

## Pressure Sensor No. 84377-Series

### GENERAL DESCRIPTION

The 84377-Series Differential Pressure Sensor is a pneumatically-actuated, snap action device which will either vent or block a signal pressure when the difference in two measured pressures exceeds an adjustable setpoint. Available either in automatic or manual reset, the sensor has adjustable differential (auto reset models only) and setpoint. There is provision for piped vent operation and the sensor is field reversible. Set point is virtually unaffected by control pressure change, or in the case of piped vent versions, vent backpressure change. In auto reset models, reset differential can be changed without shifting setpoint.

For correct operation, control pressure must be provided through a .81 mm (.032") diameter or smaller orifice.

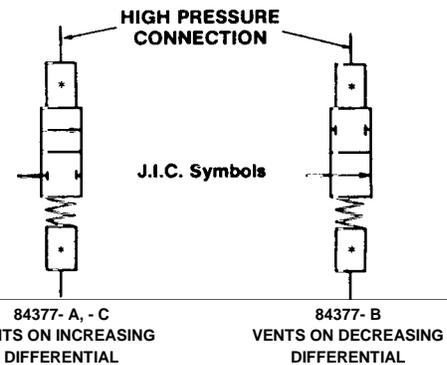


### MODELS AVAILABLE

84377-

Table 1

Table 2



**TABLE 1**

SUFFIX	DESCRIPTION	RESET
A	Direct Acting - Vents on Increase	Auto
B	Reverse Acting - Closes Vent on Increase	Auto
C	Direct Acting - Vents on Increase	Manual

**TABLE 2**

SUFFIX	SETPOINT RANGE - kPa (psi)
1	21 to 83 (3 to 12)
2	69 to 207 (10 to 30)
3	172 to 621 (25 to 90)
4	414 to 1103 (60 to 160)

### ORDERING INFORMATION

**Specify:**

1. Model
2. Control Pressure-If not specified, sensor is set using 207 kPa (30 psi).
3. Setpoint-If not specified, set at minimum.
4. Differential (Automatic Reset models only)-If not specified, set at standard.
5. Tagging Information.

See Page 2 for SPECIFICATIONS

# SPECIFICATIONS

**Valve Housing, Housing Plate and Cover:** ..... Anodized Aluminum Alloy.  
**Spring Housing:** ..... 316 Stainless Steel.  
**Springs:** ..... Stainless Steel.  
**O-Rings:** ..... Fluorocarbon and Neoprene.  
**Diaphragms and Gasket:** ..... Buna-N on Nylon.  
**Control Pressure:** ..... 138 to 414 kPa (20 to 60 psi).  
**Maximum Control Pressure:** ..... 517 kPa (75 psi).  
**Maximum Ambient Temperature:** ..... 71°C. (160°F).  
**Repeatability:** ..... ± 1% of setpoint.  
**Approximate Shipping Weight:** ..... 12 lbs.  
**Control Medium:** ..... Air, Natural Gas, Nitrogen, CO<sub>2</sub>  
**Filtration (Minimum):** ..... 25 microns  
**Moisture (Pressure Dewpoint):** ..... 8°C. (15°F.) less than ambient temperature.

