BELMED INC.

MANIFOLD SYSTEMS

with CROSSGUARD safety system

INSTALLATION AND INSTRUCTION MANUAL

DESCRIPTION
INSTALLATION
OPERATION
SERVICE
The National Fire Protection Association Standard, NFPA 56B-1977 for Non-Flexible Medical Gas Systems, Chapter 6, applies to small supply systems in non-hospital based facilities. Small systems are those in which the medical gas is a cylinder system which supplies no more than six use points, and has no more than 2000 cubic feet of gas in facility.

The Reliable Gas Supply Systems conform with the code requirements specified in NFPA No. 56B-1977, Chapter 6, and include the following code required features:

1. Pressure regulator set at 50-55 PSI installed on each cylinder
2. Flexible hose of 1000 PSI burst strength
3. Connections between regulator and piping system are approved Diameter Index Safety System (DISS)
4. Check valve located downstream of each regulator
5. Pressure relief valve for each gas pipeline, set at 70-80 PSI, located downstream of each check valve
6. Restraints to adequately secure cylinders from tipping
7. Audible and visual alarm for each gas pipeline, activated by an automatic pressure switch when pipeline pressure is less than 50 psi or more than 65 psi.

![Diagram of Typical Manifold System](image-url)
This instruction manual covers installation instructions for this equipment only. The following information is intended to provide a general guideline. NFPA No. 58F-1977, Chapter 8, should be consulted for detailed information. Reprints are available by writing to: The National Fire Protection Association, 470 Atlantic Ave., Boston, Massachusetts 02210.

1. No more than 2000 cubic feet of gas in building
2. Gas stored in locked cabinets or room
3. Room or cabinet to have 1 /2 hour fire rating
4. At least 72 square inches of vent area
5. Cylinders securely restrained to wall
6. No compressors, flammable material or other equipment in cylinder room
7. No smoking in cylinder enclosure

PIPEING
8. Pyrocleaned, degreased, and capped type L or K tubing ONLY
9. Solder connections should be of 1000 F. silver solder
10. DO NOT use oil or grease on any part of system
11. Concealed piping should conform to local codes
12. Pipeline marked every 20 feet with gas content
13. No more than 10 outlets stations of the approved type per facility
14. Supply line shut off valves should be installed inside facility when cylinder site is remote from facility (i.e., outside, basement, etc.)
15. Threaded connections for valves, etc., should be cleaned with soft cloth or an approved type sealing compound

TESTING
PRESSURE TEST: After installation, each pipeline system must be tested for leakage using dry nitrogen at 150 PSI for 24 hours. Each joint should be checked with soap water or an approved type leak detector.

CROSSLINE TEST: Each gas pipeline MUST be checked to determine that no cross connections have been made. Reduce pipeline pressure to zero and then pressurize one pipeline to 30 PSI using gas intended for that pipeline. Check each outlet station to determine that gas being discharged only from pipeline being tested.

TEST PROCEDURES MUST BE PERFORMED AND ARE VITAL FOR THE SAFE OPERATION OF SYSTEM AS WELL AS YOUR OWN PROTECTION

NOTE: The Belden Manifold is designed to accept the 24 hr./150 psi pressure test. Relief valve plugs are supplied with each manifold. Plugs are attached to both end caps, to prevent plugging. To plug relief valves, screw plugs into the ends of both relief valves. DO NOT GREASE SEATS, a gentle finger tightening is sufficient to prevent valve seat from lifting during test. REMOVE PLUGS AFTER TEST.
The Belmed Manifold is designed to be installed with fixed piping exposed or concealed, depending on wall construction. Manifold attaches to wall with three (3) #10 fasteners.

