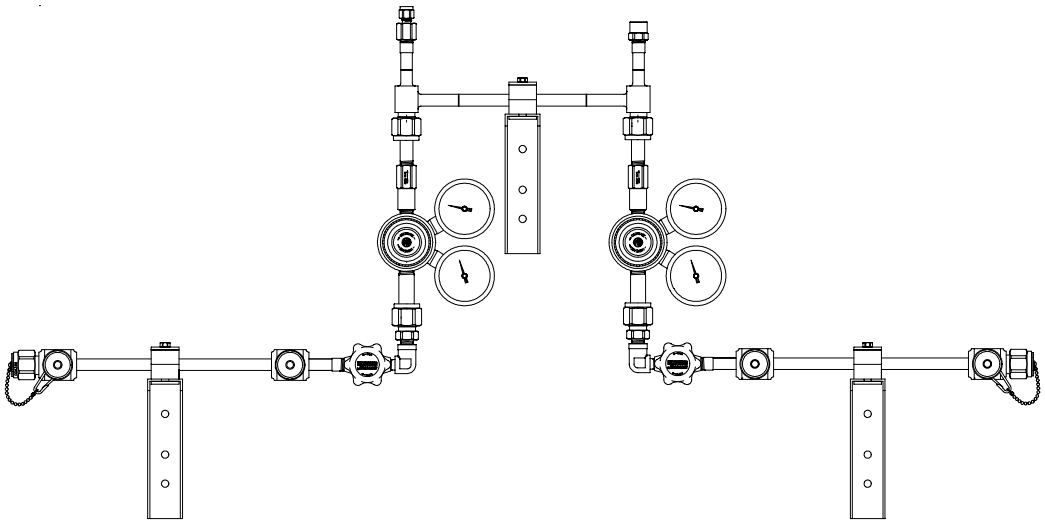
WESTERN INNOVATOR GAS MANIFOLD SYSTEMS

Installation and Operating Instructions For

AUTOMATIC CHANGEOVER MANIFOLD

HSAD2 SERIES



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 and Compressed Gas Association guidelines. The manifold consists of a manifold control and two supply bank headers, one service and one supply, to provide an uninterrupted supply of gas for the specific gas application. The control is designed and built with features providing automatic changeover from the depleted "Service " supply bank to the "Reserve" supply with a predetermined drop in delivery pressure. Pressure gauges show system status and alert the need to replace depleted cylinders. Features of the automatic systems include stainless steel regulators, flexible stainless steel inner core pigtails with check valves, modular wall-mounted headers and complete mounting hardware.

CAUTION

Failure to follow the following instructions can result in personal injury or property damage:

- Never permit oil, grease, or other combustible materials to come in contact with cylinders, manifold, and connections. Oil and grease may react and ignite while in contact with some gases — particularly oxygen and nitrous oxide.
- Cylinder, header, 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 5 inches. Mistreatment may cause the pigtail to burst.
- Do not apply heat. Oil and grease may react with and ignite while in contact with some gases — particularly oxygen and nitrous oxide.
- 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 from its current position with great force.
- Oxygen manifolds and cylinders should be grounded. Static discharges and lightning may ignite materials in an oxygen atmosphere creating a fire or an explosive force.
- Welding should not be performed near nitrous oxide piping. Excessive heat may cause the gas to dissociate, creating an explosive force.

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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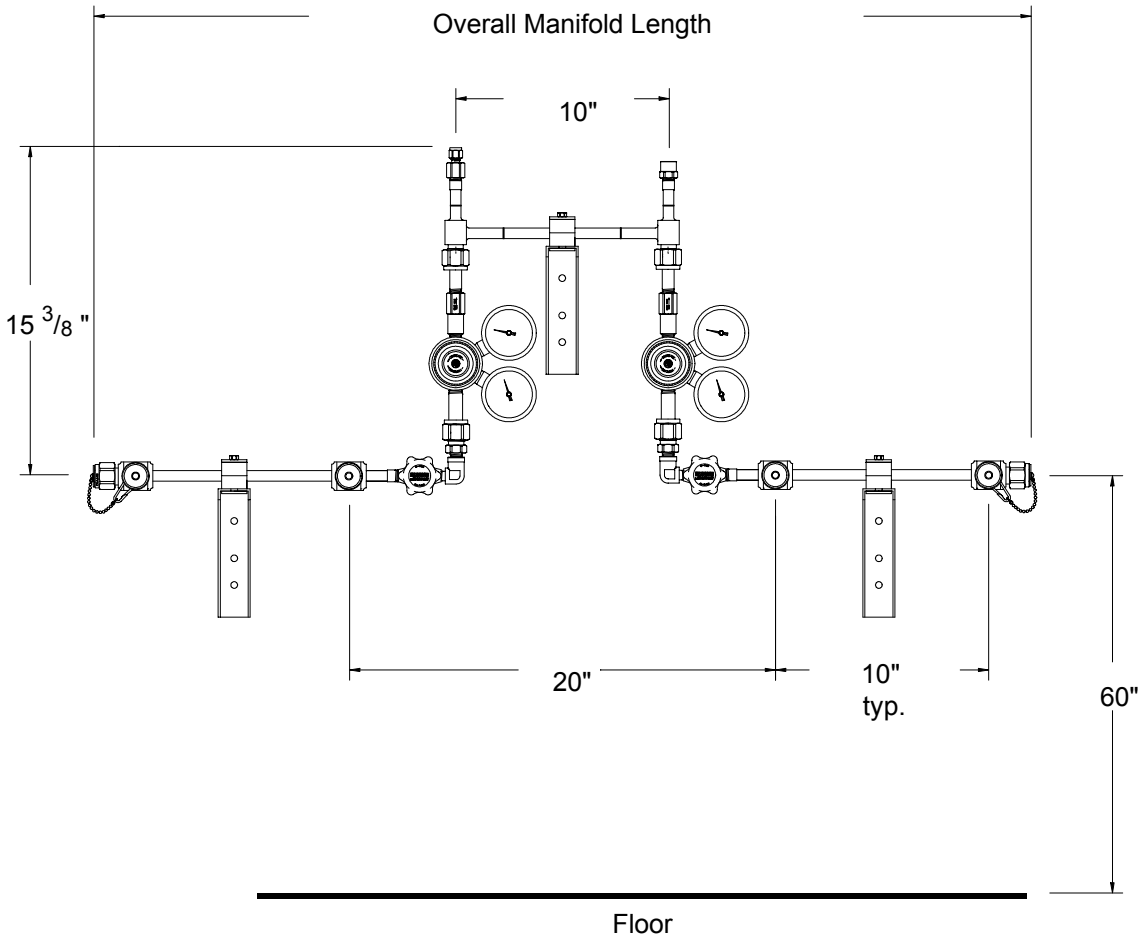
GENERAL INSTRUCTIONS

