Installation & Maintenance Manual

C2 & C3 Manifolds

Andersen Medical Gas
12 Place Lafitte
Madisonville, LA 70447
http://www.TheMedicalGas.com
1-866-288-3783
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User Responsibility

The information contained in this Installation and Maintenance Manual, pertains only to the C2 and C3 manifold. This product will perform in conformity with the descriptions contained in this manual, when assembled, operated, maintained and serviced in accordance with the installation instructions provided.

The manifold must be checked periodically. Parts that are broken, missing, worn, distorted or contaminated, must be replaced immediately. Should such repair or replacement become necessary, please contact Amico Labs Corp. or their distributors.

All manifolds should not be repaired, or altered without prior written approval of Amico Labs Corp. or it’s distributors. Failure to comply will void all warranty on the manifold.

Statements in this manual preceded by the words WARNING, CAUTION, DANGER and NOTE are of special significance. Please read these sections carefully.

**WARNING:** denotes steps which can prevent injury.

**CAUTION:** denotes steps which can prevent damage to equipment.
The Amico C2 and C3 Manifold incorporates the basic necessities for the distribution and monitoring of medical gases. The manifold has been designed to provide user flexibility and reliability. This manual will enable the customer to install, use and maintain the manifold properly.

The total amount of medical gas contained in the left or right banks is displayed on the analog gauges on either side of the manifold. These gauges are provided to show the cylinder bank pressure in use and the cylinder bank pressure in reserve at all times.

When the gas cylinder pressure depletes on the “In Use” (primary) side, below the set point of the pressure switch, a signal will go to the master alarm (or remote buzzer) informing the hospital personnel that the “In Use” cylinder bank pressure is low and the cylinders need replacement. At this point someone has to silence the alarm (or buzzer) and manually switch the lever from “Left Bank In Use” to “Right Bank In Use.” To do this, for the C2, simply move the lever from left to right and for the C3, move the lever from top to bottom. Then proceed to change the cylinders. Changing the settings of the operating regulators will also reset the pressure switch and cancel the alarm condition.

**NOTE:** Always change the regulator settings BEFORE changing the empty cylinders.

**Features Include:**

- Preset operating regulators for easy switch over
- C2: single line regulators; C3: single or dual line regulators
- CGA gas specified header bar with integral check valves and cylinder pigtail assemblies to be ordered separately
- High pressure header isolation valves (optional)
Description of the Manifold

**Shipment Details**
The package consists of one fully tested C2 or C3 Manifold. Optional header bar assemblies, and pigtails are available.

**Description of Parts**
The C2 and C3 manifolds are divided into (2) main sections:

**Pressure Regulators**
There are two types of regulators in the Amico manifold: the operating pressure regulator and the line pressure regulator. Both types conform to NFPA 99.

1. **Operating (Source) Regulators**
   There are two operating regulators on every manifold, one for the left bank and one for the right bank. For Oxygen, Nitrous Oxide, Compressed Medical Air and Carbon Dioxide service, the “In Use” regulator will be set at 160 psi and the “Reserve” regulator will be set at 120 psi. For Nitrogen, the “In Use” regulator will be set at 250 psi and the “Reserve” regulator will be set at 200 psi.

2. **Line Regulators**
   There are also one or two line regulators on every manifold. The line regulator is capable of maintaining a constant dynamic delivery pressure at the maximum desired flow rate of the system. For Oxygen, Nitrous Oxide, Compressed Medical Air and Carbon Dioxide service, the line regulator(s) should be set at 55 psig [379 kPa]. For Nitrogen service, the regulator(s) are to be set at 170 psig [1,172 kPa].

**Pressure Relief Valves**
Pressure relief valves are installed downstream of all pressure regulators and are set at no more than 50% above the setting of the pressure regulator located immediately upstream. All pressure relief valves are capable of fully relieving the pressure at the set point and are upstream of any shut-off valve.

All pressure relief valves in the manifold have piping connections to allow for connection of vent lines to outside facilities.

