NELLCOR PURITAN BENNETT

MEGA 2000®
Semi-Automatic Switchover Manifold
Service Manual

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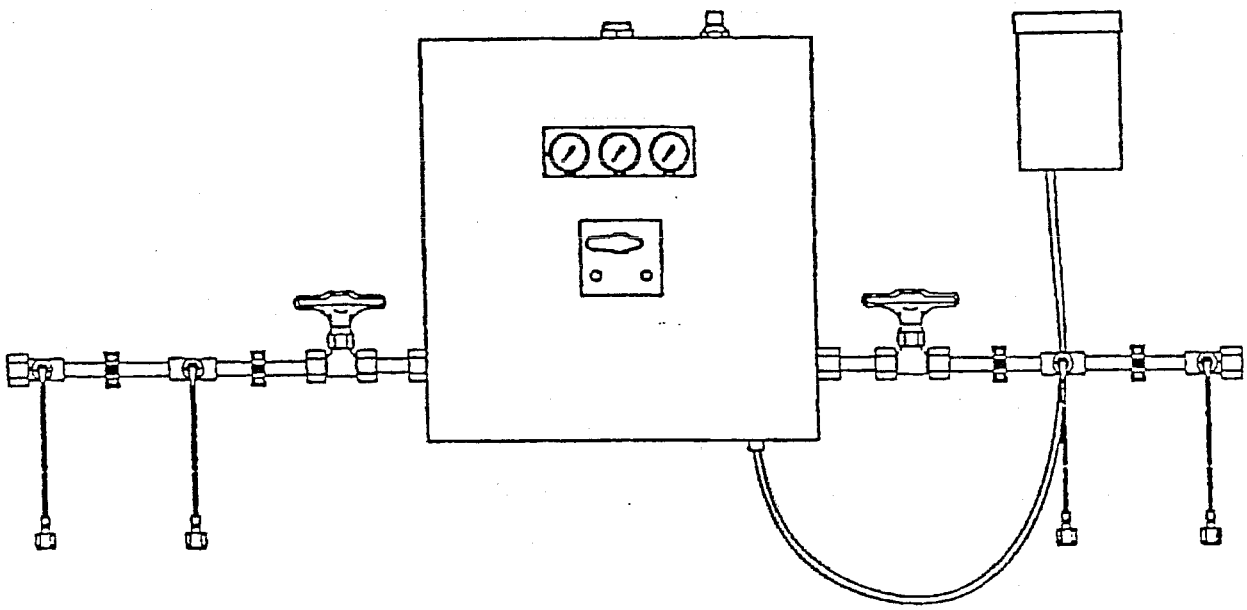

FOR YOUR SAFETY:

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 service the manifold.

⚠WARNING Means there is a possibility of injury or death to yourself or others.

⚠CAUTION Means there is the possibility of damage to the unit or other property.

NOTICE Indicates points of particular interest for more efficient and convenient installation or operation.

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WARRANTY

Nellcor Puritan Bennett makes no warranty of any kind with regard to the material in this manual, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

Refer to the installation and operating instructions manual for warranty information.

Nellcor Puritan Bennett shall not be liable for errors contained in this manual or consequential damages in connection with providing this manual or the use of the material in this manual.

NTRODUCTION

nformation necessary to perform maintenance and service on the Nellcor Puritan Bennett Mega 2000® Semi-matic Switchover Manifold is contained in this manual. This information is intended for use by technicians or personnel qualified to repair and service manifold equipment.

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

WARNINGS

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

⚠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 when ignited 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. This heat may ignite combustible materials creating explosive force.

⚠WARNING Do not kink, twist or bend pigtails into a radius smaller than 5 inches. If you do this, the pigtail may burst.

⚠WARNING Do not apply heat. Oil and grease may react with explosive force when ignited while in contact with some gases, particularly oxygen and nitrous oxide.

⚠ARNING 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 manifolds and cylinders. Static discharges and lightning may ignite materials in an oxygen atmosphere, creating fire or explosions.

⚠WARNING Do not weld near nitrous oxide piping. Excessive heat may cause the gas 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
PCB - Printed Circuit Board

PRODUCT DESCRIPTION:

The Nellcor Puritan Bennett Semi-Automatic Switchover Manifold is designed to provide a reliable uninterrupted supply of gas to a hospital or clinic's medical gas pipeline system.

The manifold has headers on each side connected to gas cylinders. One side is the service side, and one side is the reserve side. The position of the diversion valve on the front of the unit determines which side of the manifold is the supply side. Gas flows from the supply side until the pressure in the cylinders falls below the preset pressure of the primary regulator on the reserve side. At that point, the reserve cylinders become the supply cylinders. The pressure switch senses the low pressure in the former supply cylinders and activates a red light on the front of the cabinet. When the empty cylinders are replaced, the operator must switch the diversion valve to the new supply bank. The manifold also closes contacts which can signal a remote location that the cylinders need to be replaced with full ones.

Lights on the front of the manifold indicate the status of the gas supply. An external power supply converts 115VAC power to 24VAC. A 24 in. cord connects the power supply to the manifold.

A five terminal strip inside the power supply is provided for connection to a remote alarm. An internal power supply relay provides dry alarm contacts rated to 3 amps at 30 VDC, or 2 amps at 250 VAC.

Some Nitrous Oxide and Carbon Dioxide manifolds come equipped with a 480 Watt gas heater which gives the manifold a 500 scfh flow capacity. Heater models come with a grounded six foot power cord, ready to be plugged into a 115VAC power supply.

Manifold headers are made of brass. Pigtails are Teflon® lined stainless steel exterior braid. Pigtails use standard CGA inlet connections, as listed below.

CGA Inlet Connection Numbers

- Carbon Dioxide - CGA 320
- Nitrous Oxide - CGA 326
- Breathing Air - CGA 346
- Oxygen - CGA 540
- Helium - CGA 580
- Nitrogen - CGA 580

The manifold outlet is a ½ NPTF located at the center of the top of the control cabinet.

The relief valve outlet is a ½ NPTM fitting located at the top right of the control cabinet.

EY ELEMENTS OF THE SEMI-AUTOMATIC SWITCHOVER MANIFOLD

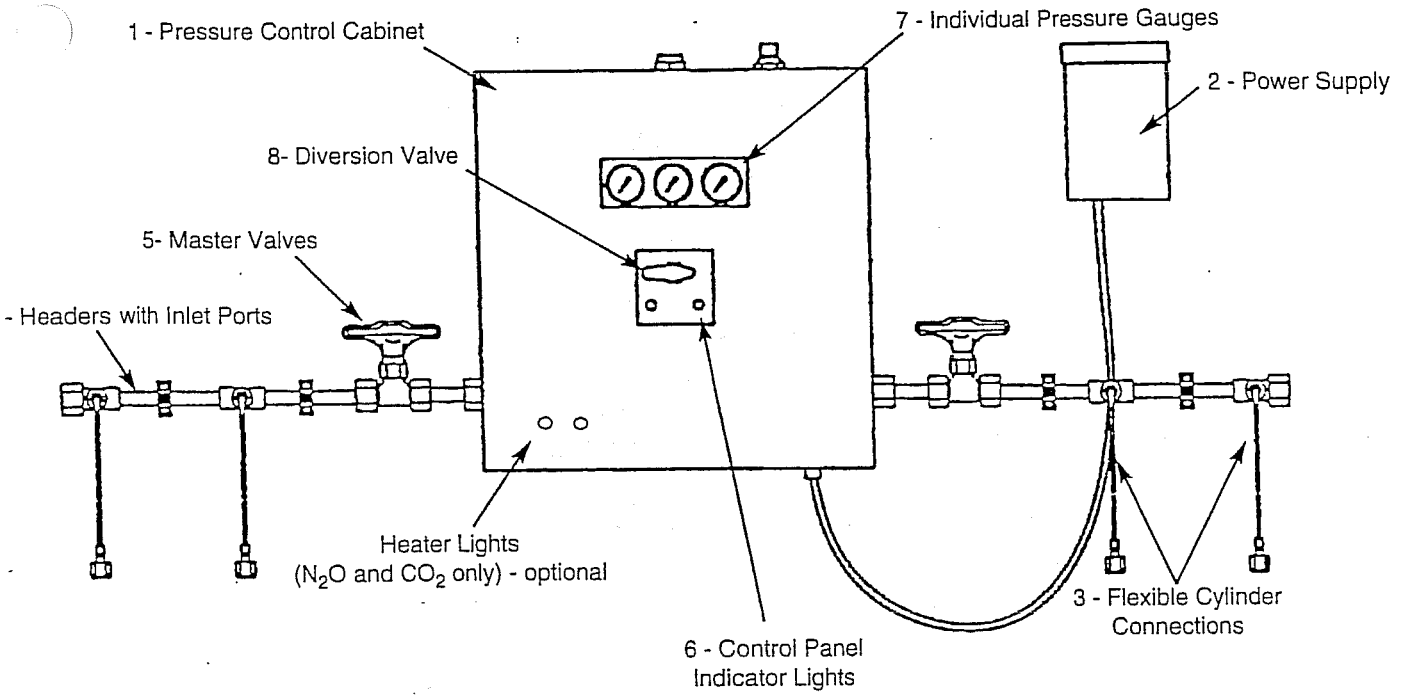


Figure 1

- A pressure control cabinet (1) that maintains constant pressure to the pipeline and enables smooth uninterrupted switchover from the "service" to the "reserve" cylinders.
- A 115 VAC input, 24 VAC output power supply (2). Power supply includes dry contacts for local and remote alarm connections.
- Flexible cylinder connections (3) with built-in check valves.
- Headers (4) with an individual check valve at each inlet port (4). Headers are modular construction to facilitate future expansion.
- Master valves (5) used to shut off gas in emergency situations. Should normally be left open.
- Control panel indicator lights (6) indicate manifold status. Green light "SYSTEM NORMAL" indicates both banks have pressure. Red light "RESERVE IN USE" indicates one bank of cylinders is depleted.
- Individual pressure gauges (7) allow monitoring of left and right cylinder bank pressure, as well as pipeline delivery pressure.
- Diversion valve (8) - Diversion valve lever points toward the primary cylinder bank.
- Carbon Dioxide and Nitrous Oxide Manifolds have two additional amber lights indicating "Power on" and "Heater is Active."

