

## INTRODUCTION

Western manifold systems are cleaned, tested, and prepared for the indicated gas service and are built in accordance with the National Fire Protection Association (NFPA), Food and Drug Administration (FDA), and Compressed Gas Association (CGA) guidelines.

The transfer of gas from one cylinder to another, commonly known as transfilling, must be carried out under carefully controlled conditions and requires appropriate equipment and properly trained and qualified personnel. Oxygen used for medical purposes is considered a drug and its processing requires additional tests and records. Transfilling medical oxygen must be done in a facility registered annually with the FDA. Regulations of the Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), and other government agencies also apply.

The Western manifold is designed and built to meet the above requirements. The system consists of a header for supply cylinders, a regulator for controlling the fill pressure, a vacuum regulator for the evacuation of the fill cylinders, and a fill header that includes gauges, orifices, and valves for each cylinder being filled. The manifold is also designed to allow for expansion to meet future needs. In addition, a vacuum pump and an oxygen analyzer are required to meet the above regulatory requirements. These pieces of equipment may be purchased separately or as part of the Western PK option.

## CAUTION

### **Failure to follow these instructions can result in personal injury or property damage:**

- Never permit oil, grease, or other combustible materials to come in contact with cylinders, manifolds, and connections. Oil and grease may react and ignite when in contact with some gases - particularly oxygen.
- Cylinder, manifold, and master valves should always be opened very s-l-o-w-l-y. Heat of recompression may ignite combustible materials.
- Pigtails should never be kinked, twisted, or bent into a radius smaller than 3 inches. Mistreatment may cause the pigtail to burst.
- Do not apply heat. Some materials may react and ignite while in contact with some gases - particularly oxygen.
- Cylinders should always be secured with racks, chains, or straps. Unrestrained cylinders may fall over and damage or break off the cylinder valve, which may propel the cylinder with great force.
- Oxygen manifolds and cylinders should be grounded. Static discharges and lightning may ignite materials in an oxygen enriched area, creating a potential hazard.

## WARRANTY

All Western manifolds are warranted against defects in materials and workmanship for the period of one year from date of purchase. See back cover for details of limited warranty.

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## MANIFOLD LOCATION

1. Manifolds should be installed in accordance with guidelines stated by the NFPA and CGA as well as OSHA, Canadian Standards Association (CSA) and all local codes.
2. The manifold should **not** be placed in a location where the temperature will exceed 100° F (38°C) or fall below 50°F (10°C).
3. The manifold should be located indoors in a clean, well vented area which is free of oil and combustible materials.
4. The transfilling manifold should be located on an external wall, to facilitate installation of vent lines. However, vent lines are optional if the cylinders are completely vented (blown down) to atmospheric pressure outdoors.
5. Observe local fire codes and any other regulations that may apply.

### CAUTION:

- Locate the vacuum pump and electrical outlets at least ten feet (10) from any part of the manifold system in conjunction with CGA P-2.5 requirements. This is a precautionary measure because electrical devices can spark and may be a fire hazard if they are operated in an oxygen-enriched environment.

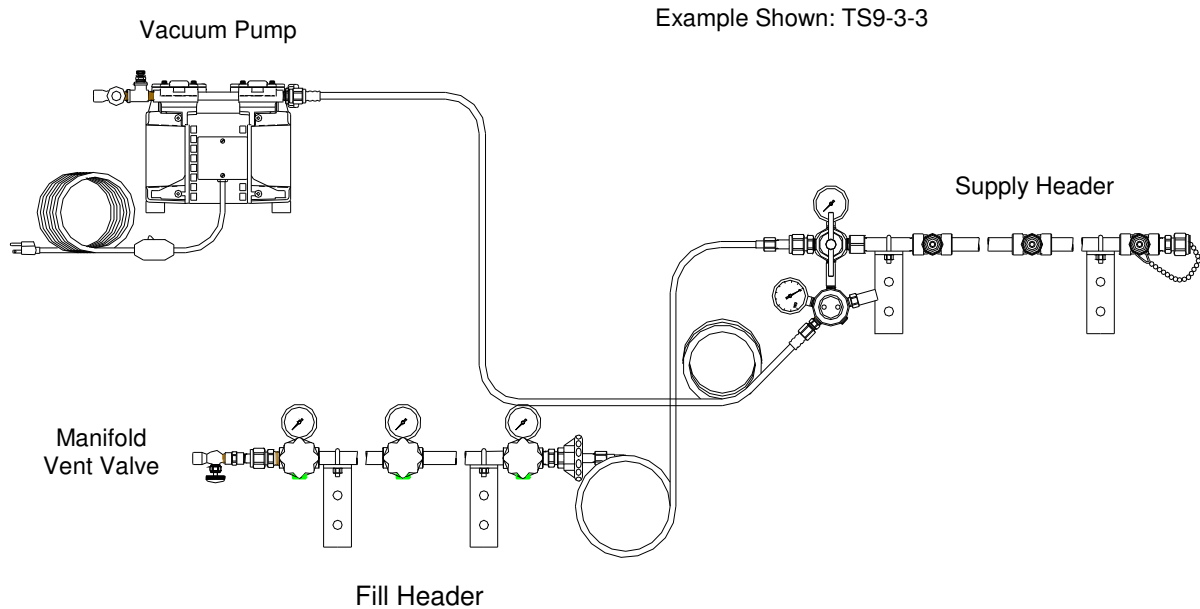


FIGURE 1

## MANIFOLD ASSEMBLY

### CAUTION:

- Leave all protective covers in place until removal is required for installation. This precaution will keep moisture and debris from the piping interior, avoiding operational problems.
- Prior to assembly, remove all protective caps. The protective caps may ignite if left installed, due to heat of recompression in oxygen systems.

