

Technical Data

Technical Terms

Adjustable Operating Range — Total span within which the contacts can be adjusted to trip and reset.

Trip Setting — Higher pressure setting at which value the contacts transfer from their normal state to a change state.

Reset Setting — Lower pressure setting at which value the contacts return to their normal state.

Adjustable Differential — Difference between the trip and reset values.

Minimum Differential — When the differential is set to the lowest possible difference between trip and reset.

Maximum Differential — When the differential is set to the highest possible difference between trip and reset.

Max. Occasional Surge Pressure — Maximum surge pressure that can be applied to the actuator. Surges or ransients can occur during start-up and shut-down of a machine or system. Expressed in milliseconds, complex electronic instrumentation is required to measure the varying amplitude, frequency, and duration of this wave form. Extreme surges that occur approximately 8 times in a 24-hour period are negligible.

Maximum Line Pressure — Maximum sustained pressure that can be applied to the actuator without permanent damage. The control should not be cycled at this pressure. **Note:** Does not apply to piston type controls.

psi — Pounds per square inch gauge (positive pressure). Devices listed are in gauge pressure units which use atmospheric pressure as a reference. Atmospheric pressure at sea level is approximately 14.7 psi or 30 in. Hg.

Vacuum — Inches of mercury vacuum (negative pressure).

Operating Range Adjustment Screw — This screw is used to adjust the trip setting by varying the force of the main spring.

Differential Adjustment Screw — This screw is used to adjust reset setting by varying the force of the differential blade spring.

Pressure Media — There are many types of pressure media that can be controlled. Examples include air, water, hydraulic fluids and other types of gases and liquids. The type of media and the maximum system pressure will determine the type of actuator used for the pressure control application. See [Pressure Control Selection](#).

Pressure Connection — Common standard types of pressure connections used in control systems are 1/4 in. and 3/8 in. N.P.T. female pipe threads. SAE 7/16 and SAE 9/16 O-ring Boss Seals are also available (piston versions only).

Contact Configuration — Bulletin 836T controls are available with either a 2-circuit or 4-circuit contact block. See [Contact Wiring Configurations](#).

Style D

Style D — Pressure Difference Controls

Adjustable System Difference Range — The adjustable operating range for a pressure difference control.

System Difference Pressure Bushing — This bushing is used to adjust the trip setting by varying the force on the main spring.

Trip Setting — Desired difference in pressure between the two bellows at which value the contacts transfer

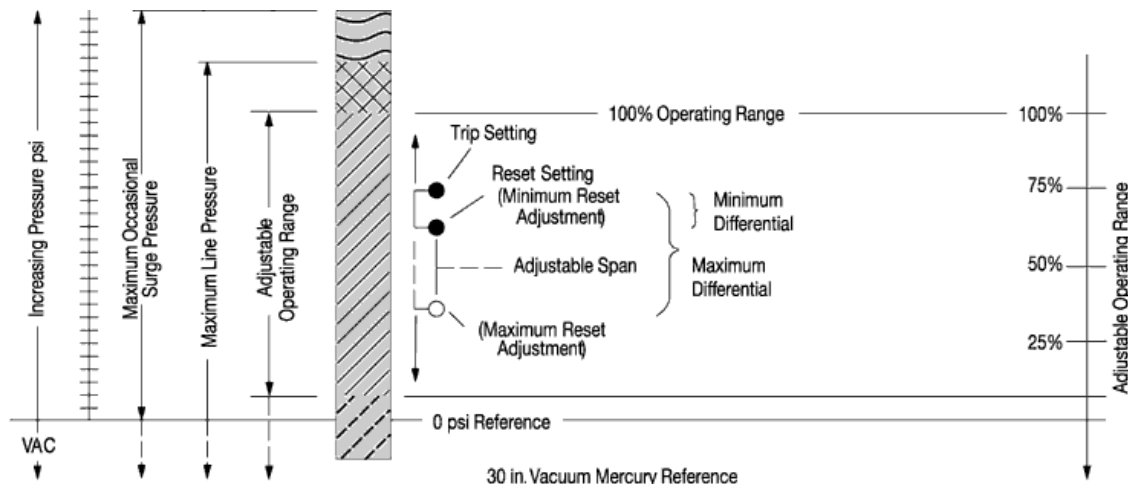
from their normal state to a changed state. This occurs in one of the following conditions:

- The pressure in the bottom bellows is higher than the pressure in the top bellows by a value equal to the trip setting.
- The pressure in the bottom bellows remains constant and the pressure in the top bellows decreases by a value equal to the trip setting.