**Oil Content (Natural Base):** ..... 5 ppm.  
**Oil Content (Synthetic Base):** ..... 0 ppm.

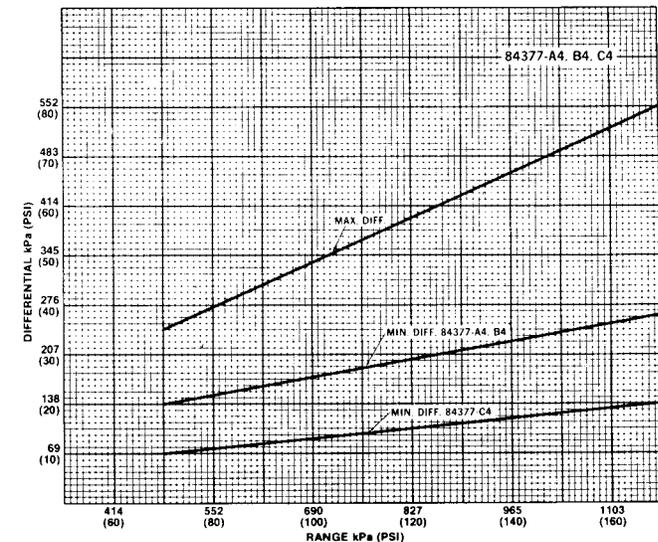
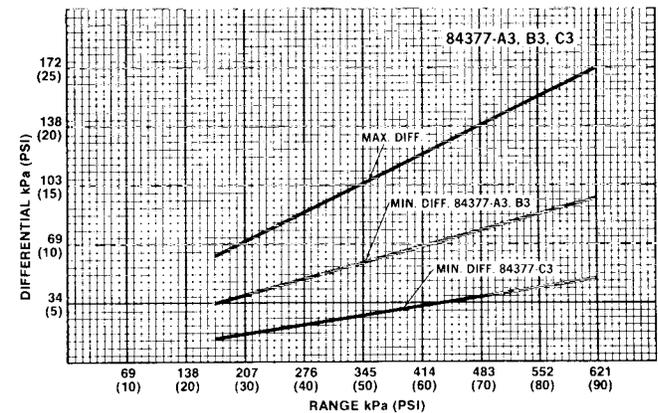
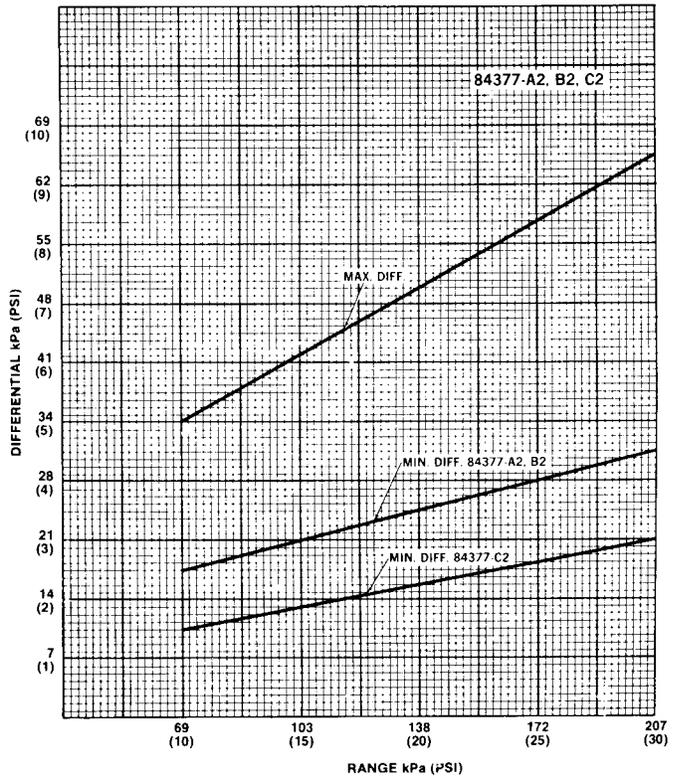
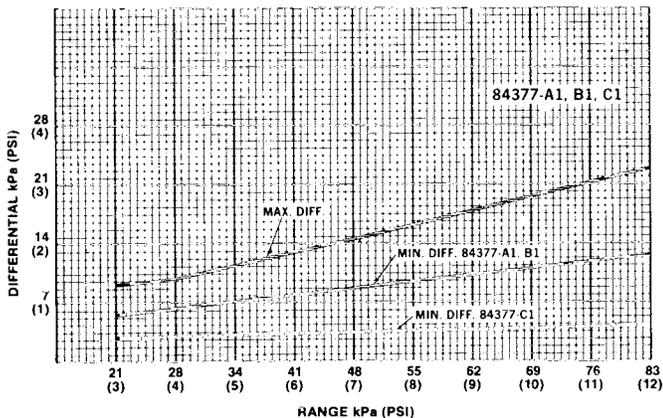
*NOTE: These are suggested minimums for control medium quality. For operation under more adverse conditions, consult factory.*

**CAUTION: DO NOT EXCEED MAXIMUM TEMPERATURE/ PRESSURE RATINGS.**

## Process and Reset Pressure Characteristics:

Model No.	Maximum Process Pressure, kPa (psi)	Standard Reset Differential kPa (psi)	Minimum Process Pressure Drop to Manually Reset, kPa (psi)
84377-A1	6900 (1000)	14 (2)	
84377-A2	6900 (1000)	14 (2)	
84377-A3	6900 (1000)	103 (15)	
84377-A4	6900 (1000)	103 (15)	
84377-B1	6900 (1000)	14 (2)	
84377-B2	6900 (1000)	14 (2)	
84377-B3	6900 (1000)	103 (15)	
84377-B4	6900 (1000)	103 (15)	
84377-C1	6900 (1000)		17 (2.5)
84377-C2	6900 (1000)		17 (2.5)
84377-C3	6900 (1000)		17 (2.5)
84377-C4	6900 (1000)		17 (2.5)

**Reset Differential Range:** See graph corresponding to instrument model numbers.



# INSTALLATION

## MOUNTING:

The No. 84377-Series Pressure Sensor may be mounted in any position, although vertical (upright) is recommended. It should be securely mounted on the panel or other suitable surface to prevent excessive vibration using the mounting bracket.

If the measured variable is a liquid, consideration should be given to the liquid level. An error in calibration could be caused by weight of a body of liquid acting on the measuring assembly. It may be necessary to adjust calibration to compensate for the constant weight (See ADJUSTMENTS).

