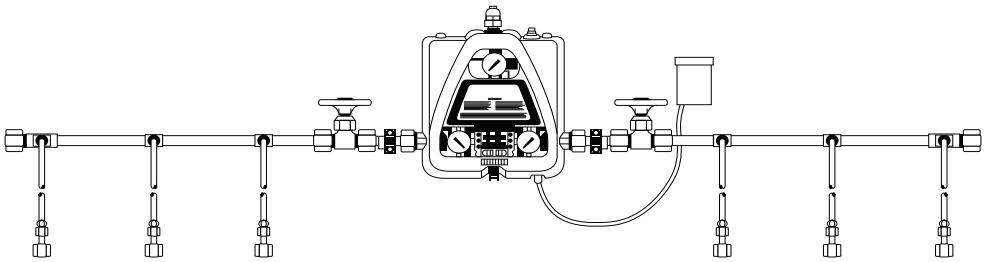
HIGH PRESSURE AUTOMATIC SWITCHOVER MANIFOLD



SAFETY AND OPERATING INSTRUCTIONS

Revision: AD	**Issue Date:** May 2024	**Manual No.:** 0056-3089

WE APPRECIATE YOUR BUSINESS!

Congratulations on your new Ohio Medical product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry. This product is backed by our extensive warranty and world-wide service network. To locate your nearest distributor or service agency call 866-549-6446, or visit us on the web at **www.ohiomedical.com, www.ohiomedicalparts.com.**

This Manual has been designed to instruct you on the correct installation and use of your Ohio® Medical product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore, please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

YOU ARE IN GOOD COMPANY!

The Brand of Choice for Contractors and Fabricators Worldwide.
Ohio Medical is a Global Brand of Gas Equipment Products.

We distinguish ourselves from our competition through market-leading, dependable products that have stood the test of time. We pride ourselves on technical innovation, competitive prices, excellent delivery, superior customer service and technical support, together with excellence in sales and marketing expertise.

Above all, we are committed to developing technologically advanced products to achieve a safer working environment within the medical gas industry.

WARNING

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment. While the information contained in this Manual represents the Manufacturer's judgment, the Manufacturer assumes no liability for its use.

High Pressure Automatic Switchover Manifold
Safety and Operating Instructions
Instruction Guide Number: 0056-3089
Published by:

www.ohiomedical.com
www.ohiomedicalparts.com

Customer Care: (866) 549-6446

Publication Date: April 2024
Revision Date: May 2024

Record the following information for Warranty purposes:

Where Purchased:_____

Purchase Date:_____ _____

Equipment Serial #:_____ _____

TABLE OF CONTENTS

SECTION 1: INTRODUCTION

1.01 HOW TO USE THIS MANUAL

Information necessary to perform maintenance and service is contained in the manual. this information is intended for used by technicians or personnel qualified to repair and service this equipment. The information contained in the documents, including performance specifications ,is subjects to change without notice. To ensure safe operation, read the entire manual, including the chapters on safety instructions and warnings.

Throughout this manual, the words WARNING, CAUTION, and NOTE may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

NOTE

NOTE conveys installation, operation, or maintenance information which is important but not hazard-related.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

1.02 RECEIPT OF EQUIPMENT

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the location in your area, listed in the inside back cover of this manual. Include a full description of the parts in error.

If you want additional or replacement copies of this manual, they can be found on ohiomedical.com, www.ohiomedicalparts.com or at 866-549-6446. Include the Manual number (Page i).

1.03 DESCRIPTION

The Ohio Medical manifold system is designed to be fully automatic. The manifold gives an uninterrupted supply of gas to a hospital or clinic's medical gas pipeline. The manifold provides an uninterrupted supply of gas as the primary bank of cylinders is depleted. At a preset pressure, the manifold automatically switches to the reserve bank. The Ohio Medical manifold is designed and manufactured to comply with the requirements of NFPA99. The lights on the front of the manifold indicate the status of the gas supply. An external power supply converts 115VAC to 24VAC. A 24-inch cord connects the power supply to the manifold. When the manifold changes from the primary bank to the reserve bank, the red light comes on indicating depletion of primary bank and that the depleted bank needs to be replaced with full cylinders.The manifold also closes contacts, which can signal a remote alarm location that the cylinders need to be replaced with full ones.

A five-terminal strip, inside of the power supply, connects to a remote alarm. An internal power supply relay provides dry alarm contacts that are rated for 3 amps at 30VDC or 2 amps at 250 VAC. No manual resetting is required when the depleted bank has been replaced and is pressurized. When the depleted bank has been replaced with new cylinders and repressurized, the red light goes OFF, the yellow light comes ON and the replaced bank is now the reserve or secondary bank. The system eliminates the need for the operator to change switches or pressure upon cylinder depletion. This is a fully automatic system and comes with Ohio Medical Corporation's two-year warranty. The switchover unit has a five-year warranty. Please call Ohio Medical. with any questions on their 24-hour technical support line, 866-549-6446

This Page Intentionally Blank

SECTION 2: SAFETY PRECAUTIONS

FOR YOUR SAFETY

Installation and utilization of manifold and piping systems must conform to federal, state, and local specifications and regulations. The National Fire Protection Association Bulletin #99 outlines standards for the installation and operation of medical gas systems for hospital and home care facilities. Copies can be obtained by writing National Fire Protection Association, 470 Atlantic Avenue, Boston MA 02210. Be certain to consult your fire marshal concerning regulations applicable to your location and particular requirements.

Read and understand these operating instructions before attempting to attempting to operate or service this equipment.

The information contained in this documents is subject to change without notice.

WARNING

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

WARNING

Personal injury or property damage can occur if you fail to follow the instructions in this manual.

WARNING

Working with high-pressure gas can be hazardous. Open all valves SLOWLY. Very high temperatures and pressures, with possible damage to the equipment, will result if valves are not opened slowly.

WARNING

DO NOT use a flame or “sniff" test for leaks.

WARNING

Never permit oil, grease, or other combustible materials to come in contact with cylinders, manifold, and connections. Oil and grease may react with explosive force while in contact with some gases, particularly oxygen and nitrous oxide.

WARNING

ALWAYS open cylinder, header, and manifold valves very slowly. When valves are opened rapidly, sudden pressurization will cause heat of recompression to occur. These temperatures and pressures can damage the manifold system and may cause injury to operator. ALWAYS open valves slowly.

WARNING

DO NOT kink, twist, or bend pigtails into a radius smaller than 5 inches (12.7cm). If you do this, the pigtail might burst.

WARNING

ALWAYS secure cylinders with racks, straps, or chains. Unrestrained cylinders may fall over and damage or break off the cylinder valve.

WARNING

Electrically ground oxygen and fuel gas manifolds and cylinders. Static discharges and lightning may ignite materials in an oxygen atmosphere, creating fire or explosions.

WARNING

DO NOT apply heat to any part of the manifold system.

WARNING

DO NOT weld near piping. Excessive heat may cause certain gases to dissociate, creating explosive force.

SECTION 3: FEATURES AND SPECIFICATIONS

Abbreviation	Description
C	Common
CGA	Compressed Gas Association
Ft. Lbs.	Foot pounds torque
In. Lbs.	Inch pounds torque
N/C	Normally Closed
N/O	Normally Open
NPT	National Pipe Taper
OSHA	Occupational Safety and Health Administration
PSIG	Pounds per Square Inch
SCFH	Standard Cubic Feet per Hour
VAC	Voltage, Alternating Current
VDC	Voltage, Direct Current

3.01 STANDARD FEATURES

1. Manufacturing - Ohio Medical Corp. quality system is registered by BSI to meet the requirements of ISO 9001.
2. Safety Standards and Codes - Ohio Medical Manifold Systems meet or exceed the following industry standards:
    - Compressed Gas Association (Pamphlets V-1, E-1, G-1)
    - American National Standards Institute (Pamphlet B57.1, B40.1)
    - National Fire Protection Association (Pamphlet NFPA-51 and NFPA-99)
    - Manifolds are UL Listed

3. Brazing Details – Manifold header joints are brazed for maximum strength and leak prevention. Brazed joints are 100% pneumatically or hydrostatically tested after assembly to at least 1.5 times their rated pressure (4500 PSIG [31026,4Kpa]).

4. Operating Temperature Range – Recommended operating range for manifold system is 0° to 140°F (-18°C to 60°C).

5. Environmental Considerations – Ohio Medical manifold systems are manufactured to be used in Indoor locations. Do not expose control boxes to direct precipitation such as rain, sleet, snow, etc. Exposure to heavy saltwater environment will not degrade the integrity of the system, but may degrade appearance of pressure gauges and surface finish.

6. Preservation – Each manifold is packaged in a heavy gauge cardboard box with internal foam supports to prevent damage during the shipping process. No special provisions are made to protect the manifolds from prolonged exposure to the elements.