Manifolds should be installed in accordance with guidelines stated by the National Fire Protection Association, the Compressed Gas Association, OSHA, Canadian Standards Association, and all applicable local codes. The carbon dioxide and nitrous oxide manifolds should not be placed in a location where the temperature will exceed 120°F (49°C) or fall below 20°F (-7°C). The manifolds for all other gases should not be placed in a location where the temperature will exceed 120°F (49°C) or fall below 0°F (-18°C). A manifold placed in an open location should be protected against weather conditions including rain and heavy moisture. During winter, protect the manifold from ice and snow. In summer, shade the manifold and cylinders from continuous exposure to direct rays of the sun.

Leave all protective covers in place until their removal is required for installation. This precaution will keep moisture and debris from the piping interior, avoiding operational problems.



Total number of cylinders	4	6	8	10	12
Overall manifold length	5'-5"	7'-5"	9'-5"	11'-5"	13'-5"

FIGURE 1

MANIFOLD ASSEMBLY (Refer to figure 2)

Leave all components in their protective polybags until the component is to be assembled.

1. Assemble the right and left headers to the regulator inlets.

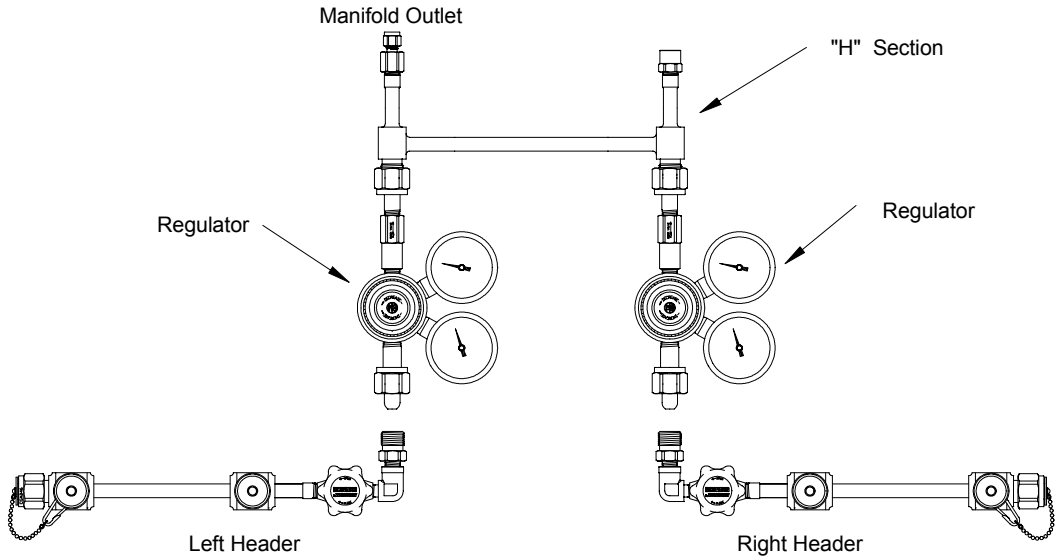


FIGURE 2

MANIFOLD INSTALLATION

1. Determine and mark the vertical center line for installation of the manifold (Figure 3).

2. Measure from the floor to a point 71" in height* of this vertical line. Using a level, mark a horizontal line at this point extending approximately 10" to the left and 10" 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.)