If the sensor is out of doors or in any way exposed to water during cleaning, etc., it should be mounted in a position that will prevent water entry into the valve or spring housings. Water trapped in the housing will impair operation and could freeze during winter months. Vent openings should have fittings installed turned down. The 1/8"-27 NPT vent connection can be used for piped vent operation if gas is used.

If the sensor is used with a liquid process pressure, entrapped air in tubing connected to the measuring assembly should be vented. This can be accomplished by bleeding the connection at the sensing element.

## CONNECTIONS:

The sensor has five 1/8"-27 NPT connections—one for control pressure, one for vent pressure, one for case relief pressure and two for process pressure.

**CAUTION: Do not pipe or plug case relief connection. The vent pressure connection from the sensor cannot be used as a supply or control source for any other equipment. Vent backpressure should be held to as low a level as possible.**

Control port pressure must be provided through a .8 mm (.032") diameter or smaller orifice using 6 mm (1/4") or 9.5 mm (3/8") O.D. tubing. Using excessive lengths or other than the specified tubing is not recommended.

Tubing and fittings used to connect tile sensor must be free of chips, dirt, moisture or other foreign matter.

On fittings, it is recommended that a non-hardening, "anti-seize" type thread compound be applied to the threads in moderate amount. The first thread should then be wiped of excess to avoid compound being deposited inside the relay. Thread sealing tape is not recommended.

