



# 601 Series Regulators

## **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](http://www.concoa.com)

**February, 2004**

**Warning:** An appropriately sized pressure relief device downstream of the regulator should be installed in your system to prevent damage to equipment and/or injury to personnel should an internal failure of the regulator occur.

**Warning:** Maximum allowable working pressure indicated on product labeling is for the regulator only. Ratings for peripherals/accessories may be less than the pressure indicated on the product label. Do not exceed the pressure ratings of the attached peripherals/accessories and the regulator's maximum allowable working pressure. Please contact your gas supplier for more information.

**Warning:** for regulators with tube fittings, select the appropriate tubing. Use seamless tubing with the proper consideration given to wall thickness and material. Please contact your gas supplier for more information.

## **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. 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.

This equipment or any of its parts should not be altered without prior written approval by CONCOA. The user of this equipment shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, damage, improper repair, or alteration by anyone other than CONCOA or a service facility designated by CONCOA.

## **CUSTOMER SERVICE**

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

### **Things to consider before removing the regulator from the box....**

1. Know the properties and special handling requirements of the gas being used. Many gases are quite dangerous (flammable, toxic, corrosive, simple asphyxiant, or oxidizers). Equipment failure or misuse may lead to problems such as a release of gas through the relief valve or regulator diaphragm. Proper safety measures should be established to handle these and other component failures.
2. Be sure that the assembly purchased is suitable for the gas and type of service intended. The system label provides the following information:
  - a. Model number
  - b. Serial number
  - c. Maximum inlet pressure

Be sure that the equipment received conforms to the order specifications. The user is responsible for selecting equipment compatible with the gas in use, and conditions of pressure, temperature, flow, etc. Selection information can be found in CONCOA technical data sheets. In addition, CONCOA representatives are trained to aid in the selection process.

3. Inspect the assembly upon receipt to be sure that there is no damage or contamination. Pay particular attention to connecting threads. While CONCOA assembles system components to exacting leak-tight standards, the customer should also inspect for any loosening of parts that may occur in shipping or installation. Loose parts may be dangerously propelled from an assembly. If there are adverse signs (leakage or other malfunction), return the assembly to the supplier. While it is advised that soiled regulators be returned for cleaning, simple external dust or grease may be removed by a clean cloth and if required with aqueous detergent suitable for the application. If there are signs of internal contamination, return to the supplier.
4. Before system start-up, it is recommended that all systems be pressure tested, leak tested, and purged with an inert gas such as nitrogen. To accomplish this with connections other than a CGA 580, it will be necessary to use an adapter. The recommended use of an adapter is for temporary use, for start-up and system checks only. Adapters should never be used on a permanent basis.

If the regulator includes gas specific inlet connections, their purpose is to prevent usage on the wrong gases. Adaptation or alteration for use on other gases can be dangerous, and is not recommended.

## **GENERAL SAFETY PRACTICES**

Comply with precautions listed in C.G.A. Pamphlet P-1, Safe Handling of Compressed Gases in Containers.

Consult the cylinder distributor for the proper use of cylinders and for any restrictions on their use (such as flow rate and temperature requirements).

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 regulator.

Always leak-test any manifold or distribution pipeline before using.

Always be sure that the gas in the system is the correct gas for the intended use.

For the United States, some applicable safety rules and precautions are listed below:

1. American National Standards Institute standard Z49.1, Safety in Welding and Cutting, American Welding Society, 2501 NW Seventh Street, Miami, Florida 33125
2. N.F.P.A. Standard 51, Oxygen-Fuel Gas systems for Welding and Cutting, N.F.P.A., 470 Atlantic Avenue, Boston, Massachusetts 02210
3. N.F.P.A. Standard 51B, Cutting and Welding Processes (same address as #2).
4. CONCOA publication ADE 872, Safety Precautions in Welding and Cutting.
5. Local Ordinances
6. O.S.H.A. Standard 29 CFR
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 G-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 22202-3239, (703) 979-0900. Publications: (703) 979-4341. Fax: (703) 979-0134.

# INSTALLATION

Please observe the previously mentioned safety precautions before actual installation.

1.1 Before removing the cylinder cap, move the cylinder of gas to the work site:

- a. Secure cylinder to floor, wall or bench with appropriate chain or stand to prevent toppling.
- b. Remove the cylinder cap.
- c. Be sure the cylinder valve is tightly closed (clockwise).
- d. Remove the cylinder valve plug, if any.
- e. Inspect the cylinder valve and threads for damage or contamination.

