



ADI 2068A

REPAIR INSTRUCTIONS
CONCOA Standard 400 Series
Stainless Steel
2-Stage Regulators
(Applicable to the following regulator series:
415, 417, 432, 433)



WARNING:

**DO NOT ATTEMPT TO REPAIR ANY REGULATOR
THAT WAS USED IN AN UNKNOWN, TOXIC, OR
HAZARDOUS GAS SERVICE.**

Before Repairing 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



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.

When risking the release of toxic, corrosive, flammable, or oxidizing gas, such as during disconnection of a gas cylinder containing such gas, use appropriate measures such as breathing apparatus, eye protection, and protective clothing to ensure the safety of personnel.

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

Phone: (703) 979-0900. Publications: (703) 979-4341. Fax: (703) 979-0134

CONDITIONS REQUIRED BEFORE ATTEMPTING A REPAIR

Do not attempt to repair a malfunctioning regulator unless the following conditions are true:

1. The gas service in which the regulator has been used is known.
2. The regulator is not being used in and has not been used in a toxic or corrosive gas service.
3. Personnel are available with the proper knowledge and training to make regulator repairs.
4. There have been no modifications made to the regulator not authorized by CONCOA.
5. Actions have been taken to properly deal with all down-stream systems (e.g., preventing atmospheric contamination of downstream equipment if this is undesirable).
6. The gas supply to the regulator has been shut off, and the regulator has been disconnected from pressurized gas.

REPAIR THE REGULATOR

With the regulator removed from the system and purged of process gas, follow the TROUBLE SHOOTING suggestions in the table below to help identify the problem and the solution to the problem. Refer also to the Exploded View of a Typical Regulator and the Parts List, Lubricants List, Torqueing List, and PTFE Taping List tables below. Remove any PTFE tape left in the NPT ports of the regulator and on the NPT threads of fittings that will be reused. This can be done using a small wire brush or dental pick and with a small vacuum cleaner or with compressed air to blow away the old tape. If using compressed air, insert the nozzle into bottom of the NPT ports to blow tape out of the port, not into the regulator.

TROUBLE SHOOTING	
<i>Symptom</i>	<i>Probable Cause</i>
Gas leakage at the regulator outlet when the adjusting knob is turned fully counterclockwise.	Seat Leak or Creep: Replace the diaphragm, the capsule assembly, and the capsule o-ring.
With the regulator outlet pressure set and no gas flowing, the outlet pressure increases steadily above the set pressure.	
System makes a humming noise.	Damaged Vibration Damper: Replace the vibration damper. -or- Capsule Failure: Replace the diaphragm, the capsule assembly, and the capsule o-ring.
Gas leakage from regulator spring case.	Regulator Diaphragm Failure: Replace the diaphragm, the capsule assembly, and the capsule o-ring.
Excessive drop in outlet pressure when regulator flow is started.	Blockage in Regulator Seat Assembly or Inlet Filter: Replace the diaphragm, the capsule assembly, and the capsule o-ring.
Gas leakage from a pipe thread joint.	Loose Fitting: Remove fitting; clean it; reapply PTFE tape; reinstall the fitting.
Gas leakage from relief valve.	Relief Valve Failure: Replace the relief valve. -or- Possible Seat Leak or Creep: Replace the diaphragm, the capsule assembly, and the capsule o-ring.
Inconsistent repeat pressure reading.	Possible Bad Pressure Gauge: Replace the gauge. -or- Seat Sticking: Replace the diaphragm, the capsule assembly, and the capsule o-ring.
Inlet or outlet pressure gauge does not return to zero with no pressure applied to the regulator.	Gauge has Suffered Physical Damage: Replace the gauge.
Inlet or outlet valve fails to cut off gas flow when closed.	Damaged or Faulty Valve Seat: Replace the valve.