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

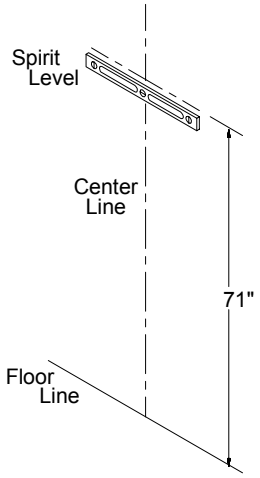


FIGURE 3

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

5. Mount the manifold by placing the "H" section of the manifold in the clamp. Fit the clamp over the "H" section and tighten the mounting bolts. (Figure 5)

6. Using a level, mark the placement of mounting brackets while keeping the header on a horizontal plane. (Figure 5)

7. Remove the clamp assemblies from the header mounting brackets. Position the brackets and bottom half of the clamp so that they are aligned with the bottom of the headers and are centered between the header sections. The brackets should be evenly placed to provide the most support and stability.

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

9. Fit the top half of the clamp over the header piping and tighten the two mounting bolts.

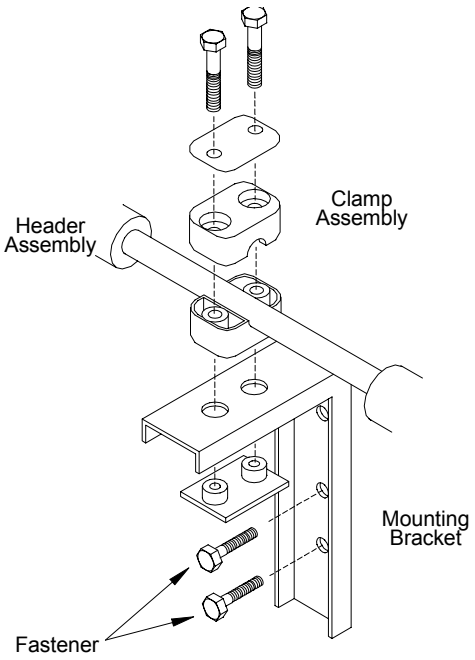


FIGURE 4

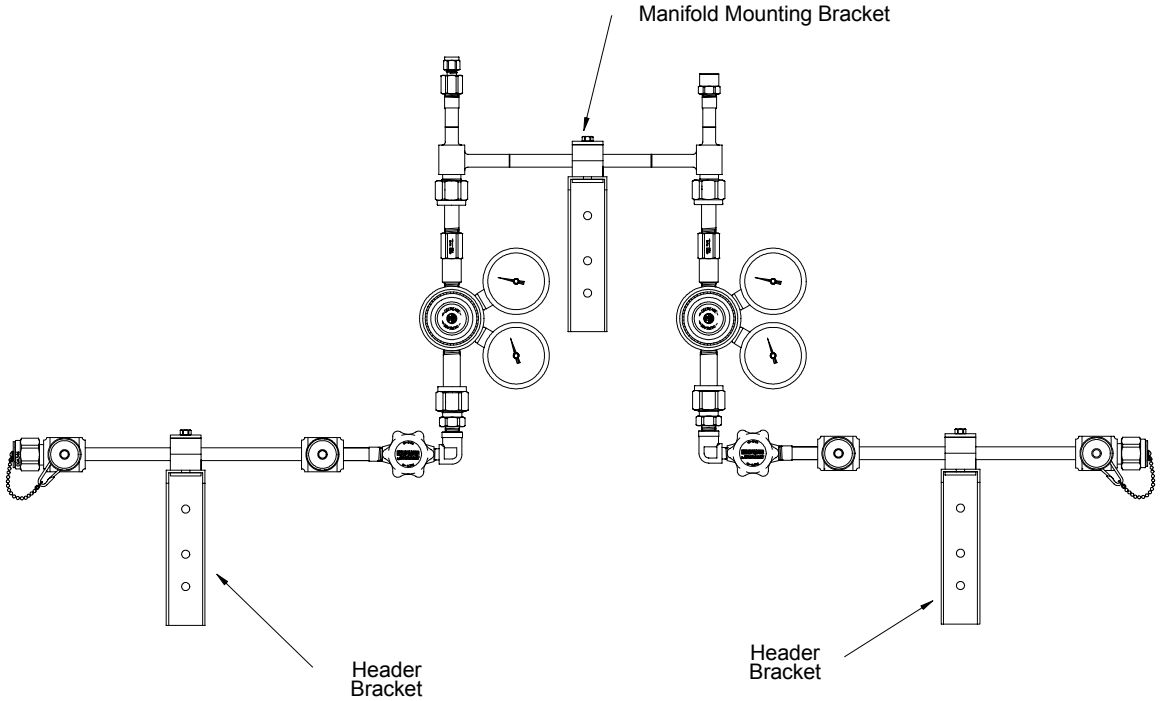


FIGURE 5

PLUMBING

1. A 1/4" tube compression fitting is supplied with the control and is located at the left of the manifold "H" section. Connect the pipeline system to this fitting. The fitting provided permits removal of the manifold for service. (Figure 6)

INSTALLATION OF OPTIONAL EQUIPMENT

PRESURE SWITCH

1. Remove the cap on the right side of the "H" section (Figure 6).
2. Install a 1/4 x 1/2 NPT reducer fitting onto the manifold port.
3. Install the pressure switch onto the 1/2 NPT fitting (Figure 6).

PURGE ASSMBLIES

1. Remove the cap on the ends of the manifold headers (Figure 6).
2. Connect the purge assembly to the ends of the headers (Figure 6).

