

# POLYCOLD SYSTEMS

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## HELIX TECHNOLOGY CORPORATION

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*Field Service Manual*

## CRYOTIGER® Systems

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**Cool°Solutions®**

# CRYOTIGER® Field Service Manual

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 April 4, 2005

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# 1 INTRODUCTION

This field service manual contains procedures that guide qualified service personnel to charge systems or to clean up systems that contain contaminated gas.

The Refrigerant Addition Procedure (Section 5) gives step-by-step instructions for adding CRYOTIGER® gas to systems which are low on charge.

If the pressure in the system to be charged is lower than 70 psig, then the Field Recharge Procedure for Depressurized Systems (Section 6) should be followed to recharge the system.

If it is determined that the gas in the system has been contaminated, then one of the two remaining procedures should be followed.

The procedure entitled Field Cleanup of CRYOTIGER® System with Compressor Exchange (Section 7) should be followed when downtime at the customer's site is to be minimized and an exchange compressor is available.

If no exchange compressor is available, then the procedure entitled Field Cleanup of CRYOTIGER® System without Compressor Exchange (Section 8) should be followed to clean up the contaminated system.

Use the Service Procedure Selection Diagram on the following page to determine which procedure to follow.

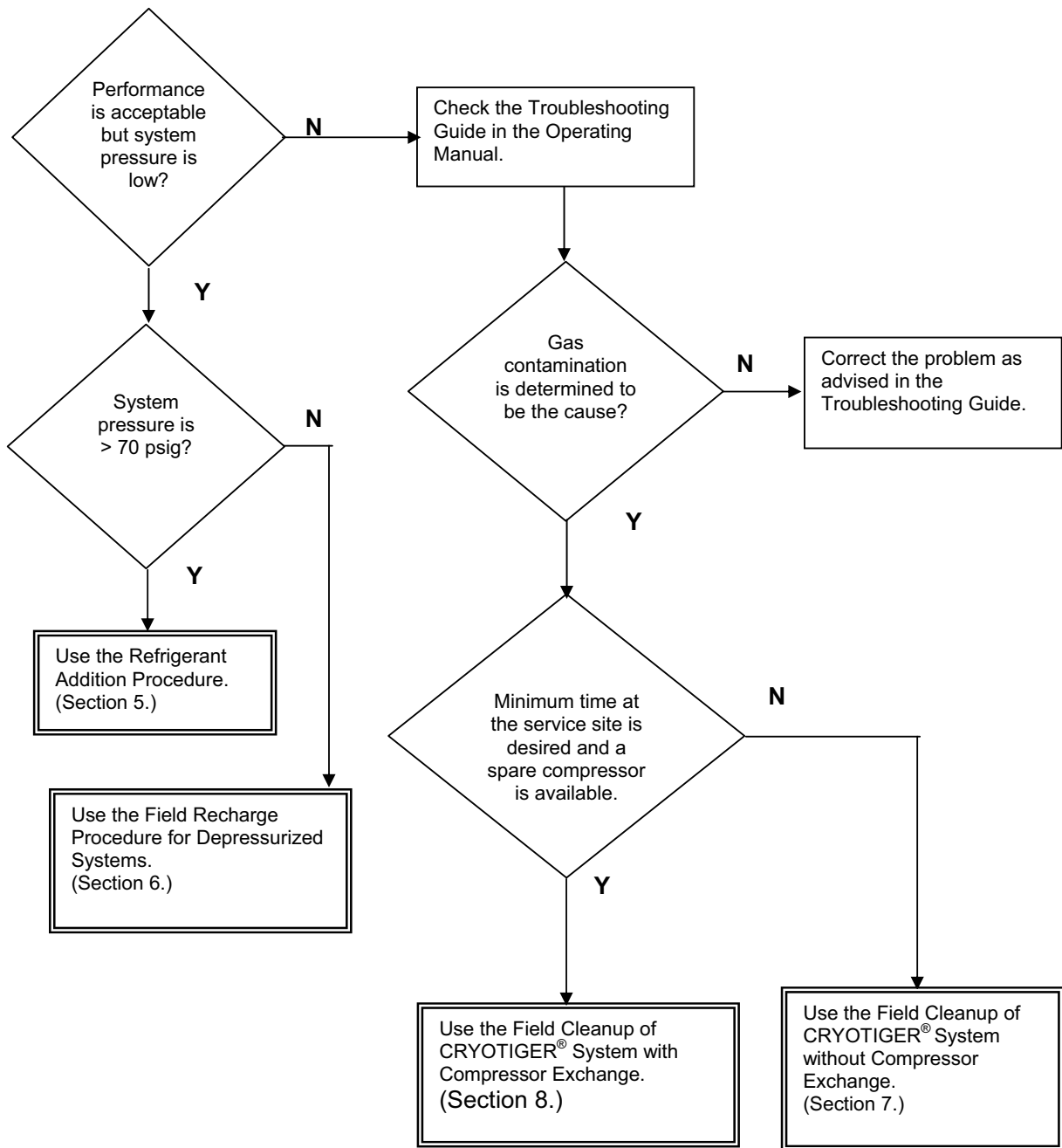


Figure 1: Service Procedure Selection Diagram



## 2 SAFETY INFORMATION AND WARNINGS



### **The refrigerant is flammable.**

Refrigerant vapors can ignite easily and burn explosively.  
Make all gas connections carefully so that gas does not escape.

### **Supply pressure must remain below 345 psig at all times.**

Do not allow the compressor supply pressure to rise above 345 psig. Exceeding the pressures listed in this procedure can cause the flammable CRYOTIGER® gas to vent and ignite.

### **Eliminate all ignition sources.**

Do not smoke.

Extinguish all open and concealed flames, pilot lights, and other sources of heat or sparks. Turn off heaters, electric motors, electric tools, and other sources of ignition during this procedure except the CRYOTIGER® compressor as directed in the procedures.

Do not use in areas where static electric sparks may be generated.

### **Handle gas lines carefully.**

Keep gas lines free of dirt and debris.

Inspect seals and sealing surfaces. Follow the cleaning procedure in the System Operating Manual if dirt and debris are found.

Improper gas connections or disconnections can cause gas to escape.

Use extreme care in making or breaking all gas line connections.

### **Use only with adequate ventilation.**

All work on the CRYOTIGER® system, including recharging, should be performed in a well-ventilated area.

**Trained service personnel only.**

Only trained Helix Polycold Systems service personnel or authorized OEMs should conduct this service procedure. Trained personnel should be experienced in the following:

- 1) Working with and repairing refrigeration systems;
- 2) Handling high-pressure gas systems and related equipment;
- 3) Moving, using and storing compressed gasses in cylinders; and
- 4) Making and breaking gas connections with seft-sealing couplings without releasing gas.

If you are not familiar with these systems, do not attempt to service the CRYOTIGER® System. Contact Polycold or your nearest Polycold service center for assistance.

**Contents under pressure.**

Wear eye protection.

For additional information refer to MSDS product name Flammable HC POLYCOLD refrigerant.

**Follow these procedures in order.**

Failure to follow these procedures in the order specified could cause the flammable CRYOTIGER® gas to vent and ignite.

Vent gas lines properly.

When the cold end is below 0 °C, disconnecting the gas lines from the compressor without venting the lines for longer than 5 minutes will cause the cold-end gas to vent from the relief valve.

### 3 REQUIRED EQUIPMENT

Equipment required to complete these procedures is identified in Table 1.

**Table 1: Required Equipment**

	<b>Item</b>	<b>Part No.</b>	<b>Qty.</b>
1.	OEM Service Bottle	25041-XX	1
2.	Bottle Charge Manifold	263696C	1
3.	Compressor Charge Manifold	263695C	1
4.	Flex Line, 5 Ft.	261848B5	1
5.	Female Purge Fitting	253757B	1
6.	Male Purge Fitting	262557B	2
7.	Coupling Tee	264372B2	1
8.	Supplemental Charge Volume	263745C2	1
9.	High Purity Nitrogen, H <sub>2</sub> O content <5 ppm Note: N <sub>2</sub> bottle pressure regulator must be adjustable in the range of 10 psig to 150 psig	User Supplied	A/R
10.	Vacuum Pump (must pull > 28" Hg)	User Supplied	1
11.	Power Strip with Remote Switch, 10 Amp 1	User Supplied	
12.	Vent Line, capable of safely venting flammable gas to outside (see the Venting Procedures for details)	User Supplied	1
NOTE			
For Cleanup of System with an exchange compressor, compressor part number should match customer's compressor part number.			
13.	CRYOTIGER® Compressor (Exchange only)		1

## 4 TERMS AND DEFINITIONS

To complete this procedure, you need to be familiar with the equipment listed in Table 1, the system diagram in Figure 2, and the following terms:

**System Pressure:** the pressure indicated by the pressure gauge on the compressor when the compressor is not running; also called equalization pressure and balance pressure.

**Return Pressure:** the pressure indicated by the pressure gauge on the compressor when the compressor is running. This is the pressure of the gas returning to the compressor.

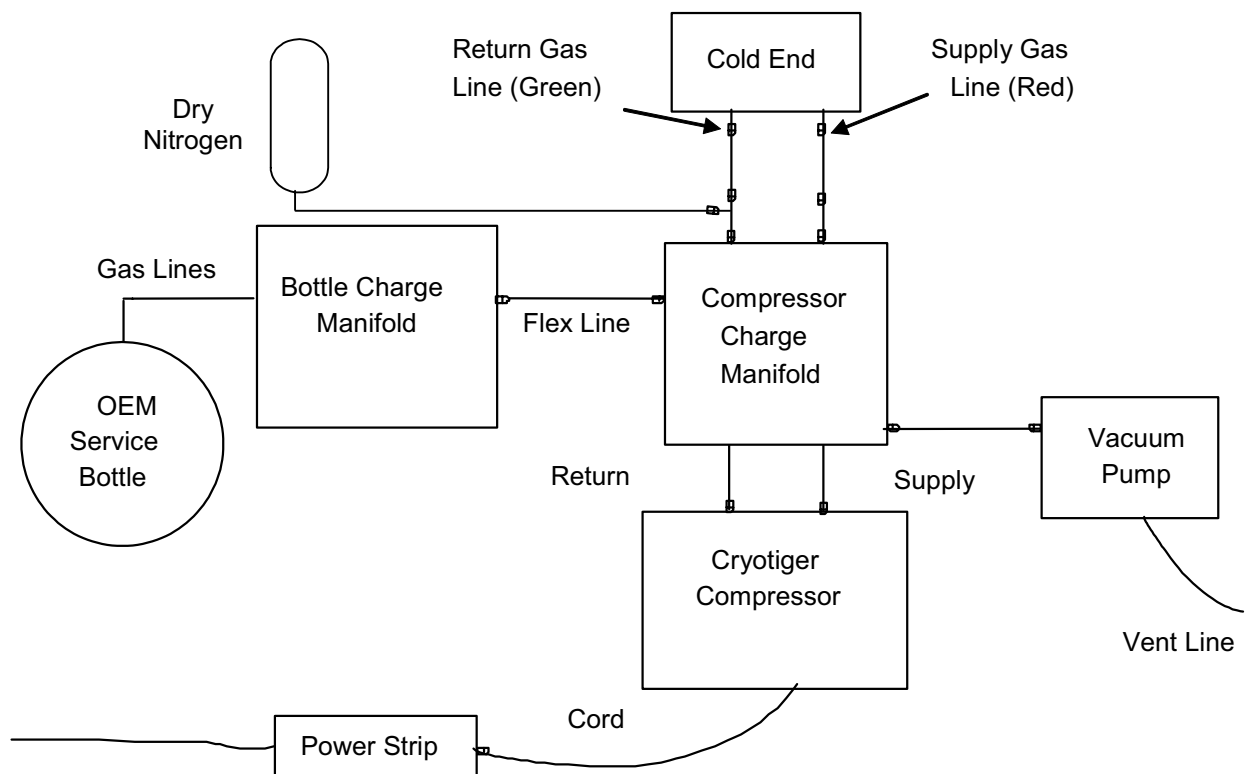
**Supply Pressure:** the pressure indicated by the pressure gauge on the compressor supply manifold when the compressor is running. This is the pressure of the gas going from the compressor to the cold end.

## 5 REFRIGERANT ADDITION PROCEDURE

**Note: Re-read Safety Information and Warnings, before starting this procedure.**

### Purpose

This procedure guides qualified personnel in field adding refrigerant charge to CRYOTIGER® systems. These guidelines must be followed in order to avoid gas leaks and to prevent an accidental fire. This is not a procedure for completely recharging a system. If the pressure in the system to be charged is lower than 70 psig, refer to Field Recharge Procedure for Depressurized Systems.



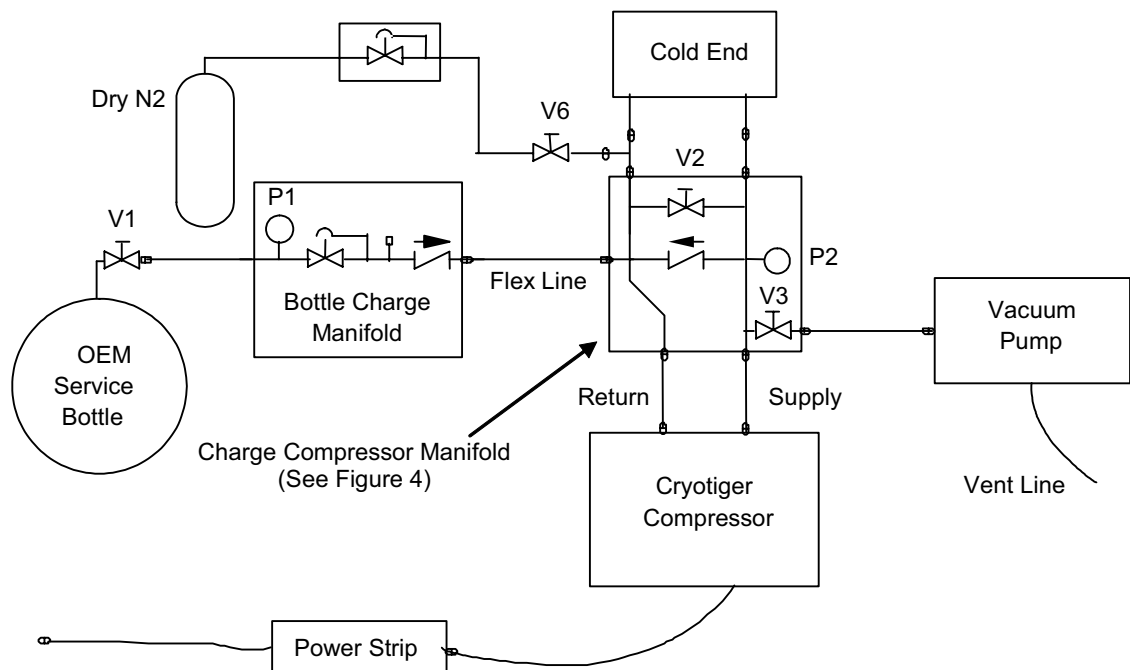
**Figure 2: System Diagram, Field Charge**

## Key Parts

Key parts for this procedure are identified in Table 2 and Figures 3 & 4.

**Table 2: Valves and Pressure Gauges**

Item	Name	Location
V1	Valve Number 1	OEM service bottle, see Figure 3
V2	Valve Number 2	Compressor charge manifold, see Figures 3-4
V3	Valve Number 3	Compressor charge manifold, see Figures 3-4
V4	Valve Number 4	Male purge fitting, see Figures 23-25
V5	Valve Number 5	Male purge fitting, see Figures 23-25
V6	Valve Number 6	Female purge fitting, see Figure 3
P1	Pressure Gauge #1	Bottle charge manifold, see Figure 3
P2	Pressure Gauge #2	Compressor charge manifold, see Figures 3-4



**Figure 3: Key Part Locations, Field Charge**

The compressor charge manifold is depicted in Figure 4, which shows valve and pressure gauge numbering.