1. Apply Teflon tape to the 1/4 NPT threads on the vacuum regulator. (Figure 2)

### NOTE:

- When applying Teflon tape, face the threaded end towards you. Apply 2-3 wraps of Teflon tape clockwise around the threads, leaving the first two threads untaped.

2. Assemble the vacuum regulator to the header assembly as shown in figure 2.

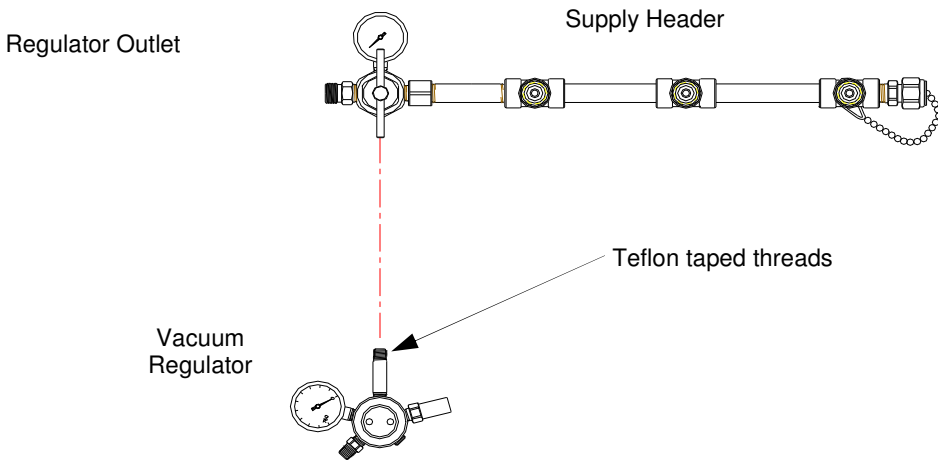


FIGURE 2

### MANIFOLD INSTALLATION - Supply Side

1. Measure from the floor to a point 60" in height\*. Using a level, mark a horizontal line extending approximately 20" to the left and 20" to the right of center.

(\*- Suggested manifold height. Wall mounting heights may vary from one installation to another depending on available space, cylinder height etc.)

2. Measure the header and mark a distance on the wall that would evenly space the brackets to provide the most support and stability. Take into consideration the location of the tees on the header. The brackets will need to be located on the pipe between the tees.

3. Remove the U-bolt assemblies from the mounting brackets. Position the brackets so that the top of the bracket is aligned with the horizontal line.

4. Mark the mounting holes and install fasteners suitable for the type of wall construction. (Figure 4)

5. Install the brackets. (Figure 4)

6. Mount the manifold by placing the header on the brackets. Fit the U-Bolt over the header pipe and tighten the two mounting nuts. (Figure 4)

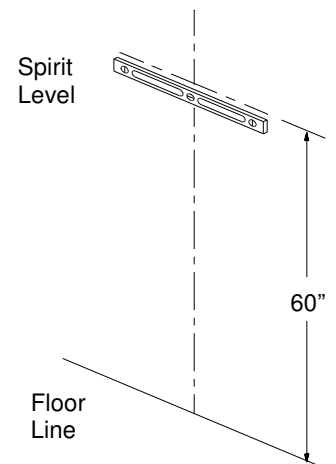


FIGURE 3

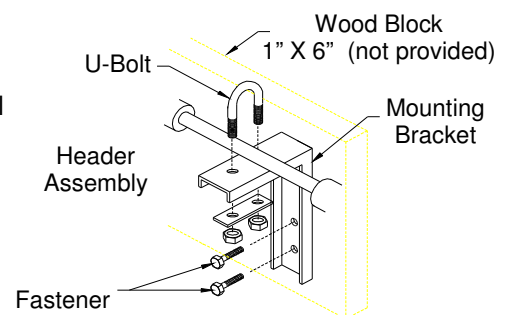


FIGURE 4

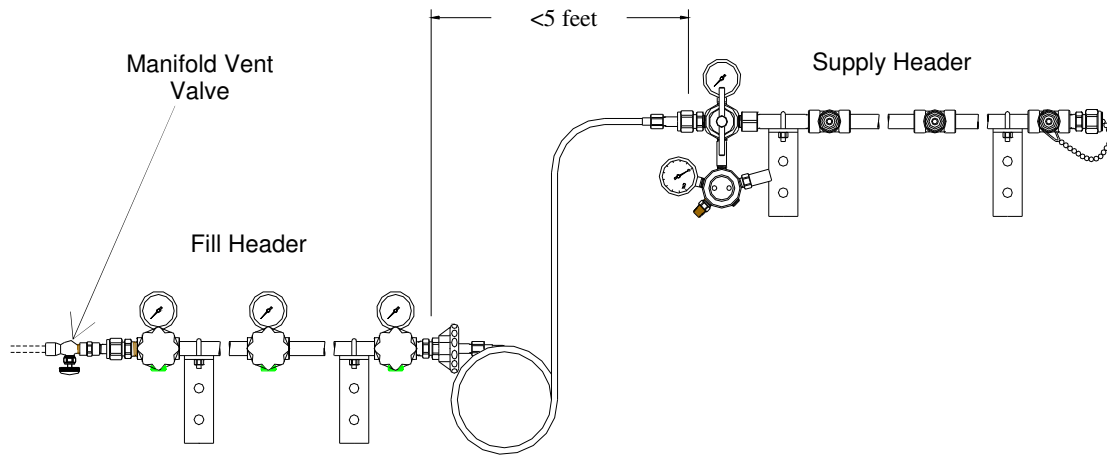


FIGURE 5

### MANIFOLD INSTALLATION - Fill Side

If your system does not have a fill header, skip this section.

