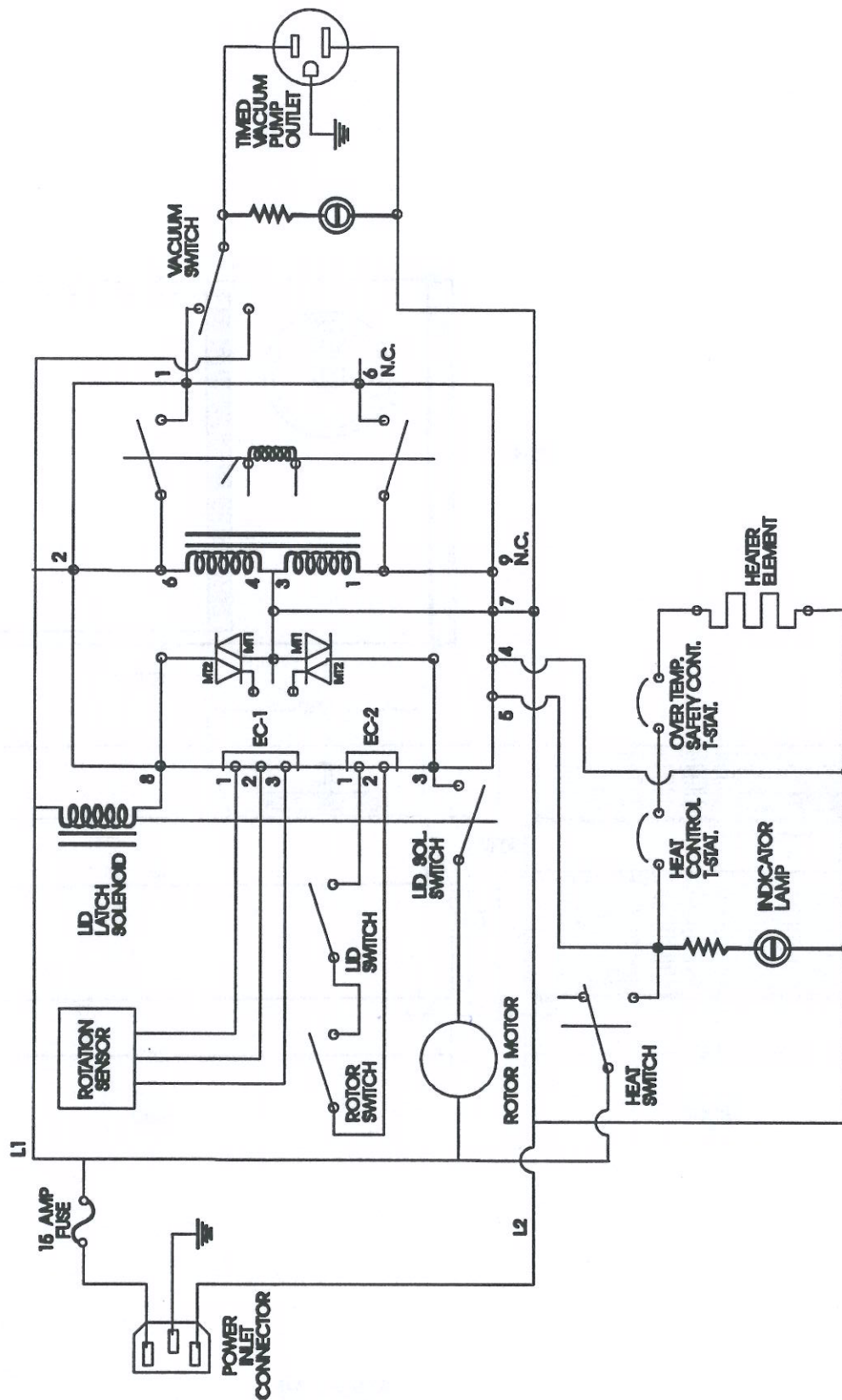


Figure 10

