

# POLYCOLD SYSTEMS

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## HELIX TECHNOLOGY CORPORATION

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*Customer Instruction Manual*

## **POLYCOLD<sup>®</sup> Portable Crycooler Model P-75 & P-100**

Helix Polycold Systems Inc.  
3800 Lakeville Highway  
Petaluma, CA 94954  
U.S.A.

**Cool<sup>°</sup>Solutions<sup>®</sup>**

## P-75 & P-100 Customer Instruction Manual

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Cryotiger® is a registered trademark of Helix Technology Corporation.

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### Limited Warranty Terms

#### ***Helix Polycold Cooling Products, CryoTiger®, AquaTrap®, Polycold Compact Cooler, Repair Services and Certified Refurbished Products***

Helix Polycold cryogenic cooling products, including water vapor cryopumps (PFC, PCT, FLC, FI), chillers (PGC, PGCL), cryocoolers (P), CryoTiger, AquaTrap, Polycold Compact Cooler (PCC) and accessories, Certified Refurbished products (the “Products”) and Repair Service are warranted to be free from defects in materials and/or workmanship under normal service for the time period as set forth in Table A below from date of shipment from Helix Polycold Systems Inc. (“Polycold”). The warranty for Repair Service is limited to the component parts replaced or repair performed by Polycold at Polycold’s facility. Customer is responsible for all charges and expenses for Polycold Services provided at Customer’s location by Polycold technicians as set forth in a quotation. Certified Refurbished Products and warranty exchange Products are remanufactured to like-new condition and contain used parts and materials. Except as provided for elsewhere herein, Products are intended for use on Large Stationary Equipment only, other end-use by customer may void this warranty.

Table A

| Product                                                                                                                                     | New Product Warranty | Repair Warranty | Certified Refurbished Cryogenic Cooling Products | Spare Parts & Accessories |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|--------------------------------------------------|---------------------------|
| Cryotiger® Products and Systems<br>AquaTrap® Products and Systems<br>Polycold® Compact Cooler (PCC)                                         | 15 Months            | 12 Months       | N/A                                              | 12 months                 |
| Cryogenic cooling products, including:<br>Water vapor cryopumps (PFC, PCT, FLC, FI), chillers (PGC, PGCL), cryocoolers (P), and accessories | 24 Months            | 12 Months       | 12 months                                        | 12 months                 |

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All Polycold Products are subject to the Helix Polycold Systems Inc. General Terms and Conditions, an excerpt of which are set forth above.  
April 4, 2005

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# 1 INTRODUCTION

## 1.1 Basic 'Polycold' Refrigeration Cycle

This cooling process is a self-refrigerating cascade type. A mixture of non-flammable and safe halocarbon ("Freon") refrigerants is compressed and circulated by a compressor. In a simplified version, the 'Polycold' cycle comprises: (a) compressing a mixture of refrigerants, (b) partially condensing the higher boiling fractions in an air-cooled condenser, (c) withdrawing and throttling the condensate to produce cooling which condenses the remaining vapors in a special heat exchanger, (d) throttling and evaporating this latter condensate in a coil to produce cooling at very low temperatures, and (e) passing the refrigerant leaving the cooling coil back through the heat exchanger to the compressor.

Operating pressures and compressor temperatures are similar to those in air-conditioning systems. The compressor lubricating oil circulated with the discharge vapors is promptly returned to the compressor without reaching the very low temperature portions of the system. This eliminates the common problems of oil plugging in evaporators and expansion devices too frequently experienced in low temperature systems. The mixed refrigerant charge is hermetically sealed into the system; normally neither it nor the compressor lubricating oil requires replacement or recharging.

In this unit, there is a series of intermediate special heat exchangers (cascade condensers) between the air-cooled condenser and the final cooling coil (cold probe). There are several stages of partial condensation, phase separation, condensate throttling, and intermediate cooling. In addition, the system has a suction-side refrigerant vapor expansion tank and a discharge-side buffer tank to limit start-up discharge pressures.

## 2 SAFETY INFORMATION

Safety and limit devices are installed to protect your Polycold Portable Cryocooler. If any of these protective devices are triggered, the cause of the problem must first be identified and corrected before continuing to use your Polycold Portable cryocooler.

