

# MODEL B7

## BACK PRESSURE REGULATOR

### SECTION I

#### I. DESCRIPTION AND SCOPE

The Model B7 is a back pressure regulator used to control upstream (inlet or  $P_1$ ) pressure. Available in sizes 1/2" and 3/4" (DN15 and DN20) with FNPT, Flanged ends or Tri-Clamp connections. The unit is suitable for gaseous service. Refer to Technical Bulletin B7-TB for design conditions and selection recommendations.

#### ⚠ CAUTION

**This is not a safety device and must not be substituted for a code approved pressure safety relief valve or a rupture disc.**

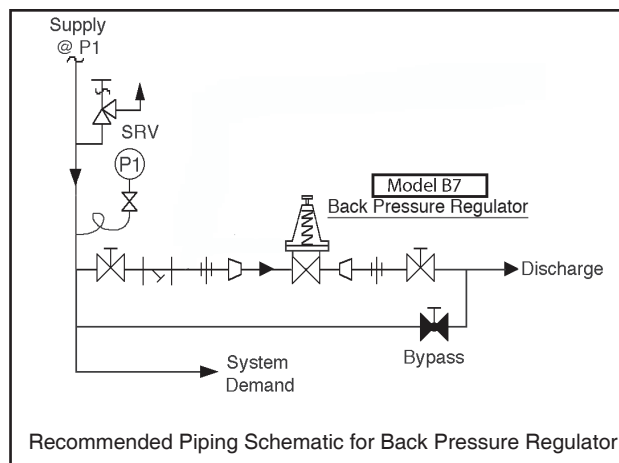
### SECTION II

#### II. INSTALLATION

#### ⚠ CAUTION

**Installation of adequate overpressure protection is recommended to protect the regulator from overpressure and all downstream equipment from damage in the event of regulator failure.**

1. An inlet block valve should always be installed.
2. If service application is continuous such that shutdown is not readily accomplished, it is recommended that an inlet block valve, outlet block valve, and a manual bypass valve be installed.
3. Pipe unions should be installed to allow removal from piping.
4. An inlet pressure gauge should be located approximately ten pipe diameters upstream, and within sight.
5. All installations should include a downstream relief device if the inlet pressure could exceed the pressure rating of any downstream equipment or the maximum outlet pressure rating of the unit.
6. Clean the piping of all foreign material including chips, welding scale, oil, grease and dirt before installing the regulator. Strainers are recommended.
7. In placing thread sealant on pipe ends prior to engagement, ensure that excess material is



- removed and not allowed to enter the regulator upon startup.
8. Flow Direction: Install so the flow direction matches the inlet stamp on the regulator body (1).
9. For best performance, install in well drained horizontal pipe.
10. Regulator may be rotated around the pipe axis 360°. Recommended position is with knob (20) or adjusting screw (14) vertical upwards.
11. Regulators are not to be buried underground.
12. For insulated piping systems, recommendation is to not insulate regulator.

## SECTION III

### III. PRINCIPLE OF OPERATION

1. Movement occurs as pressure variations register on the piston (5). The registering pressure is the inlet,  $P_1$ , or upstream pressure. The range spring (12) opposes piston movement. As inlet pressure drops, the range spring pushes the piston down, closing the

port; as inlet pressure increases, the piston pushes up and the port opens.