Relief pressure settings vary with gas service as follows:

<table>
<thead>
<tr>
<th></th>
<th>Oxygen</th>
<th>Carbon Dioxide</th>
<th>Nitrous Oxide</th>
<th>Medical Air</th>
<th>Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Line Pressure Relief Valve</strong></td>
<td>75 psi [517 kPa]</td>
<td>75 psi [517 kPa]</td>
<td>75 psi [517 kPa]</td>
<td>75 psi [517 kPa]</td>
<td>225 psi [1,551 kPa]</td>
</tr>
<tr>
<td><strong>Operating Pressure Relief Valve</strong></td>
<td>225 psi [1,551 kPa]</td>
<td>225 psi [1,551 kPa]</td>
<td>225 psi [1,551 kPa]</td>
<td>225 psi [1,551 kPa]</td>
<td>350 psi [2,413 kPa]</td>
</tr>
</tbody>
</table>
Description of the Manifold

Control Components
The Amico manifold qualifies as a “Cylinder System Without Reserve Supply” as classified in NFPA 99, Clause 4-3.1.5. This is one category of the broader classification “Central Supply System” which encompasses many types of sources of supply to nonflammable medical gas piping systems.

Warning System Components
The Amico C2 and C3 manifolds have the capability to be connected to external devices whose function is to give continuous information as to the state of operation of the system (i.e.: an alarm condition).

Operating Alarm Systems
Operating alarm systems are mandatory according to CSA/Z305.1. Amico does supply a complete range of operating alarm units which can be used in conjunction with the Amico manifold, to provide the required visual and audible signals, in suitable locations, when change-over from the primary supply to the secondary supply occurs and cylinder replacement is necessary.

Mounted with the manifold is a preset pressure switch. It’s function is to send a signal to the alarm unit when the operating pressure drops below it’s set point. For Medical Air, Oxygen, Carbon Dioxide, and Nitrous Oxide the pressure switch will be set at 140 psi. For Nitrogen the pressure switch will be set at 225 psi.

Safety Features

Gas Service Identification
Amico manifolds are clearly labelled for the gas that they are intended to be used for. A large nameplate, indicating the appropriate gas is attached on the bottom of the manifold back plate. There are three pipes extending from the top of the manifold. Two pipes are for line pressure relief and one for operating pressure relief. All three pipes are labelled accordingly.

Cylinder Connections
The Amico manifold is designed to ensure that only cylinders containing the proper gas, can be connected to it. All cylinder extension bar connections, as well as pigtail hose assemblies, comply with CGA Standard B96, “Compressed Gas Cylinder Valve Outlet and Inlet Connections”.
Receipt and Location
The Amico manifold should be carefully examined upon receipt. If any damages are found, a claim should be filed with the transport company and Amico Labs Corp. Any authorized dealers and distributors should also be notified immediately.

Assembly Instructions

Cylinder Bank Installation Instructions

**CAUTION:** This section contains important information necessary for proper installation of the cylinder banks. Read it carefully before installing cylinder banks.

Connect the two high pressure inlet valves/header bar assemblies to the CGA connection on each side of the cabinet.

Secure the cylinder extension bar to the support using the U-bolts supplied as part of the assemblies.

Remove the plug and chain assembly on each outlet connection on the cylinder extension bar. Attach the cylinder pigtails to the header bar connections, while ensuring the check valves are operating in the proper direction.

When the medical gas piping system has been tested in accordance with Part 4-5, Testing of NFPA 99, the manifold can then be connected to it.

The outlet pipes leading from the Amico C2 or C3 manifold should be connected to their respective pipeline system connections. The connection to the relief valves should be made with a union (supplied by others) to facilitate change if required.

As the threaded joints are installed, an appropriate sealing compound that is suitable for the gas being transmitted shall be used.
**C2 Manifold**

The following instructions must be followed:

1. Be sure to move the lever to the side of the full bank.
2. The “In Use” regulator is set to 160 psi and the “Reserve” regulator is set to 120 psi.
3. When the “In Use” side is depleted, the pressure will drop to approximately 120 psi and start feeding from the “Reserve” bank.
4. The pressure switch is set to 140 psi decreasing pressure and will alarm when the “In Use” bank is depleted.
5. To switch over, simply move the lever to the “In Use” position on the side of the full bank (to the “Left” for the left bank to be in use and to the “Right” for the right bank to be in use). This resets the pressure switch.
6. Now change the cylinders in the empty bank.
7. The system is now ready for the next switchover.
8. The normal pressure setting for the line regulators is 55 psi.