Reset Setting — Predetermined normal difference in pressure between the two bellows at which value the contacts return to their normal state. This occurs in one of the following conditions:

- The pressure in the bottom bellows is lower than the top bellows.
- The pressure in the bottom bellows remains constant and the pressure in the top bellows increases.

Figure 1
Graphics to Illustrate Technical Terms

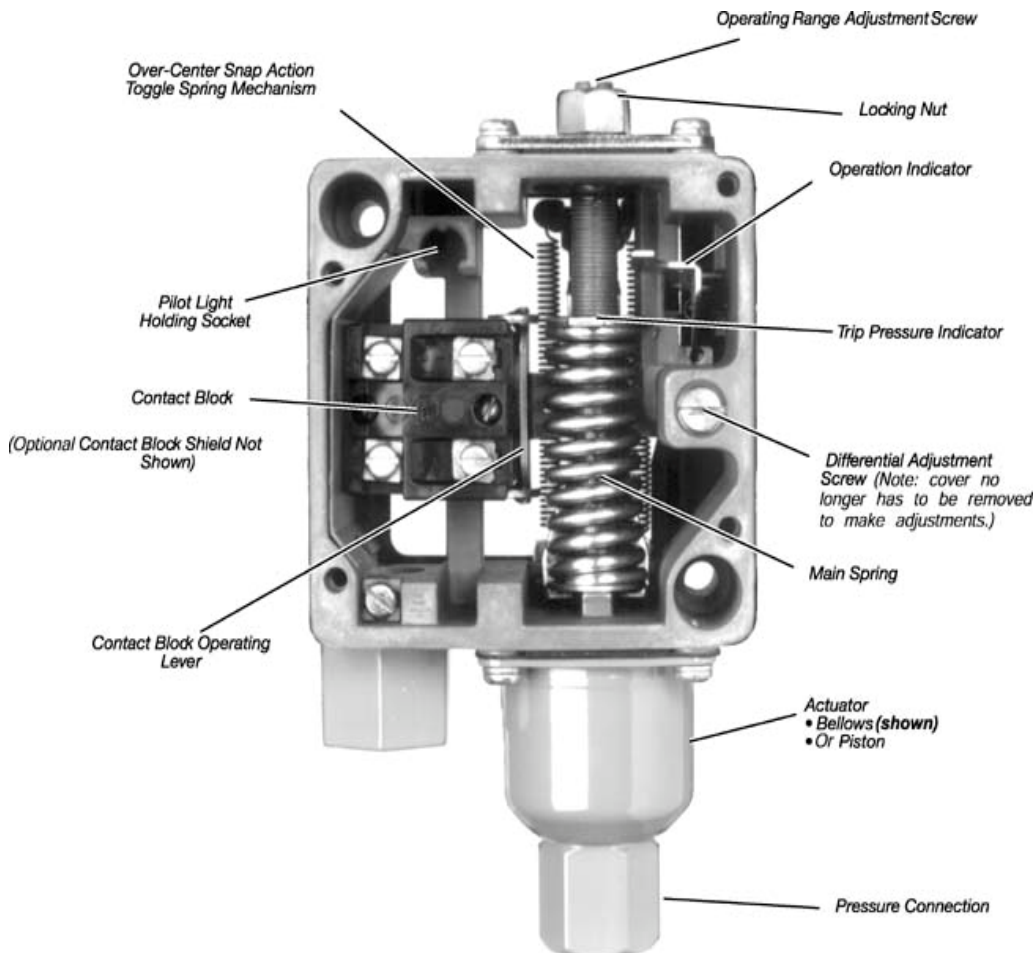


Theory of Operation

Bulletin 836T Pressure Controls are designed to open or close electrical circuits in response to changes in pneumatic (air or gas) or hydraulic (oil or non-corrosive liquids) pressure. Piston controls are not intended for use with air or water. Figure 2 shows the basic operating mechanism. Pressure is applied to the actuator which can be either a bellows or piston type. As pressure rises, the actuator exerts force on the main spring. When the threshold force of the main spring is overcome, levers transfer the motion to the contact block, displacing the contacts — this is referred to as the Trip Setting. The unique lever design amplifies the actuator motion providing shorter stroke which results in maximizing bellows life. The lever assembly also includes a virtually friction-free over-center toggle arrangement providing positive snap action to the contact block for long contact life. As pressure falls, force on the differential spring increases and contacts return to their normal state — this is referred to as Reset Setting. Varying the force of the main spring (by turning the operating range adjustment screw) determines when the contacts will trip. Varying the force of