2. A piston failure will cause the regulator to fail closed.

## SECTION IV

### IV. STARTUP



#### CAUTION

**The maximum inlet pressure is stamped on the body as the upper range spring pressure level, and is the recommended "upper operative limit" for the sensing piston (see Section IV. Startup, Step 7). Higher pressures could damage the internals. DO NOT HYDROSTATIC TEST THROUGH AN INSTALLED UNIT; ISOLATE FROM TEST.)**

1. Start with the block valves closed. A bypass valve may be used to maintain inlet pressure in the upstream system without changing the following steps.
2. Relax the range spring (12) by turning knob (20) or adjusting screw (14) counter clockwise (CCW) a minimum of three full revolutions. This reduces the inlet pressure setpoint.
3. If it is a "hot" piping system, and equipped with a bypass valve, slowly open the bypass valve to pre-heat the system piping and to allow slow expansion of the piping. Closely monitor inlet (upstream) pressure via gauge to assure not over-pressurizing. **NOTE:** *If no bypass valve is installed, extra caution should be used in starting up a cold system; i.e. do everything slowly.*
4. Crack open the inlet (upstream) block valve.
5. Slowly open the outlet (downstream) block valve observing the inlet (upstream) pressure gauge. Determine if the regulator is flowing. If not, slowly rotate the regulator knob or adjusting screw CCW until flow begins.

6. Continue to slowly open the outlet (downstream) block valve until fully open.
7. Observing the inlet (upstream) pressure gauge, rotate knob or adjusting screw clockwise (CW) slowly until the inlet pressure begins to rise. Rotate CW until the desired setpoint is reached.
8. Continue to slowly open the inlet (upstream) block valve. If the inlet (upstream) pressure exceeds the desired setpoint pressure, rotate knob or adjusting screw CCW until the pressure decreases.
9. When flow is established steady enough that both the outlet and inlet block valves are fully open, begin to slowly close the bypass valve, if installed.
10. Develop system flow to a level near its expected normal rate, and reset the regulator setpoint by turning knob or adjusting screw CW to increase inlet pressure, or CCW to reduce inlet pressure.
11. Using a downstream valve, reduce system flow to a minimum level and observe setpoint. Inlet pressure will rise from the setpoint of Step 9. (Ensure this rise does not exceed the stated upper limit of the range spring by greater than 50%, i.e. 2-50 psig (.14 - 3.4 Barg) range spring, at maximum flow the inlet pressure should not exceed  $1.5 \times 50$  psig (3.4 Barg), or 75 psig (5.2 Barg). If it does, consult factory).
12. Increase flow to maximum level, if possible. Inlet (upstream or  $P_1$ ) pressure should fall off. Readjust setpoint as necessary at the normal flow rate.

## SECTION V

### V. SHUTDOWN

1. On systems with a bypass valve, and where system pressure is to be maintained as the regulator is shut down, slowly open the bypass valve while closing the inlet (upstream) block valve. Fully close the inlet (upstream) block valve. (When on bypass, the system pressure must be constantly observed and manually

regulated. Close the outlet (downstream) block valve.



#### CAUTION

**Do not walk away and leave a bypassed regulator unattended.**

2. If the regulator and system are to both be shut down, slowly close the inlet (upstream) block

valve. Close the outlet (downstream) valve only if regulator removal is required.

## SECTION VI

### VI. MAINTENANCE

#### **WARNING**

**SYSTEM UNDER PRESSURE. Prior to performing any maintenance, isolate the regulator from the system and relieve all pressure. Failure to do so could result in personal injury.**

##### **A. General:**

1. Maintenance procedures hereinafter are based upon removal of the regulator unit from the pipeline where installed.
2. Owner should refer to owner's procedures for removal, handling, cleaning and disposal of nonreusable parts, i.e. gaskets, etc.
3. Refer to Figure 1 basic regulator drawing.

##### **B. O-rings & Seat Replacement:**

#### **CAUTION**

**To prevent damage to body, use soft jaws when placing body in a vise. Position so that vise closes over the flats on lower end of body.**

1. Install the body (1) in a vise securely with knob (20) directed upwards.

#### **WARNING**

**SPRING UNDER COMPRESSION. Prior to removing spring chamber, relieve range spring compression by turning the knob CCW until rotation comes to a complete stop. Failure to do so may result in flying parts that could cause personal injury.**

2. Relax range spring (12) by turning knob (20) or adjusting screw (14) CCW until rotation comes to a complete stop.
3. Remove spring chamber (2) by grasping flats and turning CCW. For regulators with a knob (20) - upon removal, the range spring (12) and spring button (15) should remain inside the spring chamber. For regulators with adjusting screw (14) - upon removal the ball (28) and spring button (15) should be resting on top of the spring follower. Lift range spring and follower up and set aside.

