
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 operate or service this equipment.

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

Information necessary to perform maintenance and service on the Victor manifold system is contained in this manual. This information is intended for use by technicians or personnel qualified to repair and service this equipment.

The information contained in this document, including performance specifications, is subject to change without notice.

⚠️ WARNINGS ⚠️

Items in this manual that significantly affect safety are identified with the following headings. Please read and understand this manual, paying special attention to items identified with these headings, before attempting to operate or service this manifold.

⚠️ WARNING ⚠️ Indicates the presence of a hazard which can cause severe personal injury, death, or substantial damage if the warning is ignored.

⚠️ CAUTION ⚠️ Indicates the presence of a hazard which will cause minor personal injury, death, or substantial damage if the warning is ignored.

NOTICE — conveys installation, operation, or maintenance information which is important but not hazard related.

⚠️ 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 S-L-O-W-L-Y. 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. If you do this, the pigtails 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.
ABBREVIATIONS

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

STANDARD FEATURES

Manufacturing - Victor Equipment Company's quality system is registered by DNV Certification, Inc to meet the requirements of ISO 9001.

Safety Standards and Codes - Victor 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

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

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

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

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

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

MATERIAL SPECIFICATIONS

Enclosure - 12.8" w x 14.1" h x 5.0" 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

Inlet Block Assemblies
- Brass CDA360

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
- 72" flexible polyester cover, polyethylene lined.

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

Economizer Circuit
- Copper tubing
- Brass check valve body
- Neoprene seat

⚠️ 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 Victor 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.
PRODUCT DESCRIPTION

The Victor VM1100 manifold system is designed to be fully automatic. The manifold gives 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 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.

The built-in economizer circuit is designed to prevent gas waste through the cylinder vent system of the reserve bank while the manifold system is in operation.

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 Victor's two-year warranty. The switchover unit has a five-year warranty.

FLOW CONSIDERATIONS

The VM1100 series manifold is rated for 3000 scfh of gas. Flow rate is listed for reference only. To properly operate manifold, the user must supply sufficient gas capacity to the manifold. One liquid oxygen or nitrogen cylinder will typically supply 325 scfh of gas. Two liquid cylinders will typically supply 575 scfh gas and three cylinders will supply 800 scfh. Carbon dioxide cylinders will typically supply 110 scfh maximum from each cylinder while nitrous oxide will typically supply 80 scfh from each cylinder. The user must make sure sufficient cylinder capacity is available to supply the flow rate desired.

If you are unsure of the proper withdrawal rate for the cylinders in use, consult your gas supplier.
Victor VM1100 Medical Liquefied Gas Automatic Switchover Manifold

Victor VM1100 Liquid Medical
150 PSIG Inlet - 50 PSIG Delivery

Victor VM1100 Liquid Medical
220 PSIG Inlet (Switchover Point) - 180 PSIG Delivery

Performance Specifications
Figure 1
Victor VM1100 Liquid Medical
250 PSIG Inlet - 50 PSIG Delivery

Flow (SCFH)

Victor VM1100 Liquid Medical
NFPA 99C Flow Requirements
90 PSIG Inlet (Switchover Point) - 50 PSIG STATIC Delivery

Flow (SCFM)

Performance Specifications
Figure 1
A pressure control cabinet (1) that maintains constant pressure to the pipeline and enables smooth uninterrupted switchover from the primary to the reserve cylinders.

A 115 VAC input, 24 VAC output power supply (2). Includes dry contacts for the local and remote alarm connections.

Flexible cylinder connections (3) with built-in check valves.

Control panel indicator lights (4) 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.

Individual pressure gauges (5) allow monitoring of left and right supply pressure as well as pipeline delivery pressure (6).

Cabinet latch (7) can be locked to help prevent tampering.

By pass valve (8) is optional and is recommended for use during manifold servicing.

Actuating switch port (9) for high-pressure reserve.

High-pressure backup port (10) for connecting high-pressure reserve.

Inlet block (11).
Manifold Overall Length
Figure 3
MANIFOLD OPERATION

The basic manifold system consists of the pressure control cabinet (VM Manifold), 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. The reserve or secondary bank is in a static condition until the pressure in the primary bank reaches the switchover pressure setting.

