



MANI-FLEX[®] **AutoSwitch**

**Automatic and Semi-Automatic
Switchover Systems**

INSTALLATION AND OPERATION INSTRUCTIONS

Before Installing or Operating, Read and Comply with These Instructions

Controls Corporation of America
1501 Harpers Road • Virginia Beach, VA 23454
To Order Call 1-800-225-0473 or 757-422-8330 • Fax 757-422-3125
www.concoa.com

May 2000
Supersedes March 1998

USER RESPONSIBILITY

This equipment will perform in conformity with the description contained in this manual and accompanying labels and/or inserts when installed, operated, maintained, and repaired in accordance with the instructions provided. This equipment must be checked periodically. Improperly working equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated, should be replaced immediately. Controls Corporation of America, Inc. (CONCOA) recommends that a telephone or written request for service advice be made to CONCOA Customer Service in Virginia Beach, Virginia. PHONE: 1-800-225-0473, FAX: 1-757-422-3125, or E-MAIL: e-mail@concoa.com.

CAUTION

Gas equipment improperly operated or maintained can be hazardous. Service or repair of CONCOA gas equipment should not be attempted by anyone other than a qualified, properly trained service technician. This equipment or any of its parts should not be altered without the written approval of CONCOA. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair, or alteration by anyone other than CONCOA or a service facility designated by CONCOA.

REPLACEMENT PARTS

Any gas equipment requiring repair or replacement of parts subject to gas pressurization should be sent to CONCOA's designated service location as special tools, techniques, and testing is required. Upon completing of servicing, the equipment must be in a condition equal to new equipment. No field repair should be attempted by anyone not trained in the testing and repair of equipment of this nature.

CUSTOMER ASSISTANCE

In the event of equipment failure, call the CONCOA Customer Service Line: 1-800-225-0473. Please be prepared to provide the model number and serial number of the equipment involved, in addition, to some details regarding its application.

SAFETY

Carefully read and comply with these instructions before installing or operating any high pressure gas manifold. These manifolds are designed, manufactured, and tested to conform to industry standards for safety for high pressure gas manifolds for maximum inlet pressure of 3000 pounds per square inch (200 bar), working pressure.

Always observe the following safety practices:

- √ Store cylinders with valve caps screwed on, and cylinders chained to a supporting wall or column.
- √ Handle cylinders carefully and only with valve caps screwed on. The cap will prevent the cylinder valve from breaking off at the top of the cylinder if the cylinder is accidentally dropped or falls over. The cap also protects the cylinder valve from damage to screw threads, which could cause leaky connections.
- √ Due to the highly combustible nature of hydrogen, all manifolds used with this gas are provided with flashback arrestors to stop any burning gas in the pipeline from getting back to the manifold or cylinders. Flashback arrestors are either water filled or dry check valve type. Gas flowing from the regulators on the manifold flows through the flashback arrestor to the pipeline.

- √ Keep all cylinders away from any source of high temperature (not over 120° F, 50° C) or possible fire hazards. High-pressure gas contained in a closed cylinder becomes increasingly dangerous when exposed to high temperature because pressure increases and the strength of the cylinder decreases.
- √ No smoking should be permitted near oxygen nitrous oxide, flammable gases and flammable mixtures and in area where cylinders are stored.
- √ Where oxygen or nitrous oxide is used, the manifold and cylinders must be kept clean. No oil, grease, or combustible substances should come in contact with oxygen or nitrous oxide storage or handling equipment. Such materials in contact with oxygen or nitrous oxide are readily ignitable and when ignited, will burn intensely.
- √ Never strike an electric arc on a gas cylinder of any kind.
- √ Never lift gas cylinders with a magnetic lifting device.
- √ Never use an open flame when leak testing.
- √ Always open valves slowly when high-pressure gases are being used.
- √ Always be sure that a cylinder contains the correct gas before connecting it to any manifold.
- √ Always leak-test any manifold or distribution pipeline before using.
- √ Always be sure that the gas in a pipeline is the correct gas for the intended use.
- √ Always install a blind gland an nut on any manifold inlet fitting if no cylinder is connected to the fitting before opening any cylinder valve which is already connected to the manifold.
- √ Always close all cylinder valves before disconnecting cylinders from a manifold.
- √ Always remove all empty cylinders from a manifold before connecting full cylinders.
- √ Always test cylinders to be sure they are full before connecting to a manifold.
- √ NOTE: Use of Teflon[®] lined pigtailed for oxygen installations is not recommended. Components in the manifold system can create a dead end passage. The combination of a dead end passage coupled with a rapid pressurization may lead to adiabatic compression of the contained oxygen and subsequent failure of the pigtail by ignition.
- √ All gas distribution piping systems must meet appropriate industrial standards for the intended service, and must be thoroughly cleaned before using.