### **BYPASSING OR REPEATED RESETTING OF A PROTECTIVE DEVICE MAY VOID YOUR WARRANTY**

Please see the Trouble-Shooting Guide in your manual or consult a Polycold Service Center if you need help in determining the cause of any problem with your Polycold Portable cryocooler.

### **2.1 Danger, Warning, Caution and Notes**

Four types of special notices — **DANGER**, **WARNING**, **CAUTION**, and **NOTE** are used in this manual. They are defined as follows and appear throughout the text.



**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**

**CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Caution also is used to alert against unsafe practices and to alert personnel against equipment damage accidents.






**NOTE**

**NOTE** gives important, additional information, explanations or recommendations related to the appropriate procedure or discussion.

These special notices appear in the text where they are applicable.

## 2.2 Symbols on the Equipment

Symbols on the equipment and their descriptions:

-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_
-  \_\_\_\_\_

## 3 SPECIFICATIONS

# P-75 & P-100



## The Low-Cost Replacement for Liquid Nitrogen in Small Vacuum Systems

Now you can eliminate liquid nitrogen from your cold traps with Polycold Portable Cryocoolers. They use a Patented cascade refrigeration technology to cool cold traps for: multiple potential applications.

### The Polycold Cryocooler:

- Helium mass spectrometer leak detectors
- Mechanical pumps
- Chevron baffles for four - and six-inch diffusion pumps
- Small chamber cold/vapor trapping probes

### Polycold Portable Cryocoolers:

- Eliminate the cost, inconvenience and hazards of liquid nitrogen with comparable performance
- Provide high-speed pumping of water vapor to the  $10^{-7}$  torr range
- Are quickly and easily installed
- Give a fast payback through savings
- Effectively stop backstreaming
- Supply uninterrupted cooling of cryosurfaces

Polycold Portable Cryocoolers provide compact, portable, easy-to-use alternatives to liquid nitrogen in small vacuum systems. These cryogenerators use safe, non-flammable, non-toxic refrigerants in a closed-loop system. This means no moving of heavy dewars and no running out of liquid nitrogen with resultant downtime.

Cold probes or chevron baffles (cryosurfaces) are integral to the refrigerant line and are not detachable from it without loss of refrigerant. Cryosurfaces for all major leak detectors and other small vacuum systems are available from Polycold. If the cryosurface is obtained elsewhere and is shipped to Polycold postpaid, Polycold will intergrate it and test the entire system at no added cost.



*P-100 with 6" CB6 Baffle*

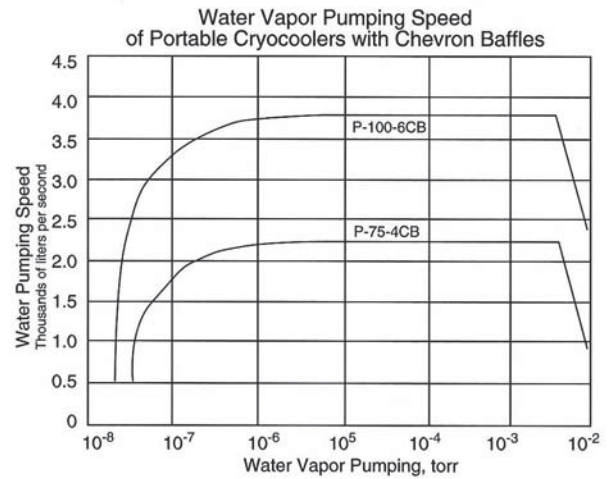


Installation is quick and easy. The cold trap is inserted into the housing, or the baffle is installed between the diffusion pump and the high-vacuum valve.

Polycold Portable Cryocoolers are available in two models to suit your requirements. They provide effective cooling for many applications where temperatures from -90°C to -130°C are required.

Please refer to our price list for price and option details. A lease/purchase option is also available.