7. Manuals – A Safety and Operating instruction manual is provided with each manifold system.

8. Cleaning – Components are cleaned for oxygen service to comply with the applicable sections of CGA Pamphlet G-4.1.

3.01 MATERIAL SPECIFICATIONS

Enclosure	12.8" w X 14.1" h X 5.0" d (32.5 cm w X 35.8 cm h X 12.7 cm d) Inlet: 1" - 11" NPS (M) Outlet: 1/2 NPTF Material: ABS (Acrylonitrile Butadiene Styrene)
Electrical	Cabinet lights indicating status. 115 VAC input, 24 VAC output. (Not required for manifold to operate.) Optional remote alarm system using dry contacts in power supply.
Pressure Switches	Body: Brass Seals: Buna N (Nitrile) (UL listed)
Connections	Regulator inlets/outlets, tube ends, plugs, nuts: CDA360 UL Listed
Relief Valve Tubing	Nylon tubing
Delivery Regulators	Body and Housing Cap: Forged Brass CDA377 Seat: Urethane Seat Assembly Components: Brass CDA360 & 303 SST Friction Damper: Teflon Return Spring: 302 SST Diaphragm: Fabric Reinforced Neoprene
Face Seals	Face seal: Brass CDA360 O-Ring: Buna N (Nitrile)
Relief Valves	Lower seat: Buna N (Nitrile) Upper seat: Brass CDA360 Spring: TY 17-7 pH SST Adjustment Disc: 304 SST Body: Brass CDA360 Cap: Brass CDA360
Pigtails	Rigid and Flexible available and matched for gas service
Inlet Regulators	Body and Cap: Brass CDA360 Seat: Nylon Piston: Brass CDA360 O-rings: Buna-N (Nitrile) Spring: Chrome Vanadium

Switch Unit	Body and end caps: Brass CDA360 Switch piston: 316 SST Roller: 316 SST Pin: 304 SST Set piston: Naval Brass CDA485 O-ring: Buna-N (Nitrile) Bumpers: Nylon

WARNING

Do not attempt to use this apparatus unless you are trained in its proper use or are under competent supervision. For your own safety, practice the safety and operating procedures described in this booklet every time you use the apparatus. Deviating from these procedures may result in fire, explosion, property and/or operator injury. All operations must conform to the applicable federal, state, county or city regulations for installation, operation, ventilation, fire prevention and protection of personnel. If at any time the apparatus you are using does not perform in its usual manner, or you have any difficulty in the use of the apparatus, stop using it immediately. DO NOT use the apparatus until the problem is solved.

WARNING

Service or repair of apparatus should be performed only by a qualified repair technician. Improper service, repair, or modification of the product could result in damage to the product or injury to the operator. The term "Qualified Repair Technician" refers to repair personnel capable of servicing gas apparatus in strict accordance to Ohio Medical Part and Service Bulletins.

WARNING

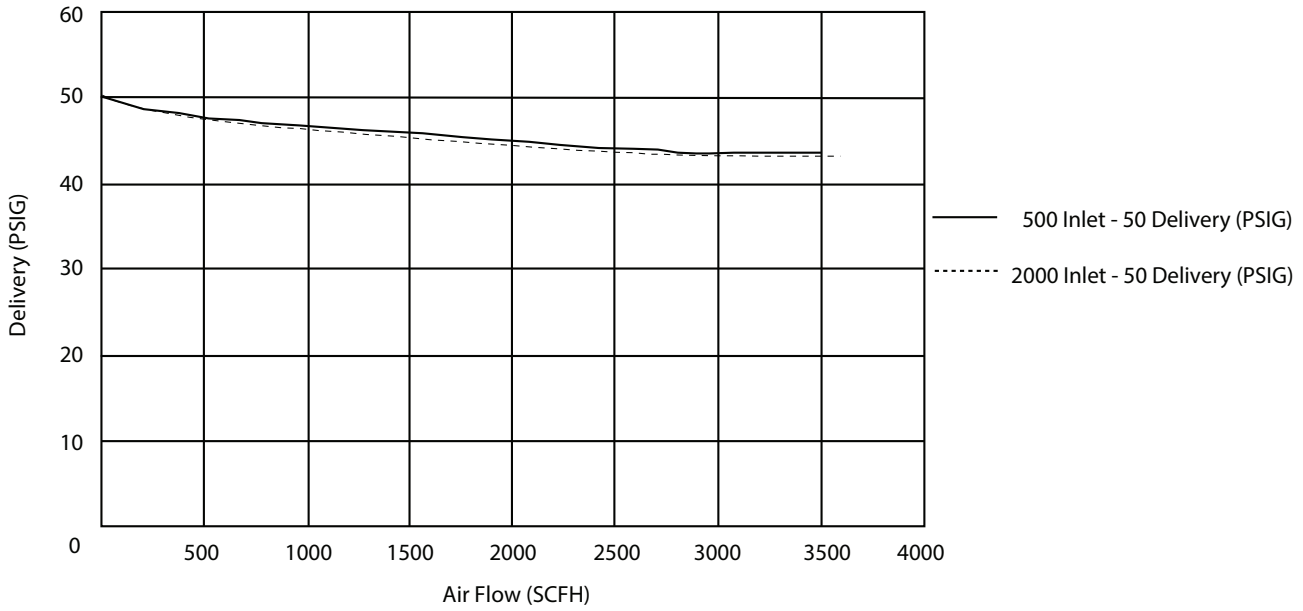
READ AND UNDERSTAND ALL THE SAFETY AND OPERATING INSTRUCTIONS CONTAINED IN THIS BOOKLET AND THE INSTRUCTIONS OF FOR ALL OTHER EQUIPMENT YOU ARE USING. If you do not understand these instructions, or have any question, contact your supervisor or dealer before attempting to use the apparatus. FAILURE TO FOLLOW ALL THE INSTRUCTIONS MAY RESULT IN FIRE, PROPERTY DAMAGE AND/OR INJURY.

3.03 NITROUS OXIDE/CARBON DIOXIDE FLOW CHARACTERISTICS

Nitrous Oxide and Carbon Dioxide are supplied in a liquefied state. As the liquid vaporizes in the cylinder, it turns to a gaseous state. Under normal conditions, gas pressure is at a normal 750 PSIG. Ambient temperature affects this pressure significantly.

These cylinders are specified by how many pounds of liquid are in the cylinder. A standard "H"cylinder is usually a 50 lb. cylinder. Most literature suggests the user should not withdraw more than 50 SCHF of gas from a 50 lb. cylinder. If more than 50 SCFH is withdrawn, the gas pressure in the cylinder will decrease because the liquid cannot vaporize fast enough. When this happens, the liquid will begin to cool and eventually freeze solid, so no gas will be delivered. It is important for the user to size the manifold properly so that excessive flow does not occur during use. The most prevalent problem associated with nitrous oxide and carbon dioxide manifolds is freeze-up due to excessive flow. Excessive flow is caused by trying to flow more than 50 SCHF from a 50 lb. cylinder.

However, the proper number of cylinders is required to prevent the cylinders from freezing, causing premature changeover and loss of flow. If you are unsure of the proper withdrawal rate for your cylinders, consult your gas supplier.



