

# Robertshaw

## INDUSTRIAL PRODUCTS DIVISION

### GENERAL DESCRIPTION

The I-542 Series Explosion-Proof Temperature-Pressure Switch is designed for rigorous engine-mounted service as well as low-cost, dependable protection against damage to equipment or process.

Originally, these explosion-proof switches were developed for safety shutdown service on internal combustion engines where hazardous atmospheres were involved. Units are equally suitable for monitoring the temperature and pressure on turbines and various processes.

Typical applications include shutting off ignition, grounding magnetos, serving as safety shutdown switches or actuating a visual/audible signal when setpoints are exceeded.

### SPECIFICATIONS

#### Temperature Ranges:

Six temperature ranges are available with either a remote or integral bulb design: 130-150 F (54.4-65.6°C.), 150-170 F (65.6-76.7°C.), 170-190 F (76.7-87.8°C.), 185-205 F (85.0-96.1°C.), 205-225 F (96.1-107.2°C.), 315-345 F (157.2-173.9°C.). Maximum over-temperature is 50 F (27.8°C.) above highest adjustable temperature. All temperature models are "fail-safe."

#### Pressure Ranges:

5-25 psi (.345-1.724 bar) adjustable. (Max. over-pressure, 75 psi (5.171 bar).

#### Switch Ratings:

| Switch Type             | Rating |      |
|-------------------------|--------|------|
|                         | VAC    | VDC  |
|                         | 120    | 125  |
| Standard SPDT No. 92611 | 15     | .5   |
| Split Contact No. 93525 | 5      | 1.0  |
| Heavy-Duty DC No. 95970 | --     | 10.0 |

#### Construction:

**Housing:** Explosion proof, die cast aluminum approved by Underwriters Laboratories for Class I, Group D, hazardous atmospheres.

**Pressure Element:** ..... Brass.

**Temperature Element:** ..... Brass.

**Other Parts:** ..... Steel.

#### Accessories:

Capillary up to 30 ft. (9.14 m) [6 ft. (1.83 m) Standard].

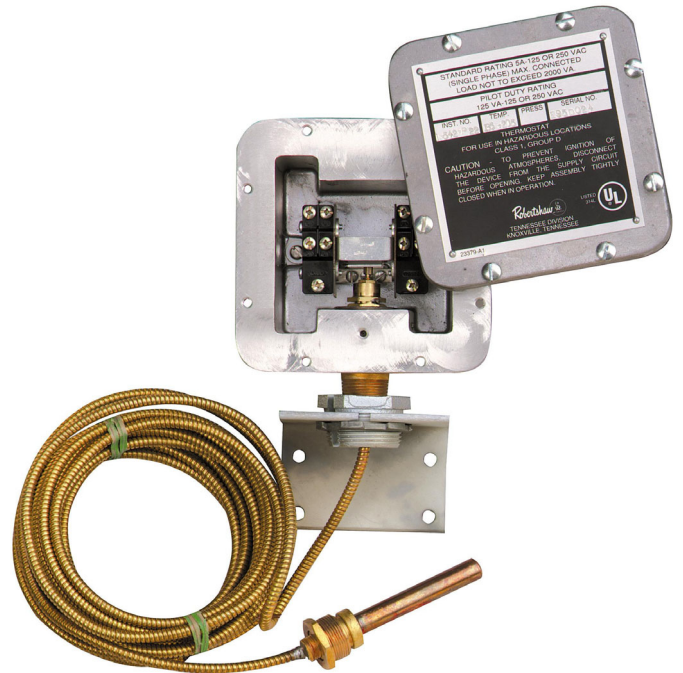
Mounting Brackets (standard on L, N, P, Series).

Sockets (copper or stainless steel).

#### Switch Staging:

For units having two switches acting simultaneously, the pressure element has a maximum staging of 5 psi (.345 bar). The temperature element has a maximum staging of 6 F (3.3°C.).

# EXPLOSION-PROOF TEMPERATURE PRESSURE SWITCH I-542 Series



#### Ordering Information:

When ordering, give the following information:

1. Model number. (See Tables I thru VI.)
2. Temperature range, setpoint and capillary length.
3. Pressure range and setpoint.
4. Number and type of switches required.
5. Accessories.
6. Shipping, invoicing and tagging instructions.