Piping

Belmed Manifold systems utilize CROSSGUARD SAFETY SYSTEM which is designed to prevent cross-connections between nitrous oxide and oxygen by eliminating common sizes. The Belmed Manifold is supplied with 3/8" O.D. tubing pipeline connector for nitrous oxide and 1/2" O.D. tubing pipeline connector for oxygen. The pipeline connectors attach to manifold with DISS nuts (see Figure 2). The Employment of THIS DIAMETER INDEXED COPPER TUBING MUST BE INSTALLED THROUGHOUT ENTIRE PIPING SYSTEM. OUTLET STATIONS MUST BE RELINED OR INCORPORATE THE SAME DIAMETER INDEXING.

CAUTION

THIS DEVICE CONTAINS CROSSGUARD SAFETY SYSTEM. Utilizing diameter indexed copper tubing, reducing pipe sizes or tampering with the CROSSGUARD SAFETY SYSTEM constitutes acceptance of liability by the installer. Refer to instructions, Contact Belmed Inc., with any questions or problems.
MANIFOLD

Manifold cover attaches via tongue and groove arrangement. To attach align cover over gauges and push down to remove cover, place thumbs on inside each cover side and push outward slightly while lifting.

Manifold should be installed so that bottom edge is five (5) feet above floor line. Determine center of wall where manifold is to be attached and measure 6'/2" from floor to this point. Secure a Ø10 fastener at this point and allow head or fastener to protrude 3/4" from wall. Hang manifold onto fastener through keyway mounting hole. Using manifold as a template, level and mark two lower mounting holes. If piping is to be concealed, also mark for two holes on Ø2" centerline in output area of mounting panel. Remove manifold and complete all hole drilling.

EXPOSED PIPING INSTALLATION:
Secure manifold to wall as described in previous paragraph. Remove dust covers from Ø1/2" male outlet connectors and moderately tighten pipeline connectors to manifold. Couple each pipeline connector to fixed piping and silver solder. Refer to figure #3. NOTE: Do not allow dust or other debris to enter manifold block.

CONCEALED PIPING INSTALLATION:
Drill 3/8" diameter holes on Ø3/4" centerlines at points marked earlier (paragraph #1) for concealed piping. Cut pipeline connectors 3" above Ø1/2" nuts and allow connectors to suitable lengths of piping and silver solder fittings/piping. (Refer to figure #3). Allow vertical riser lines to hang loosely for later manifold attachment. Note: Do not allow dust or debris to enter manifold block.

ROUGHED IN PIPING INSTALLATION:
If studs are in place but walls not erected, install pipelines as previously described (for either concealed or exposed piping). The bottom edge of Ø1/2" nuts on pipeline connectors should be 6'/2" above floor line and risers on Ø3/4" centerlines for later manifold attachment. Allow vertical risers to hang loosely to provide some play in lines to attach Ø1/2" fitting to manifold. PROVIDE INFORMATION FOR OVERALL INSTALLER WITH HOLE DIMENSIONS. (TWO - 3" DIA. HOLES, 6'/2" ABOVE FLOOR, Ø3/4" CENTERS).

COMPLETE REST OF PIPELINE INSTALLATION, WHEN COMPLETELY INSTALLED, PERFORM REQUIRED PRESSURE TEST AND CROSS LINE CHECK (see page #2) PURGE PIPELINE SYSTEM WITH INJECTED GAS.

CYLINDER RESTRAINT INSTALLATION: Securely anchor screw eyes into wall studs 40" above floor line. Allow minimum of 10" for each cylinder. Generally, 3/8" apart for 3 cylinders and 3/4" apart for 4 cylinders to match wall stud on 16" capture. Attach hooks of restraining bolt into screw eyes. Pull bolt through cam buckle until taut around cylinders. Secure belt end through loop. To remove restraint, press the thumb release on cam buckle. Restraint will adapt to many other cylinder configurations. Always securely anchor 40" above floor line.

CONNECT REGULATORS AND HOSES (see page #9 for regulator adjustment.)
DESK STYLE ALARM INSTALLATION

Route manifold & transformer cables as shown on page 6. (fuse box not supplied). Remove alarm from case by gently pulling up on bezel while holding case. Remove terminal plug from alarm and wire per page 6. To replace alarm, align pins on alarm with holes in gang box and slide alarm into gang box until alarm is flush with wall surface. Test alarm.