Comply with all safety rules and precautions of the following:

1. American National Standards Institute standard Z49.1 or Safety in Welding and Cutting, American Welding Society, 2501 NW Seventh Street, Miami, FL 33125.
2. N.F.P.A. Standard 51, Oxygen-Fuel Gas Systems for Welding and Cutting, N.F.P.A., 470 Atlantic Avenue, Boston, MA 02210.
3. N.F.P.A. Standard 51B, Cutting and Welding Processes, (see Address in #2)

4. CONCOA Publication ADE 872, Safety Precautions in Welding and Cutting.
5. Local ordinances.
6. O.S.H.A.
7. C.G.A. Pamphlet C-4, American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained.*
8. C.G.A. Pamphlet G-4, Oxygen-Information on the properties, manufacture, transportation, storage, handling, and use of oxygen.
9. C.G.A. Pamphlet G-4.1, Equipment Cleaned for Oxygen Service.
10. C.G.A. Pamphlet C-4.4, Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems.
11. C.G.A. Pamphlet G-5, Hydrogen - Information on the properties, manufacture, transportation, storage, handling, and use of hydrogen.
12. C.G.A. Pamphlet G-6, Carbon Dioxide - Information on the properties, manufacture, transportation, storage, handling, and use of carbon dioxide.
13. C.G.A. Pamphlet G-6.1, Standard for Low Pressure Carbon Dioxide Systems at Consumer Sites.
14. C.G.A. Pamphlet P-1, Safe Handling of Compressed Gases in Containers.
15. C.G.A. Safety Bulletin SB-2, Oxygen Deficient Atmospheres.

*C.G.A. pamphlets can be obtained from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202-3269, (703) 979-4341. FAX: (703) 979-0134.