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.

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Internal Components
Figure 4


**INSTALLATION**

The manifold should be installed in accordance with guidelines stated by the National Fire Protection Association, Occupational Safety and Health Administration, 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 as well as 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 G-4.1 “Cleaning Equipment for Oxygen Service” for directions.

The manifold components are designed to work best with the temperature range of 0-140° F (-18 o 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. Water and excessive moisture will not affect the manifold headers and pigtails.

See Figure 3 (page 10) 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 will depend upon wall construction.

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. Attach each inlet block to each manifold inlet connection. Tighten manifold fittings to 55-65 ft. lbs. torque.

5. Tighten all header mounting hardware.

6. Wrap the 1/4" NPT male end with teflon tape and attach each pigtail assembly to each inlet block.

7. 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).

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

9. 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 that is connected to the pipeline system.

10. 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.

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**Remote Alarm Wiring**

*Figure 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 115 VAC to the power supply.

3. With no pressure applied, as soon as power is switched on, the red "REPLACE CYLINDERS" light on the front of the manifold should light.

**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.

4. Slowly apply pressure to one of the inlet sides of pressure cabinet. **NOTE:** The first side pressurized will become the primary side and the green light comes on for that side while the other side will be the reserve side.

5. Apply pressure to the other side of the manifold. When over 125 psig of gas is applied, the red light on that side of the manifold should go off and the yellow "READY FOR USE" light will be lit.

**NOTE:** When both sides of the manifold are pressurized, perform leak test as outlined in the following section.

LEAK TEST

1. Shut off flow at the outlet of the pressure control cabinet.

2. Shut off all cylinders supplying pressure to the supply headers.

3. Monitor pressure on the three 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.
CYLINDER REPLACEMENT

Delta 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. Pigtailed 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. Observe the following conditions:

   "REPLACE CYLINDERS" red light goes out.
   "READY FOR USE" yellow light comes on.

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

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
- Teflon tape
INSPECTING MANIFOLD OPERATION

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

NOTICE: 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 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, Carbon Dioxide, Nitrous Oxide.........................125 psig minimum
   Nitrogen......................................250 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 come on, examine electrical components as directed by the Electrical System Troubleshooting Procedures.
6. Slowly pressurize the left inlet to test pressure specified above. 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. 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.
8. Open the bleed valve to initiate flow. Shut off right bank cylinder valves. Monitor the condition of the lights. At 110 +/- 10 psig the red light on the right side will turn on. The left side yellow light will go off and the left side green light will come on. Immediately after this, at 90 +/- 10 psig, switchover will occur. The right inlet gauge will indicate the pressure at which the switchover occurred, and should read 90 +/- 5 psig. Shut off the bleed valve.
9. Slowly open the RIGHT bank cylinder valve again. Verify that the red light on right side turns off and the yellow light on right side turns back on.
10. Open the bleed valve to initiate flow. Shut off left bank inlet cylinder valve. Monitor the condition of the lights. At 110 +/- 10 psig the red light will turn on and the green light will turn off. Immediately after this, at 90 +/- 10 psig, switchover will occur. The left inlet gauge will indicate the pressure at which the switchover occurred, and should read 90 +/- 5 psig.
11. Slowly open the LEFT bank inlet cylinder valve again. Verify that the left side red light turns off and yellow light turns back on.
12. Shut off both cylinder valves and the bleed valve. Monitor all three 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, re-pressurize both inlets, and repeat this step as necessary.
13. Close both inlet valves. Keep the bleed valve shut off.
14. Reconnect to downstream gas supply.
15. Open both inlet valves.
## Component Location