4. Grab top part of the piston (5) and pull upwards to remove sleeve (3), piston, and seat retainer (7) sub-assembly from the body.
5. Press downwards on the top of the piston (5) and seat retainer (7) to separate them from sleeve (3).
6. Remove sleeve o-ring (4) from groove on O.D. of sleeve (3), discard o-ring.
7. Remove piston o-ring (6) from groove on O.D. of piston (5), discard o-ring.
8. Secure the flats on the piston (5) in a soft jaw vice with the seat retainer (7) facing up.
9. Place a wrench on the hex surfaces of the seat retainer and rotate CCW to remove seat retainer.
10. With thumb, press seat (8) out of seat retainer and discard.
11. To replace orifice o-ring (9) use 13/16" socket wrench and rotate orifice (10) CCW to remove orifice from body. Discard o-ring.
12. Clean body (1) and all reusable parts according to owner's procedures. **NOTE:** *On regulators originally supplied as "oxygen clean", maintenance must include a level of cleanliness equal to Cashco's cleaning standard #S-1134. Contact factory for details.*
13. Inspect and replace any necessary parts. **NOTE:** *Use only parts manufactured and supplied by Cashco, Inc. for these products. See Section VIII.*
14. **Apply a thin coat of "Christo-Lube" to all o-rings prior to re-assembly.**
15. Place o-ring (9) over the threaded end of the orifice. Thread orifice into body. Tighten to 15 ft-lbs.
16. Secure the flats of the piston (5) in a smooth jawed vice. Place seat (8) into the center of the piston (5) with narrow end facing up.

17. Thread the seat retainer (7) into the piston with the center bore fitting over the seat. Tighten to 20-15 ft lbs.
18. Place piston o-ring (6) into the groove on the O.D. of the piston.
19. Lightly lubricate the I.D. of the sleeve (3) with Christo-Lube and insert the piston/seat assembly into the sleeve.
20. Lightly lubricate the O.D. of the sleeve(3).
21. Place sleeve o-ring (4) into the groove on the O.D. of the sleeve and insert this assembly of parts into the body (1) as shown in Figure 1.
22. Place the spring follower (11) on top of the sleeve/piston/seat assembly and set the range spring (12) on top of the follower. For

regulators with adjusting screw (14), place spring button (15) on top of the spring. Apply multi-purpose, high temperature grease into depression of spring button and place ball into the depression.

23. With the body clamped in a vice, lower the top works over range spring (12) and follower. Thread the spring chamber onto the body and tighten to approx. 70 to 90 ft lbs.
24. Rotate the exposed section of the adjusting screw assembly CW until the spring button makes contact with the range spring.
25. Return to Section IV to adjust set point of regulator.

## SECTION VII

### VII. TROUBLE SHOOTING GUIDE

#### 1. Erratic operation; chattering.

Possible Causes	Remedies
A. Oversized regulator; inadequate rangeability.	A1. Check actual flow conditions, re-size regulator for minimum and maximum flow. A2. Increase flow rate. A3. Decrease regulator pressure drop; decrease inlet pressure by placing a throttling orifice in inlet piping union. A4. Install next step higher range spring. A5. Before replacing regulator, contact factory.

#### 2. Regulator inlet (upstream) too high.

Possible Causes	Remedies
A. Regulator undersized.	A1. Confirm by opening bypass valve together with regulator. A2. Check actual flow conditions, re-size regulator; if regulator has inadequate capacity, replace with larger unit.
B. Incorrect range spring (screwing in CW of adjusting screw does not allow bringing pressure level up to proper level).	B. Replace range spring with proper lower range.
C. Too much rise (build).	C1. Review rise (build) expected. C2. Contact factory.

