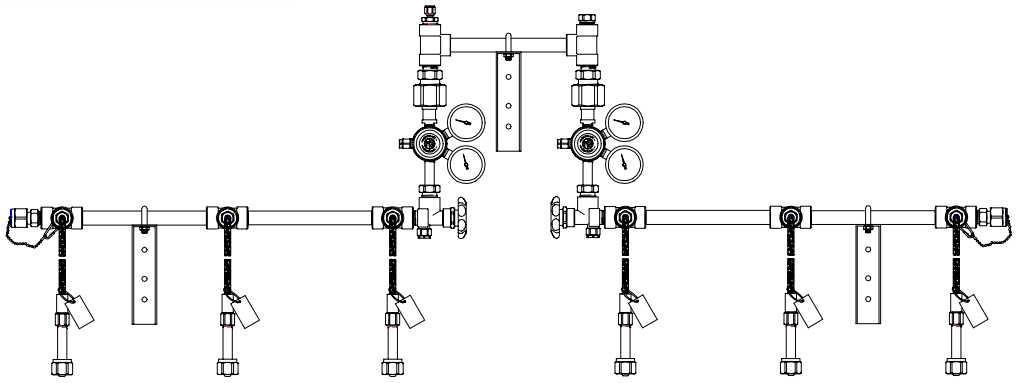
WESTERN INNOVATOR

Installation and Operating Instructions For AUTOMATIC CHANGEOVER MANIFOLDS

HBAD and HBMS2 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. The HBAD2 manifold consists of a manifold control and two supply bank headers, one service and one reserve supply, to provide an uninterrupted supply of gas for the specific gas application. The HBAD2 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 HBAD2 and HBMS2 systems include brass regulators with stainless diaphragm stainless steel inner core braided flexible pigtails with check valves, headers and complete mounting hardware.

CAUTION

Failure to follow the subsequent 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 when 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. Some materials may react when 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 damaged or break off the cylinder valve, which may propel the cylinder with great force.
- Oxygen manifolds and cylinder should be grounded. Static charges and lightning may ignite material in an oxygen atmosphere, creating 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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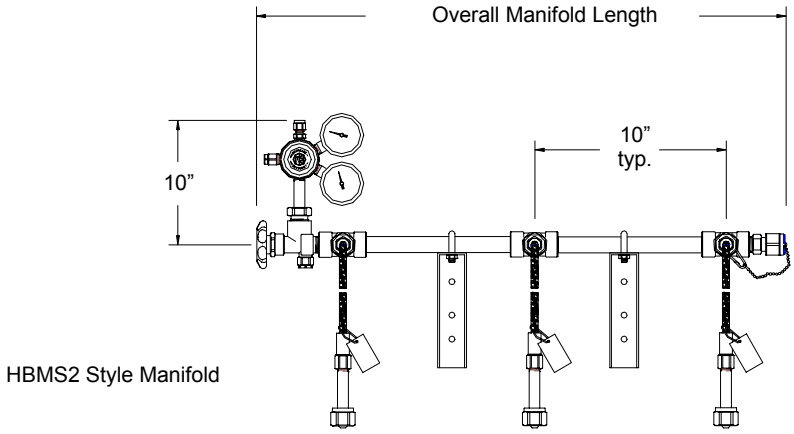
GENERAL INSTRUCTIONS

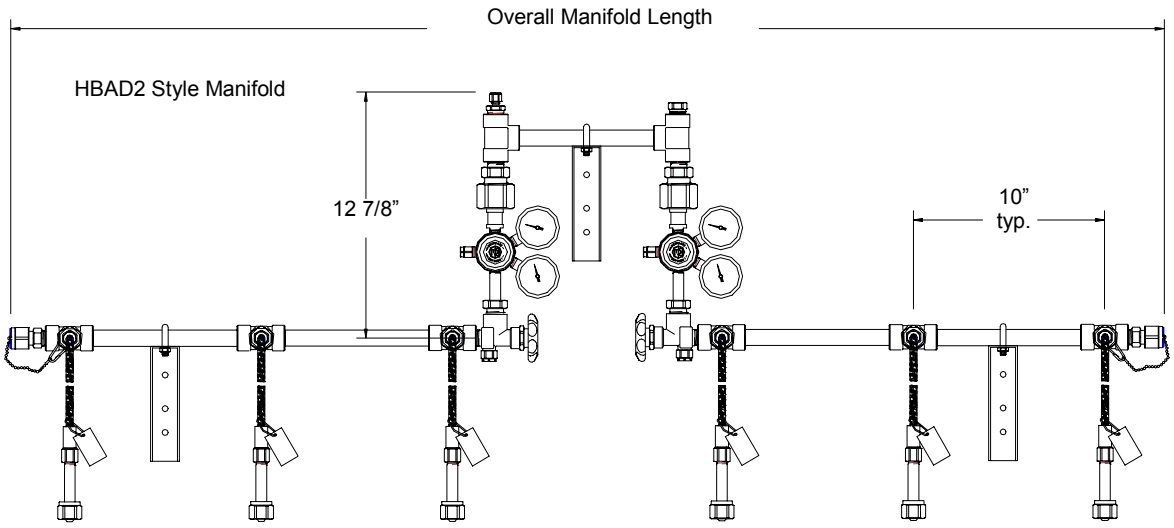
Manifolds should be installed in accordance with guidelines stated by the National Fire Protection Association, the Compressed Gas Association, the Occupational Safety and Health Administration, and all applicable local codes. The carbon dioxide and nitrous oxide manifolds should not be placed in a location where the temperature will exceed 120° F (49° C) or fall below 20° F (-7° C). The manifold 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. 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.