1. The distance between the left end of the supply header and the right end of the fill header should be less than five (5'). The length of the PF-63HT-60 pigtail, which will connect the two headers, is five feet (5').

2. Measure from the floor to a point 36" in height\*. Using a level, mark a horizontal line extending approximately 20" to the left and 20" to the right of center.

(\* - Typical manifold height. The wall mounting height should be chosen by considering:

- A) Will this header clear the taller fill cylinder?
- B) Will this header clear the cylinder rack (or other form of support) being used?
- C) Will the cylinders be able to sit on a surface? They should not hang on the pigtails.

3. Measure the header and mark a distance on the wall that would evenly space the brackets to provide the most support and stability. Take into consideration the location of the tees on the header. The brackets will need to be located on the pipe between the tees.

4. Remove the U-bolt assemblies from the mounting brackets. Position the bracket so that the top of the bracket is aligned with the horizontal line.

5. Mark the mounting holes and install fasteners suitable for the type of wall construction. (Figure 6)

6. Install the brackets. (Figure 6)

7. Mount the manifold by placing the header on the brackets. Fit the U-bolt over the header pipe and tighten the two mounting nuts. (Figure 6)

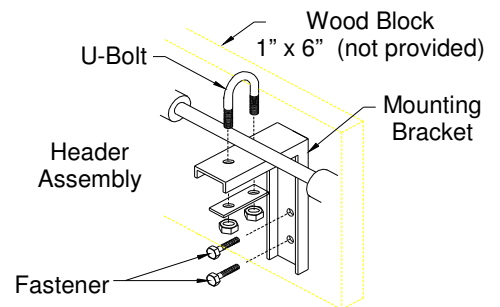
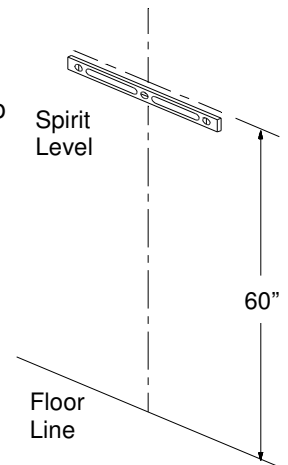
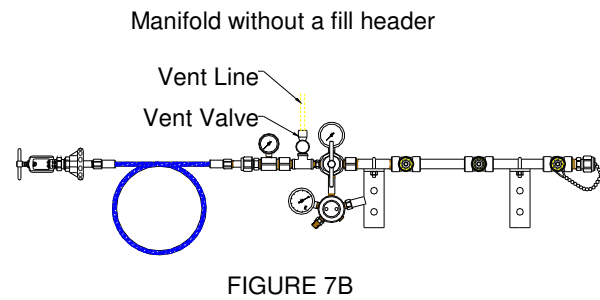
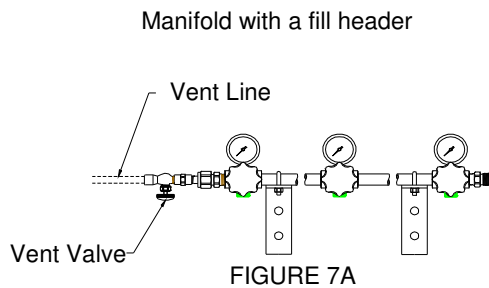


FIGURE 6



## MANIFOLD INSTALLATION - Manifold Vent Line

During normal operation, the manifold system and cylinders will need to be vented. Install a vent line, connecting the manifold system to the outside of your building. This will prevent the creation of an oxygen-enriched environment. Vent lines are optional if the cylinders are vented (blown down) completely to atmospheric pressure outdoors.

1. Determine a path for the manifold vent line. The vent line will connect the shut-off valve (located at the left end of the fill manifold) to a point outside of your building.
2. Determine the piping material (not provided with the manifold system), flex copper tubing (Western P/N CT-70) is recommended. Rigid copper tubing may be used if oxygen-compatible brazing practices are followed. Fittings to connect to both types of copper piping materials are provided with this system.
3. Install the proper fitting(s) into the shut-off valve. Apply Teflon tape to any pipe threads as described previously. (see Figure 7)

### CAUTION:

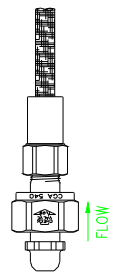
- If piping is brazed, it must be cleaned in a manner complying with CGA G-4.1 Contaminants in the piping may ignite in an oxygen-enriched atmosphere
  - The manifold vent line should be piped to an area that is clear of debris or anything that may become flammable in an oxygen-enriched environment.
4. Support the vent line piping from the shut-off valve to the outside using the appropriate wall-mounting hardware. (Not provided with the manifold system.) The exposed end of the vent pipe should be angled down to prevent rain and debris from entering.

## MANIFOLD INSTALLATION - Pigtails

1. Connect a PF-63CV-24 pigtail to each port of the supply header. This pigtail is 24" in length and has a CGA 540 nut and nipple at both ends. One end contains a check valve, indicated by a stamped arrow. When the pigtail is attached, this arrow should point towards the supply header.

### NOTE:

- Care should be taken to make sure the correct pigtails are used in the right locations. If a pigtail with a check valve is located on the fill header, you will not be able to either fill or evacuate the cylinder.
2. Connect the supply header to the fill header using a PF-63HT-60 pigtail. This pigtail is 60" in length. One end has a standard CGA 540 nut and nipple, while the other end has a hand-tight CGA 540 nut and nipple. Attach the standard end to the regulator. Attach the hand-tight end to the right end of the fill header.