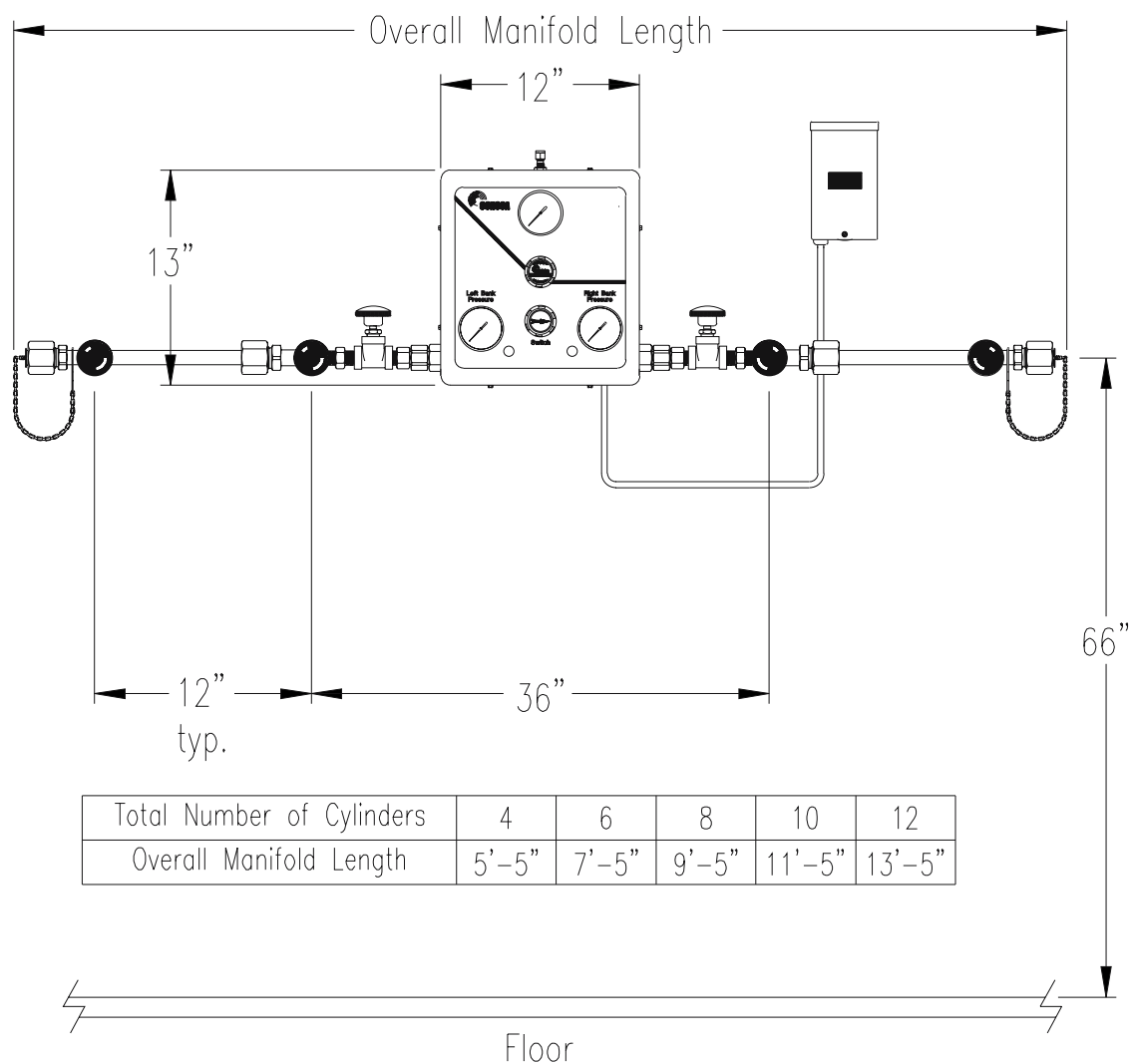


Figure 1. Manifold System

LOCATION

The site chosen for the manifold installation shall be one that is level, well ventilated, and at a safe distance from sources of flames, sparks, and excessive heat. The location shall be such that the equipment is not subjected to damage from passing trucks, cranes, or other heavy machines.

Oxygen manifolds shall not be located in an acetylene generator room or in close proximity to cylinders of combustible gases. Unless well separated, there should be a fire resistant partition between the oxygen manifold and a combustible gas manifold or cylinders. Oxygen manifolds shall be located away from highly flammable material, especially oil, grease or any substance likely to cause or accelerate fire. They must not be installed under shafting, belting, or other places where oil can drip on them.

Oxygen manifolds to which cylinders having an aggregate capacity of more than 6,000 cu.ft. of oxygen are connected should be preferably located either outside or in a special building. If located inside a building having other occupancy, such manifolds shall be located in a separate room of fire-resistant construction, or in an area of fire-resistant construction with no combustible material within 20 feet of the manifold.

The floor space required shall be determined by the type of installation being made (see Figure 1).

GENERAL INSTRUCTIONS

Manifolds should be installed in accordance with guidelines stated by the National Fire Protection Agency, The Compressed Gas Association, OSHA and all applicable local codes. Manifolds should not be placed in locations where the temperature will exceed 102°F (49°C) or fall below 0°F (-18°C). Manifolds installed in open locations should be protected from weather conditions. During winter, protect the manifold from ice and snow. In summer, shade the manifold and cylinders from continuous exposure to direct sunlight. Always leave access to the manifold for cylinder replacement.

WALL-MOUNTED INSTALLATION

1. Determine and mark the vertical center line for installation of the AutoSwitch Console. (Figure 2).
2. Measure from the floor 73" in height* of this center line. Using a level, mark a horizontal line at this point extending approximately 10 inches to the left and right of center.
3. Remove the mounting bracket from the rear of the AutoSwitch Console by removing the nuts at the bottom of the bracket. Place the upper edge of the bracket cross-member on the horizontal line so that it is centered with the vertical line. Holding the bracket with the slotted extensions away from the wall, mark the location of the two mounting bolts (Figure 3)
4. Using appropriate hardware based on wall construction, anchor the mounting bracket to the wall (Figure 4).
5. Secure the AutoSwitch Console in place by sliding the round retainers on the back of the back of the console and tighten lightly. These bolts stabilize the unit and are not load bearing (Figure 5).

*The height of 73" is recommended. Locating the AutoSwitch Console at this height will place the manifold header at approximately 66". (Figure 1).

Note: The 528 Series Maniflex UHP stainless steel modular manifolds are only available in the standard length single row orientation.

The 528 Manifold header valve has a CGA 346 on inlet of the valve. The pigtails must have a CGA 346 nut and gland on the end of the pigtail that connects to the manifold header valve. The cylinder connection end of the pigtail will be the CGA nut and gland as required for the use of the gas cylinder. The cylinder connection end of the pigtail incorporates a check valve.