**C3 Manifold**

The following instructions must be followed:

1. Be sure to move the lever to the position of the full bank.
2. The “In Use” regulator is set to 160 psi and the “Reserve” regulator is set to 120 psi.
3. When the “In Use” side is depleted, the pressure will drop to approximately 120 psi and start feeding from the “Reserve” bank.
4. The pressure switch is set to 140 psi decreasing pressure and will alarm when the “In Use” bank is depleted.
5. To switch over, simply move the lever to the position of the full bank (to the “Up” position for the left bank to be in use and to the “Down” position for the right bank to be in use). This resets the pressure switch.
6. Now change the cylinders in the empty bank.
7. The system is now ready for the next switchover.
8. The normal pressure setting for the line regulators is 55 psi.

**Nitrogen C2 or C3 Manifolds**

The C2 and C3 manifold, when built for Nitrogen gas service shall have the “In Use” regulator set to 250 psi and the “Reserve” at 200 psi. The pressure switch should be set to 225 psi decreasing pressure while the normal pressure setting for the line regulators shall be 170 psi.
Maintenance

General
The tests and inspections specified below apply only to the Amico manifold and not to the medical gas pipeline system as a whole. They are intended to help ensure the proper operation of the manifold and not to be interpreted as repair instructions. Fault finding and repair procedures are given in the Trouble Shooting section of this manual.

Amico Control Equipment
Control equipment should be inspected and tested according to the following schedule:

1. PRESSURE REGULATOR
   a. Observe and record line pressure periodically
   b. Test for external leaks at least semiannually
   c. Switch line regulators monthly (if applicable)

2. PRESSURE RELIEF VALVES
   Determine the pressure at which relief occurs at least annually and compare with the requirements of “Clause 4-3.1.8.5. of NFPA 99.”

3. HIGH PRESSURE INLET VALVE (MANIFOLD HAND VALVES)
   Inspect semiannually and test for external leakage and tightness of shut-off.

Cylinder Extension Bars
The following components shall be inspected semi-annually as indicated:

1. Test check valves of pigtail assemblies for proper closure.

2. Inspect pigtail assemblies for apparent damage and thread damage to cylinder connections, replacing all damaged pigtails immediately.

   NOTE: Replace ALL pigtails after 5 years of service.

The cylinders and the operating regulators of a Nitrous Oxide or a Carbon Dioxide supply system shall be observed daily during peak demand periods to determine whether they show frosting or condensation on the surface.

Where this is evident, the system shall be further inspected for evidence of leaks. Should excessive condensation or frosting occur, it may be necessary to upgrade to an Amico Microprocessor Digital Manifold with a built in heater kit.

Periodic Standing Pressure Test
At intervals of not more than 5 years, a 1-hour standing pressure test shall be made on each medical gas system to check for leakage.
This section is intended to serve as a general guide for identifying the potential functional problems which occur in operation of Amico manifolds.

When an asterisk (*) appears beside the CORRECTIVE ACTION, the recommended procedure is to replace the whole unit in question, with a substitute unit, until repairs are completed on the original equipment.

Components removed for maintenance must be serviced, repaired and tested, only by personnel qualified to work on equipment used in medical service. Only original manufacturer’s parts, as supplied by Amico, may be used in the maintenance of Amico manifolds.

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>CAUSE</th>
<th>CORRECTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPERATING REGULATOR FAULTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas leakage around operating pressure regulator body cap</td>
<td>Loose cap</td>
<td>Tighten cap</td>
</tr>
<tr>
<td></td>
<td>Diaphragm leak</td>
<td>* Replace regulator with substitute unit and change diaphragm</td>
</tr>
<tr>
<td>Venting at intermediate relief valve</td>
<td>Over pressure due to creeping or faulty regulation by operating pressure regulator</td>
<td>* Replace regulator with substitute unit and repair</td>
</tr>
<tr>
<td><strong>LINE PRESSURE REGULATOR FAULTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline not at desired pressure</td>
<td>Line regulator not set correctly</td>
<td>Set line regulator to value specified on (page 5) Line Regulator</td>
</tr>
<tr>
<td>Required gas flow not available</td>
<td>Line regulator not set correctly</td>
<td>Set line regulator to value specified on (page 5) Line Regulator</td>
</tr>
<tr>
<td>Low pressure relief valve venting</td>
<td>Line regulator set at too high a delivery pressure</td>
<td>Set line regulator to value specified on (page 5) Line Regulator</td>
</tr>
<tr>
<td></td>
<td>Relief valve set at too low a pressure</td>
<td>Replace the relief valve with a new one set in accordance with (page 6) Pressure Relief Valve</td>
</tr>
</tbody>
</table>
1. Keep the main bank valve open throughout these procedures.