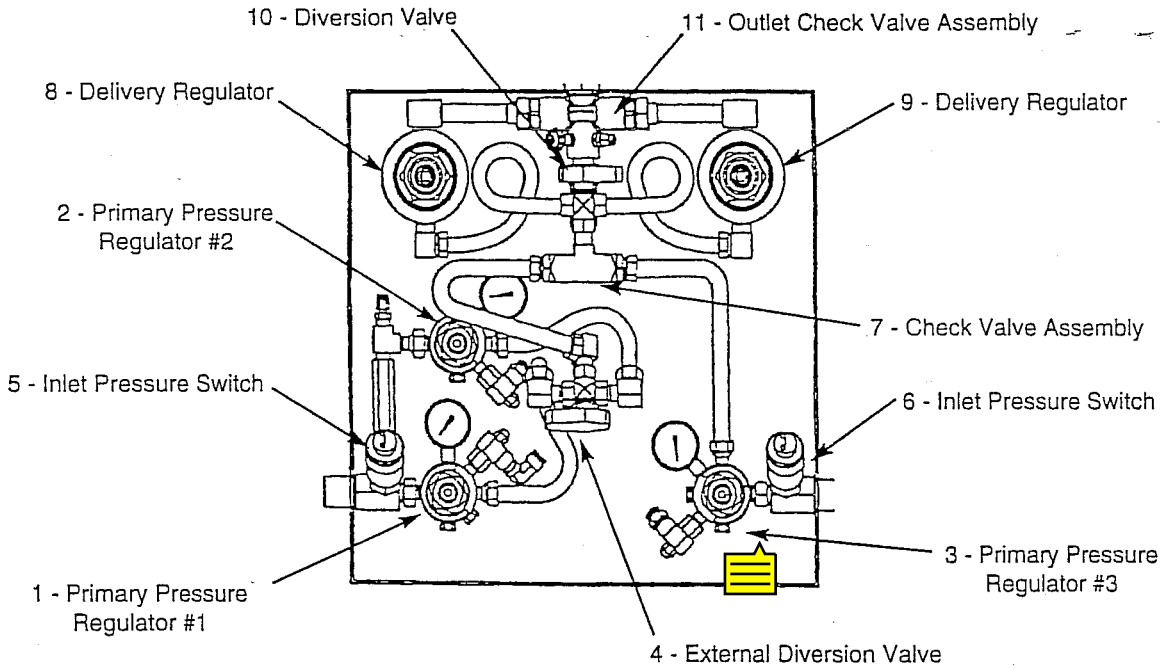


Figure 2

MANIFOLD OPERATION

The switchover control operation is based on the pressure settings of the three primary supply regulators, items (1), (2) and (3) in Figure 2 above. The primary bank (or "supply") is controlled by the position of the diversion valve (4), whose position indicates the cylinder bank from which gas is being drawn.

Regulator (1) is preset at 300 psig. Regulator (2) is preset at 200 psig and regulator (3) is preset at 250 psig.

In operation, when the diversion valve (4) points to the left side, regulator (1), which is preset at 300 psig, overrides delivery of regulator #3 (250 psig). When the diversion valve points to the left, regulator (2) is not in the flow circuit.

As gas is depleted from the left cylinder bank, regulator (1) delivery pressure will eventually drop to less than the preset of regulator (3) (250 psig). At that point, gas starts being supplied through regulator (3). The inlet pressure switch on the left side (5) measures the gas pressure and at its preset point (250-350 psig) its contacts open and the red "RESERVE IN USE" light is activated on the cabinet front. The green "SYSTEM NORMAL" light goes off. The dry contacts in the power supply box also open, activating a remote alarm if one is attached.

When the gas cylinders on the left side are replaced, pressure on regulator (1) returns to normal. At that point, the operator should turn the diversion valve to point to the right side of the pressure control cabinet. This will cause gas to continue to be supplied through regulator (3) on the right side. The red "RESERVE IN USE" light will go out and the green "SYSTEM NORMAL" light will relight when pressure is applied to the left side.

When the diversion valve is pointed to the right cylinder bank, the regulator (3) delivery pressure will eventually drop below the preset of regulator (2), at which point gas starts being supplied through regulator (2). The inlet pressure switch on the right side (6) measures the gas pressure and at its preset point (250-350 psig) its contacts open and the red "RESERVE IN USE" light in the pressure control cabinet front activates, as described previously.

The control circuitry of the pressure control cabinet continues to cycle in this manner as each bank of cylinders empties and is then refilled.

The check valve assembly (7) prevents reverse flow of gas at cylinder changeover and if one of the primary regulators must be removed for repair.

Items (8) and (9) are L700 delivery regulators. Diversion valve (10) located on the inside of the cabinet, controls which of these regulators deliver pressure. If it becomes necessary to repair the active regulator, diversion valve (10) must be switched to make the other L700 the supply regulator. At that point, the L700 regulator needing repair may be removed for repair. Check valve assembly (11) isolates the regulator so the system can still deliver pressure while the regulator is being removed and repaired.

The check valve assembly (11) also contains a vent valve, relief valve and a 1/2" NPTF outlet port.

Nitrous Oxide/Carbon Dioxide Flow Characteristics

Nitrous Oxide and Carbon Dioxide are supplied in a liquified state. As the liquid vaporizes, gas occurs in the cylinder. Under normal conditions, gas pressure is at a nominal 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 pound cylinder. Most literature suggests the user should not withdraw more than 50 scfh of gas from a 50 pound 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, it will freeze solid. No gas will be delivered.

It is important for the user to size his manifold properly so that excessive flow does not occur during use. The most prevalent problem associated with nitrous oxide and carbon dioxide manifolds is that of freeze-up caused by excessive flow. Excessive flow is caused by trying to flow more than the rated supply capacity of the sypply cylinder.

Some Nitrous Oxide and Carbon Dioxide manifolds are equipped with a gas heater which allows 500 scfh of flow. However, the proper number of cylinders are required to prevent the cylinders from freezing up, causing premature changeover and loss of flow.

If you are unsure of the proper withdrawal rate for your cylinders, consult your gas supplier.

ADJUSTMENT SPECIFICATIONS

Figure 3: Pressure Settings of Semi-Automatic Switchover Manifolds

Gas	Pressure Switch	Primary Reg. Relief Valve	Primary Reg. #1	Primary Reg. #2	Primary Reg. #3	Line Regulator	Line Regulator Relief Valve
Oxygen	250-350	400	300	200	250	50	75
Nitrogen	250-350	400	320	220	270	180	250
Nitrous Oxide	250-350	400	300	200	250	50	75
Breathing Air	250-350	400	300	200	250	50	75
Helium	250-350	400	300	200	250	50	75
Carbon Dioxide	250-350	400	300	200	250	50	75

Line regulator pressure is at the user's discretion. The value for line pressure on the chart is the pressure the manifold is set at the factory.

Primary regulator preset is at 2000 psig inlet pressure. Primary regulator delivery pressure increases by 1.5 psig per 100 psig of inlet pressure decrease.

RECOMMENDED TOOLS AND EQUIPMENT

Combination Wrenches - 1/4" through 1", 1 1/8", 1 3/8", 1 1/2", 1 3/4"
3/16", 5/16" and 5/32" Allen wrenches
Needle nose pliers
Flat blade screwdriver
Phillips screwdriver
Volt/Ohm meter
Oxygen compatible liquid leak detector
Teflon® Tape
Thermocouple with 1/8" probe

INSPECTING MANIFOLD OPERATION

NOTICE Refer to Figure 2 for component locations.

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 the manifold inlets.
2. Disconnect the power supply connector from the bottom right corner of the manifold cabinet.
3. Pressurize the right inlet to the test pressure specified in the chart below.