## SECTION VIII

### VIII. ORDERING INFORMATION

#### NEW REPLACEMENT UNIT vs PARTS "KIT" FOR FIELD REPAIR

To obtain a quotation or place an order, please retrieve the Serial Number and Product Code that was stamped on the metal name plate and attached to the unit. This information can also be found on the Bill of Material ("BOM"), a parts list that was provided when unit was originally shipped. (Serial Number typically 6 digits). Product Code typical format as follows: (last digit is alpha character that reflects revision level for the product).

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#### NEW REPLACEMENT UNIT:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. With this information they can provide a quotation for a new unit including a complete description, price and availability.



#### CAUTION

**Do not attempt to alter the original construction of any unit without assistance and approval from the factory. All purposed changes will require a new name plate with appropriate ratings and new product code to accommodate the recommended part(s) changes.**

#### PARTS "KIT" for FIELD REPAIR:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. Identify the parts and the quantity required to repair the unit from the "BOM" sheet that was provided when unit was originally shipped.

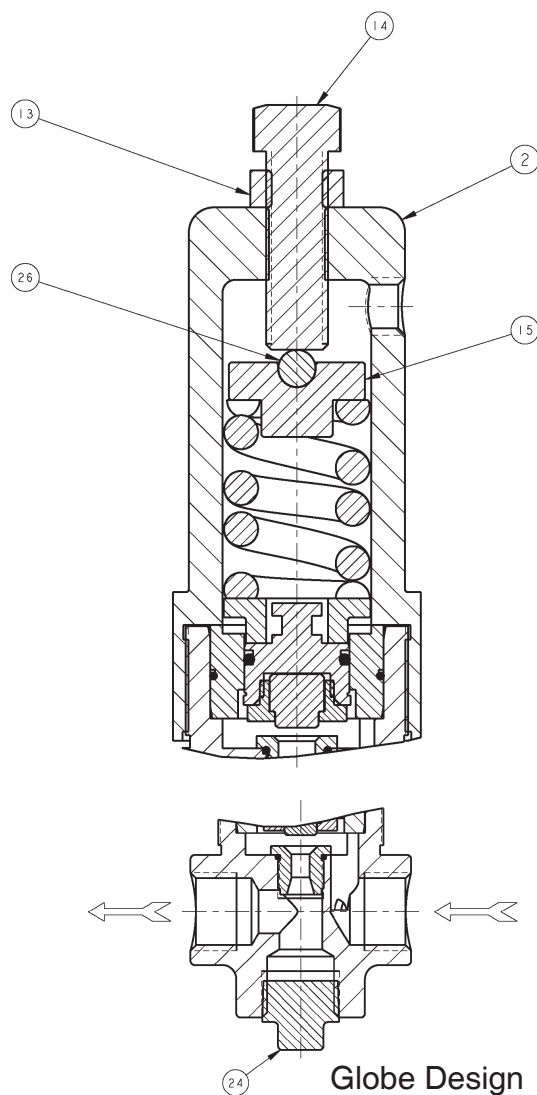
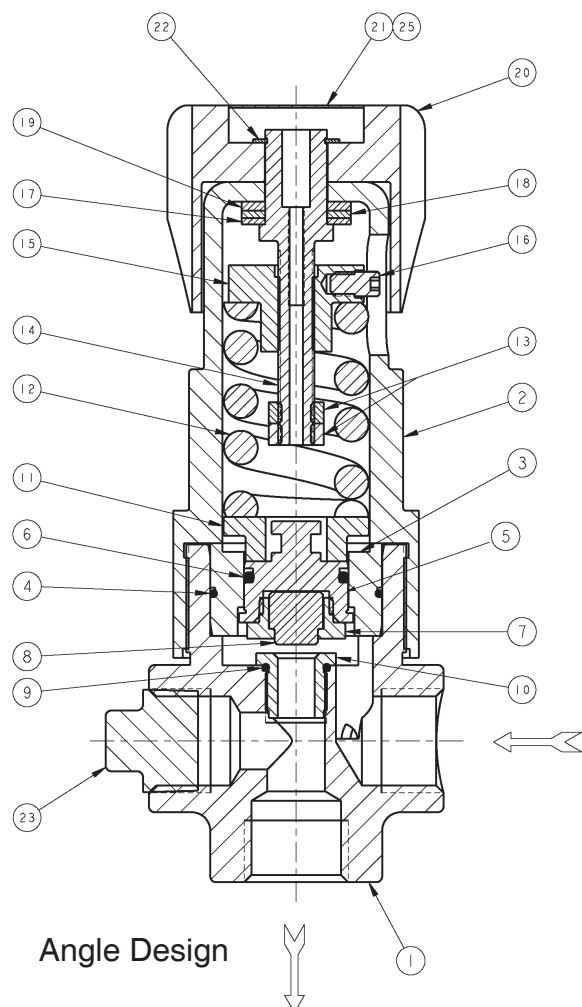
**NOTE:** *Those part numbers that have a quantity indicated under "Spare Parts" in column "A" reflect minimum parts required for inspection and rebuild, - "Soft Goods Kit". Those in column "B" include minimum trim replacement parts needed plus those "Soft Goods" parts from column "A".*