PARTS LIST

ITEM	QTY IF PRESENT	DESCRIPTION	ITEM	QTY IF PRESENT	DESCRIPTION
1	1	Regulator Body	15	2	Knob Nut
2*	2	Capsule O-Ring	16	1	Knob
3*	2	Capsule Assembly	17	1	Knob Cap
4*	2	Diaphragm	18	1	Knob Label
5	2	Diaphragm Plate	19*	1	Relief Valve or Pipe Plug
6*	2	Leaf-Style Vibration Damper	20	1	Pipe Plug
7	1	Bonnet	21*	1	Inlet Gauge
8	1	Main Pressure Adjusting Spring	22*	1	Outlet Gauge
9	1	Spring Button O-Ring	23	1	1st Stage Pressure Adjusting Spring
10	1	2nd Stage Spring Button	24	1	1st Stage Spring Button
11	1	Adjusting Screw Ball Bearing	25	1	Outlet Gauge
12	1	Adjusting Screw Retaining Ring	26	1	1st Stage Set Screw
13	1	Adjusting Screw Assembly or Set Screw	27	1	Acorn Nut
14	1	Bonnet Cap			

* Items marked with an asterisk are the items that most frequently require replacement. Other items rarely require replacement.

TORQUEING LIST

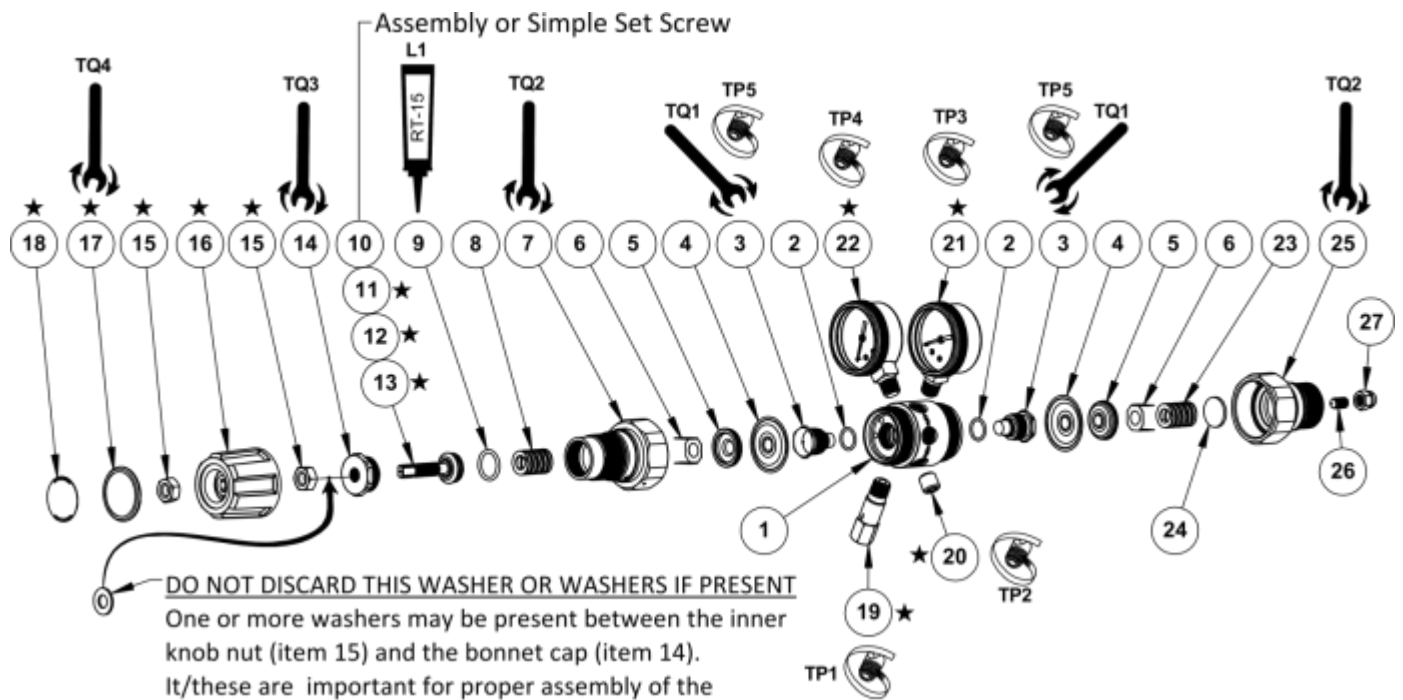
ITEM	TORQUE SPECIFICATION	DESCRIPTION
TQ1	90 ft-lbs min. (122 Nm)	Stainless Steel Capsule Installation
TQ2	180 ft-lbs min. (244 Nm)	Bonnet Installation
TQ3	150-250 in-lbs (17-28 Nm)	Bonnet Cap Installation
TQ4	80 in-lbs min. (9 Nm)	Top Knob Nut Installation