Recommended Minimum Inlet Pressure Requirements

Oxygen, Breathing Air, Helium, Nitrogen . . . . . .1800 psig minimum
Nitrous Oxide/Carbon Dioxide . . . . . 500 psig minimum

NOTICE For every 100 psig the test inlet pressure is below the recommended inlet pressures, the primary regulator preset must be increased 1.5 psig above the value shown in Figure 3.

4. Open the manifold cabinet door. Observe the pressure gauge on the right primary regulator. If it does not indicate the pressure shown in Figure 3, reset the preset as directed in the **Primary Regulator Preset Procedure** that follows in this manual. Shut off the right side inlet pressure.
5. Make sure the external diversion valve (Item 4, Figure 2) is pointing to the right bank. Pressurize the left inlet to the pressure recommended above. Observe the pressure gauge on the top left primary regulator (#2). If it does not indicate the pressure shown in Figure 3, reset the preset as directed in the **Primary Regulator Preset Procedure** that follows in this manual.
6. Turn the external diversion valve handle (Item 4, Figure 2) to point to the left bank supply. Observe the gauge on the bottom left primary regulator (#1). If it does not indicate the pressure shown in Figure 3, reset the preset as directed in the **Primary Regulator Preset Procedure** that follows in this manual.
7. Observe the center l.p. gauge on the manifold gauge block. If it is not indicating the correct delivery pressure into the system, reset the preset of the line regulator that is in use as required. Refer to the **Line Regulator Preset Procedure** that follows in this manual. Turn the internal diversion valve (Item 10, Figure 2) toward the other line regulator. Observe the center l.p. gauge on the manifold gauge block. If it is not indicating the correct delivery pressure into the system, reset the preset of the line regulator. Refer to the **Line Regulator Preset Procedure** that follows in this manual.
8. Attach the power supply cord to the manifold and apply power.
9. With no pressure on the manifold, the red light should be on and the green light should be off. If the manifold is pressurized on both inlets with the recommended inlet pressure, the green light should light and the

red light should be off. If this is not the case, refer to the electrical system trouble shooting procedures later this manual.

). Turn the external diversion valve (Item 4, Figure 2) to point to the left cylinder bank. Shut off the left bank inlet valve. While bleeding pressure off the manifold, monitor the pressure indicated by the left bank inlet pressure gauge. At 250-350 psig, the green light should go off and the red light go on. If this does not occur, reset the pressure switch as directed by the **Pressure Switch Setting Procedure** found later in this manual. Repressurize the left inlet. The red light should go out and the green light should come on.

1. Turn the external diversion valve (Item 4, Figure 2) to point to the right cylinder bank. Shut off the right bank inlet valve. While bleeding pressure off the manifold, monitor the pressure indicated by the right bank inlet pressure gauge. At 250-350 psig, the red light should come on and the green light go off. If this does not occur, reset the pressure switch as directed by the **Pressure Switch Setting Procedure** found later in this manual. Repressurize the right bank inlet and retest.

2. There are two ways to test for leak.
   Method One - Use leak detector on all joints and leak paths.
   Method Two - Shut off the flow from the manifold. Shut off inlet pressure. Monitor the two inlet gauges and the outlet gauge for five minutes. If the gauges show pressure loss, a leak is occurring. Use leak detector to find the leak.

TROUBLESHOOTING, ADJUSTMENT AND REPLACEMENT OF COMPONENTS

Forcing Switchover

the external diversion valve (Item 4, Figure 2) toward the cylinder bank you wish to be the supply bank.

Primary Regulator Preset Procedure

NOTICE The primary regulator preset may be changed while the manifold is in operation. The regulator being set must be the supply regulator.

1. Remove the 5/8" hex nut from the adjusting screw of the regulator.
2. Use a 3/16" allen wrench to turn the adjusting screw until the regulator preset is as specified. Clockwise rotation increases pressure, counterclockwise rotation decreases pressure. If the manifold is not flowing, vent pressure with the bleed valve on the outlet block of the manifold to check adjusted pressure.
3. Reinstall the hex nut on the adjusting screw and gently snug it into place.

Primary Regulator Repair/Replacement Procedure

NOTICE The primary regulator may be removed from the manifold while it is in the "reserve" condition. A check valve is located upstream of the regulator to allow removal while the other side of the manifold is in the "service" mode.

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

1. Make sure the regulator to be replaced is the "reserve" regulator. If it is not the "reserve" regulator, follow the **Forcing Switchover** procedure, found previously in this manual, to cause switchover.
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. Use a 1" open end wrench to loosen and detach the face seal fittings from the regulator inlet and the outlet fitting of the regulator.
4. To repair the regulator, hold the regulator body by the hex knob on the back and remove the cap. Once the cap is removed, lift off the diaphragm components. Remove the nozzle from the body. At this point, the seat