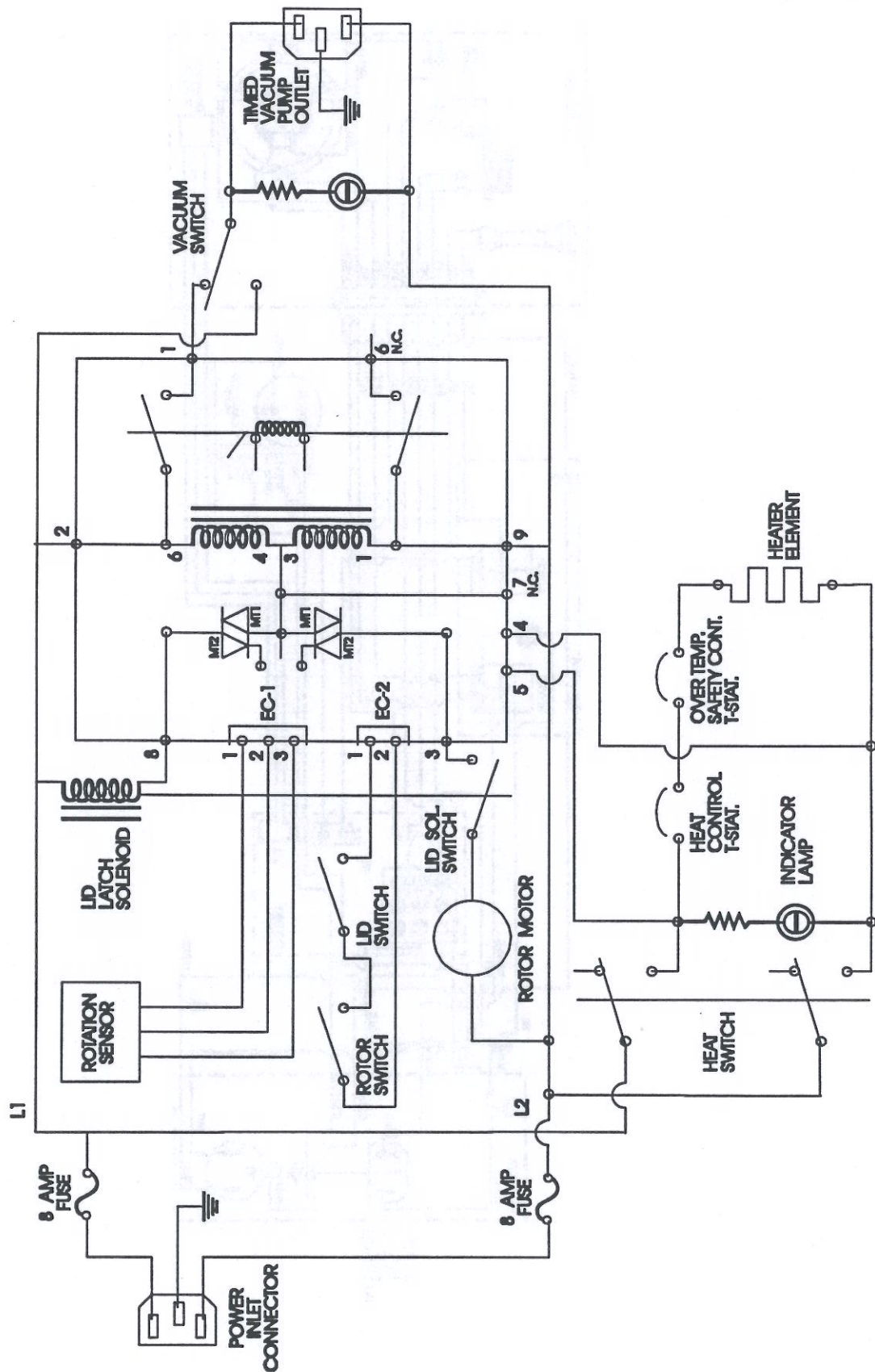
SCHEMATIC

Model 78100-00 Concentrator (115V)