RELIEF VALVES

A relief valve may be installed into the manifold outlet as shown in figure 6.

1. Remove the compression fitting from the manifold outlet.
2. Install a 1/4 NPT street tee onto the manifold outlet using Teflon tape.
3. Install the relief valve into the tee.
4. Install the compression fitting into the street tee.

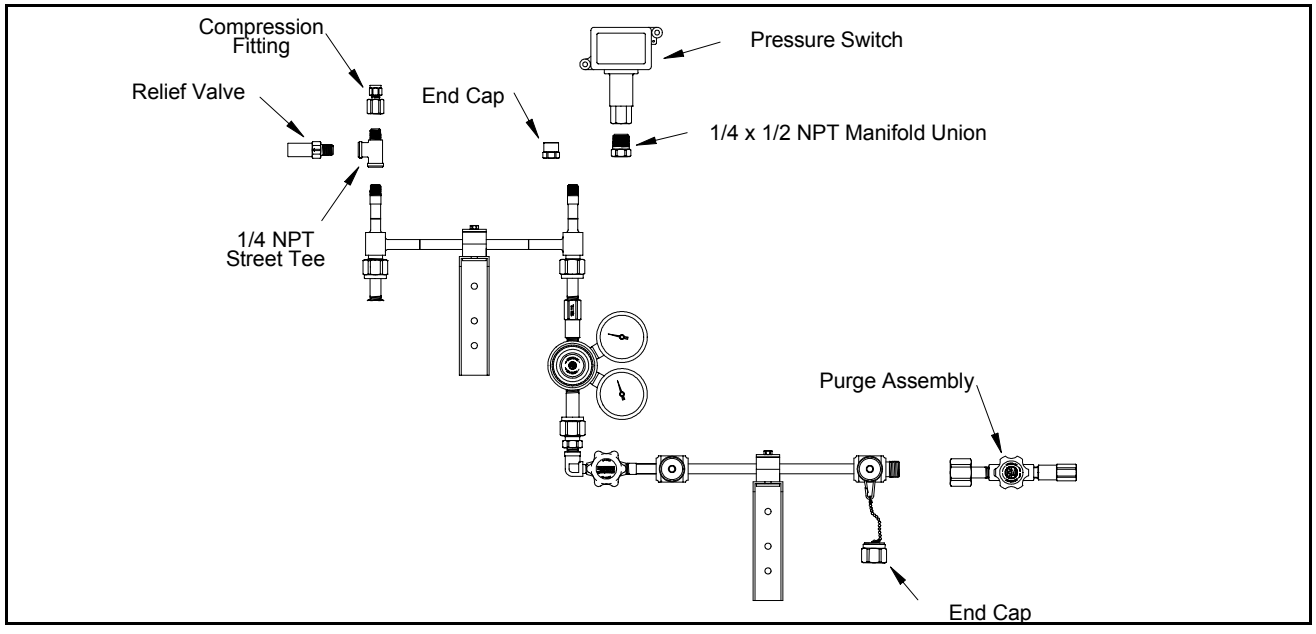


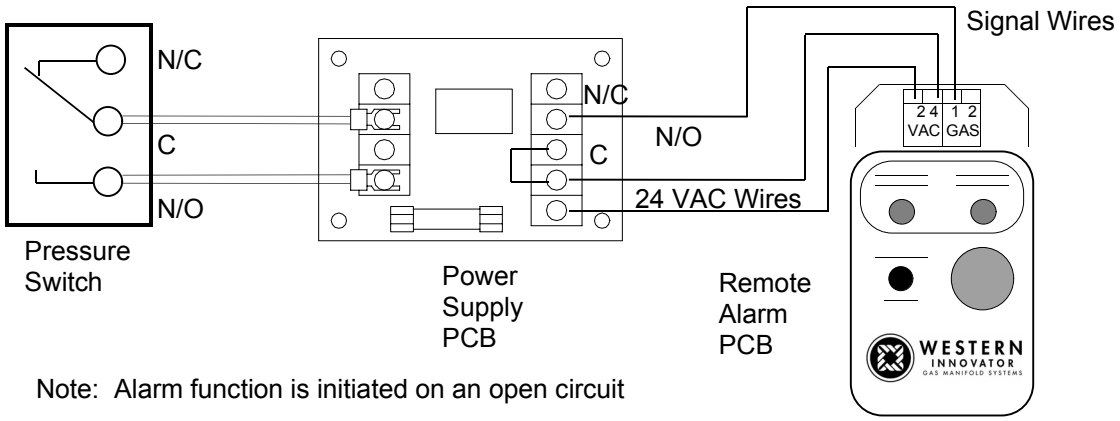
FIGURE 6

REMOTE ALARM HOOKUP

Western HSAD2 manifolds may be connected to an alarm system provided a pressure switch is installed into the manifold. The pressure switch provides isolated (dry) remote alarm contacts. Wiring diagrams for remote audio/visual alarms are included with the alarms. Listed below are three different remote alarm configurations.