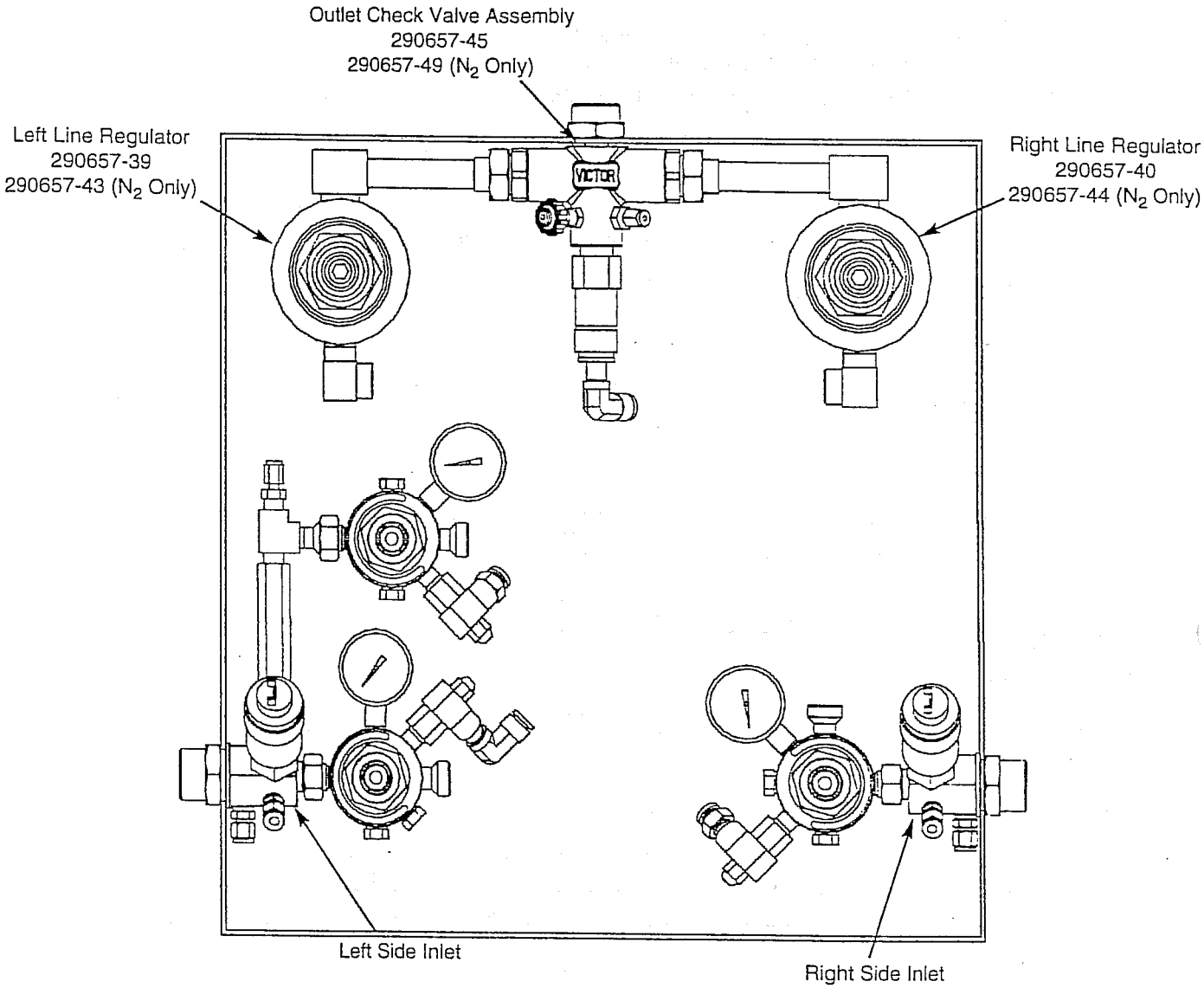


Figure 4: Location of Main Subassemblies

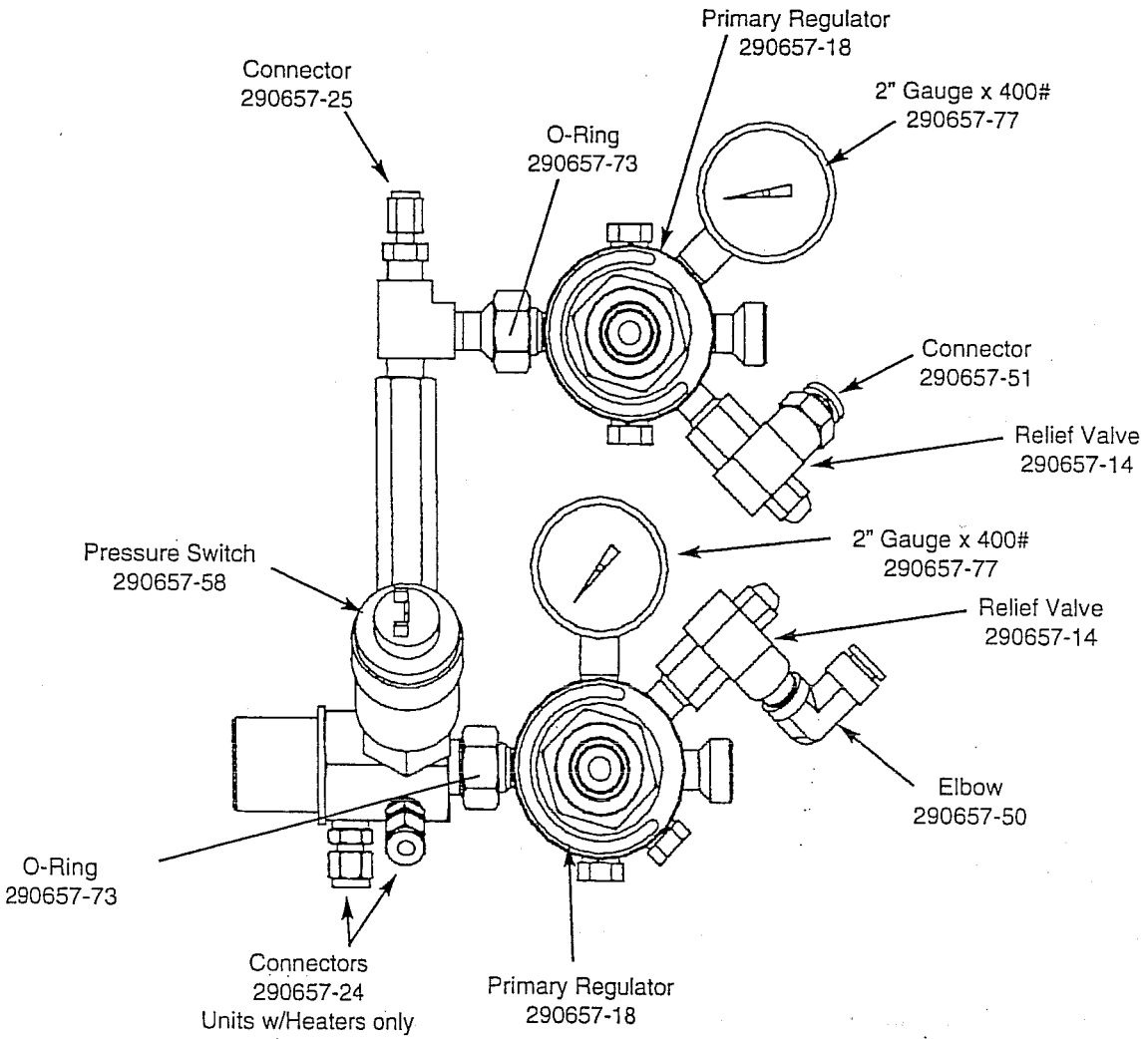


Figure 5: Left Side Inlet

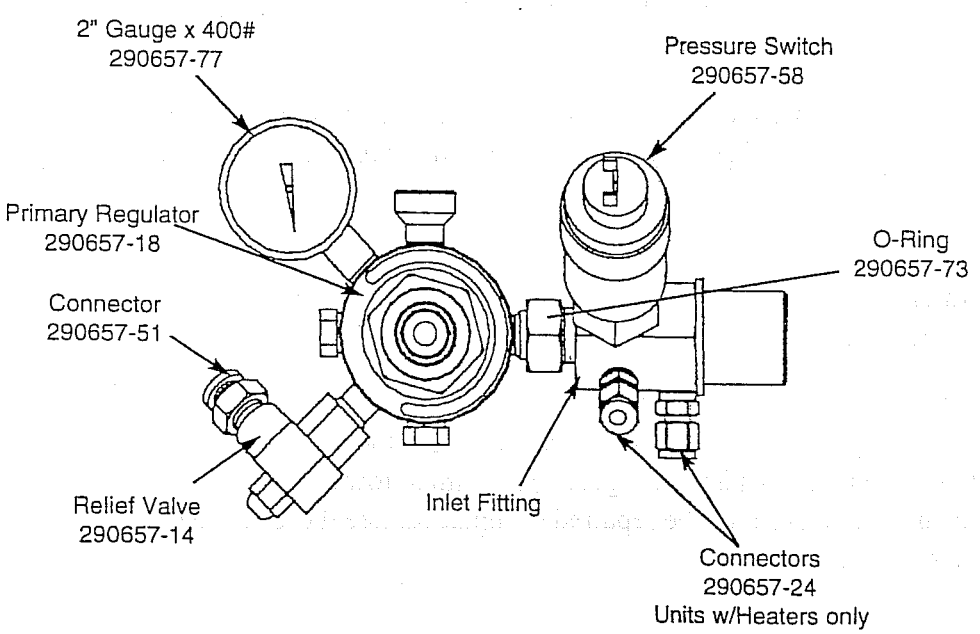


Figure 6:Right Side Inlet

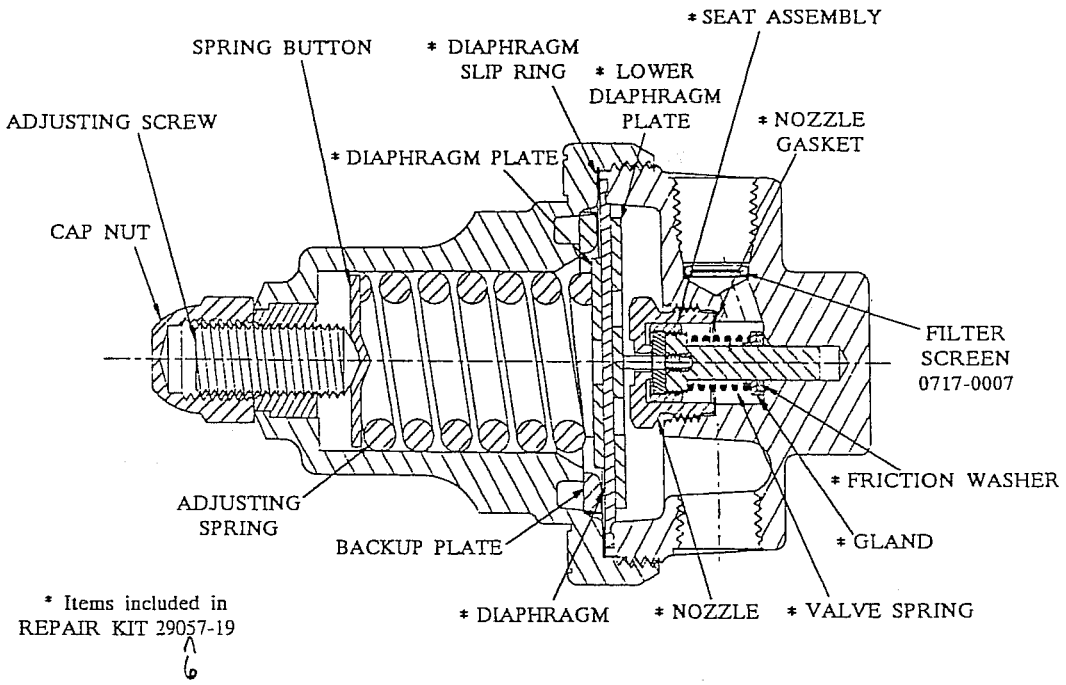


Figure 7: SR 250-300-AM
(Nitrogen)

assembly and its associated components may be replaced, as can be the nozzle and diaphragm components. See Figure 7 for a list of repair components and the assembly schematic.

5. To replace the regulator, hold the regulator in a vise by the hex knob on the back of the body and remove the components from the ports.
6. Clean the fittings, retape the pipe threads with 1½ turns of Teflon® tape. Asemble the fittings into the new regulator assembly.
8. Either discard the old regulator, repair it or send it to an authorized repair facility for reconditioning.
9. Replace the o-rings at all opened face seals when replacing the regulator.

Line Regulator Preset Procedure

NOTICE The line regulator preset may be changed while the line regulator is serving as the "service" regulator. The position of the diversion valve (Item 10, Figure 2) controls which line regulator is the "service" regulator.

1. Loosen the 3/4" hex nut from the adjusting screw of the regulator to be adjusted.
2. Use a 5/16" allen wrench to turn the adjusting screw to change pressure. Clockwise rotation increases pressure, counterclockwise rotation decreases pressure. Use the bleed valve to bleed off excess pressure.
3. When the pressure is adjusted properly, reinstall the hex nut on the adjusting screw. Tighten the nut snugly.
4. If the preset cannot be changed properly, check that the outlet pressure from the primary regulators is as specified, and that the internal diversion valve (Item 10, Figure 2) is pointed toward the regulator being tested. If these items are correct, the line regulator must be repaired or replaced. See the **Line Regulator Repair/Replacement Procedure** below.