## DIMENSIONS - Millimeters (Inches)

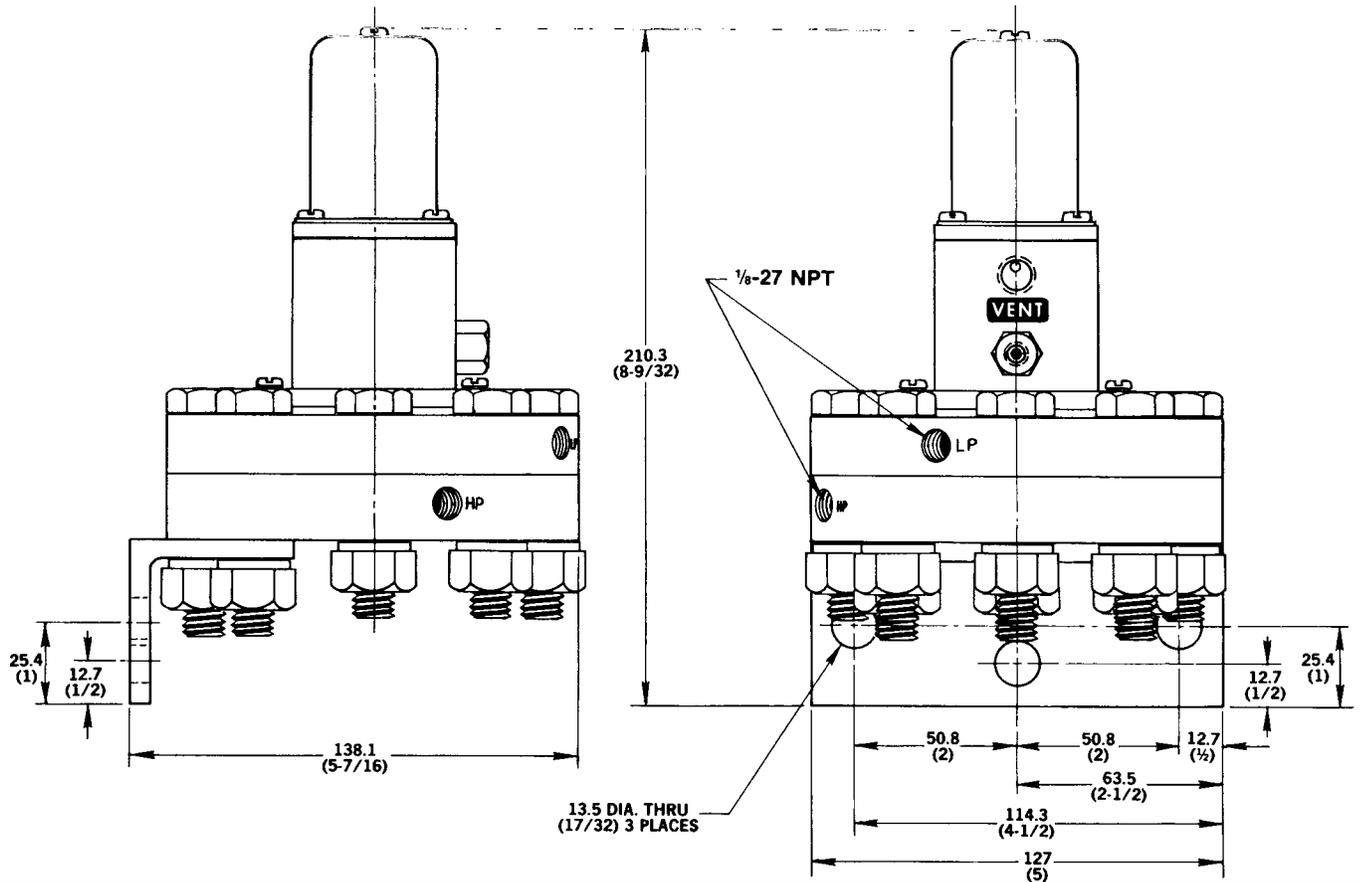


Figure 1  
Direct Acting

**OPERATION - See Figure 2**

*NOTE: For descriptive purposes the operation of the direct-acting (automatic reset) sensor shown in Fig. 2 will be explained. The operation of the reverse acting model is the same although reversed. It vents on a decrease in high process pressure.*

As shown, pressure entering the CONTROL port of the sensor will flow around the stem and sleeve, thru the bellows head, and out the VENT port. The bellows head is at the limit of its downward travel which is restricted by the reset /differential adjustment screw. By limiting the downward travel of the bellows head, this adjustment screw defines how low the high process pressure must drop (compared to the low process pressure) before causing the sensor to reset and stop venting. (See Adjustments -Differential).

A decrease in the High Process Pressure will cause the stem to travel downward as the force exerted downward on the stem by the range spring overrides the force exerted upward by the High Process Pressure. The sleeve will travel downward with the stem until it seats on the O-ring in the bellows head.

When the sleeve seats on the O-ring, it will block the control pressure flowing around the stem and stop the venting of the sensor. The control pressure will then build around the outside of the bellows and cause the bellows to compress. As the bellows compresses, the bellows head will move upward carrying the sleeve with it until the tubular portion of the bellows head contacts the upper diaphragm seat.

When the bellows head seats, upward travel will be stopped and the sensor reset. The sensor will remain in this

position unless the High Process Pressure increases enough to overcome the force exerted by the range spring.

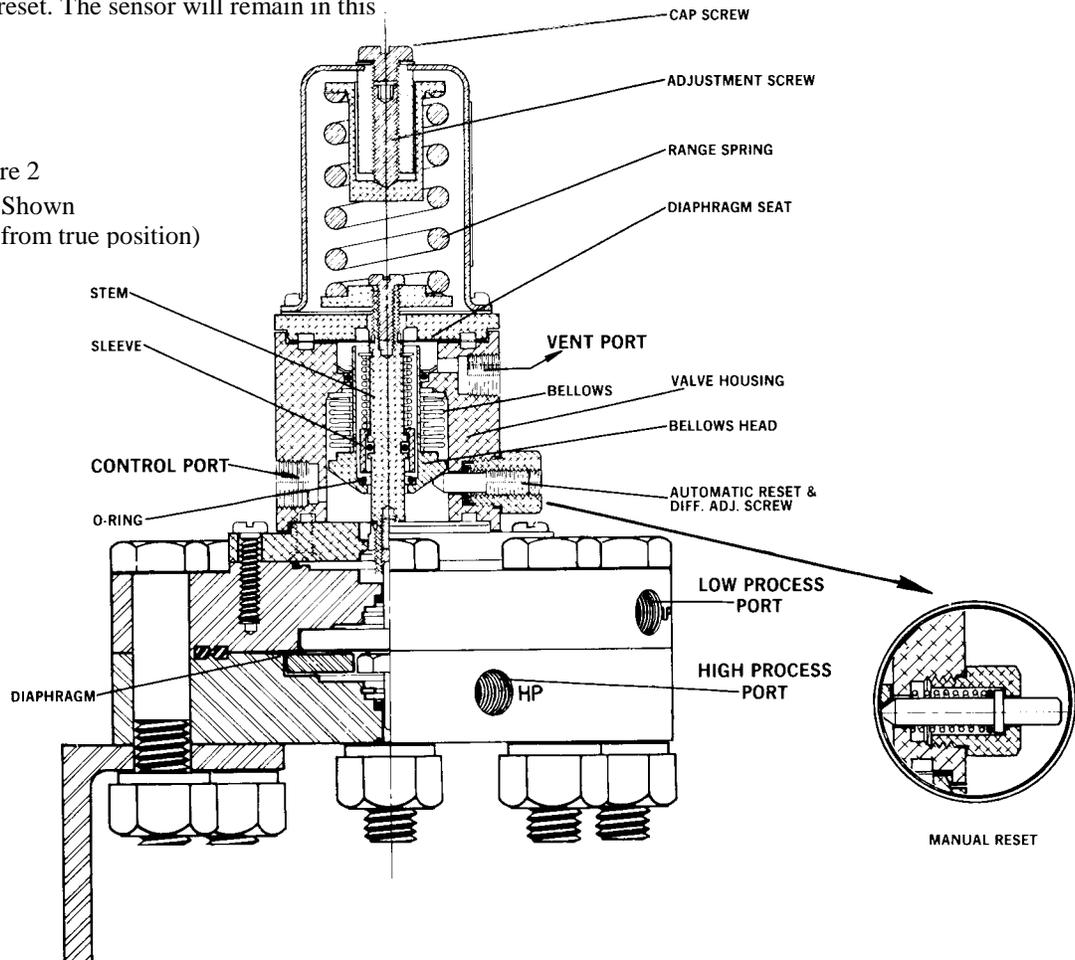
As the High Process Pressure increases, the stem will be forced upward against the range spring until travel is sufficient to lift the sleeve off the O-ring, the control pressure will flow inside the bellows until sufficient to equalize the pressure on the outside of the bellows.