1.2 Following procedures below, secure the regulator inlet connector to the outlet connector on the cylinder. Use an open-end wrench, not a pipe wrench.

- a. The connection should be easily threaded. Do not force. If it is not easy, you may have the wrong regulator for the gas you are using.
- b. LEFT HAND THREADS are used on some inlet connectors and are indicated by a notch in the middle of the hex nut.
- c. GASKETS are used on some inlet connectors. If so, it will be provided with the regulator. Be sure the gasket is in good shape. Do not overtighten to avoid squashing the gasket into the gas line. You may want to order an extra supply of these gaskets from your gas supplier.
- d. Never use oil or grease on regulator or cylinder fittings, as you may contaminate pure gases, or create a fire hazard.

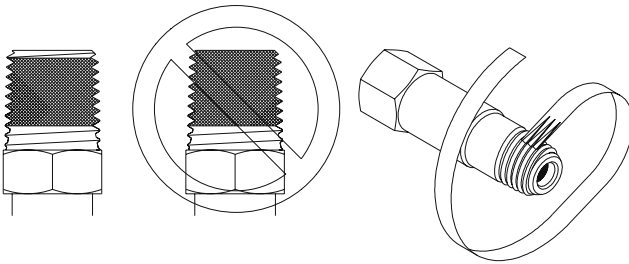
1.3 Close the regulator by turning the pressure control knob, or handle, counterclockwise. As the control knob is closed, turning should become easier.

1.4 Shut the regulator outlet valve (if supplied) by turning the knob on the valve clockwise.

1.5 Observing the following procedures; make connections from the regulator outlet to your downstream equipment.

- a. BE SURE TO CONSIDER ALL FACTORS WHEN SELECTING MATERIALS. For example, if you have both high pressure and corrosive service, select material that is suitable for both.

- b. Do not use oil or grease on fittings, especially not on oxidizing gas service equipment.
- c. Be sure that all fittings are secure and leak tight. Teflon tape should be used on pipe fittings, but avoid impinging on the gas stream. Before applying Teflon tape, inspect the NPT threads and if necessary, clean the fitting to remove any dirt or thread sealant that remains on the threads. Start the Teflon tape on the second thread as shown above; make sure the tape does not overlap the end of the fitting. As the tape is wrapped in the direction of the thread spiral, pull tightly on the end of tape so that the tape conforms to the threads. Apply two overlapping layers of Teflon tape. Cut off the excess tape and press the end firmly into the threads.



*Figure 1. Tape Installation procedures.*

- d. RELIEF VALVE. Some regulators are equipped with a relief valve. The purpose of a relief valve is to protect the regulator and its components. If there is pressure sensitive equipment downstream of the regulator it is recommended that a relief valve be installed in the line to protect this equipment. If you are using toxic, corrosive, or flammable gases, it is recommended that the exhaust from the valve be piped to a safe discharge area.
- e. PURGE DEVICES (Optional). If your regulator includes a purge, review the safety operation in the specific instruction manual for your regulator. Purge devices are highly recommended when using toxic or corrosive gases.

## OPERATION

Read the “Safety” and “Installation” sections before operating your equipment.

2.1 It is advised that high purity systems be thoroughly purged before use.

- 2.2 The regulator adjusting knob should be turned fully counterclockwise (see 1.3) and the outlet valve should be closed (see 1.4).
- 2.3 Put on safety glasses and gloves.
- 2.4 Position yourself with the cylinder between you and the regulator. Keep hands off the regulator while opening the cylinder valve.
- 2.5 To avoid damage to regulator parts, slowly open the cylinder valve. Observe the high pressure gauge for a rise in pressure up to full cylinder pressure.
- 2.6 Observe all connections for leaks.
- An approved leak detection solution may be applied to the connections, if compatible to your usage. Leaks are indicated by bubbling.
  - To further check for leaks, or if you cannot use the leak detection solution, reclose the cylinder valve for five minutes, and observe the high pressure gauge for a drop in pressure. If so indicated, recheck the CGA connection and all other high pressure port connections.
- 2.7 (Open the cylinder valve fully in order to form a good seal at the cylinder valve packing.) Keep the valve hand wheel or wrench on the open cylinder valve at all times to allow prompt emergency shutoff.
- 2.8 Adjust to the desired working pressure by turning the pressure control knob or handle clockwise, while observing the delivery pressure gauge for the approximate desired setting.
- Do not exceed the maximum delivery pressure indicated on the regulator label.
  - Again check for leaks on the low pressure ports.
  - Check the delivery pressure gauge for any drop in pressure. If a drop is indicated, check all low pressure ports for leakage.
- 2.9 Again set the delivery pressure, open the outlet valve if any, and check your system for leaks and otherwise proper functioning.
- With gas flowing through your system, some adjustment to delivery pressure may be required.
  - TWO-STAGE REGULATORS.** After the above final setting of delivery pressure, no further adjustment should be required as the cylinder depletes.