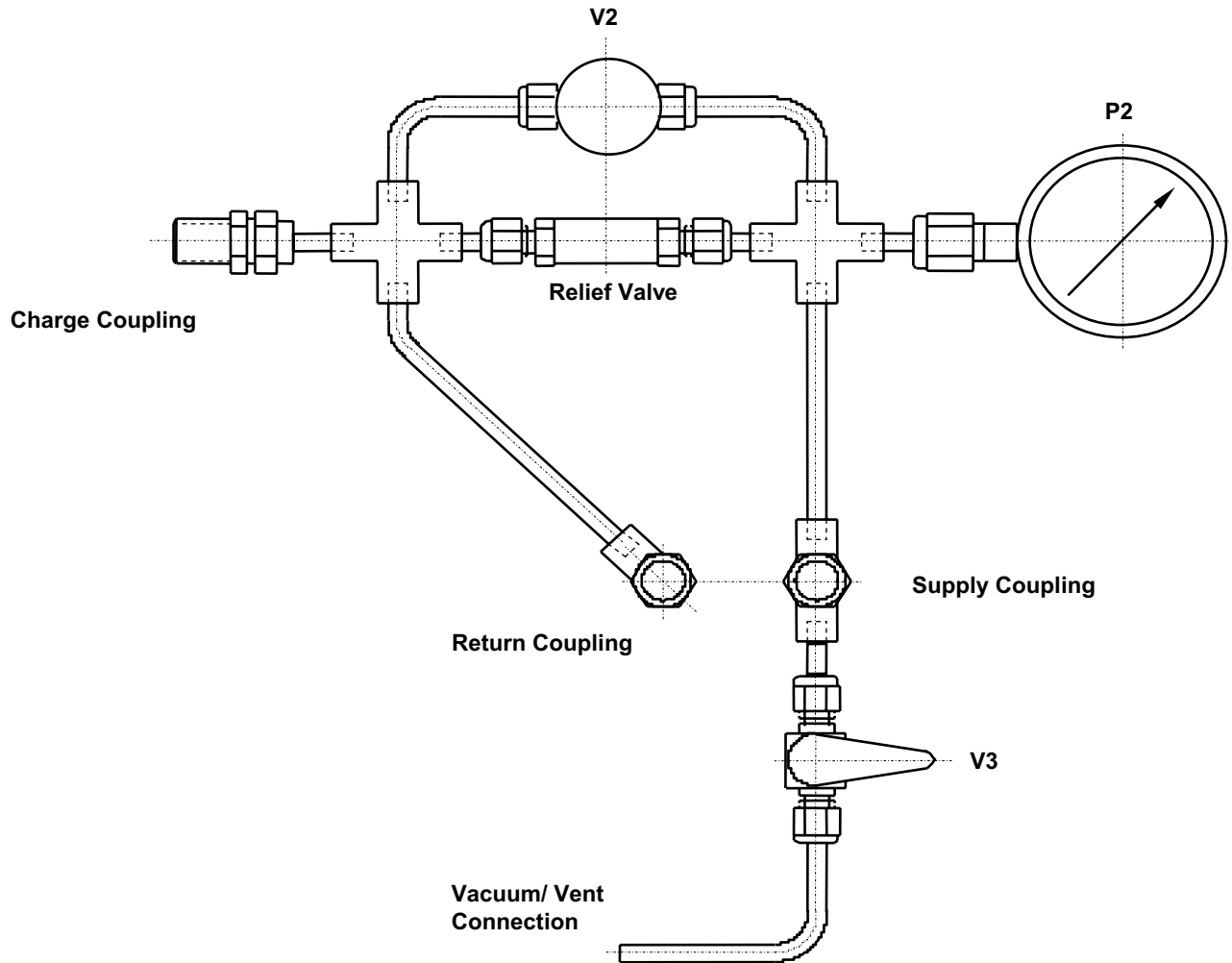


Figure 4: Compressor Charge Manifold 263695C - Detail

## 5.1 Prepare the Area

### 5.1.1 Eliminate all sources of ignition

- Turn off heaters, electric motors, electric tools, and other sources of ignition during this procedure except the CRYOTIGER® compressor as directed in the procedure.
- Do not smoke.
- Extinguish all open and concealed flames, pilot lights, and other sources of heat or sparks.
- Do not use in areas where static electric sparks may be generated.

### 5.1.2 Remove all flammable liquids stored in the area.

## 5.2 Set Up Remote Compressor Switch (Refer To Figure 5)

5.2.1 Turn off the compressor. Use the compressor's on/off switch.

5.2.2 Unplug the compressor.

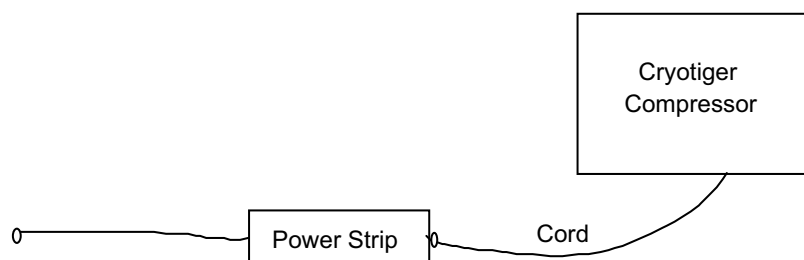
5.2.3 Set the switch on the power strip to the off position.

5.2.4 Plug in the power strip.

5.2.5 Set the compressor's on/off switch to the on position.

5.2.6 Plug the compressor into the power strip.

5.2.7 Do not turn the power strip switch on. The compressor should remain off until Step 5.7.



**Figure 5: Plug Compressor into Power Strip**



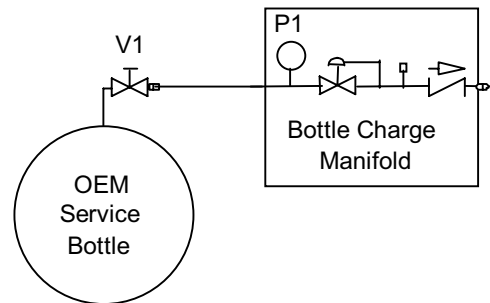
### 5.3 Check the Service Bottle Pressure (Refer To Figure 6)

- 5.3.1 Attach the bottle charge manifold to the OEM service bottle.
- 5.3.2 Open V1.
- 5.3.3 Wait 5 seconds.
- 5.3.4 Close V1.
- 5.3.5 Check pressure on P1:

If the pressure on P1 is less than 65 psig,

- Disconnect the OEM service bottle.
- Restart Step 5.3 with a new OEM service bottle.

If P1 reads greater than 65 psig, go to Step 5.4.



**Figure 6: Check Service Bottle Pressure**

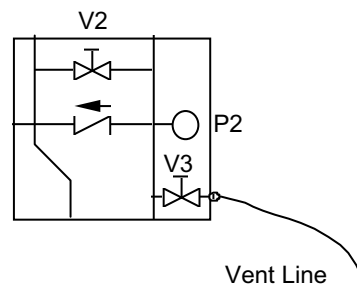
### 5.4 Install the Vent Line (Refer to Figure 7)

The refrigerant is flammable. The vent line must be long enough to safely vent to an outside location free of ignition sources or flammable material. Venting gas to interior spaces can result in a fire.

A vent line is not supplied with this kit. You must supply an appropriate vent line. An example of an appropriate vent line is a 1/4 inch copper vent line with a 1/4 inch Swagelok coupling.

Although a metal vent line is preferred, a polyethylene tube may be used provided the line remains free of plugs, kinks, and reductions. If you do not have a vent line, or you are uncertain if your vent line is appropriate, contact Polycold.

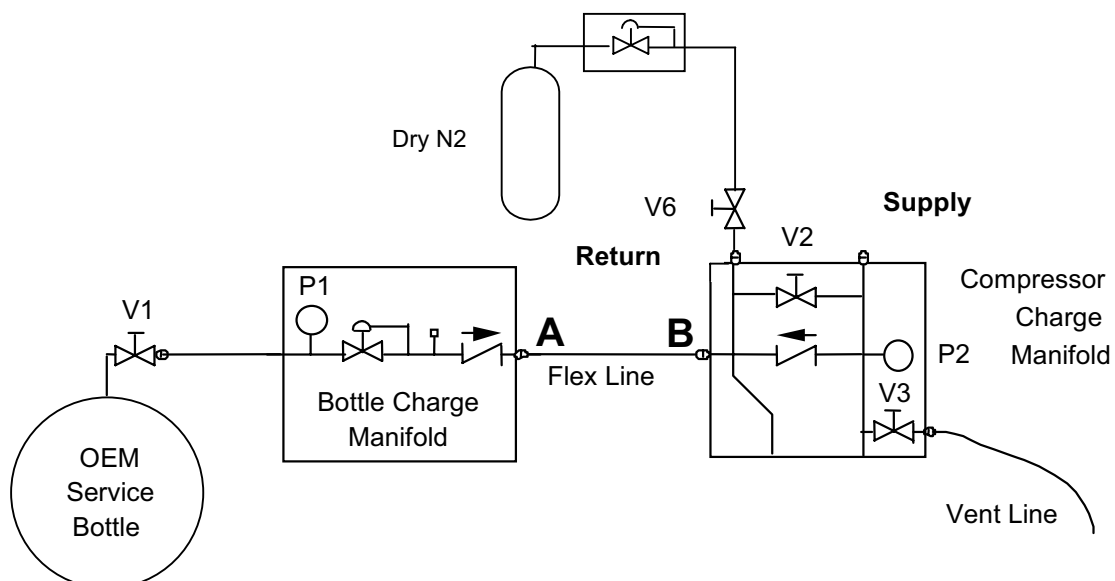
- 5.4.1 Connect the vent line to the compressor charge manifold.



**Figure 7: Install Vent Line**

## 5.5 Purge the Manifolds (Refer to Figure 8)

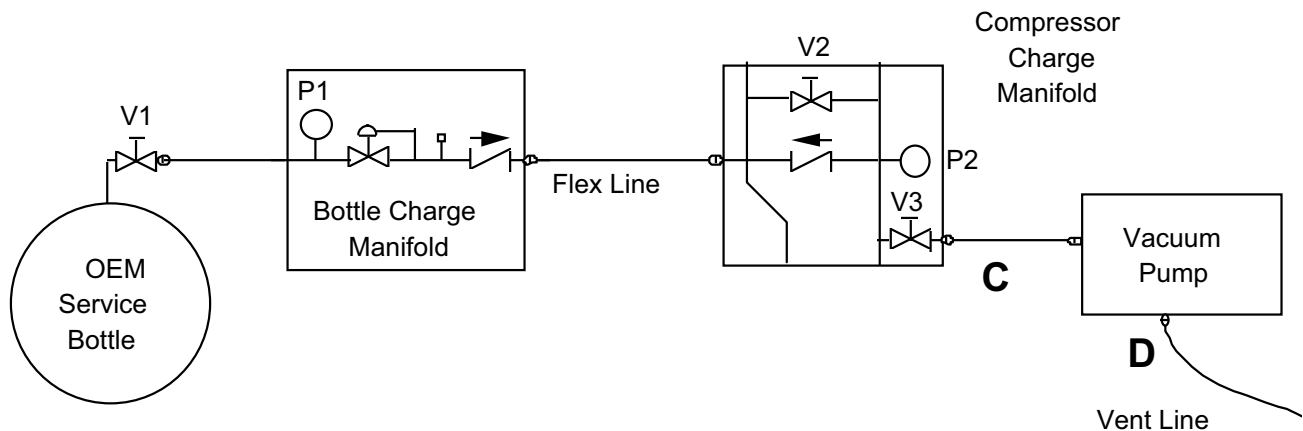
- 5.5.1 Close V3.
- 5.5.2 Fully open V2.
- 5.5.3 Connect the flex line to the bottle charge manifold (A).
- 5.5.4 Connect the compressor charge manifold to the flex line (B).
- 5.5.5 Open V3.
- 5.5.6 Wait until P2 reads 0 psig, then close V3.
- 5.5.7 Close V6 on the female purge fitting.
- 5.5.8 Attach it to the compressor charge manifold as shown.
- 5.5.9 Attach dry N2 source to the female purge fitting.
- 5.5.10 Open V6, wait until P2 reads 100 psig.
- 5.5.11 Close V6.
- 5.5.12 Open V3.
- 5.5.13 Wait until P2 reads 0 psig, then close V3.
- 5.5.14 Disconnect N2 source.



**Figure 8: Purge Bottle Charge Manifold and Compressor Charge Manifold**

## 5.6 Evacuate and Refill the Manifolds (Refer to Figure 9)

- 5.6.1 Disconnect the vent line from the compressor charge manifold and connect the vacuum pump in its place (C).
- 5.6.2 Connect the vent line to the vacuum pump exhaust (D).
- 5.6.3 Switch on the vacuum pump.
- 5.6.4 Slowly open V3.
- 5.6.5 Wait until P2 reads greater than 28 inches Hg in vacuum.
- 5.6.6 Close V3.
- 5.6.7 Switch off the vacuum pump.
- 5.6.8 Open V1.



**Figure 9: Evacuate and Refill Bottle Charge Manifold and Compressor Charge Manifold**

## 5.7 Install the Compressor Charge Manifold (Refer to Figures 10 and 11)

- 5.7.1 Disconnect the gas lines from the compressor (E). See Figure 10.
- 5.7.2 Connect the compressor charge manifold to the compressor (F). See Figure 11.
- 5.7.3 Connect the gas lines to the compressor charge manifold (G). See Figure 11.
- 5.7.4 Close V2. The system is now ready for recharging.

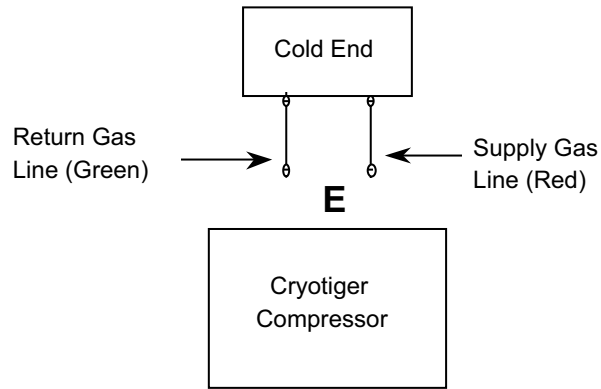


Figure 10: Disconnect Gas Lines from Compressor

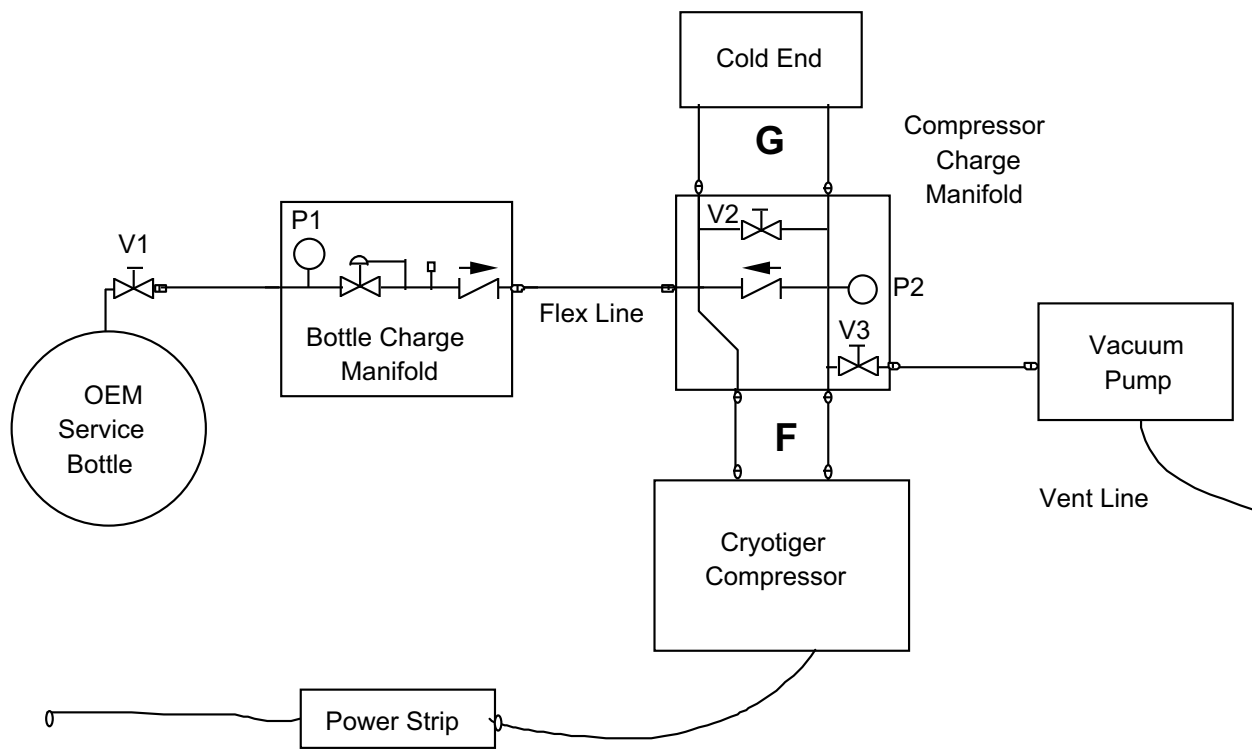


Figure 11: Connect Compressor Charge Manifold

## 5.8 Charge the System by Remote Operation of the Compressor (Refer to Figure 11)



Supply pressure must remain below 345 psig at all times.

Do not allow the compressor supply pressure to rise above 345 psig.

**Exceeding the pressures listed in this procedure can cause the flammable CRYOTIGER® gas to vent and ignite.**

- 5.8.1 Turn on the compressor using the power strip.
- 5.8.2 When P2 reaches 330 psig, switch off the compressor using the power strip. Do not allow the compressor supply pressure to rise above 345 psig during charging.
- 5.8.3 Adjust system pressure:
  - If your system has flex lines, refer to Table 3.
  - If your system has copper lines, refer to Table 4.
- 5.8.4 Compare P2 to the recommended system pressure in Table 3 or Table 4.
  - If P2 is more than 15 psig below the recommended system pressure, repeat Step 5.8 to increase system pressure.
  - If P2 is more than 5 psig above the recommended system pressure, go to Step 5.8.5.
  - If P2 is within tolerance, go to Step 5.9.
- 5.8.5 Disconnect the vacuum pump.
- 5.8.6 Connect the vent line in its place (as in Figure 6 of Step 5.5).
- 5.8.7 Open V2.
- 5.8.8 Slowly open V3 and gradually vent gas from the system until P2 reads the recommended system pressure.
- 5.8.9 Repeat steps 5.8.3 - 5.8.8 as necessary to adjust P2 to +5/-15 psig of recommended system pressure.