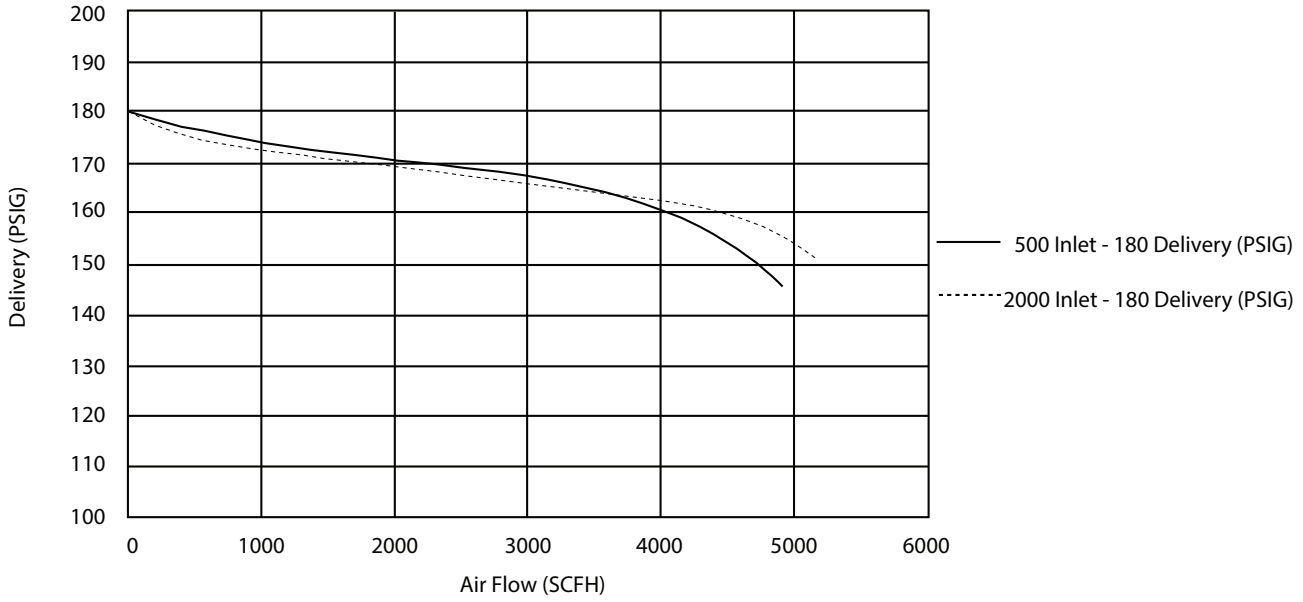


Figure 1: Ohio Medical High Pressure Manifold

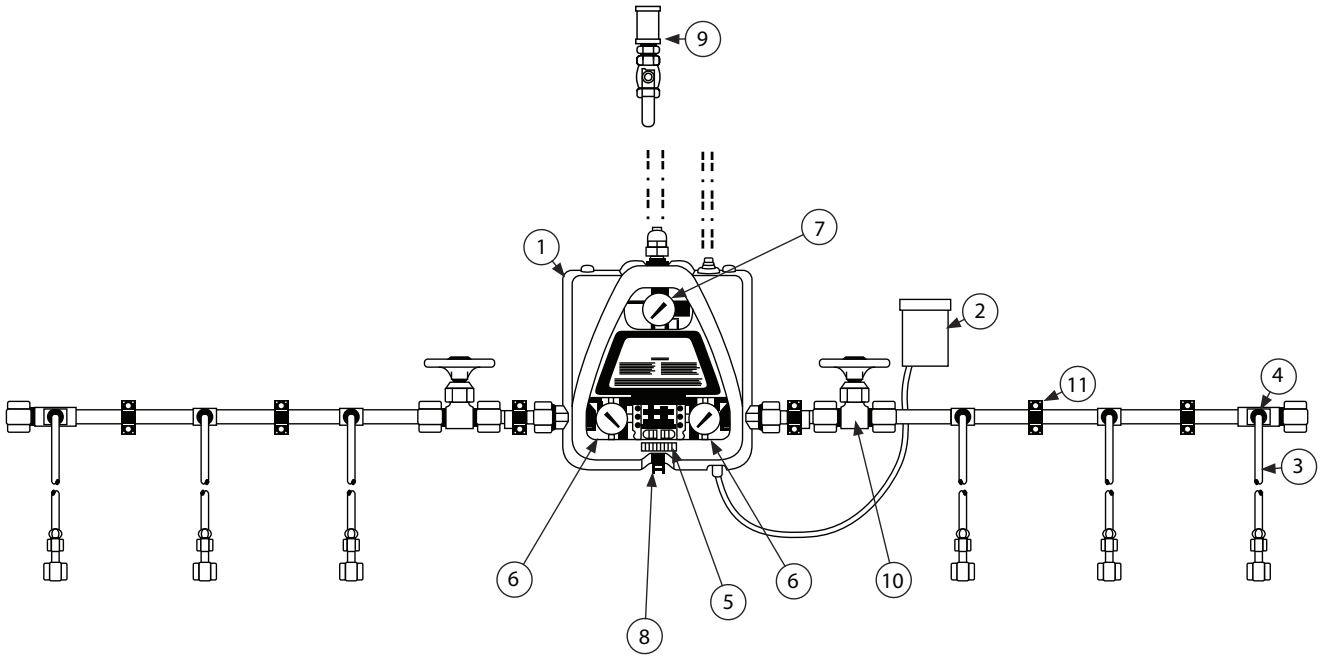
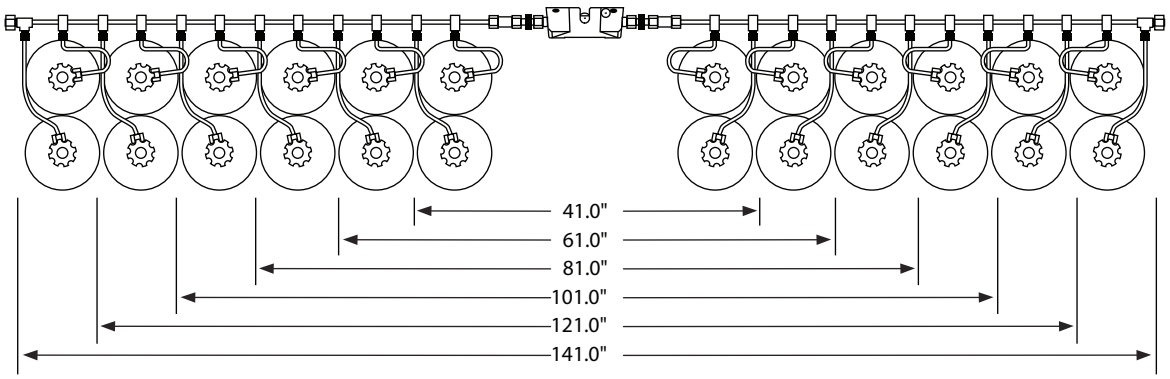


Figure 2: Key Elements

Item No	Part Name	Description
1	Pressure control cabinet	Maintains constant pressure to the pipeline and enables smooth uninterrupted switchover from the primary to the reserve cylinders
2	Output power supply	115 VAC input, 24 VAC. Includes dry contacts for the local and remote alarm connections.
3	Flexible cylinder connections	Connects cylinders to headers
4	Headers with shut-off valve	At each inlet port. Headers are modular construction to facilitate future expansion.
5	Control panel indicator lights	Indicate status of the left and right cylinder banks. The “IN SERVICE” (supply side) is indicated by the green light while the reserve cylinder bank is indicated by the yellow “READY FOR USE”, a red “REPLACE CYLINDERS” indicates a depleted bank of cylinders.
6	Individual pressure gauges	Allow monitoring of left and right supply pressure.
7	Pipeline delivery pressure	Allow monitoring of left and right supply pressure.
8	Cabinet latch	Can be locked to help prevent tampering.
9	Master valves	Used to shut OFF gas in emergency situations. Should normally be left open.
10	Mounting brackets	Used to secure headers to wall.

TOP VIEW



Length is for both sides of header bar connected to a 13" wide manifold cabinet. Total horizontal space will be dependent upon cylinder placement.

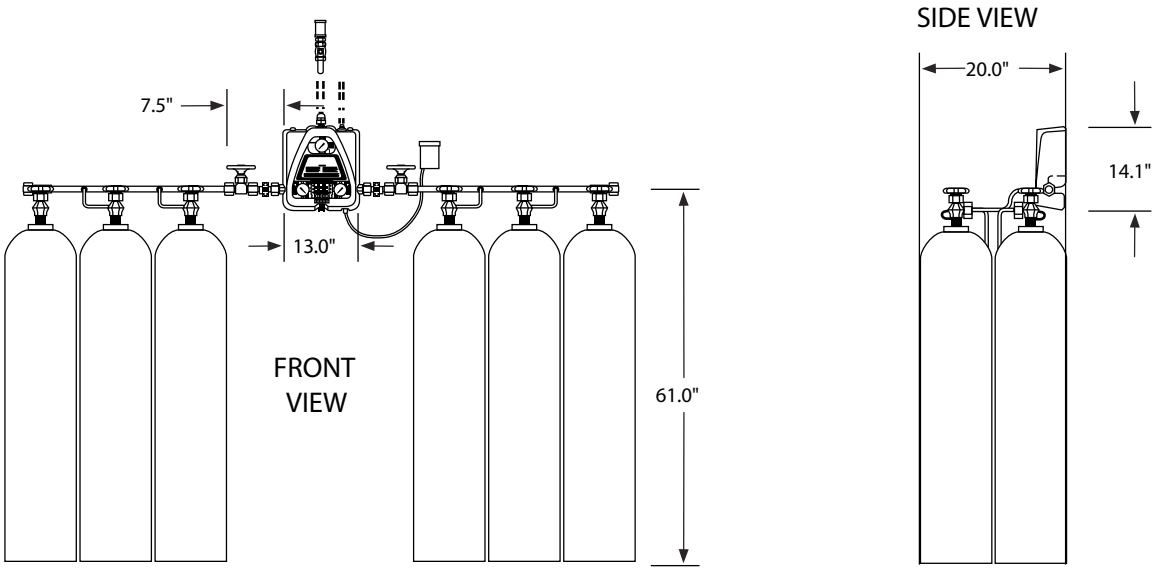


Figure 3: Overall Manifold Length

SECTION 4 :MANIFOLD OPERATION

The basic manifold system consists of the pressure control cabinet, two banks of cylinders, pigtails, delivery pressure gauge, and cylinder gauges for measuring the pressure in each bank. When the first bank is opened and pressure is applied to the pressure control cabinet, it automatically becomes the primary bank. When the second bank is opened, it becomes the reserve or secondary bank. The reserve or secondary bank is in a static condition until the pressure in the primary bank reaches the switchover pressure setting. The intermediate pressure gauge can be used to monitor the condition of the manifold at any time. It will indicate the delivery pressure of the inlet regulator currently in use, and will also clearly show when the lights change from green to red and when switchover occurs.

At the switchover point, the reserve bank automatically switches over to become the primary and the red light comes on signaling the primary bank has been depleted and must be replaced. Dry contacts inside the power supply box also open, activating a remote alarm if one is attached. The red light will indicate which bank has been depleted. Bank pressure can also be read on the bank inlet pressure gauges and will show an empty or near empty condition, indicating the depleted bank.

When the depleted bank has been replaced with new cylinders, the red light goes OFF and the yellow light comes ON, and the depleted bank becomes the reserve bank allowing the cycle to be repeated. In case of power failure, the manifold will continue to function, as power is used only for the red, yellow and green indicator lights and alarm.

Internal Components

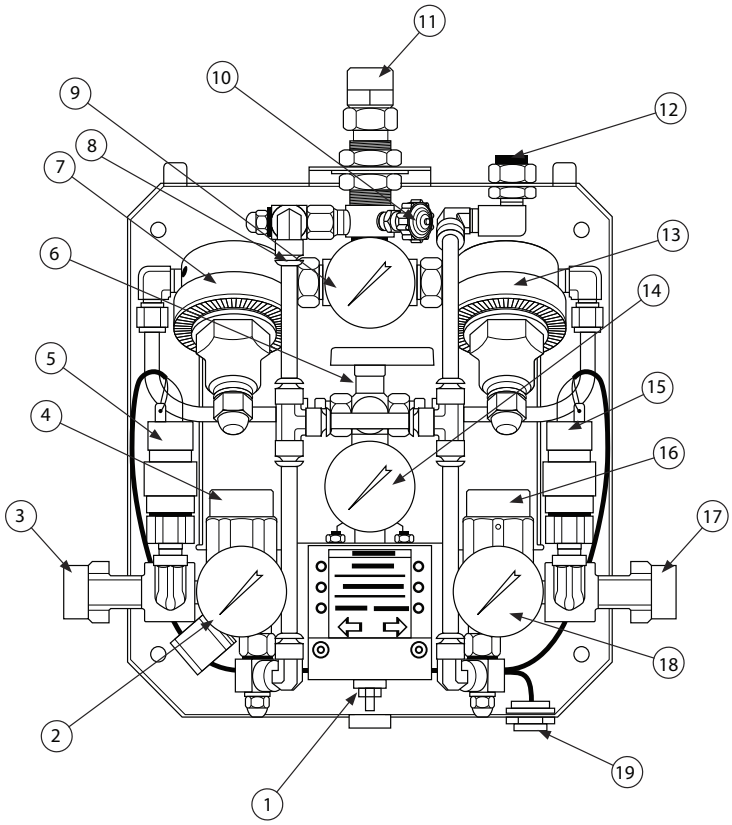


Figure 4: Internal Components

Item No.	Description
1	Manifold Switch Unit
2	Left Bank Pressure Gauge
3	Left Bank Inlet
4	Left Bank Pressure Regulator
5	Left Bank Pressure Switch
6	Diversion Valve
7	Left Side Delivery Regulator
8	Relief Valve Fitting
9	Delivery Pressure Gauge
10	Bleed Valve
11	Outlet
12	Vent
13	Right Side Delivery Regulator
14	Intermediate Pressure Gauge
15	Right Bank Pressure Switch
16	Right Bank Pressure Regulator
17	Right Bank Inlet
18	Right Bank Pressure Gauge
19	Electrical Connection from Power Supply

SECTION 5 : INSTALLATION

The manifold should be installed in accordance with guidelines stated by the National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA), and all applicable state and local codes.

