



Please read user's manual before
operating equipment

Original Instructions

LABCONCO CORPORATION

8811 Prospect Avenue
Kansas City, MO 64132
(800) 821-5525 | +1 (816) 333-8811
labconco.com

User's Manual

CT Freeze Dryers

Register this product

CT Freeze Dryers

2025—Present

8700xxx (-50C Series)

8701xxx (-84C Series)

8702xxx (-105C Series)

Copyright © 2024 Labconco Corporation. The information contained in this manual and the accompanying products are copyrighted and all rights reserved by Labconco Corporation. Labconco Corporation reserves the right to make periodic design changes without obligation to notify any person or entity of such change.

Warranty

Labconco Corporation provides a warranty to the original buyer for the repair or replacement of parts and reasonable labor as a result of normal and proper use of the equipment with compatible chemicals. Broken glassware and maintenance items, such as filters, gaskets, light bulbs, finishes, and lubrication are not warranted. Excluded from warranty are products with improper installation, erratic electrical or utility supply, unauthorized repair, use with incompatible chemicals, or non-factory modifications to the original product.

The warranty for CentriVap® Cold Traps will expire one year from date of installation or two years from date of shipment from Labconco, whichever is sooner. Warranty is non-transferable and only applies to the owner (organization) of record.

Buyer is exclusively responsible for the set-up, installation, verification, decontamination, or calibration of equipment. This limited warranty covers parts and labor, but not transportation and insurance charges. If the failure is determined to be covered under this warranty, the dealer or Labconco Corporation will authorize repair or replacement of all defective parts to restore the unit to operation. Repairs may be completed by 3rd party service agents approved by Labconco Corporation. Labconco Corporation reserves the rights to limit this warranty based on a service agent's travel, working hours, the site's entry restrictions and unobstructed access to serviceable components of the product.

Under no circumstances shall Labconco Corporation be liable for indirect, consequential, or special damages of any kind. This warranty is exclusive and in lieu of all other warranties whether oral, or implied.

Returned or Damaged Goods

Do not return goods without the prior authorization from Labconco. Unauthorized returns will not be accepted. If your shipment was damaged in transit, you must file a claim directly with the freight carrier. Labconco Corporation and its dealers are not responsible for shipping damages.

The United States Interstate Commerce Commission rules require that claims be filed with the delivery carrier within **fifteen (15) days** of delivery.

Limitation of Liability

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 required 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. Labconco Corporation is held harmless with respect to user's compliance with such regulations.

For additional questions or support:

Labconco Customer Care +1 (816) 333-8811

Labconco Technical Support (800) 821-5525

Hours 7:30 a.m.-5:30 p.m. CST

**Part # 7520704 Rev. -
ECO 15167**

Table of Contents

1: INTRODUCTION	6
About This Manual	6
Contents Included	6
2: BEFORE YOU INSTALL	7
Location Requirements	7
Space Requirements	7
Clearance Requirements	7
Electrical Requirements	8
Exhaust Requirements	8
Vacuum Pump Requirements	8
3: SAFETY PRECAUTIONS	10
Typographical Conventions	10
General Safety Precautions	12
Safety Precautions for this Product	14
For Hydrocarbon Refrigeration only	14
Solvent Safety Precautions	14
Replacement components and servicing	15
4: INSTALLATION	16
Unpacking	16
Installation	18
Electrical Connection	20

Ground Wire	20
5: USING YOUR CT FREEZE DRYER	21
Freeze Dry Process	21
Freeze Dry Rates	21
Freeze Dry Capacity	23
Samples Containing Volatile Substances	24
Sample Preparation	24
Chemical Resistance of Cold Trap Components	24
Feature Overview	25
Start-up	26
Shutdown	27
6: MAINTAINING YOUR COLD TRAP	28
Maintenance Safety Precautions	28
Recommended Maintenance Schedule	29
7: TROUBLESHOOTING	31
APPENDIX A: PARTS LIST	33
APPENDIX B: DIMENSIONS	37
APPENDIX C: SPECIFICATIONS	41
Power Data	41
Environmental Conditions	41

1: Introduction

Congratulations on the purchase of a CT Freeze Dryer. The CT Freeze Dryer is designed for laboratory lyophilization procedures. It is the result of years of experience in manufacturing laboratory equipment, and users like you suggested many of its features to us.

Please acquaint yourself with this manual and keep it handy for future reference.

About This Manual



This manual is written for the installer and user of this product. This manual contains important operation and safety information. When you see a symbol, such as the INFO symbol to the left, pay close attention to the information provided. Before installing or operating this product, you must read Section 3: Safety Precautions.

Contents Included

The following items are packaged with the product.

- Centrivap Cold Trap (-50, -84 or -105C)
 - User's manual thumb drive
 - Ground Wire Assembly
 - Tubing – Clear PVC (38" long)
 - (2) Hose Clamps
 - Power Cord
- 4 or 8 Port Manifold
 - Tubing - Clear PVC (3" long)
 - (2) hose clamps
 - Plug – 1/2"

2: Before You Install

Before you install the product, the site should be planned for installation. Examine the location where you intend to install it. You must be certain that the area is level and of solid construction. In addition, a means to exhaust the vacuum pump must be provided and a dedicated source of electrical power must be located near the installation site.

Location Requirements

The Cold Trap should be located on a surface that is stable, flat, and level. The performance of the Cold Trap refrigeration system can be adversely affected by high ambient room temperature. For optimal performance, the ambient room temperature should be 70 – 75°F (21 – 24°C).

Space Requirements

See Appendix B: Dimensions for overall product dimensions.

Clearance Requirements

A minimum clearance of at least three inches (7.6 cm) should be allowed between the sides and back of the Cold Trap and adjacent wall surfaces or other equipment. Restriction of the airflow through the cabinet during operation could adversely affect performance.

Electrical Requirements

The product models have the following electrical requirements.

Catalog Number*	Typical Operating Current (Amps)	Electrical Circuit Requirements**	
8700X00	5.9 A	115V, 60 Hz, 7A	1 Phase
8700X30, -40, -50, -70, -80, -90	2.6 A	230V, 50 Hz, 3A	1 Phase
8700X10, -15	2.9 A	230V, 60 Hz, 3A	1 Phase
8701X00	11.2 A	115V, 60 Hz, 12A	1 Phase
8701X30, -40, -50, -70, -80, -90	5.2 A	230V, 50 Hz, 6A	1 Phase
8701X10, -15	5.6 A	230V, 60 Hz, 6A	1 Phase
8702X00	13 A	115V, 60 Hz, 13A	1 Phase
8702X30, -40, -50, -70, -80, -90	6.3 A	230V, 50 Hz, 7A	1 Phase
8702X10, -15	6.5 A	230V, 60 Hz, 7A	1 Phase

*Catalog Number: X = 1, 2, 5 or 6

**Electrical Requirements, 'V' = VAC (Voltage with alternating current), 'A' = Amperes

A dedicated outlet with an appropriate circuit breaker should be located as close as possible to the product. Consult your local electrical codes for properly rated circuit breakers. For safe operation, the dedicated outlet must provide a protective earthing ground connection to the product.

Exhaust Requirements



Solvents used in the Cold Trap can cause skin, eye, respiratory and digestive system disorders. The Cold Trap should be located within a fume hood if hazardous or flammable solvents are used. Heating of materials could lead to the liberation of hazardous gases. In all cases, regardless of the solvent used, it is strongly recommended that the vacuum pump is vented into a fume hood. An accessory secondary trap is available to minimize the exhausting of solvents into the atmosphere. This does not, however, negate the need to exhaust the vacuum pump into a fume hood. Failure to properly vent the system will expose personnel to potentially harmful chemicals.

The Cold Trap has not been evaluated by an approval agency for the use of biological, radio toxins or flammable liquids or materials.

Vacuum Pump Requirements

The inlet fitting on the vacuum pump must be suitable for 0.50 ID hose. When freeze-drying, the manifold should be used with a vacuum pump capable of achieving less than 0.02 mbar vacuum.



When selecting the vacuum pump, it is very important to consider the flammability of the solvent that will be used. If the solvents are flammable, an explosion-proof vacuum pump or one suitable for the solvents to be processed is recommended. To ensure that aggressive vapors do not damage the vacuum pump, it is recommended that all internal wetted parts of the vacuum pump are PTFE or PTFE coated when using aggressive solutions.



Several components within the CentriVap Cold Trap are made from stainless steel or other materials and can be degraded if exposed to acids. Contact Labconco before Freeze Drying acids.

3: Safety Precautions

Before unpacking, installing, operating, maintaining, or servicing this equipment, read the following safety warnings and precautions.

Avant le déballage, l'installation, le fonctionnement, l'entretien ou la maintenance de cet équipement, lire les avertissements de sécurité et les précautions d'emploi.



CAUTION – See Manual. When this symbol is on the equipment, it indicates a caution that is detailed in this manual.

MISE EN GARDE – Voir le manuel. Lorsque ce symbole est apposé sur l'équipement, il renvoie à une mise en garde détaillée dans ce manuel.

Typographical Conventions



DANGER – An imminently hazardous situation which, if not avoided, will result in death or serious injury.