WALL STYLE ALARM INSTALLATION

Attach 3-gang electrical box to studs at a point 5 ft. above floor line. (Studs must be in 16" centers) Gang box has a mounting bracket and clamp for easy attachment to studs (nail to wood studs, sheet metal screw to aluminum studs). Gang box must be mounted level and installed to ensure alarm will be flush to finished wall surface. Depth markings are located on side of box for 3/8", 1/2", and 5/8" wall thickness. We recommend gang box be installed slightly below flush to finished wall (approx. 1/8") to ensure alarm will fit snug and flush with finished wall surface. Route manifold and transformer cables through gang box, remove approximately 6" of cable cover from wiring and strip about 3/8" from each wire end. Wrap cable to gang box with clamp inside box. (Clamp may have to be moved) To attach wires to alarm, remove terminal plug from alarm and attach stripped wire ends to proper terminal (see page 6) Reconnect plug to alarm, align pins on alarm with holes in gang box and slide alarm into gang box until alarm is flush with wall surface. Test alarm.

EXISTING WALL INSTALLATION

Wall style alarm may be installed in existing walls when walls are hollow and there are drop ceilings or otherwise accessible areas to route cables. Remove mounting bracket from gang box by drilling out rivets with a 1/8" drill bit. Remove clamp. Attach the two metal tabs supplied with gang box to the center top and bottom positions on front of gang box. (Attach tabs so that indentations are inside and facing to rear of gang box) Cut an opening 5 3/4" x 3 7/8" high in wall at desired alarm site. Attach gang box into opening with switch box supports (Madison Straps) which are installer supplied. Refer to regular wall style installation above to complete. Test alarm.

TRANSFORMER INSTALLATION

Remote transformer is designed to connect to a 4" x 4" junction box with a 120 volt AC supply. Connect the 120 volt primary side of transformer to 120 Vac supply with wire nuts. Connect the 12 volt AC secondary side of transformer to the 2 conductor wires of alarm cable with wire gut. Cover wires with rubber cover to junction box. Transformer must be mounted as to be OUTSIDE junction box. Refer to diagram on page 6. (SEE SPECIAL NOTE UNDER DECK ALARM INSTRUCTIONS REGARDING THE OPTIONAL PLUG IN AC ADAPTOR TYPE TRANSFORMER)

ALARM TEST: Refer to page 6 of manual for alarm test instructions. Note: If piping system and gas tanks are not installed, pressure switch contacts on manifold may be bridged to determine alarm circuit is connected properly. Alarm test procedure described on page 8 must still be performed after the system is completely installed.
DEALERS INSTRUCTIONS

1. VERIFY THAT SYSTEM HAS BEEN LEAK TESTED
2. INSTALL COVER PLATES ON OUTLET STATIONS
3. INSTALL ALL SECONDARY EQUIPMENT (flowmeters, mounting brackets, etc.)
4. TEST FOR CROSSED LINES
   a. use quick connect without machine attached to bleed system to zero
   b. connect oxygen and nitrous oxide cylinders to manifold
   c. close cylinders to wall
   d. turn on oxygen ONLY (make sure nitrous oxide pressure is zero)
   e. insert quick connects into outlet stations
   f. gas should flow ONLY from oxygen outlets
   g. turn off oxygen cylinder
   h. bleed oxygen line pressure to zero
   i. repeat procedure with nitrous oxide
5. TEST ALARM AND ADJUST REGULATORS
   a. remove 3/16" cap nut located on front of regulator
   b. insert 3/16" allen wrench into brass screw on regulator
   c. turn on alarm
   d. establish 5 liter flow of oxygen on flowmeter
   e. turn allen wrench counter clockwise until line pressure is just below 40 PSI
   f. oxygen "LOW" indicator light and audio signal should come on, depress reset button to cancel audio signal
   g. turn allen wrench clockwise until line pressure is just above 65 PSI
   h. oxygen "HI" indicator light and audio signal should come on, depress reset button to cancel audio signal
   i. adjust oxygen pressure back to 50 PSI
   j. adjust other oxygen regulator(s) to 50 PSI if required
   k. replace cap nuts on regulators
   l. repeat procedure with nitrous oxide
6. PLACE INSTRUCTION MANUAL AND OPERATING INSTRUCTIONS ON WALL NEXT TO MANIFOLD
7. FILL OUT WARRANTY CARDS AND RETURN TO DEALER
8. DEMONSTRATE SYSTEM TO DOCTOR
NOTE: With exception of bulb replacement, all service on manifold system should be performed by a qualified, experienced service person only.