CAUTION:

- Remove all protective caps prior to assembly. The protective cap may ignite due to heat of recompression in oxygen systems.





Total number of cylinders	2	3	4	5	6	7	8
HSMS2 manifold length	1’-5”	2’-3”	3’-1”	3’-11”	4’-9”	5’-7”	6’-5”
HBAD2 manifold length	1’-6”	N/A	3’-2”	N/A	4’-10”	N/A	6’-6”

FIGURE 1

HBAD2 MANIFOLD ASSEMBLY

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

1. Assemble both regulators to the “H” section (Figure 2).
2. Assemble the headers to the regulators as shown.
3. Assemble the pigtails to the headers.

CAUTION:
- Verify flow direction of the check valve located in the pigtails. Pigtails assembled backwards will not flow.

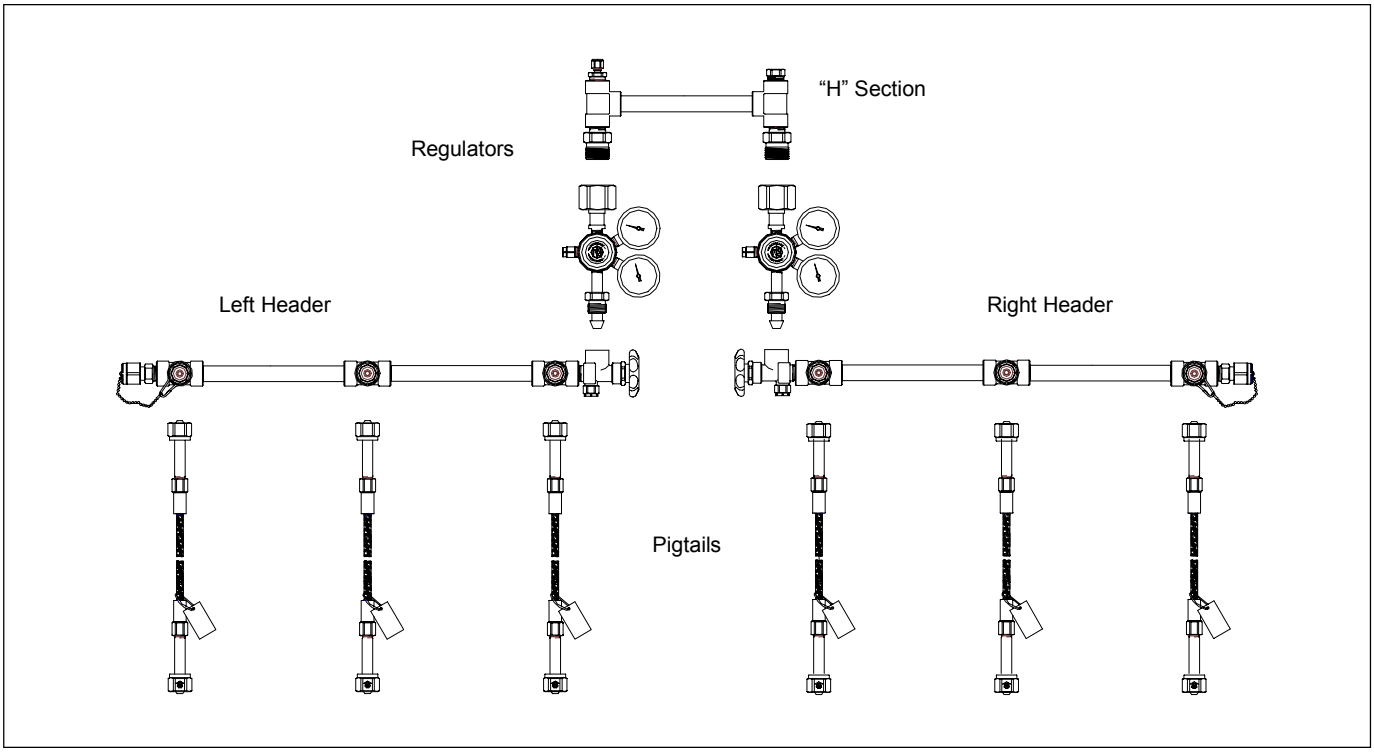


FIGURE 2

HBMS2 MANIFOLD ASSEMBLY

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

1. Assemble the header to the regulator as shown in Figure 3.
2. Assemble the pigtails to the headers.

CAUTION:
- Verify flow of the check valve located in the pigtails. Pigtails assembled backwards will not flow.