WARNING

To avoid potential shocks, do not attempt to hook-up or repair this device in the presence of water, such as rain. The power supply and cabinet should be properly grounded in accordance with the National Electric Code (NEC) and state and local guidelines.

The equipment has been cleaned for oxygen service. Care must be taken during handling so that oil, grease, and dirt do not contact parts. If cleaning is necessary, refer to Compressed Gas Association Pamphlet (CGA) G-4.1 "Cleaning Equipment for Oxygen Service" for directions.

The manifold components are designed for optimal performance with the temperature range of 0°F to 140°F (-18°C to 60°C). Wider temperature variations may cause leaks or malfunctions to occur.The pressure control cabinet should be mounted in a location protected from moisture.

See Figure 3 for manifold overall length. Refer to Figure 5 when following the instructions below:

1. Measure and mark a horizontal line approximately 58" from floor for the bottom mounting holes in the manifold mounting plate. This will determine the centerline of about 61" for the inlets to the control box. (Wall mounting heights may vary depending on cylinder height,etc.)

2. Remove the cover from the pressure control cabinet by opening the latch on the bottom and lifting the cover up over the mounting tabs of the mounting plate. Securely attach the mounting plate to the wall. The type of fasteners used depend upon wall construction.

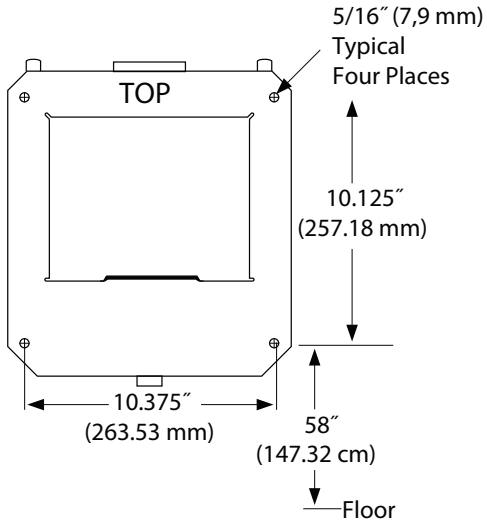


Figure 5: Mounting Plate

3. Remove the nut and plug from each inlet of the pressure control cabinet.

WARNING

Do not use any components if you detect oil, grease, or damage. These items must either be cleaned, repaired, or replaced by qualified personnel.

4. Hold each header in a level position and mark the location of each mounting bracket. Attach each mounting bracket to the mounting surface. The type of fasteners used will depend upon wall construction.

5. Attach each header to each manifold inlet connection. Attach the nut and plug to the end of each header.

NOTE

The rounded end of the plug is the sealing surface. Tighten all manifold fittings to 55-65 ft. lbs. torque.

6. Tighten all header mounting hardware.

7. Pigtails supplied with this manifold have check valves built into the CGA adapter on the header. Attach each pigtail assembly to each CGA adapter and tighten to 15-25 ft. lbs. torque.

8. Mount the power supply in a location convenient to the pressure control cabinet. Using conduit connect 115 VAC power wiring to the free leads of the power supply as shown in electrical drawing (Figure 6).

9. For remote alarm electrical connection, use electrical wiring drawing shown in Figure 6.

10. The outlet on the top of the manifold control box comes with an O-ring face seal connection that has a 1/2 NPT female thread connected to the pipeline system.

11. The relief valve vent is located to the right side of the outlet and has a 1/4 NPT female port for connecting the vent piping to the outside.

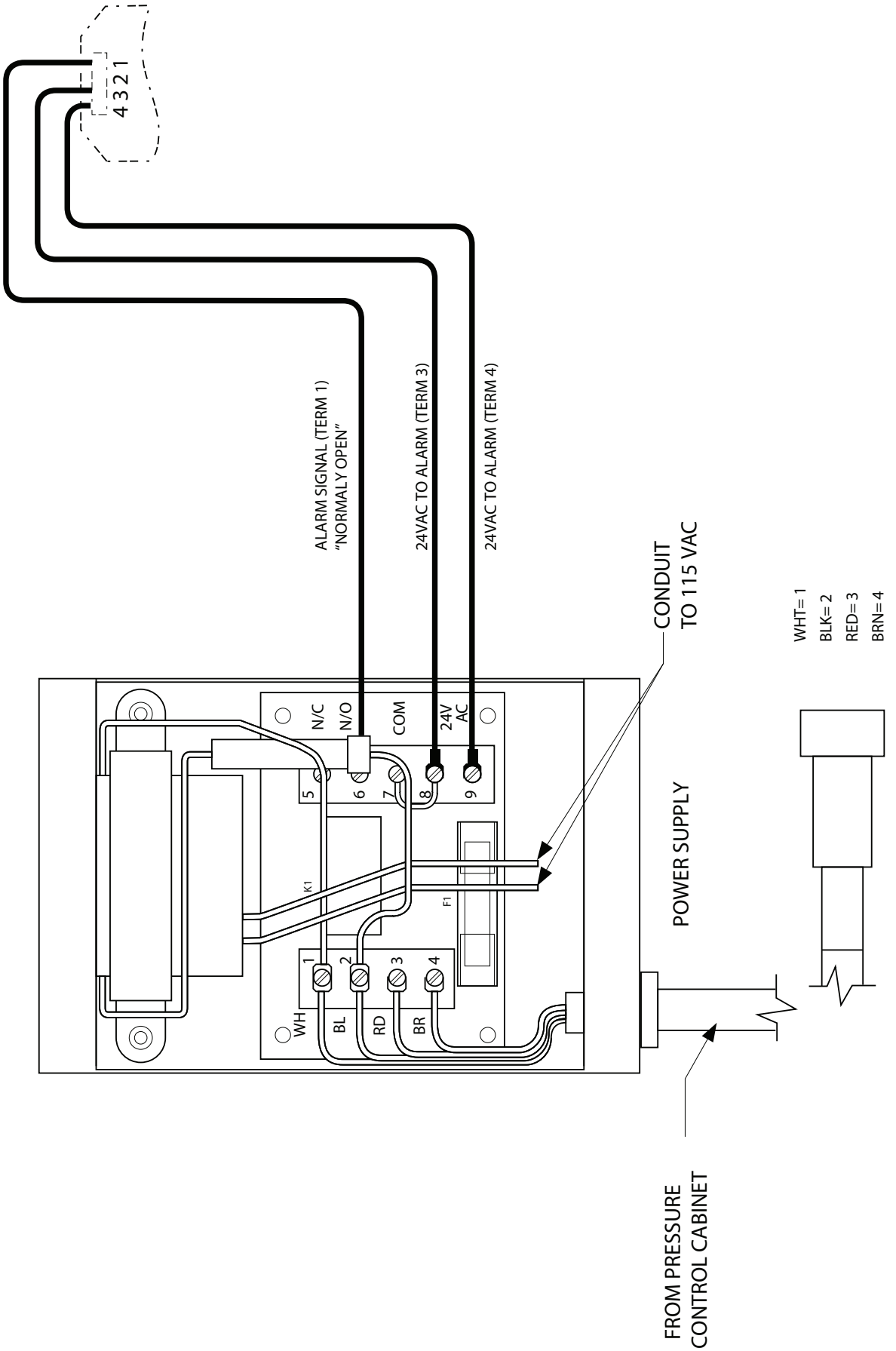


Figure 6: Header Wall Mounting Bracket

This Page Intentionally Blank

SECTION 6: INITIAL POWER-UP

WARNING

Make sure all the previous installation procedures are completed before beginning operation of the manifold.

1. Plug the circular four-prong plug from the power supply into the plug receptacle on the lower right bottom of the pressure control cabinet. Tighten the nut on the plug to secure the plug to the pressure control cabinet.
2. Apply 230 or 115 VAC to the power supply.
3. With no pressure applied, as soon as power is switched on, the red light on the front of the manifold should light.
4. Slowly apply pressure to one of the inlet sides of pressure cabinet.

NOTE

The first side pressurized becomes the primary side and the other side will be the reserve or secondary side. When over 350 PSIG of gas is applied, the red light should turn OFF and the green “IN SERVICE" light should turn ON.

WARNING

At initial installation, the headers, manifold, and possibly any piping downstream of the manifold will be filled with ambient atmosphere. Provisions should be made to completely purge the entire system with the gas intended for service before the system is put into use. If this is not done an improper gas may be administered with injurious results.

5. When over 350 PSIG of gas is applied to both of the pressure control cabinet inlets, the red light should turn OFF and the green light should turn ON.

NOTE

When both sides of the manifold are pressurized, perform leak test as outlined in Section 7.

This Page Intentionally Blank

SECTION 7: LEAK TEST

1. Turn OFF flow at the outlet of the pressure control cabinet.

2. Turn OFF all cylinders supplying pressure to the supply headers.

3. Monitor pressure on the four gauges on the pressure control cabinet.

4. If any of the gauges show a drop in pressure, a leak is present.

5. Use an approved liquid leak detector solution to locate leaks.

6. If a leak detector is used to detect leaks inside the pressure control cabinet, use caution to ensure the solution does not get into electrical components.

7. If leaks are detected, bleed all pressure from the manifold BEFORE repairing the leak.

8. Disassemble and examine leaking joints that have metal-to-metal seals. If dents, scratches, or other damage to the seals are the cause of the leak, replace damaged components. Reassemble the manifold and test again for leaks.