When the pressure on the inside equals the pressure on the outside, the bellows will attempt to recover to its free length carrying the bellows head downward until stopped by the reset/ adjustment screw. The sensor will again be in the venting configuration as shown.

On Manual Reset models, the automatic reset/ differential adjustment screw will be replaced with a spring loaded plunger as shown in the inset. The reset plunger will allow the bellows to extend downward to a point the sleeve cannot reach regardless of how much the High Process Pressure drops. For this reason, the plunger must be depressed (while pressure is supplied to the CONTROL port) to raise the bellows head enough to allow the sleeve to contact the bellows head O-ring. With this accomplished, the sensor will reset as previously described.

*NOTE: Depressing the plunger without a CONTROL PRESSURE present will NOT reset the sensor. Sensor must be reset anytime there has been a loss of CONTROL PRESSURE.*

Figure 2  
84377-A1 Shown  
(Inlet Port rotated 90° from true position)



## MAINTENANCE - See Figure 4

### **WARNING: USE CARE WHEN DISASSEMBLING, SPRING FORCES PRESENT.**

**Caution: Do not subject O-rings, gasket, or diaphragm to cleaning fluid, acetone, or any halogenated hydrocarbons such as degrease liquids, etc. Clean only with a soft, dry cloth. Metal parts can be cleaned with a suitable solvent, then dried thoroughly before reassembly.**

### **Pressure Assembly and Bushing:**

Remove the reset bushing (detail 19); remove and replace the defective O-ring. Remove the four screws (detail 22) securing the pressure assembly to the valve housing and remove the assembly. The O-ring should come off with the assembly. Remove and replace the O-ring.

Remove the eight nuts and bolts (details 36 and 20) securing the upper and lower flanges together. Three of these bolts also secure the assembly to the mounting bracket, so remove the mounting bracket simultaneously. Separate the upper and lower flanges. Lift the diaphragm and stem assembly from the lower flange and remove the diaphragm shoe. Replace the defective parts and reassemble\* in reverse order. Recalibrate if sensor is an automatic reset model.

### **Spring Housing Assembly:**

Remove the cap screw (detail 1) and washer (detail 2) and turn the adjustment screw (detail 5) counterclockwise to bring the range spring (detail 6) to its free length. Remove the four screws (detail 11) securing the spring housing and remove the housing and gasket. Remove the range spring and spring seat (detail 4). Reassemble\* in reverse sequence.

### **Valve Housing Assembly:**

Remove the reset bushing, pressure assembly, and spring housing as described above. Proceed as described under applicable instructions for either the direct acting or reverse acting sensor.

### **Direct Acting:**

Remove the four screws (detail 24) securing the flange that was under the pressure assembly. Remove the flange (detail 23). Prevent the spring seat (detail 9) from rotating and remove the exposed diaphragm clamp. Remove the exposed diaphragm (detail 14). Pull the stem (detail 16) from the valve housing by removing it as an assembly with the remaining flange (detail 13). (The spring seat will remain intact).

Prevent the spring seat from rotating and remove the locking screw (detail 8). Prevent the stem from rotating and remove the spring seat. Remove the flange from the stem assembly. Proceed with the instructions under "Direct and Reverse Acting."

### **Reverse Acting:**

Remove the four screws (detail 31) securing the flange that was under the pressure assembly. Remove the flange (detail 30).

Prevent the spring seat (detail 9) from rotating and remove the locking screw (detail 8). Prevent the exposed diaphragm clamp (detail 10) from rotating and remove the spring seat. Remove the remaining flange (detail 13).

Still holding the same diaphragm clamp, remove the newly exposed clamp and diaphragm. Pull the stem (detail 16) from the valve housing with the remaining diaphragm and clamp intact. Proceed with the instructions under "Direct and Reverse Acting."