**Table 3 - System Charge Pressure for Systems with Flex Lines**

Gas Line Length (ft.)	System Charge Pressure (psig)*
0 to 10	275
11 to 15	265
16 to 25	255
26 to 50	240

\*Tolerance on charge is +5/-15 psig.  
System will achieve full performance operating within +5/-25 psig of nominal charge pressure.

**Table 4 - System Charge Pressure for Systems with Copper Lines**

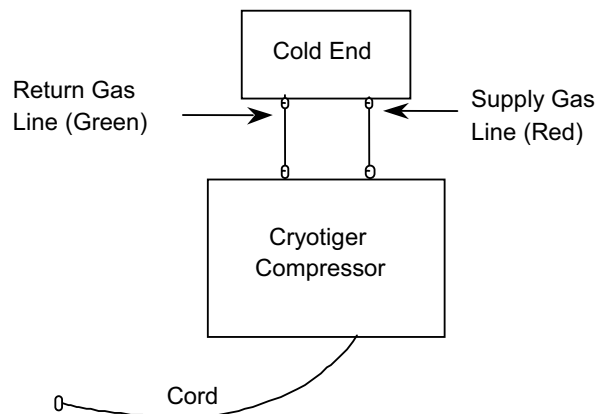
Gas Line Length (ft.)	System Charge Pressure (psig)*
0 to 25	275
26 to 40	270
41 to 60	260
61 to 85	250
86 to 120	240
121 to 150	235

\*Tolerance on charge is +5/-15 psig.  
System will achieve full performance operating within +5/-25 psig of nominal charge pressure.

## 5.9 Disconnect Charge Equipment and Reconnect the System

- 5.9.1 Switch off the compressor at the power strip.
- 5.9.2 Disconnect the gas lines from the compressor charge manifold.
- 5.9.3 Disconnect the compressor charge manifold from the compressor.
- 5.9.4 Reconnect the gas lines to the compressor.
- 5.9.5 Read the system pressure indicated by the gauge on the compressor.
  - If the system pressure is more than 15 psig below the recommended system pressure in Table 3 or Table 4, repeat Steps 5.7 and 5.8;
  - If the system pressure is within the recommended pressure, go to Step 5.9.6.
- 5.9.6 Unplug the power strip from the wall or other supply.
- 5.9.7 Turn the compressor switch to the off position.
- 5.9.8 Unplug the compressor from the power strip.
- 5.9.9 Plug in the compressor to the wall or other supply.
- 5.9.10 Turn on the compressor using the compressor switch.

The system should now appear as in Figure 12.



**Figure 12: Operational CRYOTIGER® System**

The service procedure is complete. The system is now recharged.

- If the manifolds will be stored at the customer's facility until the next use and not shipped, go to Step 5.10.
- If the manifolds will be shipped from the customer's facility to a service center or other locations, go to Step 5.11.

## 5.10 Manifold Storage at Customer's Facility

**NOTE:** If the manifolds will be stored at the customer's facility and not shipped to other location(s), the manifolds do not need to be evacuated and refilled with nitrogen.

- 5.10.1 Close V1.
- 5.10.2 Disconnect the vent line or vacuum pump from the compressor charge manifold.
- 5.10.3 Disconnect the flex line from the compressor charge manifold.
- 5.10.4 Disconnect the flex line from the bottle charge manifold.
- 5.10.5 Disconnect the bottle charge manifold from the OEM service bottle.
- 5.10.6 Store manifolds and equipment for further use.



**The refrigerant gas is flammable.**

**Refrigerant vapors can ignite easily and burn explosively.**

**Store the OEM service bottle and equipment in the same location that you use for storing a propane bottle.**

**Follow the same safety precautions used for storing propane bottles.**

**Store the equipment away from heat, flame and sparks.**

**Store the equipment in a location with adequate ventilation.**

**The equipment and OEM service bottle temperature should not exceed 125° F (52° C).**

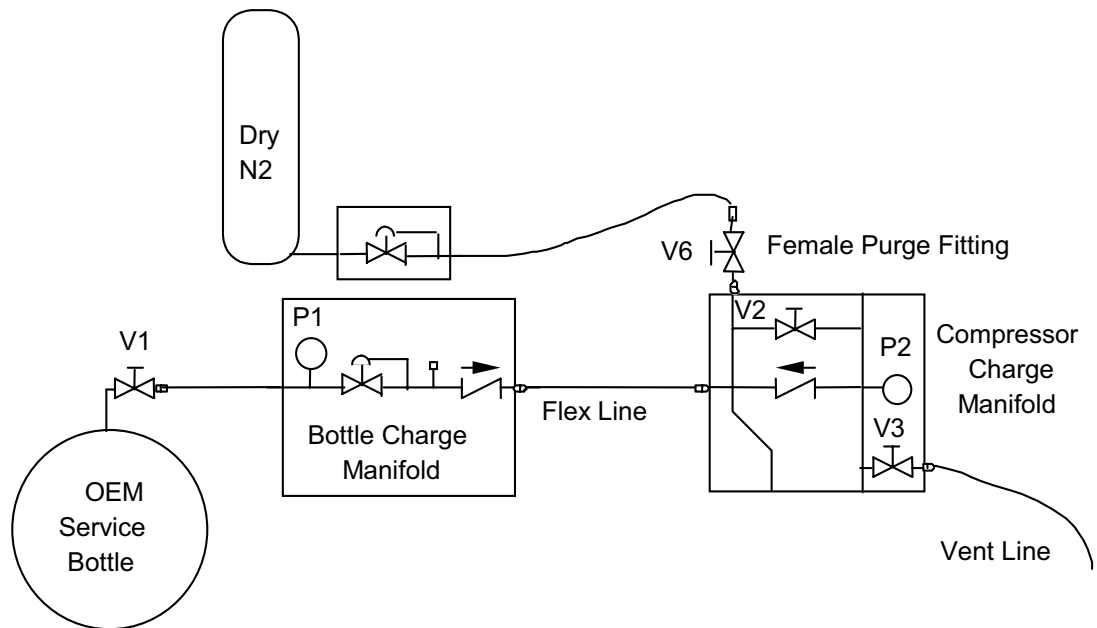
**See instructions on the OEM service bottle for further safety and storage information.**

## 5.11 Prepare Manifolds for Shipping (Refer to Figure 13)

**NOTE:** If the manifolds will be shipped from a customer's facility to a service center or other location(s), manifolds must be evacuated and re-filled with nitrogen prior to shipping.

- 5.11.1 Close V1.
- 5.11.2 Connect the vent line to the compressor charge manifold.
- 5.11.3 Connect the 5 foot flex line to the compressor charge manifold.
- 5.11.4 Close valve V6 on the female purge fitting and connect it to the compressor charge manifold as shown in Figure 13.





**Figure 13: Purge Compressor Charge Manifold**

- 5.11.5 Connect the nitrogen source to the female purge fitting.
- 5.11.6 Open V2.
- 5.11.7 Open V6.
- 5.11.8 When P2 reads 100 psig, close V6.
- 5.11.9 Open V3.
- 5.11.10 Close V3 when the pressure indicated on P2 drops to 0 psig.
- 5.11.11 Disconnect the vent line and connect the vacuum pump in its place.
- 5.11.12 Connect the vent line to the vacuum pump exhaust.
- 5.11.13 Switch on the vacuum pump.
- 5.11.14 Open V3.
- 5.11.15 When the vacuum indicated on P2 reads greater than 28 inches Hg, close V3.
- 5.11.16 Switch off the vacuum pump.
- 5.11.17 Set the nitrogen source between 10 and 20 psig.
- 5.11.18 Open V6.
- 5.11.19 Close V6 when the pressure indicated on P2 reads between 10 and 20 psig.
- 5.11.20 Disconnect the nitrogen source and female purge fitting.
- 5.11.21 Disconnect vacuum pump from the compressor charge manifold.
- 5.11.22 Disconnect the 5 foot flex line from the compressor charge manifold.
- 5.11.23 Disconnect the 5 foot flex line from the bottle charge manifold.
- 5.11.24 Disconnect the bottle charge manifold from the OEM service bottle.

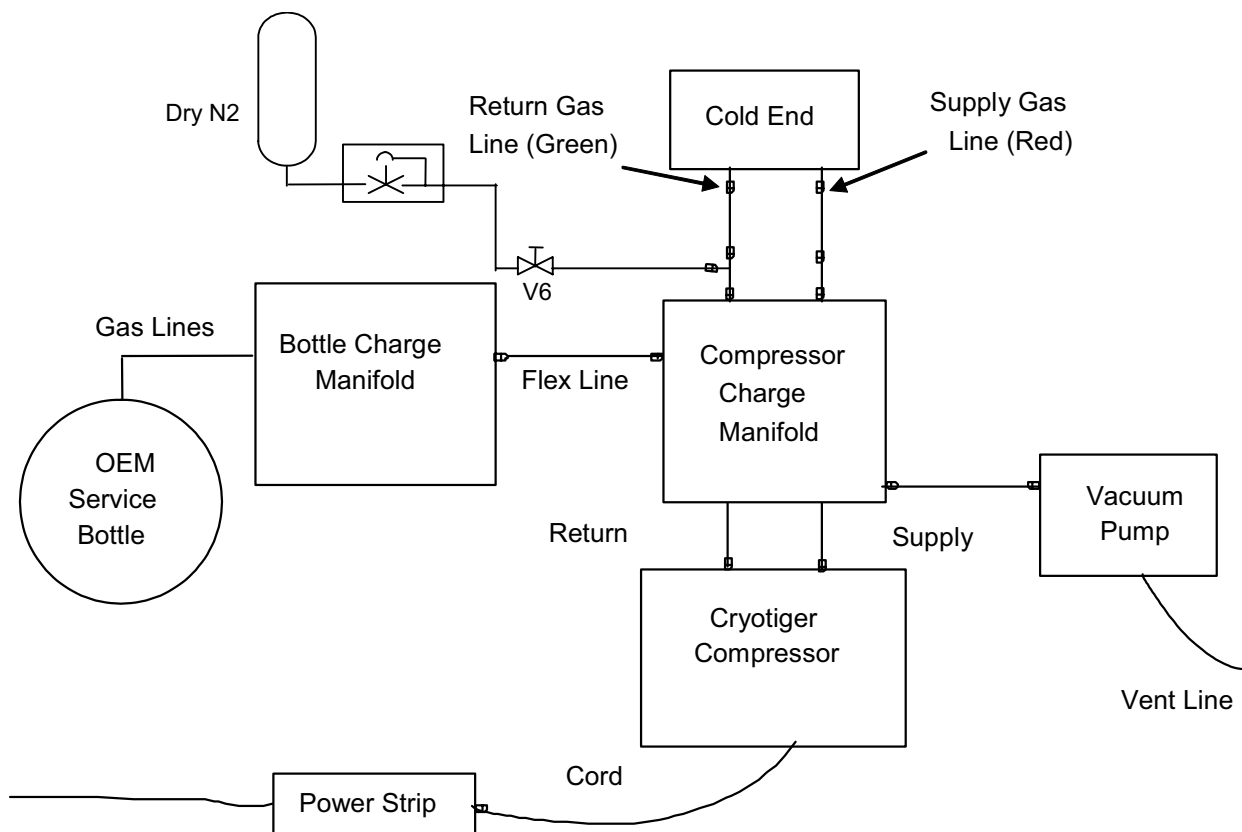
**Manifolds are now ready to be packaged and shipped to a service center.**

## 6 FIELD RECHARGE PROCEDURE FOR DEPRESSURIZED SYSTEMS

**Note: Re-read Safety Information and Warnings, before starting this procedure.**

### Purpose

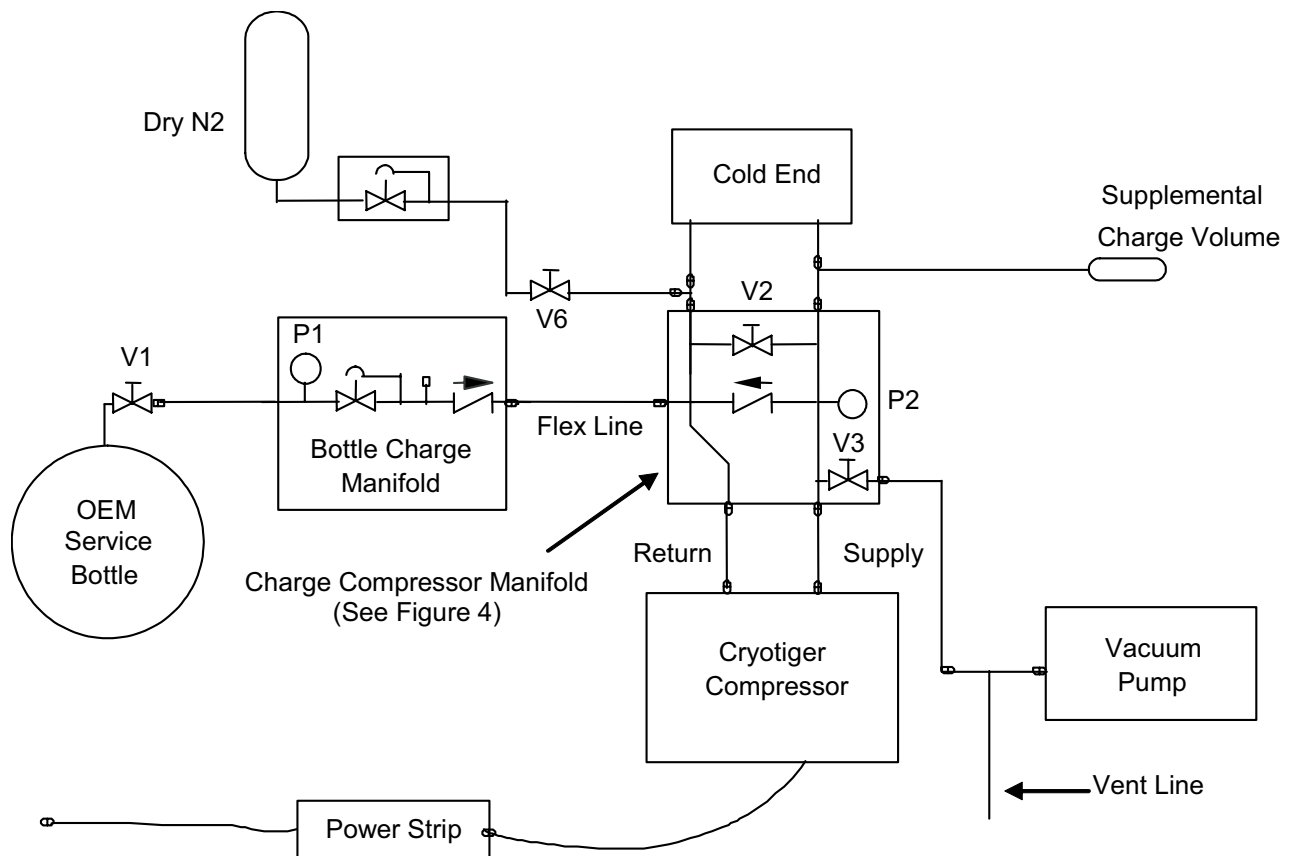
This procedure guides qualified personnel to perform gas service and recharge of a CRYOTIGER® System at a customer's site. These guidelines must be followed in order to avoid gas leaks and to prevent an accidental fire. If the pressure in the system to be charged is 70 psig or above, refer to other procedures (in this manual).



**Figure 14: System Diagram, Field Recharge**

### Key Parts

Key parts for this procedure are identified in Table 2 and Figures 14 & 15. The compressor charge manifold is shown in Figure 4, where valve and pressure gauge numbering is shown. Equipment required for this procedure is listed in Table 1.



**Figure 15: Key Part Locations, Field Recharge**

## 6.1 Prepare the Area

### 6.1.1 Eliminate all sources of ignition

- Turn off heaters, electric motors, electric tools, and other sources of ignition during this procedure except the CRYOTIGER® compressor as directed in the procedure.
- Do not smoke.
- Extinguish all open and concealed flames, pilot lights, and other sources of heat or sparks.
- Do not use in areas where static electric sparks may be generated.

## 6.2 Set Up Remote Compressor Switch (Refer To Figure 5)

- 6.2.1 Turn off the compressor. Use the compressor's on/off switch.
- 6.2.2 Unplug the compressor.
- 6.2.3 Set the switch on the power strip to the off position.
- 6.2.4 Plug in the power strip.
- 6.2.5 Set the compressor's on/off switch to the on position.

- 6.2.6 Plug the compressor into the power strip.
- 6.2.7 Do not turn the power strip switch on. The compressor should remain off until Step 6.7.