9. Remove the component at the leaking joints that have pipe threads. Remove the old tape and apply new Teflon tape to the pipe threads. Reinstall the component. Slowly pressurize the manifold and test for leaks again.

10. Disassemble leaking joints that have o-ring seals. Examine the o-ring. If the o-ring is cut, dented or otherwise damaged, replace it. Reassemble the joint. Slowly pressurize the manifold and test for leaks again.

WARNING

All leaking components MUST be repaired or replaced. DO NOT use the manifold if leaks are present.

This Page Intentionally Blank

SECTION 8: CYLINDER REPLACEMENT

WARNING

Never permit oil, grease, or other combustible material to come into contact with cylinders, manifolds, and connections. Oil and grease may react with explosive force in the presence of some gases, particularly oxygen and nitrous oxide, resulting in damage to the equipment and possible injury to nearby personnel. Keep tools and equipment clean. Valves MUST be opened slowly. Pigtails must never be kinked, twisted, or bent into a radius of smaller than 5 inches. Do not apply heat to any part of the manifold or cylinders. Close pipeline shut-off valve in emergency only.

1. Turn OFF all valves on depleted cylinders.

2. Slowly loosen and then remove the pigtail connections from the depleted cylinders.

3. Remove the depleted cylinders and reinstall protective caps.

4. Secure full cylinders in place using chains, belts or cylinder stands. Refer to Compressed Gas Association Pamphlet P-1 for more information.

5. Remove the protective caps from full replacement cylinders. DO NOT stand in front of the cylinder valve outlet. Slowly open and quickly close (cracking) each valve slightly to blow any dirt or contaminates which may have become lodged in the cylinder valve.

6. Connect the manifold pigtails to the cylinder valves and tighten with a wrench. Slowly open cylinder valve farthest from the manifold. Wait 60 seconds. Slowly open the remaining cylinder valves. Use an approved liquid leak detector solution to locate leaks.

7. The red light on the manifold should turn OFF and the green light should turn ON.

8. The bank has now been replenished and is now in reserve.

8.01 RECOMMENDED TOOLS AND EQUIPMENT

- Combination wrenches 7/16", 1/2", 11/16", 3/4", 1", 1 5/16" and 1-1/2"
- 1/8", 1/4" hex wrenches
- Needle nose pliers
- Flat blade screwdriver, Phillips screwdriver
- Volt/Ohm meter
- Oxygen-compatible liquid leak detector
- Oxygen-safe Teflon tape

This Page Intentionally Blank

SECTION 9: INSPECTING MANIFOLD OPERATION

NOTE

To perform these steps, the manifold outlet must be isolated from the downstream gas supply.

NOTE

Refer to Figure 2 for a drawing showing individual manifold components.

1. Attach pressure source to manifold inlets.

2. Make sure the power supply connector is connected at the bottom right corner of the manifold cabinet. Apply 230 or 115VAC to power supply box. Both red lights will be ON and all other lights will be OFF.

3. Slowly pressurize the right inlet to test pressure specified below.

Recommended Minimum Inlet Test Pressure Requirements	
Oxygen, Breathing Air, Helium, Nitrogen	1800 PSIG minimum
Nitrous Oxide, Carbon Dioxide	500 PSIG minimum

4. Remove cover. Observe the pressure gauge on the Right bank inlet.

NOTE

The first side pressurized will become the primary side and the other side will be the reserve side.

5. Verify that green light of right side and red light of left side is illuminated. Yellow lights should not be illuminated. If the lights do not turn ON, examine electrical components as directed by the "Electrical System Troubleshooting Procedures" (page 33).

6. Slowly pressurize the left inlet to test pressure specified above in Step 3. Observe the pressure gauge on the left side inlet. The yellow light on the left side should be illuminated. All other lights on left side should be OFF.

7. Position the diversion valve so that the right side delivery regulator is activated. Open and shut the bleed valve several times. Verify the preset is at the pressure required by the customer. To change the preset, follow the "Delivery Regulator Preset Procedure" (page 29).

8. Position the diversion valve so that the left side delivery regulator is activated. Open and shut the bleed valve several times. Verify the preset is at the pressure required by the customer. To change the preset, follow the "Delivery Regulator Preset Procedure" (page 29).

9. Open the bleed valve to initiate flow. Turn OFF right bank master valve. Observe the Intermediate Pressure Gauge and monitor the condition of the lights. At 270 ± 10 PSIG the red light on the right side will turn ON. The left side yellow light will turn OFF and the left side green light will turn ON. Immediately afterwards, at 220 ± 10 PSIG, switchover will occur, followed by an immediate rise in pressure to the set point of the inlet regulator now in use (450-500 PSIG flowing). Turn OFF the bleed the valve.

10. Slowly open the RIGHT bank master valve again. Verify that the red light on right side turns OFF and the yellow light on right side turns ON.

11. Turn OFF left bank inlet master valve. Observe the Intermediate Pressure Gauge and monitor the condition of the lights. At 270 ± 10 PSIG the red light will turn ON and the green light will turn OFF. Immediately afterwards, at 220 ± 10 PSIG, switchover will occur, followed by an immediate rise in pressure to the set point of the inlet regulator now in use (450-500 PSIG flowing).

12. Slowly open the LEFT bank inlet master valve again. Verify that the left side red light turns OFF and yellow light turns ON.

13. Turn OFF both master valves and the bleed valve. Monitor all four gauges for five (5) minutes. If any gauge drops, the manifold is leaking. Use leak detector on joints to check for leaks.Repair any leaks, repressurize both inlets, and repeat this step as necessary.

14. Close both inlet valves. Keep the bleed valve turned OFF.
15. Reconnect to downstream gas supply.
16. Open both inlet valves.

Component Location

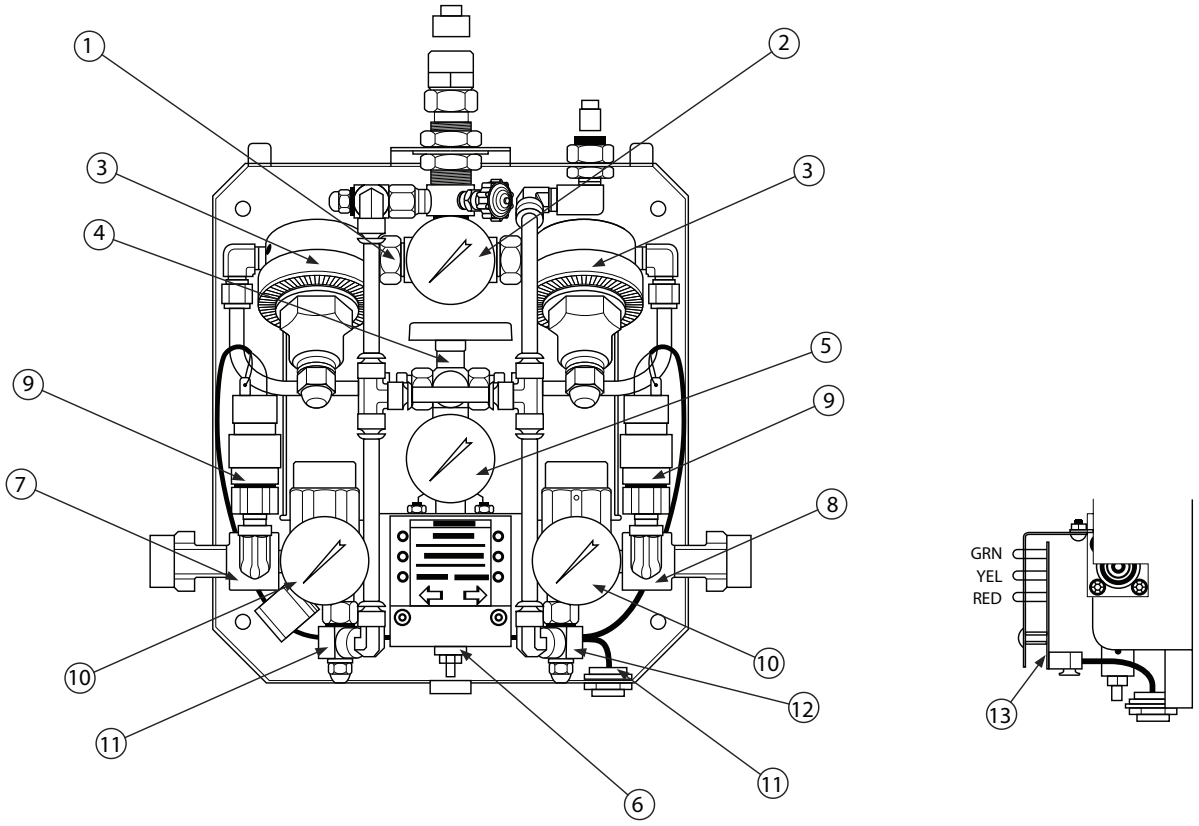


Figure 7: Component Location

Item No.	Part No.	Description
1	263062	Check Valve/Outlet Assembly (50 PSIG)
	263063	Check Valve/Outlet Assembly (200 PSIG)
2	263064	Delivery Pressure Gauge 2" x 100 PSIG
	263065	Delivery Pressure Gauge 2" x 400 PSIG
3	263066	L350E-AM Regulator - 2 per
4	263067	Diversion Valve
5	263068	Intermediate Pressure Gauge 2" x 600 PSIG
6	263069	Switchover Assembly (220 PSIG)
7	263070	Left Inlet Assembly
8	263071	Right Inlet Assembly
9	263072	Pressure Switch (270 PSIG set) - 2 per
10	263073	Inlet Gauge 2" X 4000 PSIG - 2 per
11	263074	Wiring Harness
12	263075	Relief Valve (600 PSIG) - 2 per
13	263076	Control Board

SECTION 10: PROCEDURES

10.01 REPLACEMENT OF COMPONENTS

WARNING

DO NOT attempt to repair the regulator unless you have been trained in the proper repair procedures.