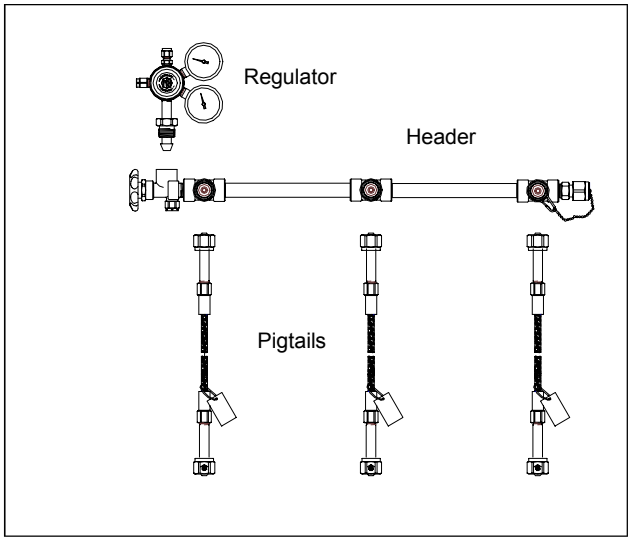


FIGURE 2

HBAD2 MANIFOLD INSTALLATION

1. Determine and mark the vertical center line for installation of the manifold. (Figure 4)

2. Measure from the floor to a point 60” 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 may vary from one installation to another depending on available space, cylinder height, etc.)

3. 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 and the center line.

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

5. Mount the manifold by placing the “H” section of the manifold bracket. Fit the U-bolt over the “H” section and tighten the mounting nuts. (Figure 6)

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

7. Remove the U-bolt assemblies from the header mounting brackets. Position the brackets so that the top of the brackets is aligned with the bottom of the headers and is centered between the header sections. The brackets should be evenly spaced to provide the most support and stability.