#### Spare Parts:

When ordering spare parts, please furnish the following:

1. Model number from cover plate.
2. Serial number from cover plate.
3. Pressure and/or temperature ranges.

# MODEL IDENTIFICATION

**TABLE I**

| SPECIFY MODEL | TEMP. ELEMENT |          | PRESSURE ELEMENT | SWITCHING ACTION                     | STANDARD NO. SWITCHES |
|---------------|---------------|----------|------------------|--------------------------------------|-----------------------|
|               | REMOTE        | INTEGRAL |                  |                                      |                       |
| I-542-H       |               | X        | X                | Independent-Pressure and Temperature | 2                     |
| I-542-J       |               | X        |                  | Simultaneous-Temperature             | 1                     |
| I-542-K       |               |          | X                | Simultaneous-Pressure                | 1                     |
| I-542-L       | X             |          | X                | Simultaneous-Temperature or Pressure | 1                     |
| I-542-M       |               | X        | X                | Simultaneous-Temperature or Pressure | 1                     |
| I-542-N       | X             |          | X                | Independent-Temperature and Pressure | 2                     |
| I-542-P       | X             |          |                  | Simultaneous-Temperature             | 1                     |
| I-542-Q       |               |          | 2X               | Independent- (2) Pressure            | 2                     |

**TABLE II - I-542-H and N SERIES**

NUMBER SHOWN IN BOX AT INTERSECTION OF RANGE AND SWITCH ASSEMBLY DESIRED IS SUFFIX NUMBER FOR UNIT.

| SWITCHES            | TEMPERATURE RANGE-F. (°C.) |                        |                        |                        |                         |                          |
|---------------------|----------------------------|------------------------|------------------------|------------------------|-------------------------|--------------------------|
|                     | 130-150<br>(54.4-65.5)     | 150-170<br>(65.6-76.7) | 170-190<br>(76.7-87.8) | 185-205<br>(85.0-96.1) | 205-225<br>(96.1-107.2) | 315-345<br>(157.2-173.9) |
| Two SPDT            | 1                          | 4                      | 7                      | 10                     | 13                      | 16                       |
| Two Split-Contact   | 2                          | 5                      | 8                      | 11                     | 14                      | 17                       |
| Two Heavy-Duty SPDT | 3                          | 6                      | 9                      | 12                     | 15                      | 18                       |

**TABLE III - I-542-J SERIES**

NUMBER SHOWN IN BOX AT INTERSECTION OF RANGE AND SWITCH ASSEMBLY DESIRED IS SUFFIX NUMBER FOR UNIT.

| SWITCHES            | TEMPERATURE RANGE-F. (°C.) |                        |                        |                        |                        |                         |                          |
|---------------------|----------------------------|------------------------|------------------------|------------------------|------------------------|-------------------------|--------------------------|
|                     | 110-130<br>(43.3-54.4)     | 130-150<br>(54.4-65.6) | 150-170<br>(65.6-76.7) | 170-190<br>(76.7-87.8) | 185-205<br>(85.0-96.1) | 205-225<br>(96.1-107.2) | 315-345<br>(157.2-173.9) |
| One SPDT            | 6                          | 42                     | 38                     | 34                     | 30                     | 26                      | 22                       |
| Two SPDT            | 5                          | *43,41                 | 37                     | *44,33                 | 29                     | 25                      | 21                       |
| One Split-Contact   | 4                          | 40                     | 36                     | 32                     | 28                     | 24                      | 20                       |
| Two Split-Contact   | 3                          | 39                     | 35                     | 31                     | 27                     | 23                      | 19                       |
| One Heavy-Duty SPDT | 2                          | 18                     | 16                     | 14                     | 12                     | 10                      | 8                        |
| Two Heavy-Duty SPDT | 1                          | 17                     | 15                     | 13                     | 11                     | 9                       | 7                        |

\*J-43 and J-44 have 6" (152.40 mm) bulb instead of Standard 3-7/16" (87.31 mm) Bulb.