PTFE TAPING LIST

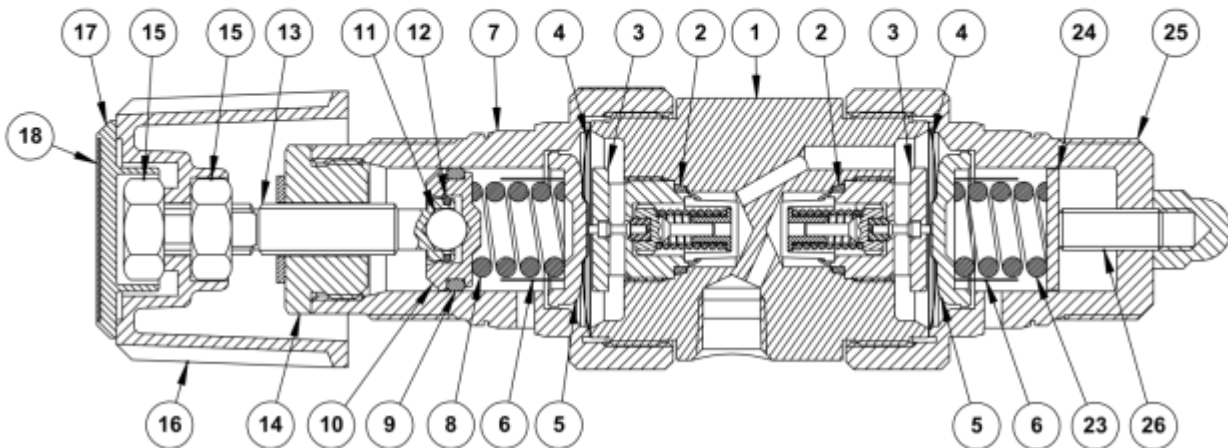
ITEM	DESCRIPTION
TP1	Apply PTFE tape to threads of fitting in relief valve port (RV or pipe plug).
TP2	Apply PTFE tape to threads of fitting in aux. HP port (usually a pipe plug).
TP3	Apply PTFE tape to threads of inlet pressure gauge.
TP4	Apply PTFE tape to threads of outlet pressure gauge.
TP5	Apply PTFE tape to threads of capsules.

LUBRICANTS LIST

ITEM	LUBRICANT	DESCRIPTION
L1	Klubertemp GT RT-15	Lubricate Spring Button O-Ring



★ Shown is a typical 6-port regulator. Items marked with a star are not present on all models. Some regulator series have a different port arrangement (e.g., 5-ports). Some models have a pipe plug in place of the relief valve (item 19).

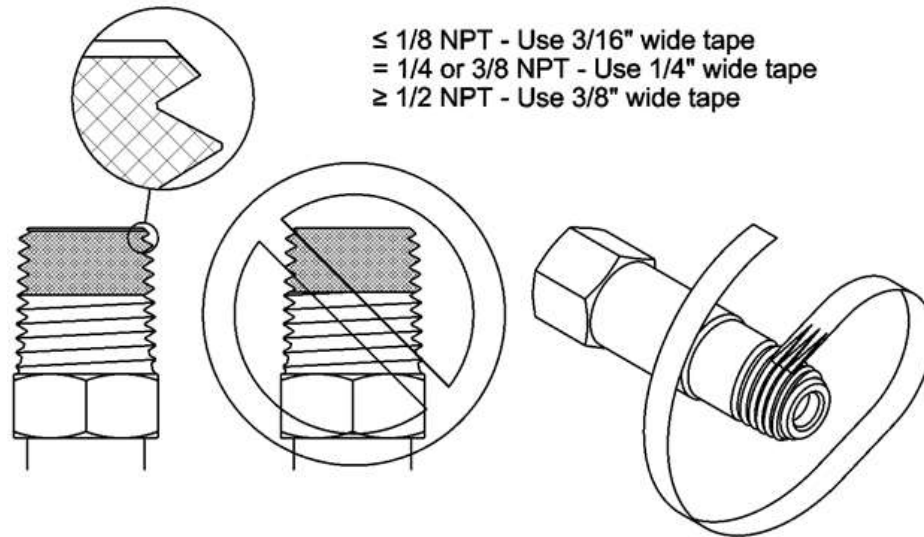


SYSTEM REASSEMBLY

Observe the following instructions when reassembling the system.

a. Avoid the use of oil or grease on fittings. In the rare circumstances where lubrication is required (e.g., on stainless steel metal-to-metal seats to prevent galling), ALWAYS USE AN OXYGEN COMPATIBLE LUBRICANT AND USE IT SPARINGLY.