the differential spring (by turning the differential adjustment screw) determines when the contacts will reset. Setting trip and reset values determines the operating parameters of the application.

Figure 2
Basic Mechanical Structure



Applications for Control

Pressure controls can be used to either control or monitor a machine or process. Figure 3 shows a typical control application. Here, pressure is controlled within predetermined high and low values. Figure 4 shows a typical monitoring application. Here, pressure is monitored between a high and low value, signaling when a preset limit has been exceeded.

Figure 3
Typical Control Application

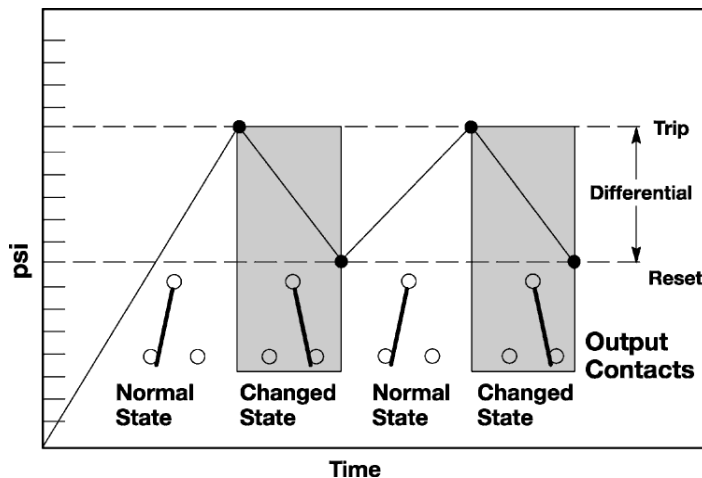
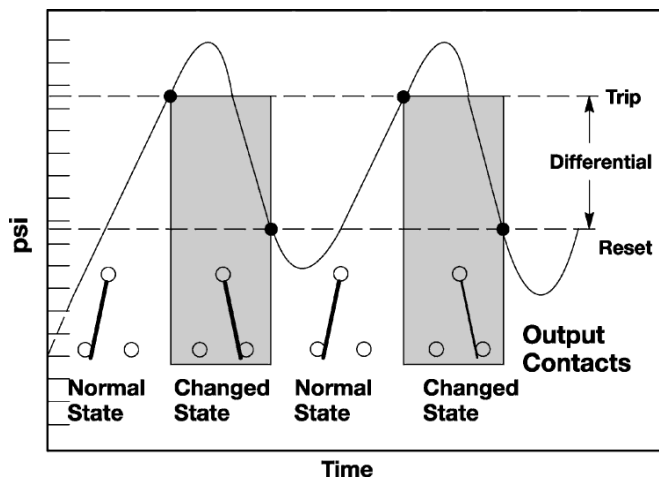


Figure 4
Typical Monitoring Application



Control Setting — Style T Pressure Controls

Allen-Bradley controls are designed for ease of setting to help minimize installation time. Standard pressure controls shipped from the factory are set at the maximum operating range and minimum differential. By using a pressure gauge and following these simple directions, the control can be set to the specific requirements for each application. See Figure 5.

Step 1 — Adjust Trip Setting

The trip setting is controlled by the operating range adjustment screw and is adjusted externally. After loosening the lock nut, the trip setting is set by turning the operating range adjustment screw counterclockwise to lower the trip setting or clockwise to raise the trip setting. The approximate trip setting is shown on the indicating scale. When the proper setting is reached, simply tighten the lock nut.