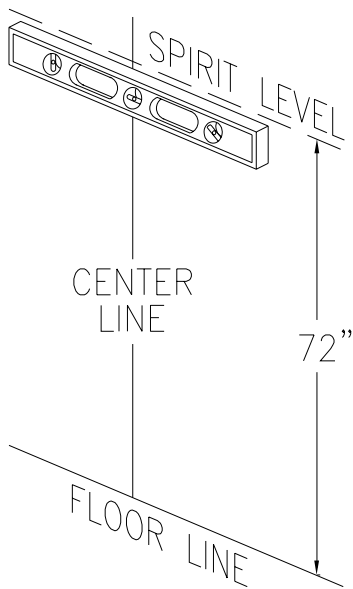


Figure 2. Center Line Mark

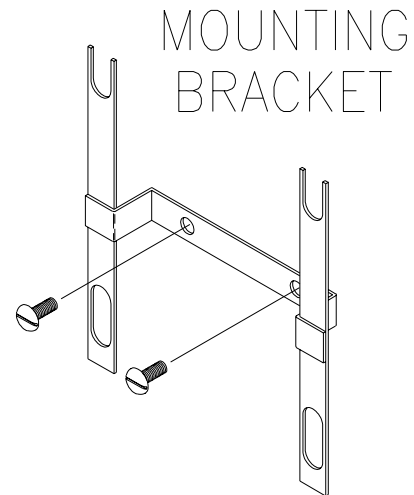


Figure 3. Mounting Bracket

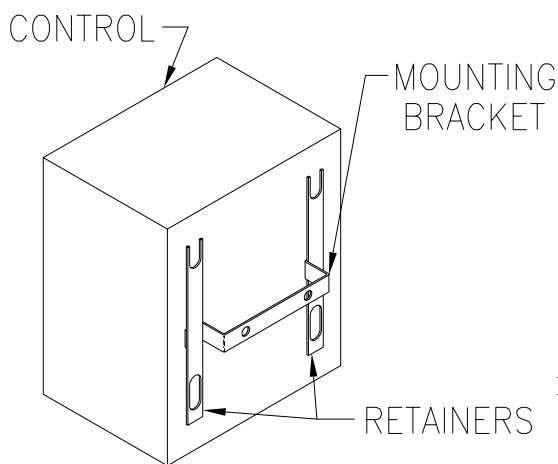


Figure 4. Console and Mounting Bracket

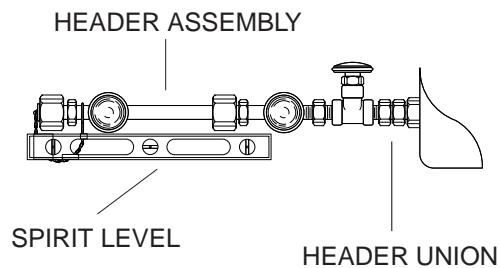


Figure 5. Level and Header Assembly

FLOOR-MOUNTED INSTALLATION

If ridged coils are used, connect one coil assembly to a gas cylinder of the type to be used. The coils should be in the vertical position. The manifold valve should be positioned with the inlet facing down (hand wheel toward you) for single row application. For double row manifolds, the manifold valves are positioned with the inlet facing you (hand wheel up). The coils for double row manifolds have a 90° elbow to allow easy installation.

Measure the distance from the floor to the center line of the manifold inlet connection. This is the Manifold Center Line Height. If flexible pigtails are employed, the manifold valves are to be positioned as described for single and double rows above. With the flexible pigtails, the dimensions shown on Figure 1 may be used. If the system includes an automatic console, two floor stands are supplied to support the console (see Figure 6). The hardware includes a console lower bracket that should be installed on the console utilizing the lower bolts and nuts on the rear of the console.

Floor stands are provided to support the manifold bar. The number of stands provided is dependent on the number of cylinders the manifold accommodates. The floor stands should be positioned approximately 24" apart (see Figure 6). Each stand includes a cylinder chain bracket with mounting hardware and chain.

The height of the cylinder bracket is determined by positioning the bracket using a cylinder of the type to be used . For single row installation two chains per bracket are provided and double row manifolds have four chains provided per bracket. The stands should be place in its desired location on the floor (see Figure 6). The floor should be reasonably level and smooth and suitable for installation of anchor bolts to secure the stands to the floor to permit easy handling of cylinders. The floor stands are provided with special hardware that allows easy height adjustment to the cylinder bracket and manifold module. A special nut and spring combination is provided. The spring should be positioned to sit on the closed section of the U-channel and the threaded nut facing the open end of channel (see stand detail, Figure 6.).