WARNING

Do not use any components if you detect oil, grease or damage. These items must either be cleaned, repaired or replaced by qualified personnel.

Line Regulator Assembly

NOTE

The line regulator may be removed and replaced while the manifold is in operation. Turn the diversion valve (See "Internal Components" diagram, page 13) to point away from the regulator to be changed. A check valve upstream of the delivery regulator will contain the pressure, allowing the manifold to remain in operation.

1. Use a 1/2" open-end wrench to force the collar back on the quick-connect fitting where the relief valve plastic tube is inserted and pull the plastic tube out. See "Internal Components" diagram (page 13).
2. Use a 1" open-end wrench to loosen and detach the face seal fittings from the regulator inlet.
3. Use a 1 1/2" open-end wrench to loosen and remove the nut on the outlet connection.
4. Remove the regulator assembly from the mounting bracket.
5. Remove all fittings from the line regulator.
6. Send the regulator to an authorized repair facility for reconditioning.
7. Reinstall new regulator assembly in the mounting assembly.
8. Replace o-rings at all opened face seals when replacing regulator assembly.
9. Connect the face seal on the inlet connection and using a 1" wrench, tighten the nut securely.
10. Connect the relief valve tubing to the quick-connect fitting.

Inlet Regulator Assembly

1. Use a 1/2" open-end wrench to force the collar back on the quick-connect fitting where the relief valve plastic tube is inserted and pull the plastic tube out.
2. Remove wires from pressure switch.
3. Move the vent tubing out of the way before loosening face seal.
4. Use a 1" open-end wrench to loosen and detach the face seal fittings from the switchover unit.
5. Remove inlet assembly from mounting bracket.
6. Send the regulator to an authorized repair facility for reconditioning.

Switch Unit

1. Remove both left and right delivery regulators, diversion valve, and inlet regulators as shown in Figure 8.
2. Using a 1-1/2" open-end wrench, remove the nut from the switch unit and slide unit out of mounting bracket.
3. Contact Ohio Medical to have the switch unit repaired or replaced.
4. Reinstall the line regulator and inlet regulators as shown in Figure 8.

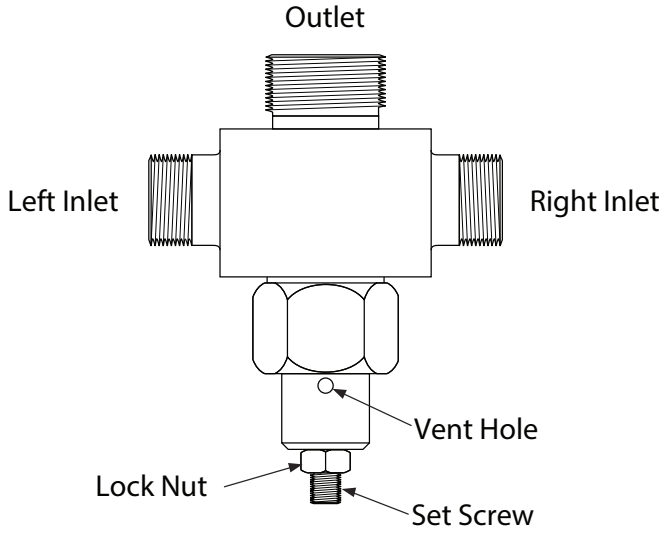


Figure 8: Switch Unit

Check Valve Outlet Assembly

1. Remove line and inlet regulators as shown above.
2. Use a 1/2" wrench to force the collar back on the quick-connect fitting where the relief valve plastic tube is inserted and pull the plastic tube out.
3. Using a 1 5/16" wrench, remove the face seal adapter from the outlet.
4. Using a 1 1/2" wrench, remove the nut from the outlet unit and slide the check valve assembly out of mounting bracket.
5. Remove the components of the check valve. See "Check Valve Outlet Assembly," diagram (page 26) for a list of repair components.
6. Replace both seats, all four o-rings, spring, and spring guide.
7. Reassemble the unit and test the check valve by applying 50-60 PSIG to female pipe port thread. Use a leak detector solution to check for leaks on each end. Do not use if visible leaks are detected.

Check Valve Outlet Assembly

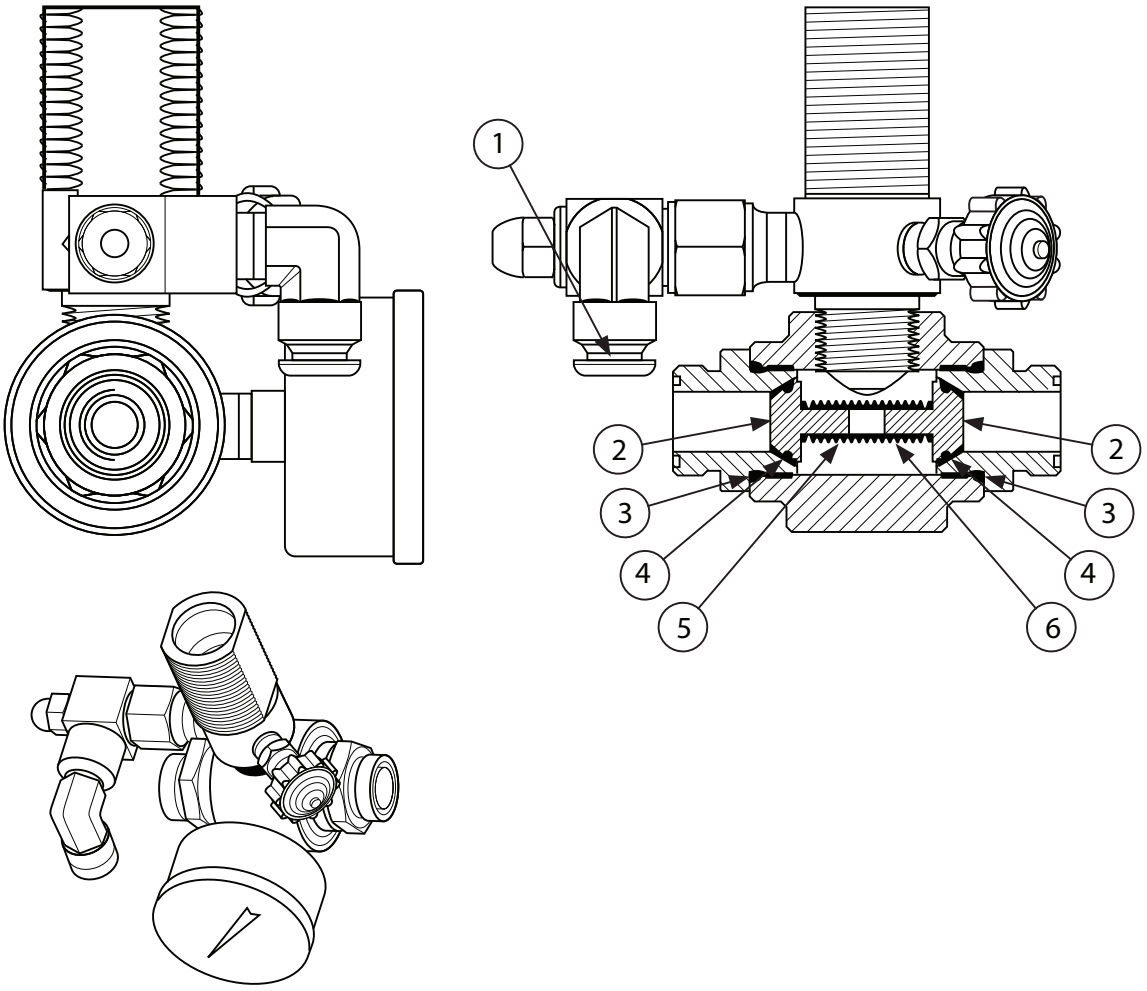


Figure 9: Check Valve Outlet Assembly

Item No.	Part No.	Description
1	N/A	Relief Valve Fitting
2	263081	Seat
3	263082	O-Ring
4	263083	O-Ring
5	263084	Spring
6	263085	Spring Guide

10.02 ADJUSTMENT SPECIFICATIONS

Nominal Factory Pressure Settings (PSIG)

Gas	Line Regulator	Line Regulator Relief Valve	Pressure Switch	Switchover Pressure
Oxygen	50 (344, 7 Kpa)	75 (517,2 Kpa)	270 (1861,16 Kpa)	220 (1516,9 Kpa)
Nitrogen	180 (1241 Kpa)	250 (1723,7 Kpa)		
Nitrous Oxide	50 (344, 7 Kpa)	75 (517,2 Kpa)		
Breathing Air				
Helium				
Carbon Dioxide				

Adjustable Range (PSIG)

Gas	Line Regulator	Line Regulator Relief Valve	Pressure Switch	Switchover Pressure
Oxygen	10 - 80 (69-551,6 Kpa)	60 - 200 (413,7-1379 Kpa)	100 - 1400 (689,5-9652,7 Kpa)	50 - 300 (344,7-2068,3 Kpa)
Nitrogen	10 - 180 (69-1241 Kpa)	200 - 500 (1379-3447,4 Kpa)		
Nitrous Oxide	10 - 80 (69-551,6 Kpa)	60 - 200 (413,7-1379 Kpa)		
Breathing Air				
Helium				
Carbon Dioxide				

Line regulator pressure is at the user's discretion.

10.03 CHANGING SWITCHOVER UNIT PRESET

Resetting the switchover point of the manifold is done using the set screw located at the bottom of the switch unit (see Figure 9). The following procedure should be performed when changing the switchover point:

1. Determine the current switchover point. This can be done by watching the Intermediate Pressure Gauge (Diagram, Page 12) on the manifold. Close all cylinders on each side except for one. Force the manifold to switch over by closing off the cylinder valve of the side in use, and observe the respective gauge. The Intermediate Pressure Gauge will drop to the switchover point and then immediately return to the normal working pressure of the system(approximately 450-500 PSIG).