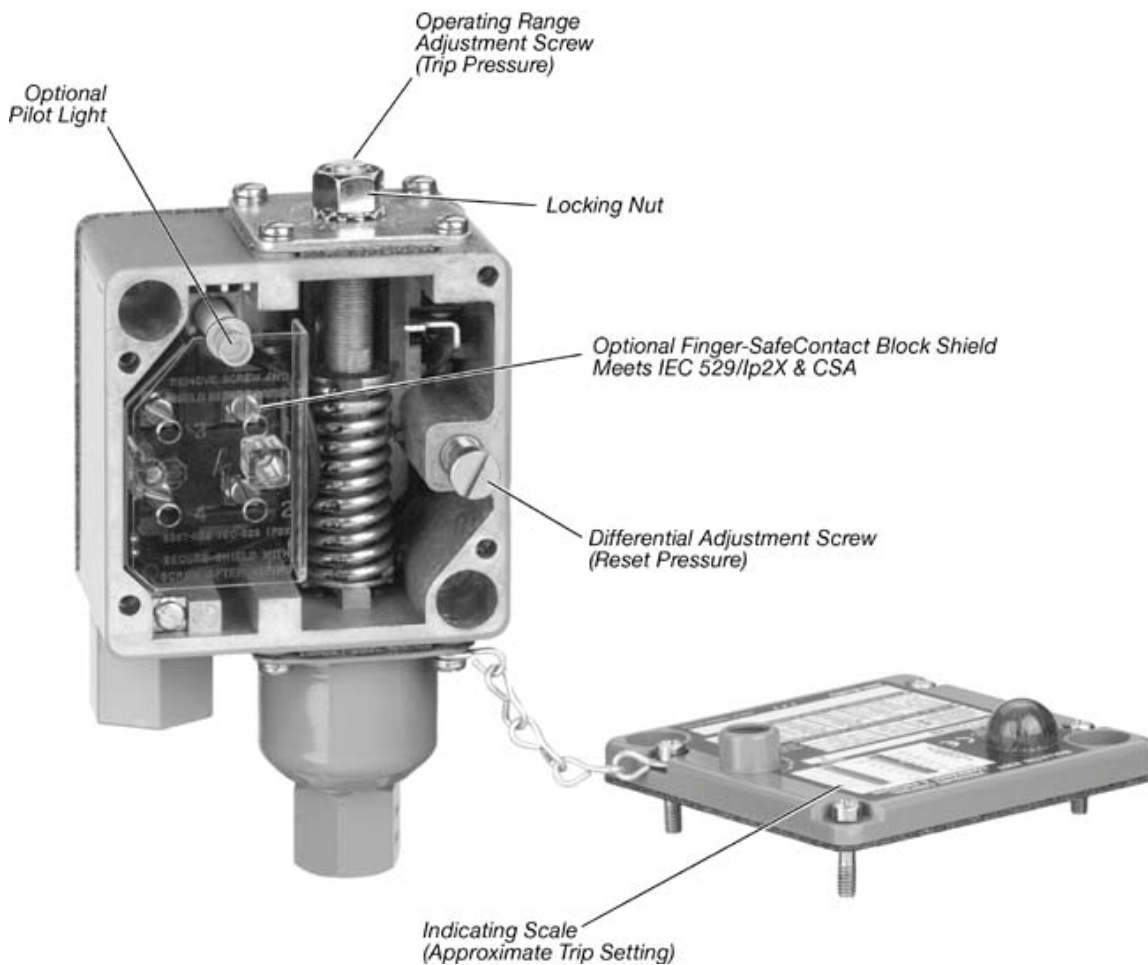
Note: Turning the operating range adjustment screw will cause both the trip and reset settings to change in virtually equal increments.

Step 2 — Adjust Reset Setting

The reset setting is controlled by an external differential adjustment screw. The reset setting is set by turning the differential adjustment screw clockwise to increase the differential or counterclockwise to decrease the differential.

Note: Adjusting the differential has little or no affect on the trip setting.

Figure 5
Trip and Reset Adjustment for Pressure Controls



Control Setting — Style D Pressure Difference Controls

Standard pressure difference controls shipped from the factory are set at the maximum adjustable difference range and minimum differential. Remove the front cover and use a pressure gauge to make the following adjustments. See Figure 6.