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

9. Fit the U-bolt over the header piping and tighten the two mounting nuts.

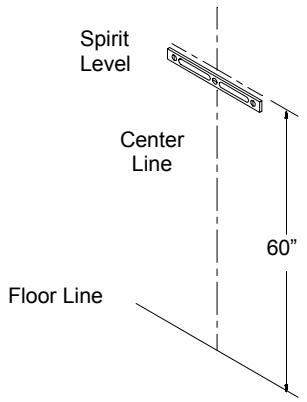


FIGURE 4

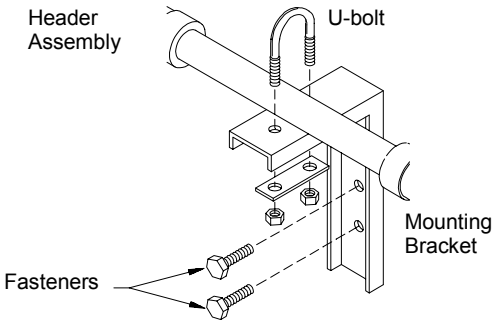


FIGURE 5

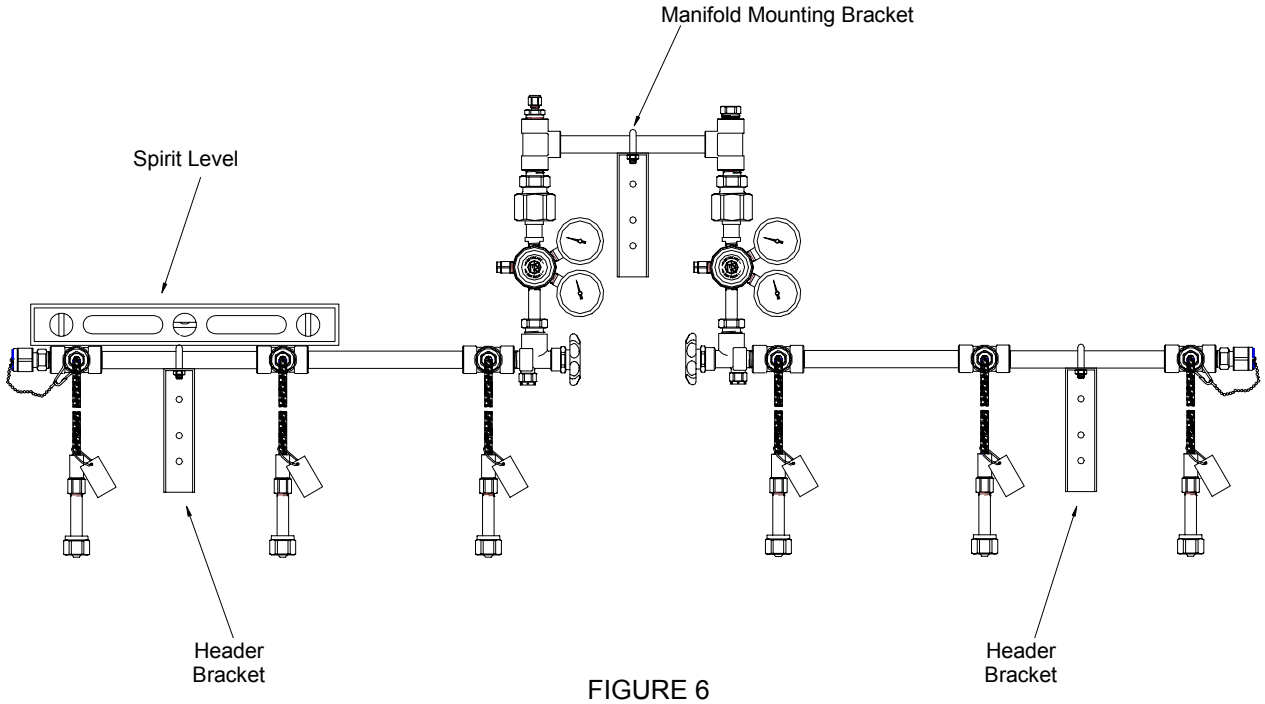


FIGURE 6

HBMS2 MANIFOLD INSTALLATION

1. Determine and mark the vertical center line for installation of the manifold. (Figure 7)

2. Measure from the floor to a point 50” 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 may vary from one installation to another depending on available space, cylinder height, etc.)

3. 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 and the center line.

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

5. Measure and mark a distance 10” from the centerline of the mounted bracket. This distance may vary depending on the number of cylinders.

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

7. Mount the manifolds by placing the header on the brackets. Fit the U-bolt over the header pipe and tighten the mounting nuts. (Figure 8)

8. Using a level, mark the placement of mounting brackets while keeping the header on a horizontal plane. (Figure 9)

9. Remove the U-bolt assemblies from the header mounting brackets. Position the brackets so that the top of the bracket is aligned with the bottom of the headers and is centered between the header sections. The brackets should be evenly spaced to provide the most support and stability.

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

11. Fit the U-bolt over the header piping and tighten the two mounting nuts.

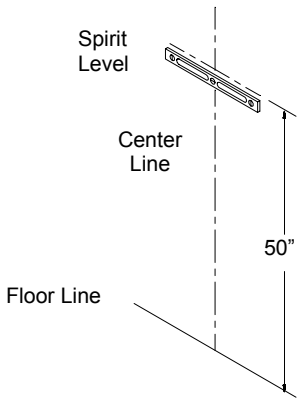


FIGURE 7

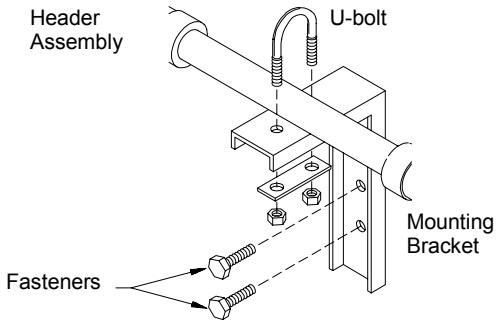


FIGURE 8

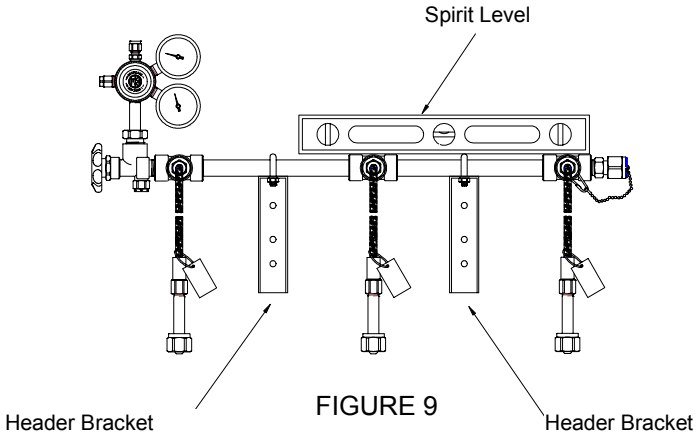


FIGURE 9

PLUMBING

The 1/4” tubing connection on the left side of the HBAD2 manifold should be connected to the pipeline system. The 1/4” tubing connection on the outlet of the regulator on the HBMS2 manifold should be connected to the pipeline system. The union provided permits removal of the manifold for service.

FUEL GAS SASFETY KIT INSTALLATION (For HBMS2 Acetylene Manifolds)

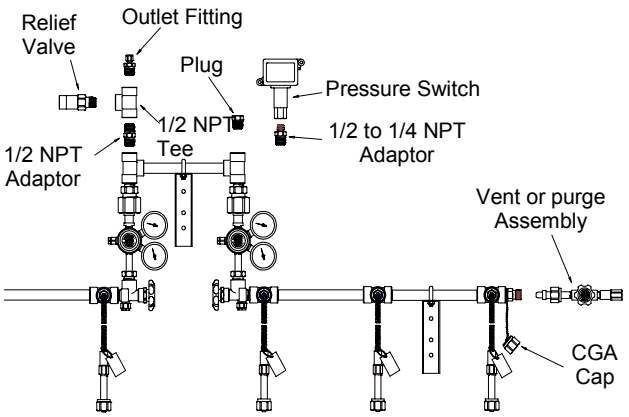
See instructions provided with the kit.