DANGER – Situation dangereuse imminente qui, si elle n'est pas évitée, peut entraîner la mort ou des blessures graves.



CAUTION – Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to property.

MISE EN GARDE – Signale une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut provoquer des blessures mineures à modérées ou des dommages matériels.



NOTE – Advice or suggestions to help the process.

REMARQUE – Conseils ou suggestions pour le déroulement du processus.



BURN RISK (HIGH TEMPERATURE) – Air or components that will be very hot. Take care not to touch these defined areas. Failure to avoid these areas may result in moderate to severe injury.

RISQUE DE BRÛLURE (TEMPÉRATURE ÉLEVÉE) – Air ambiant ou composant devenant très chaud. Veiller à ne pas toucher ces zones délimitées. L'absence de précaution pour éviter ces zones peut entraîner des blessures modérées, voire graves.



EXTREME COLD (LOW TEMPERATURE) – Air or components that will be very COLD. Take care not to touch these defined areas. Failure to avoid these areas may result in moderate to severe injury.

FROID INTENSE (TEMPÉRATURE BASSE) – Air ambiant ou composant devenant très froid. Veiller à ne pas toucher ces zones délimitées. L'absence de précaution pour éviter ces zones peut entraîner des blessures modérées voire graves.



PINCH POINT – Areas or components that can pinch or cut. Take care not to touch these defined areas.

POINT DE PINCEMENT – Zones ou composants présentant un risque de pincement ou de coupure. Veiller à ne pas toucher ces zones délimitées.



MOVING PARTS – Areas or components that contain moving parts. Take care not to touch these defined areas.

PIÈCES MOBILES – Zones ou composants contenant des pièces mobiles. Veiller à ne pas toucher ces zones délimitées.



RISK OF ELECTRICAL SHOCK – The specified procedure or area poses a risk of electrical shock. ALWAYS disconnect main power cord or electrical supply before proceeding.

RISQUE DE CHOC ÉLECTRIQUE – La procédure ou la zone spécifiée présente un risque de choc électrique. TOUJOURS débrancher le cordon d'alimentation secteur ou l'alimentation électrique avant toute intervention.



FLAMMABLE / NO SOLVENTS – Do not place flammable liquids or solvents in this product.

INFLAMMABLE / PAS DE SOLVANTS – Ne placez aucun liquid inflammable dans cette produit.



LIFTING HAZARD – Do not lift or move this equipment without assistance.
DANGER DE LEVAGE – Ne pas soulever ou déplacer cet équipement sans assistance.



MAGNETIC FIELD IN USE – Magnets or magnetic field present.
CHAMP MAGNETIQUE UTILISE – Présence d'aimants ou de champ magnétique.



DO NOT TOUCH – Components or areas indicated are sensitive and will suffer damage if touched. Take care not to touch these defined components or areas. Failure to avoid these areas will result in damage to the product.
NE PAS TOUCHER – Les composants ou les zones indiquées sont sensibles et subiront des dégâts s'ils sont touchés. Veiller à ne pas toucher ces composants ou zones délimité(e)s. L'absence de précaution pour éviter ces zones endommagera le produit.



TOOL REQUIRED – Tool required to access specified area.
OUTIL NÉCESSAIRE – Outil nécessaire pour accéder à la zone spécifiée.

General Safety Precautions

Follow all the safety precautions described in this section.



Before removing any panels which require a tool for removal, **ALWAYS** disconnect the main power cord or electrical supply. Failure to remove all electrical power before proceeding will result in moderate to serious injury, death, or damage to property.

Avant le retrait d'un panneau nécessitant l'utilisation d'un outil, **TOUJOURS** débrancher le cordon d'alimentation secteur ou l'alimentation électrique. Le non-respect de la consigne consistant à couper complètement l'alimentation électrique avant toute intervention peut entraîner des blessures graves, la mort ou des dommages matériels.



Never contact moving parts with your person. Failure to avoid moving parts will result in moderate to serious injury, death, or damage to property.

Ne jamais toucher les parties mobiles. Le non-respect de la consigne consistant à éviter les pièces mobiles peut entraîner des blessures graves, la mort ou des dommages matériels.



Never misuse this product. Never disable, override, or otherwise bypass safety guards, panels, switches, sensors or alarms. Doing so will result in moderate to serious injury, death, or damage to this product or property.

Ne jamais utiliser ce produit à mauvais escient. Ne jamais désactiver, annuler ou contourner les capots, panneaux, interrupteurs, capteurs ou alarmes de sécurité. Ceci entraînerait des blessures graves, la mort ou des dommages matériels à ce produit ou à d'autres biens.



If the unit is not operated as specified in this manual it may impair the protection provided by the unit.

Si l'unité n'est pas utilisée comme spécifié dans ce manuel il peut diminuer la protection fournie par l'unité.



Do not position the unit so that it is difficult to operate the main disconnect device.

Ne placez pas l'appareil de sorte qu'il est difficile de faire fonctionner le dispositif principal de déconnexion.



Do not lift or move this equipment without assistance.

Ne pas soulever ou déplacer cet équipement sans assistance.

Safety Precautions for this Product



Do not use any detachable power cord that is not adequately rated for the unit.
Ne pas utiliser un fil électrique amovible qui n'est pas du tension nominale de l'appareil.

For Hydrocarbon Refrigeration only



- **DANGER** – Risk of fire or explosion. Flammable refrigerant used. Do not use mechanical devices to defrost refrigerator. Do not puncture refrigerant tubing.
DANGER – Risque d'incendie ou d'explosion. Réfrigérant inflammable utilisé. N'utilisez pas d'appareils mécaniques pour dégivrer le réfrigérateur. Ne percez pas les tubes de réfrigérant.
- **DANGER** – Risk of fire or explosion. Flammable refrigerant used. To be repaired only by trained service personnel.
DANGER – Risque d'incendie ou d'explosion. Réfrigérant inflammable utilisé. À réparer uniquement par un personnel de service qualifié.
- **WARNING** – Ensure all ventilation openings are not obstructed.
AVERTISSEMENT – Assurez-vous que toutes les ouvertures de ventilation ne sont pas obstruées.
- **CAUTION** – Risk of fire or explosion. Flammable refrigerant used. Consult repair manual/owner's guide before attempting to service this product. All safety precautions must be followed.
ATTENTION – Risque d'incendie ou d'explosion. Réfrigérant inflammable utilisé. Consultez le manuel de réparation/guide du propriétaire avant d'essayer de réparer ce produit. Toutes les précautions de sécurité doivent être respectées.
- **CAUTION** – Risk of fire or explosion. Dispose of properly in accordance with federal or local regulations. Flammable refrigerant used.
ATTENTION – Risque d'incendie ou d'explosion. Éliminer correctement conformément aux réglementations fédérales ou locales. Réfrigérant inflammable utilisé.
- **CAUTION** – Risk of fire or explosion due to puncture of refrigerant tubing. Follow handling instructions carefully. Flammable refrigerant used.
ATTENTION – Risque d'incendie ou d'explosion dû à la perforation du tube de réfrigérant. Suivez attentivement les instructions de manipulation. Réfrigérant inflammable utilisé.

Solvent Safety Precautions



CAUTION: Solvents used in the Cold Trap may be flammable or hazardous. Use extreme caution and keep sources of ignition away from the solvents. When using flammable or hazardous solvents, both the Cold Trap and the vacuum pump should be operated inside a fume hood.

Hazardous materials, such as strong acids or bases, radioactive substances, and volatile organics, must be handled carefully and promptly cleaned up if spilled.

Do not store flammable or hazardous solvents within 12 inches (300 mm) of the CentriVap Cold Trap.



The disposal 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.

Replacement components and servicing



Component parts shall be replaced with like components.

Authorized service personnel shall perform servicing to minimize the risk of possible ignition due to incorrect parts or improper service.

4: Installation

With the installation site properly prepared, you are ready to unpack and install the equipment. This section covers how to:

- Unpack and move the equipment
- Install the equipment
- Connect electrical service
- Connect service utilities
- Properly exhaust the equipment

Unpacking



The following tools are required to unpack the equipment:

- Box Knife



The following safety precautions must be followed by all personnel unpacking the equipment.

- Wear safety glasses
- Wear gloves
- No loose fitting clothes
- Wear close-toed shoes
- Follow safe-lifting practices
 - The Cold Trap weighs over 70 lbs. (33 Kg). The carton allows for lifting with a mechanical lift truck or hand truck. If you must lift the Cold Trap manually, use at least two (2) persons and follow safe lifting guidelines.

Step 1

Carefully remove the outer carton and inspect the product for damage that may have occurred in transit. If the product is damaged, take pictures of the product and the outer packaging, and notify the delivery carrier immediately. Retain the entire shipment, including outer packaging, intact for inspection by the carrier.



Note: United States Interstate Commerce Commission rules require that claims be filed with the delivery carrier within fifteen (15) days of delivery.

Do not return goods without the prior authorization of Labconco. Unauthorized returns will not be accepted.

If the product was damaged in transit, you must file a claim directly with the freight carrier. Labconco Corporation and its dealers are not responsible for shipping damages.