### **Direct and Reverse Acting:**

Remove the remaining diaphragm and clamp. Remove the retaining ring (detail 42) while compressing and holding the spring (detail 45) on the stem. Remove the spring and sleeve (detail 46) to expose the O-ring (detail 47) for replacement. Reassemble\* the stem assembly in reverse sequence.

To replace the O-ring (detail 44) in the valve housing, remove the retaining ring (detail 43) and the O-ring directly beneath it. Insert the new O-ring and replace the retaining ring.

To replace the O-ring (detail 48) located in the bellows head, remove the O-ring with a knife or some other sharp pointed instrument. Carefully remove any residue where the O-ring was removed and clean the seating area with a suitable solvent. Dry thoroughly and place a few drops of liquid Viton (Pelmar Laboratories PLV-2000 or equivalent) on the seating area. Clean and place the new O-ring on the seating area. Allow bond to cure for one or more hours.

With all O-rings, diaphragms, gaskets and defective parts replaced, reassemble\* as follows: (refer to Fig. 3).

*NOTE: For Direct Acting, hold valve housing as in Figure 3; for Reverse Acting, invert housing.*

Be certain that all parts are clean and free of foreign matter. On automatic reset models, turn the differential adjustment screw counter clockwise several turns. Replace the stem, diaphragms and diaphragm clamps.\* Hand tighten the clamps and then while holding each clamp with a wrench, tighten 1/4 turn more.

Replace both flanges and secure with at least two screws (placed diagonally from each other). On the flange where the pressure assembly mounts, replace all four screws\* (securing the flange) and snug all screws down.

Replace the spring seat and its locking screw. DO NOT TIGHTEN YET. Turn the differential adjustment screw clockwise until it becomes difficult to turn; DO NOT TIGHTEN. On manual reset models, depress the reset plunger. Then apply an approximate one-pound force at "P" (see Fig. 3) and turn the spring seat to obtain dimension "A." Tighten the locking screw\* snug and turn the differential adjustment screw counterclockwise 3/4 turn.

Remove the two screws securing the flange under the spring seat and replace the spring and spring tower assembly. Then replace all four screws\* to secure the flange and spring tower.

Reassemble the remainder in reverse sequence and recalibrate.

\* *NOTE: The following should be fitted using Loctite Sealant "H," or equivalent, applied before reassembly: Spring Seat Screw (detail 8), Diaphragm Clamps, Spring Housing Screws (detail 11), Bushing, Flange Screws (detail 31), Housing Plate Screws (detail 32), Diaphragm Shoe Screw (detail 34) and Cover Screws (detail 37).*

## FIELD REVERSAL

To change the sensor from direct to reverse acting or vice versa, disassemble down to valve housing assembly. Remove the locking screw (detail 8) and spring seat (detail 9). With a long allen wrench, remove the set screw (detail 33) from inside the stem. Remove the flanges.

Invert the valve housing assembly and re-install the set screw all the way to the end of the stem. Replace the flanges and secure with screws. Reassemble the pressure assembly to the valve housing. **DO NOT** replace the spring seat or screw at this time. Apply 172 kPa (25 psi) process pressure to the HP process port. Apply 207 kPa (30 psi) pressure to the control port. Insert the allen wrench at point "P." Apply approximately a one pound downward force on the allen wrench and slowly turn the set screw clockwise until the sensor vents the control pressure on direct acting models. Then turn one-half turn further. On reverse acting models first turn the set screw clockwise until the venting stops and then turn counter clockwise until the sensor vents once more. Then turn one-half turn further. Apply Loctite to set screw.

Complete the re-assembly per previous instructions and recalibrate sensor.

## ADJUSTMENTS SETPOINT

1. Remove cap screw.
2. Apply operating control pressure to inlet port through a .8 mm (.032") diameter or smaller orifice. Control pressure and orifice size must be the same as that used during normal operation.

3. Apply process pressure at desired setpoint to the process port.
4. Insert a 1/8" hex wrench into the adjustment screw and turn screw counterclockwise (clockwise for reverse-acting units) until the valve snaps open and sensor vents. If the valve is already open, turn the screw clockwise (counterclockwise for reverse acting units) until the valve closes, then reverse direction and turn screw until valve snaps open and vents.
5. Check operation and trim as necessary.
6. Replace the cap screw.

## DIFFERENTIAL (Applicable to Auto Reset versions only)

**CAUTION: Sensor will not vent if differential adjustment screw is turned clockwise to its maximum insertion into the valve housing. Do not set differential below minimum recommended value as shown in graphs.**

1. Apply operating control pressure to inlet port through a .8 mm (.032") diameter or smaller orifice. Control pressure and orifice size must be the same as that used during normal operation.
2. Cycle measured pressure at the process port and adjust the differential adjustment screw until desired differential is obtained. Differential is increased by turning the screw counterclockwise.