INSTALLATION OF OPTIONAL EQUIPMENT

PRESSURE SWITCH

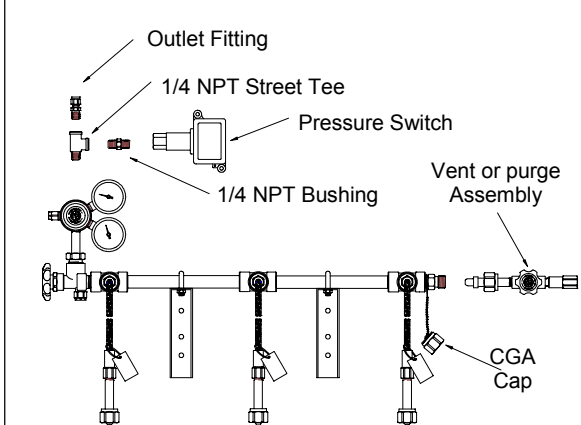
HBAD2 manifolds: Remove the plug on the right side of the “H” section (Figure 10a). Install a 1/2 x 1/4 NPT adaptor into the tee. Install the pressure switch onto the adaptor.

HBMS2 manifolds: Remove the tube fitting from the regulator outlet and install a 1/4 NPT street tee into the regulator outlet. Install the tube fitting into the street tee. Install a 1/4 NPT busing into the street tee and install pressure switch onto the busing (Figure 10b).



HBAD2 Manifolds

FIGURE 10a



HBMS2 Manifolds

FIGURE 10b

PURGE AND VENT ASSEMBLIES

1. Remove the CGA cap on the ends of the headers (Figure 10a & 10b).

2. Connect the purge assembly to the ends of the headers.

RELIEF VALVES

HBAD2 manifolds: Remove the manifolds outlet fitting from the tee. Install a 1/2 NPT adaptor into the tee and a 1/2 NPT tee onto the adaptor. Install the outlet fitting and relief valve into the tee (Figure 10a).

HBMS2 manifolds: Remove the tube fitting from the regulator outlet and install a 1/4 NPT street tee. Install the tube fitting and relief valve into the street tee (Figure 11).

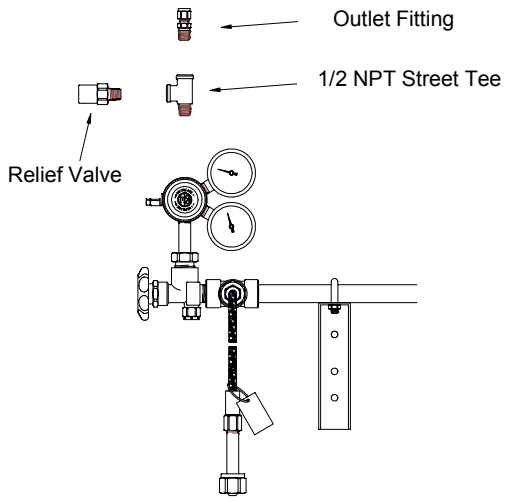


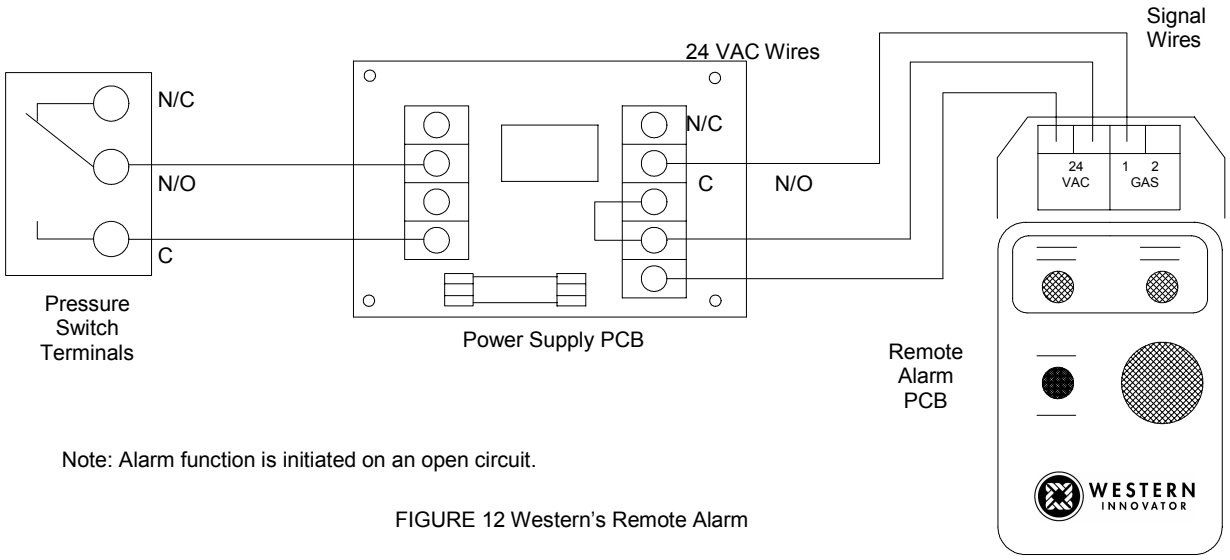
FIGURE 11

REMOTE ALARM HOOKUP

Western manifolds may be connected to an alarm system provided a pressure switch is installed into the manifold. The pressure switch provide 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 alarms (#BIA-1, BIA-2, and BIA-3) require a 24 VAC power supply (P/N WMS-9-25C).
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.