- c. SINGLE-STAGE REGULATORS. After the above final setting of delivery pressure, you may have to periodically adjust delivery pressure as the cylinder depletes.
- d. As a general rule, a cylinder should be considered EMPTY when the cylinder pressure drops to a value of two (2) times the delivery pressure or less. This avoids the possibility of dangerous suck-back conditions. However, particular system requirements may indicate greater or less margin than the recommendation. Contact your CONCOA representative if you have any questions.

## **SHUTDOWN AND DISASSEMBLY**

As indicated in the “Operation” section, a cylinder should be regarded as empty when the cylinder pressure has dropped to twice the delivery pressure or less. This will avoid the possibility of dangerous suck-back conditions, where other system gases are pulled back into the regulator and cylinder.

3.1 BRIEF SHUTDOWN (less than 30 minutes). Simply close the regulator outlet valve (if supplied). If the regulator does not have an outlet valve use procedure 3.2.

3.2 EXTENDED SHUTDOWN (beyond 30 minutes).

- a. NORMALLY OPEN SYSTEMS or COMPLETE SYSTEM DISASSEMBLY. This section applies when there is no concern about entry of atmospheric gases into the system.
  - 1. Close the gas cylinder valve.
  - 2. Shut down any other gas supplies which may be connected to your system.
  - 3. Turn the adjusting knob clockwise and open the outlet valve to drain the line through your usage points. Both regulator gauges should descend to zero.
  - 4. With HAZARDOUS GASES run an inert purging gas through the regulator and system before disassembly.
  - 5. After venting (and purging when applicable), turn the adjusting knob fully counterclockwise and close the outlet valve.
  - 6. Disconnect downstream equipment.
  - 7. In disassembling, slowly loosen the cylinder valve connection, while listening for gas seepage. If leaking is evident, retighten the connection, and check for effective closing of the cylinder valve.

8. Cap the cylinder after disconnecting the regulator. Mark the cylinder "EMPTY" if this is the case, and move it to the storage area for return cylinders.
  9. If HAZARDOUS GASES have been used, and there has not been a purging procedure as recommended, some benefit can be gained by directing a stream of dry nitrogen through the fully opened regulator. When using HAZARDOUS GASES or when in a CONFINED AREA, be sure to provide a safe discharge area when clearing the regulator.
  10. Install a new cylinder, if called for.
  11. When a regulator is out of service, close the pressure control knob by turning counterclockwise until the spring tension relieves, and close the outlet valve. Also cap open ends of the regulator, or if removed, store it in a plastic bag to prevent contamination, especially by unobserved particulate buildup inside the regulator.
- b. ISOLATED GAS SYSTEMS. Some laser manufacturers, demand that ambient air be excluded from the system. There are several methods in use:
1. Seal the usage gas in the system via a check valve in the inlet CGA gland.
  2. Purge the regulator with the process gas using the innerstage purge option.
  3. Purge the regulator with the process gas using the inlet block and bleed option.

3.3 CYLINDER CHANGE - ISOLATED GAS SYSTEMS. For cylinder change using the inner stage purge option, perform the following as shown in Figure 2:

- a. Tightly close the gas cylinder valve.
- b. Turn pressure adjusting knob counter-clockwise until the positive stop is reached.
- c. Change cylinder.
- d. Open cylinder valve.
- e. Slowly open inner purge valve located at the seven (7) o'clock position until you hear a slight "hiss".
- f. Close inner purge valve after five (5) seconds.
- g. Repeat steps e and f.
- h. Turn pressure adjusting knob to the desired operating pressure.
- i. Ready for use.