### 6.3 Check the Service Bottle Pressure (Refer To Figure 6)

- 6.3.1 Attach the bottle charge manifold to the OEM service bottle.
- 6.3.2 Open V1.
- 6.3.3 Wait 5 seconds.
- 6.3.4 Close V1.
- 6.3.5 Check pressure on P1:
  - If the pressure on P1 is less than 65 psig,
    - disconnect the OEM service bottle.
    - restart Step 6.3 with a new OEM service bottle.
  - If P1 reads greater than 65 psig, go to Step 6.4.

### 6.4 Vent the System and the Manifolds (Refer to Figure 16)



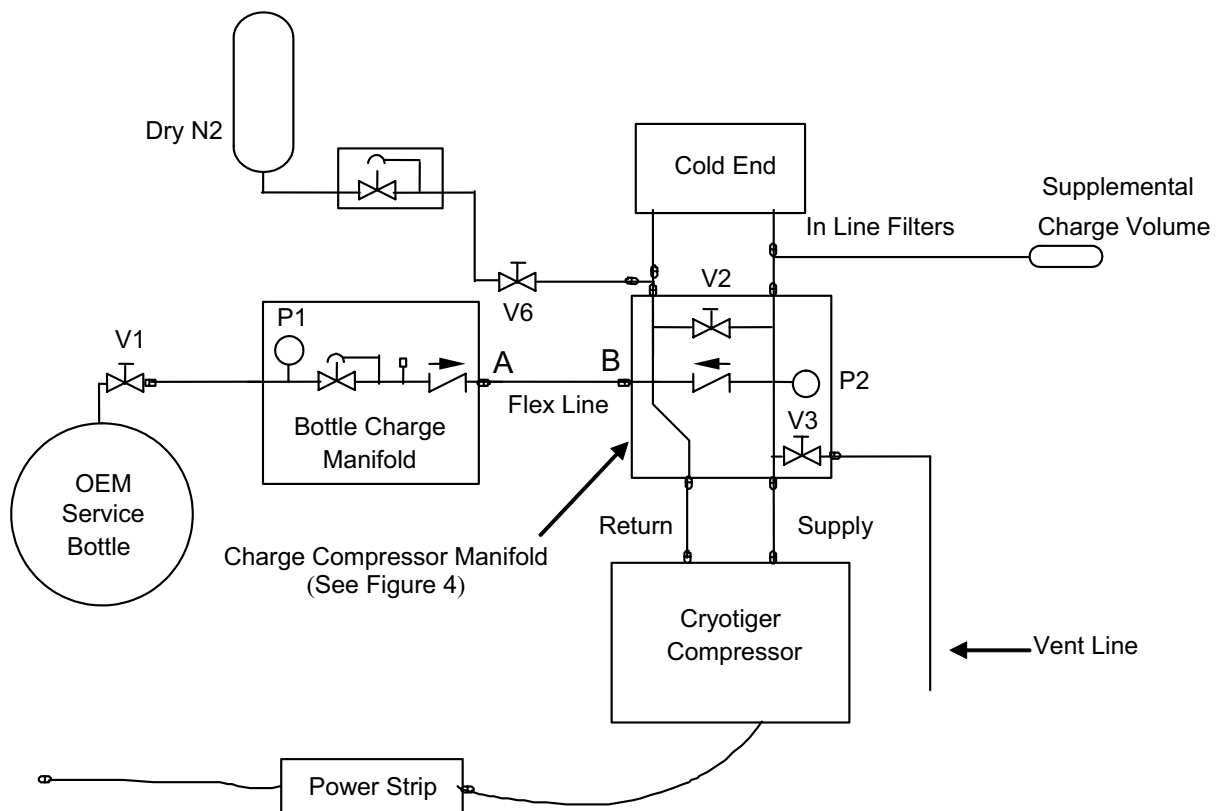
The refrigerant is flammable. The vent line must be long enough to safely vent to an outside location free of ignition sources or flammable material. Venting gas to interior spaces can result in a fire.

A vent line is not supplied with this kit. You must supply an appropriate vent line. An example of an appropriate vent line is a 1/4 inch copper vent line with a 1/4 inch Swagelok coupling.

**Although a metal vent line is preferred, a polyethylene tube may be used provided the line remains free of plugs, kinks, and reductions. If you do not have a vent line, or you are uncertain if your vent line is appropriate, contact Polycold.**

- 6.4.1 Close V3.
- 6.4.2 Connect the vent line to the compressor charge manifold.
- 6.4.3 Disconnect the gas lines from the compressor.
- 6.4.4 Attach the compressor charge manifold to the compressor.
- 6.4.5 Attach the supplemental charge volume to the supply side of the compressor charge manifold.
- 6.4.6 Close V6 on the female purge fitting.

- 6.4.7 Attach it to the coupling tee as shown.
- 6.4.8 Connect coupling tee to the return side of the compressor charge manifold.
- 6.4.9 Attach the gas lines to the coupling tee (return side) and supplemental charge volume (supply side).
- 6.4.10 Connect the flex line to the bottle charge manifold (A).
- 6.4.11 Connect the compressor charge manifold to the flex line (B).
- 6.4.12 Open V2.
- 6.4.13 Slowly open V3 and vent the gas from the system until P2 reads 0 psig.
- 6.4.14 Close V3.
- 6.4.15 Open V6.
- 6.4.16 When P2 reads 100 psig, close V6.
- 6.4.17 Open V3, wait until P2 reads 0 psig.
- 6.4.18 Close V3.
- 6.4.19 Disconnect cold end, the gas line (return side) and supplemental charge volume (discharge side) from the compressor charge manifold.
- 6.4.20 Set N2 source to 30 psig.
- 6.4.21 Open V6.
- 6.4.22 Close V2.

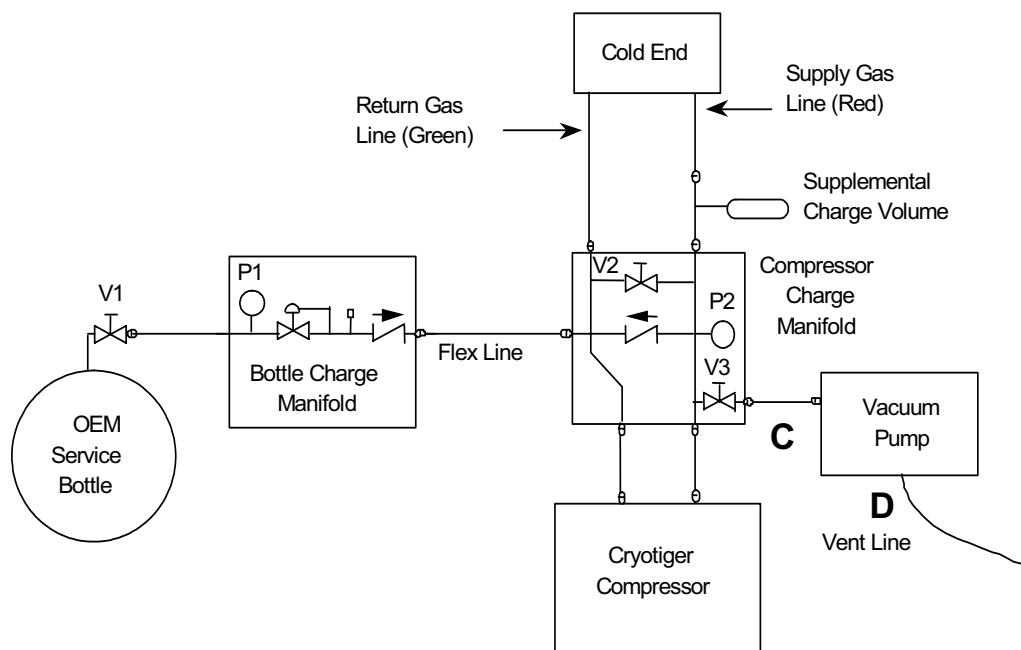


**Figure 16: Vent the System and Manifolds**

- 6.4.23 Switch on the compressor.
- 6.4.24 When P2 reads 300 psig, close V6.
- 6.4.25 Open V2 until the return pressure gauge reads 60 psig.
- 6.4.26 Run the compressor for 15 min.
- 6.4.27 Turn the compressor off.
- 6.4.28 Open V2.
- 6.4.29 Open V3, wait until P2 reads 0 psig.
- 6.4.30 Open V6 and purge the compressor with dry N2 for 3 min.
- 6.4.31 Close V3.
- 6.4.32 Repeat steps 6.4.22 through 6.4.29.
- 6.4.33 Close V3.
- 6.4.34 Disconnect dry N2 source.
- 6.4.35 Reconnect cold end, gas line and supplemental charge volume to the compressor charge manifold.

## 6.5 Evacuate the System and the Manifolds (Refer To Figure 17)

- 6.5.1 Disconnect the vent line from the compressor charge manifold and connect the vacuum pump in its place (C).
- 6.5.2 Connect the vent line to the vacuum pump exhaust (D).



**Figure 17: Evacuate the System and Manifolds**

- 6.5.3 Switch on the vacuum pump.
- 6.5.4 Slowly open V3.
- 6.5.5 Evacuate the system and manifolds for a minimum of 2 hours.
- 6.5.6 Close V3.
- 6.5.7 Switch off the vacuum pump.

## 6.6 Prime the System with CRYOTIGER® Gas (Refer to Figure 18)

- 6.6.1 Open V1.
- 6.6.2 Close V2. The system is now ready for recharging.

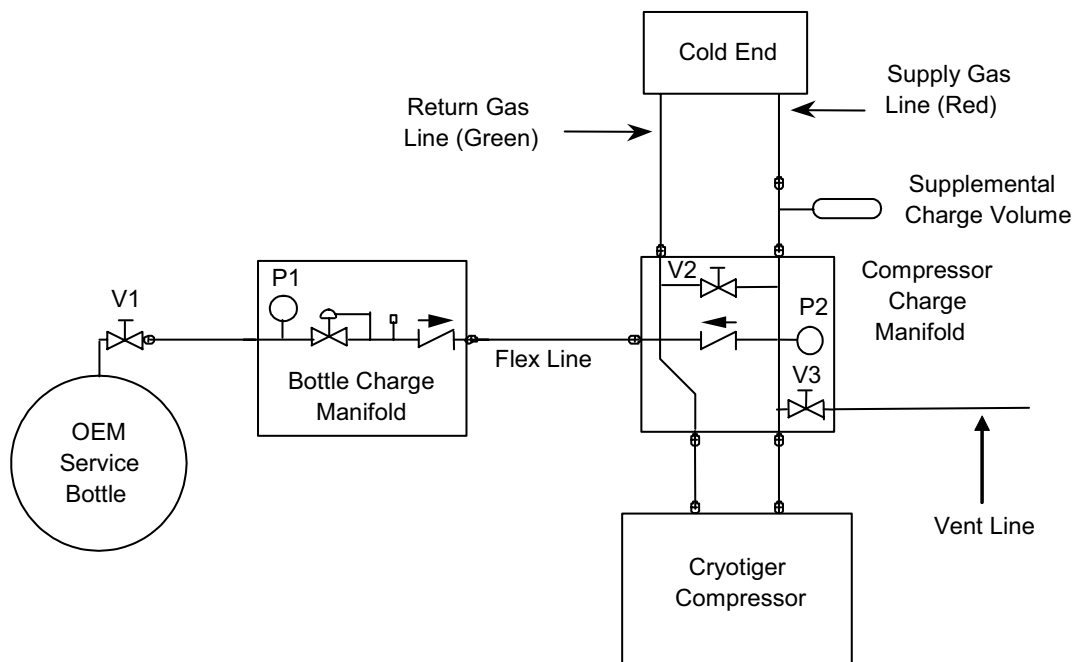


Figure 18: Prime System with CRYOTIGER® Gas

## 6.7 Charge the System by Remote Operation of the Compressor.



**Supply pressure must remain below 345 psig at all times.**

**Do not allow the compressor supply pressure to rise above 345 psig. Exceeding the pressures listed in this procedure can cause the flammable CRYOTIGER® gas to vent and ignite.**

- 6.7.1 Turn on the compressor using the power strip.
- 6.7.2 When P2 reaches 330 psig, switch off the compressor using the power strip. Do not allow the compressor supply pressure to rise above 345 psig during charging.
- 6.7.3 Adjust system pressure:
- If your system has flex lines, refer to Table 3.
  - If your system has copper lines, refer to Table 4.
- 6.7.4 Compare P2 to the recommended system pressure in Table 3 or Table 4.
- If P2 is more than 15 psig below the recommended system pressure, repeat Step 6.7 to increase system pressure.
  - If P2 is more than 5 psig above the recommended system pressure, go to Step 6.7.5.
  - If P2 is within tolerance, go to Step 6.8.
- 6.7.5 Disconnect the vacuum pump.
- 6.7.6 Connect the vent line in its place (as in Figure 18).
- 6.7.7 Open V2.
- 6.7.8 Slowly open V3 and gradually vent gas from the system until P2 reads the recommended system pressure.
- 6.7.9 Repeat steps 6.7.3 - 6.7.8 as necessary to adjust P2 to +5/-15 psig of recommended system pressure.

## 6.8 Remove Compressor Charge Manifold from the System (Refer to Figure 19)

- 6.8.1 Switch off the compressor.
- 6.8.2 Disconnect the supplemental charge volume (supply side) and gas line (return side) from the compressor charge manifold.

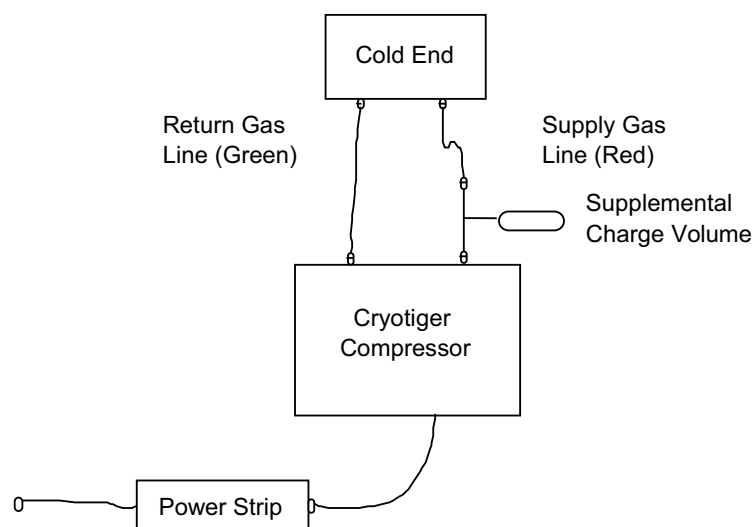


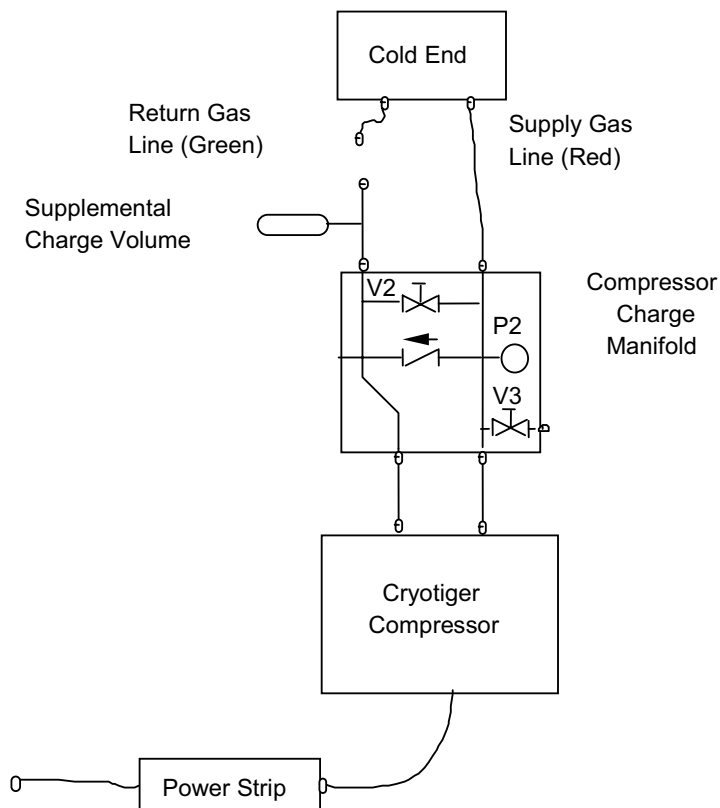
Figure 19: Remove Compressor Charge Manifold from the System



- 6.8.3 Disconnect the 5 foot flex line from the compressor charge manifold.
- 6.8.4 Disconnect the vacuum pump or vent line from the compressor charge manifold.
- 6.8.5 Disconnect the compressor charge manifold from the compressor.
- 6.8.6 Maintain the gas charge in the manifold.
- 6.8.7 Connect the supplemental charge volume (supply side) to the compressor.
- 6.8.8 Connect the gas line (return side) to the compressor.
- 6.8.9 Switch on the compressor and allow the system to cool down.

## 6.9 Remove Supplemental Charge Volume from the System (Refer to Figure 20)

- 6.9.1 After the system has reached operating temperature, switch off the compressor.
- 6.9.2 Disconnect the gas line from the supplemental charge volume.
- 6.9.3 Disconnect the supplemental charge volume from the compressor.
- 6.9.4 Disconnect the gas line from the return side of the compressor.
- 6.9.5 **Immediately** install the compressor charge manifold on the compressor and connect the supply-side, gas line to the compressor charge manifold.



