

**Fermilab**

**Particle Physics Division  
Mechanical Department Calibration  
Standards/Procedures**

**Number:** MD-CALPROC-005

**Date:** 6/26/2009

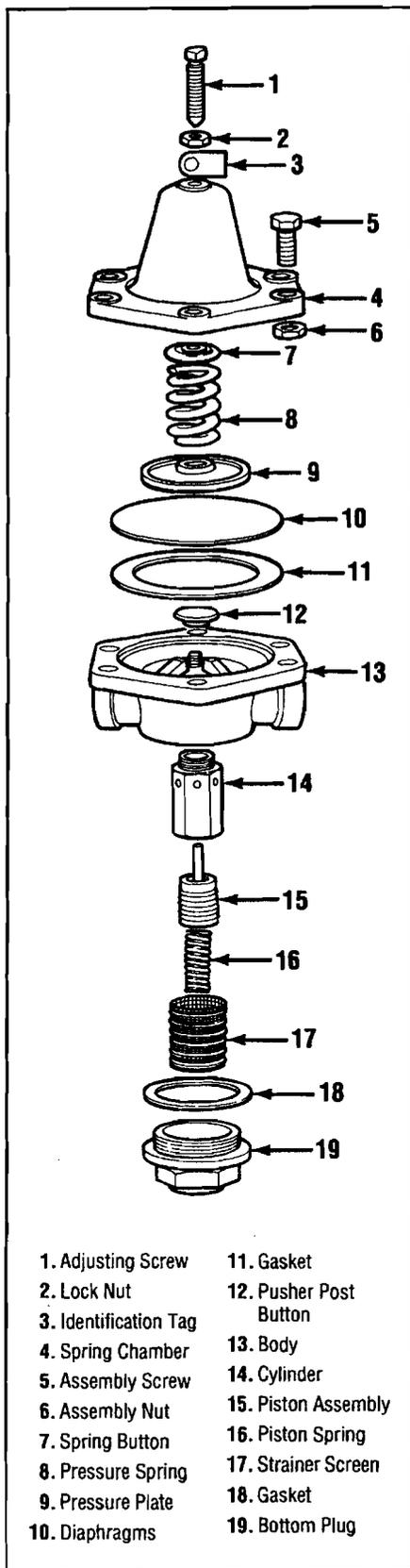
**Manufacturer:** Tyco

**Model:** Tyco Type B Cryogenic Pressure Regulator

**Reviewer(s):** *James E. Tweed*

**This Procedure is used for:**

Calibration of Cashco pressure relieving regulator.



## DESCRIPTION

The Type B regulator is a fully automatic pressure regulating valve designed for cryogenic service in the pressure build-up circuit. Because the Type B may be used for either cryogenic liquids or gases, it may be installed either before or after the pressure build-up coil.

## SPECIFICATION DATA

**Service:** Cryogenic liquids and gases (pressure reducing or pressure build-up service)

**Sizes:** 1/4", 3/8", 1/2", 3/4", 1", 1-1/4", 1-1/2" and 2"

**Connections:** Threaded (NPT) female inlet and outlet. BSPT also available (consult factory).

**Temperature Rating:** +150°F (339°K) to -320°F (78°K)

**Maximum Initial Pressure:** 400 psi

**Pressure Control Range:** Per Spring Range Table

## CONSTRUCTION

Bronze body, internal trim, and diaphragms; Teflon seat, diaphragm gasket, and bottom plug gasket; stainless steel bolts and nuts; stainless steel pressure spring.

All parts commercially cleaned for cryogenic service.