REGULATOR ADJUSTMENT

Regulator line pressure should be 90 PSI at full cylinder pressure. Regulator should be adjusted with gas flowing. Connect gas machine to gas pipeline and establish a 5 liter flow. Remove 3/16" cap nut located on front of regulator. Insert 3/16" Allen wrench base brass screw. Turn clockwise to increase pressure and counter clockwise to decrease pressure. When line pressure is 90 PSI, remove Allen wrench and replace cap nut.

NOTE: Top view drawing of Pressure Switch at left shows both the high (NO) terminal and low (NC) terminal for illustration purposes only. Pressure switches on manifold will have only one terminal, either high (NO) or low (NC). First remove soft rubber cover from center of switch by gently prying off with small flat bladed screwdriver or similar tool. This will allow access to 7/32" hex socket. Replace cover after adjustment.

HIGH PRESSURE ADJUSTMENT (Normally open terminal) Turn Allen wrench LEFT to INCREASE pressure.

Turn Allen wrench RIGHT to DECREASE pressure.

LOW PRESSURE ADJUSTMENT (Normally closed terminal) Turn RIGHT to INCREASE setting Turn LEFT to DECREASE setting.

NOTE: Right indicates clockwise direction and left counter-clockwise.
Color coding: RED - 02 IN, GREEN - 02 IO, BROWN - N20 HI, WHITE - N20 LO, BLACK - COMMON

RELIEF VALVE

Relief valve incorporates a preset 75/80 psi spring and is non-adjustable. If valve is leaking, it may be caused by foreign material on seal or poppet seat.
To correct, loosen vent cap with 9/16" wrench. Carefully remove vent cap, spring and poppet (seat and retainer will stay in valve body). Wipe poppet seat with clean dry cloth and clean seal with a 0-TIP type cotton swab. Reassemble valve and test by increasing line pressure to 75-80 psi to verify valve valves properly. Decrease line pressure to 50 psi and verify that valve seats properly and does not leak. If this does not correct problem, replace valve.

ALARM BULB REPLACEMENT

A spare bulb is located within Reset button housing. Disconnect alarm from power source, gently pull on reset lens to remove and expose housing. A tweezer type tool or someone with small fingers can remove bulb by gently pulling toward you. Replacement bulb; GE 77330.

FUSE REPLACEMENT: Fuse is located at right rear of alarm. Replace with 20m - .5 amp fuse.
NORMAL OPERATIONS:

At the start of each work day, clean cylinder valves for each gas. CAUTION: OPEN CYLINDER VALVES SLOWLY. If more than one cylinder for a gas, read cylinder pressure for each regulator gauge and close those cylinders with the highest pressure. This will maintain the least pressure open and maintain the fullest cylinders in reserve. Your gas supplier will supply tags to identify the "in use" and "reserved" cylinders. After checking proper manifold, gauge indicators should be in the white area of dial between A and H (preferably at 0 psi). After turning on cylinders and verifying correct line pressure, turn on gas supply alarm. Activate "HIGH TO LOW" switch to determine that audio and visual indicators are working normally. If during work day, any cylinder becomes empty, the gas supply alarm will activate a LO condition. When this occurs, depress reset button to signal to cancel audio signal. Press reserve cylinder valve and read a replacement cylinder from gas supplier. The alarm will automatically reset when normal pressure is restored.