**Figure 20: Attach Supplemental Charge Volume to Return Side and Remove Supplemental Charge Volume from the System**



**When the cold end is below 0° C, disconnecting the gas lines from the compressor without venting the lines for longer than 5 minutes will cause the flammable CRYOTIGER® gas to vent from the relief valve.**

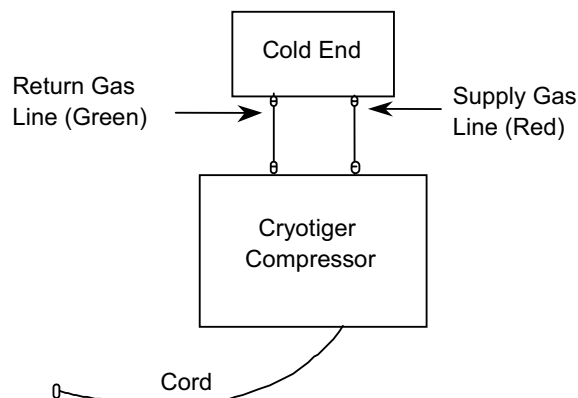
- 6.9.6 Attach the supplemental charge volume to the return side of the compressor charge manifold.
- 6.9.7 Close V2 and then open it one turn.
- 6.9.8 Switch on the compressor.
- 6.9.9 Adjust V2 so that the pressure gauge on the compressor reads between 10 psig and 30 psig.
- 6.9.10 While the compressor is running, disconnect the supplemental charge volume from the manifold.

## 6.10 Reconnect the System (Refer To Figure 21)

- 6.10.1 Switch off the compressor at the power strip.
- 6.10.2 Unplug the power strip from the wall or other supply.
- 6.10.3 Unplug the compressor from the power strip.
- 6.10.4 Turn the compressor switch to the off position.
- 6.10.5 Disconnect the supply-side, gas line from the compressor charge manifold.



**When the cold end is below 0° C, disconnecting the gas lines from the compressor without venting the lines for longer than 5 minutes will cause the flammable CRYOTIGER® gas to vent from the relief valve.**



**Figure 21: Reconnect the System**

- 6.10.6 Disconnect the compressor charge manifold from the compressor.
- 6.10.7 Immediately reconnect the gas lines to the compressor.
- 6.10.8 Plug the compressor into its original power supply.
- 6.10.9 Switch the compressor on.

The service procedure is complete. The system is now recharged.

- If the manifolds will be stored at the customer's facility until the next use and not shipped, go to Step 6.11.
- If the manifolds will be shipped from the customer's facility to a service center or other locations, go to Step 6.12.

## 6.11 Manifold Storage at Customer's Facility.

**NOTE: If the manifolds will be stored at the customer's facility and not shipped to other location(s), the manifolds do not need to be evacuated and refilled with nitrogen.**

- 6.11.1 Close V1.
- 6.11.2 Disconnect the vent line or vacuum pump from the compressor charge manifold.
- 6.11.3 Disconnect the flex line from the compressor charge manifold.
- 6.11.4 Disconnect the flex line from the bottle charge manifold.
- 6.11.5 Disconnect the bottle charge manifold from the OEM service bottle.
- 6.11.6 Store manifolds and equipment for further use.



**The refrigerant gas is flammable.**

**Refrigerant vapors can ignite easily and burn explosively.**

**Store the OEM service bottle and equipment in the same location that you use for storing a propane bottle.**

**Follow the same safety precautions used for storing propane bottles.**

**Store the equipment away from heat, flame and sparks.**

**Store the equipment in a location with adequate ventilation.**

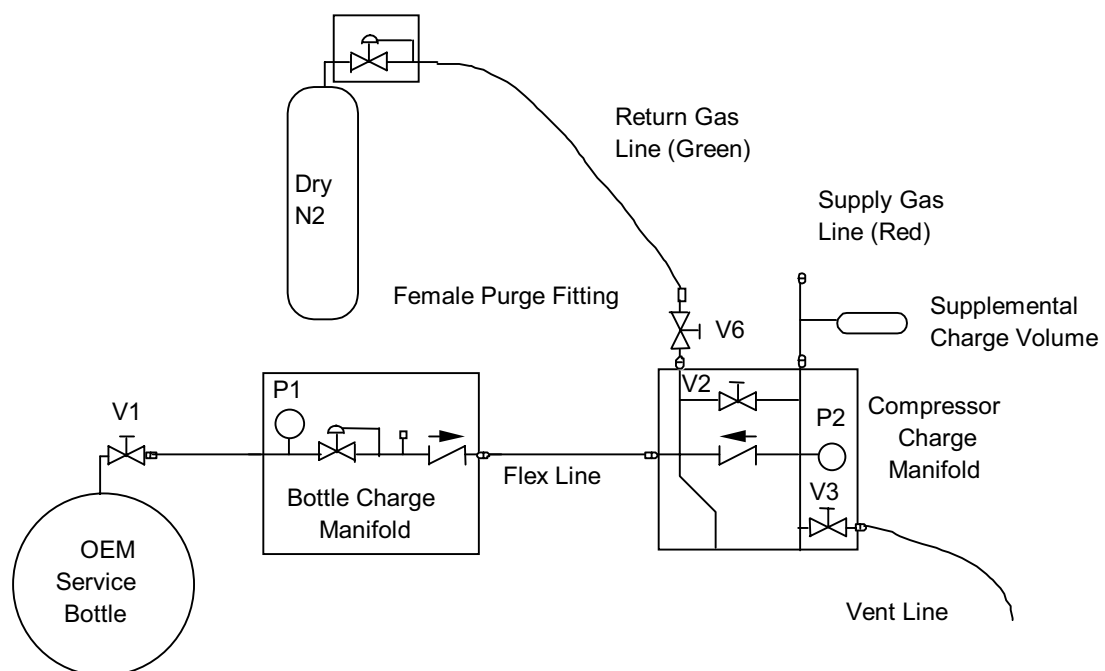
**The equipment and OEM service bottle temperature should not exceed 125° F (52° C).**

**See instructions on the OEM service bottle for further safety and storage information.**

## 6.12 Prepare Manifolds for Shipping (Refer to Figure 22)

**NOTE:** If the manifolds will be shipped from the customer's facility to a service center or other location(s), the manifolds must be evacuated and refilled with nitrogen prior to shipping.

- 6.12.1 Close V1.
- 6.12.2 Connect the vent line to the compressor charge manifold.
- 6.12.3 Connect the 5 foot flex line to the compressor charge manifold.
- 6.12.4 Close valve V6 on the female purge fitting and connect it to the compressor charge manifold as shown in Figure 13.
- 6.12.5 Connect the nitrogen source to the female purge fitting.
- 6.12.6 Open V2.
- 6.12.7 Open V6.
- 6.12.8 When P2 reads 100 psig, close V6.
- 6.12.9 Open V3.
- 6.12.10 Close V3 when the pressure indicated on P2 drops to 0 psig.
- 6.12.11 Disconnect the vent line and connect the vacuum pump in its place.
- 6.12.12 Connect the vent line to the vacuum pump exhaust.
- 6.12.13 Switch on the vacuum pump.
- 6.12.14 Open V3.
- 6.12.15 When the vacuum indicated on P2 reads greater than 28 inches Hg, close V3.



**Figure 22: Purge Compressor Charge Manifold**

- 6.12.16 Switch off the vacuum pump.
- 6.12.17 Set the nitrogen source between 10 and 20 psig.
- 6.12.18 Open V6.
- 6.12.19 Close V6 when the pressure indicated on P2 reads between 10 and 20 psig.
- 6.12.20 Disconnect the nitrogen source and female purge fitting.
- 6.12.21 Disconnect vacuum pump from the compressor charge manifold.
- 6.12.22 Disconnect the 5 foot flex line from the compressor charge manifold.
- 6.12.23 Disconnect the 5 foot flex line from the bottle charge manifold.
- 6.12.24 Disconnect the bottle charge manifold from the OEM service bottle.

**Manifolds are now ready to be packaged and shipped to a service center.**

## 7 FIELD CLEANUP OF CRYOTIGER® SYSTEM WITHOUT COMPRESSOR EXCHANGE

**Note:** Re-read Safety Information and Warnings, before starting this procedure.

### Purpose

This procedure guides qualified personnel to perform gas service and recharge of a CRYOTIGER® System at a customer's site. These guidelines must be followed in order to avoid gas leaks and to prevent an accidental fire.

**Special Note:** The system should be left running before the service engineer arrives to minimize the on-site service time. You should instruct the system owner to leave the system running before you arrive. If the system is warm, turn it on and allow it to reach minimum temperature before starting this procedure. Do not begin this service procedure until the system reaches the minimum temperature.

### Key Parts

Key parts for this procedure are identified in Table 2 and Figures 14 and 15. The compressor charge manifold is shown in Figure 4, where valve and pressure gauge numbering is shown. Equipment required for this procedure is listed in Table 1.

### 7.1 Prepare the Area

#### 7.1.1 Eliminate all sources of ignition

- Turn off heaters, electric motors, electric tools, and other sources of ignition during this procedure except the CRYOTIGER® compressor as directed in the procedure.
- Do not smoke.
- Extinguish all open and concealed flames, pilot lights, and other sources of heat or sparks.
- Do not use in areas where static electric sparks may be generated.

#### 7.1.2 Remove all flammable liquids stored in the area.

## 7.2 Set Up Remote Compressor Switch (Refer To Figure 5)

- 7.2.1 Turn off the compressor. Use the compressor's on/off switch.
- 7.2.2 Unplug the compressor.
- 7.2.3 Set the switch on the power strip to the off position.
- 7.2.4 Plug in the power strip.
- 7.2.5 Set the compressor's on/off switch to the on position.
- 7.2.6 Plug the compressor into the power strip.
- 7.2.7 Turn the power strip switch on. The compressor should restart.

## 7.3 Vent the Cold End and the Gas Lines (Refer to Figures 23 and 24)



**The refrigerant is flammable. The vent line must be long enough to safely vent to an outside location free of ignition sources or flammable material. Venting gas to interior spaces can result in a fire.**

**A vent line is not supplied with this kit. You must supply an appropriate vent line. An example of an appropriate vent line is a 1/4 inch copper vent line with a 1/4 inch Swagelok coupling.**

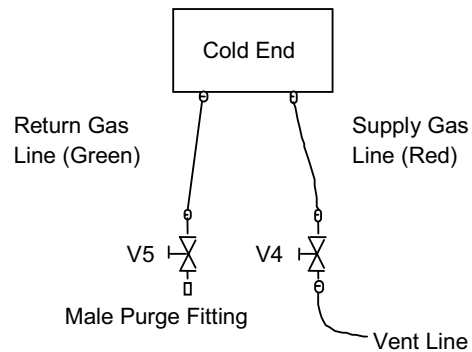
**Although a metal vent line is preferred, a polyethylene tube may be used provided the line remains free of plugs, kinks, and reductions. If you do not have a vent line, or you are uncertain if your vent line is appropriate, contact Polycold.**



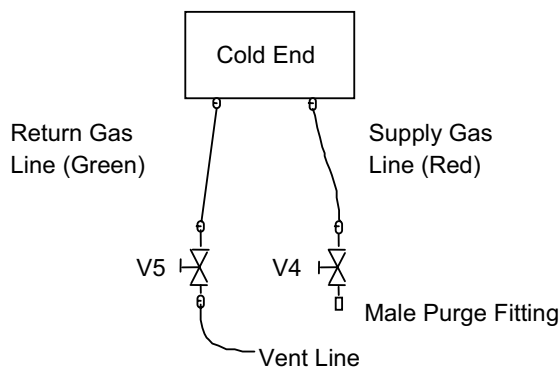
**When the cold end is below 0° C, disconnecting the gas lines from the compressor without venting the lines for longer than 5 minutes will cause the cold end gas to vent from the relief valve. Complete Steps 7.3.4 to 7.3.6 in order immediately after completing Step 7.3.3.**

- 7.3.1 Switch off the compressor.
- 7.3.2 Close the valves on both male purge fittings.
- 7.3.3 Disconnect both gas lines from the CRYOTIGER compressor.
- 7.3.4 **Immediately** attach male purge fittings to the supply and return gas lines .
- 7.3.5 Immediately attach the vent line to the supply side purge fitting (Figure 23).
- 7.3.6 **Immediately** open V4.

- 7.3.7 Wait 30 seconds.
- 7.3.8 Close V4.
- 7.3.9 Disconnect the vent line and attach it to the return side purge fitting (Figure 24).
- 7.3.10 Open V5.



**Figure 23: Vent the Supply line**

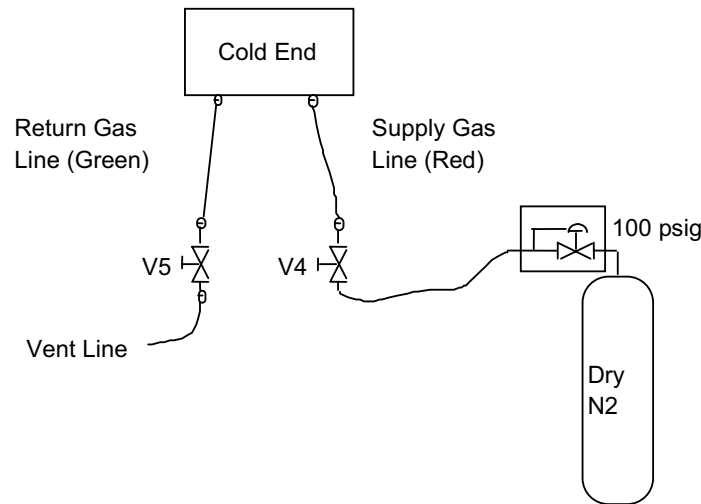


**Figure 24: Vent the Return Line**

## 7.4 Purge the Gas Lines and the Cold End (Refer to Figure 25)

- 7.4.1 Attach the nitrogen source to the supply side gas line and set the pressure to 100 psig.
- 7.4.2 Open V4.
- 7.4.3 Purge for a minimum of 4 hours after nitrogen starts flowing from the cold end.
- 7.4.4 Close V5, close V4, disconnect dry N2 source.
- 7.4.5 Optional: Close V5, V4, disconnect vent line and N2 source for use in Step 7.6. One hour after nitrogen starts flowing. Return to Step 7.4.3 after Step 7.6 is complete. Reconnect N2 source, set the pressure to 100 psig, open V5, V4 and continue dry N2 flowing for 3 more hours. It allows to complete Step 7.4 and Step 7.7 simultaneously.





**Figure 25: Purge the Gas Lines and Cold End**

## 7.5 Check the Service Bottle Pressure (Refer To Figure 6)

- 7.5.1 Attach the bottle charge manifold to the OEM service bottle.
- 7.5.2 Open V1.
- 7.5.3 Wait 5 seconds.
- 7.5.4 Close V1.
- 7.5.5 Check pressure on P1:

If the pressure on P1 is less than 65 psig,

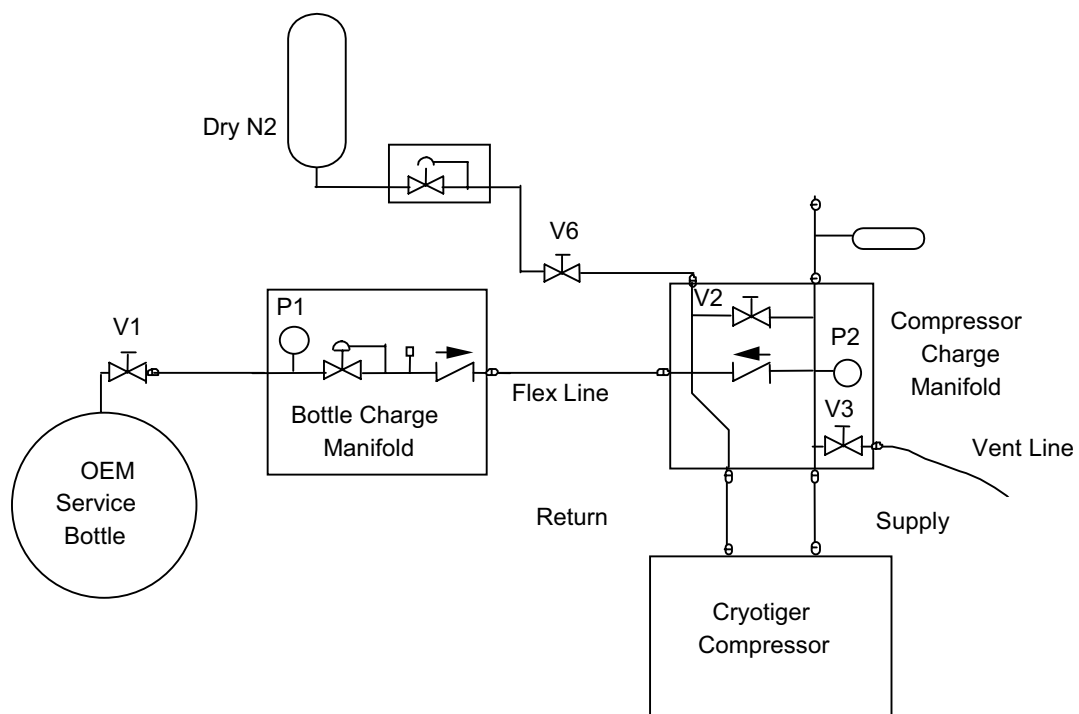
- disconnect the OEM service bottle.
- restart Step 7.5 with a new OEM service bottle.