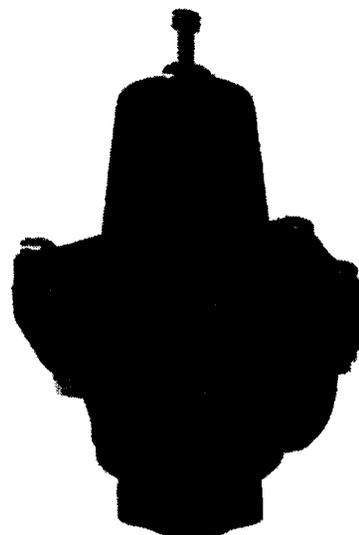
## GENERAL INSTALLATION INSTRUCTIONS

The Type B regulator may be installed in the horizontal position with the spring chamber up or down. For other installation requirements consult the factory. For ease of operation and maintenance, it is suggested that manual shut-off valves be installed upstream and downstream from the valve. Before installing the valve, all piping should be thoroughly flushed out to remove any foreign material. Install the valve with the inlet pipe fitted to the inlet connection identified on the valve body. Use a compatible sealant on the male pipe threads and do not overtighten the valve connections.

## OPERATING INSTRUCTIONS

### Adjusting the Delivery Pressure

The regulator's delivery pressure setting is adjusted by turning the adjusting screw (1) at the top of the spring chamber after loosening the adjusting screw lock nut (2). To increase the



## Type B CRYOGENIC PRESSURE REGULATOR

This Bulletin No.	<b>TS-BCRY</b>
Date Of This Issue	<b>MARCH 2000</b>
Supersedes Bulletin No.	<b>TS-BCRY</b>
Dated	<b>APRIL 1999</b>

delivery pressure, turn the adjusting screw clockwise (into the spring chamber). To decrease the delivery pressure, turn the adjusting screw counter-clockwise (out of the spring chamber). Tighten the adjusting screw lock nut after the adjustment has been made.

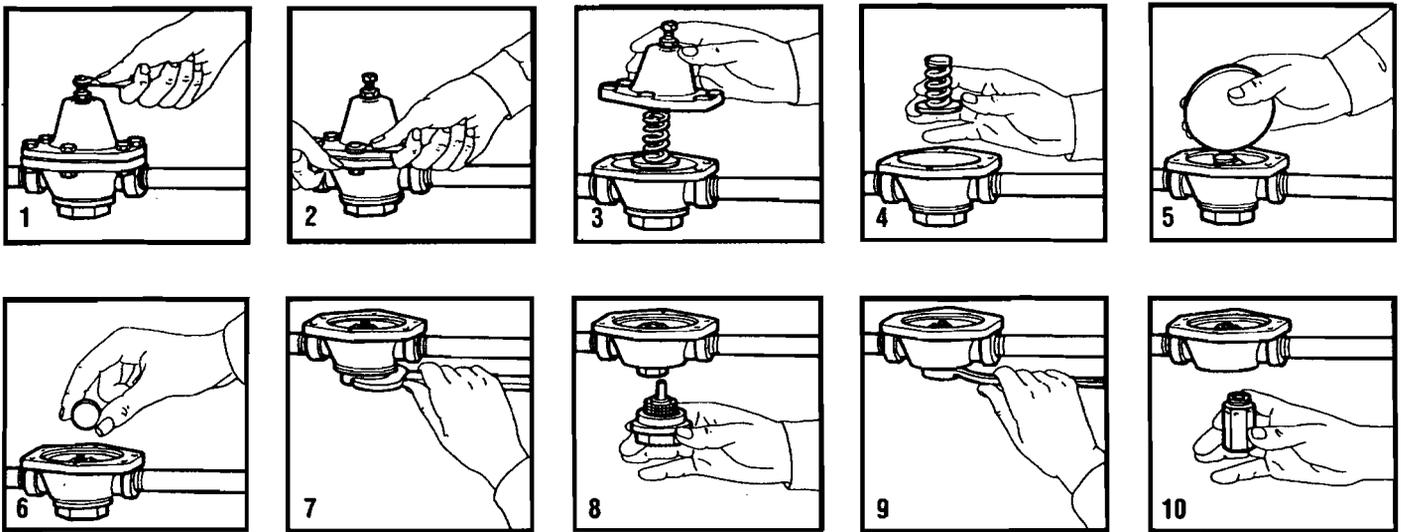
## MAINTENANCE INSTRUCTIONS

The following procedures are provided for servicing the recommended spare parts for the Type B regulator. Repair parts can easily be installed without removing the regulator from the line.