Do not discard the carton or packing material for the product until all of the components have been checked, installed and tested.

Step 2

Locate the model of Cold Trap you received in the following table. Verify that the components listed are present. If you did not receive one or more of the components listed for your Cold Trap, contact Labconco Corporation immediately for further instructions.

Cold Traps													
Description			Power Cords						Accessories				
Catalog #	Voltage(V)	Frequency (Hz)	1334500	1338000	1336100	1332700	1332600	1345700	1331800	7828606	1488800	7464600	1089029
			Connector: IEC C13 Plug: NEMA 5-15	Connector: IEC C13 Plug: NEMA 6-15	Connector: IEC C13 Plug: CEE 7/7	Connector: IEC C13 Plug: CH1-10P	Connector: IEC C13 Plug: BS 1363	Connector: IEC C13 Plug: SANS 164-1	Connector: IEC C13 Plug: AU1 10P	Tubing, 1/2 ID x 38"	Hose Clamps (2)	Ground Wire Assembly	User Manual Thumbdrive
86xxx00	115	60	X							X	X	X	X
86xxx10	230	60		X						X	X	X	X
86xxx15	230	50					X			X	X	X	X
86xxx30	230	50			X					X	X	X	X
86xxx40	230	50				X			X	X	X	X	X
86xxx50	230	50					X			X	X	X	X
86xxx70	230	50						X		X	X	X	X
86xxx90	230	50			X	X	X	X	X	X	X	X	X

Installation

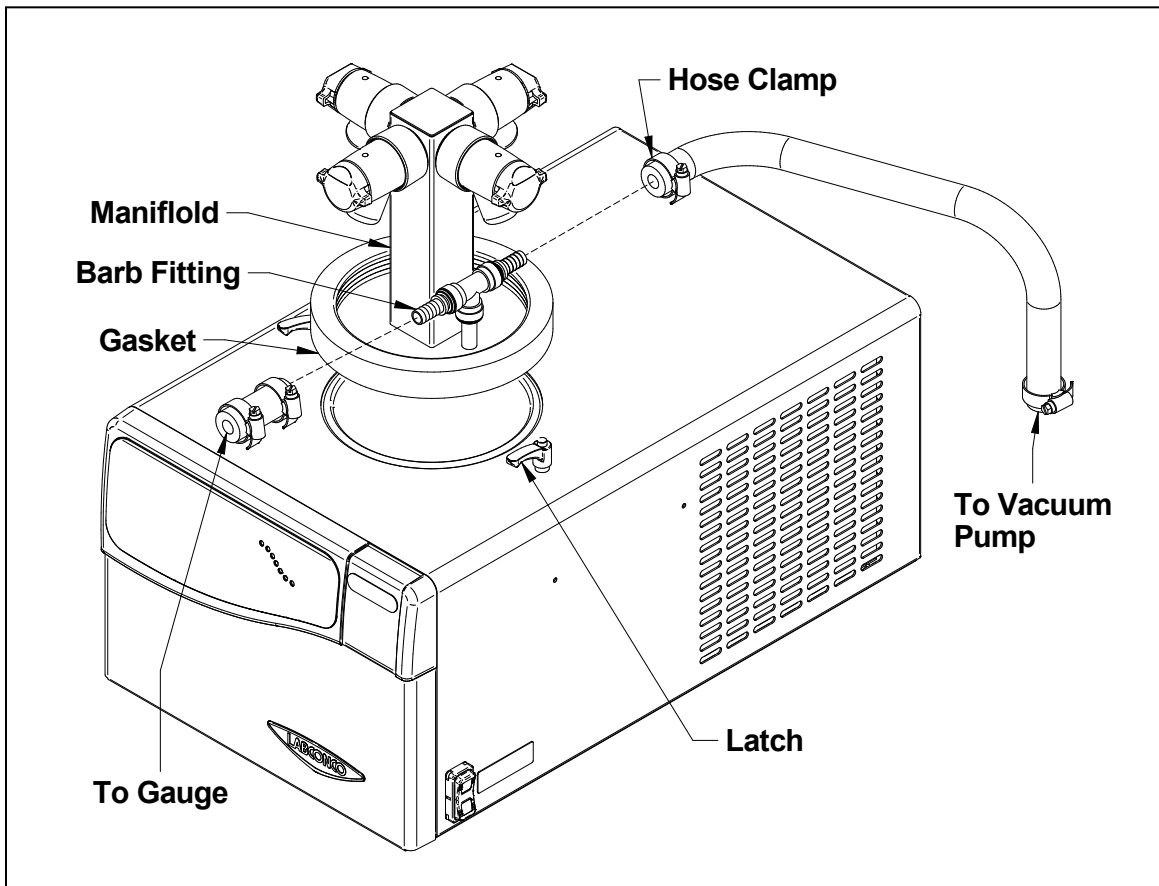
The relative position of the Cold Trap and the vacuum pump is critical. The Cold Trap should always be placed before the vacuum pump. Air to cool the refrigeration system of the Cold Trap is drawn into the right side of the Cold Trap cabinet and exhausts out the left side of the cabinet. A minimum of 3" should be allowed between the sides of the Cold Trap and the adjacent wall surfaces. Restriction of the airflow through the cabinet during operation could adversely affect performance.



The following tools are required for installation

- 5/16" nut driver or flat head screwdriver

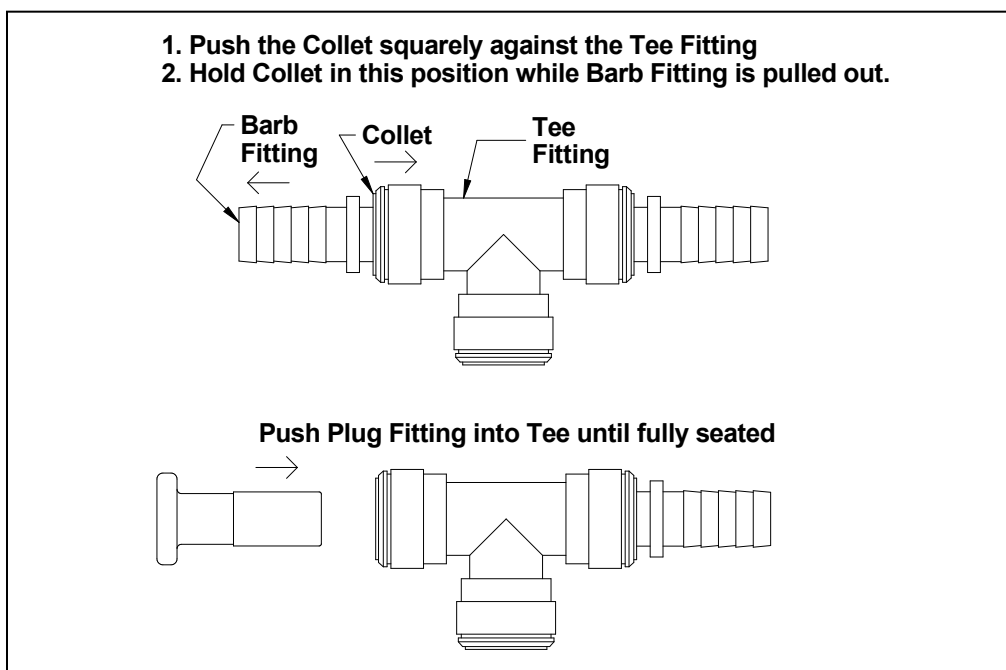
Figure 4-1



1. Remove the lid assembly supplied for the Cold Trap.
2. Center the manifold gasket on the chamber.
3. Use the two latches to prevent the manifold from tipping over when vacuum is not applied to the system. The latch pawl is positioned by first lifting it and then rotating it to the desired position.
4. A 3" long piece of vacuum tubing is supplied with the manifold for connecting to a vacuum gauge. If vacuum monitoring is not desired, replace the plastic barb fitting with plug fitting supplied with the manifold (see Figure 4-2).
5. The other plastic barb fitting must be connected to a vacuum pump.
6. Secure hoses with the clamps supplied.

How to remove barb fitting

Figure 4-2



WARNING: Solvents used in the Cold Trap can cause skin, eye, respiratory and digestive system disorders. Locate the Cold Trap inside a fume hood. It is recommended that the vacuum pump be located inside a fume hood or other laboratory ventilation device if hazardous solvents are being used. If this is not possible, the vacuum pump should have a hose attached to the exhaust port and the other end of the hose should be positioned inside the fume hood or ventilation device.

Electrical Connection

Plug the power cord into the receptacle on the back of the Cold Trap and plug the other end into a suitable power receptacle. Plug the power cord from the vacuum pump into a suitable receptacle.

Ground Wire



CAUTION: Solvents may be flammable. When draining the CentriVap Cold Trap always attach the other end of the grounding clip to the solvent catch pot to eliminate the risk of electrostatic spark ignition.

Attach one end of the included ground wire to the stainless-steel elbow on the drain tubing on the right or left side (depending on model) of the Cold Trap

5: Using Your CT Freeze Dryer

This section details the functional features and proper techniques for safely and efficiently using the CT Freeze Dryer.