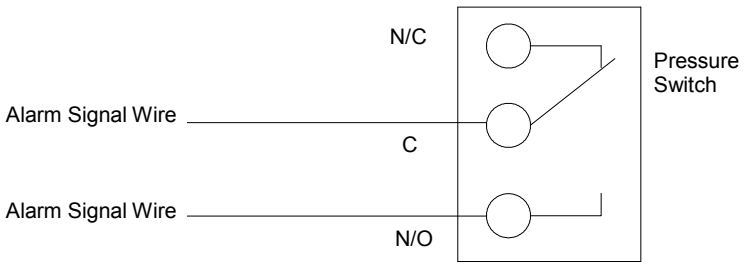


Note: Alarm function is initiated on an open circuit.

FIGURE 12 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 exist 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 13)
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 13 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.)

WESTERN'S ALARM

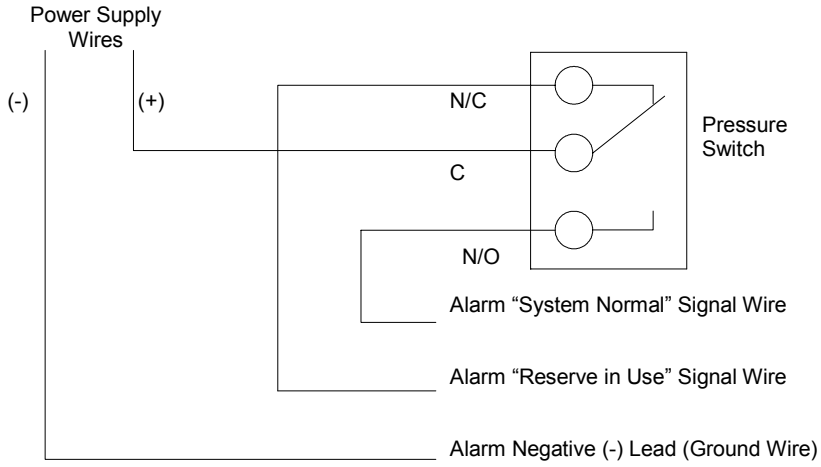
1. The power supply will be determined by the remote alarm operating voltage. If the remote alarm is designed for 115 VAC service then the existing 115 VAC power source can be utilized directly. (Figure 14) If the remote alarm is designed for other then the existing AC power source, then it is necessary to install a transformer in the system to proved the proper operating voltage. (Figure 15)

2. Connect the positive led (+) 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.

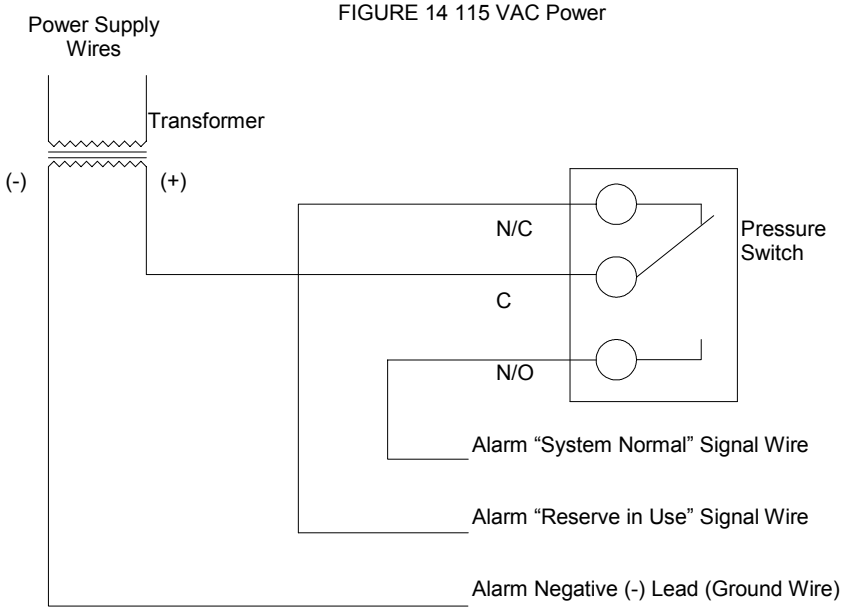
4. Connect the "Reserve in Use" signal wire from the alarm to the normally closed (N/C) terminal on the pressure switch.

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 close circuit.

FIGURE 14 115 VAC Power



Note: Alarm Function is initiated on a close circuit.