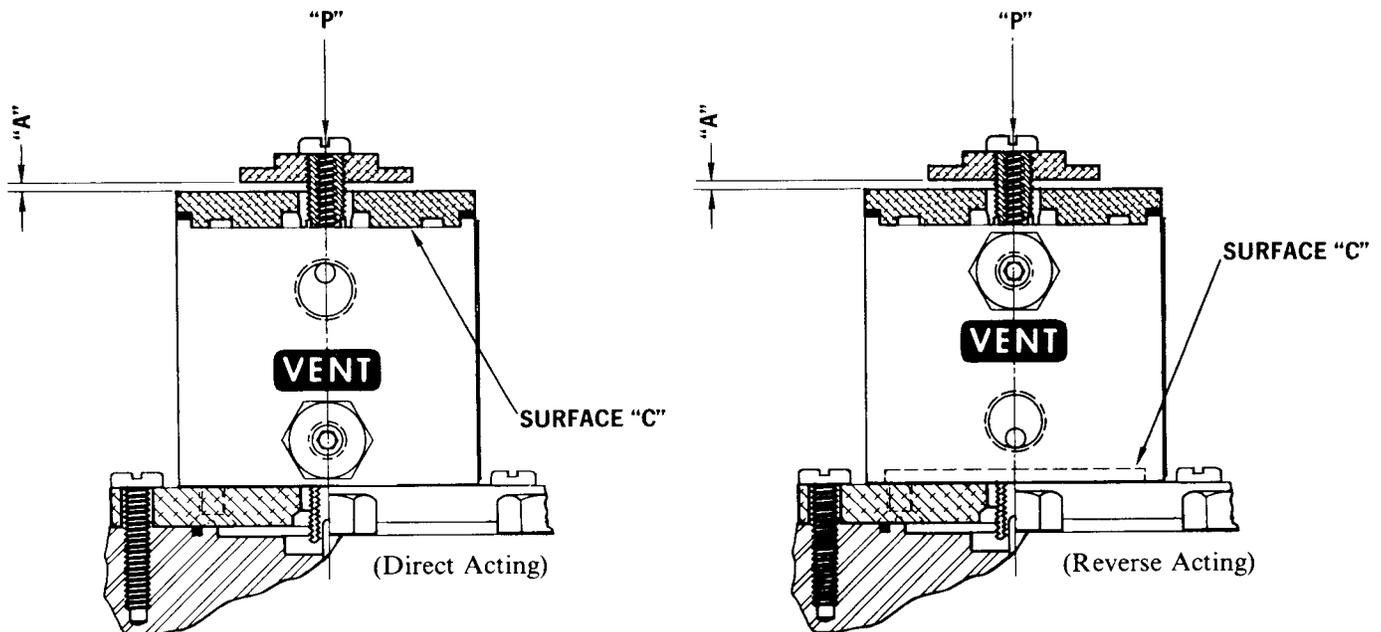


Figure 3

TABLE 3

Sensor Assy. No.	Dim. A
84377-A, C	.065
84377-B	.020

**PARTS LIST**

D et. No.	No. Reqd	Description	Prod. Part Number
1	1	Screw	33718-G0509
2	1	Washer	24425-A1
3	1	Spring Housing	84366-A1
4	1	Spring Seat	24557-B1
5	1	Name Plate	See tabulation
6	1	Adjustment Screw	24558-A2
7	1	Spring	See tabulation
8	1	Screw	33713-G1109
9	1	Spring Seat	33968-A2
10	2	Diaphragm Clamp	33969-A1
11	4	Screw	33713-G1309
*12	1	Gasket	33971-A1
13	1	Flange	33966-B1
*14	2	Diaphragm	33972-A1
15	1	Stem	33973-B1
16	1	Housing Assembly	84364-A1
*17	1	O-Ring	36240-V0007
18	1	Adjustment Screw	33963-A1
19	1	Reset Bushing	See tabulation
20	8	Bolt	36625-E3219
21	1	Set Screw	33995-A1
22	4	Screw	33713-G1309
23	1	Flange	33966-C1
24	4	Screw	33713-L1309
*†25	1	O-Ring	36240-C0030
26	1	Reset Plunger	33962-A2
27	1	Flange, Low Pressure	32397-C1
†28	2	Gasket, Flange	39385-A12
†29	2	O-Ring	36240-N6
30	2	Washer	29492-A1
†31	2	Retaining Ring	36605-C1
32	1	Diaphragm Shoe	32399-A1
†33	1	Assembly, Diaphragm & Stem	83229-B1
34	8	Lockwasher	36600-F1300
35	1	Flange, High Pressure	32396-B1
36	8	Nut	36602-K2517
37	1	Bracket	29496-A1
38	1	De-cal (not shown)	33979-A1
39	1	De-cal (not shown)	30613-A1
40	5	Protective Plug (not shown)	20516-A5
41	1	Spring	33965-A1
*42	1	Retaining Ring	36605-Q9
*43	1	Retaining Ring-Included in Det. 16	36605-B2
*44	1	O-Ring-Included in Det. 16	36240-V0016
45	1	Spring	33975-A1
46	1	Sleeve	33974-A2
*47	1	O-Ring	36240-V0010
*48	1	Quad Ring-Included in Det. 16	36243-V0012

NOTE: For complete kit containing all O-rings, gaskets, diaphragms and retaining rings to service one valve body, order Repair Kit No. 82665-G1. This kit contains details marked \*.