**Figure 7**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1109-0486</td>
<td>Outlet Assembly (100 psig gauge)</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1109-0493</td>
<td>Outlet Assembly (400 psig gauge) Nitrogen</td>
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<tr>
<td>2</td>
<td>1424-0488</td>
<td>Delivery Pressure Gauge 2&quot; x 400 psig</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1424-0487</td>
<td>Delivery Pressure Gauge 2&quot; x 100 psig</td>
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<td>3</td>
<td>0781-2454</td>
<td>L350E-AM Regulator</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1112-0020</td>
<td>Diversion Valve</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1118-0109</td>
<td>Pressure Switch (110 psig set)</td>
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<tr>
<td>6</td>
<td>0650-0070</td>
<td>High Pressure Reserve Check Valve</td>
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</tr>
<tr>
<td>7</td>
<td>1109-0507</td>
<td>Economizer Valve Assembly</td>
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</tr>
<tr>
<td>8</td>
<td>1109-0492</td>
<td>Right Inlet Assembly</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1109-0491</td>
<td>Left Inlet Assembly</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1424-0489</td>
<td>Inlet Gauge 2&quot; X 600 psig</td>
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<td>11</td>
<td>0600-0072</td>
<td>Relief Valve (600 psig)</td>
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<td>12</td>
<td>1109-0496</td>
<td>Switchover Assembly (90 psig)</td>
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<td>Switchover Assembly (220 psig)</td>
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<td>1118-0137</td>
<td>Control Board</td>
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<td>14</td>
<td>1118-0142</td>
<td>Wiring Harness</td>
<td>1</td>
</tr>
</tbody>
</table>
REPLACEMENT OF COMPONENTS

\textbf{WARNING} DO NOT attempt to repair the regulator unless you have been trained in the proper repair procedures.

\textbf{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.

DELIVERY 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. See Figure 7.

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. Either discard the regulator and replace it with a new regulator or send it to a qualified repair technician for reconditioning. (See warning on page 6).

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 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. Refer to Figure 7.

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.
Switch Unit

1. Remove delivery regulator and inlet block assemblies as shown.

2. Using a 1 1/2" open-end wrench remove the nut from the switch unit and slide unit out of mounting bracket.

3. Send the switch to a local Victor distributor to have the unit repaired or replaced.

4. Reinstall the delivery regulator as shown.

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Check Valve Outlet Assembly

1. Remove both left and right delivery regulators and diversion valve 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 FIGURE 9 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 and check for leaks on each end. No visible leaks are allowed.
**ADJUSTMENT SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Nominal Factory Pressure Settings</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>Model</td>
<td>Pressure Switch</td>
</tr>
<tr>
<td>VM1100</td>
<td>110 psig</td>
</tr>
</tbody>
</table>

**Adjustable Range**

<table>
<thead>
<tr>
<th>Model</th>
<th>Pressure Switch</th>
<th>Switchover Pressure</th>
<th>Line Regulator</th>
<th>Line Regulator Relief Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM1100</td>
<td>70-250 psig</td>
<td>50-300 psig</td>
<td>20-180 psig</td>
<td>200-500 psig</td>
</tr>
</tbody>
</table>

Delivery regulator pressure is at the user's discretion. The delivery regulator is preset to 50 psig at the factory.
CHANGING SWITCHOVER UNIT PRESET

Resetting the switchover point of the manifold is done using the setscrew located at the bottom of the switch unit (see Figure 8). The following procedure should be performed when changing the switchover point:

1. Determine the current switchover point. 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 inlet Pressure Gauge will drop to the point at which switchover occurred and should be 90 +/- 5 psig.

   **NOTE:** From the factory, high-pressure models have a set point of 90 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 90 PSIG, and you wish to have it switchover at 75 PSIG instead, then the difference from old to new is a decrease of 15 PSIG. Note this value for your desired configuration.

3. One complete turn of the switch unit setscrew (360 degrees) will change the switchover point APPROX. 30 PSIG. Backing out the setscrew will decrease the switchover point, and screwing it in further will increase the switchover point. In the example mentioned above, to decrease the switchover point by 15 PSIG would require backing out the set screw APPROX. ONE HALF TURN.

   Using a 7/16" wrench, loosen the setscrew 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. Opening and closing the cylinder valves, forcing the manifold to switch back and forth can do this. This should be performed 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 switchover point.

5. Re-adjust the set screw as necessary to fine tune the manifold to the exact switchover point desired (backing the set screw out to decrease the switchover point, and turning it in to increase the switchover 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 20 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 insure proper operation of the manifold, the pressure switches should always be reset to maintain the 20 PSIG margin from the actual switchover point.