WESTERN'S ALARM

1. Western's alarms (#BIA-1, BIA-2, and BIA-3) require a 24 VAC power supply (P/N WMS-11-36).
2. Connect one 24 VAC wire from the right side of the circuit board in the power supply box to the first 24 VAC terminal on the remote alarm printed circuit board (PCB).
3. Connect the other 24 VAC wire from the right side of the power supply box to the second 24 VAC terminal on the remote alarm PCB.
4. Connect a jumper wire from the 24 VAC terminal used in step 3 to the common (C) terminal on the power supply.
5. Connect a signal wire from the normally open (N/O) terminal on the Power supply to the GAS 1 terminal on the remote alarm PCB.
6. Connect the Second terminal on the left side of the power supply to the common terminal on the pressure switch.
7. Connect the fourth terminal on the left side of the power supply to the normally open (N/O) terminal on the pressure switch.

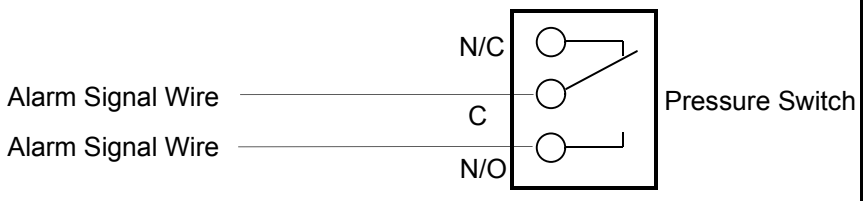


Note: Alarm function is initiated on an open circuit

FIGURE 7 Western's Remote Alarm

In some instances the power supply for the remote alarm is normally a part of the electrical contract on proposed constructions and exists in any furnished hospital. The following procedure should be followed:

1. Two alarm signal wires requiring dry contacts should run to the manifold location.
2. Connect one signal wire to the common (C) terminal on the pressure switch. (Figure 8)
3. Connect the other signal wire to the normally open (N/O) terminal on the pressure switch.



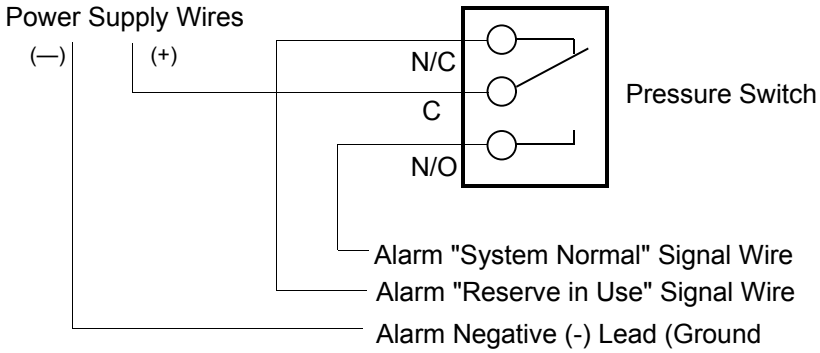
Note: Alarm function is initiated on an open circuit

FIGURE 8 Signal Wire Installation

If the remote alarm requires a power supply for operation, then connect the alarm as follows:

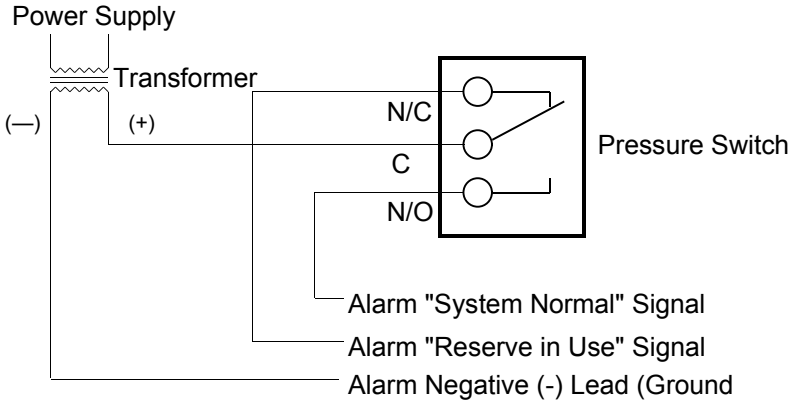
(Also see WESTERN'S ALARM section.)

1. The power supply will be determined by the remote alarm operating voltage. If the remote alarm is designed for 115 VAC service then the existing 115 VAC power source can be utilized directly. (Figure 9)
   If the remote alarm is designed for other than the existing AC power source, then it is necessary to install a transformer in the system to provide the proper operating voltage. (Figure 10)
2. Connect the positive lead (+) from the power supply to the common (C) terminal on the pressure switch.
3. Connect the ground wire from the alarm to the negative (-) lead from the power supply.
4. Connect the "reserve in use" signal wire from the alarm to the normally closed (N/C) terminal on the pressure switch.
5. If a "system normal" signal is also employed, connect that signal wire to the normally open (N/O) terminal on the pressure switch.



Note: Alarm function is initiated on a closed circuit

FIGURE 9 115 VAC Power



Note: Alarm function is initiated on a closed circuit

FIGURE 10 User Supplied Power

INSTALLING PIGTAILS AND ATTACHING CYLINDERS

1. Establish the CGA and the manifold ends of the pigtails. (Check valves are located on both ends of the pigtails)
2. Connect the manifold end of the pigtails to the manifold header.
3. Check the master valves to be certain they are open.
4. Attach full cylinders to the pigtail connections as explained in "Cylinder Replacement & Handling" on page 10.
5. Open section header valves (turn counter-clockwise to open).
6. S-L-O-W-L-Y turn all cylinders on fully (turn counter-clockwise to open). Check all cylinder and pigtail connections for leaks using Western leak detector LT-100 or an oxygen safe solution. (Any bubbles around connections indicate leakage.)