b. Be sure that all fittings are secure and leak tight. Use PTFE tape on all NPT connections. PTFE tape must be used on NPT threads to ensure a gas tight seal. Avoid impinging on the gas stream. On stainless steel connections, PTFE tape also helps to prevent the connections from galling together when tightening or loosening. Follow the rules below when using PTFE tape:



PTFE TAPING PROCEDURE FOR FITTINGS (not applicable to capsules):

Before applying PTFE tape to a fitting, inspect the NPT threads, and, if necessary, clean the fitting to remove any dirt or thread sealant that remains on the threads. Start the PTFE tape on the first thread, leaving a slight section of the chamfer exposed as shown in the figure 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 the tape so that the tape conforms to the threads. Apply at least 2 but no more than 3 layers of tape to the threads. Cut off excess tape, and press the end firmly into the threads.

PTFE TAPING PROCEDURE FOR CAPSULES

Use PTFE tape on the threads of stainless steel capsules (not required on brass capsules) to minimize the risk of galling the capsule into the capsule cavity.

Using 3/16" wide PTFE tape, wrap one turn of tape only around the capsule thread taking care to keep the tape within the thread boundaries top and bottom. After assembly of the capsule into the capsule cavity, all PTFE tape must be sandwiched between threads. No PTFE tape may be visible protruding from between the threads of the capsule and the capsule cavity. If necessary, trim protruding tape using a precision razor knife.

RESTARTING THE REPAIRED SYSTEM

Read the "General Safety Practices" section before operating the repaired equipment.

1. Before restart, the regulator adjusting knob if present should be turned fully counterclockwise (OFF), and the outlet valve if present should be closed.
2. Put on safety glasses.
3. Place capped full cylinder(s) in the regulator supply position. Cylinder(s) should be secured to the wall, floor, or bench with appropriate chain or bracket to prevent toppling.
4. Remove the cylinder cap(s).
5. Ensure that the cylinder valve(s) are tightly closed (clockwise).
6. Remove the cylinder valve plug if any.
7. Inspect the cylinder valve and threads for damage or contamination.
8. Secure the regulator inlet connector(s) to the outlet connector on each cylinder using 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 gas cylinder for the system.
 - 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. Be sure the gasket is in good shape. Do not over-tighten to avoid squashing the gasket into the gas line. You may want to order extra gaskets from the gas supplier.
 - d. Never use oil or grease on the cylinder fittings as you may contaminate pure gases or create a fire hazard.
9. Position yourself with the cylinder(s) between you and the regulator. Keep hands off the regulator while opening the cylinder valve(s).
10. To avoid damage to regulator parts, slowly open the cylinder valve(s). Observe the high pressure gauge if present for a rise in pressure up to full cylinder pressure.
11. Observe all connections for leaks.
 - a. An approved leak detection solution may be applied to connections if compatible with your usage. Leaks are indicated by bubbling.
 - b. If the regulator has an inlet pressure gauge, you can further check for leaks (or you can use this method if you cannot use leak detection solution) by reclosing the cylinder valve(s) for five minutes and then observing the high pressure gauge for a drop in pressure. If inlet pressure drops, there is a leak. Recheck the cylinder connections and all other high pressure port connections.
12. Open the cylinder valve(s) fully in order to form a good seal at the cylinder valves' packing. Keep a hand on each valve hand wheel or a wrench on each cylinder valve at all times while opening to allow prompt emergency shutoff.
13. For regulators with an adjusting knob, adjust to the desired working pressure by turning the pressure control knob clockwise while observing the delivery pressure gauge if present for the approximate desired setting.

- a. Check for leaks on the low pressure ports.
 - b. Check the delivery pressure gauge for any drop in pressure. If a drop is indicated, check all low pressure ports for leakage.
14. Again set the delivery pressure, open the outlet valve if present, and check your system for leaks and otherwise proper functioning.
- a. With gas flowing through your system, some adjustment to delivery pressure may be required (flowing pressure may differ from static pressure).
 - b. After the above final setting of delivery pressure, you will rarely need to adjust delivery pressure on a 2-stage regulator (delivery pressure remains constant on a 2-stage regulator as cylinder pressure goes down).
 - c. 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 require greater or less margin than this recommendation. Contact your CONCOA representative if you have any questions.