**CAUTION:** Before attempting to replace any spare parts be sure to shut off all pressure connections to the valve being serviced. Even with the valve closed, however, system pressure could still be locked between the shut-off valve and the inlet and/or outlet sides of the regulator. Before proceeding with any valve service be certain to relieve the pressure from BOTH sides of the regulator.

## INSTALLATION, MAINTENANCE & REPAIR PARTS INFORMATION 1

Tyco Valves & Controls LP, Black Mountain Facility, 953 Old US 70, Black Mountain, NC 28711



Refer to the Type B regulator exploded view for parts identification.

### Servicing the Diaphragms (10) and Pressure Spring (8)

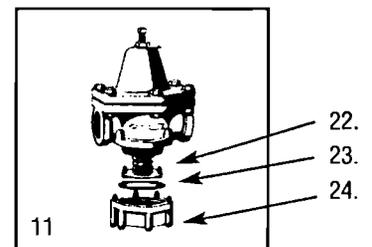
1. Loosen the lock nut (2) 1/4 turn and turn the adjusting screw (1) counter-clockwise until the pressure spring (8) is no longer under tension, Figure 1.
2. Remove the six assembly screws (5) and nuts (6) securing the spring chamber (4) to the valve body (13), Figure 2. During reassembly, tighten the screws evenly in an alternate diagonal pattern.
3. Lift the spring chamber (4) from the valve body, Figure 3. Then remove the spring button (7), pressure spring (8), and pressure plate (9), Figure 4. The pressure plate is **not** secured to the diaphragm.
4. Remove the Diaphragms (10), Figure 5, and the Teflon gasket (11) located under the diaphragms. Five metal diaphragms are used in valve sizes 1/4" through 3/4"; six are used in valve sizes 1" through 2".
5. Remove the pusher post button (12) from the protruding pusher post, Figure 6. During reassembly, be sure the pusher post button is centered properly on the pusher post.
6. Inspect all parts and replace if necessary. Reassemble the parts in reverse order.

### Servicing the Cylinder (14), Piston (15), Strainer Screen (17), and Bottom Plug Gasket (18)

1. It is important that the load on the pressure spring (8) be relieved before attempting to service any parts through the bottom of the valve. Relieve the pressure spring tension as detailed in Step 1 under Servicing the Diaphragms (10) and pressure spring (8), above.
2. Remove the bottom plug (19) as follows:
  - 1/4" through 1-1/2" valves:** The bottom plug is under slight tension as a result of the piston spring (16) acting against the plug. Loosen the bottom plug with a standard wrench, Figure 7, then carefully unscrew the plug by hand. The piston (15), piston spring (16), and strainer screen (17) will normally "drift" out with the bottom plug.
  - 2" valves:** Remove the six bottom screws (22) retaining the bottom plug (21) to the valve body. Next, carefully remove the two cylinder plate screws (24) and the cylinder plate (23). The piston (17), piston spring (18), and strainer screen (19) can now be removed. See Figure 11.

**NOTE: The Teflon bottom plug gasket (18) not only provides a tight seal but also assures easy removal of the bottom plug by preventing sticking or bonding of the plug to the valve body.**

3. Thoroughly clean the strainer screen and flush the valve body to remove any foreign material that may have collected around the strainer screen.
4. Unscrew the hexagon cylinder (14) from the valve body with a socket wrench, Figure 9, to prevent distortion. Note that the cylinder extends below the face of the valve body to permit convenient removal.
5. Inspect all parts and replace if necessary. Should either the cylinder (14), Figure 10, or the piston (15) need replacing, then it will be necessary to replace **both** parts because both parts wear equally.
6. Reassemble the valve in reverse order. After placing the valve in service, readjust the delivery pressure as detailed under Operating Instructions.