START UP AND CHECKING PROCEDURES

The HSAD2 series manifold is designed to change over from one bank to another automatically provided a sufficient differential is maintained between the two primary regulators.

1. S-L-O-W-L-Y open one cylinder on the right bank (turn counter-clockwise to open). The high pressure gauge will show the full pressure of the right bank of cylinders. (Figure 11)

2. Adjust the delivery pressure of the regulator to the desired pressure. A pressure setting of 150 psig is recommended. The selection of the regulator set pressure may vary due to application requirements. This will be the service side of the manifold.

3. Close the right cylinder valve and deplete pressure from the system.

4. S-L-O-W-L-Y open one cylinder valve on the left bank (turn counter-clockwise to open). The high pressure gauge will show the pressure of the left bank of cylinders.

5. Adjust the delivery pressure to approximately 25 psi less than the right side regulator. If the right regulator was set at 150 psig, the left regulator should be set at 125 psig. The selection of the regulator set pressure may vary due to application requirements. This will be the reserve side of the manifold.

6. If a pressure switch has been installed in the system the switch setting shall be 5 - 10 psig greater than the reserve side regulator setting.

7. S-L-O-W-L-Y open one cylinder on the right bank (turn counter-clockwise to open).

8. Simulate change over by closing the right valve and creating a flow of gas through the manifold. The pressure reading on the gauge will drop to the change over pressure set in step 5. Any alarms connected to the system monitoring change over will activate.

9. S-L-O-W-L-Y open cylinders on both the right and left banks (turn counter-clockwise to open).

10. The manifold is now ready to supply your system.

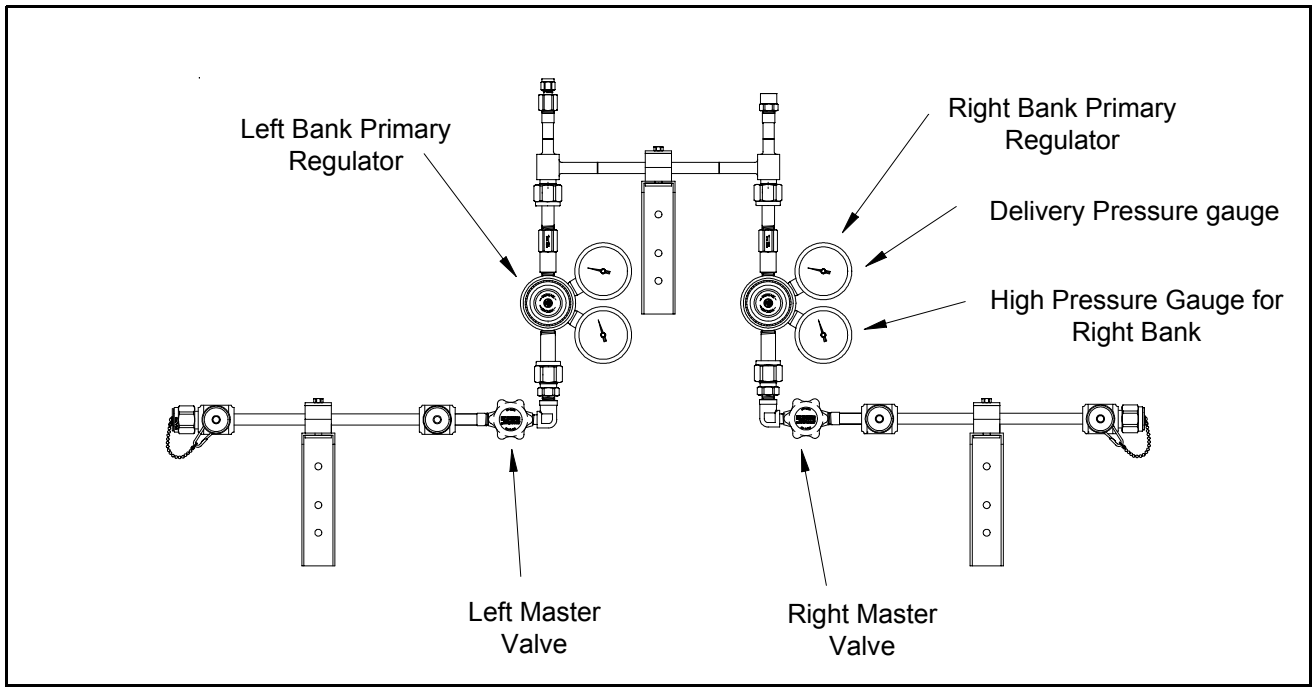


FIGURE 11

MANIFOLD OPERATION

The manifold control includes the following components and features: orbital welded fittings, stainless steel regulator with a stainless steel diaphragm, stainless steel packless master valves, flexible stainless steel inner core pigtails with check valves, headers designed to be easily expanded, port for an optional pressure switch, header construction allows installation of purge assemblies, and automatic bank switching. The manifold is designed to use a line regulator (optional item) which can be mounted on the manifold outlet.