If you have an unusual or non-vacuum-related application for cooling that requires temperatures in the range of -90°C to -150°C. Contact our Applications Engineering Department for recommendations.



| CRYOCOOLER SPECIFICATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------|
| Physical Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Model              | Model           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P-75               | P-100           |
| Cool down time, hr.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.4                | 1.5             |
| Flex line length, in (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 54 (1372)          | 54 (1372)       |
| Dimensions:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                 |
| Width, in (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 20.5 (521)         | 20.5 (521)      |
| Depth, in (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 17.3 (440)         | 17.3 (440)      |
| Height, in (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 32.5 (826)         | 32.5 (826)      |
| Weights, with lines, lb (kg)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 180 (82)           | 180 (82)        |
| Utitlites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |                 |
| Standard electrical, +/-10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 115-120/1/50-60    | Not available   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | or 208-230/1/50-60 | 208-230/1/50-60 |
| Current, amp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 12 or 6.5          | 7.5             |
| Cooling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | forced air         | forced air      |
| <p><b>Baffles and Cold Probes</b><br/>                     Chevron Baffles, opaque, low-profile, spool piece style<br/>                     -4 CB, nominal 4-inch chevron baffle, p/n 460000<br/>                     -6 CB, nominal 6-inch chevron baffle, p/n 460003- for use with P-100 only</p> <p><b>Cold Probes</b><br/>                     Trap housing for mechanical pumps traps, p/n 461002<br/>                     Cold probe, stainless steel, "Easy Clean", p/n 462021<br/>                     Cold probe, nickel-plated copper with coil on exterior of mandrel, p/n 462023</p> |                    |                 |

## 4 INSTALLATION

### 4.1 Installation

Carefully remove the packaging materials and visually inspect the unit for shipping damage. The flexible line to the cold probe should have no sharp bends nor signs of broken tubing. Plug the unit into a suitable power circuit.

### 4.2 Start-up and Operation

Start the unit by turning on the switch. The compressor and condenser fan should start running. Within about 5-10 minutes, cooling should commence in the cold probe. If the compressor turns off during initial start up, turn the switch off for 5-10 minutes, then restart. It is best not to operate the unit for more than 15 minutes with the cold probe out of a vacuum system because of moisture accumulation.

Turn off the unit, warm the cold probe and dry it off. Remove the liquid nitrogen cold trap from the vacuum system and insert the cold probe in its place. Make certain there are no sharp bends or strains on the flexible insulated line leading to the cold probe. Rough the vacuum system down. Then turn on the 'Polycold' unit. Be careful not to bend the insulated flex line appreciably after the unit has chilled down the probe and line. This can lead to cracks in the insulation. The system may be operating continuously. It should be turned off any time the fore- or roughing pump(s) are to be turned off.

### 4.3 Defrosting

If vacuum pump-down times or ultimate levels degrade, the cold probe may have accumulated enough frost to affect performance. To defrost, close the high vacuum valve and turn off the 'Polycold' unit. The diffusion pump may be left on or turned off at the user's option, but the fore-pump should be left on to remove the evaporating moisture from the system. Overnight defrosting is suggested. After defrosting, the 'Polycold' unit can then be turned back on, then the diffusion pump restarted if it also was turned off. Many applications have low moisture loads and continuous operation for months is possible without defrosting. Those systems with very heavy moisture loads may require weekly defrosting.

## 5 MAINTENANCE

### 5.1 Maintenance and Periodic Inspections

The only component requiring maintenance is the air-cooled condenser. It should be kept clean enough for free air flow through it. Accumulated dirt or lint may be removed by brushing, vacuum cleaning or with a compressed air blow-gun. Inspect the condenser face about weekly for the first month then monthly thereafter to determine the cleaning frequency which will be required.

The compressor and condenser fan motors are lifetime lubricated and do not require regular oiling. If practical, the temperature of the compressor should be checked every several months by feeling it. It should be possible to hold a hand on top of it for a few seconds. Also there should be no frost accumulation on the suction valve on the side of the compressor.

## 6 TROUBLE SHOOTING

### **WARNING**

**AVOID ELECTRIC SHOCK.** Permit only qualified electrical technicians to open electrical enclosures, to perform electrical checks, or to perform tests with the power supply connected and wiring exposed. Failure to observe this warning can result in injury or death.

### **WARNING**

**AVOID ELECTRIC SHOCK.** Disconnect the power to the compressor before troubleshooting the electrical components.

### **WARNING**

**AVOID ELECTRIC SHOCK.** Touching a fully charged capacitor can cause severe electrical shock resulting in injury or death.