Step 1 — Adjust Trip Setting (Difference Pressure)

The trip setting is controlled by the system difference pressure bushing and is adjusted internally. With no pressure (open to atmosphere) applied to top bellows, apply a constant pressure to bottom bellows equal to

the desired difference in pressure at which the contacts are to trip. Insert a 1/8 in. diameter rod into a hole in the bushing and turn bushing to the left. Continue to turn bushing until the mechanism trips; circuit 1-2 will open. At this value, the trip setting is set at the pressure which is being applied to the bottom bellows.

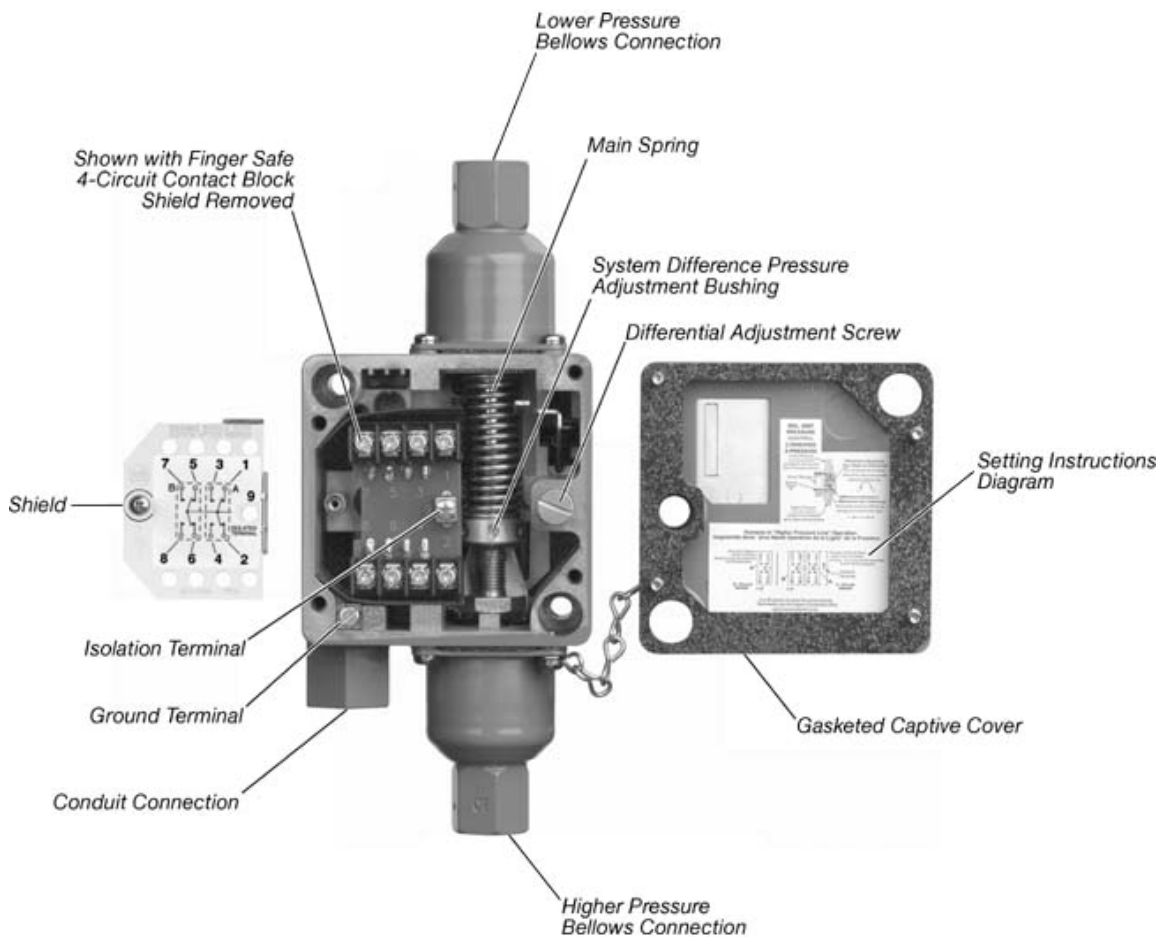
Note: Turning the system difference pressure bushing will cause both the trip and reset settings to change in virtually equal increments.