NOTE

From the factory, high-pressure models have a set point of 220 PSIG nominal.

2. Determine how far you wish to change the switchover point from its current value. For example, if the manifold has the factory setting of 220 PSIG, and you wish to have it switchover at 160 PSIG instead, then the difference from old to new is a decrease of 60 PSIG. Note this value for your desired configuration.

3. One complete turn of the switch unit set screw (360°) will change the switchover point approximately 30 PSIG. Backing out the set screw will decrease the switchover point, and screwing it in further will increase the switchover point. In the example mentioned in Step 2, to decrease the switchover point by 60 PSIG would require backing out the set screw approximately two full turns. Using a 7/16" wrench, loosen the set screw locking nut. Then, using a 1/8" hex key wrench, turn the set screw the amount necessary for your desired switchover point. Lightly tighten the locking nut back up.

4. Now you must cycle the manifold back and forth to determine how close the switchover point is to the desired value. Do this by opening and closing the cylinder valves and forcing the manifold to switch back and forth. Perform this with the system at a very low flow rate, so the manifold doesn't bleed down and switch over too fast, making it difficult to get an accurate reading of the switch point.

5. Re-adjust the set screw as necessary to fine tune the manifold to the desired switchover point (backing out the set screw to decrease the switch point, and turning it in to increase the switch point). Once the exact set point is obtained, securely tighten the locking nut, locking the setting in place.

NOTE

The manifold pressure switches, used to control the lights and alarm, are set from the factory at 50 PSIG nominal above the switchover point. If you change the switchover point too much, the lights and alarm may not correctly represent when a switchover has occurred. To ensure proper operation of the manifold, the pressure switches should always be reset to maintain the 50 PSIG margin from the actual switchover point.

NOTE

Important! Pressure switches should always be set above the switch oversetting. Refer to the following section for resetting the pressure switches.

10.04 PRESSURE SWITCH SETTING PROCEDURE

1. When not pressurized, the pressure switches used in these manifolds are normally closed. When pressurized above their set point, they will be in the open condition.

2. The pressure switches on the Ohio Medical manifolds are factory set to 270 PSIG.

3. The pressure switches used have common, normally open and normally closed electrical contacts. The connections used are common and normally closed terminals. Remove the connectors from the spade connections on the pressure switch.

4. Use an ohmmeter to determine the condition of the pressure switch.

5. Gradually pressurize the pressure switch. When pressure reaches the set point, the state of the switch should change. On increasing pressure, the switch will open. On decreasing pressure, the switch will close.

6. Open the collar of the pressure switch by pushing it toward the spade connectors. See Figure 10.

7. Use a flat blade screwdriver to adjust the set point of the pressure switch. Turning clockwise will increase the set point. Turning counterclockwise will lower the set point.

8. Once the pressure switch is set to the correct point, push to collar back in place and reattach the wires.

9. If the pressure switch cannot be set, the switch must be replaced. The pressure switches are not repairable.

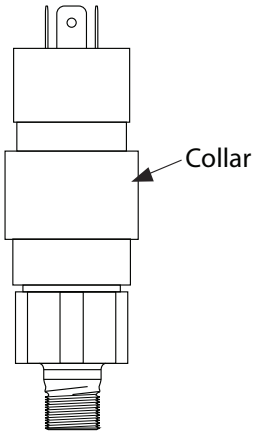


Figure 10: Pressure Switch

10.05 DELIVERY REGULATOR PRESET PROCEDURE

1. Loosen the 3/4" hex cap nut from the adjusting screw of the delivery regulator. Refer to Figure 11.

2. Use a 1/4" hex key wrench to turn the adjusting screw to change the pressure. Clockwise rotation increases pressure while counterclockwise rotation decreases pressure. Use the bleed valve to bleed off excessive pressure.

3. The delivery pressure can be determined by monitoring the pressure on the delivery pressure gauge at the upper portion of the pressure control cabinet.

4. When pressure is properly adjusted, reinstall the hex nut on the adjusting screw. Tighten the hex cap nut securely.

5. If the delivery regulator cannot be changed properly, check the outlet pressure of the inlet regulators to verify 500 PSIG is being delivered. This can be accomplished by monitoring the intermediate pressure gauge. If the intermediate reads correctly, the delivery regulator must be repaired or replaced.

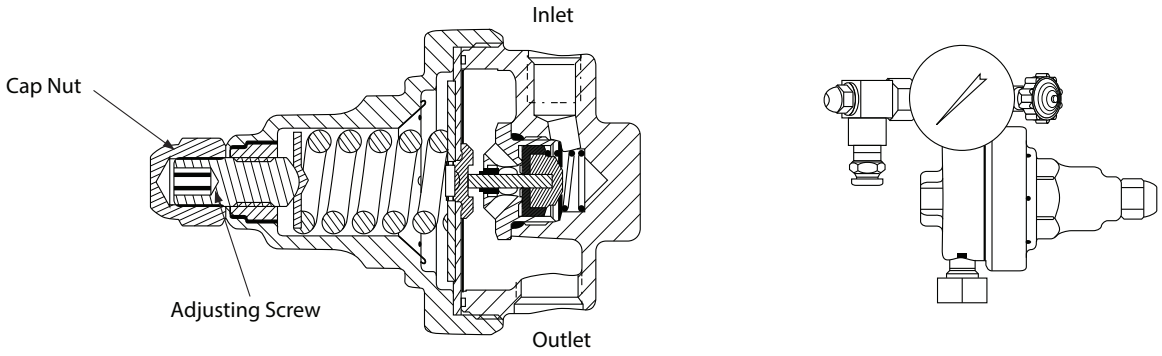


Figure 11: Delivery Regulator

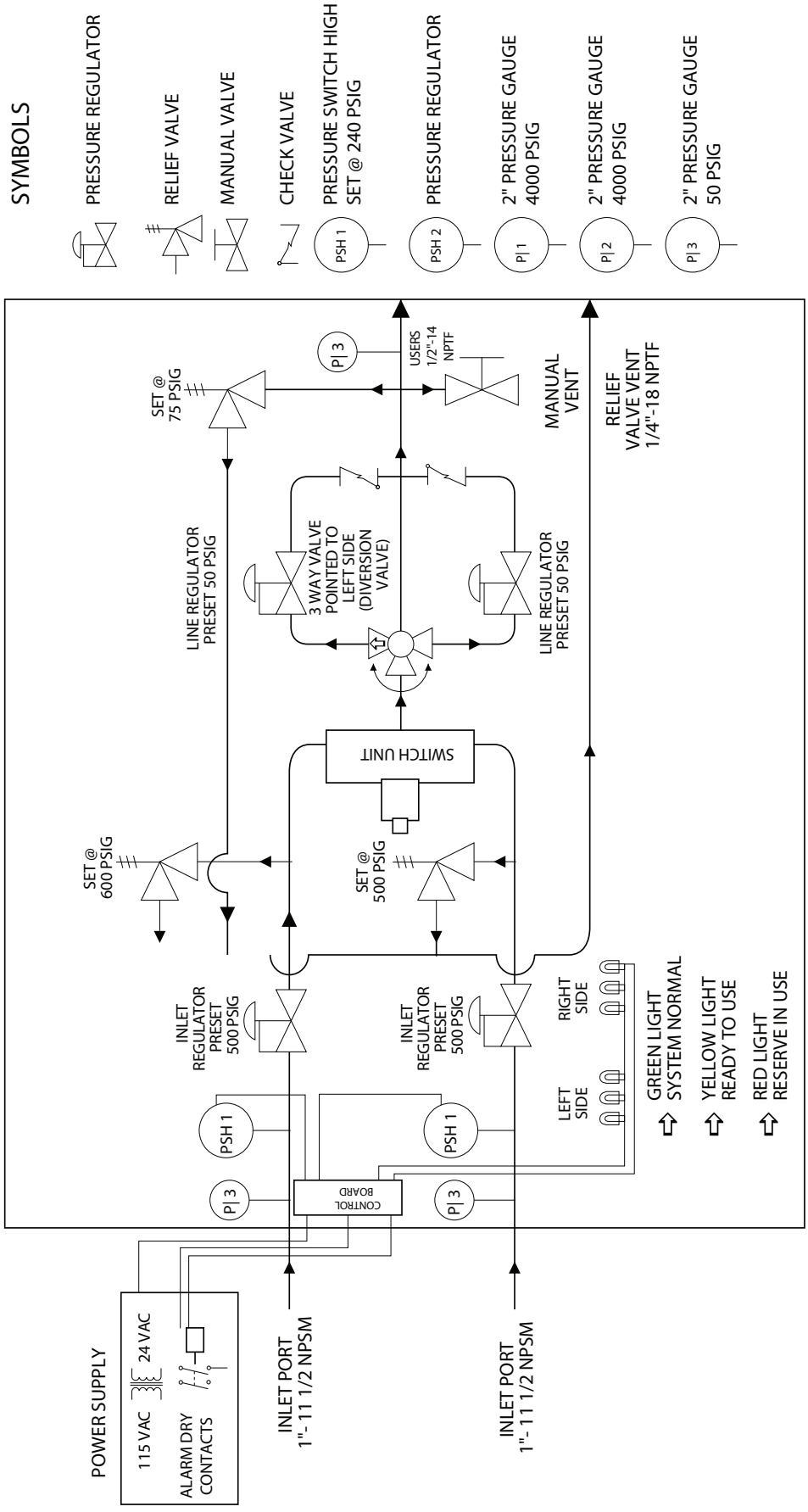

SYMBOLS
PRESSURE REGULATOR
RELIEF VALVE
MANUAL VALVE
CHECK VALVE
PRESSURE SWITCH HIGH SET @ 240 PSIG
PRESSURE REGULATOR
2" PRESSURE GAUGE 4000 PSIG
2" PRESSURE GAUGE 4000 PSIG
2" PRESSURE GAUGE 50 PSIG
PSH 1
PSH 2
P|1
P|2
P|3
SET @ 75 PSIG
USERS 1/2"-14 NPTF
MANUAL VENT
RELIEF VALVE VENT 1/4"-18 NPTF
LINE REGULATOR PRESET 50 PSIG
3 WAY VALVE POINTED TO LEFT SIDE (DIVERSION VALVE)
LINE REGULATOR PRESET 50 PSIG
SWITCH UNIT
SET @ 600 PSIG
SET @ 500 PSIG
INLET REGULATOR PRESET 500 PSIG
INLET REGULATOR PRESET 500 PSIG
RIGHT SIDE
LEFT SIDE
GREEN LIGHT SYSTEM NORMAL
YELLOW LIGHT READY TO USE
RED LIGHT RESERVE IN USE
PSH 1
PSH 1
P|3
CONTROL BOARD
P|3
POWER SUPPLY
115 VAC
24 VAC
ALARM DRY CONTACTS
INLET PORT 1"- 11 1/2 NPSM
INLET PORT 1"- 11 1/2 NPSM