### NOTE:

- If your system does not have a fill header, use the PF-63-870-60 (which includes a yoke) and skip step 3.

3. Connect a PF-63-870-24 pigtail to each port of the fill header. This pigtail is 24" in length. One end has a standard CGA 540 nut and nipple, while the other end has a CGA 870 yoke adapter. Attach the CGA 540 end to the fill header.

### CAUTION:

- Never connect fill pigtails where the vent valve is located (end of the fill header). This port location does not have a flow restrictor. Transfilling from this location will cause cylinders to fill too quickly. The heat generated during the filling process could cause a fire or damage the cylinder being filled.

## VACUUM PUMP INSTALLATION

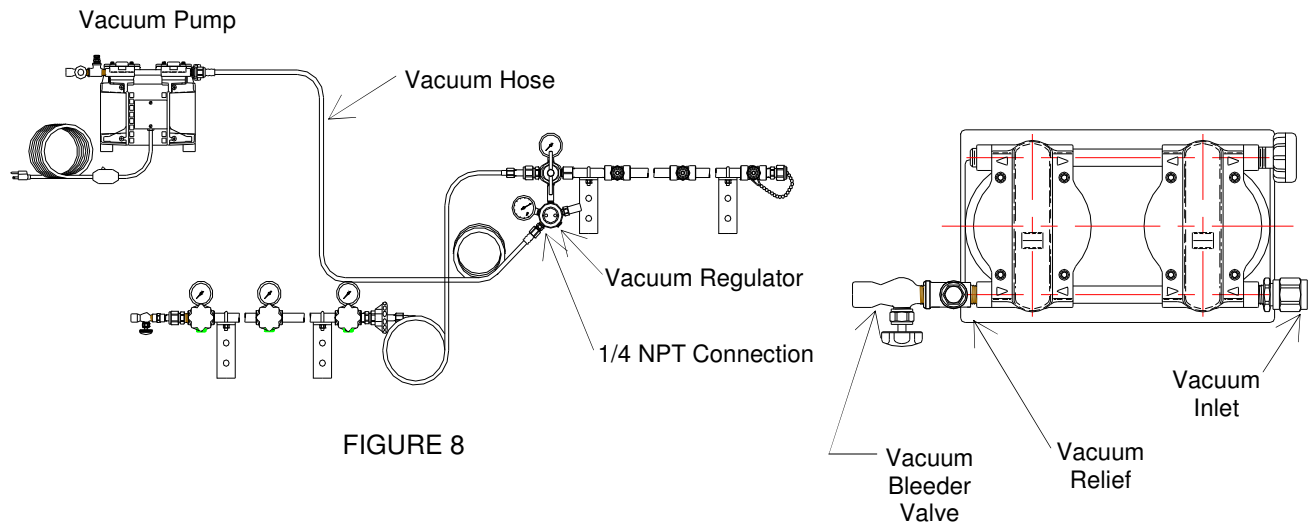
During normal operation, a vacuum source (producing at least 25 inches of mercury) is required by the Food and Drug Administration (FDA). To install the vacuum source, follow the instructions that best describe your installation.

### CAUTION:

- Locate the vacuum pump and electrical outlets at least ten feet (10') from any part of the manifold system in conjunction with CGA P-2.5 requirements. This is a precautionary measure because electrical devices can spark, and may be a fire hazard if they are operated in an oxygen-enriched environment.

### VACUUM PUMP INSTALLATION - Western CS-PK2

1. Properly secure the vacuum pump to a table or shelf. The vacuum pump must be located at a height above the fill manifold.
2. Connect the vacuum hose between the vacuum regulator and the vacuum pump. This hose has a 1/4" NPT adapter at one end and a DISS 1220 suction nut and nipple at the other end. Attach the 1/4" NPT end to the VV100 vacuum regulator. If Teflon tape is not present, apply as described previously.
3. Attach the DISS 1220 (suction nut) end to the inlet of the vacuum pump. (Teflon tape should not be used.)
4. Plug the vacuum pumps power cord into a 110 VAC outlet.



## **VACUUM PUMP INSTALLATION - Non Western**

1. Obtain a properly sized vacuum hose, a minimum of 5/16" diameter should be used. This hose will need a 1/4" NPT (F) adapter at one end and the other end will need to adapt to your vacuum source.
2. Attach the 1/4" NPT end to the vacuum regulator. If Teflon tape is not present, apply as described previously. The other end should be connected to your vacuum source. The vacuum source should be located per the caution statement on the previous page.
3. Pipe the exhaust of the vacuum pump per manufacturers' requirements.

## **CHECKING PROCEDURES**

1. Attach one full H, J or K (2200-2400 psig) cylinder to each supply manifold pigtail.
2. Tag each cylinder with a number starting at 1, 2, 3..... from left to right.
3. Back out the tee handle on the pressure regulator until it spins freely. (turn handle counter-clockwise)
4. Make sure the manifold vent valve and the valves on the fill manifold are closed.
5. S-L-O-W-L-Y open the first cylinder valve on the supply manifold (turn handle counter-clockwise to open). The contents gauge on the pressure regulator will show the pressure of the supply cylinder. (Figure 9)
6. Adjust the pressure regulator to the desired fill pressure (generally around 2000 psig). Wait 5 minutes and verify that the regulator setting has not increased more than 50 psig.
7. Apply an oxygen safe leak test solution (Western P/N LT-100) to all the manifold joints. After the system is depressurized and the cylinders have been removed, tighten or reinstall all connections that showed signs of leakage.
8. Close the cylinder and deplete the gas by opening the manifold vent valve.
9. The manifold is now ready for operation.