Step 2 — Adjust Reset Setting (Differential Pressure)

The reset setting is controlled by differential adjustment screw (this adjustment can be made with the cover on). The reset setting is adjusted by turning the differential adjustment screw clockwise to increase the differential or counterclockwise to decrease the differential.

Note: Adjusting the differential has little or no affect upon the trip setting (difference pressure).

Figure 6
Trip and Reset Adjustment for Pressure Difference Controls — 4-Circuit Contact Block

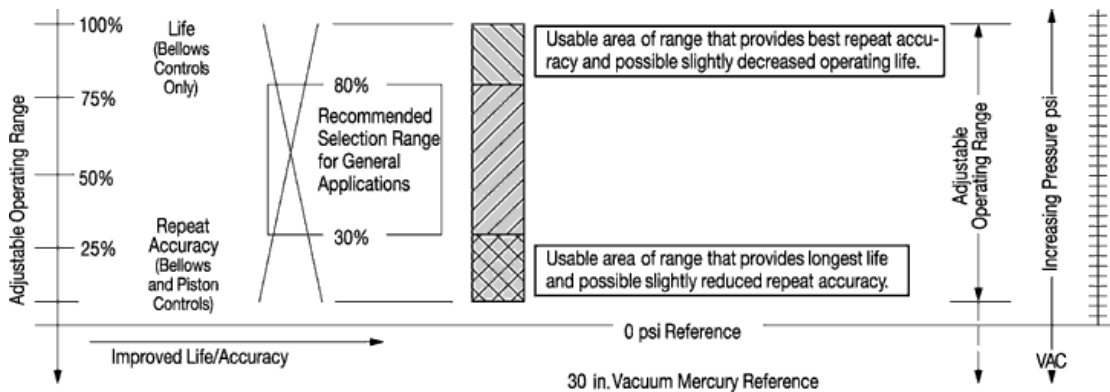


Repeat Accuracy and Mechanical Life

The design and construction of Bulletin 836T Pressure Controls provide a typical repeat accuracy equal to or better than the values shown in the Repeat Accuracy table below. Repeat accuracy is based on percent of maximum range, evaluated from test data and calculated using the formula per ICS 2-225 standards. Repeat accuracy and mechanical life of bellows type controls is graphically illustrated in Figure 7. The life curve does not apply to piston type controls.

For general applications, controls selected where the contacts operate between 30% and 80% of the operating range and where the maximum line and surge pressures do not exceed the specified values will provide excellent life and repeat accuracy. For more specific applications, it is important to note that the controls are designed to operate below or above these values. However, there may be a small trade-off between the factors of repeat accuracy and mechanical life.

Figure 7
Repeat Accuracy Versus Mechanical Life Graph



Repeat Accuracy

Type	Typical Characteristics (% of Maximum Range) ★
Bellows	± 1%
Piston with seal	± 5% †
Piston without seal	± 3%

★ Evaluation made from test data and calculated using formula per ICS 2-225 Standards.

† Seal adds additional friction and value shown takes into consideration initial breakaway frictional force incurred during start-up or infrequent cycle operation. On continual cycle operation the repeat accuracy approaches ±3%.

Conversion Factors (Rounded)

psi x 703.1 = mm/H₂O
psi x 27.68 = in. H₂O
psi x 51.71 = mm/Hg
psi x 2.036 = in. Hg
psi x 0.0703 = kg/cm²

psi x 0.0689 = bar
psi x 68.95 = mbar
psi x 6895 = Pa
psi x 6.895 = kPa
Note: psi - pounds per square inch (gauge). H ₂ O at 39.2 °F Hg at 32 °F

Mounting without Removing Cover

Bulletin 836T controls can be mounted without removing the front cover. This helps prevent foreign materials from entering the opened enclosure during the interval between mounting and wiring of the control.

Factory Set Pressure Controls

Allen-Bradley will factory set pressure controls to customer specified values. Unspecified Pressure controls shipped from the factory are set at the maximum operating range and minimum differential. See Factory Set Pressure Controls, [Factory-Set Pressure Controls](#).