### **CAUTION**

**PRESERVE YOUR WARRANTY.** Modification to equipment without the consent of the manufacturer will void the warranty.

### **CAUTION**

**FOLLOW ALL LOCKOUT/TAGOUT PROCEDURE** for your facility when servicing the equipment.

The Troubleshooting Guide that follows lists problems which can occur with the system components and suggests causes and corrective actions.

| <b>Problem</b>                                                                       | <b>Possible Cause</b>                     | <b>Corrective Action</b>                                                                                               |
|--------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Compressor does not start when turned on and there is no noise                       | No electrical power to unit               | Determine reason and correct cause. Replace blown fuses. Measure operating current. Check fuse or circuit breaker size |
|                                                                                      | Loose wiring                              | Check internal wiring for continuity. Tighten any loose connections                                                    |
| Unit will not start when turned on; compressor hums then trips on overload protector | Low voltage at unit                       | Determine reason and correct. Check branch circuit wire size                                                           |
|                                                                                      | Starting capacitor defective              | Determine reason and replace                                                                                           |
|                                                                                      | Relay failing to close                    | Determine reason and correct, replace if necessary                                                                     |
|                                                                                      | Compressor has a winding open or shorted  | Check and replace compressor. Contact a Polycold Service Center for details                                            |
|                                                                                      | Internal mechanical trouble in compressor | Check and replace compressor. Contact a Polycold Service Center for details                                            |
| Compressor starts but does not switch off start winding                              | Low voltage to unit                       | Determine reason and correct                                                                                           |
|                                                                                      | Relay failing to open                     | Determine reason and correct. replace relay if necessary                                                               |
|                                                                                      | Compressor has a winding open or shorted  | Check and replace compressor. Contact a Polycold Service Center for details                                            |
|                                                                                      | Internal mechanical trouble in compressor | Check and replace compressor. Contact a Polycold Service Center for details                                            |
| Compressor starts and runs, but short cycles on overload protector                   | Low voltage to unit                       | Determine reason and correct                                                                                           |
|                                                                                      | Overload protector defective              | Check current, replace protector                                                                                       |
|                                                                                      | Excessive discharge pressure              | Check for cleanliness of condenser. Clean if necessary. Check operation of fan motor. Replace if necessary             |
|                                                                                      | Compressor too hot - suction gas hot      | Carefully add 1-2 oz of R-12 (no more). If Still hot contact a Polycold Service Center for recommendations             |
|                                                                                      | Compressor has a winding shorted          | Check and replace compressor. Contact a Polycold Service Center for details                                            |

| <b>Problem</b>                         | <b>Possible Cause</b>                                  | <b>Corrective Action</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inadequate cooling of cold probe       | Excessive heat load on cold probe                      | Check to be certain probe is in proper ambient pressure (1 torr or deeper vacuum); see if there is excessive external frosting of trap housing. Defrost probe and retest results. Contact a Polycold Service Center if in doubt                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                        | Unit has lost portion of refrigerant charge in mixture | Shut off unit. HAllogen leak test entire unit. If leaks are found, turn unit back on and feel discharge line from compressor. It should get hot. If not, install service gauge manifold (see section 7) and check non-operating pressure of system. It should be about 90 psig. If pressure is near zero, pressurize with any available Freon refrigerant to at least 40-60 psig and retest. Repair leak and recharge (see section 8)                                                                                                                                                                                                                                     |
|                                        | Compressor has a broken valve                          | Install service gauge manifold (see section 7) and check operation. Normal operating pressures are 20-25 psig suction, and 170-185 psig discharge. If suction pressure is higher than normal and discharge is normal or lower, a broken valve is indicated. To verify, close suction service valve completely and operate compressor. It should pump the suction pressure down to about 10-15 in. Hg vacuum and hold low pressure when turned off. If it cannot pump down and/or suction pressure rises at a steady rate after turning compressor off, a valve in the compressor is definitely broken. Replace compressor. Contact a Polycold Service Center for details. |
| Start capacitor open, shorted or blown | Relay contacts not operating properly                  | Clean contacts or replace relay if necessary. Replace capacitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                        | Prolonged operation on start cycle due to low voltage  | Determine reason and correct. Replace relay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Relay defective or burned out          | Line voltage too high or too low                       | Determine reason and correct. Replace relay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| <b>Problem</b> | <b>Possible Cause</b>   | <b>Corrective Action</b>     |
|----------------|-------------------------|------------------------------|
| Unit noisy     | Loose parts or mounting | Find and tighten             |
|                | Tubing rattle           | Reform to be free of contact |
|                | Bent fan blade          | Replace blade                |
|                | Loose fan blade         | Tighten nut on motor shaft   |
|                | Worn fan motor bearing  | Replace fan motor            |