The cylinder bank that supplies the piping system is known as the "Service" supply, while the cylinder bank on stand-by is referred to as the "Reserve" supply. Gas flows through the manifold control to first the service primary regulator and then through the line regulator. Final delivery pressure is controlled by the line regulator that must be installed on the manifold outlet. This line regulator is not provided with the manifold.

Changeover from the "Service" to "Reserve" side is accomplished when the "Service" side pressure falls below the set point of the reserve side regulator. When this pressure drops to the reserve regulator set point, the reserve side begins to flow, without any interruption of gas to the line regulator.

After change over the high pressure gauges on the regulators will indicate which bank should be changed.

After replacing empty cylinders, reset the regulators so that the reserve side is now the supply side. This will ensure that the reserve side is always full. Follow the steps outlined in the START UP AND CHECKING PROCEDURES to reset the manifold.

To insure proper operation, observe the following guidelines:

1. Carefully follow all instructions.

2. Establish proper flow direction of check valves.

3. Be sure cylinder valves are fully opened.

4. Replace depleted cylinders as soon as practical after the manifold has changed over.

RESETTING THE HSAD2 MANIFOLD AFTER CHANGE OVER

The manifold should only be reset when the application can be shut down. The system should be purged to ensure that any air is removed from the line. After replacing empty cylinders, reset the regulators so that the reserve side is now the supply side. This will ensure that the reserve side is always full. Follow the steps outlined below to reset the manifold.

1. Replace depleted cylinders by following the instructions in "CYLINDER REPLACEMENT AND HANDLING" section.

2. The new cylinder bank should be vented and/or purged.

3. Close the master valve on the bank of fresh cylinders.

4. Adjust the delivery pressure of the reserve bank regulator so that it is set where the service regulator was set. If the service regulator was set at 150 psig, the regulator should be set at 150 psig. The selection of the regulator set pressure may vary due to application requirements. This will now be the service side of the manifold. Close the master valve on this bank of cylinders.

5. Open the master valve on the bank with the new cylinders. Create a flow of gas through the system. This bank will now be set as the reserve. Adjust the regulator to the reserve setting approximately 25 psig less than the service regulator. If the service regulator was set at 150 psig, the regulator should be set at 125 psig. The selection of the regulator set pressure may vary due to application requirements. This will now be the reserve side of the manifold.

6. S-L-O-W-L-Y open the service master valve (turn counter-clockwise to open).

7. The manifold is now ready to supply your system.

CYLINDER REPLACEMENT & HANDLING

1. Shut off all cylinder valves and header valves as well as the master valve on depleted cylinders.

2. S-L-O-W-L-Y loosen and remove the pigtail connection from the depleted cylinders.

3. Remove depleted cylinders and replace protective caps.

4. Remove protective cylinder caps from full replacement cylinders. With the valve outlet pointed away from you or anyone else, slowly open each cylinder valve slightly to blow out any dirt or contaminants which may have become lodged into the cylinder valve.

5. Place and secure full cylinders into position using chains, belts, or cylinder stands.

6. Connect pigtails to cylinder valves and tighten with wrench.

7. Open header valves and master valves. S-L-O-W-L-Y turn each cylinder valve until each cylinder is fully on.

8. The manifold supply bank is now replenished The HSAD2 manifold may be reset by following the manifold resetting instructions located in the "RESETTING THE HSAD2 MANIFOLD AFTER CHANGE OVER" section.

GENERAL MAINTENANCE

1. Main section
   a) Daily - record line pressure.
   b) Monthly
      1) Check regulators and valves for external leakage.
      2) Check valves for closure ability.
   c) Annually - check relief valve pressures.
      - check regulators for crawl (inability to maintain a set delivery pressure)

2. Manifold header
   a) Daily - observe nitrous oxide and carbon dioxide systems for cylinder frosting or surface condensation. Should excessive condensation or frosting occur it may be necessary to increase manifold capacity.
   b) Monthly
      1) Inspect valves for proper closure.
      2) Check cylinder pigtails for cleanliness, flexibility, wear, leakage, and thread damage. Replace damaged pigtails immediately.
      3) Inspect pigtail check valves for closure ability.
   c) Every 4 Years
      1) Replace all pigtails

TROUBLE-SHOOTING (Only qualified repair personnel should make repairs)

SYMPTOM	PROBABLE CAUSE	REMEDY OR CHECK
SYSTEM CHANGES OVER PREMATURELY		
Both banks deplete at the same time.	Pressure differential between the two primary regulators is too small.	Increase the pressure differential between the two primary regulators.
Alarms signaling change over actuate and system changes over.	The pressure setting of the pressure switch is too close to the supply primary regulator setting and the pressure differential between the two primary regulators is too small.	Increase the pressure differential between the supply primary regulator and the pressure switch. Increase the pressure differential between the two primary regulators. Check all wiring connections.
Alarms signaling change over actuate and system does not change over.	The pressure setting of the pressure switch is too close to the supply primary regulator setting.	Increase the pressure differential between the supply primary regulator and the pressure switch.
SYSTEM DOES NOT CHANGE OVER		
Reserve side does not flow and delivery gauges drop down to 0.	Reserve primary regulator set at 0 psig.	Reset the reserve primary regulator following instructions on page 9 (Start up and checking procedures).
LOSS OF CYLINDER CONTENTS		
Audible or inaudible gas leakage (unknown origin).	Leakage at manifold piping connections.	Tighten, reseal or replace.
	Leakage at manifold tubing connections.	Tighten, reseal or replace.
	Leakage in downstream piping system.	Repair as necessary.
	Leakage at cylinder valve.	Replace cylinder.
	Gauge leaks.	Reseal or replace.
	Regulator leaks.	Repair or replace.