## **GENERAL MAINTENANCE**

1. Daily
  - a) Check vacuum gauge zero.
2. Monthly
  - a) Check pressure regulator, manifold, and valves for external leakage.
  - b) Check valves for closure ability.
  - c) Check pigtail for cleanliness, flexibility, wear, leakage, and thread damage.
3. Annually
  - a) Check relief valve pressure.
  - b) Check accuracy of the vacuum gauge.
  - c) Check accuracy of the pressure gauges.
4. Every 4 years
  - a) Replace all pigtails.
5. As needed
  - a) Replace yoke washers.
6. Per Manufacturer's instructions
  - a) Vacuum pump.
  - b) Oxygen analyzer.
7. Per written procedures
  - a) Thermometer accuracy.



## OPERATING INSTRUCTIONS

Summary:

1. Inspect cylinders
2. Vent cylinders
3. Evacuate cylinders
4. Fill cylinders
5. Label Cylinders
6. Verify cylinder contents
7. Document required information

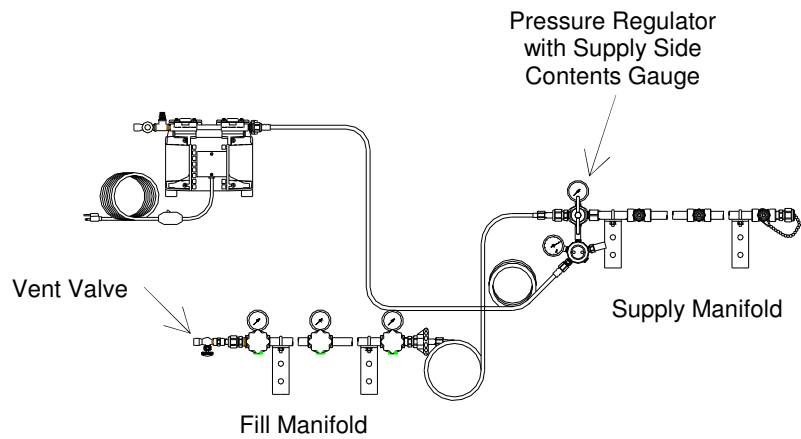


FIGURE 9

### Cylinder Inspection

The following instructions were taken from CGA P-2.5, C-6, C-6.1 and FDA guidelines. See these documents for additional information on definitions and specific requirements.

1. Markings
  - a) Check ownership.
  - b) Check ICC or DOT specification number.
  - c) Verify pressure rating.
  - d) Check retest date - Do not refill the cylinder if retesting is required (DOT part 173.34(e), Aluminum cylinders require testing every 5 years and steel cylinders every 10 years.)
  - e) Check label for gas service.

#### NOTE:

- The specification and service pressure number marking is normally located immediately below the neck ring, and consists of a combination of numbers and letters. For example the designation DOT-3AA-2015 indicates that the cylinder was fabricated and tested to DOT specification 3AA for a service pressure of 2015 PSIG.

#### 2. Visual Inspection

##### Steel Cylinders

- a) Visually inspect the entire cylinder following CGA guidelines outlined in CGA C-6. These defects include: corrosion, cuts, digs, cracks, dents, gouges, bulges, arc burns, fire damage, neck defects, threads and valving. If damaged, return the cylinder to an approved repair facility. **NEVER** attempt to repair a cylinder.
- b) Verify the color of the cylinder. The cylinder should be green indicating its for oxygen.

##### Aluminum cylinders

- a) Visually inspect the entire cylinder following CGA guidelines outlined in CGA C-6.1. These defects include: corrosion, cuts, digs, cracks, dents, gouges, bulges, arc burns, fire damage, neck defects, threads and valving. If damaged, return the cylinder to an approved repair facility. **NEVER** attempt to repair a cylinder.
- b) Verify the color of the cylinder. The cylinder should be green indicating it's for oxygen service.

#### CAUTION

- Do not refill a damaged cylinder. Filling a damaged cylinder may cause the cylinder to rupture which can cause personal injury or property damage.

### 3. Contamination

- a) Do not fill cylinders that show signs of contamination from oil, or other unidentifiable substances.
- b) Do not fill any cylinder that fails the odor test. See FDA documentation for further information.

#### **NOTE:**

- Oxygen supports combustion. Materials that burn in air will burn much more vigorously, and at higher temperatures in oxygen. If ignited, some combustibles such as oil, burn in oxygen with explosive force. Also other materials that do not burn in air will burn vigorously in an oxygen-enriched atmosphere. One must be careful to inspect work gloves as well as hands for proper cleanliness.

#### **CAUTION:**

- **NEVER** lubricate valves, regulators, fittings, etc., with oil or any other combustible substance. Some lubricants may cause the cylinder to ignite and rupture, which may cause personal injury or property damage.

### 4. Cylinder valve

- a) Check threads for damage - if damaged, quarantine for repair.
- b) Check for cleanliness - clean as required per CGA G-4.1.
- c) Visually inspect the relief device for the proper setting - if not present, quarantine for repair.
- d) Check the relief device for damage - if damaged, quarantine for repair.

#### **CAUTION:**

- All valves repairs should be done by an approved repair facility.

### 5. Internal Corrosion (Steel cylinders only. **Do not perform this test on aluminum cylinders**).

- a) Hammer test: lightly tap the cylinder with a 1/2 lb. ball-peen hammer. The cylinder should have a clear bell like ring. A dull ring would indicate internal corrosion, liquid, or accumulation of foreign material in the cylinder. Any cylinders having a dull ring should be returned to the manufacturer.