## 7 SERVICE

### 7.1 Service Gauge Manifold Installation

Remove the seal cap on the access port of the compressor suction service valve and connect the suction (“low-side”) hose from the manifold to it. Remove the seal cap on the access port of the valve found on the side of the discharge “buffer” tank (approximately 3 1/2” OD x 8-10” high) and connect the discharge (“high-side”) hose from the manifold to it. Be certain NOT to connect this hose to the valve on the expansion tank which is about 5” OD x 10” high and is connected internally to the suction side of the system. Remove the caps covering the valve stems and turn each valve closed (clockwise) two or three turns (away from the back seating position). It is helpful to have small adjustable and 1/4” square drive (valve) wrenches.

For manifold removal, fully back-seat both valves on the unit by turning them counterclockwise. Remove the hoses and put the seal caps back on the service ports and over valve stems. Leak check the valves and ports to be certain the system is tight.

### 7.2 Recharging the Refrigerant Circuit

The refrigeration system has been hermetically sealed at the factory. If the unit has lost cooling capacity and it has been determined from Section 6. Above, the most likely cause is a partial refrigerant loss, the unit may be field recharged after repairing a leak. Call or write to a Polycold Service Center for a set of refrigerant field recharge instructions. A complete charge is available in a cylinder or the individual refrigerant components can be charged at the jobsite.

### 7.3 Wiring Diagram

Please see diagram inside cover of starting component box for compressor. An on-off line switch is installed between the line cord and compressor for operation of the unit.