22. Bottom Screws  
23. Cylinder Plate  
24. Cylinder Plate Screws

## REPAIR PARTS INFORMATION

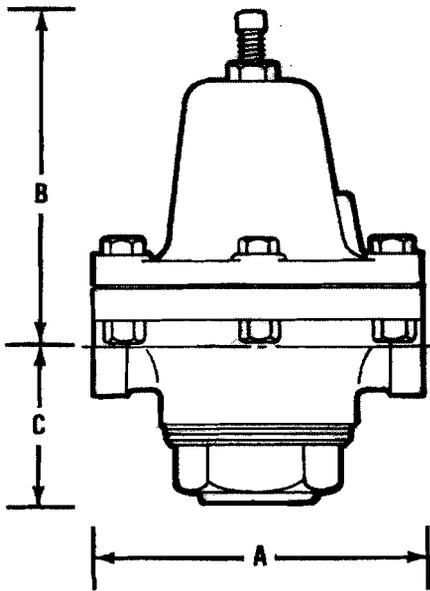
Refer to the exploded view of the Type B regulator for parts identification.

### TYPE B REPAIR KITS

Kit Number	Valve Size	Diaphragm	Diaphragm Gasket	Piston Spring	Piston	Cylinder	Bottom Plug Gasket
12358	1/4"	12315	1632	12308	8597	1933	7984
12359	3/8"	12316	1763	12309	8598	1934	7984
12360	1/2"	12317	1580	12311	12394	1935	3109
13658	1/2"	12290	1580	12311	12294	12293	3109
13655	3/4"	12300	1582	12312	12294	12293	3109
12362	1"	12319	1781	12297	7795	1936	4068
13656	1-1/4"	12320	1802	12326	8561	1938	4068
13656	1-1/2"	12321	1802	12326	8561	1938	4068
18541	2"	8580	1834	18627	8576	1824	8578

## SPECIFICATIONS

Each Type B pressure regulator is equipped with a pressure spring selected to provide the desired outlet or reduced pressure setting. The range of adjustment or satisfactory "working range" of individual springs is shown below for each valve size. Every regulator has the "set" pressure and range of adjustment stamped on a tag fastened to the valve. The ranges shown below are recommended for best performance.



## SPRING RANGES

Valve Size	Spring #1	Spring #2	Spring #3	Spring #4	Spring #5	Spring #6
1/4"	#4765 10-30	#7337 25-100	#8741 50-200	#10661 100-250	-	-
3/8"	#11143 10-50	#8691 40-150	-	#14301 100-250	-	-
1/2"	#11143 10-30	#10016 20-75	#10017 25-125	#10018 100-200	#10019 150-250	-
3/4"	#11143 10-30	#10016 20-70	#10017 30-100	#10018 50-150	#10019 100-225	#9983 150-250
1"	#8484 10-35	#8485 20-60	#8486 50-100	#19068 50-150	-	-
1-1/4"	#8484 10-30	#8485 20-40	#8486 35-80	#8487 75-150	-	-
1-1/2"	#8484 10-30	#8485 20-40	#8486 35-80	#8487 75-150	-	-
2"	#6301 5-20	#8773 10-50	#12913 20-100	-	-	-

## DIMENSIONS

Valve Size	Body Diameter (A)	Body Height (B)	Body Depth (C)	Body Length (D)	Ship Wt (lbs)
1/4"	3"	2-7/8"	1-3/4"		3
3/8"	3-7/8"	4-1/2"	1-3/4"		5-1/2
1/2"	4-1/2"	4-1/2"	2-1/8"		8
3/4"	5-1/8"	4-5/8"	2-1/8"		10
1"	5-7/8"	5-3/8"	2-1/8"		16
1-1/4"	6-3/4"	6-1/8"	2-5/8"		20
1-1/2"	6-3/4"	6-1/8"	2-5/8"		20
2"	9-1/4"	8-1/2"	3-1/2"		37

## HOW TO ORDER

Convenient, pre-packaged repair kits are available for the Type B regulators. Each kit includes diaphragm(s), diaphragm gasket, piston assembly, cylinder, strainer screen, piston spring and bottom plug gasket. The kits may be ordered by kit number as listed.