SCHEMATIC

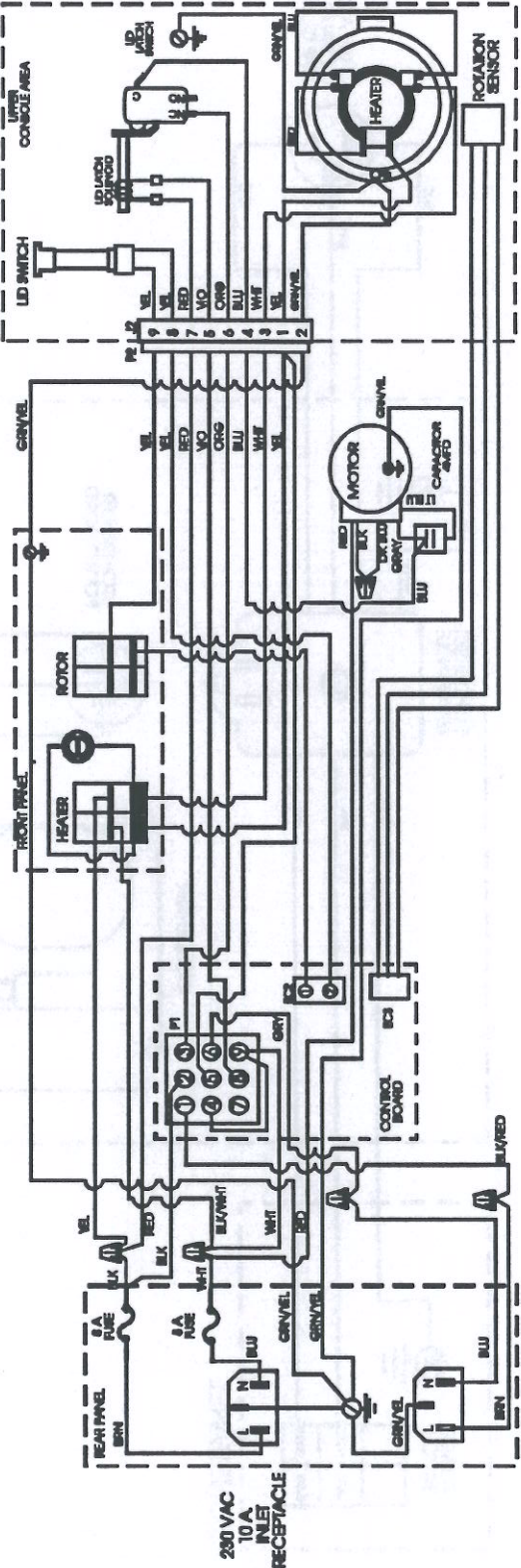
Model 78100-01 Concentrator
(230 V)



Model 78100-01 Concentrator (115 V)