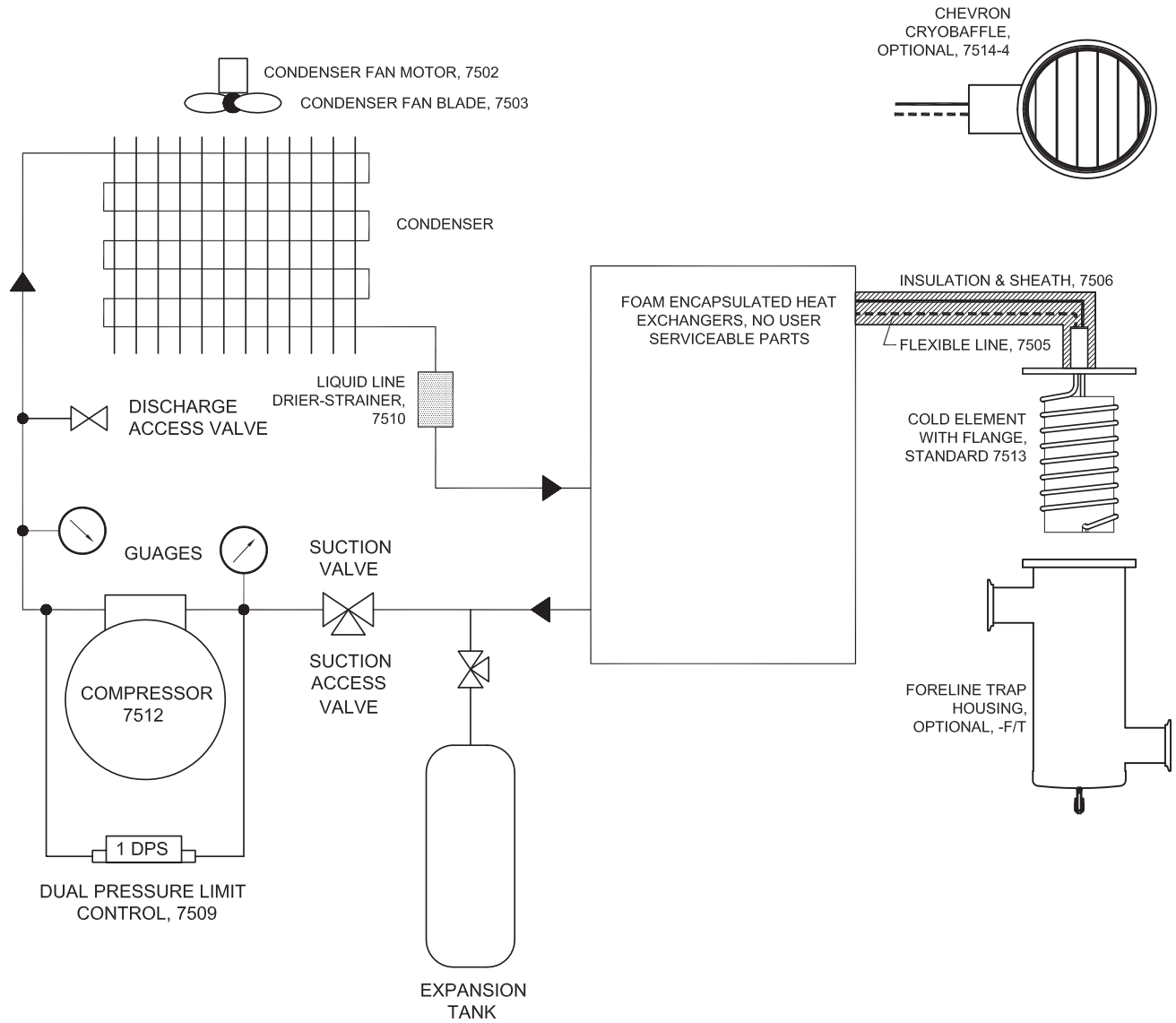


Figure 1 System Diagram P75

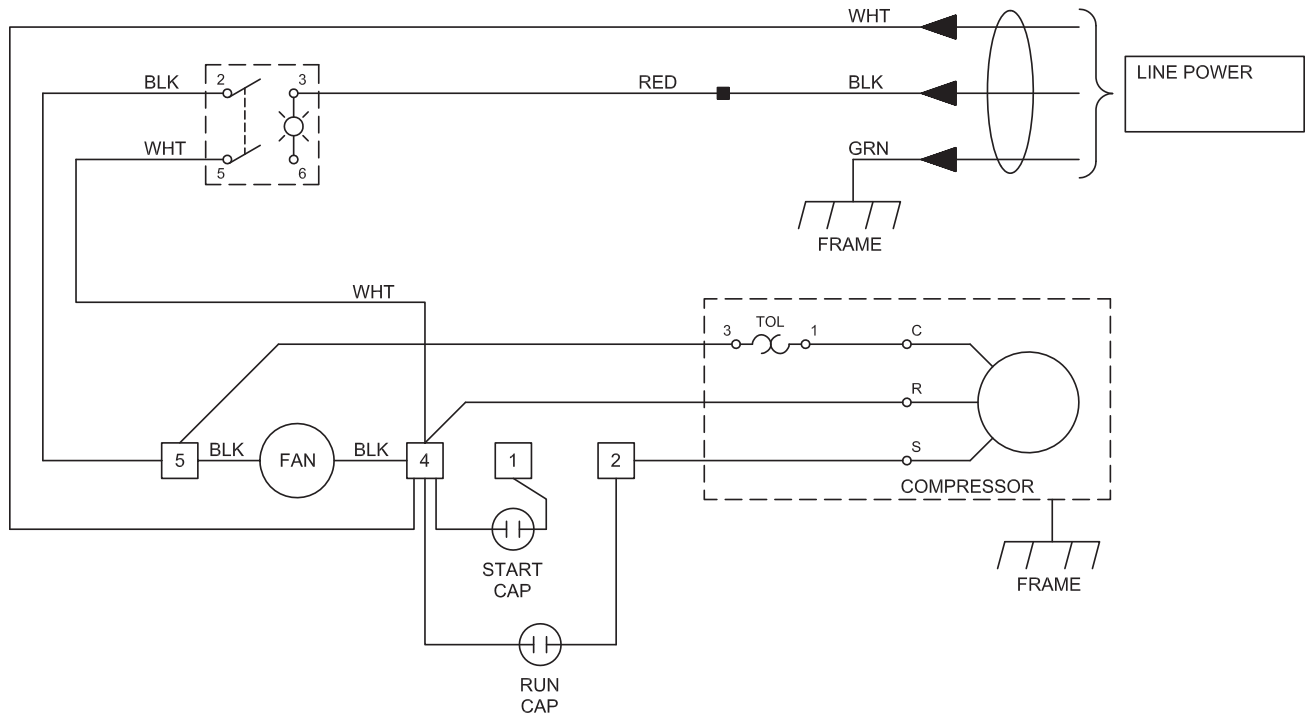


Figure 2 Circuit Diagram P-100

## 7.4 Service

### HEADQUARTERS

Helix Polycold Systems Inc.  
 3800 Lakeville Highway  
 Petaluma, CA 94954  
 U.S.A.