If P1 reads greater than 65 psig, go to Step 7.6.

## 7.6 Vent the Compressor and the Manifolds (Refer to Figure 26)

- 7.6.1 Close V3.
- 7.6.2 Connect the vent line to the compressor charge manifold.
- 7.6.3 Attach the compressor charge manifold to the compressor.
- 7.6.4 Attach the supplemental charge volume to the supply side of the compressor charge manifold.
- 7.6.5 Connect one end of the 5-foot flex line to the compressor charge manifold.
- 7.6.6 Connect the other end of the 5-foot flex line to the bottle charge manifold.
- 7.6.7 Open V2.

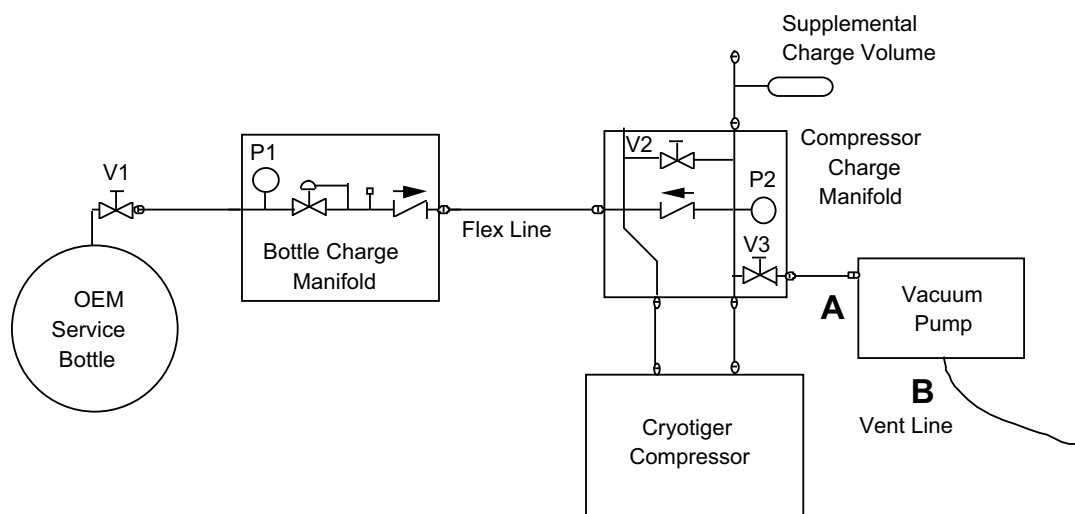
- 7.6.8 Slowly open V3 and vent the gas from the compressor until P2 reads 0 psig.
- 7.6.9 Close V3.
- 7.6.10 Close V6 on the female purge fitting.
- 7.6.11 Attach it to the return side of the compressor charge manifold as shown.
- 7.6.12 Set the N2 source pressure to 30 psig.
- 7.6.13 Open V6.
- 7.6.14 Close V2.
- 7.6.15 Switch on the compressor.
- 7.6.16 When P2 reads 300 psig, close V6.
- 7.6.17 Open V2 until the return pressure gauge reads 60 psig.
- 7.6.18 Run the compressor for 15 min.
- 7.6.19 Turn the compressor off.
- 7.6.20 Open V2.
- 7.6.21 Open V3, wait until P2 reads 0 psig.
- 7.6.22 Open V6 and purge the compressor with dry N2 for 3 min.
- 7.6.23 Close V3.
- 7.6.24 Repeat steps 7.6.14 through 7.6.21.
- 7.6.25 Close V3.
- 7.6.26 Disconnect dry N2 source.



**Figure 26: Vent the Compressor and Manifolds**

## 7.7 Evacuate the Compressor and the Manifolds (Refer to Figure 27)

- 7.7.1 Disconnect the vent line from the compressor charge manifold and connect the vacuum pump in its place (A).
- 7.7.2 Connect the vent line to the vacuum pump exhaust (B).
- 7.7.3 Switch on the vacuum pump.
- 7.7.4 Open V3.
- 7.7.5 Wait 5 minutes.
- 7.7.6 Disconnect the 5-foot flex line from the compressor charge manifold.
- 7.7.7 Open V1.
- 7.7.8 Evacuate the compressor, supplemental charge volume, and compressor charge manifold for a minimum of 2 hours.
- 7.7.9 After waiting 2 hours, close V3.
- 7.7.10 Switch off the vacuum pump.

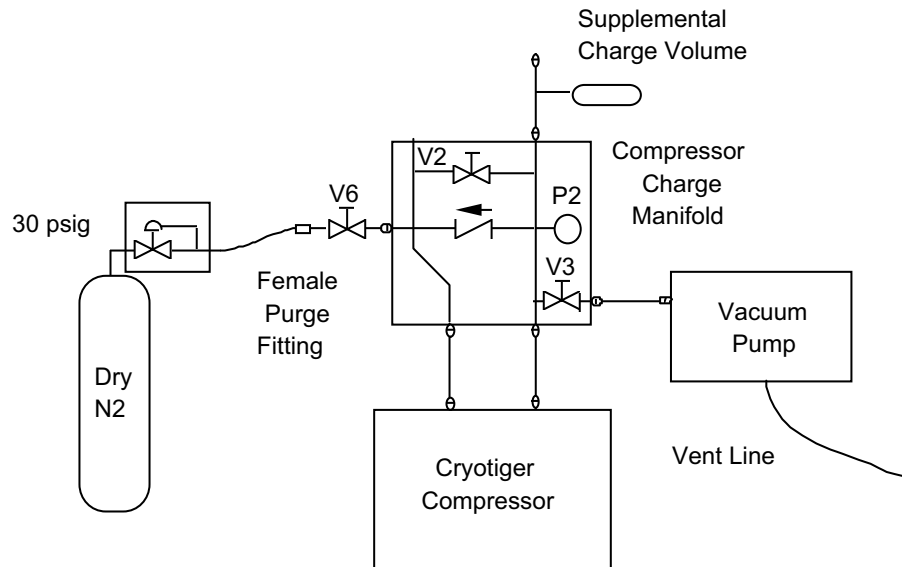


**Figure 27: Evacuate the Compressor and Manifolds**

## 7.8 Charge the Compressor with Dry Nitrogen and Warm Up (Refer to Figure 28)

- 7.8.1 Close valve V6 on the female purge fitting.
- 7.8.2 Attach it to the compressor charge manifold as shown.
- 7.8.3 Attach the dry nitrogen source to the female purge fitting.
- 7.8.4 Set the dry nitrogen pressure to 30 psig.
- 7.8.5 Open V6.
- 7.8.6 Close V2.

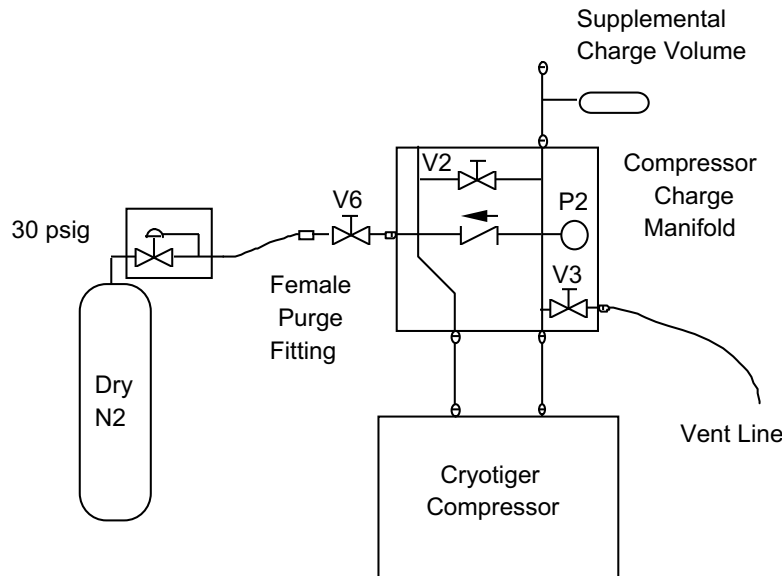
- 7.8.7 Switch on the compressor.
- 7.8.8 When P2 reads 230 psig, close V6.
- 7.8.9 Open V2 until the pressure gauge on the compressor reads 30 psig.
- 7.8.10 Run the compressor for 30 minutes.



**Figure 28: Charge Compressor with Dry Nitrogen and Warm Up**

## 7.9 Charge and Vent the Compressor (Refer to Figure 29)

- 7.9.1 Disconnect the vacuum pump.
- 7.9.2 Attach the vent line in its place.
- 7.9.3 Switch off the compressor.
- 7.9.4 Close V2.
- 7.9.5 Open V3.
- 7.9.6 Close V3 when the pressure indicated on P2 drops to 10 psig.
- 7.9.7 Open V6.
- 7.9.8 Switch on the compressor.
- 7.9.9 When P2 reads 230 psig, close V6.
- 7.9.10 Switch off the compressor.
- 7.9.11 Repeat Steps 7.9.5 to 7.9.10 nine (9) more times.



**Figure 29: Charge and Vent the Compressor**

### 7.10 Reconnect System, Evacuate and Prime with Cryotiger Gas (Refer to Figure 30)

- 7.10.1 Remove the two male purge fittings from the gas lines.
- 7.10.2 Attach the gas lines to the compressor charge manifold (return side) and supplemental charge volume (supply side).
- 7.10.3 Disconnect the female purge fitting/ nitrogen line.
- 7.10.4 Open V3.
- 7.10.5 When the pressure indicated on P2 drops to 0 psig, close V3.
- 7.10.6 Disconnect the vent line.
- 7.10.7 Attach the vacuum pump in its place.
- 7.10.8 Switch on the vacuum pump.
- 7.10.9 Open V2.
- 7.10.10 Open V3.
- 7.10.11 When P2 reads greater than 28 inches Hg in vacuum, close V3.
- 7.10.12 Switch off the vacuum pump.
- 7.10.13 Connect the 5-foot flex line to the compressor charge manifold.
- 7.10.14 Close V2.

**The system is now ready for recharging.**

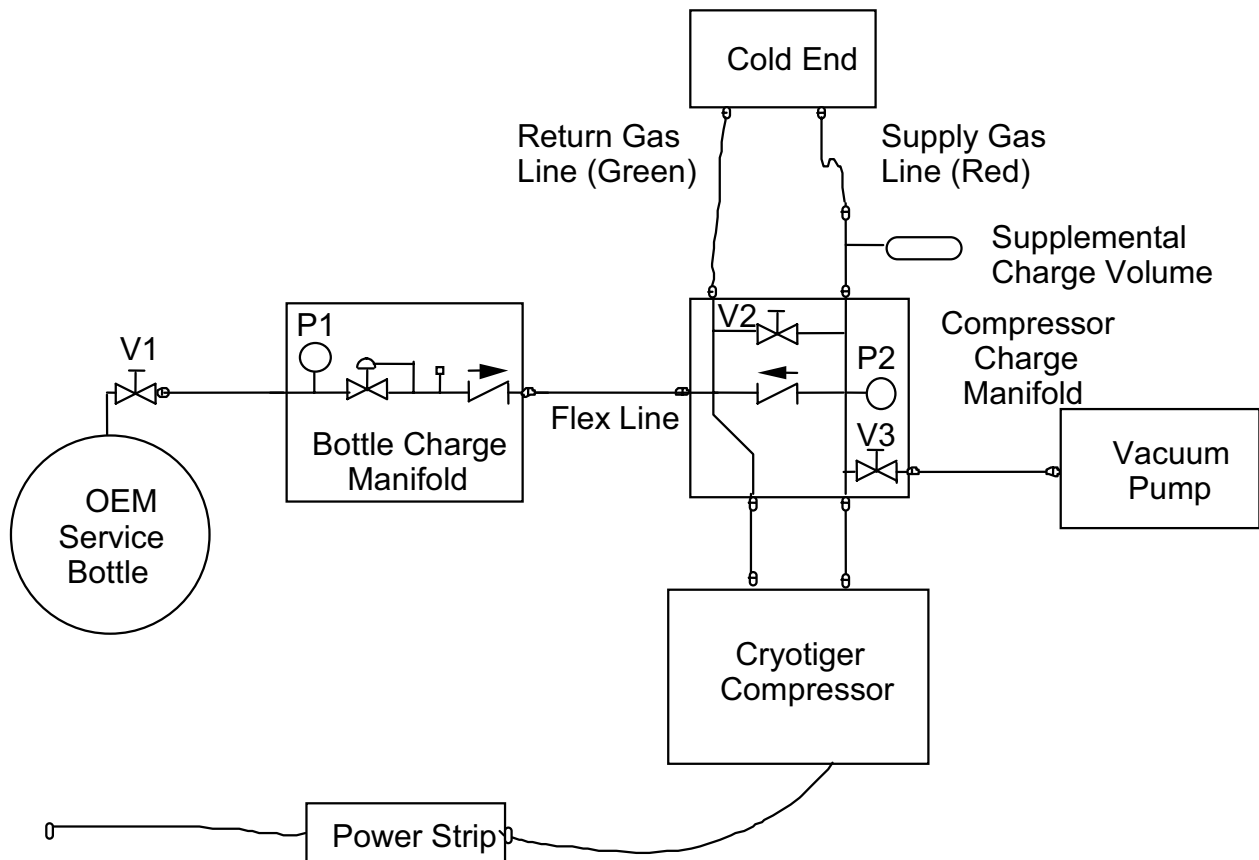


Figure 30: System Charge Assembly

### 7.11 Charge the System by Remote Operation of the Compressor (Refer to Figure 31)



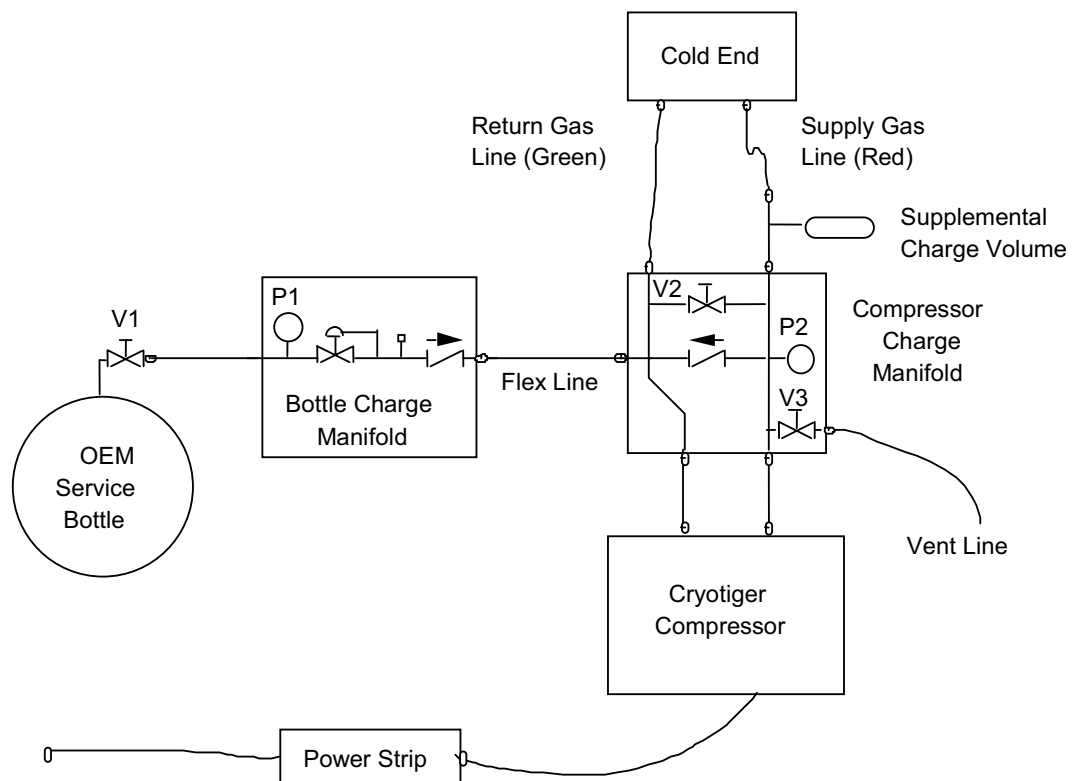
Supply pressure must remain below 345 psig at all times.

Do not allow the compressor supply pressure to rise above 345 psig.

Exceeding the pressures listed in this procedure can cause the flammable CRYOTIGER gas to vent and ignite.

- 7.11.1 Turn on the compressor using the power strip.
- 7.11.2 When P2 reaches 330 psig, switch off the compressor using the power strip.

**Do not allow the compressor supply pressure to rise above 345 psig during charging.**



**Figure 31: Adjust System Pressure**

7.11.3 Adjust system pressure:

- If your system has flex lines, refer to Table 3.
- If your system has copper lines, refer to Table 4.