If the "BOM" is not available, refer to the cross-sectional drawings included in this manual for part identification and selection.

A Local Sales Representative will provide quotation for appropriate Kit Number, Price and Availability.

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**Figure 1**



Item No.	Description	Repair Parts Kit B
1	Body	
2	Spring Chamber	
3	Sleeve	
4	Sleeve O-ring	††
5	Piston	
6	Piston O-ring	††
7	Seat Retainer	
8	Seat	††
9	Orifice O-ring	††
10	Orifice	††
11	Spring Follower	
12	Range Spring	
13	Nut	

Item No.	Description	Repair Parts Kit B
14	Adjusting Screw	
15	Spring Button	
16	Set Screw	
17	Thrust Button	
18	Thrust Bearing	
19	Thrust Washer	
20	Knob	
21	Knob Cover	
22	Snap Ring	
23	Plug	
24	Plug	
25	Decal	
26	Ball	
††	Recommended Spare Part	



IOM ADDENDUM:

ATEX DIRECTIVE 2014/34/EU and THE EQUIPMENT AND PROTECTIVE SYSTEMS INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES REGULATIONS 2016

Cashco, Inc. declares that the products listed in the table below has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II of the ATEX Directive 2014/34/EU and given in Schedule 1 of The Equipment and Protective Systems Indented for Use in Potentially Explosive Atmospheres Regulations 2016. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN ISO 80079-36:2016 and EN ISO 80079-37:2016. The product will be marked as follows:



The 'X' placed after the technical file number indicates that the product is subject to specific conditions of use as follows:

1. The maximum surface temperature depends entirely on the operating conditions and not the equipment itself. The combination of the maximum ambient and the maximum process medium temperature shall be used to determine the maximum surface temperature and corresponding temperature classification, considering the safety margins described prescribed in EN ISO 80079-36:2016, Clause 8.2. Additionally, the system designer and users must take precautions to prevent rapid system pressurization which may raise the surface temperature of system components and tubing due to adiabatic compression of the system gas. Furthermore, the Joule-Thomson effect may cause process gases to rise in temperature as they expand going through a regulator. This could raise the external surface temperature of the regulator body and the downstream piping creating a potential source of ignition. Whether the Joule-Thomson effect leads to heating or cooling of the process gas depends on the process gas and the inlet and outlet pressures. The system designer is responsible for determining whether the process gas temperature may raise under any operating conditions.
2. Where the process medium is a liquid or semi-solid material with a surface resistance in excess of  $1\text{G}\Omega$ , special precautions shall be taken to ensure the process does not generate electrostatic discharge.
3. Special consideration shall be made regarding the filtration of the process medium if there is a potential for the process medium to contain solid particles. Where particles are present, the process flow shall be  $<1\text{m/s}$  ( $<3.3\text{ ft/s}$ ) in order to prevent friction between the process medium and internal surfaces.
4. Effective earthing (grounding) of the product shall be ensured during installation.
5. The valve body/housing shall be regularly cleaned to prevent build up of dust deposits.
6. Regulators must be ordered with the non-relieving option (instead of the self-relieving option) if the process gas they are to be used with is hazardous (flammable, toxic, etc.). The self-relieving option vents process gas through the regulator cap directly into the atmosphere while the non-relieving option does not. Using regulators with the self-relieving option in a flammable gas system could create an explosive atmosphere in the vicinity of the regulator.
7. Tied diaphragm regulators with outlet ranges greater than 7 barg (100 psig) should be preset to minimize the risk that improper operation might lead to an outboard leak and a potentially explosive atmosphere.
8. All equipment must only be fitted with manufacturer's original spare parts.
9. Ensure that only non-sparking tools are used, as per EN 1127-1, Annex A.



	PRODUCT
	31-B, 31-N
	1164, 1164(OPT-45)
	1171, 1171(OPT-45), 1171(CRYO)
	2171, 2171(OPT-45), 2171(CRYO), 3171
	1465, 3381, 3381(OPT-45), 3381(OPT-40)
	4381, 4381(OPT-37), 4381(CRYO), 4381(OPT-45), 5381
	MPRV-H, MPRV-L
	PBE, PBE-L, PBE-H
	CA-1, CA-2
	CA1, SA1, CA4, SA4, CA5, SA5
	DA2, DA4, DA5, DA6, DA8
	DA0, DA1, DAP, SAP
	SLR-1, SLR-2, PTR-1
	ALR-1, ULR-1, PGR-1
	BQ, BQ(OPT-45), BQ(CRYO)
	123, 123(CRYO), 123(OPT-45), 123(OPT-46G)
	123-1+6, 123-1+6(OPT-45), 123-1+6(OPT-46G), 123-1+6+S, 123-1+6+S(OPT-40)
	1000HP, 1000HP(OPT-37), 1000HP(OPT-45), 1000HP(OPT-45G), 1000HP(CRYO)
	1000HP-1+6, 1000HP-1+8, 1000LP, 1000LP(OPT-45), 1000LP(OPT-46G)
	6987
	8310HP, 8310HP-1+6, 8310HP-1+8, 8310LP, 8311HP, 8311LP
	345, 345(OPT-45)
	BA1/BL1, PA1/PL1
	C-BPV, C-PRV, C-CS
	D, D(CRYO), D(OPT-37), D(OPT-20), D(OPT-45)
	DL, DL(LCC), DL(OPT-45)
	BR, BR(CRYO)
	HP, HP(LCC), HP(OPT-45), HP(OPT46G), HP-1+6+S(OPT-40), HP-1+6+S
	P1, P2, P3, P4, P5, P7
	B2, B7
	POSR-1, POSR-2
	5200P, 5300P
	135
	NW-PL, NW-SO
	CG-PILOT
	FG1
REGULATORS	RANGER, 987, PREMIER
	964, 521, 988, 988-MB, 989
	2296/2296HF
	SCV-30, SCV-S
TANK BLANKETING	8700, 8910, 8920, 8930, 8940
	2100, 2199
	3100, 3200, 3300, 3400, 3500, 3600, 3700
	1078, 1088, 1100, 1049
	5100, 5200, 5400, 5500
	4100, 4200, 4300, 4400, 4500, 4600
MISC	764P/PD, 764-37, 764T

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