Tel: 707-769-7000  
 Fax: 707-769-1380  
 E-mail: Sales@polycold.com

### SERVICE CENTERS

#### Western U.S.A.

Helix Polycold Systems Inc.  
 3800 Lakeville Highway  
 Petaluma, CA 94954  
 U.S.A.

Tel: 707-769-7000  
 Fax: 707-769-1380

## 8 REFRIGERANT FIELD RECHARGE PROCEDURE

FOR P-75/P-100 Cryocoolers, PFC Cryopumps, and PGC-75/PGC-100 Gas Chillers

---

### Tools & materials required:

- Polycold® premixed refrigerant charge
  - electronic halogen leak detector (TIF 5500 or equivalent)
  - cylinder of halogen gas (R-22)
  - cylinder of dry nitrogen gas with a pressure regulator
  - manifold gauge set with five hoses (two extra) and a 1/4" male flare tee--The end of the discharge hose must have a push-pin for opening the Schraeder access valve in the discharge line.
  - vacuum pump capable of pumping down to at least 50 microns
  - adjustable wrench
  - ratchet valve wrench
  - any additional equipment/personnel required by your local codes to remove the refrigerant (See step 8.3)
- 

### 8.1 Before you start

The procedure assumes a basic understanding of equipment and techniques used in the refrigeration industry. Review the entire procedure at this time; make certain you understand the instructions.

Verify you have the correct charge for your model. -Compare the label on the premix tank to the nameplate on your unit.

Turn off the unit. Wait at least 12-18 hours for it to warm up to room temperature. (the heat exchanger section is well insulated and requires a long time to soak up heat from the ambient)

Remove the access panel to the compressor space.

### 8.2 Install the manifold gauge set

Remove the valve-stem caps on the compressor suction service valve and on the refrigerant expansion (larger) tank valve\*. Make certain that both valves are fully back-seated with their access ports closed.

Remove the access port caps on:

- a) the discharge line Shraeder valve,
- b) the compressor suction service valve, and
- c) the refrigerant expansion tank valve\*.

Assure both manifold valves are closed. Connect the manifold's discharge (high-pressure) hose to the discharge line. Make certain the push-pin opens the discharge access valve when attaching the hose.

Connect the flare tee to the manifold's suction (low-pressure) hose\*. Attach the two extra hoses to the tee\*. Connect one hose to the compressor suction service valve, and the other hose to the refrigerant expansion tank valve\*.

#### NOTE

This direct hose connection (from the refrigerant expansion tank to the compressor suction) provides a bypass around the internal restrictor tube in the unit. This permits complete evacuation and charging of the expansion tank.

Open both the refrigerant expansion tank and the compressor suction service valves by turning them two (2) turns clockwise (away from their backseats)\*. (all parts of the systems are now fully open to the manifold.)

### 8.3 Recover any remaining refrigerant from the system

Remove the refrigerant according to your local codes. (open both manifold valves to discharge the refrigerant through the manifold's center hose.)

### 8.4 Leak check the system

Connect the R-22 cylinder to the manifold's center hose. Open both manifold valves and the cylinder valve to pressurize the system to 10-20 psig. Close the manifold and cylinder valves and remove the R-22 cylinder from the center hose. Attach a nitrogen cylinder with regulator to the hose and increase the system pressure to about 100 psig. Leak check the entire system with the electronic halogen leak detector. Make sure the system is completely leak-free before proceeding further.

\*Units manufactured before July 1985 do not have a valve on the refrigerant expansion tank and above references to its connection do not apply. The third hose is not used--only the one to the compressor suction service valve is used.

## 8.5 Adjust the low pressure cutout switch (if the unit has one)

Note and mark the setting of the low pressure indicator. Adjust its setting to the vacuum end of its range. (This allows compressor operation without the pressure cutout stopping it, for both rough evacuation of the system and pumping down the recharge cylinder.)