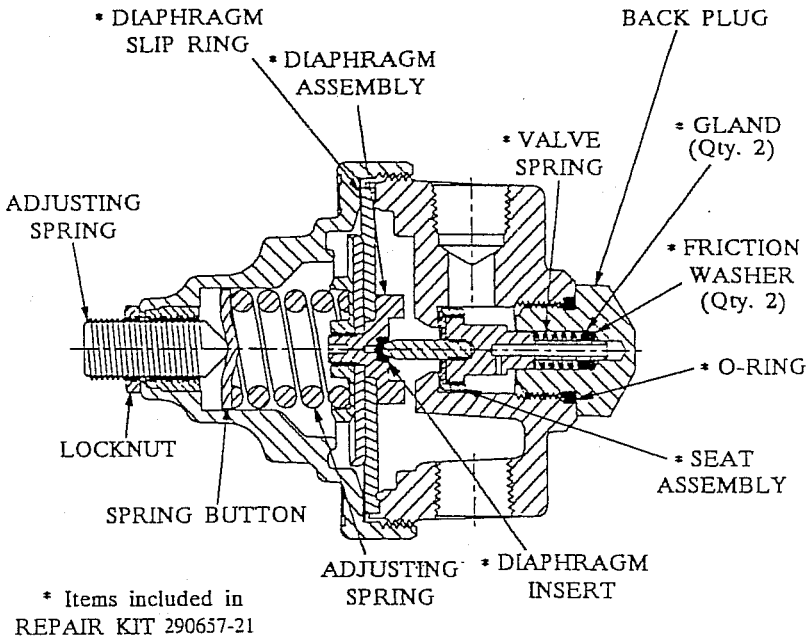


Figure 8: L700C-AM Regulator
(Oxygen, Air, Helium, Carbon Dioxide and Nitrous Oxide)

Line Regulator Repair/Replacement Procedure

NOTICE The line regulator may be removed and repaired or replaced while the manifold is in operation. Turn the diversion valve (Item 10, Figure 2) to point away from the regulator to be changed. A check valve upstream of the line regulator will contain pressure, allowing the manifold to remain in service.

1. Use an open end wrench to loosen and remove the face seal nut downstream of the line regulator, and use a 1" open end wrench to loosen and remove the face seal nut at the inlet of the line regulator.
2. Remove the line regulator.
3. To repair the line regulator, remove the regulator cap and the diaphragm assembly. Remove the back plug and the seat assembly. Replace the components that need to be replaced. See Figure 8 (Oxygen, Air, Helium, Carbon Dioxide and Nitrous Oxide Regulator) or Figure 9 (Nitrogen Regulator) for replaceable components and the assembly schematic.
4. Install new o-rings on all face seals.

Pressure Switch Setting Procedure (See Figure 3)

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. To check the pressure switch, first refer to Figure 3 to determine the pressure setting for the switch in the manifold you are working on.
3. Remove the connectors from the spade connections on the pressure switch. The connections are not polarity sensitive, so the wires can be connected to either spade at reassembly.
4. Use the 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. Turn the ribbed cover of the pressure switch to adjust its set point. Turning the cover clockwise (looking at it from the spade connection end) will increase the set point. Turning the cover counter-clockwise will lower the set point.

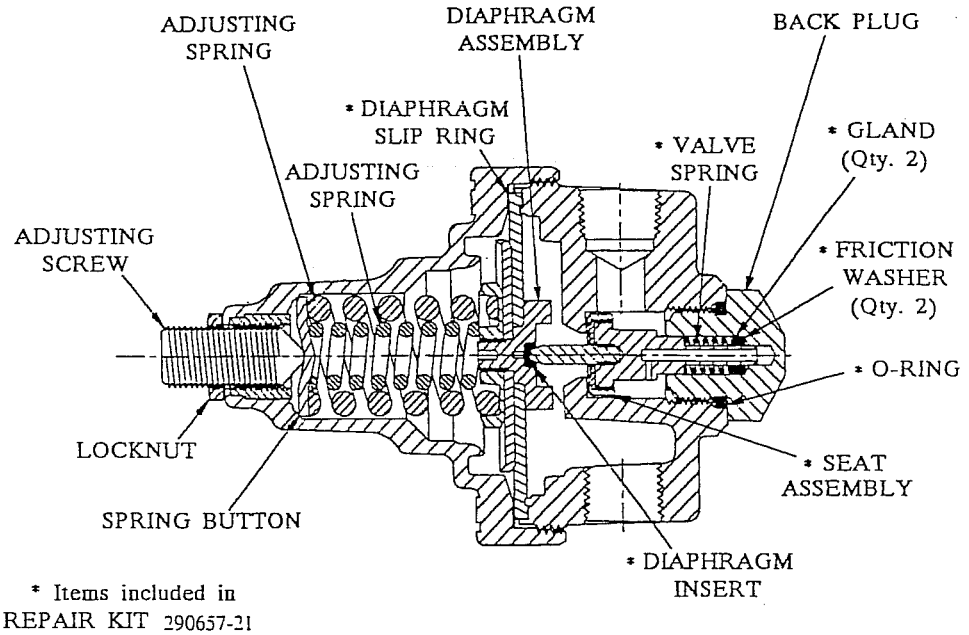


Figure 9: L700E-AM Regulator (Nitrogen)

7. Once the pressure switch is set to the correct set point, reattach the wires.
8. If the pressure switch preset cannot be set, the switch must be replaced. The switches are not repairable.

ersion Valve with Check Valve Repair/Replacement Procedure (See Figures 2 and 10)

1. Remove the face seals that hold the assembly in place.
2. Remove the components. See Figure 10 for a list of repair components.
3. Replace the components that need to be replaced.
4. The check valves are not required to be leak tight in the reverse flow condition. The check valve is allowed to leak 1 bubble in 12 seconds.
5. Reassemble the components and reinstall the assembly.

Cross Body Check Valve Assembly Repair/Replacement Procedure

1. Remove the face seals that hold the assembly in place.
2. Remove the components. See Figure 11 for the components that can be repaired and the assembly schematic.
3. Replace the components that need to be replaced.
4. The check valves are not required to be leak tight. The seat is allowed to leak 1 bubble in 12 seconds.
5. Reassemble the components and reinstall the assembly.

Power Supply Troubleshooting Procedure

1. Examine power supply. Make sure power supply is connected to 115 VAC.
2. Use volt meter to determine that power supply is supplying 24-30 VAC. (**NOTICE** 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 3A fuses if necessary.
3. Make sure the power supply cable is attached securely to the manifold. Use the volt meter to confirm that

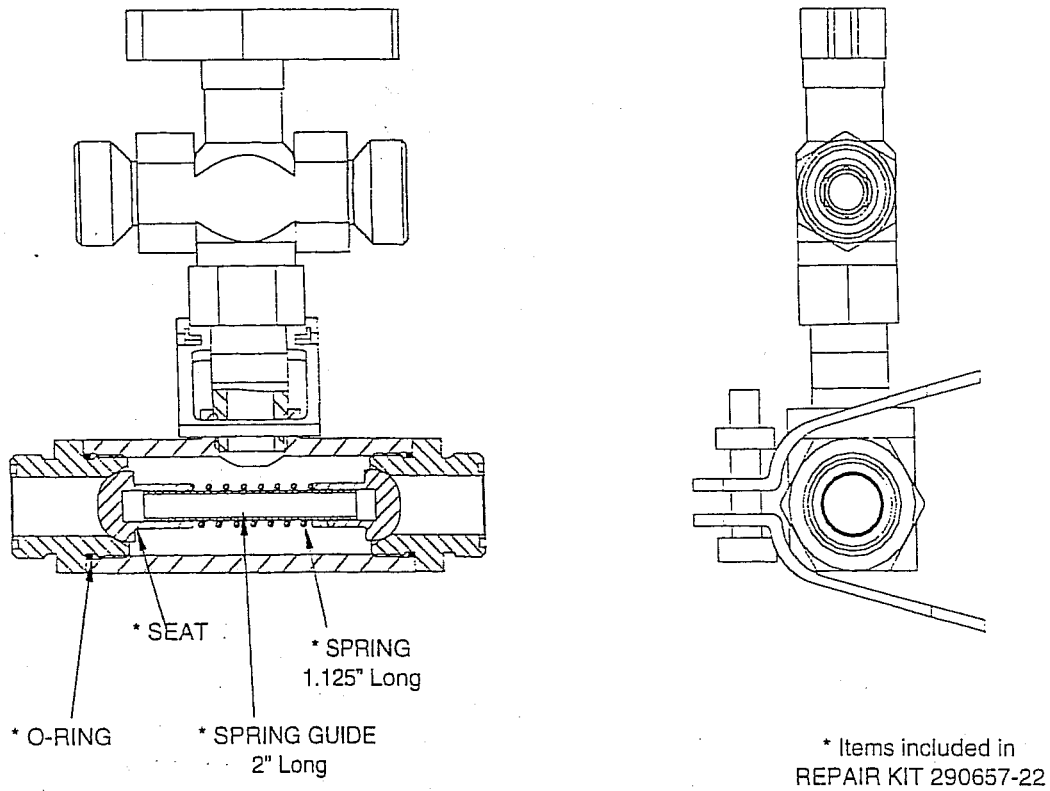


Figure 10: Diversion Valve with Check Valve Assembly

24-30 VAC is supplied at pins 1 and 2 of the power supply cord connector.