FIGURE 15 User Supplied Power

INSTALLING PIGTAILS AND ATTACHING CYLINDERS

1. Establish flow direction of check valves located in the pigtails.

2. Connect the outlet end of the pigtail to the manifold header.

3. Check the master valves to be certain they are closed.

4. Attach full cylinders to the pigtail connections as explained in "Cylinder Replacement & Handling" on page 12.

4. Open master valves (turn counter-clockwise to open).

5. S-L-O-W-L-Y turn all cylinder on fully (turn counter-clockwise to open). Check all cylinder and pigtail connections for leaks using Western leak detector LT-100 or any oxygen safe solution. Any bubbles around connections indicates leakage.

HBAD2 START UP AND CHECKING PROCEDURES

The HBAD2 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 the right master valve (turn counter-clockwise to open). The high pressure gauge will show the full pressure of the right bank of cylinders (Figure 16)

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 master valve and deplete pressure from the system.

4. S-L-O-W-L-Y open the left master valve (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 psig 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 set half way between the two regulator settings.

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

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

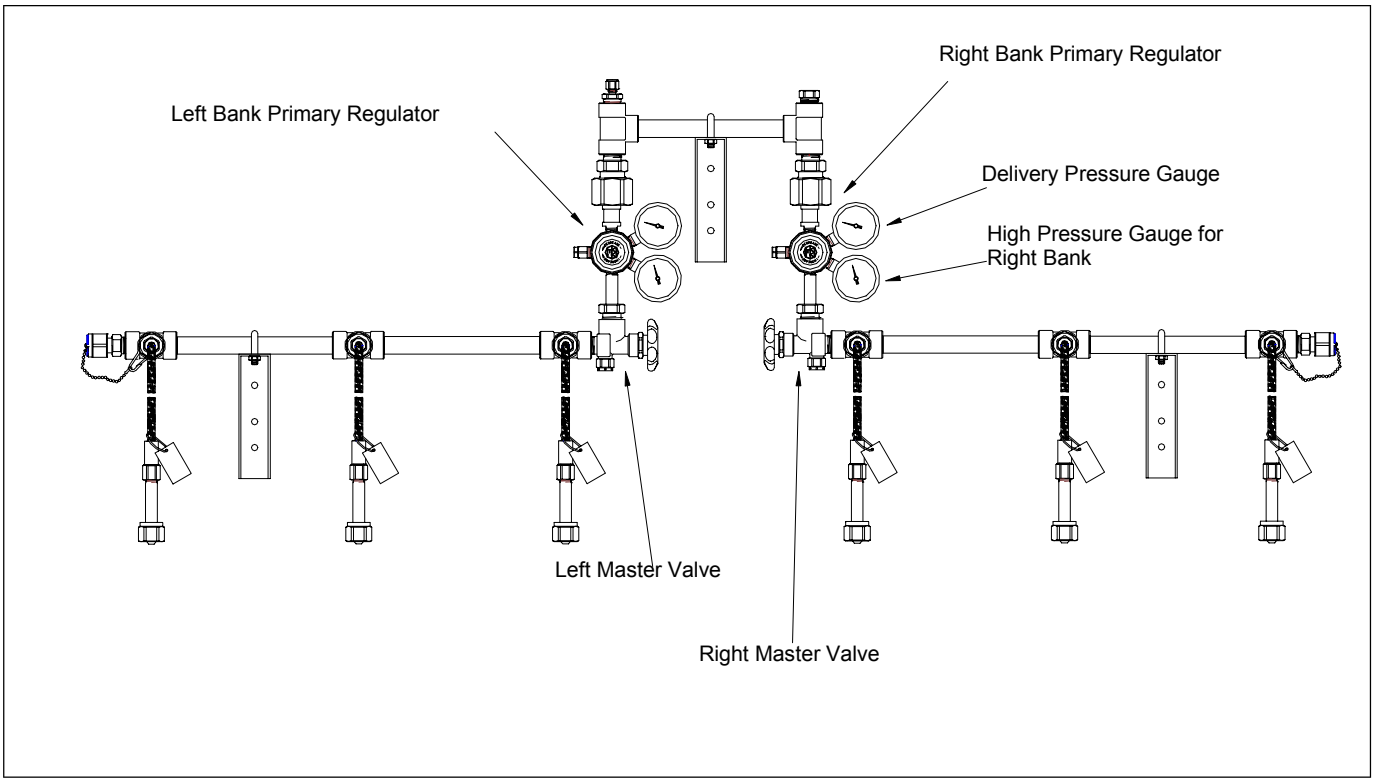


FIGURE 16

HBMS2 START UP AND CHECKING PROCEDURES

1. S-L-O-W-L-Y open the master valve (turn counter-clockwise to open). The high pressure gauge will show the full pressure of the bank of cylinders.

2. Adjust the delivery pressure of the regulator to the desired pressure. The selection of the regulator set pressure may vary due to application requirements.

3. If a pressure switch has been installed in the system the switch setting shall be approximately 10-15 psig less than the delivery pressure setting.

4. Simulate a depleted bank by closing the master valve and creating a flow of gas through the manifold. Any alarms connected to the system monitoring change over will activate.