**TABLE IV - I-542-K SERIES**

NUMBER SHOWN IN BOX AT INTERSECTION OF MOUNTING THREAD AND SWITCH ASSEMBLY DESIRED IS SUFFIX NUMBER FOR UNIT.

| SWITCHES            | EXTERNAL MOUNTING THREAD |              |
|---------------------|--------------------------|--------------|
|                     | 3/4 - 14 NPT             | 1/2 - 14 NPT |
| One SPDT            | 1                        | 5            |
| Two SPDT            | 2                        | 6            |
| One Split-Contact   | 3                        | 7            |
| Two Split-Contact   | 4                        | 8            |
| One Heavy-Duty SPDT | 9                        | 11           |
| Two Heavy-Duty SP T | 10                       | 12           |

**TABLE V - I-542-L, M and P SERIES**

NUMBER SHOWN IN BOX AT INTERSECTION OF RANGE AND SWITCH ASSEMBLY DESIRED IS SUFFIX NUMBER FOR UNIT.

| SWITCHES            | TEMPERATURE RANGE-F. (°C.) |                        |                        |                        |                         |                          |
|---------------------|----------------------------|------------------------|------------------------|------------------------|-------------------------|--------------------------|
|                     | 130-150<br>(54.4-65.6)     | 150-170<br>(65.6-76.7) | 170-190<br>(76.7-87.8) | 185-205<br>(85.0-96.1) | 205-225<br>(96.1-107.2) | 315-345<br>(157.2-173.9) |
| One SPDT            | 1                          | 7                      | 13                     | 19                     | 25                      | 31                       |
| Two SPDT            | 2                          | 8                      | 14                     | 20                     | 26                      | 32                       |
| One Split-Contact   | 3                          | 9                      | 15                     | 21                     | 27                      | 33                       |
| Two Split-Contact   | 4                          | 10                     | 16                     | 22                     | 28                      | 34                       |
| One Heavy-Duty SPDT | 5                          | 11                     | 17                     | 23                     | 29                      | 35                       |
| Two Heavy-Duty SPDT | 6                          | 12                     | 18                     | 24                     | '10                     | 36                       |

**TABLE VI - I-542-Q SERIES**

NUMBER SHOWN IN BOX AT INTERSECTION OF THREAD COMBINATION AND SWITCH ASSEMBLY DESIRED IS SUFFIX NUMBER FOR UNIT.

NOTE: MOUNTING BRACKET IS AVAILABLE ONLY FOR O1 thru Q9.

CODE FOR CONNECTION SIZES:

A = 3/4-14 NPT

B = 1/2-14 NPT

C = 7/16-20-UNF-2A Std. SAE FLARE

FIRST LETTER IN SERIES SUCH AS "A-B" IS TOP THREAD.

| SWITCHES            | THREAD COMBINATION - SEE CODE ABOVE |     |     |     |     |     |     |     |     |
|---------------------|-------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
|                     | A-A                                 | A-B | A-C | B-A | B-B | B-C | C-A | C-B | C-C |
| Two SPDT            | 1                                   | 4   | 7   | 13  | 10  | 16  | 22  | 25  | 19  |
| Two Split-Contact   | 2                                   | 5   | 8   | 14  | 11  | 17  | 23  | 26  | 20  |
| Two Heavy-Duty SPDT | 3                                   | 6   | 9   | 15  | 12  | 18  | 24  | 27  | 21  |

**INSTALLATION**

**A. Temperature**

Prior to installation, the unit should be inspected to determine if any damage has occurred during shipment.

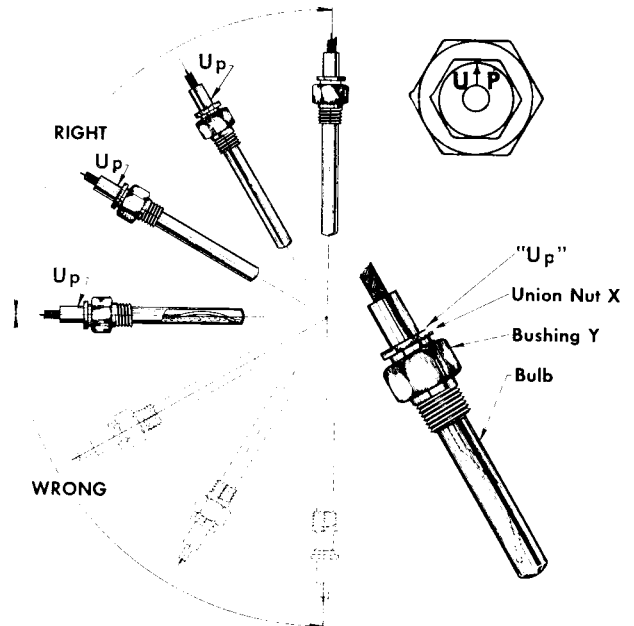
Models H, J and M are equipped with integral temperature bulbs having 1/2"-14 NPT external threads. DO NOT use housing as lever when tightening pipe threads. Hex wrench flats are provided for this purpose. Be sure unit is located in an area of good circulation.