Temperature Range

The temperature range at +32° F (0° C) or below is based on the absence of freezing moisture, water, or other fluids that may solidify and impede the operation of the control. Temperature ratings:

Operating:	–22... +150 °F (–30...+66 °C)
Storage:	–22...+200 °F (–30...+93 °C)


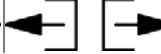
Contacts

Bulletin 836T controls feature 2-circuit and 4- circuit contact blocks for added control circuit flexibility. Two-circuit contact blocks have one normally open contact and one normally closed contact and may be arranged for single-pole double-throw operation or separate circuit operation having the same polarity. Four-circuit contact blocks may be arranged for double-pole double-throw operation or separate circuit operation having the same polarity.

2-Circuit Contact Ratings — NEMA A600 (ICS 2-125)

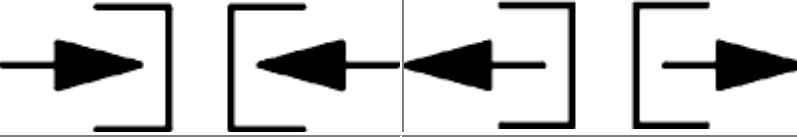
AC	DC
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Maximum AC Voltage	A		Continuous Carrying Current	VA		Maximum Voltage	A
	Make	Break		Make	Break		
120	60	6.00	10	7200	720	115...125	0.4
240	30	3.00	10	7200	720	230...250	0.2
480	15	1.50	10	7200	720	550...600	0.1
600	12	1.20	10	7200	720	—	—

IEC 337-1						
Maximum Operational Voltage U_e	Utilization Category	Maximum Continuous Current I_{th}	Volts U_e	Rated Operational Current		
				Make	Break	
						
AC600	AC-11	10	120...600 AC	7200 VA	720 VA	
		10	72...120 AC	60 A	720 VA	
DC600	DC-11	10	24...72 AC	60 A	10 A	
		—	115...600 DC	50 VA	50 VA	

4-Circuit Contact Ratings — NEMA B150 (ICS 2-125)

AC					DC		
Maximum AC Voltage	A		Continuous Carrying Current	VA		Maximum Voltage	A
	Make	Break		Make	Break		
120	30	3.00	5	3600	360	115...120	0.33
240	27.5	2.80	5	6600	660	230...240	0.17

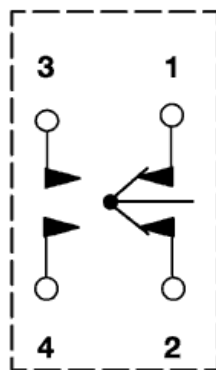
IEC 337-1						
Maximum Operational Voltage U_e	Utilization Category	Maximum Continuous Current I_{th}	Volts U_e	Rated Operational Current		
				Make	Break	
AC150	AC-11	5	72...120 AC	30 A	360 VA	
		5	24...72 AC	30 A	5 A	
DC150	DC-11	—	115...240 DC	40 VA	40 VA	

Note: NEMA does not rate contacts to switch low voltage and current. Bulletin 836T Styles T and D Pressure Controls are supplied with silver contacts. The devices are designed to deliver high force snap action to the contacts. This provides exceptional contact fidelity at 24V DC I/O card current level entry when the integrity of the enclosure is maintained.