Freeze Dry Process

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

Freeze drying is a process whereby water or other solvent is removed from frozen material by converting the frozen water directly into vapor without the intermediate formation of liquid water. The basis for this sublimation process involves the absorption of heat by the frozen sample in order to vaporize the ice; the use of a vacuum pump to enhance the removal of water vapor from the surface of the sample; the transfer of water vapor to a collector; and the removal of heat by the collector in order to condense the water vapor. In essence, the freeze dry process is a balance between the heat absorbed by the sample to vaporize the ice and the heat removed by the collector 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 collector temperature and vacuum obtained, the eutectic point and solute concentration of the sample. It is important to remember these 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 5-1 for your reference.

Table 5-1

SAFE TEMPERATURE AND DRYING TIMES FOR SELECTED MATERIALS			
Material 10mm Thick	Safe Temperature °C	Collector 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.

Up to the point of overloading the system, the greater the surface area of the sample, the faster 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 because 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.

For lyophilization to occur, ice must be removed from the frozen sample via sublimation. This is accomplished by the collector and the vacuum pump. The collector, which should be at least 15 to 20°C colder than the eutectic temperature (melting temperature) of the sample, traps vapor as ice. Since the vapor pressure at the collector is lower than that of the sample, the flow of water vapor is from the sample to the collector. Since this vapor diffusion process occurs very slowly under normal atmospheric conditions, a good vacuum is essential to maintain an efficient rate. In many applications, the maintenance of a vacuum of 0.133 mbar or less is recommended.

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 and water 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 of water 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 the sample contains a simple sugar such as 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 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 collector 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, 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 collector temperature can be cooled to below -75°C , or a dry ice/solvent trap may be used between the collector 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 acetonitrile, methanol, acetic acid, formic acid or pyridine. In addition to these substances influencing the eutectic temperature, they may increase 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, 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.

Sample Preparation

For some tips to avoid breaking glassware, and help you select the best method of freeze dry sample preparation see the following video on the Labconco website:

<https://www.labconco.com/resources/videos/preparing-pre-freeze-samples-in-flasks-for-lyoph>

Chemical Resistance of Cold Trap Components

The Cold Trap is designed to be chemically resistant. However, by necessity, the Cold Trap is comprised of a number of different materials, some of which may be attacked and degraded by corrosive chemicals. The degree of degradation is obviously dependent on the concentration and duration of exposure. Some major components of the Cold Trap that are susceptible to degradation are as follows:

COMPONENT	MATERIAL	Acids							Bases		Solvents													
		Acetic Acid 20%	Boric Acid	Formic Acid	Hydrobromic Acid 20%	Hydrochloric Acid 20%	Nitric Acid 20%	Sulfuric Acid 10%	Trifluoroacetic Acid (TFA)	Ammonium Hydroxide	Acetone	Acetonitrile	Chloroform	Dimethyl Formamide	Dimethyl Sulfoxide (DMSO)	Ethanol	Ethyl Acetate	Hexanes	Isopropanol	Methanol	Methylene Chloride	Methyl t-Butyl Ether (MTBE)	Toluene	Water
Cold Trap -50°C																								
Chamber	Stainless Steel				D	D		D																
Lid	Acrylic							C	D	C														
Cold Trap Gasket	Neoprene		D		D	C	D		D															
Cold Trap -84°C & -105°C																								
Chamber	Stainless Steel				D	D		D																
Lid	Stainless Steel				D	D		D																
Cold Trap Gasket	Neoprene		D		D	C	D		D															
C- Moderate Degradation- Questionable use																								
D- Severe Degradation- Infrequent use recommended- immediate thorough cleaning required																								

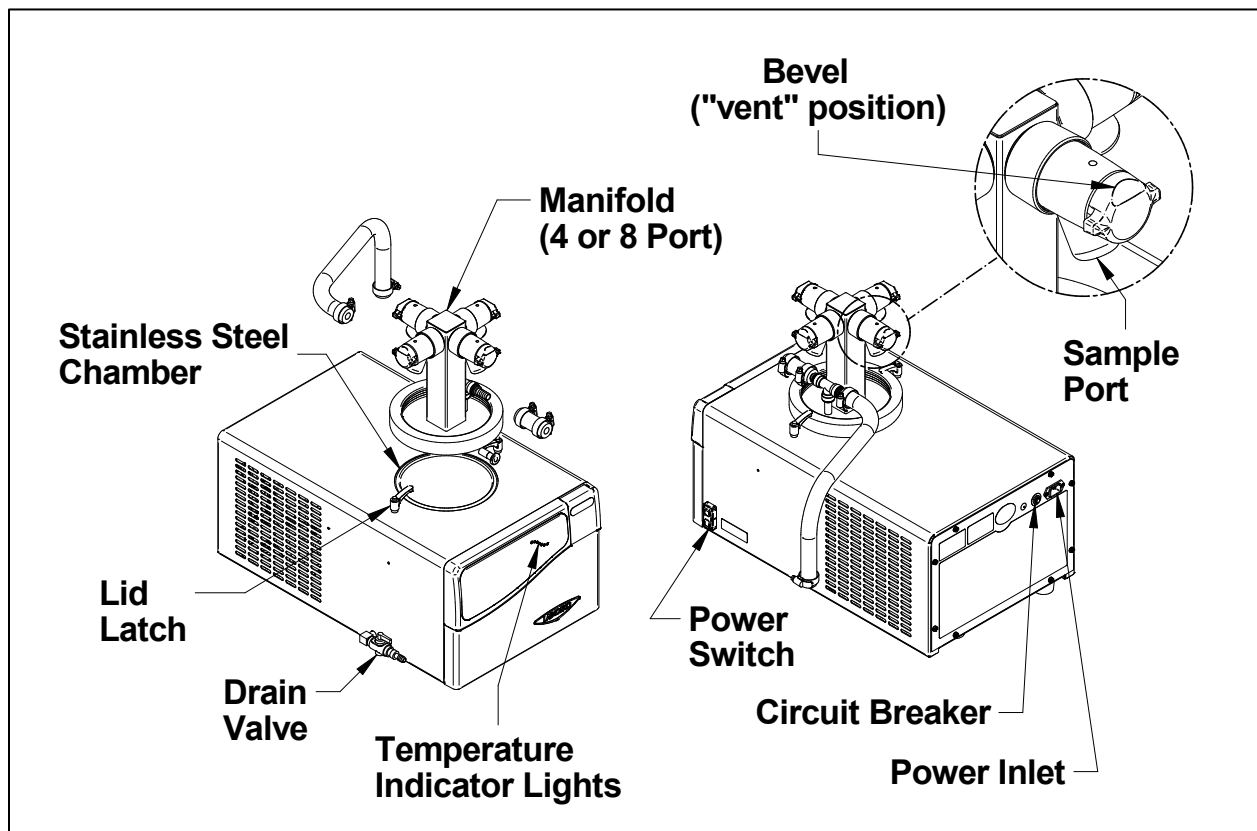
If a rotary vane vacuum pump is used, frequent oil changes are required. Many compounds will degrade the oil if allowed to enter to pump.

When using compounds in the CentriVac Cold Trap that are hostile to the materials of construction, it is imperative that the equipment is appropriately maintained. After each run, clean and rinse off all residues, spills and materials that might have splashed in the chamber.

Feature Overview

Figure 5-1 illustrates key features and components of the product.

Figure 5-1



Start-up

- Ensure all hoses are properly attached.
- Secure the manifold with the two lid latches.
- Turn power switch ON. The top amber indicator will illuminate. Additional indicators will illuminate, as the Cold Trap gets colder. A green indicator will illuminate when the Cold Trap reaches operating temperature.
- Make sure all valves are closed on the manifold and the drain valve is closed.
- Start the vacuum pump.
- After vacuum pump has run for 5 minutes, check that the manifold lid is pulled down to the Cold Trap by vacuum by gently trying to move the manifold lid or check vacuum gauge if available.
- Once vacuum is confirmed, add pre-frozen samples one at a time allowing ample time (approx. 5 minutes) for the vacuum to recover before adding another sample.
- Apply vacuum to the samples by turning the neoprene valve to the “vacuum” position (bevel on knob toward sample port). Let samples run until primary freeze drying and secondary drying is complete.
- It is important not to overload the collector. When adding samples notice the indicator light wave and make sure that your collector is able to recover back to the green light status after each sample is added. See chart for the maximum total sample volume capacities or your Cold Trap for **aqueous samples**. Note that when freeze drying samples with volatiles, the total sample capacity may decrease.