Models L, N, and P with remote bulbs are equipped with angle bracket which may be attached to any flat surface. The thermo-sensitive bulb must be installed as shown in Figure 1.

To install bulb, loosen Union Nut X and Bushing Y and tighten Bushing Y into 1/2"-14 NPT tapped opening. Check "UP" imprinted on Position Disc for proper orientation and tighten Union Nut X (Figure 1).

**CAUTION:**

1. When removing Union Nut X, care should be taken not to lose seal between Bushing and Union.
2. Do not kink, crush or sever capillary.
3. Do not place capillary on or near surfaces which have temperatures which will affect the operation of the instrument (steam lines, exhaust manifolds, etc.).



**Figure 1**

## INSTALLATION (Continued)

4. On remote bulb models (L, N, and P) elevating or lowering the bulb with respect to the instrument may have a marked effect on the range. This is due to the effect of liquid column on the instrument. Elevations in excess of 2-3 feet (.61-.91 m) shift the setpoint.
- Setpoint is lowered if bulb is above instrument.
  - Setpoint is raised if bulb is below instrument.

### B. Pressure

Pressure, such as Tube oil, may be monitored by connecting the pressure element to the oil pressure line by means of copper tubing [ 1/4" (6.35 mm)]. Pressure connections are available with 7/16"-20 SAE tube fittings, 1/2" NPT or 3/4" NPT external male threads. All pipe connections are also tapped 1/8"-27 NPT internal.

### C. Electrical Connections

All electrical wiring on explosion-proof installation must be in rigid conduit connected to tapped holes provided in housing and secured with lock nut. If only one hole is used, the other MUST be plugged with pipe plug.

#### Local codes (if any) must be observed.

Any time cover is removed and replaced, tighten screws until a .0015" (.037 mm) feeler gage will not enter the joint, between housing and cover, more than 1/8" (3.18 mm) at any point along housing.