SYMPTOM	PROBABLE CAUSE	REMEDY OR CHECK
LOSS OF CYLINDER CONTENTS (continued)		
Venting at relief valve. (optional item)	Regulator setting too high.	Set delivery pressure to specifications.
	Overpressure due to creeping or faulty regulation by regulator.	Replace regulator seat and nozzle components.
	Overpressure due to creeping or faulty regulation by line regulator.	Replace regulator seat and nozzle components.
	Regulator freeze-up. (Nitrous oxide or carbon dioxide)	Reduce the flow demand or increase the number of supply cylinders.
Gas leakage around regulator body or bonnet.	Loose bonnet.	Tighten bonnet.
	Diaphragm leak on regulator.	Replace diaphragm.
LOSS OF RESERVE BANK CONTENTS		
Both banks feeding.	Faulty primary regulator.	Replace regulator seat and nozzle components.
Premature changeover to reserve bank.	Flow demand too high.	Reduce flow demand.
	Primary regulator setting too low.	Set delivery pressure per specifications.
Opposite bank feeding.	Primary regulator settings incorrect.	Adjust primary regulator settings per instructions on page 9 (Start up and checking procedure).

MANIFOLD MAINTENANCE & REPAIR PARTS

REPLACEMENT PIGTAILS

Flexible Stainless Steel Inner Core Pigtails with Check Valves

HSPF-320CV-24A.....CGA 320 Pigtail with Check Valve
HSPF-326CV-24A.....CGA 326 Pigtail with Check Valve
HSPF-346CV-24A.....CGA 346 Pigtail with Check Valve
HSPF-83CV-24A.....CGA 350 Pigtail with Check Valve
HSPF-92CV-24A.....CGA 580 Pigtail with Check Valve
HSPF-93CV-24A.....CGA 590 Pigtail with Check Valve

MANIFOLD FITTINGS

WLF-3-37SS.....1/4 tube x 1/4 NPT Female

REGULATORS

WMS-12-62 .....Primary Regulator for all gases except CO_2 and N_2O
WMS-12-61 .....Primary Regulator for N_2O or CO_2

VALVES AND VALVE REPAIR KITS

DV-4SS .....Master Valve
CVM-4FSSV.....Check Valve Regulator Outlet All Gases Except CO_2 and N_2O
CVM-4FSS .....Check Valve Regulator Outlet CO_2 and N_2O

OPTIONAL EQUIPMENT

PRESSURE SWITCHES

WME-4-5 .....Explosion proof: 30 - 300 psig pressure setting range (250 psig max. inlet)
WME-4-16 .....General Purpose: 20 - 200 psig pressure setting range (250 psig max. inlet)
WME-4-17 .....General Purpose: 100 - 1700 psig pressure setting range (2,500 psig max. inlet)
WME-4-18 .....High/Low Switch: 20 - 200 psig pressure setting range (250 psig max. inlet)

POWER SUPPLYS

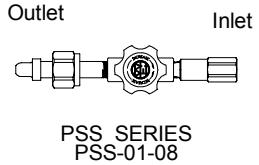
WMS-11-36 .....24 VAC Power supply

REMOTE ALARMS — 24 VAC Service

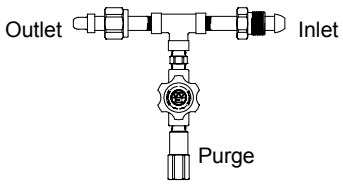
BIA-1 .....Visual - 1 Gas
BIA-2 .....Audio/Visual - 2 Gases
BIA-3 .....Audio/Visual - 1 Gas

PURGE ASSEMBLIES **(For additional information see INNOVATOR catalog)**

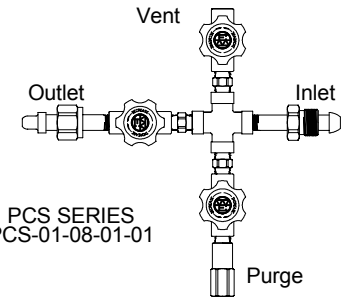
PSS-01-08.....1/4 NPT inlet and manifold header connection outlet
PTS-06-08-01.....CGA 580 inlet by Manifold connection outlet with 1/4 NPT female purge
PCS-06-08-01-01 .....CGA 580 inlet by Manifold connection outlet with 1/4 NPT female purge and vent
(Other inlet, outlet, purge, and vent connections available)



PSS SERIES
PSS-01-08



PTS SERIES
PTS-01-08-01



PCS SERIES
PCS-01-08-01-01

LIMITED WARRANTY

WARRANTY: The Seller expressly warrants that the products 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 Seller's plant and in such event, freight for returning 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 Seller's 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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