READ THE MANUAL ! UNDERSTAND ALL SAFETY CONCERNS !





WATER VAPOR CRYO-CHILLER INSTRUCTION MANUAL

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How to recharge your Cryochiller

Required items:

- 1) Refrigeration service "manifold".
- 2) Charge recovery system.
- 3) Dry nitrogen gas. If a high pressure cylinder is used, a pressure regulator will be needed
- 4) Cylinder of leak detectable gas
- 5) Halogen leak detector for refrigerants.
- 6) Leak check soap
- 7) Vacuum pump capable of 5 x 10^{-2} Torr or 50 microns.

Insure Technician is properly certified and follows your countries local Laws when doing any refrigerant recovery.

Gas charge recovery units

- There are many different models of gas recovery units available on line or at any HVAC parts center.
- This will be used to recover any gas charge left in your unit if required for service
- This will be used to pump in the gas charge from your tanks or tanks of gas charge to make sure your full gas charge is filled into the Cryochillers.





Refrigeration service manifold

- There are many different models of service manifolds available on line or at any HVAC parts center.
- There is a low side (blue color)gauge and a high side (red)gauge. The low side will be connected to the Suction side of the compressor and the high side will be connected to the discharge side of the compressor
- This will be used to add gas to units, for leak check purposes or refilling gas charges to the cryochiller.

Refrigeration Vacuum pump





- There are many different models of vacuum pumps available on line or at any HVAC parts center.
- With proper adaptors you can use the vacuum pump on your vacuum coating system
- There are many portable refrigeration vacuum pumps available too

Understanding valves on the compressor

- The following terms will be used to describe the position of the 3 way compressor service value:
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- Back Seated Position: Turn valve stem counter-clockwise until the valve stem is fully extended. This closes off the service port (the small port on the side of the valve with the brass blank off nut).
- •
- **Mid Seated**: From the backseat (per above) turn the valve stem three turns clockwise. This allows refrigerant to flow to the service port. This is a common position during servicing.
- ullet
- Front Seated Position: Turn valve stem clockwise until fully shortened. This stops any flow of refrigerant. THE COMPRESSOR SHOULD NOT BE RUN WITH THE VALVE IN THIS POSITION.

Compressor valve back seated

 Turn valve stem counter-clockwise until the valve stem is fully extended. This closes off the service port (the small port on the side of the valve with the brass blank off nut).



Compressor valve Mid seated

 From the backseat (per above) turn the valve stem three turns clockwise. This allows refrigerant to flow to the service port. This is a common position during servicing.



Compressor valve front seated

 Turn valve stem clockwise until fully shortened. This stops any flow of refrigerant. THE COMPRESSOR SHOULD NOT BE RUN WITH THE VALVE IN THIS POSITION.



Lets get started

- **<u>Step #1</u>** Check the Cryochiller for Leaks.
- You must locate the source of leak before putting new a charge into the Cryochiller
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- Remove side panels to access compressor area.
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- Leak check the full system before adjusting any valves or installing the manifold. You don't want to inveterately fix the leak by adjusting a valve before you find the leak. Leak test the line and coil as well as the TVP. Check the water side of the condenser by removing the water lines and blowing out the water.

- **<u>Step #2</u>** Connect the Manifold to the Unit
- Insure Manifold's valves are closed.
- Connect the manifolds suction hose to the compressors suction service valve.
- Connect the manifolds discharge hose to the compressor's discharge service valve.
- Midseat the compressors suction and discharge service valves.

Discharge valve Bitzer Comp. Suction valve Bitzer Comp.



Suction valve Emerson Comp. Discharge valve Emerson Comp.



<u>Step #3</u> Recover Any Remaining Refrigerant from the Unit

You may need one or two recovery cylinders depending on how much gas in the Cryochiller. Remove the cap from the recovery cylinder's vapor access port (the one with the blue hand valve). Evacuate each recovery cylinder according to the cylinder manufacturer's instructions. Follow all local and federal codes. US federal law requires that cylinders be evacuated to 25-29 Hg vacuum.

•Connect the manifold's center port to your charge recovery system's inlet. Connect a recovery cylinder to the outlet of your charge recovery system. (If the discharge side of your recovery system does not have a pressure gauge, install a gauge between your recovery system and the cylinder.) Connect the suction side of the manifold to the suction valve on the compressor.

•Open the valves on the manifold and on the recovery cylinder. Turn on the charge recovery system to pump the refrigerant out of the Cryochiller.

When the recovery cylinder is filled to its rated pressure, turn off the charge recovery system. Close the valves on the recovery system and on the recovery cylinder. Remove the full recovery cylinder and connect an empty recovery cylinder. Continue this process until the unit is evacuated to the required level (per your local codes or to US federal law which requires refrigerant to be recovered to 10 inches Hg vacuum.)

•Re-install the flare cap on the recovery cylinder's vapor access port.