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

Electrical Cable Troubleshooting Procedure

Examine the electrical cable inside the manifold control cabinet. The wiring schematic is shown on the decal on the inside of the control cabinet, and is also shown in this manual. Look for loose wires, unconnected wires, and any broken or damaged wires. Make sure the cable is firmly connected to the pressure switches (see Figure 12).

Heater Cable Assembly Replacement (for models that have heaters)

1. **⚠WARNING** Unplug the heater power cord. Allow the heater core to cool if it is hot.
2. The heater core contains three components, two heater cartridges and one thermostat. Remove the ring clip from the hole above each of these components. Remove each component.
3. Disconnect the wire connectors that attach the cable assembly to the power cord.
4. Remove the two nuts from the heater lights on the front of the door. Remove the lights.
5. Connect the new heater cable assembly to the appropriate wires, see Figure 13.
6. Cover the heater thermostat and the two heater cartridge elements with a coating (to prevent them from sticking).Insert the thermostat and the cartridge elements into the holes in the heater core. The thermostat has a small stud on the side which fits into one specific hole with a machined groove for the thermostat.
7. Press a ring clip into each hole above the heater cartridges and the thermostat.

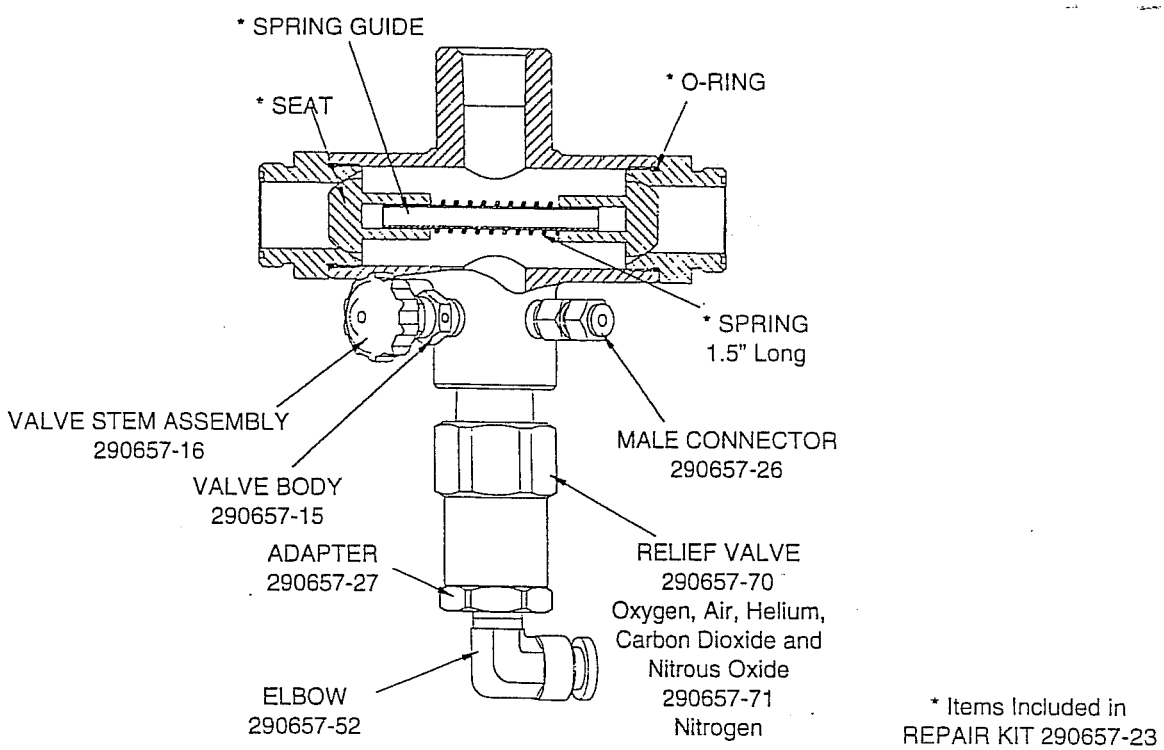


Figure 11: Check Valve Assembly

Plug the heater cord in and allow the heater to warm up. It should come to 160° +/-10°F. If it does not, the thermostat can be adjusted by turning the screw mounted in it.

Replacing the Heater Core

NOTICE Pressure must be removed from the manifold prior to replacing the heater core.

1. **WARNING** Unplug the heater power supply. Allow the heater core to cool.
2. Remove the heater thermostat and the two heater cartridges from the core as directed by the previous section.
3 Use a 9/16" open end wrench to remove the four tube fittings that connect the 1/4" tubing to the manifold inlet fittings, see Figure 13.
4. Use the allen wrench to remove the two allen screws that hold the heater in place from the bottom of the manifold control box.
5. Remove the heater core.
6. Place the new core in the manifold. Secure it in place with the two allen screws installed into the bottom of the core from the bottom.
7. Align the 1/4" tubing, as necessary, to each tube connection in each manifold inlet fitting. The heater core tubes are pre-bent. Make sure that the tubes on each side are connected.
8. Tighten the 1/4" tube fittings using the 9/16" open end wrench. With new tube fittings, the nut should be turned 3/4 turn after the nut is in the snug or finger tight position.

   Reinstall the thermostat and the two heater cartridges.