Contact Wiring Configurations

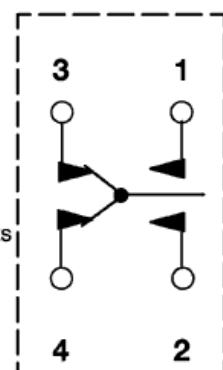
2-Circuit Contact Blocks

Positive Pressure



Trip — on increasing pressure, contacts 1-2 open and 3-4 close

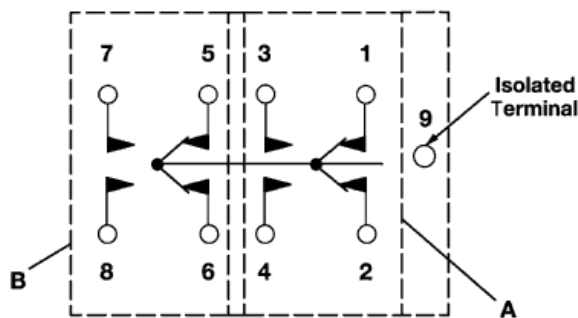
Vacuum Pressure



Trip — on increasing vacuum, contacts 3-4 open and 1-2 close

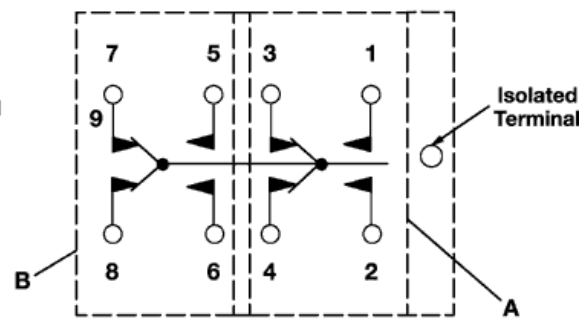
4-Circuit Contact Blocks

Positive Pressure



Trip — on increasing pressure, contacts 1-2 and 5-6 open and 3-4 and 7-8 close

Vacuum Pressure



Trip — on increasing vacuum, contacts 3-4 and 7-8 open and 1-2 and 5-6 close

Note: Circuits A and B are electrically isolated from one another.
A or B circuits must be the same polarity.

Figure 8
Removable Paint Mask



Cover with Transparent Mask and Instruction Label in Place



Cover with Mask Partially Removed
Nameplate with Removable Paint Mask

The masks are convenient for the many users who repaint controls to match the machine or color code equipment. Saves costly time-consuming hand masking necessary so as not to conceal product functional specifications and approval listings. This feature is standard on most controls at no additional cost. The paint mask feature cannot be supplied on controls with pilot lights. They are also not available on those devices where it is necessary to remove the mask and add suffix modifications to the catalog number or specific customer identification in the space provided.

Pressure Control Selection

The selection table below is an overview of the five types of Bulletin 836T Pressure Controls Allen-Bradley offers. Each type of control is suitable for use on many types of applications. Pressure ranges, pressure connections, enclosure types and the compatibility of the actuator with different types of pressure media are given to assist in the selection of which type of control to use.

836T				
Actuator Type	Copper Alloy Bellows	Type 316 Stainless Steel Bellows	Piston Type Without Seal	Piston Type With Seal
Adjustable Operating Ranges	30 in. Hg Vacuum...650 psi	30 in. Hg Vacuum...375 psi	40...5000 psi	80...5000 psi

Adjustable Differentials	2...125 psi	2...90 psi	20...650 psi	40...650 psi
Maximum Line Pressures	up to 1300 psi	up to 600 psi	—	—
Occasional Surge Pressures	up to 1600 psi	up to 600 psi	up to 15,000 psi	up to 15,000 psi
Pressure Media				
Air	•	•		
Water	•	•		
Hydraulic Fluids	•	•	•	•
Corrosive Liquids ★		•		
Non-Corrosive Liquids	•	•		
Corrosive Gases ★		•		
Non-Corrosive Gases	•	•		
Enclosures				
Type 1, 4 & 13	•	•	•	•
Type 7 & 9 and 4 & 13, IP66	•	•	•	•
Pipe Connections				
Standard Pressure Connection	1/4 in. N.P.T. Female Pipe Thread	1/4 in. N.P.T. Female Pipe Thread	3/8 in. N.P.T. Female Pipe Thread SAE 7/16-20 UNF-2B Thread O-ring Boss Seal SAE 9/16-18 UNF-2B Thread O-ring Boss Seal	3/8 in. N.P.T. Female Pipe Thread SAE 7/16-20 UNF-2B Thread O-ring Boss Seal SAE 9/16-18 UNF-2B Thread O-ring Boss Seal
★ Corrosive liquids and gases must be compatible with Type 316 Stainless Steel Bellows.				
Note: Pressure Difference Controls are supplied with either copper alloy or stainless steel bellows. See Ordering Information on Style D with Copper Alloy Bellows ★ — S.P.D.T. 2-Circuit Contact Block⌘ and Style D with Type 316 Stainless Steel Bellows ★ — S.P.D.T. 2-Circuit Contact Block⌘ for details.				