## **CYLINDER REFILLING PROCEDURE**

#### **CAUTION:**

- There are serious hazards involved in transfilling compressed gas from one cylinder to another. If there are any questions after reading this procedure, contact Western Medica.

## **CYLINDER VENTING**

For manifolds that have a fill header, follow steps 1 through 7 below. If your manifold does not have a fill header (single fill manifold), then follow the steps indicated "For Manifolds without a Fill Header".

#### **CAUTION:**

- Cylinders should never be vented indoors without proper provisions. This would create an oxygen-enriched area, which may create a fire hazard.

## **INSTALLATION INCORPORATING A MANIFOLD VENT LINE**

1. Complete the inspection requirements listed on pages 9 and 10, including FDA requirements.
2. Make sure all the supply cylinder valves are closed.
3. Connect the fill pigtails to the cylinders (**DO NOT** use adapters). Make sure all connections are tightly sealed.
4. Open the manifold vent valve on the fill header.
5. Open the header valves for all the fill locations that have cylinders attached.
6. S-L-O-W-L-Y open the fill cylinder valves and allow their residual gas to vent completely.
7. Close the vent valve on the fill manifold.

## INSTALLATIONS WITHOUT A MANIFOLD VENT LINE

1. Complete the inspection requirements listed on pages 9 and 10, including FDA requirements.
2. Take the cylinders to be filled outdoors.
3. Orient the cylinder so gas will be directed away from personnel in the area.
4. S-L-O-W-L-Y open the fill cylinder valve and vent (blow down) the cylinder to atmospheric pressure.
5. Make sure all the supply cylinder valves are closed.
6. Make sure the manifold has been vented by opening the manifold vent valve.
7. Close the manifold vent valve.
8. Connect the fill pigtailed to the fill cylinders (**DO NOT** use adapters).

## CYLINDER / MANIFOLD EVACUATION

1. As previously stated, the headers and fill cylinders must be vented prior to pulling a vacuum on the system.
2. Make sure the pressure regulator is open (tee handle turned clockwise) so a vacuum can be pulled on the supply side also.
3. Make sure the valves on the supply cylinders are closed.
4. Verify that the vacuum gauge indicates that there isn't any vacuum present in the vacuum hose. If the vacuum gauge indicates that there is a vacuum present, open the bleeder vent valve located on the vacuum pump to remove this vacuum. Close the bleeder valve after the vacuum has been removed.
5. Turn on the vacuum pump and evacuate the cylinders to 25 in Hg.

### NOTE:

- The 25 in. Hg requirement is at sea level. As elevation increases, the equivalent vacuum to obtain the same sea level vacuum decreases. The chart to the right references the various equivalent vacuum readings at different elevations.

Altitude (feet)	in Hg
0	25.00
500	24.56
1000	24.11
1500	23.68
2000	23.25
2500	22.83
3000	22.41
3500	22.00
4000	21.58
4500	21.20
5000	20.81
5500	20.42
6000	20.04
6500	19.66
7000	19.29
7500	18.93
8000	18.57
8500	18.22
9000	17.87
9500	17.53
10000	17.20

5. When the required vacuum level has been reached, continue vacuuming for 90 seconds. Then turn off the vacuum pump.
6. Open the bleeder valve on the vacuum pump inlet (if using the Western vacuum pump). This will allow the vacuum hose to return to atmospheric pressure.

### CAUTION:

- **DO NOT** attempt to start the CS-PK2 vacuum pump if the gauge is registering a vacuum. The vacuum hose and pump must always be vented to atmosphere prior to starting the pump. This pump is not designed to be started under a load (pre-existing vacuum in the hose).

## FILLING CYLINDERS

1. A temperature gauge should be attached to the cylinders being filled. If only one cylinder is being monitored, it should be the cylinder with the smallest fill volume.
2. SLOWLY open the first supply cylinder valve. The supply pressure gauge on the pressure regulator will indicate the supply cylinder pressure.
3. SLOWLY increase the pressure regulator setting (if filling is always done to the same pressure, the pressure regulator can be preset and then the only adjustment necessary will be the minor adjustment due to cylinder temperature).

### CAUTION:

- Filling at a rate faster than 200 psig/minute is not recommended. Filling faster than this rate will increase the temperature of the cylinder. At no time, should the cylinder temperature increase above 120°F. The fill gauge mounted at each filling port monitors the pressure in the cylinder(s) being filled. The Western system uses restrictors to assist in maintaining this flow rate.

4. During the filling process, the cylinders being filled will increase in temperature. To compensate for this, the fill pressure must be adjusted. The Pressure/Temperature chart should be used to determine the required cylinder pressure. This chart is an excerpt from CGA P-15.
5. Continually monitor the temperature of the cylinders being filled. If the temperature increases to a point near 120°F, the system should be shut down and the cylinders allowed to cool before finishing the filling operation.
6. When the pressure in the cylinders reaches around 1,500 psig, touch each cylinder for warmth. Any cylinders cool to the touch may have closed valves and may not be filling. These cylinders should be marked for the next batch.

### CAUTION:

- Opening cylinders during the filling process could result in contamination of the other cylinders and the manifold system since these cylinders were not vented or evacuated previously.

7. Apply an oxygen compatible leak test solution (Western P/N LT-100) to each cylinder valve, valve stem, burst disc, and valve to cylinder connection. Any cylinder found with leaks should be marked and isolated by closing the cylinder valve. Do not remove these cylinders until the filling process has been completed and pressure has been vented from the system. Once removed, quarantine for repair.