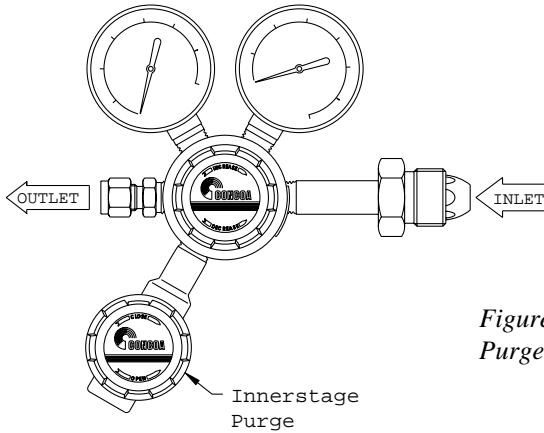


Figure 2. Innerstage Purge Option.

3.4 CYLINDER CHANGE - ISOLATED GAS SYSTEMS. For cylinder change using a block and bleed inlet purge, perform the following as shown in Figure 3:

- a. Tightly close the gas cylinder valve.
- b. Tightly close the block valve directly connected to the regulator body.
- c. Change cylinder.
- d. Open cylinder valve.
- e. Slowly open the bleed valve located at a right angle to the CGA connection until you hear a slight “hiss”.
- f. Close bleed valve after five (5) seconds.
- g. Wait thirty (30) seconds.
- h. Repeat steps e and f.
- i. Open block valve.
- j. Ready for use.

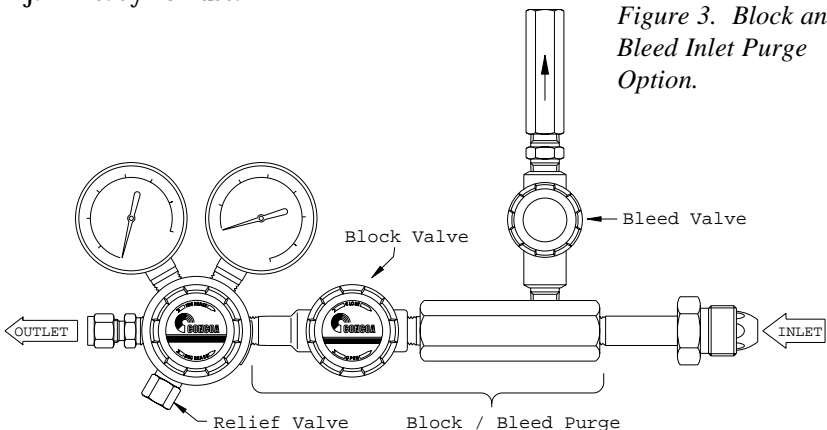


Figure 3. Block and Bleed Inlet Purge Option.

## General

A unit which is not functioning properly should not be used until all required repairs have been completed and the unit has been tested to ascertain that it is in proper operating order.

## SERVICE

It is recommended that all servicing be done by a service facility authorized by CONCOA. Contact the CONCOA Customer Service Department in Virginia Beach or the nearest CONCOA District Sales Office for assistance.

If so advised, the unit should be sent to a service facility authorized by CONCOA, adequately packaged, in the original shipping container if possible, and shipped prepaid, with a statement of observed deficiency. The gas service that the equipment has been subjected to must be clearly identified. All equipment must be purged before shipment to protect the transporter and service personnel. The purging is especially important if the equipment has been in hazardous or corrosive gas service. Return trip transportation charges are to be paid by Buyer. In all cases other than where warranty is applicable, repairs will be made at current list price for the replacement part (s) plus a reasonable labor charge.

Test regulator for leaks on a routine schedule.

# Trouble Shooting

## Symptoms

1. Gas leakage at the regulator outlet when the adjusting screw is turned fully counterclockwise.
2. With no flow through the system (downstream valves closed), outlet pressure increases steadily above the set pressure.
3. Gas leakage from spring case or bonnet.
4. Excess drop in outlet pressure with regulator flow open.
5. Gas leakage from any pipe thread joint.
6. Gas leakage from relief valve.
7. Inconsistent repeat reading
8. Inlet or outlet pressure gauge does not return to zero with no pressure applied to the regulator

## Probable Cause

1. Seat leak or creep, have regulator repaired.
2. Seat leak or creep, have regulator repaired.
3. Diaphragm failure, have regulator repaired.
4. Blockage in seat assembly or inlet filter. Have regulator repaired.
5. Loose fitting, remove connection clean, reapply Teflon tape and re-tighten.
6. Possible faulty relief valve, replace. Possible seat leak or creep, have repaired.
7. Seat sticking, have regulator repaired. Possible bad pressure gauge.
8. Gauge has suffered physical damage, replace gauge.

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# 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.**



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