Figure 12

This Page Intentionally Blank

SECTION 11: MAINTENANCE AND TROUBLESHOOTING

11.01 MAINTENANCE

1. Pressure Control Cabinet

Daily	Record delivery pressure
Monthly	Check Regulators and valves for external leakage. Check valves for proper closure

2. Manifold Header

Daily	Observe Nitrous Oxide and Carbon Dioxide systems for cylinder frosting or surface condensation. Should condensation or frosting occur it might be necessary to increase manifold capacity or add external heaters to manifold.
Monthly	Inspect valves for proper closure. Check cylinder pigtails for cleanliness, flexibility, wear, leakage, and thread damage. Replace damaged pigtails immediately Inspect pigtail check valves for closure.
Every 4 Years	Replace pigtails

11.02 POWER SUPPLY TROUBLESHOOTING PROCEDURE

1. Examine power supply. Make sure power is connected to 115 VAC.

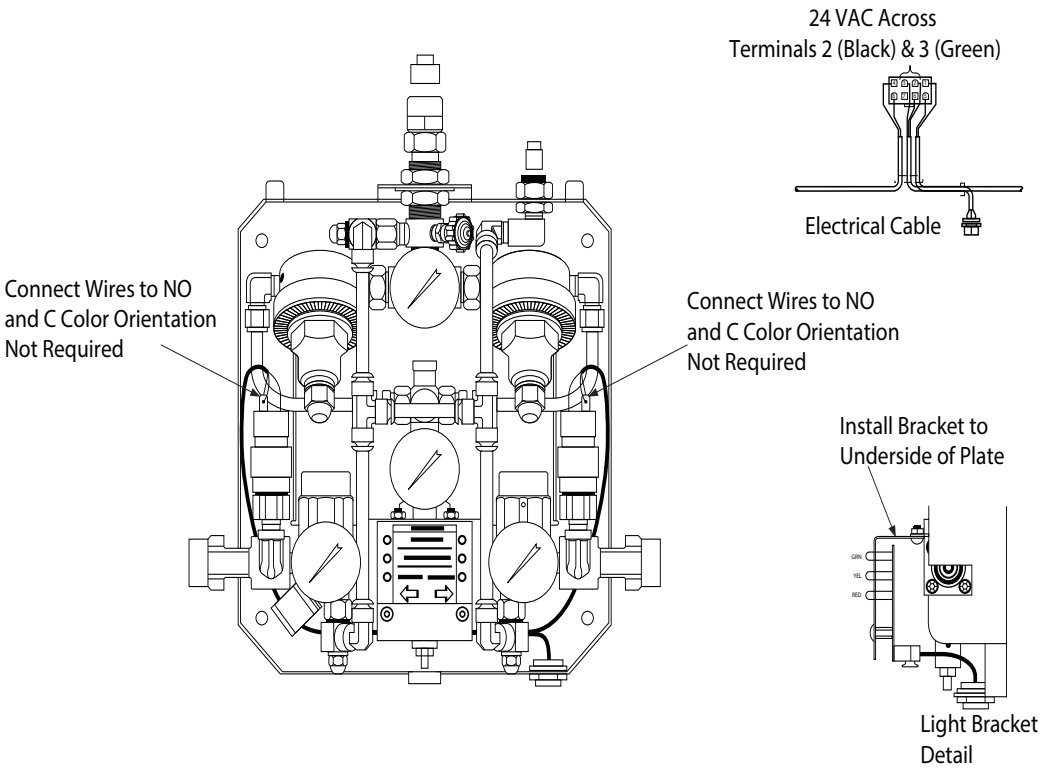
2. Use voltmeter to determine that power supply is supplying 24-30 VAC (The power supply will supply a nominal 28 VAC with no load.) If this is not the case, examine the fuses (2) in the power supply. Replace with 3 A fuses if necessary.

3. Make sure the power supply cable is attached securely to the manifold. Use voltmeter to confirm the 24-30 VAC is supplied at pins 1 and 2 of the power cord connector.

4. If the power supply is not supplying 24-30 VAC, replace it with a new one.

11.03 ELECTRICAL CABLE TROUBLESHOOTING PROCEDURE

1. Examine the electrical cable inside the manifold control cabinet. The wiring schematic is shown in Figure 13. Look for loose wires, unconnected wires and any broken or damaged switches. Make sure the cable is firmly connected to the pressure switches.



11.04 CONTROL BOARD TROUBLESHOOTING PROCEDURE

1. Use a voltmeter to make sure the electrical cable has 24-30 VAC at pins 2 and 3 as shown in Figure 13.

2. There are no repairable components on the Control Board. If it is getting power, but it is not functioning properly, it must be replaced. Before replacing the Control Board, perform the "Inspecting Manifold Operation" shown on page 21 to make sure the pressure switches are set properly.

3. Replace the Control Board. Remove the Control Board by removing the two screws underneath the bank indicator lights.

11.05 TROUBLESHOOTING

Problem	Possible Cause	Possible Solution
ELECTRICAL SYSTEM		
No indicator lights on front of panel come on when power is connected	1. No power input 2. Internal wiring is disconnected 3. Fuse blown	1. Check power supply 2. Check all wiring connections 3. Check fuse in power supply
Red indicator light is on but both banks are full	1. Defective pressure switch. 2. Master valves shut OFF	1. Replace pressure switch. 2. Open master valves
Red indicator light does not come on when one back is empty and changeover occurs	1. Pressure switch set wrong 2. Defective pressure switch	1. Adjust pressure switch (see page 26) 2. Replace pressure switch
Red indicator light turns ON when one bank is empty but changeover does not occur	1. Switch unit set wrong 2. Defective switchover unit	1. Reset switch unit (see page 26) 2. Replace switchover unit
Green light does not turn ON even though bank is full	1. Defective pressure switch 2. Master valves turned OFF	1. Replace pressure switch 2. Open master valves
SWITCHOVER SYSTEM		
Both banks feeding	1. Leaking o-ring on switchover unit	2. Replace switchover unit
Will not switch over to reserve bank	1. Switch unit improperly set 2. Defective switchover unit 3. Setscrew has come loose on switchover unit 4. Reserve bank empty (check pressure on inlet gauges)	1. Reset switchover pressure (see page 26) 2. Replace switchover unit 3. Reset switchover pressure (see page 26) 4. Replace reserve bank
Inlet relief valve leaking	1. Spool regulator creeping (check intermediate pressure gauge) 2. Relief valve not shutting OFF	1. If gauge reads improperly replace or repair spool regulator 2. Replace relief valve
Banks not switching at same pressure	1. Defective switchover unit	1. Replace switchover unit
OUTLET REGULATOR		
Incorrect delivery pressure	1. Delivery regulator not set properly 2. Flow demand too high	1. Reset delivery pressure regulator 2. Check flow requirements
Delivery pressure creeping	1. Delivery pressure regulator not seating properly	1. Repair or replace delivery pressure regulator

This Page Intentionally Blank

SECTION 12: STATEMENT OF WARRANTY

1. Ohio Medical warrants the MEDICAL GAS PIPELINE EQUIPMENT to be free of defects in material and workmanship for a period of twenty-four (24) months from the date of shipment or twelve (12) months from the date of start-up, whichever occurs first. Within said period Ohio Medical will repair or replace any part or component which is proven to be defective in either material or workmanship.

2. To obtain service within the warranty period, first contact Ohio Medical Service Department.

3. Ohio Medical is responsibility under this warranty shall be limited to providing at Ohio Medical is sole discretion, new or replacement parts to replace any component found to be defective within the warranty period. Installation of user-replaceable items will be the user's responsibility.

4. Labor to repair any part or component proved to be defective within the warranty period will be provided at no charge for any item returned to our factory adequately packaged and insured with shipping costs prepaid. Standard surface freight shipping cost to return the repaired part or component to the user will be paid by Ohio Medical.

   a. Before returning any part or component to the factory, proper return authorization must first be obtained from Ohio Medical Service Department.

   b. The user will be required to issue a purchase order for replacement items. Upon receipt of the defective items, Ohio Medical will issue a credit to the user in the amount equal to the purchase order.

5. This warranty is valid only when the product has been properly installed according to Ohio Medical specifications, used in a normal manner, and serviced according to factory recommendations. The warranty does not cover failures due to damage which occurs in shipment or failures which result from accidents, misuse, abuse, neglect, mishandling, alteration, misapplication, or damage that may be attributable to acts of God.

6. Ohio Medical shall not be liable for incidental or consequential damages resulting from the use of this product. There are no expressed or implied warranties which extend beyond the warranties set forth above. Ohio Medical makes no warranty of merchantability or fitness for a particular purpose to equipment and to its parts and components.

7. THE CONDITIONS OF THE BUYER'S RESPONSIBILITY ARE:

   a. The equipment is stored properly before installation;

   b. The equipment is installed according to Ohio Medical is specifications and installation procedures;

   c. The equipment is properly maintained and not altered unless by an authorized representative of Ohio Medical;

(866)549-6446
www.ohiomedical.com
www.ohiomedicalparts.com