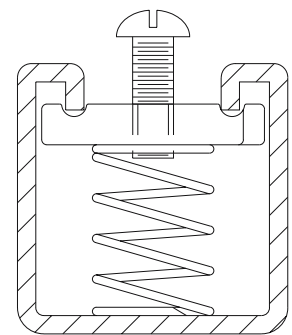
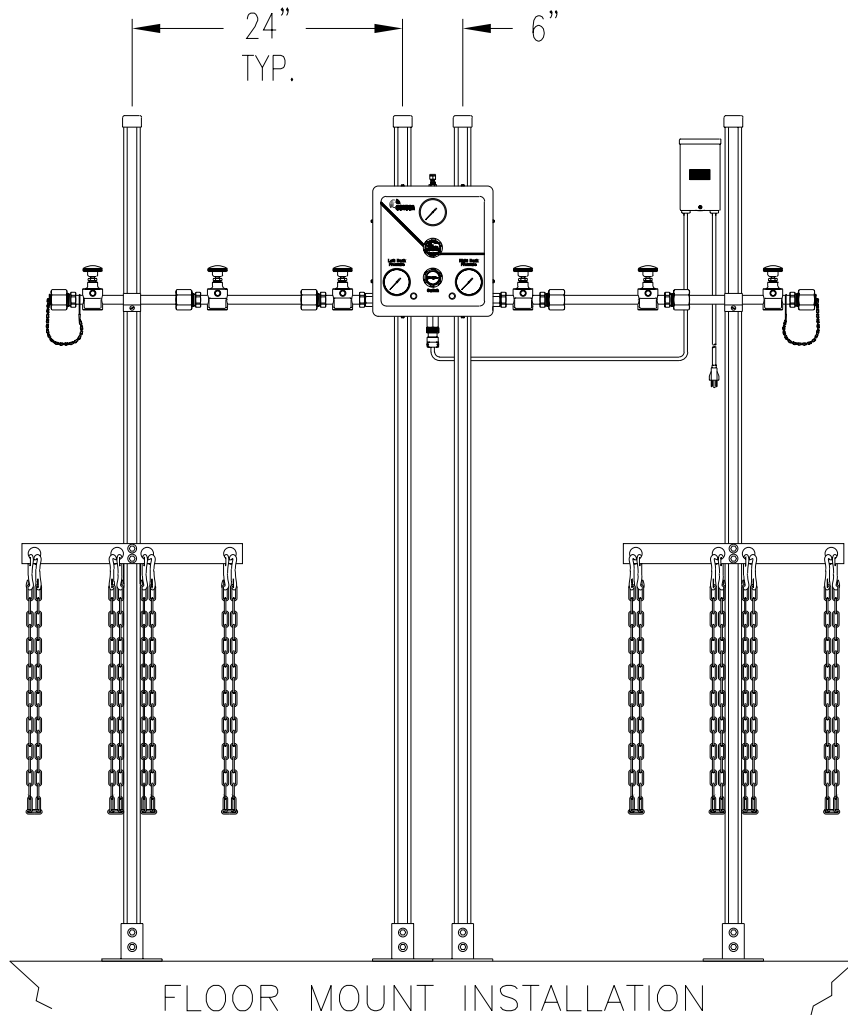


Figure 6. Floor Mount Installation and Stand Detail

HEADER INSTALLATION

1. Disassemble the ½" Swagelok connection in the control connector assembly. Wrap the male pipe threads with Teflon tape. Thread the male connector into the inlet connection on the Switchover console. Thread the other male pipe threaded end into the starter assembly. NOTE: When attaching the header to the console hold the bulkhead fitting on the console with a wrench and tighten the header with a second wrench.
2. Assemble the header mounting bracket to the starter assembly. Reassemble the control connector assembly. Checking for level, mark the wall at the mounting bracket holes.
3. Using appropriate hardware for the wall construction, secure the starter assembly to the wall.
4. Assemble mounting brackets to the extensions. Loosely assemble extensions one at a time to the header (no Teflon tape required) and secure mounting bracket to the wall. Tighten each extension connection before installing the next.
5. With the header extension completely assembled install and tighten the end plug to the open end of the final extension.
6. Make sure that all connections are tightened.
7. Teflon tape the male pipe thread end of the pigtails and thread into the header control blocks. The proper orientation for all pigtails is vertically down from the manifold header.
8. The Switchover Console is supplied with a ¼" Swagelok connection on the outlet. Insert use line (¼" O.D. seamless stainless steel or copper tubing) into the connection with the nut finger tight. Tighten the nut 1¼ turns from finger tight.