Model	Max Instantaneous Ice Load Capacity
-50C	1.6L
-84C	2.1L
-105C	1.6L

Shutdown

- Release the vacuum to the samples by turning the neoprene valves to the “vent” position.
- After the sample vial is removed from the neoprene valve, system vacuum to the pump may be vented by turning the sample valve to “vacuum” position.
- Turn the vacuum pump power switch OFF.
- Turn the Cold Trap power switch OFF.
- Allow ice to melt until it is free from the walls of the Cold Trap. DO NOT chip ice off the Cold Trap walls as damage may occur.
- Drain the Cold Trap immediately after the collected ice is melted to prevent corrosive liquids from residing in the trap. Flush out the trap with water after draining.
- DO NOT start the vacuum pump when the Cold Trap contains any liquid or if liquid is present in the vacuum tubing. The liquid will be drawn into the pump and can damage the vacuum pump.
- When using a rotary vane vacuum pump, the oil in the pump should be checked often. It must be changed if it is cloudy, shows particles or is discolored. The useful life of vacuum pump oil can be extended if the vacuum pump is operated for an extended period with the gas ballast open after the run is over. This allows contaminants to be purged from the hot oil. This must be done with the inlet to the pump blocked off to prevent air from free flowing through the pump. If the pump is operated at an elevated vacuum level, oil will be expelled from the pump and damage will occur.

6: Maintaining Your Cold Trap

This section details the maintenance required for optimal operation of the Cold Trap.

Maintenance Safety Precautions



The following tools and supplies are required to maintain the equipment:

- Mild non-abrasive cleaning solution
- Soft cloth



The following safety precautions must be followed by all personnel maintaining the equipment.

- Wear safety glasses, and/or additional eye and face protection as required by your Health & Safety Department.
- Wear gloves, and/or additional skin protection as required by safety instructions for cleaning/disinfecting chemicals used. Consult your Health & Safety Department for additional skin protection requirements.
- No loose fitting clothes
- Wear close-toed shoes
- When removing any panels that expose moving or electrical parts, you must follow these instructions before doing so:
 - Disconnect main power cord or electrical service connection.
 - Never touch moving parts such as fan blades or blower wheels.



Recommended Maintenance Schedule

Activity	Maintenance Frequency		
	After each run	Monthly	Annually
Completely empty the trap before the next run.	•		
Clean up all spills. Clean or decontaminate all surfaces using agents suitable for the substance spilled.	•		
Clean Manifold and gasket using soft cloth and mild, non-abrasive cleaner.	•		
Check oil level of the vacuum pump, if applicable. It should be between MIN and MAX.	•		
If oil shows cloudiness, particles, or discoloration, drain the pump, and replace with fresh oil.	•		
Utilization of acids requires immediate cleaning and neutralization after a run or physical damage to the collection chamber will result.	•		
Check the continuity of the protective earth ground between the ground terminal on the power inlet and a bare metal housing panel. Contact Labconco if there is no continuity.		•	

Activity	Maintenance Frequency		
	After each run	Monthly	Annually
Check all hoses & gaskets and replace any that show signs of hardening, permanent set, or deterioration.		•	
Clean exterior surfaces with cloth & non-abrasive cleaner (solvents may damage the finish)		•	
Using a vacuum cleaner with brush attachment, clean the condenser to ensure proper airflow for peak performance.			•

7: Troubleshooting

This section details common troubleshooting for your Cold Trap.

PROBLEM	CAUSE	CORRECTIVE ACTION
Unit will not operate	Unit not connected to electrical power	Connect unit to proper electrical receptacle.
	Circuit breaker blown	Correct electrical problem and reset circuit breaker by pressing button.
Sample odor in lab	Vent hose exhausting into lab area	Redirect hose to fume hood.
No vacuum/poor vacuum	Pump not on	Turn on pump.
	Leaks in lines or connectors or gasket	Locate and repair.
	Foreign material on Manifold gasket	Clean gasket.
	Sample valve open	Close sample valve
	Drain valve open	Close drain valve
	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.
	Manifold gasket not seated	Check position of manifold gasket on Cold Trap chamber.

PROBLEM	CAUSE	CORRECTIVE ACTION
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	<p>Turn vacuum pump OFF and allow Cold Trap to cool for at least 30 min. to reach temperature.</p> <p>Temperature can be checked with a solvent thermometer or digital thermometer.</p>
Frequent oil change needed in pump	Cold Trap is not emptied after each run and dried	Empty the stainless steel cold trap and drain line and ensure they are dry before starting vacuum pump.
	No outgassing of vacuum pump being performed	After FD run is complete, continue to run vacuum pump with gas ballast open for 15 min
	High solvent content in frozen samples	Evaporate solvents out of sample before freeze drying process
Samples Melting	Poor vacuum (vacuum level not low enough)	Ensure pump is operating properly and/or check for leaks in the vacuum system.
	Collector temperature not cold enough for samples	Collector needs to be 10-15°C colder than the sample freezing point.
	High solvent content	<p>Dilute samples.</p> <p>Evaporate solvents out of sample before freezing.</p> <p>Isolate the flask from room temp. with insulation or putting the flask inside a larger flask.</p>

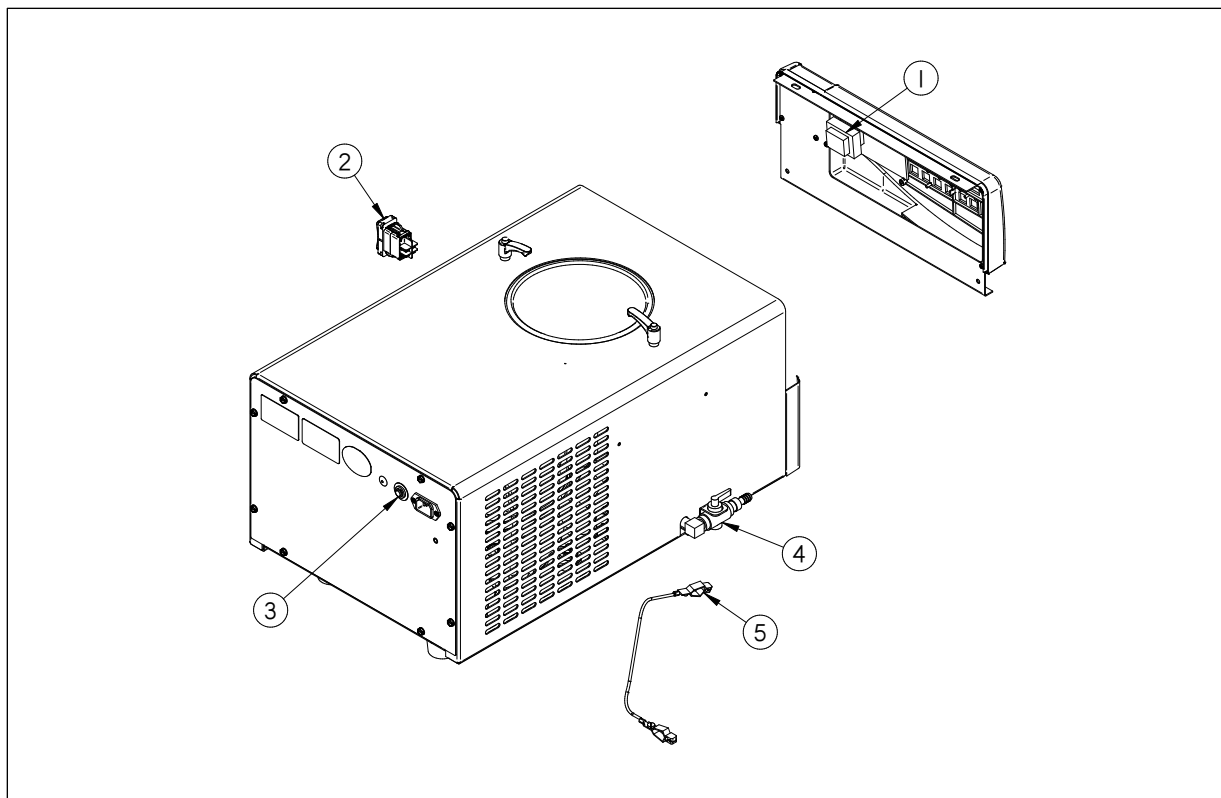
Appendix A: Parts List

Cold Trap -50 Models

Table A-1

Item	Quantity Required	Catalog Number	Description
1	1	7394400	Circuit Board
2	1	1307400	Switch
3	1	1327208	Circuit Breaker (115V)
3A	2	1327204	Circuit Breaker (230V)
4	1	1360500	Valve
5	1	7464600	Ground Wire Assembly
6	1	7515300	Temperature Sensor (not shown)