### CAUTION:

- All valve repairs should be done by an approved repair facility.

8. If the desired pressure has been reached, proceed to step 10. Otherwise, proceed to step 9.

### NOTE:

- As stated in step 4, the fill pressure is related to the cylinder temperature. Based on the temperature of your cylinders, identify the required fill pressure per the Pressure/Temperature Chart.
- You will need to remain near the filling area to make sure the cylinders are filling properly and to monitor the temperature of the cylinders.

9. If the first supply cylinder cannot completely fill the cylinders, close it and open the next supply cylinder. Continue until the cylinders are completely filled.

**NOTE:**

- If the supply pressure is greater than the fill pressure, and the pressure in the fill cylinder is no longer increasing, the pressure regulator will need adjustment.

10. Close the valve(s) on the filled cylinder(s).
11. Close the valve on the supply cylinder.
12. Open the vent valve on the manifold and deplete the gas from the system.
13. Begin the next cycle using the supply cylinder with the lowest pressure and working your way to the one with the highest pressure. If the cylinder is below 300 psig, it is no longer economical to be used as a supply cylinder. The cylinder should be replaced with a full cylinder per the "Cylinder Replacement and Handling Instructions". This process will continue each time another supply cylinder empties.

**LABELING CYLINDERS**

1. Place your identification labels, as required by DOT and/or FDA regulations, to each cylinder being filled. Refer to FDA Guidelines for the Transfilling of Medical Oxygen.

**VERIFICATION OF CYLINDER CONTENTS**

1. One cylinder out of each batch must have its contents verified.
2. Fill out the required FDA documentation for the analyzed cylinders.

**DOCUMENTATION**

1. Fill out the required FDA documentation for the filled cylinders. Refer to FDA Guidelines for the Transfilling of Medical Oxygen.

**SUPPLY CYLINDER REPLACEMENT & HANDLING**

1. Shut off the cylinder valve on the depleted cylinder.

**CAUTION:**

- Do not replace cylinders when system is operating.

2. S-L-O-W-L-Y loosen and remove the pigtail connection from the depleted cylinder.
3. Remove depleted cylinder and replace protective cap.
4. Remove the protective cylinder cap from the full replacement cylinder. With the valve outlet pointed away from you or anyone else, slowly open the cylinder valve slightly to blow out any dirt or contaminants which may become lodged into the cylinder valve.
5. Place and secure the full cylinder into position using chains, belts, or a cylinder stand.
6. Connect the pigtail to the cylinder valve and tighten.
7. Each numbered tag must be moved one cylinder to the right, making the new cylinder the last in line.
8. Do not open the cylinder valve until it is required for filling.

**CYLINDER PRESSURE / TEMPERATURE CHART**

CYLINDER TEMP. °F	CYLINDER PRESSURE (PSI) 70°		
	2015	2200	2216
56	1941	2117	2132
58	1951	2129	2145
60	1962	2141	2157
62	1972	2153	2168
64	1983	2165	2180
66	1994	2176	2193
68	2004	2188	2204
70	2015	2200	2216
72	2026	2212	2228
74	2036	2224	2239
76	2047	2235	2252
78	2057	2247	2264
80	2068	2259	2275
82	2079	2271	2287
84	2089	2282	2299
86	2100	2294	2311
88	2111	2306	2323
90	2121	2318	2335
92	2132	2329	2346
94	2142	2341	2358
96	2153	2353	2370
98	2164	2365	2382
100	2174	2376	2394
102	2185	2388	2406
104	2195	2400	2418
106	2206	2411	2429
108	2216	2423	2441
110	2227	2435	2454
112	2238	2447	2465
114	2248	2458	2477
116	2259	2470	2489
118	2269	2482	2500

EXAMPLE: If the cylinder temperature has risen to 90° F while filling, the cylinder should be filled to 2121 psi. This will insure that the cylinder settles to the correct pressure at 70° F.

**TROUBLE-SHOOTING**

(Only qualified repair personnel should make repairs)

<b>SYMPTOM</b>	<b>PROBABLE CAUSE</b>	<b>REMEDY OR CHECK</b>
No pressure to supply regulator.	Supply pigtail check valves on wrong end.	Flow arrow should point from the supply cylinder to manifold.
	Supply cylinders valves closed.	Open supply cylinder valve.
No pressure or pressure restricted to the fill manifold.	Defective pressure regulator.	Replace the valve and seat or replace pressure regulator.
No pressure to the fill cylinders.	Check valve pigtails on the fill side.	Switch with pigtails from supply side.
	Fill cylinders closed.	Open the fill cylinders.
	Defective orifice bushings.	Replace orifice bushings.
Cylinders won't fill to required pressure.	Not enough pressure in the supply cylinder.	Replace empty supply cylinder.
	Restriction in pressure regulator.	Replace the valve and seat or replace the supply regulator.
Cylinders fill very slow.	Defective orifice bushings.	Replace the orifice bushings.
	Fill cylinder valves not open completely.	Completely open the fill cylinder valves.
	Restriction in pressure regulator.	Replace the supply regulator.
When pulling a vacuum, obtain full vacuum immediately.	Orifice bushing defective.	Replace orifice bushings.
	Positive pressure against the vacuum regulator.	Back out the pressure regulator tee handle and vent any remaining pressure in the fill manifold.
	Defective vacuum regulator.	Replace vacuum regulator.
	Fill manifold or cylinder valves closed.	Open the valves.
	Check valve pigtail on the fill side.	Switch with the pigtails from the supply side.
Cannot pull a vacuum.	Defective vacuum regulator.	Replace vacuum regulator.
	Defective vacuum pump.	Repair or replace vacuum pump.
Vacuum pulls very slow.	Defective orifice bushing.	Replace orifice bushings.
	Defective vacuum regulator.	Replace vacuum regulator.
	Defective vacuum pump.	Repair or replace vacuum pump.
	Vacuum pump not strong enough for fill volume.	Replace vacuum pump with a stronger unit.