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

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

HBAD2 MANIFOLD OPERATION

The HBAD2 manifold control includes the following components and features: brass regulator with stainless steel diaphragm, brass 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 constructions allows installation of purge assemblies, and automatic bank switching. The manifold is designed to use a line regulator which can be mounted on the manifold outlet.

The cylinder bank that supplies the piping system is known as the “Service” supply, while the cylinders on stand-by are referred to as the “Reserve” supply. Gas flows through the manifold control to the 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 changeover the high pressure gauges on the regulator will indicate which bank should be changed.

To insure proper operation, observe the following guidelines:

1. Carefully follow all instructions.
2. Establish proper flow direction of check valves.
3. Be sure header shut-off valves are fully open.
4. Be sure cylinder valves are fully opened.
5. Replace depleted cylinders as soon as practical after the manifold has changed over.

RESETTING THE HBAD2 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 that 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.

HBMS2 MANIFOLD OPERATION

The HBMS2 manifold control includes the following components and features: brass regulator with stainless steel diaphragm, brass 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 constructions allows installation of purge assemblies, and automatic bank switching. The manifold is designed to use a line regulator which can be mounted on the manifold outlet for delivery pressure less than 20 psig.

Gas flows through the manifold to the primary regulator and then through the line regulator (if installed). Final delivery pressure is controlled by either the line regulator or by the primary regulator should the application not require a line regulator. A line regulator is not provided with the manifold.

As cylinders deplete the high pressure gauge on the regulator along with any alarm systems installed will indicate that the bank of cylinders should be changed.

After replacing empty cylinders the manifold is immediately ready for service.

To insure proper operation, observe the following guidelines:

1. Carefully follow all instructions.
2. Establish proper flow direction of check valves.
3. Be sure header shut-off valves are fully open.
4. Replace depleted cylinders as soon as practical after the manifold has changed over.

CYLINDER REPLACEMENT AND HANDLING

1. Shut off all cylinder valves as well as the master valve on depleted cylinder bank.

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. Removed 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 contaminations 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. Vent the header to remove any moisture or air that entered the system while changing cylinders.

8. Open the master valve(s). S-L-O-W-L-Y turn each cylinder valve until each cylinder is fully on.

9. The manifold supply bank is now replenished. The HBAD2 manifold may be reset by following the manifold resetting instructions located in the “RESETTING THE HBAD2 MANIFOLD AFTER CHANGE OVER” section.

VENTING HEADERS

1. Close the master valve.

2. Slowly open each cylinder valve, to pressurize the bank.

3. Close the cylinder valves.

4. Open the vent valve and deplete the system of gas.

5. Repeat steps 2, 3, and 4 for a total of 3 cycles.

6. Slowly open the master valve and then open all of the cylinder valves. The bank is now ready to be used.

GENERAL MAINTENANCE

1. Main section
   a) Daily - record line pressure.
   b) Monthly
      1) Check regulators and valve for external leakage.
      2) Check valves for closure ability.
   c) Annually
      1) Check relief valve pressures.
      2) Check regulator seats.

2. Manifold header
   a) Daily - observe nitrous oxide and carbon dioxide systems for cylinder 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 cylinders 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.

TROUBLESHOOTING **(Only qualified repair personnel should make repairs)**

SYMPTOM	PROBABLE CAUSE	REMEDY OR CHECK
SYSTEM CHANGED 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 regulator.
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 down 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 CHANGEOVER		
Reserve side does not flow and delivery gauges drop down to 0.	Reserve primary regulators set at 0 psig.	Reset the reserve primary regulator following instructions on page 9 (Start up and checking procedures).
LOSS OF CYLINDER CONTENT		
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

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

Stainless Steel Inner Core Flexible Braid with Check Valves

HPF-15CVFA-24A..... CGA 510 Flexible Pigtail
HPF-16CVFA-24A..... CGA 300 Flexible Pigtail
HPF-320CV-24A ..... CGA 320 Flexible Pigtail
HPF-326CV-24A ..... CGA 326 Flexible Pigtail
HPF-346CV-24A ..... CGA 346 Flexible Pigtail
HPF-83CV-24A ..... CGA 350 Flexible Pigtail
HPF-63CV-24A ..... CGA 540 Flexible Pigtail
HPF-92CV-24A ..... CGA 580 Flexible Pigtail
HPF-590CV-24A ..... CGA 590 Flexible Pigtail

REGULATORS

SHSS150R0580..... Primary Regulator for all gases except Acetylene
WMS-11-106 .....Primary Regulator for Acetylene

VALVES

WMV-2-56 ..... Master Valve
CVM-4F ..... Check valve for CO_2 and N_2O
CVM-4FV ..... Check valve for all gases except for 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-4-13 ..... High / Low Switch: 0 - 200 psig pressure setting range (350 psig max inlet)
WMS-4-14 ..... General Purpose: 20 - 200 psig pressure setting range (250 pisg max inlet)

POWER SUPPLIES

WMS-9-25C ..... 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

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 supplied 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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