10. Repressurize the manifold. Check the four 1/4" tube connections for leak.

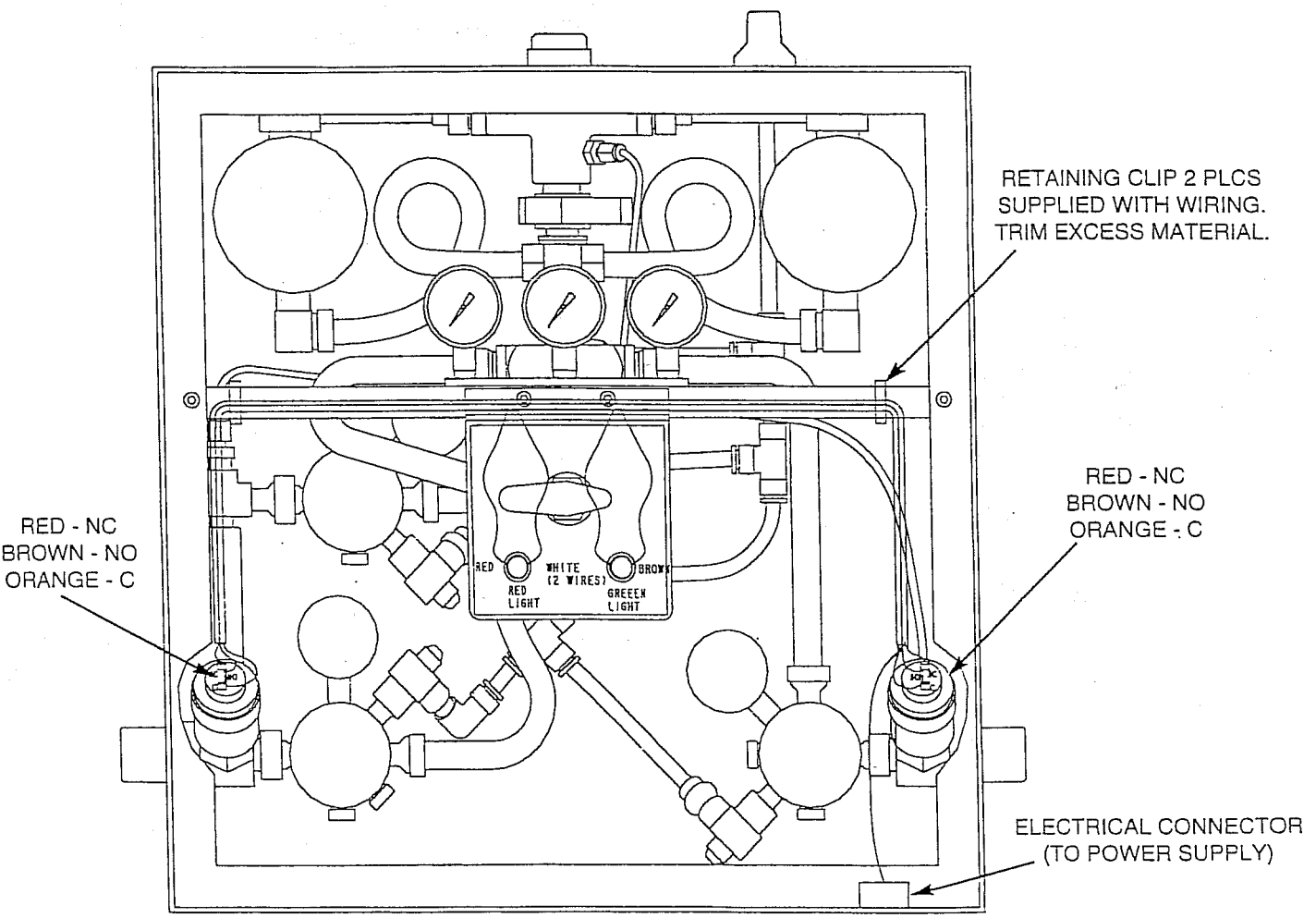


Figure 12: Semi-Auto Medical Manifold
Wiring Detail
Oxygen and Air Service

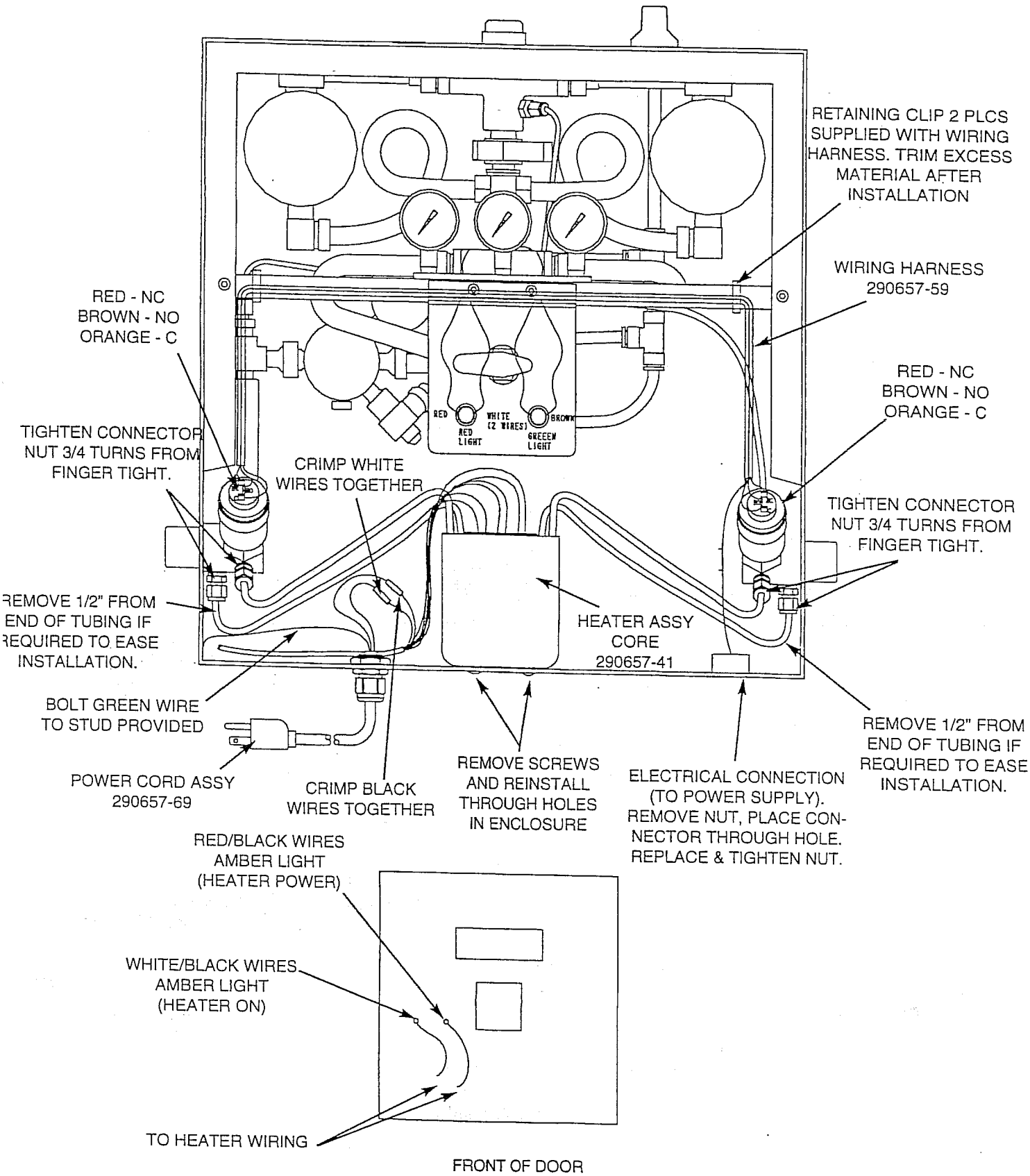
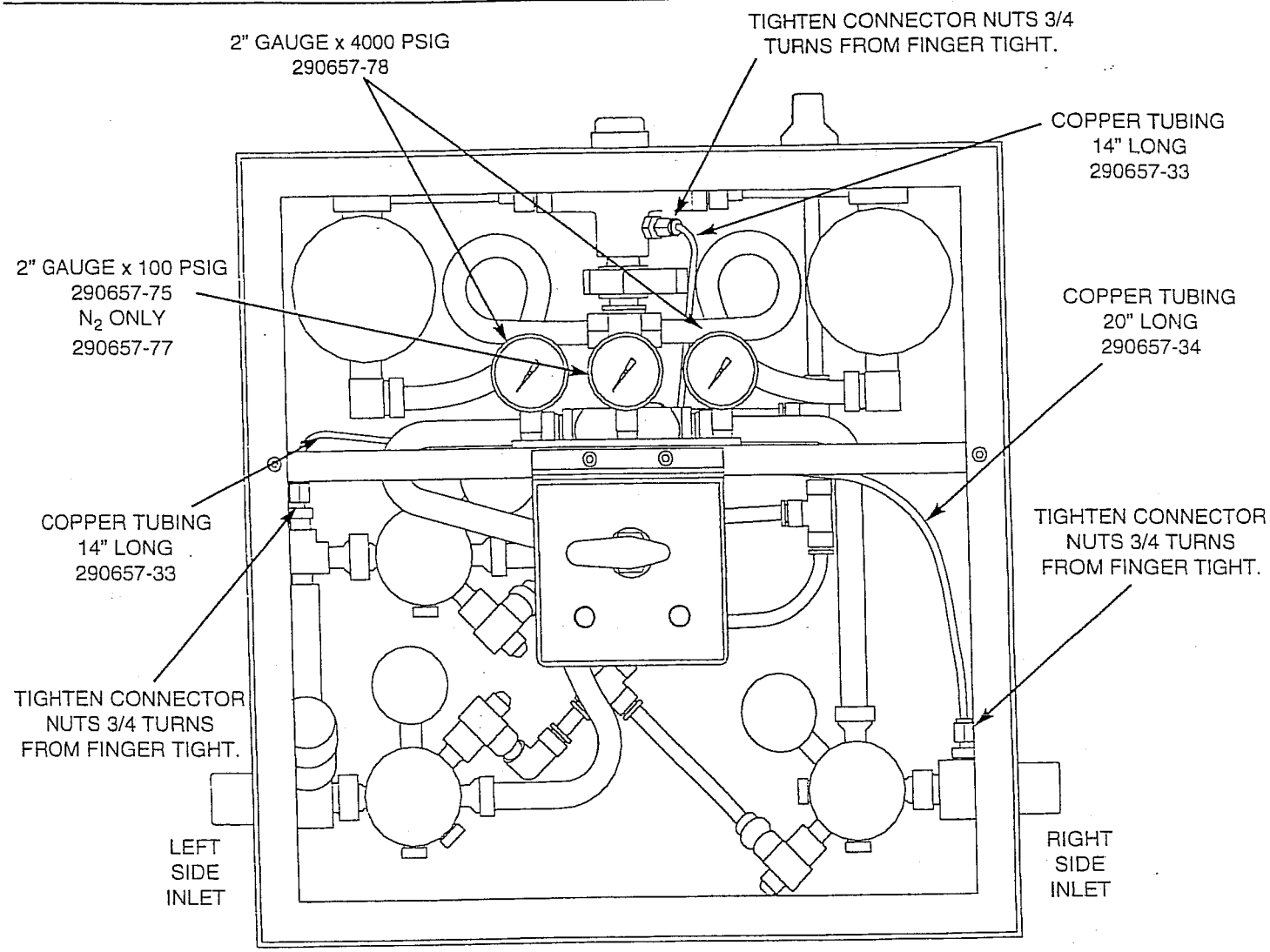


Figure 13: Semi-Auto Medical Manifold
Wiring and Heater Detail
Nitrous Oxide and Carbon Dioxide Service