HIGH PRESSURE SIGNAL: Indicates an abnormal pressure condition exists. Turn off system immediately and call a qualified service person.

NOTE: Turn off ALL CYLINDERS WHEN FACILITY IS UNATTENDED. Oxygen is a rapid accelerant at fire. With cylinder valves turned off, there is less danger in the event of an unrelated fire. This practice also provides for frequent checks on proper manifold operation and pressures.

REPLACING CYLINDER/KIT:

OXYGEN: Replace cylinder when gauge on regulator reaches 200 psi. The gauge will register approximately 200 psi with fully charged cylinder. Oxygen is in a gaseous phase within the cylinder. As the oxygen is used, the pressure indicated on regulator gauge will fall proportionally to the contents. (i.e.: 1000 psi-1/4 full, 1000 psi-1/2 full, etc.) Oxygen is generally supplied in "C" size cylinders and a fully charged cylinder contains 8500 liters of oxygen (24 cu. ft.).

NITROUS OXIDE: Replace cylinder when pressure gauge on regulator reaches 500 psi. The gauge will register approximately 750 psi when fully charged with Liquid nitrous oxide. As nitrous oxide is used, the liquid converts to a gaseous phase within the cylinder and the gauge will continue to register 750 psi until all liquid converts to gas within the cylinder. After this occurs, the gauge on regulator will indicate a decrease in pressure as the remaining nitrous oxide is used. Nitrous Oxide is generally supplied in "C" size cylinders and a fully charged cylinder contains approximately 13,800 liters of nitrous oxide (465 cu. ft.).

NEVER ATTEMPT TO REPAIR OR MAKE CHANGES TO THE SYSTEM. FOR AN ADVICE ABOUT PROPER OPERATION, A REPUTABLE SERVICE PERSON, EXPERIENCED WITH ANY OLD SYSTEM SHOULD BE CALLED AT ONCE.
# NO SMOKING
OXYGEN IN USE

## MANIFOLD OPERATION
CAREFULLY READ INSTRUCTION MANUAL BEFORE OPERATING

### CAUTION—OPEN CYLINDER VALVES SLOWLY
USE NO OIL

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<td>1</td>
<td>SLOWLY OPEN CYLINDER VALVES, TURN HANDLE COUNTER CLOCKWISE.</td>
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<td>2</td>
<td>IF MORE THAN ONE CYLINDER FOR EACH GAS, OPEN ONLY THE &quot;IN USE&quot; CYLINDERS, KEEPING FULL CYLINDERS IN RESERVE.</td>
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<tr>
<td>3</td>
<td>VISUALLY CHECK PRESSURE GAUGE ON REGULATOR. REPLACEMENT CYLINDERS SHOULD BE ORDERED FROM GAS SUPPLIER WHEN OXYGEN PRESSURE IS 200 PSI AND NITROUS OXIDE PRESSURE IS 500 PSI.</td>
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<tr>
<td>4</td>
<td>VISUALLY CHECK LINE PRESSURE GAUGE ON MANIFOLD. PRESSURE INDICATOR SHOULD BE IN WHITE AREA BETWEEN &quot;LO&quot; AND &quot;HI&quot;.</td>
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<td>5</td>
<td>TURN ON GAS SUPPLY ALARM. ACTUATE EACH TEST BUTTON TO DETERMINE VISUAL AND AUDIBLE INDICATORS ARE WORKING.</td>
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<td>6</td>
<td>WHEN UNATTENDED, TURN OFF ALARM AND CLOSE ALL OPEN CYLINDERS. TURN HANDLE CLOCKWISE.</td>
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<td>NEVER ATTEMPT TO REPAIR OR MAKE CHANGES TO THE SYSTEM. IF IN DOUBT ABOUT PROPER OPERATION, A REPUTABLE SERVICEMAN, EXPERIENCED WITH MANIFOLD SYSTEMS SHOULD BE CALLED AT ONCE.</td>
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