For complete kit containing all O-rings, retaining rings, gasket and diaphragm & stem to service one pressure assembly, order Repair Kit No. 82665-P1. This kit contains details marked †.

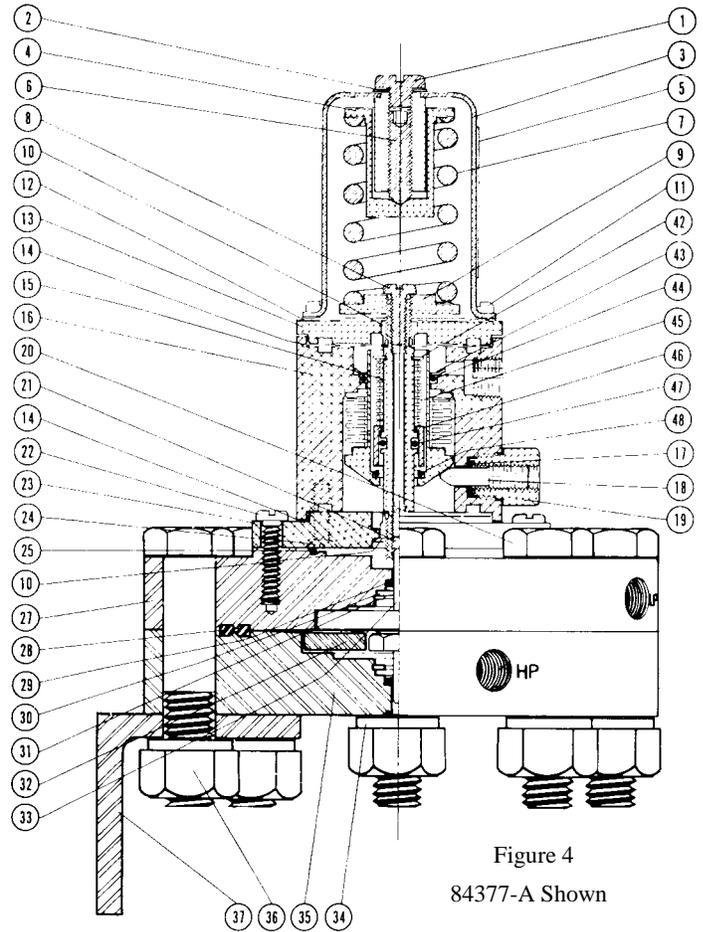
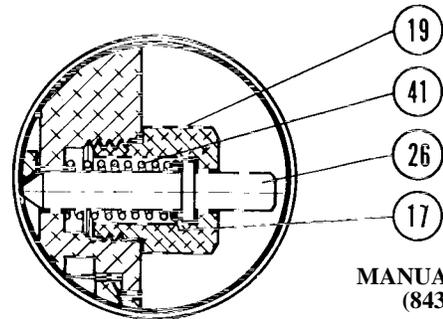


Figure 4  
84377-A Shown

**NOTE:**



**MANUAL RESET  
(84377-C)**

**TABULATION**

Assembly Number	Range, kPa (psi)	Det. 5	Det. 7	Det. 19
84377-A1	21 - 83 (3 - 12)	33970-B76	33980-E1	33964-A2
84377-A2	69 - 207 (10 - 30)	33970-B77	33980-F1	33964-A2
84377-A3	172 - 621 (25 - 90)	33970-B78	33980-B1	33964-A2
84377-A4	414 - 1103 (60 - 160)	33970-B79	33980-C1	33964-A2
84377-B1	21 - 83 (3 - 12)	33970-B80	33980-E1	33964-A2
84377-B2	69 - 207 (10 - 30)	33970-B81	33980-F1	33964-A2
84377-B3	172 - 621(25 - 90)	33970-B82	33980-B1	33964-A2
84377-B4	414 - 1103 (60 - 160)	33970-B83	33980-C1	33964-A2
84377-C1	21 - 83 (3 - 12)	33970-B84	33980-E1	33964-B2
84377-C2	69 - 207(10 - 30)	33970-B85	33980-F1	33964-B2
84377-C3	172 - 621 (25 - 90)	33970-B86	33980-B1	33964-B2
84377-C4	414 - 1103 (60 - 160)	33970-B87	3980-C1	33964-B2

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