**Important!** Pressure switches should always be set above the switch oversetting. Refer to the following section for resetting the pressure switches.
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 VM1100 series are factory set to 110 psig.

3. The pressure switches used have common, normally open and normally closed electrical contacts. The connections used are common and normally open 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.

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

Pressure Switch
Figure 10

Collar
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.

Delivery Regulator
Figure 11
Figure 12
MAINTENANCE

1. Pressure Control Cabinet
   Daily
   Record line 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

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.
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.

2. Use a voltmeter to make sure the cable is supplying 24–30 VAC to pins 2 & 3. If it is not and there is no obvious reason (broken wire, loose connection) then replace cable.

CONTROL BOARD TROUBLESHOOTING PROCEDURE

1. Use a voltmeter to make sure the electrical cable has 24-30VAC at pins 2 & 3 as shown above.

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 16 to make sure the pressure switches are set properly.

3. Replace the Control board. The Control board can be removed by removing the two screws underneath the bank indicator lights.
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>PROBABLE CAUSE</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELECTRICAL SYSTEM</td>
<td>No indicator lights on front of panel come on when power is connected.</td>
<td>No power input. Internal wiring is disconnected. Fuse blown.</td>
</tr>
<tr>
<td></td>
<td>Red indicator light is on but both banks are full.</td>
<td>Defective pressure switch.</td>
</tr>
<tr>
<td></td>
<td>Red indicator light does not come on when one bank is empty and changeover occurs.</td>
<td>Pressure switch set wrong. Defective pressure switch.</td>
</tr>
<tr>
<td></td>
<td>Red indicator light comes on when one bank is empty but changeover does not occur.</td>
<td>Switch unit set wrong. Defective switchover unit.</td>
</tr>
<tr>
<td></td>
<td>Green light does not come on even though bank is full.</td>
<td>Defective pressure switch.</td>
</tr>
<tr>
<td>SWITCHOVER SYSTEM</td>
<td>Both banks feeding.</td>
<td>Leaking o-ring on switchover unit.</td>
</tr>
<tr>
<td></td>
<td>Will not switch over to reserve bank.</td>
<td>Switch unit improperly set Defective switchover unit. Setscrew has come loose on switchover unit. Reserve bank empty (check pressure on inlet gauges).</td>
</tr>
<tr>
<td></td>
<td>Inlet relief valve leaking.</td>
<td>Spool regulator creeping (check intermediate pressure gauge). Relief valve not shutting off.</td>
</tr>
<tr>
<td></td>
<td>Banks not switching at same pressure.</td>
<td>Defective switchover unit.</td>
</tr>
<tr>
<td></td>
<td>Delivery pressure creeping.</td>
<td>Delivery pressure regulator not seating properly.</td>
</tr>
</tbody>
</table>
VICTOR LIMITED WARRANTY

Scope of Limited Warranty: Victor® Equipment Company (hereinafter, "Seller") warrants that its products are free of defects in workmanship or materials. If an authorized distributor or the customer of an authorized distributor (hereinafter, collectively, "Purchaser") who purchases Seller's product, and notifies Seller within the time set forth below that the product has a defect in workmanship or material even though it has been stored, installed, operated, and maintained in accordance with recognized standard industry practice, and the product was not misused, repaired, neglected, altered, or damaged, the Seller will repair or replace, in its sole discretion, those parts of the product determined by Seller to be defective in workmanship or material if said defect is not attributable to Purchaser's acts or omissions.

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Limited Claim Method: To make a claim under this warranty, Purchaser must notify Seller's Customer Service Department of the details of such claim within thirty days of discovering a defect in material or workmanship. If the claim is covered by this warranty, Seller's Customer Service Department will issue a return goods authorization number. Seller will not accept products returned without a returned goods authorization number.
Victor VM1100 Medical Liquidfied Gas Automatic Switchover Manifold
Victor® Equipment Company, one of the oldest and most widely recognized names in gas apparatus, was founded in 1913.

Victor Equipment Company is a ISO 9001
Registered Manufacturer
Locations in Denton, TX
and Abiline, TX

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