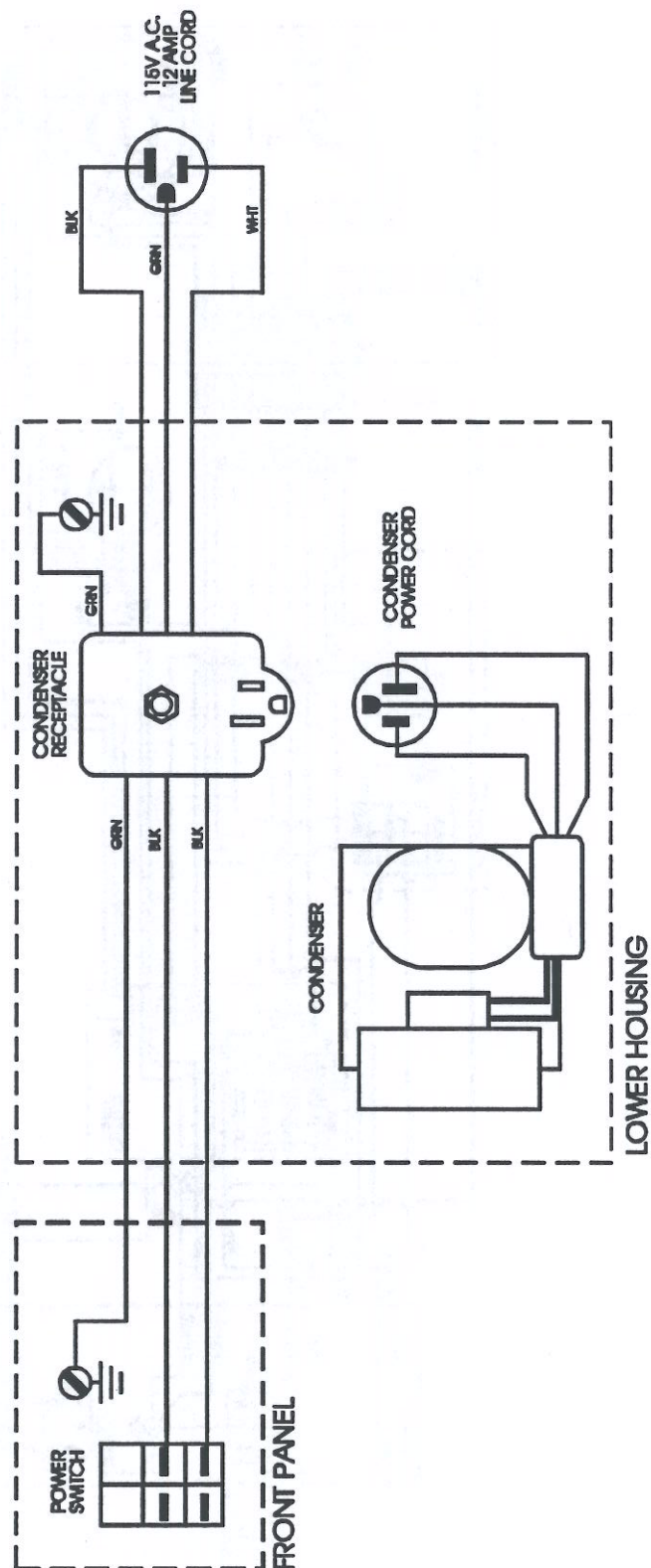


Model 78100-00 Concentrator (230V)