7.11.4 Compare P2 to the recommended system pressure in Table 3 or Table 4.

- If P2 is more than 15 psig below the recommended system pressure, repeat Step 7.11 to increase system pressure.
- If P2 is more than 5 psig above the recommended system pressure, go to Step 7.11.5.
- If P2 is within tolerance, go to Step 7.12.

7.11.5 Disconnect the vacuum pump.

7.11.6 Connect the vent line in its place (as in Figure 31).

7.11.7 Open V2.

7.11.8 Slowly open V3 and gradually vent gas from the system until P2 reads the recommended system pressure.

7.11.9 Repeat steps 7.11.3-7.11.8 as necessary to adjust P2 to  $\pm 5$ -15 psig of recommended system pressure.

## 7.12 Remove Compressor Charge Manifold from the System (Refer to Figure 19)

- 7.12.1 Switch off the compressor.
- 7.12.2 Disconnect the supplemental charge volume (supply side) and gas line (return side) from the compressor charge manifold.
- 7.12.3 Disconnect the 5-foot flex line from the compressor charge manifold.
- 7.12.4 Disconnect the vacuum pump or vent line from the compressor charge manifold.
- 7.12.5 Disconnect the compressor charge manifold from the compressor.
- 7.12.6 Maintain the gas charge in the manifold.
- 7.12.7 Connect the supplemental charge volume (supply side) to the compressor.
- 7.12.8 Connect the gas line (return side) to the compressor.
- 7.12.9 Switch on the compressor and allow the system to cool down.

## 7.13 Remove Supplemental Charge Volume from the System (Refer to Figure 20)

- 7.13.1 After the system has reached operating temperature, switch off the compressor.
- 7.13.2 Disconnect the gas line from the supplemental charge volume.
- 7.13.3 Disconnect the supplemental charge volume from the compressor.
- 7.13.4 Disconnect the gas line from the return side of the compressor.
- 7.13.5 **Immediately** install the compressor charge manifold on the compressor and connect the supply-side, gas line to the compressor charge manifold.



**When the cold end is below 0° C, disconnecting the gas lines from the compressor without venting the lines for longer than 5 minutes will cause the flammable CRYOTIGER® gas to vent from the relief valve.**

- 7.13.6 Attach the supplemental charge volume to the return side of the compressor charge manifold.
- 7.13.7 Close V2 and then open it one turn.
- 7.13.8 Switch on the compressor.
- 7.13.9 Adjust V2 so that the pressure gauge on the compressor reads between 10 psig and 30 psig.
- 7.13.10 While the compressor is running, disconnect the supplemental charge volume from the manifold.



## 7.14 Reconnect the System (Refer to Figure 20)

- 7.14.1 Switch off the compressor at the power strip.
- 7.14.2 Unplug the power strip from the wall or other supply.
- 7.14.3 Unplug the compressor from the power strip.
- 7.14.4 Turn the compressor switch to the off position.
- 7.14.5 Disconnect the supply-side, gas line from the compressor charge manifold.
- 7.14.6 Disconnect the compressor charge manifold from the compressor.
- 7.14.7 **Immediately** reconnect the gas lines to the compressor.



**When the cold end is below 0° C, disconnecting the gas lines from the compressor without venting the lines for longer than 5 minutes will cause the flammable CRYOTIGER® gas to vent from the relief valve.**

- 7.14.8 Plug the compressor into its original power supply.
- 7.14.9 Switch the compressor on.

**The service procedure is complete. The system is now recharged.**

- If the manifolds will be stored at the customer's facility until the next use and not shipped, go to Step 7.15.
- If the manifolds will be shipped from the customer's facility to a service center or other locations, go to Step 7.16.

## 7.15 Manifold Storage at Customer's Facility

**NOTE: If the manifolds will be stored at the customer's facility and not shipped to other location(s), the manifolds do not need to be evacuated and refilled with nitrogen.**

- 7.15.1 Close V1.
- 7.15.2 Disconnect the vent line or vacuum pump from the compressor charge manifold.
- 7.15.3 Disconnect the flex line from the compressor charge manifold.
- 7.15.4 Disconnect the flex line from the bottle charge manifold.
- 7.15.5 Disconnect the bottle charge manifold from the OEM service bottle.
- 7.15.6 Store manifolds and equipment for further use.



**The refrigerant gas is flammable.**

**Refrigerant vapors can ignite easily and burn explosively.**

**Store the OEM service bottle and equipment in the same location that you use for storing a propane bottle.**

**Follow the same safety precautions used for storing propane bottles.**

**Store the equipment away from heat, flame and sparks.**

**Store the equipment in a location with adequate ventilation.**

**The equipment and OEM service bottle temperature should not exceed 125° F (52° C).**

**See instructions on the OEM service bottle for further safety and storage information.**

## **7.16 Prepare Manifolds for Shipping (Refer to Figure 22)**

**NOTE: If the manifolds will be shipped from the customer's facility to a service center or other location(s), the manifolds must be evacuated and refilled with nitrogen prior to shipping.**

- 7.16.1 Close V1.
- 7.16.2 Connect the vent line to the compressor charge manifold.
- 7.16.3 Connect the 5 foot flex line to the compressor charge manifold.
- 7.16.4 Close valve V6 on the female purge fitting and connect it to the compressor charge manifold as shown in Figure 22.
- 7.16.5 Connect the nitrogen source to the female purge fitting.
- 7.16.6 Open V2.
- 7.16.7 Open V6.
- 7.16.8 When P2 reads 100 psig, close V6.
- 7.16.9 Open V3.
- 7.16.10 Close V3 when the pressure indicated on P2 drops to 0 psig.
- 7.16.11 Disconnect the vent line and connect the vacuum pump in its place.
- 7.16.12 Connect the vent line to the vacuum pump exhaust.
- 7.16.13 Switch on the vacuum pump.
- 7.16.14 Open V3.

- 7.16.15 When the vacuum indicated on P2 reads greater than 28 inches Hg, close V3.
- 7.16.16 Switch off the vacuum pump.
- 7.16.17 Set the nitrogen source between 10 and 20 psig.
- 7.16.18 Open V6.
- 7.16.19 Close V6 when the pressure indicated on P2 reads between 10 and 20 psig.
- 7.16.20 Disconnect the nitrogen source and female purge fitting.
- 7.16.21 Disconnect vacuum pump from the compressor charge manifold.
- 7.16.22 Disconnect the 5 foot flex line from the compressor charge manifold.
- 7.16.23 Disconnect the 5 foot flex line from the bottle charge manifold.
- 7.16.24 Disconnect the bottle charge manifold from the OEM service bottle.

**Manifolds are now ready to be packaged and shipped to a service center.**

## 8 Field Cleanup of CRYOTIGER® System with Compressor Exchange

**Note:** Re-read Safety Information and Warnings, before starting this procedure.

### Purpose

This procedure guides qualified personnel to perform gas service and recharge of a CRYOTIGER® System at a customer's site. These guidelines must be followed in order to avoid gas leaks and to prevent an accidental fire.

**Special Note:** The system should be left running before the service engineer arrives to minimize the on-site service time. You should instruct the system owner to leave the system running before you arrive. If the system is warm, turn it on and allow it to reach minimum temperature before starting this procedure. Do not begin this service procedure until the system reaches the minimum temperature.

### Key Parts

Key parts for this procedure are identified in Table 2 and Figures 2 and 3. The compressor charge manifold is shown in Figure 4, where valve and pressure gauge numbering is shown. Equipment required for this procedure is listed in Table 1.

### 8.1 Prepare the Area

#### 8.1.1 Eliminate all sources of ignition

- Turn off heaters, electric motors, electric tools, and other sources of ignition during this procedure except the CRYOTIGER® compressor as directed in the procedure.
- Do not smoke.
- Extinguish all open and concealed flames, pilot lights, and other sources of heat or sparks.
- Do not use in areas where static electric sparks may be generated.

## 8.2 Set Up Remote Compressor Switch (Refer To Figure 5)

- 8.2.1 Turn off the compressor. Use the compressor's on/off switch.
- 8.2.2 Unplug the compressor.
- 8.2.3 Set the switch on the power strip to the off position
- 8.2.4 Plug in the power strip.
- 8.2.5 Set the compressor's on/off switch to the on position.
- 8.2.6 Plug the compressor into the power strip.
- 8.2.7 Turn the power strip switch on. The compressor should restart.

## 8.3 Vent the Cold End and the Gas Lines (Refer to Figures 23 and 24)



**The refrigerant is flammable. The vent line must be long enough to safely vent to an outside location free of ignition sources or flammable material. Venting gas to interior spaces can result in a fire.**

**A vent line is not supplied with this kit. You must supply an appropriate vent line. An example of an appropriate vent line is a 1/4 inch copper vent line with a 1/4 inch Swagelok coupling.**

**Although a metal vent line is preferred, a polyethylene tube may be used provided the line remains free of plugs, kinks, and reductions. If you do not have a vent line, or you are uncertain if your vent line is appropriate, contact Polycold.**



**When the cold end is below 0° C, disconnecting the gas lines from the compressor without venting the lines for longer than 5 minutes will cause the cold end gas to vent from the relief valve. Complete Steps 8.3.4 to 8.3.6 in order immediately after completing Step 8.3.3.**

- 8.3.1 Switch off the compressor.
- 8.3.2 Close the valves on both male purge fittings.
- 8.3.3 Disconnect both gas lines from the CRYOTIGER® compressor.
- 8.3.4 Immediately attach male purge fittings to the supply and return gas lines.
- 8.3.5 Immediately attach the vent line to the supply side purge fitting (Figure 23).

- 8.3.6 Immediately open V4.
- 8.3.7 Wait 30 seconds.
- 8.3.8 Close V4.
- 8.3.9 Disconnect the vent line and attach it to the return side purge fitting (Figure 24).
- 8.3.10 Open V5.

#### **8.4 Purge the Gas Lines and the Cold End (Refer to Figure 25)**

- 8.4.1 Attach the nitrogen source to the supply side gas line and set the pressure to 100 psig.
- 8.4.2 Open V4.
- 8.4.3 Purge for a minimum of 4 hours after nitrogen starts flowing from the cold end.

#### **8.5 Check The Service Bottle Pressure (Refer To Figure 6)**

- 8.5.1 Attach the bottle charge manifold to the OEM service bottle.
- 8.5.2 Open V1.
- 8.5.3 Wait 5 seconds.
- 8.5.4 Close V1.
- 8.5.5 Check pressure on P1:

If the pressure on P1 is less than 65 psig,

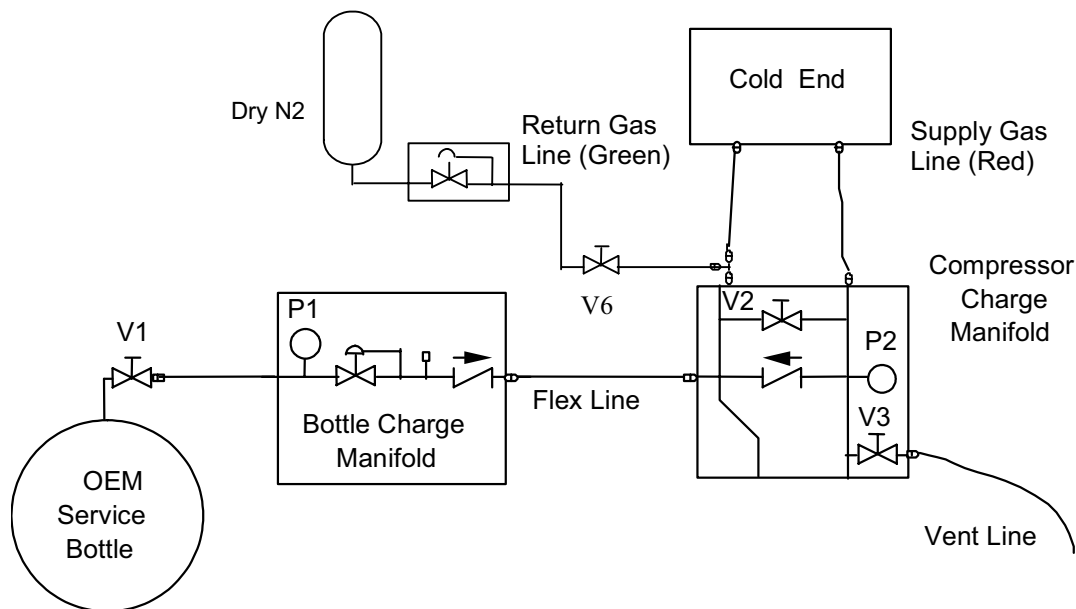
- Disconnect the OEM service bottle.
- Restart Step 8.5 with a new OEM service bottle.

If P1 reads greater than 65 psig, go to Step 8.6.

#### **8.6 Vent the Cold End, Gas Lines and the Manifolds (Refer to Figure 32)**

- 8.6.1 Close V3.
- 8.6.2 Connect the vent line to the compressor charge manifold.
- 8.6.3 Connect the 5-foot flex line between the compressor charge manifold and the bottle charge manifold.
- 8.6.4 Disconnect the male purge fittings from the gas lines.
- 8.6.5 Close V6 on the female purge fitting.
- 8.6.6 Attach it to the coupling tee as shown.
- 8.6.7 Connect coupling tee to the return side of the compressor charge manifold.
- 8.6.8 Connect the gas line to the supply side and coupling tee to the return side of the compressor charge manifold.

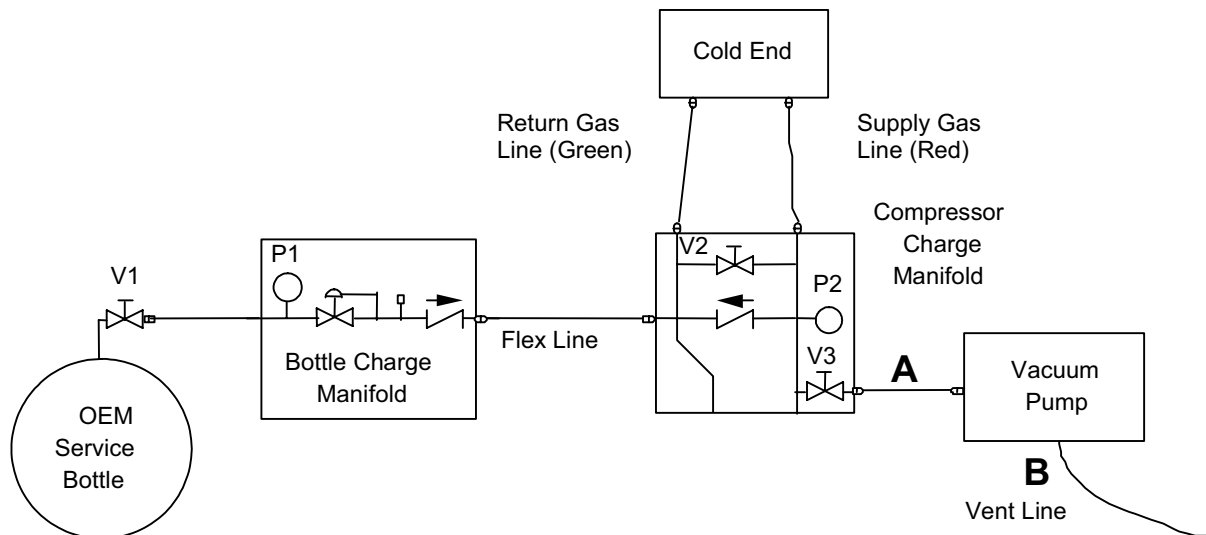
- 8.6.9 Open V2.
- 8.6.10 Slowly open V3 and vent the gas from the assembly until P2 reads 0 psig.
- 8.6.11 Close V3.
- 8.6.12 Open V6 and wait until P2 reads 100 psig.
- 8.6.13 Close V6.
- 8.6.14 Open V3, wait until P2 reads 0 psig.
- 8.6.15 Close V3.
- 8.6.16 Disconnect dry nitrogen source.
- 8.6.17 Reconnect cold end, gas lines to the compressor charge manifold.



**Figure 32: Vent the Cold End, Gas Lines, and Manifolds**

### 8.7 Evacuate and Refill the Cold End, Gas Lines and the Manifolds (Refer to Figure 33)

- 8.7.1 Disconnect the vent line from the compressor charge manifold and connect the vacuum pump in its place (A).
- 8.7.2 Connect the vent line to the vacuum pump exhaust (B).
- 8.7.3 Switch on the vacuum pump.
- 8.7.4 Slowly open V3.
- 8.7.5 Wait until P2 reads greater than 28 inches Hg.
- 8.7.6 Close V3.
- 8.7.7 Switch off the vacuum pump.
- 8.7.8 Open V1.



**Figure 33: Evacuate the Cold End, Gas Lines, and Manifolds**

## 8.8 Reconnect System (Refer to Figure 21)

- 8.8.1 Disconnect the gas lines from the compressor manifold.
- 8.8.2 Attach the compressor charge manifold to the exchange compressor.
- 8.8.3 Re-attach the gas lines to the compressor charge manifold.
- 8.8.4 Close V2.