## MANIFOLD MAINTENANCE & REPAIR PARTS

### NOTE:

- Western manifold systems are designed and tested for optimal performance and adherence to safety specifications. We recommend the use of Western replacement components to maintain the standards of performance and the safety of the product.

### REPLACEMENT PIGTAILS

PF-63CV-24.....	Oxygen supply pigtail with check valve (24")
F-63HT-60.....	Oxygen supply to fill pigtail (60" length)
PF-63HT-870-60.....	Oxygen supply to fill pigtail (60" length) (systems without fill header)
PF-63-24.....	Oxygen fill pigtail (24")

### REGULATORS (Pressure & Vacuum)

RSM20.....	Pressure Regulator (0-2200 psig)
VV100.....	Vacuum Regulator (0-30 in Hg)

### VALVES (Manifold, Check, Relief, and Restrictor)

WMS-1-53.....	CGA 540 Check Valve Outlet
WMV-2-8.....	CGA 540 Header Valve
RWS-CS.....	2450 PSIG Relief Valve
WMS-1-112.....	Restrictor valve (200 psig/min.)

### GAUGES (Pressure & Vacuum)

G-2-4000W.....	Pressure Gauge (0-4000 psig), 1/4 NPT bottom port
WEM-1-38.....	Vacuum Gauge (0-30 in Hg), 1/4 NPT bottom port

### PIN INDEXED YOKES

M87-1.....	Oxygen Yoke, CGA 870 x CGA 540 male
M00-3.....	Yoke Tee Handle
MW-87.....	Yoke Washer



## REFERENCE MATERIAL

1. Title 49\* of the Code of Federal Regulations, parts 172 and 173 in general. Sections 173.34 and 173.00 - 173.316 specifically apply.
2. Title 21\* of the Code of Federal Regulations, parts 210, 207, 210, and 211.
3. Title 29\* of the Code of Federal Regulations, parts 1910.101 and 1910.166.
4. Compressed Gas Association publications: \*\*
  - a) Pamphlet ANSI/CGA C-4 American National Standard Method of Marking Portable Compressed Gas Cylinders to Identify Material Contained.
  - b) Pamphlet CGA C-6 "Standards for Visual Inspection of Steel Compressed Gas Cylinders".
  - c) Pamphlet CGA C-6.1 "Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Containers".
  - d) Pamphlet CGA C-7 "Guide to the Preparation of Precautionary Labeling and Marketing of Compressed Gas Containers".
  - e) Pamphlet CGA C-9 "Standards Color Marking of Compressed Gas Cylinders Intended for Medical Use".
  - f) Pamphlet CGA G-4 "Oxygen".
  - g) Pamphlet CGA G-4.1 "Cleaning Equipment of Oxygen Service".
  - h) Pamphlet CGA P-2 "Characteristics and Safe Handling of Medical Gas".
  - i) Pamphlet CGA P-2.5 "Transfilling of High Pressure Gaseous Oxygen to be used for Respiration".
  - j) Pamphlet CGA P-15 "Filling of Industrial and Medical Non-Flammable Compressed Gas Cylinders".
5. Food and Drug Administration \*\*\*\*
  - b) "Compressed Medical Gases Guidelines."
  - b) "Fresh Air 98"

\* Available from: Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402

\*\* Available from: Compressed Gas Association, 1725 Jefferson Davis Highway, Suite 1004, Arlington, Virginia 22202-4102

\*\*\* Available from: Food and Drug Administration, Division of Manufacturing and Product Quality (HFD-320), Metro Park North 1, 7520 Standish Place, Rockville, Maryland 20855

## LIMITED WARRANTY

WARRANTY: The Seller expressly warrants that the product manufactured by it will be free from defects in material, workmanship, and title at the date of shipment. This warranty is exclusive and is IN LIEU OF ALL IMPLIED OR STATUTORY WARRANTIES (INCLUDING WITHOUT LIMITATION, WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR ARISING FROM COURSE OF DEALING OF USAGE OR TRADE) or any other express or implied warranties or representations. All claims under this warranty must be made in writing and delivered to the Seller prior to the expiration of 1 year from the date of shipment from the factory, or be barred. Upon receipt of a timely claim, the Seller shall inspect the item or items claimed to be defective, and Seller shall, at its option, modify, repair, or replace free of charge, any item or items which the Seller determines to have been defective at the time of shipment from the factory, excluding normal wear and tear. Inspection may be performed at the Sellers plant and in such event, freight for return items to the plant shall be paid by Buyer. Seller shall have no responsibility if such item has been improperly stored, installed, operated, maintained, modified and/or repaired by an organization other than the Seller. Adjustments for products not manufactured by Seller shall be made to the extent of any warranty of the manufacturer or supplier thereof. The foregoing shall be the Sellers sole and exclusive liability and Buyer's sole and exclusive remedy for any breach of warranty or for any other claim based on any defect in, or non-performance of, the products whether based on breach of contract or in tort, including negligence or strict liability.



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**WARNING:** This product contains chemicals, including lead, known to the state of California to cause cancer and birth defects or other reproductive harm.  
***Wash hands after handling.***