ELECTRICAL CONNECTION

FOR MODELS WITH INTERNAL PRESSURE SWITCHES

1. A 15 VAC power supply transformer is supplied with the Switchover Console. Mount the electrical box to the wall above and to the right of the console. The attached console mounts in a 5-pin plug, matching a receptacle on the bottom of the control console (Figure 7).
2. After mounting the power supply box to the wall, plug the cable into the control console receptacle.
3. The power supply is equipped with a 6-foot cord with a 3-prong plug for connection to a standard 115-volt outlet.

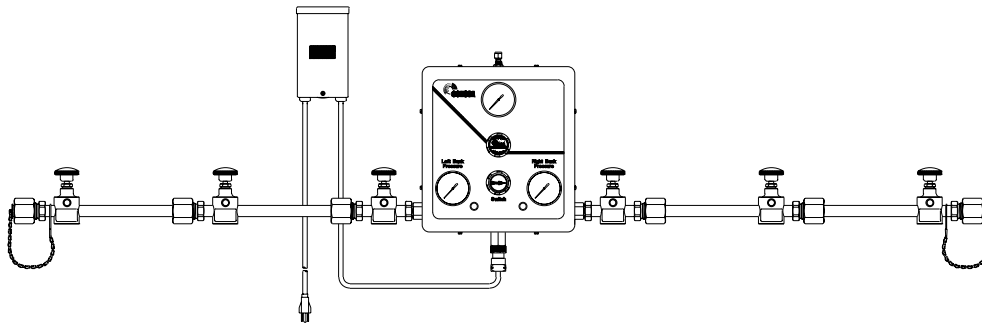


Figure 7. Electrical Connection

REMOTE ALARM INSTALLATION

1. Remove cover from remote alarm. CAUTION: Be careful not to damage components and leads attached to the front cover.
2. Mount remote alarm in location where you want the alarm to be seen and heard. Note: Mounting holes are provided on the inside rear of the alarm box.
3. Route control cable through the grommet provided in the bottom of the alarm box. Note: Customer to provide control cable, three conductor insulated cable (18ga to 24ga) is suitable.
4. Connect leads to terminal block inside alarm box (see Figure 8).
5. Reassemble cover on remote alarm. CAUTION: Be careful not to damage components and leads attached to the front cover.
6. Route control cable to switchover power supply.
7. Remove cover and bottom plug from power supply box.
8. Route control cable leads to the terminal block inside the power supply box. Note: Looking into power supply box through hole where plug was removed.
9. Attach the control cable leads to the terminal block inside the power supply box. Note: Looking into the box with the power cord on the bottom, the common terminal will be on right, the left bank terminal will be in the middle and the right bank terminal will be on the left.
10. Replace the cover on the power supply and make sure that the power supply is connected to the switchover, power cords for both the remote alarm and power supply must be attached to powered receptacles.

Installation should now be complete.