Figure A-1

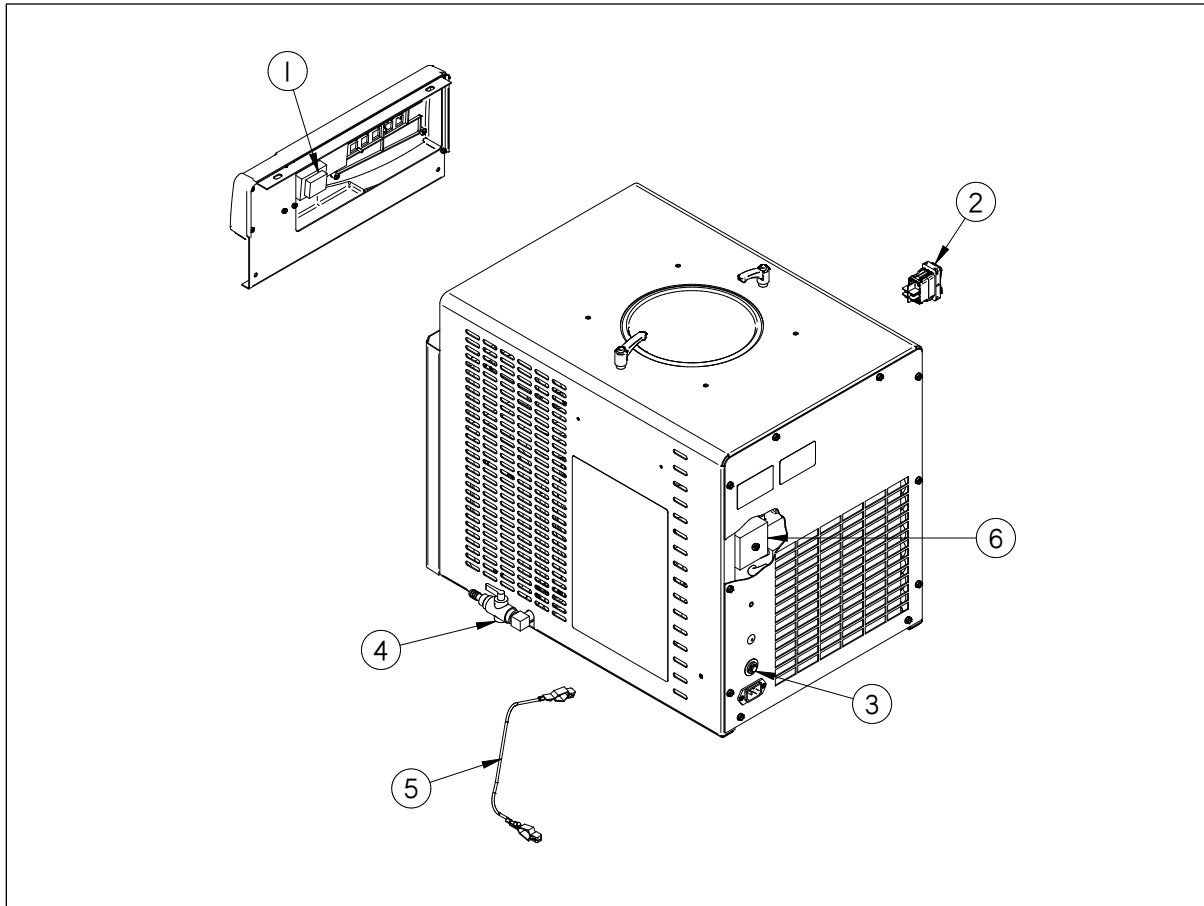


Cold Trap -84 Models

Table A-2

Item	Quantity Required	Catalog Number	Description
1	1	7394402	Circuit Board
2	1	1307400	Switch
3	1	1327207	Circuit Breaker (115V)
3A	2	1327208	Circuit Breaker (230V)
4	1	1360500	Valve
5	1	7464600	Ground Wire Assembly
6	1	7474200	Timer, 6 Minute Delay (115V)
6A	1	7474400	Timer, 6 Minute Delay (230V)
7	1	7515300	Temperature Sensor (not shown)

Figure A-2

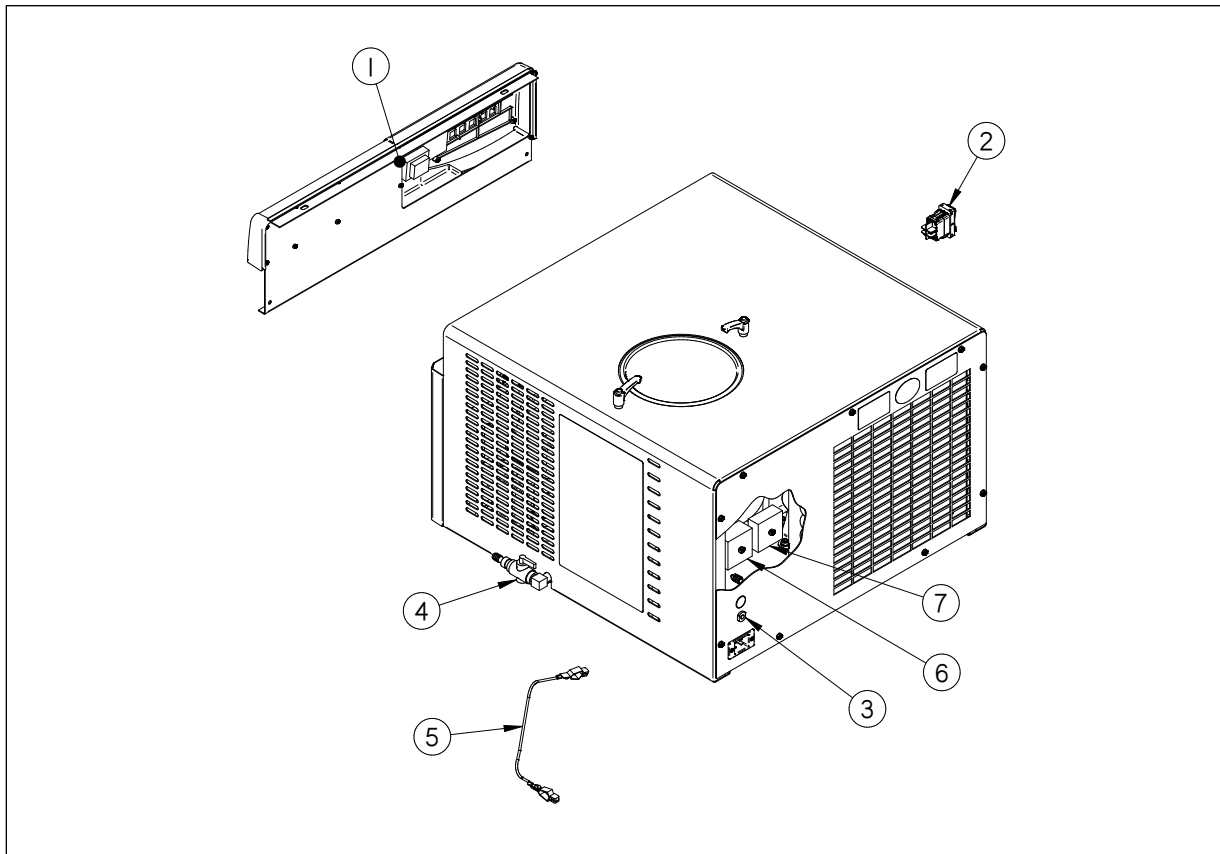


Cold Trap -105 Models

Table A-3

Item	Quantity Required	Catalog Number	Description
1	1	7394402	Circuit Board
2	1	1307400	Switch
3	1	1289315	Circuit Breaker (115V)
3A	2	1289308	Circuit Breaker (230V)
4	1	1360500	Valve
5	1	7464600	Ground Wire Assembly
6	1	7474200	Timer, 6 Minute Delay (115V)
6A	1	7474400	Timer, 6 Minute Delay (230V)
7	1	7480000	Timer, ON/OFF Recycle (115V)
7A	1	7480001	Timer, ON/OFF Recycle (230V)
8	1	7515300	Temperature Sensor (not shown)