2. Close cylinder valves on all empty cylinders.

3. Disconnect pigtails from cylinder valve outlets using an appropriate wrench.

4. Place protective caps over the cylinder valves of the empty cylinders and move them aside.

5. Remove protective caps of the full cylinders. Visually inspect the cylinder valves for dust, grease or oil.

6. Using a clean (lint free) cloth, wipe each cylinder valve outlet clean. Do not use your fingers.

7. Standing to one side, “crack” the cylinder valves by briefly opening and closing them to blow out any dust. Make sure they are pointing away from you and other personnel.

8. Connect the pigtails to the cylinder valve outlets and tighten the nut with an appropriate wrench.

9. Very s-l-o-w-l-y open the cylinder valve on the cylinder closest to the control cabinet. Watch the bank pressure display on the front of the cabinet to make sure the pressure rises slowly to the full cylinder pressure reading.

10. Wait one full minute.

11. Proceed to s-l-o-w-l-y open the remaining cylinder valves one at a time.

**WARNING:** High pressure Oxygen systems must be handled with CAUTION. Spontaneous combustion may result if Oxygen comes in contact with grease or oil. Ensure that hands, gloves, clothing and tools are kept clean and free of oil and grease. Be careful not to introduce dust or other contaminants into the system when changing cylinders. Failure to comply with this procedure may be hazardous.

**WARNING:** Fire hazard. DO NOT permit smoking or any other source of ignition in an area where the manifold is located or near the relief valve vent outlet. Be certain that all connections are free of dirt, grease and oil. These substances burn with great intensity in air, enriched with Oxygen or Nitrous Oxide and some gas mixtures.
Ordering Information

The model number for the ALERT-2 C2 and C3 manifolds are as follows:

M2H-C2-S-L-GAS
L represents the Language:
U  = English
E  = English
S  = Spanish

GAS represents the Gas:
Oxygen    = OXY
Nitrous Oxide  = N2O
Medical Air    = AIR
Nitrogen    = NIT
Carbon Dioxide = CO2

M2H-C3-X-L-GAS
X represents the Line Regulator:
S  = Single
SN = Single (No Cabinet)
D  = Dual
DN = Dual (No Cabinet)

Header-bars are sold separately:

M2-HBXX-04L-GAS
Number of Cylinders (2x2)

XX represents the type of header bar & pigtails required:
“TS”  = Straight c/w Stainless Pigtails
“TC”  = Straight c/w Copper Pigtails
“XS”  = Staggard c/w Stainless Pigtails
“XC”  = Staggard c/w Copper Pigtails

L represents the Language:
U  = English
S  = Spanish

GAS represents the Gas:
Oxygen    = OXY
Nitrous Oxide  = N2O
Medical Air    = AIR
Nitrogen    = NIT
Carbon Dioxide = CO2

Wall bracket for header bar assembly:

M-X-HB-WBRKT
List of Parts

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2-X-MAN-18A</td>
<td>Line pressure regulator for C2 manifold</td>
</tr>
<tr>
<td>M2-REG250-RK-LP</td>
<td>Repair kit for line pressure regulator for C2</td>
</tr>
<tr>
<td>M2-X-MAN-42E</td>
<td>Line pressure regulator for C3</td>
</tr>
<tr>
<td>M2-REG700-RK</td>
<td>Repair kit for line pressure regulator for C3</td>
</tr>
<tr>
<td>M2-X-MAN-18A-N2</td>
<td>Operating pressure regulator for C2 &amp; C3</td>
</tr>
<tr>
<td>M2-REG250-RK-HP</td>
<td>Repair kit for operating pressure regulator for all gases</td>
</tr>
<tr>
<td>M-X-MAN-33B</td>
<td>Operating check valve for all gases</td>
</tr>
<tr>
<td>M-X-IN-72W-075</td>
<td>Line pressure relief valve for C2</td>
</tr>
<tr>
<td>M-X-IN-72W-225</td>
<td>Operating pressure relief valve for C2</td>
</tr>
<tr>
<td>M-X-MAN-72W-075</td>
<td>Line pressure relief valve for C3 Line Regulator</td>
</tr>
<tr>
<td>M-X-MAN-72W-200</td>
<td>Operating pressure relief valve for C3</td>
</tr>
<tr>
<td>M-X-HB-NUT-GAS (N2O, AIR, CO2, NIT)</td>
<td>Plug &amp; chain assembly for N2O, AIR, CO2 &amp; NIT</td>
</tr>
<tr>
<td>M-X-MAN-36</td>
<td>Plug &amp; chain assembly for OXY</td>
</tr>
<tr>
<td>M-X-HB-PTC-GAS (OXY, N2O, AIR, CO2, NIT)</td>
<td>Copper pigtail c/w check valve for OXY, N2O, AIR, CO2 &amp; NIT</td>
</tr>
<tr>
<td>M-X-HB-PTS-GAS (N2O, AIR, CO2, NIT)</td>
<td>Stainless steel pigtail c/w check valve for N2O, AIR, CO2 &amp; NIT</td>
</tr>
<tr>
<td>M-X-HB-HPVLV-A</td>
<td>High pressure inlet valve (stainless steel handle)</td>
</tr>
<tr>
<td>M-PRSW-NIT</td>
<td>Pressure switch for C2 &amp; C3</td>
</tr>
</tbody>
</table>

Flow Capacities SCFH (L/min)

<table>
<thead>
<tr>
<th></th>
<th>Oxygen &amp; Air</th>
<th>Nitrous Oxide</th>
<th>Carbon Dioxide</th>
<th>Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C2</td>
<td>1,800</td>
<td>1,800</td>
<td>1,800</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>4,500</td>
<td>4,500</td>
<td>4,500</td>
</tr>
</tbody>
</table>
APPENDIX - A
C2 Manifold Layout

Pressure Switch
M-PRSW-NIT

Line Regulator
M2-X-MAN-18A

75 psi Line Relief Valve
M-X-IN-72W-075

Operating Regulator
M2-X-MAN-18-N2

Check Valve
M-X-MAN-33B

Line Pressure Gauge

Output 1/4" FNPT

Bank
Gauge

Bank
Gauge

Input

Input

CGA
(Gas Specific)

Operating Pressure Gauge

Operating Relief Valve
M-X-IN-72W-225

Operating Regulator
M2-X-MAN-18-N2

Operating Pressure Gauge

CGA
(Gas Specific)

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APPENDIX - B
C3 Manifold Layout

Operating Relief Valve
M-X-MAN-72W-200

Line Relief Valve
M-X-MAN-72W-075

Line Pressure Gauge

Pressure Switch
M-PRSW-NIT

Line Regulator
M2-X-MAN-42E-L

Line Regulator
M2-X-MAN-42E-R

Check Valve
M-X-MAN-33B

Check Valve
M-X-MAN-33B

Operating Pressure Gauge

Operating Pressure Gauge

Operating Regulator
M2-X-MAN-18-N2

Operating Regulator
M2-X-MAN-18-N2

Input

Input

Header Bar Adapter
MI2-X-HB-ADAPT

Header Bar Adapter
MI2-X-HB-ADAPT

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APPENDIX - C
Wiring of Remote Alarm Buzzer
Warranty Policy

Amico Corporation warrants its Lab Equipment to be free from defects in material and workmanship for a period of twelve (12) months from the date of shipment. Within this period Amico will repair or replace any part on site, or at the factory, which is proven to be defective at Amico’s cost.

All hose assemblies are excluded from this warranty. Any defective hoses shall have a maximum warranty of one (1) year from the date of purchase.

Furthermore, Amico will warrant its material to be free from defect for an additional period of four (4) years (five (5) years from the date of shipment). Within this period, Amico will replace any part, at no charge, which is proven to be defective. Shipping and Installation costs after the 1st twelve (12) months will be borne by the Customer.

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

Amico shall not be liable for incidental or consequential damages resulting from the use of the equipment.

All claims for warranty must first be approved by Amico’s Service Department (service@amico.com or 1-877-462-6426). A valid Return Goods Authorization (RGA) number must be obtained from Amico prior to commencement of any service work. Warranty work, which has not been pre-authorized by Amico, will not be reimbursed.