To order repair parts, refer to the exploded view of the Type B regulator to identify the part required. When ordering please use the part names

listed and provide the valve serial number stated on the identification tag. Also state the following:

"Repair Parts for Type B Cryogenic Regulator" and provide:

1. Valve size
2. Service
3. Inlet pressure
4. Outlet or delivery pressure range and

setting

5. Part description
6. Part number if stated
7. Quantity of each part
8. Valve assembly or serial number stated on the metal identification tag under the adjusting screw lock nut.

# ENGINEERING REQUIREMENT SHEET FOR MANUFACTURING ASSEMBLY & TEST

PRODUCT DESCRIPTION			PAGE 1 OF 1
PRESSURE REDUCING VALVE ASSEMBLY (Cryogenic)			<b>ED2026 Rev. N</b>
DISTRIBUTION	SIZE	TYPE	DATE
See ED4537	1/4" - 2"	B and B95	February 05, 2008

Replaces **ED2026M** Dated: **10/31/07**

Approved By: **Jason Stone**

⇒NOTE: Rev. M : Increased External Leak Test Pressure  
Rev. N: Revised Pressure and Leak test to clarify procedure

Particular points of construction, machining, assembling, testing, packing, operation, or use are to be recorded here as a requirement.

**ASSEMBLY:**

1. Clean all parts used in body half of valve and assemble; this includes protective closures. (Use only Flouro-lube lubricant on cylinder threads and gasket when assembling). Ref. Spec. 6364. NOTE: Bottom plug assembly must be clean under washer plate also. After cleaning parts, they must be kept covered with plastic when not in use. This includes lunch hours, etc. **PROOF TEST:** Use clean dry nitrogen to 375 psig on both inlet and outlet sides, submerge in water and inspect for any bubble leakage for at least one (1) minute. No leakage permitted. Blow dry and clean in Ultra-Sonic Degreaser.
2. Lubricate well all the Assembly Screws and Adjusting Screw before Assembling on Carbon Steel or SST Spring Chamber and Bodies.
3. Clean all parts used in chamber half of valve and assemble. Assembly bolts to be tightened evenly and uniformly, tightening across corners of hex. SEE CHART BELOW for Torque Value. **Note: Assembly p/n 22583 – install 4 long bolts with threads protruding upward, adjacent to inlet & outlet of valve.**
4. Clean off all excess flourolube after the entire valve assembly has been completed.

**Pressure Set and Test:**

1. Use nitrogen or filtered dry air for adjusting and testing. Keep clean per Spec 6364.
- ⇒ 2. Using 275 psig inlet pressure, set Valve to maximum of the spring range.
- ⇒ 3. Submerge valve in clean water. Apply inlet pressure of 275 psig to both Inlet and Outlet. (Crossover Test). Inspect for leaks at bottom plug, gasket, body, around diaphragm flange and at bolts for a minimum of 20 seconds. Use mirror to check for leaks around Bottom Plug and back of body. None allowed.
- ⇒ 4. Using inlet pressure specified on order (or if none specified, use 275 psig) reset valve to outlet pressure as specified on order, check for seat leakage (creep). Valve must conform to DE006 to pass test.
5. Blow off to remove water using nitrogen before removing from test rack. Remove from test rack and immediately re-plug inlet and outlet holes with protective closures.

VALVE SIZE	TORQUE VALUE
1/4	100 IN.-LBS.
3/8	150 IN.-LBS.
1/2	200 IN.-LBS.
3/4	200 IN.-LBS.
1	250 IN.-LBS.
1 1/4	350 IN.-LBS.
1 1/2	350 IN.-LBS.
2	350 IN.-LBS.

**CASH VALVE**

(Form ED4548)