Figure A-3

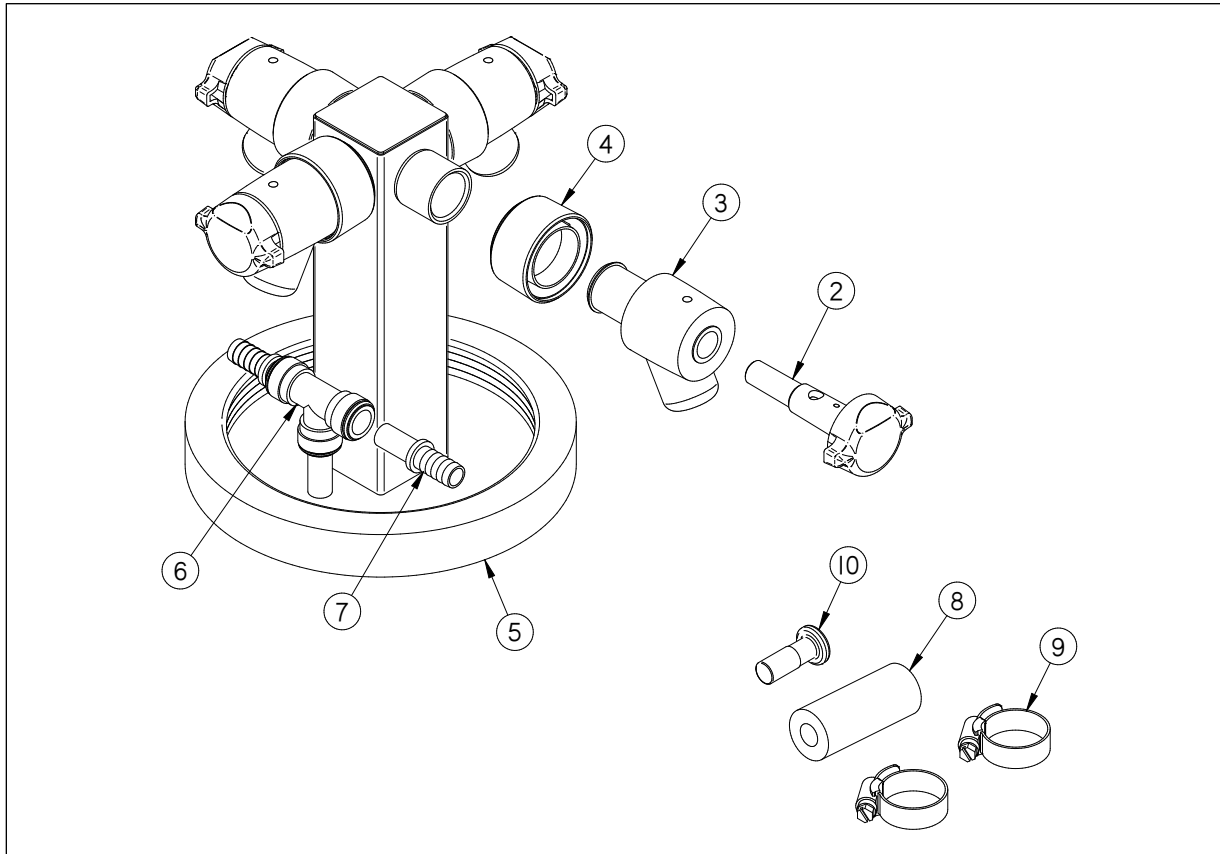


4 & 8 Port Manifold

Table A-4

Item	Quantity Required	Catalog Number	Description
1	1	7232800	4 Port Manifold (Complete)
1A	1	7232900	8 Port Manifold (Complete)
2	4 or 8	7508600	Knob & Stem Assembly
3	4 or 8	7505600	Valve Body
4	4 or 8	7506500	Trim Ring
5	1	7399400	Gasket
6	1	1548800	Tee Fitting
7	2	1554700	Stem, Tube to Hose ($\frac{1}{2}$ " x $\frac{1}{2}$ ")
8	1	7828608	Tubing, Clear PVC (3" long)
9	2	1488800	Hose Clamp
10	1	1548302	Plug ($\frac{1}{2}$ ")