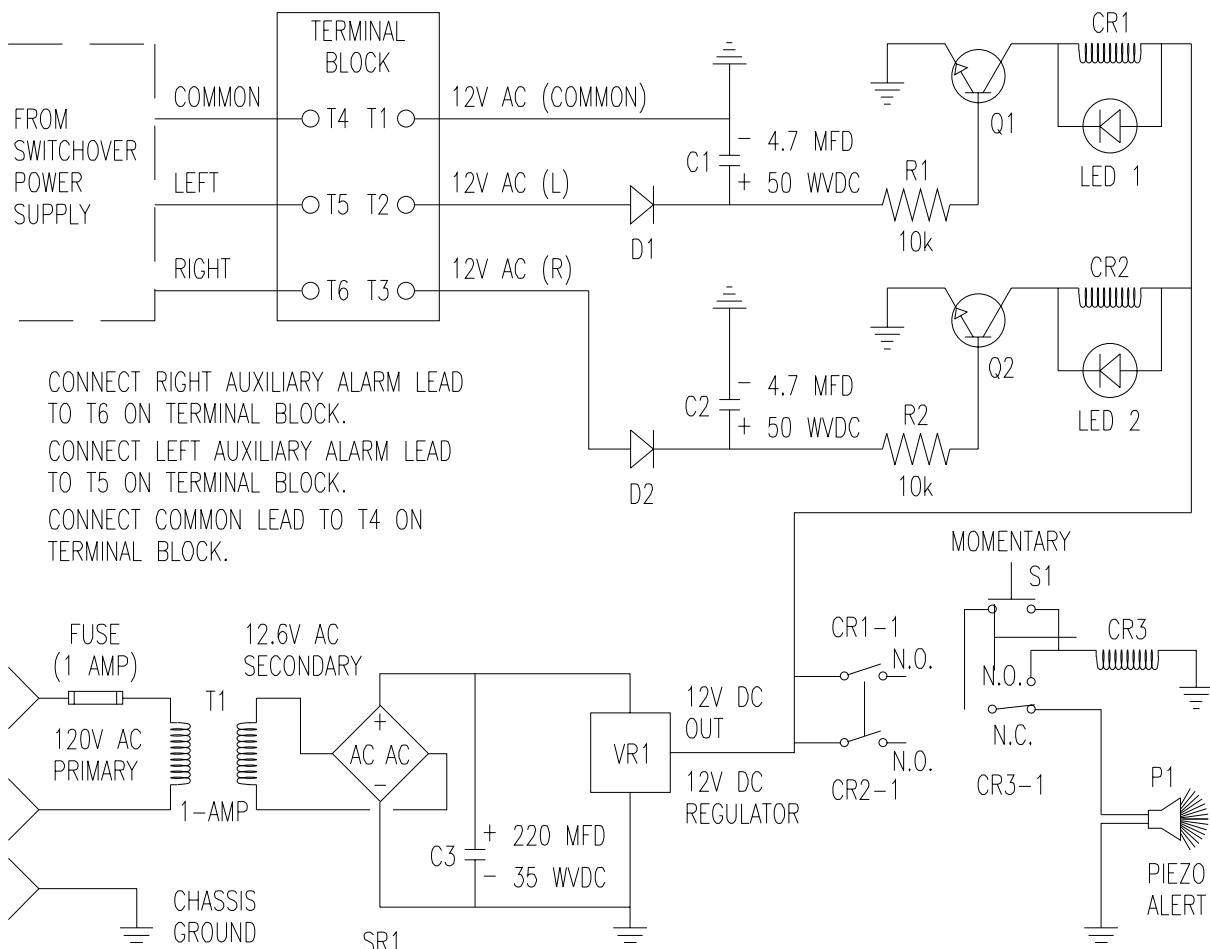


Figure 8. Remote Alarm Installation Circuit Schematic

CYLINDER CONNECTION

1. It is recommended that all systems be pressure tested, leak tested, and purged with an inert gas such as nitrogen. To accomplish this with pigtailed connections other than a CGA 580, it will be necessary to use an adapter. The recommended use of an adapter is for temporary use, only for system checks and start up. Adapters should never be used on a permanent basis.
2. Connect a nitrogen cylinder to the last pigtail on the manifold and cylinders of the use gas to each of the other pigtails. Turn off (clockwise) all manifold header valves with the exception of the header valve for the nitrogen cylinder. The line regulator on the AutoSwitch Console should be in the full off position (counterclockwise). Slowly open the valve on the nitrogen cylinder to pressurize the manifold header. Check all manifold connections for leaks using an oxygen-compatible leak test solution. Any bubbling at a connection is an indication of a leak.
3. Hydrogen systems must be purged with nitrogen. Mixtures of 4% hydrogen in dry air and up to 75% hydrogen in dry air are highly combustible
Never purge the system with hydrogen until after it has been purged with nitrogen.
4. Never attempt to fix a leak under pressure. If leaks are detected, depressurize the system and retighten the connection. Repeat, Step 2.
5. One at a time open the other manifold header valve (slowly) to pressurize the pigtails. Leak test the pigtail connections to the header valve.
6. Turn off nitrogen cylinder valve and manifold header valve. Disconnect nitrogen cylinder and remove adapter. Connect use gas cylinder.

CONSOLE START-UP AND CHECK

1. After the manifold header has been leak tested, turn on a single cylinder of gas from each side of the manifold. When the system is pressurized turn off the manifold header valve and observe the inlet pressure gauges on the AutoSwitch Console. Pressure should remain constant.
2. Turn the priority valve knob so that the arrow points to the right. This will set cylinder priority to the right side. Adjust the line regulator to yield a small-low pressure flow. If the console is equipped with pressure switches, plug in the electrical power supply. Observe pressure gauges. The pressure gauge on the right should indicate a decreasing pressure while the gauge on the left remains constant. When the gauge on the right drops to approximately 200 PSIG you should notice that the pressure stabilizes and the pressure on the left bank gauge will begin to drop. This is an indication that a switchover has occurred. In addition, if the console is equipped with pressure switches the right bank light will light, indicating that a switchover has occurred and it is time to change cylinders.
3. Repeat the procedure in Step 2 with the priority valve knob turned to the left side. The system is now ready for operation.
4. Open all manifold header valves and slowly open cylinder valves.