## 8.6 Evacuate the system

### Preliminary Evacuation:

(This step is not mandatory, however, it is recommended because it keeps vacuum pumps from being contaminated by refrigerants.)

Remove the nitrogen cylinder from the manifold's center hose. Blow out all vapors/gases from the system by opening both manifold valves. Then close the manifold suction valve. Operate the compressor for 1 to 2 minutes to rough exvacuate the system through the open manifold discharge valve and the manifold's unconnected center hose. Turn off the compressor and promptly close the manifold discharge valve to prevent air from entering the system. Observe the suction pressure. It should be below 10 inches Hg vacuum.

DO NOT OPERATE THE COMPRESSOR LONGER THAN 3-5 MINUTES IN A VACUUM  
It does not have enough motor cooling under these conditions.

### Deep Evacuation:

Connect the vacuum pump to the manifold's center hose and turn on the pump. Open both manifold valves and evacuate the system for at least 15 minutes (preferably 30 minutes) after the suction pressure gauge reaches about 30 inches Hg vacuum. Close both manifold valves.

## 8.7 Blot up/sweep out any moisture remaining in the system

Connect the nitrogen cylinder to the manifold's center hose. Open the manifold suction valve and re-pressurize the system to a slightly positive pressure of 5-10 psig. Allow the system to stand for 10-15 minutes.

## 8.8 Evacuate the system again

Repeat step 8.6. The system must be evacuated to 100 microns to assure that it is clean and dry.

Note: if the refrigerant circuit:

- a) Has been open to atmosphere for a long time,
- b) Has operated in a way which could draw in large amounts of moist air, or
- c) Shows evidence of compressor oil contamination,

Then you must perform a more thorough evacuation cycle. Please contact a Polycold Service Center for details.

## 8.9 Recharge the system

Connect the cylinder of premixed refrigerant charge to the manifold's center hose. To remove air from the hose, loosen the manifold end of this hose slightly and purge the hose by momentarily opening the cylinder valve (not more than 1-2 seconds with the valve only slightly open). Immediately tighten the manifold end of the hose.

With both manifold valves still closed, open the cylinder valve and turn the cylinder upside down so all of its liquid will flow into the system. Open the manifold discharge valve and allow the liquid & vapor mixture to flow into the discharge side of the evacuated system until the cylinder and systems pressures have equalized. This should happen within five minutes.

Operate the compressor until the cylinder is pumped down to 5-10 inches Hg vacuum, as shown by the manifold's suction gauge. Close both the cylinder & manifold suction valves, and turn off the compressor. Open the compressor suction service valve. The unit's balance pressure should be 120-135 psig. This pressure may change after running the compressor.

## 8.10 Check the system operation

Turn on the unit. Start-up pressures should be 10-25psig suction and 250-310 psig discharge (350 psig discharge if a PGC-100). When the unit reaches operating temperatures, pressures are about 10-25 psig suction and 140-220 psig discharge depending upon thermal load. Also the suction line to the compressor should be frosty or cold.

If the start-up discharge pressure rises above 335 psig (370 psig for a PGC-100) or the compressor has difficulty starting, check the fan for proper operation and the condenser for cleanliness. If these are all right, purge a little refrigerant from the suction side by momentarily opening the manifold suction valve with the center hose loose.

## 8.11 Readjust the low pressure cutout switch (if the unit has one)

Turn the low pressure adjustment back to the mark you made in step 8.5 above. Check the setting by throttling the suction and operating the compressor. Do this by closing the compressor suction service valve, and then turning on the compressor.

The low pressure cutout should stop the compressor when the suction pressure falls below about 2 psig. Reopen the compressor suction service valve. Press the cutout's reset button to restart the unit.

### **8.12 Remove the manifold gauge set**

Turn off the unit. Fully back-seat the compressor suction service valve. Check the expansion tank valve to make certain it is back-seated. Remove the hoses and tightly replace all the seal caps on the access fittings and valves.

### **8.13 Check the system for leaks again**

Carefully leak check all fittings, valve stems and caps. The system is now ready for operation.

### **8.14 Properly dispose of Polycold's refrigerant cylinder**

Each cylinder contains one complete refrigerant charge and is designed for one-time use only. The cylinders are disposable and must not be refilled. Make certain they are properly disposed of when empty--they should be rendered useless by puncturing them. They are absolutely not suitable for compressed air tanks!