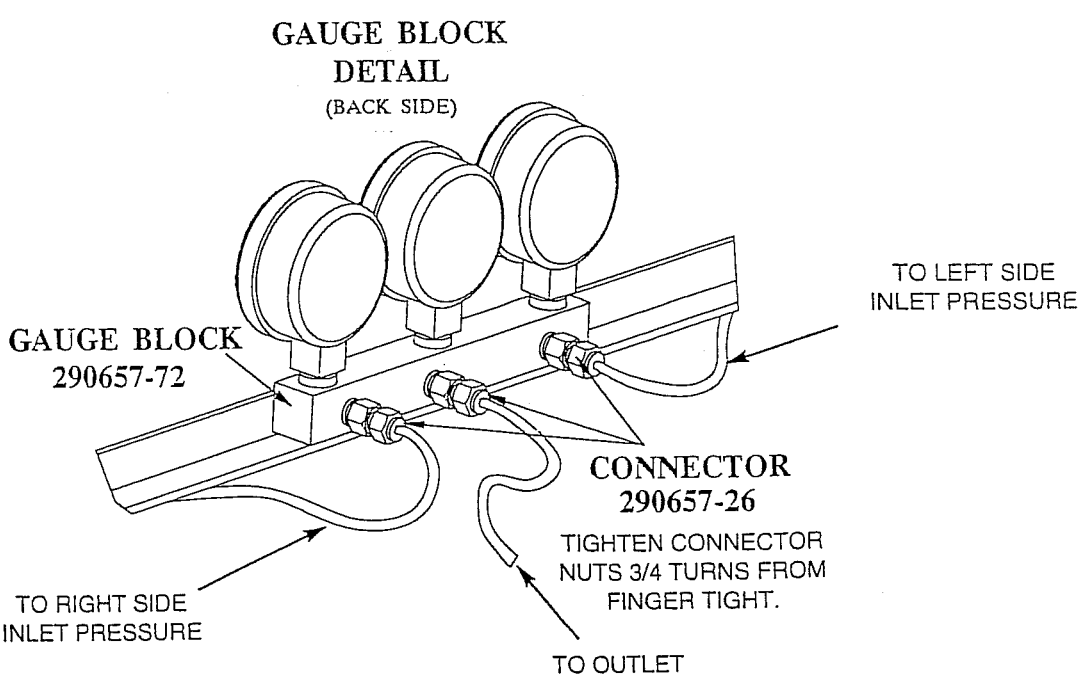
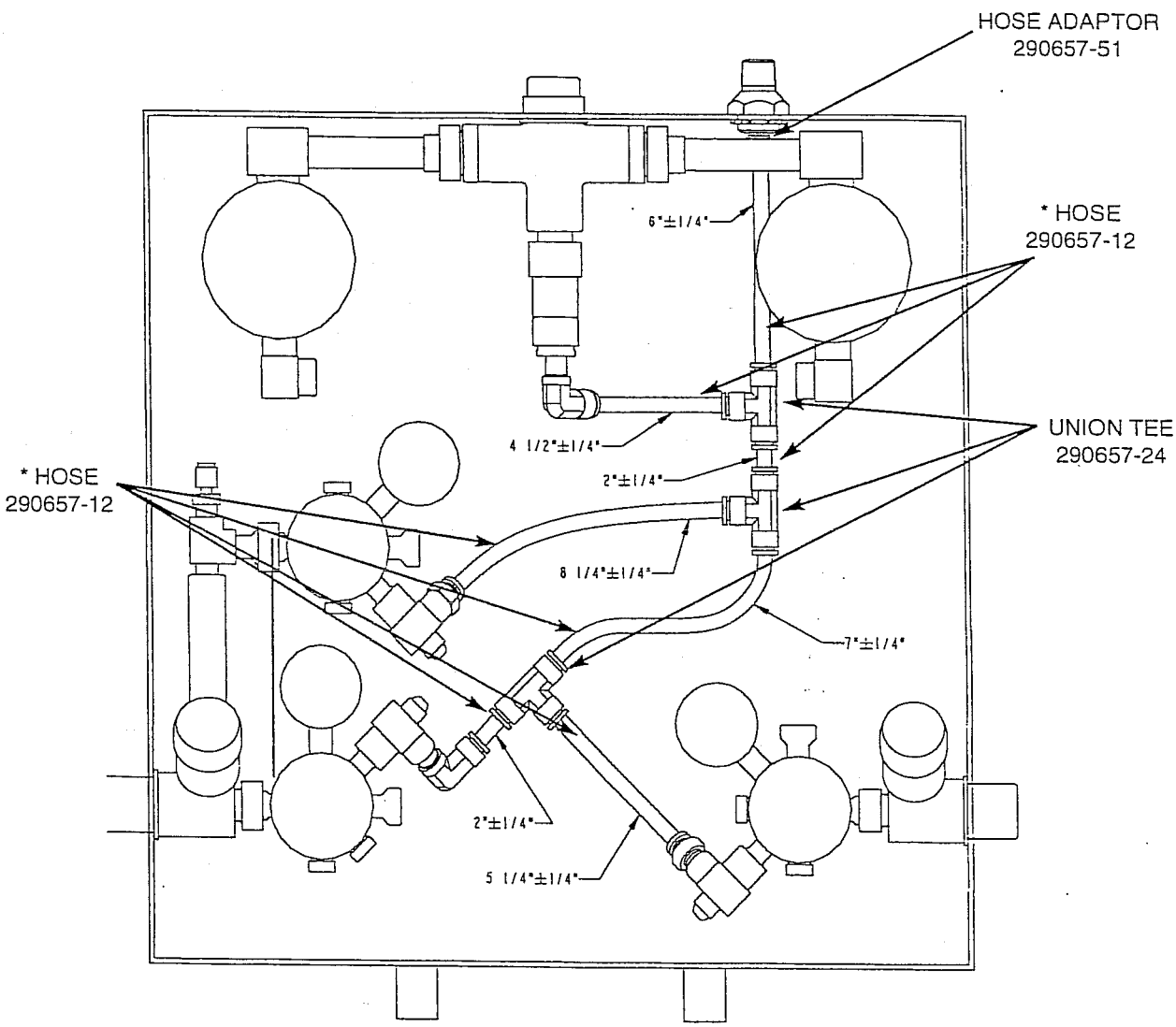


Figure 14: Gauge Schematic



* Hose sold in 32" length. Must be cut to desired length.

Figure 15: Relief Valve Schematic

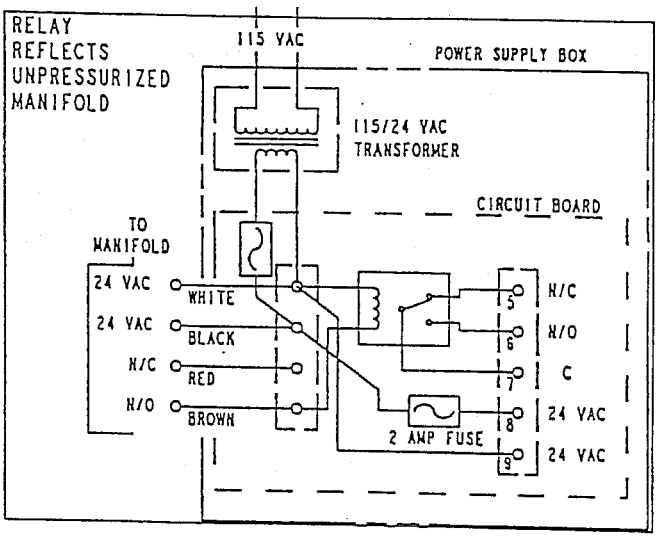
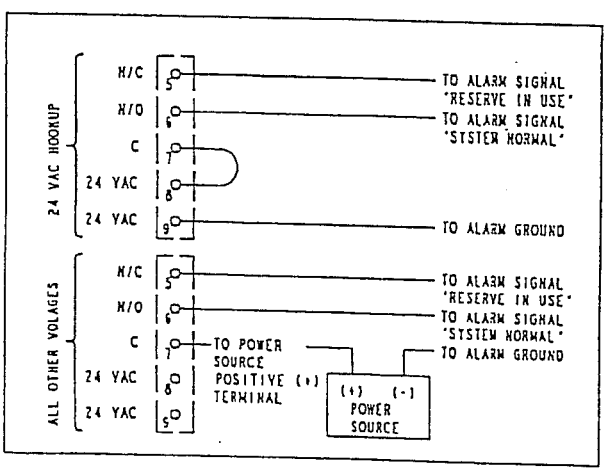
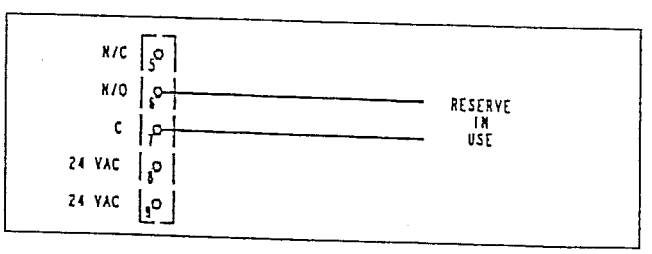


Figure 16: Electrical Service Schematics



Typical Wiring Examples



Nellcor Puritan Bennett
MEGA Alarm System

Figure 17: Electrical Service Schematics

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