Figure A-4



Appendix B: Dimensions

Figure B-1 illustrates the product dimensions for Cold Trap -50 Models

Figure B-1

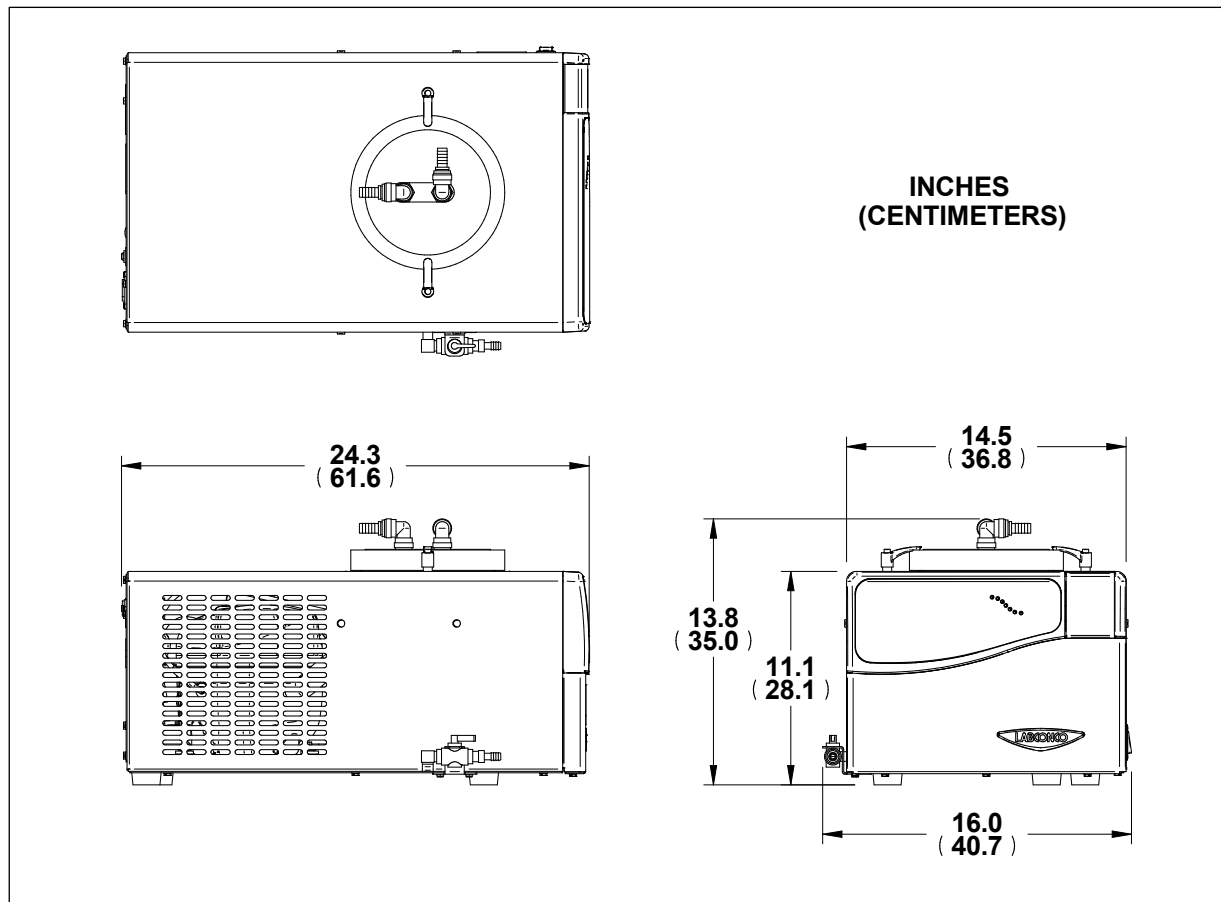


Figure B-2 illustrates the product dimensions for Cold Trap -84 Models

Figure B-2

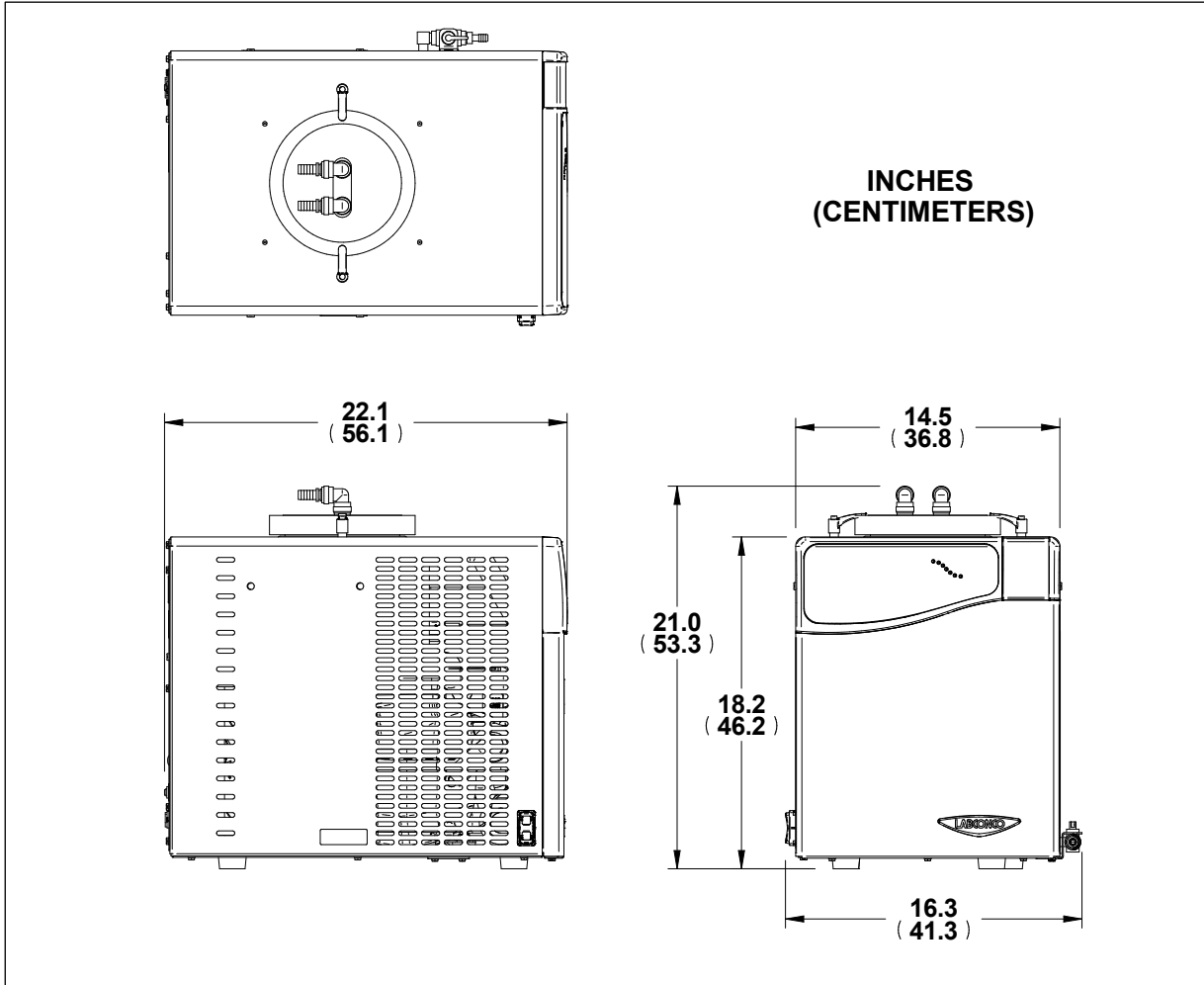


Figure B-3 illustrates the product dimensions for Cold Trap -105 Models

Figure B-3

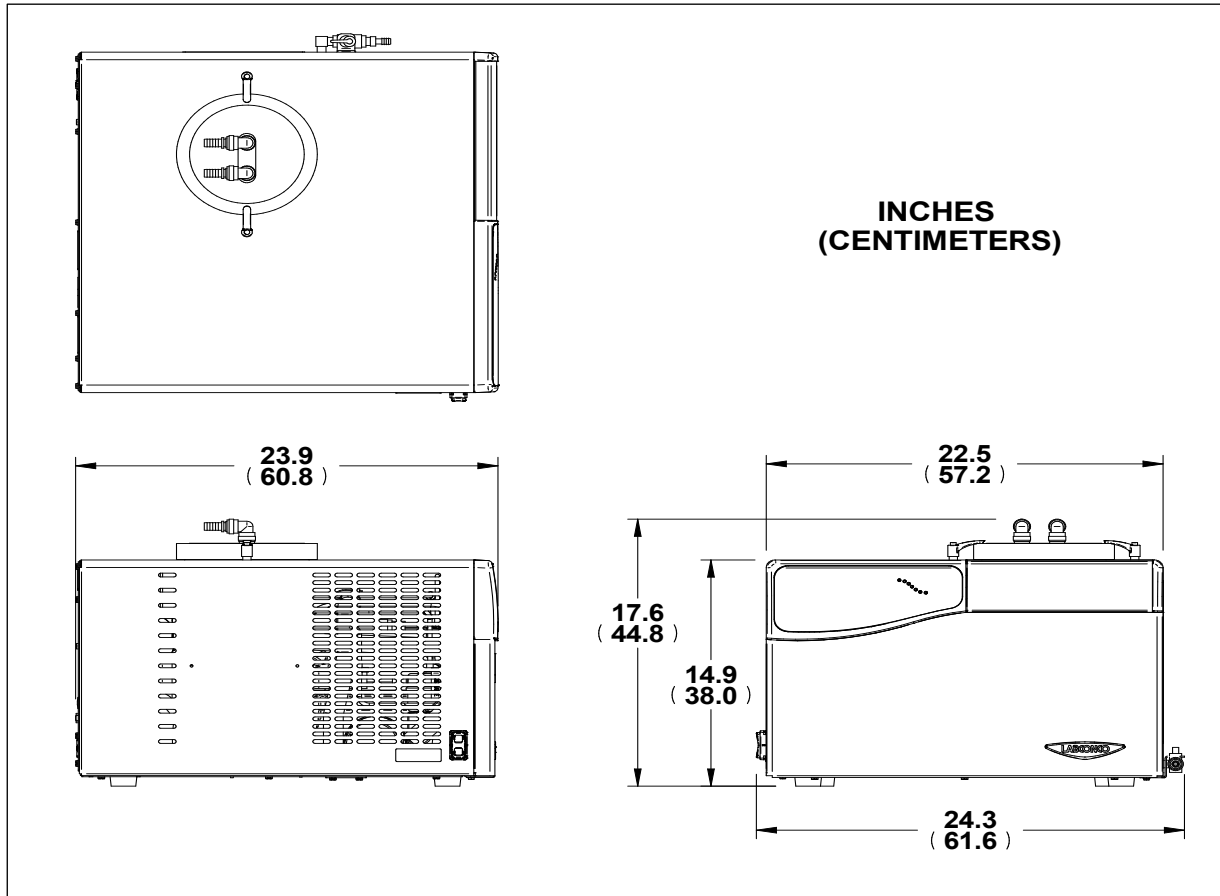
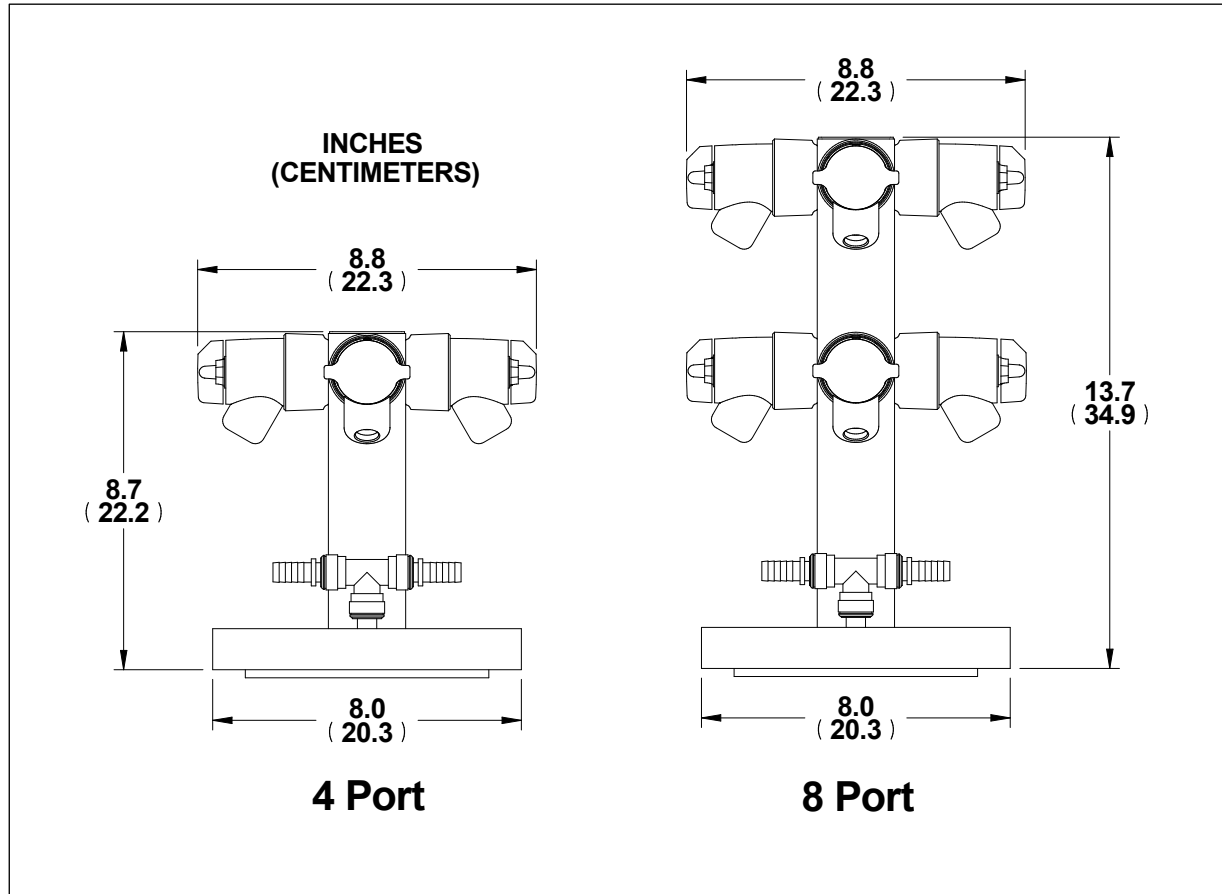


Figure B-4 illustrates the product dimensions for 4 & 8 Port Manifold

Figure B-4



Appendix C: Specifications

Power Data

Table C-1

Catalog Number (Cold Trap)	Normal Operating Power (Watts)
8601xxx	280 W
8611xxx	650 W
8621xxx	700 W

Environmental Conditions

These are conditions for safe operation of electrical components. Operating the unit outside of the optimal ambient temperature range of 70-75°F (21-24°C) can have a negative impact on the performance of the refrigeration system.

- Indoor use only
- Ambient temperature range: 41° to 104°F (5° to 40°C)
- Maximum relative humidity: 80% for temperatures up to 88°F (31°C), decreasing linearly to 50% relative humidity at 104°F (40°C)
- Main supply voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage
- Transient overvoltages according to Installation Categories II (Overvoltage Categories per IEC 1010). Temporary voltage spikes on the AC input line that may be as high as 1500V for 115V models and 2500V for 230V models are allowed
- Used in an environment of Pollution degrees 2 (i.e., where normally only non-conductive atmospheres are present). Occasionally, however, a temporary conductivity caused by condensation must be expected, in accordance with IEC 664