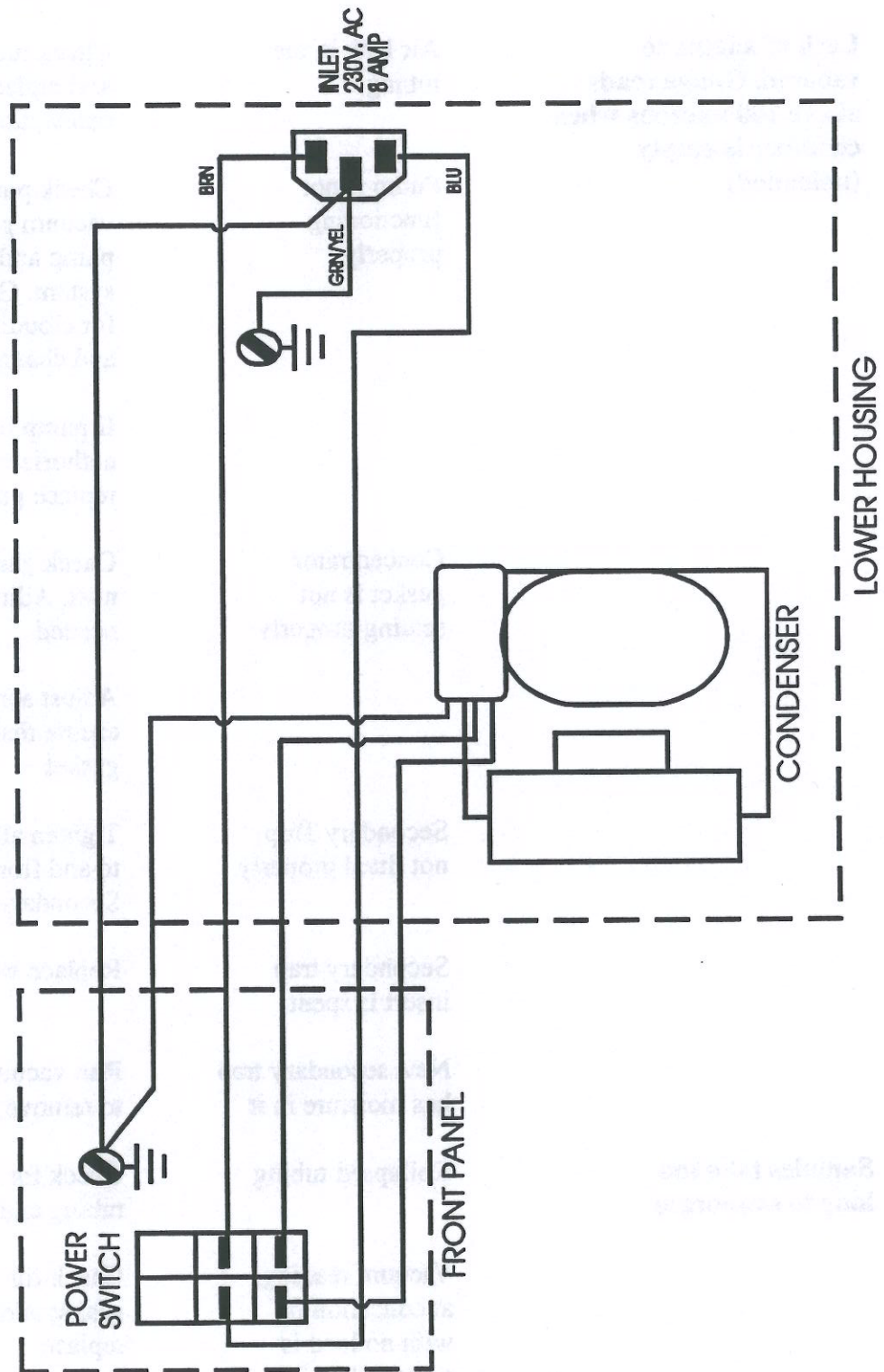
WIRING DIAGRAM

Model 78110-00 Cold Trap (115V)



WIRING DIAGRAM

Model 78110-01 Cold Trap
(230V)



TROUBLESHOOTING

PROBLEM	CAUSES	CORRECTIVE ACTION
Lack of adequate vacuum. Gauge reads above 200 microns when chamber is empty (unloaded)	Air leak in the tubing	Check tubing for wear and replace. Tighten all connections
	Pump is not functioning properly	Check pump by locating vacuum gauge closer to pump and close off rest of system. Check pump oil for cloudiness or particles and change If pump is faulty, seek authorized service or replace pump
	Concentrator gasket is not sealing properly	Check gasket for cleanliness. Adjust gasket as needed Adjust acrylic top to ensure that it covers gasket
	Secondary Trap not fitted properly	Tighten all connections to and from the Secondary Trap
	Secondary trap insert is spent	Replace with new insert
	New secondary trap has moisture in it	Run vacuum pump for 24 to remove moisture
Samples take too long to evaporate	Collapsed tubing	Check for collapsed tubing and replace
	Vacuum reading at concentrator with no load is greater than 200 microns	Check for seal of gasket and resolve or replace

PROBLEM	CAUSES	CORRECTIVE ACTION
Samples take too long to evaporate (Con't)		Check seal at vacuum fitting behind concentrator and tighten
	Obstruction in line	Trace by blocking various positions and reading gauge which is now placed right before vacuum pump. Remove obstructed tubing and replace
	Quick disconnects not properly seated	Push quick disconnects to seat
Recovery of condensate in Cold Trap is less than normally expected	Cold Trap is not ON	Check to make sure switch is ON and condensing unit fan is moving air out of the rear of the cabinet.
	Cold Trap does not cool down	Turn vacuum pump OFF and allow Cold Trap to cool for at least 30 min. to reach temperature -60°C temperature can be checked with a solvent thermometer or digital thermometer
Frequent oil change needed in pump	Secondary trap insert is spent	Change insert often
	Cold trap is not emptied after each run and dried	Empty the traps (glass or stainless steel) after each run and replace
	Vacuum too strong for chemical	Use a secondary trap insert and diaphragm pump to pull 29" Hg.