**WARNING:** All electrical circuits must be turned off before removing cover.

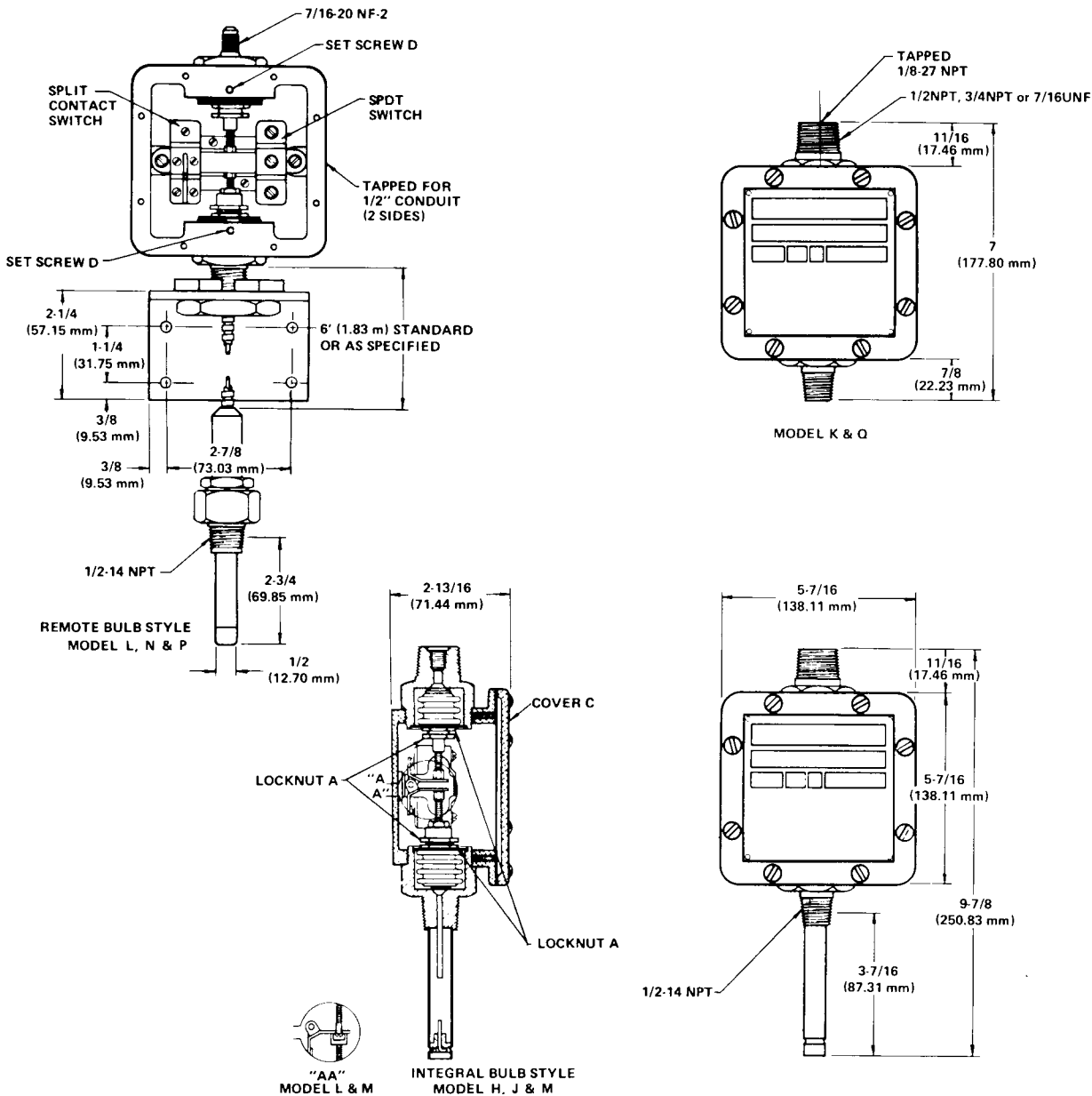


Figure 2

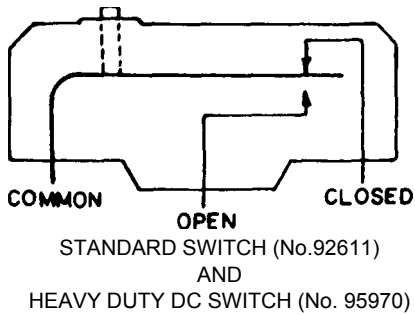


Figure 3

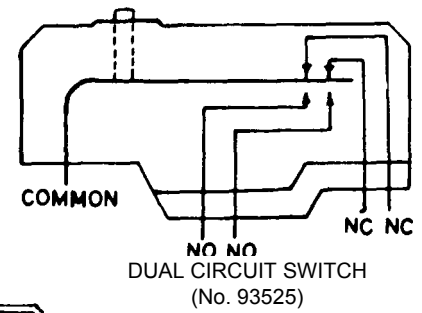


Figure 4

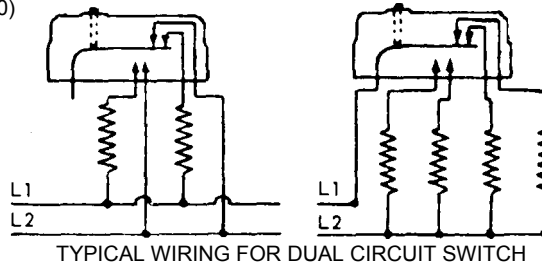


Figure 5

## OPERATION

The thermostatic assembly is activated by increasing temperature surrounding the sensing bulb. As this temperature increases the volatile charge vaporizes generating pressure on the bellows causing the stem to extend and operate the switch assembly. These thermo elements are "fail-safe," that is, failure or damage to the element will cause the instruments to actuate at a much lower temperature than the setpoint.

The pressure assembly responds directly to a pressure change. As pressure increases, the stem will extend. Switching action is adjustable or factory-set as required.

The switching action on Models L and M is simultaneous. The switches are operated by either rising temperature or falling pressure. On the other models, switches are operated independently, one switch for temperature and one for pressure.

## MAINTENANCE - See Figure 2

**WARNING:** All electrical circuits must be turned off before removing cover.

Because of special calibration procedures, Models L and M should be returned to factory for repair work. A special wrench is provided with each unit for adjusting the setpoint.

### A. Recommended Spare Parts

The following parts should be kept on hand for repair purposes:

1. Electrical switch.
2. Pressure and/or temperature assembly.

### B. Adjustments

1. To change the pressure element setpoint, within range stamped on cover, loosen Lock Nut A and turn Adjusting Screw B into the cup assembly to

increase the setpoint. To decrease setpoint, back adjusting nut out to desired setting.