PRINCIPLE OF CONSOLE OPERATION

The AutoSwitch console operates on the principle of pressure differential. The priority valve within the console incorporates two single stage regulators in one body. The rear regulator connects to the left side cylinders and is preset. The front regulator connects to the right side cylinders and is adjustable (180°). The two regulator outlets are piped together by internal passages in the priority valve such that the higher outlet pressure of the primary regulator keeps the diaphragm lifted on the reserve regulator preventing flow from the reserve regulator and allowing flow from the primary regulator.

The outlet from the priority valve is piped to the integral line regulator which controls line pressure to the system. There will be no variation in line pressure during switchover.

OPERATION

With the arrow pointing to the right, the cylinder on the right side is the primary cylinder and the cylinder on the left is held in reserve. Gas will flow from the right side cylinder. The pressure at the outlet of the priority valve will be 220 PSIG. When the pressure drops to 200 PSIG (the setting of the preset regulator), flow will begin from the left side or reserve cylinder. At this time, inlet pressure gauge on the left side bank will begin to drop indicating that a switchover has occurred (if the system is equipped with pressure switches, a light will come on the right side of the front panel). This indicates that it is time to change cylinders. Before removing the depleted primary cylinder, the knob on the right side regulator knob must be rotated 180° so that it is pointing toward the left. This makes the left side cylinder, which was in reserve, the primary source. Remove the depleted right side cylinder and replace it with a full cylinder. There will be no interruption of flow. This full bank of cylinders is now the reserve bank.

Gas will continue to flow from the left bank until outlet pressure drops to 180 PSIG as which time the knob is turned to the right and the left bank is replaced. This sequence is repeated each time a switchover occurs. It is helpful to maintain a periodic log of cylinder pressures, noting which direction the knob arrow is pointing. When the pressure gauge on the primary side is very low and the reserve side indicates that gas has begun to flow from the reserve cylinder, it is time to rotate the knob and attach a full cylinder in reserve.

NOTE: If the knob is not rotated before the empty cylinder is changed, two things can happen. First, gas may back flow from the system. This is because the pressure setting of the regulator on the primary side allows the regulator main valve to remain open. Second, when the cylinder is changed, gas will begin to flow from the new cylinder, stopping flow from the existing reserve cylinder. This means that the reserve cylinder will partially empty. After several cycles, it is possible that the reserve cylinder will go empty shortly after a switchover occurs. Always rotate the knob on the right regulator before changing a depleted cylinder.

OPERATION

There is no periodic maintenance recommended.

At no time should regulator pressure setting be changed.

Any leaks in the system should be corrected immediately.

NOTE: By periodically observing gauge readings, it is apparent when the switchover has occurred because the inlet pressure gauge on the reserve cylinder will begin to decay .

Warranty Information

This equipment is sold by CONTROLS CORPORATION OF AMERICA under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this equipment directly from CONTROLS CORPORATION OF AMERICA or its Authorized Distributors as new merchandise and are extended to the first Buyer thereof other than for the purpose of resale.

For a period of one (1) year from the date of original delivery (90 days in corrosive service) to Buyer or to Buyer's order, this equipment is warranted to be free from functional defects in materials and workmanship and to conform to the description of this equipment contained in this manual and any accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use and that regular periodic maintenance and service is performed or replacements made in accordance with the instructions provided. The foregoing warranties shall not apply if the equipment has been repaired: other than by CONTROLS CORPORATION OF AMERICA or a designated service facility or in accordance with written instructions provided by CONTROLS CORPORATION OF AMERICA, or altered by anyone other than CONTROLS CORPORATION OF AMERICA, or if the equipment has been subject to abuse, misuse, negligence or accident.

CONTROLS CORPORATION OF AMERICA's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at CONTROLS CORPORATION OF AMERICA's option, the equipment or part, which is reported to its Authorized Distributor from whom purchased, and which if so advised, is returned with a statement of the observed deficiency, and proof of purchase of equipment or part not later than seven (7) days after the expiration date of the applicable warranty, to the nearest designated service facility during normal business hours, transportation charges prepaid, and which upon examination, is found not to comply with the above warranties. Return trip transportation charges for the equipment or part shall be paid by Buyer.

CONTROLS CORPORATION OF AMERICA SHALL NOT BE OTHERWISE LIABLE FOR ANY DAMAGES INCLUDING BUT NOT LIMITED TO: INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, OR SPECIAL DAMAGES, WHETHER SUCH DAMAGES RESULT FROM NEGLIGENCE, BREACH OF WARRANTY OR OTHERWISE.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREINABOVE SET FORTH. CONTROLS CORPORATION OF AMERICA MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE EQUIPMENT OR PARTS THEREOF.