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 defect 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 circumstances 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 filter 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 users area concerning the dumping of waste materials in or upon water, land or air and to comply with such regulations.

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
78140-00	Starter Kit, 115 V Completes CentriVap Benchtop Concentrator Cold Trap system. Includes: Single hexagonal rotor, tee, secondary trap cannister, solvent trap insert, vacuum tubing kit, electronic vacuum gauge and vacuum bleed valve
78140-01	Starter Kit, 230 V Completes CentriVap Benchtop Concentrator Cold Trap system. Includes: Single hexagonal rotor, tee, secondary trap cannister, solvent trap insert, vacuum tubing kit, electronic vacuum gauge and vacuum bleed valve
78140-02	Starter Kit, 115 V Supplements CentriVap Benchtop Concentrator Cold Trap system. Includes: tee, secondary trap cannister, vacuum tubing, kit, vacuum gauge and vacuum bleed valve. Requires trap insert and rotor
78140-03	Starter Kit, 230 V Supplements CentriVap Benchtop Concentrator Cold Trap system. Includes: tee, secondary trap cannister, vacuum tubing, kit, vacuum gauge and vacuum bleed valve. Requires trap insert and rotor
78164	Single Hexagonal Rotor Capacity for 54 reach 1.5ml microcentrifuge tubes
78168	Double Deck Hexagonal Rotor Capacity for 72 each 1.5ml microcentrifuge tubes
78141	3ml Rotor (25mm x 75mm) Capacity for 30 each 3ml centrifuge tubes
78142	50ml Conical Rotor Capacity for 5 each 50ml centrifuge tubes
78169	Lower Hexagonal Rotor

Accessory Part #	Description
78156	Glass Insert For Cold Trap
78153	Secondary Trap Cannister
78148	Acid Trap Insert
78149	Moisture Trap Insert
78150	Radioisotope Trap Insert
78152	Solvent Trap Insert
14721	Direct Drive Vacuum Pump 113 liter/minute pumping capacity with gas ballast. Blank-off pressure 2×10^{-4} Torr (0.2 micron). 115 VAC, 60 Hz, single phase 6.3 amps
14677	Direct Drive Vacuum Pump 190 liters/minute capacity with gas ballast. Blank- off pressure 2×10^{-4} Torr (0.2 micron). 115 VAC, 60 Hz, single phase, 6.3 amp
77394	Direct Drive Vacuum Pump 113 liter/minute. Same as 14721 except 220/208-230VAC, 50/60 Hz, single phase 3.4 amp operation
77394-01	Direct Drive Vacuum Pump 190 Liter/minute. Same as 14677 except 220/208-230 VAC, 50/60 Hz, single phase, 3.4 amp operation
75800-00	Electronic Vacuum Gauge 115 VAC, 50/60 Hz
75800-01	Electronic Vacuum Gauge 230 VAC 50/60 Hz

ACCESSORIES

Accessory Part #	Description
78145	Vacuum Tubing Kit 1/2" ID vacuum tubing clamps
78144	Tee
78501	Tee And Valve Kit To be used with optional equipment. Order tubing and clamps as needed
78298	Cart

If you have any questions that are not addressed in this manual, or if you need technical assistance, please contact Labconco's Customer Service Department at either (800) 821-5525, or (816) 333-8811, between the hours of 8:00 a.m. and 5:00 p.m. Central Standard Time.

NOTES