**The system is now ready for recharging.**

## 8.9 Charge the System by Remote Operation of the Compressor (Refer to Figure 31)



**Supply pressure must remain below 345 psig at all times.**

**Do not allow the compressor supply pressure to rise above 345 psig.**

**Exceeding the pressures listed in this procedure can cause the flammable CRYOTIGER® gas to vent and ignite.**

- 8.9.1 Turn on the compressor using the power strip.
- 8.9.2 When P2 reaches 330 psig, switch off the compressor using the power strip.

**Do not allow the compressor supply pressure to rise above 345 psig during charging.**



- 8.9.3 Adjust system pressure:
- If your system has flex lines, refer to Table 3.
  - If your system has copper lines, refer to Table 4.
- 8.9.4 Compare P2 to the recommended system pressure in Table 3 or Table 4.
- If P2 is more than 15 psig below the recommended system pressure, repeat Step 8.9 to increase system pressure.
  - If P2 is more than 5 psig above the recommended system pressure, go to Step 8.9.5.
  - If P2 is within tolerance, go to Step 8.10.
- 8.9.5 Disconnect the vacuum pump.
- 8.9.6 Connect the vent line in its place (as in Figure 31).
- 8.9.7 Open V2.
- 8.9.8 Slowly open V3 and gradually vent gas from the system until P2 reads the recommended system pressure.
- 8.9.9 Repeat steps 8.9.3 - 8.9.8 as necessary to adjust P2 to +5/-15 psig of recommended system pressure.

## 8.10 Disconnect Charge Equipment and Reconnect the System

- 8.10.1 Switch off the compressor at the power strip.
- 8.10.2 Disconnect the gas lines from the compressor charge manifold.
- 8.10.3 Disconnect the compressor charge manifold from the compressor.
- 8.10.4 Reconnect the gas lines to the compressor.
- 8.10.5 Read the system pressure indicated by the gauge on the compressor.
- If the system pressure is more than 15 psig below the recommended system pressure in Table 3 or Table 4, repeat Steps 8.8 and 8.9.
  - If the system pressure is within the recommended pressure, go to Step 8.10.6.
- 8.10.6 Unplug the power strip from the wall or other supply.
- 8.10.7 Turn the compressor switch to the off position.
- 8.10.8 Unplug the compressor from the power strip .
- 8.10.9 Plug in the compressor to the wall or other supply.
- 8.10.10 Turn on the compressor using the compressor switch.

The service procedure is complete. The system is now recharged.

- If the manifolds will be stored at the customer's facility until the next use and not shipped, go to Step 8.11.
- If the manifolds will be shipped from the customer's facility to a service center or other locations, go to Step 8.12.

## 8.11 Manifold Storage at Customer's Facility

**NOTE:** If the manifolds will be stored at the customer's facility and not shipped to other location(s), the manifolds do not need to be evacuated and refilled with nitrogen.

- 8.11.1 Close V1.
- 8.11.2 Disconnect the vent line or vacuum pump from the compressor charge manifold.
- 8.11.3 Disconnect the flex line from the compressor charge manifold.
- 8.11.4 Disconnect the flex line from the bottle charge manifold.
- 8.11.5 Disconnect the bottle charge manifold from the OEM service bottle.
- 8.11.6 Store manifolds and equipment for further use.



**The refrigerant gas is flammable.**

**Refrigerant vapors can ignite easily and burn explosively.**

**Store the OEM service bottle and equipment in the same location that you use for storing a propane bottle.**

**Follow the same safety precautions used for storing propane bottles.**

**Store the equipment away from heat, flame and sparks.**

**Store the equipment in a location with adequate ventilation.**

**The equipment and OEM service bottle temperature should not exceed 125° F (52° C).**

**See instructions on the OEM service bottle for further safety and storage information.**

## 8.12 Prepare Manifolds for Shipping (Refer to Figure 22)

**NOTE:** If the manifolds will be shipped from the customer's facility to a service center or other location(s), the manifolds must be evacuated and refilled with nitrogen prior to shipping.

- 8.12.1 Close V1.
- 8.12.2 Connect the vent line to the compressor charge manifold.
- 8.12.3 Connect the 5 foot flex line to the compressor charge manifold.
- 8.12.4 Close valve V6 on the female purge fitting and connect it to the compressor charge manifold as shown in Figure 22.
- 8.12.5 Connect the nitrogen source to the female purge fitting.
- 8.12.6 Open V2.

- 8.12.7 Open V6.
- 8.12.8 When P2 reads 100 psig, close V6.
- 8.12.9 Open V3.
- 8.12.10 Close V3 when the pressure indicated on P2 drops to 0 psig.
- 8.12.11 Disconnect the vent line and connect the vacuum pump in its place.
- 8.12.12 Connect the vent line to the vacuum pump exhaust.
- 8.12.13 Switch on the vacuum pump.
- 8.12.14 Open V3.
- 8.12.15 When the vacuum indicated on P2 reads greater than 28 inches Hg, close V3.
- 8.12.16 Switch off the vacuum pump.
- 8.12.17 Set the nitrogen source between 10 and 20 psig.
- 8.12.18 Open V6.
- 8.12.19 Close V6 when the pressure indicated on P2 reads between 10 and 20 psig.
- 8.12.20 Disconnect the nitrogen source and female purge fitting.
- 8.12.21 Disconnect vacuum pump from the compressor charge manifold.
- 8.12.22 Disconnect the 5 foot flex line from the compressor charge manifold.
- 8.12.23 Disconnect the 5 foot flex line from the bottle charge manifold.
- 8.12.24 Disconnect the bottle charge manifold from the OEM service bottle.

**Manifolds are now ready to be packaged and shipped to a service center.**

## ADDENDUM

### A.1 MOISTURE CLEANUP OF UNUSED ¼” SUPERFLEX LINES

**NOTE-1:** Before starting this procedure, re-read SAFETY INFORMATION and WARNINGS.

**NOTE-2:** Read this procedure completely before starting.

**NOTE-3:** This procedure requires that the Compressor and External Filter/Dryer are both charged with the same PT-xx Gas.

**NOTE-4:** This procedure requires 2 *SuperFlex* Lines to be dried.

**NOTE-5:** Properly support all components during this procedure.

#### PURPOSE:

Use this procedure to reduce moisture levels in UNUSED ¼” SUPERFLEX LINES.  
This procedure requires parts and information included in the Field Service Kit.

#### PROCEDURE:

##### STEP 1 Prepare the Area

- 1.1 Eliminate all sources of ignition:
  - Turn off heaters, electric motors, electric tools, and other sources of ignition during this procedure except the CRYOTIGER® compressor as directed in the procedures.
  - Extinguish all open and concealed flames, pilot lights, and other sources of heat or sparks.
  - Do not use in areas where static electric sparks may be generated.
- 1.2 Remove all flammable liquids stored in the area.

##### STEP 2 CRYOTIGER® System Setup and Check

- 2.1 Ensure that the compressor is turned off.
- 2.2 Ensure that all components are at ambient temperature (≈285K or above).
- 2.3 Disconnect the flex lines from the compressor.

##### STEP 3 Vent Drying Equipment and Components (see Figure A1)

- 3.1 Connect flex lines to be dried with a line-to-line connector (male-male).
- 3.2 Connect the other line-to-line connector (male-male) to the end of one of the flex lines to be dried.
- 3.3 Connect the line-to-line connector (female-female) to one of the line-to-line connectors (male-male).
- 3.4 Verify that V3 on the compressor charge manifold is closed.
- 3.5 Connect the line-to-line connector (female-female) to the return side male coupling on the compressor charge manifold.
- 3.6 Connect the 5' flex line to the supply side male coupling on the compressor charge manifold.
- 3.7 Verify that V2 is open.
- 3.8 Connect the vent line to the compressor charge manifold vacuum/vent connection.
- 3.9 Vent the gas in accordance with all environmental and safety regulations by opening V3 for 1 min. Close V3.
- 3.10 Disconnect the vent line from the vacuum/vent connection.

**STEP 4 Vacuum Drying Equipment and Components**

- 4.1 Connect the Vacuum Pump to the Vacuum/Vent Connection.
- 4.2 Connect the vent line to the vacuum pump.
- 4.3 Open V3.
- 4.4 Turn on the vacuum pump and evacuate for 30 min.
- 4.5 Close V3 and turn off the vacuum pump.
- 4.6 Disconnect the vacuum pump from the vacuum/vent connection.
- 4.7 Disconnect the vent line from the vacuum pump.

**STEP 5 Preparation for Drying (see Figure A2)**

- 5.1 Disconnect the line-to-line connector (female-female) from the return side male coupling on the compressor charge manifold.
- 5.2 Disconnect the line-to-line connector (female-female) from the line-to-line connector (male-male).
- 5.3 Connect the female coupling on the external filter/dryer flex line to the line-to-line connector (male-male).
- 5.4 Connect the line-to-line connector (female-female) to the male coupling on the external filter/dryer.
- 5.5 Connect the line-to-line connector (female-female) to the return side male coupling on the compressor charge manifold.
- 5.6 Connect the female coupling of the free end of the flex line to be dried to the supply side male coupling on the compressor.
- 5.7 Connect the female coupling of the 5' flex line to the return side male coupling on the compressor.
- 5.8 Ensure that V2 is open at least one turn.

**STEP 6 Drying**

- 6.1 Start the compressor.
- 6.2 Adjust V2 for a return pressure of  $50 \pm 10$  psig as indicated on P2.
- 6.3 Run the system for 4 hours.
- 6.4 Shut off system.

**STEP 7 Disconnect Equipment and Components**

- 7.1 Disconnect the female coupling on the flex line to be dried from the supply side male coupling on the compressor.
- 7.2 Disconnect the female coupling on the 5' flex line from the return side male coupling on the compressor.
- 7.3 Disconnect the line-to-line connector (female-female) from the return side male coupling on the compressor.
- 7.4 Disconnect the line-to-line connector (female-female) from the male coupling on the external filter/dryer.
- 7.5 Disconnect the female coupling on the external filter/dryer flex line from the line-to-line connector (male-male).
- 7.6 Disconnect the line-to-line connector (male-male) from the female coupling on the dried flex line.
- 7.7 Disconnect the remaining line-to-line connector (male-male) from the female coupling on the other dried flex line.
- 7.8 The dried flex lines and the external filter/dryer are charged with PT gas from the compressor and are now ready for use.

**STEP 8 Prepare Equipment and Components for Storage - Connections  
(see Figure A3)**

- 8.1 Connect one line-to-line connector (male-male) to the return side female coupling on the compressor charge manifold.
- 8.2 Connect remaining line-to-line Connector (male-male) to the supply side female coupling on the compressor charge manifold.
- 8.3 Connect the line-to-line connector (female-female) to the return side male coupling on the compressor charge manifold.
- 8.4 Close V6 on the female purge fitting and connect it to the charge coupling on the compressor charge manifold (see Figures 3 and 12 in Field Service Manual).

**STEP 9 Prepare Equipment and Components for Storage - Venting**

- 9.1 Connect the vent line to the vacuum/vent connection on the compressor charge manifold.
- 9.1 Open V2.
- 9.3 Vent the gas in accordance with all environmental and safety regulations by opening V3 for 1 min.
- 9.4 Close V3.
- 9.5 Disconnect the vent line from the vacuum/vent connection.

**STEP 10 Prepare Equipment and Components for Storage - Vacuuming**

- 10.1 Connect the vacuum pump to the vacuum/vent connection.
- 10.2 Connect the vent line to the vacuum pump.
- 10.3 Open V3.
- 10.4 Turn on the vacuum pump and evacuate for 30 min.
- 10.5 Close V3 and turn off the vacuum pump.
- 10.6 Disconnect the vacuum pump from the vacuum/vent connection.
- 10.7 Disconnect the vent line from the vacuum pump.

**STEP 11 Prepare Equipment and Components for Storage - Charge with N2**

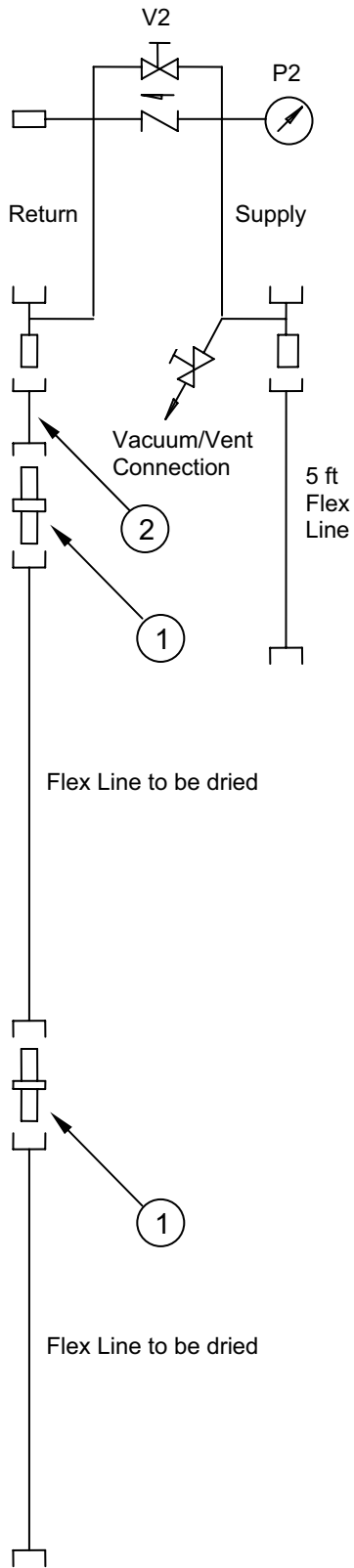
- 11.1 Connect the dry nitrogen source to the female purge fitting.
- 11.2 Open V2.
- 11.3 Set the dry nitrogen source to  $20 \pm 5$  psig.
- 11.4 Adjust V6 on the female purge fitting for a pressure of  $20 \pm 5$  psig as indicated on P2.
- 11.5 Close V6.
- 11.6 Disconnect the dry nitrogen source from the female purge fitting.
- 11.7 Disconnect the female purge fitting from the compressor charge manifold.

**STEP 12 Store Equipment and Components**

- 12.1 Disconnect the 5' flex line from the compressor charge manifold.
- 12.2 Disconnect line-to-line connectors from the compressor charge manifold.
- 12.3 Store components in the field service kit.

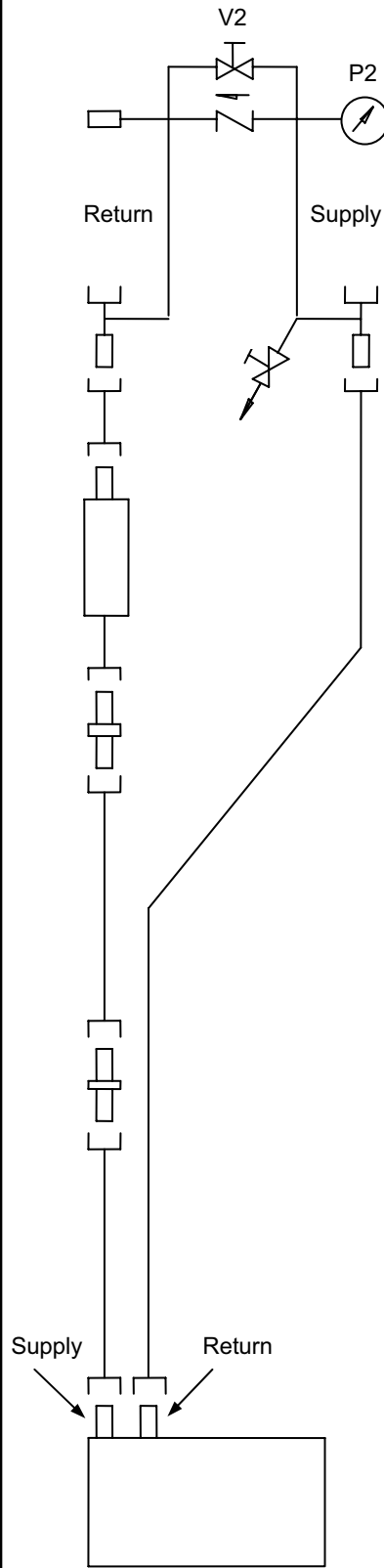
**Figure A1**

**Vent & Evacuation of Drying Components**



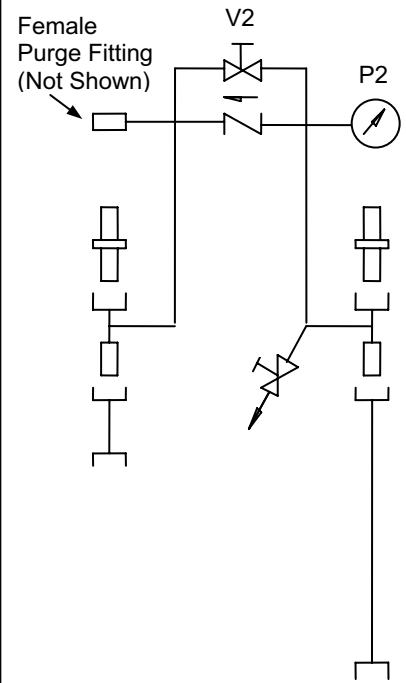
**Figure A2**

**Drying**



**Figure A3**

**Vent, Evacuation, & Charge for Storage**



- ① Line-to-Line Connector (Male-Male)
- ② Line-to-Line Connector (Female-Female)