- **<u>Step #4</u>** Re-Check the Cryochiller for Leaks.
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- Connect the trace gas cylinder to the manifolds enter hose. Open both manifold values and the cylinder value to pressurize the unit to 10 to 20 psig (70 – 140 kPa). Close both manifold values and the trace gas cylinder value. Remove the gas cylinder from the center hose.
- Attach the dry nitrogen to the manifold's center hose. Open both manifold valves and the cylinder valve and increase pressure in the unit to 250 to 350 psig.
- Check the entire system (including lines and in-chamber cryo coil) for leaks with the halogen leak detector. Insure that there are no leaks anywhere in the system.
- If possible hold pressure for 24 to 48 hours to confirm system is not leaking
- Closing hand valves on front of unit, the Cryochiller can be isolated from the coil output side. Doing this can help confirm if the leak is in the Cryochiller or the attached line set(s) and coil(s).
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- <u>Step #5</u> Evacuate the Cryochiller.
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- Turn on the unit and allow the compressor to run for 30 seconds.
- Remove the dry nitrogen connection from the manifold's center hose. Release the vapors/gasses from the unit by opening both manifold valves.
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- Connect the vacuum pump to the manifold's center hose and turn on the pump. Evacuate the system to at least 2.5 inches Hg vacuum (17 kPa). Continue pumping for another 30 minutes. Upon finishing, close both manifold valves.

Evacuate the unit for a second time

- Connect the dry nitrogen to the manifold's center hose. Open the manifold's suction valve and pressurize to 100 – 120 psig. Turn on the unit and allow the compressor to run for 30 seconds.
- Remove the dry nitrogen connection from the manifold's center hose. Release the vapors/gasses from the unit by opening both manifold valves.
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- Connect the vacuum pump to the manifold's center hose and turn on the pump. Evacuate the system to at least 0.1 Torr or 100 microns (13 Pa) to insure it is completely clean and dry. Use caution to prevent any contaminants from entering the system while connecting or disconnecting any part of the unit or manifold.



- The full gas charge can come in disposable cylinders or in a reusable cylinder.
- Depending on your countries laws and what Cryochiller model you have this can be from 1 to 3 tanks for a full gas charge.

Disposable cylinders 2-3 per charge



Re-fillable cylinder 1 per charge



- <u>Step #6</u> Recharge the Cryochiller
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- Insure manifold's values are closed. Insure the compressor's suction and discharge values are in the midseated position.
- Connect tank #1 of the replacement refrigerant charge to the manifold's center hose.
- Purge the manifold's center hose of air: loosen the hose where it connects to the manifold; slightly open the cylinder's valve for no more than 1 to 2 seconds; then immediately tighten the hose at the manifold.
- Open the cylinder valve. Turn the cylinder upside down so that the liquid refrigerant will be drawn into the unit first. If using a refillable tank connect to the liquid side of the gas cylinder.
- Open the manifold's discharge valve. Wait for the pressure to equalize (suction and discharge gauge's would show the same pressure). The pressures should equalize within 2 minutes.
- Close the manifold's discharge valve.
- Repeat steps 1 6 for Tank #2 and Tank #3 of the replacement refrigerant charge if applicable.
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- You will need to draw the remaining gas out of the cylinders. This can be accomplished one of the following ways:
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Charging with disposable tank using recovery pump



Charging with refillable tank using recovery pump



• A) <u>With a charge recovery system (preferred)</u>

- A1) Connect the manifold's center port to the outlet of your charge recovery system. Connect cylinder #1 to the inlet of your charge recovery system. Purge hoses of air.
- A2) Open the valves on the manifold and on the cylinder. Turn on the charge recovery system to pump the refrigerant into the Cryochiller.
- A3) Repeat above steps for Tank #2 and Tank #3 of the replacement refrigerant charge, if applicable . Stop charging when the replacement charge cylinder is empty .

- B) Using the Cryochiller compressor
- B1) Connect Tank #1 to the manifold's center port.
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- B2) Start compressor and open the manifold's suction valve and the valve on tank #1.
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- B3) When the system reaches the Standby Ready mode, close the manifold's suction valve and the valve on Tank #1 when you see a reading of under 40 psig. The compressor should be left operation while this work is done.
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- B4) Remove Tank #1 and Connect Tank #2 to the manifold's center port. Open the manifold's suction valve and the valve on Tank #2.(If applicable)
- B5) When the pressure in Tank #2 reaches the compressors suction pressure close the manifold's suction valve and the valve on Tank #2.
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- B6) Remove Tank #2 and Connect Tank #3 to the manifold's center port. Open the manifold's suction valve and the valve on Tank #3. (If applicable)
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- B7) When Tank #3 reaches the compressors suction pressure, close the manifold's suction valve and the valve on Tank #3.

Charging using compressor on suction side of compressor



- <u>Step #7</u> Prepare the Cryochiller Unit for Operation
- Remove the manifold
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- Backseat the compressor's suction and discharge service valves.
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- Remove the hoses.
- Re-install the flare nuts and seals on the access fittings of the service valves on the compressor.
- Leak check the stems of the service valves. Replace valve stem caps
- If the refrigerant recharges were shipped in disposable cylinders. They are intended for one time
 use only. Cylinders should be properly disposed of. These cylinders can be recycled.
 - If the gas charge was shipped in reusable cylinder these can be used for future gas recovery. Noncontaminated recovered gas can be save and used as "top off gas".
 - System is ready to run. Please note the psi of the unit before starting the compressor, for future reference to confirm if system has a leak. Pressure should be taken with CT reading approximatly 20C.