2. To change the temperature element setpoint, within range stamped on cover, loosen Lock Nut A and turn Adjusting Screw B into the cup assembly to increase the setpoint. To lower the setpoint, back adjusting nut out of cup assembly. **IMPORTANT:** In order to adjust temperature range, the pressure element must have at least 20 psi (1.379 bar) on it at all times.

## Replacements:

1. All pressure elements are field replaceable except those on Models L and M. These should be returned to factory for repair. To replace other pressure elements, remove Cover C and Set Screw D allowing old element to be unscrewed and new one inserted.
2. All temperature elements are field replaceable. To replace, remove Cover C and Set Screw D allowing old temperature element to be unscrewed and new element inserted.

## Troubleshooting

1. A damaged pressure assembly will display the following characteristics:
  - a. Process variable, such as Tube oil will be in the housing.
  - b. Stem will fail to make stroke as pressure increases.
2. Damaged thermo element will display the following characteristics:
  - a. As temperature decreases, stem will not retract to original position.
  - b. Unit will trip at a much lower setpoint than it was originally set for.

# PARTS LIST

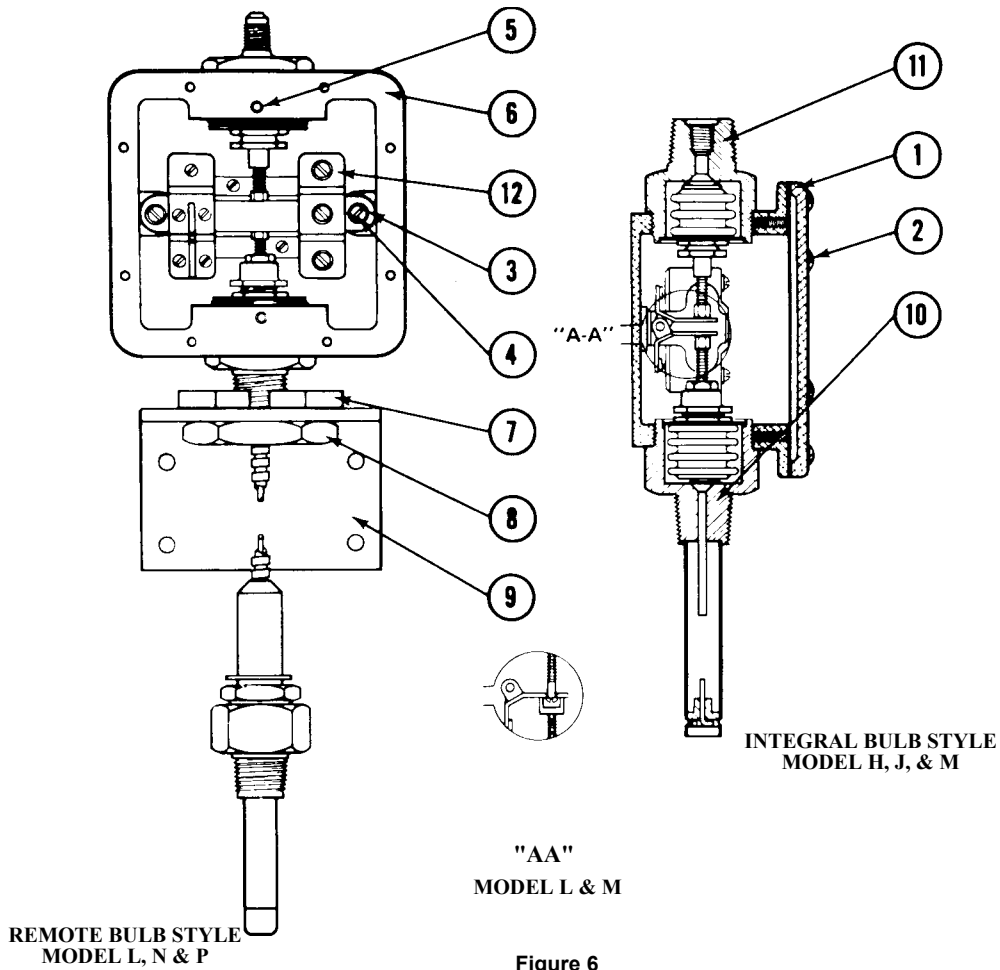


Figure 6

| Name             | Det. No. | No. Req'd | I-542-H            | No. Req'd | I-542-J     | No. Req'd | I-542-K     | No. Req'd | I-542-L     | No. Req'd | I-542-M     | No. Req'd | I-542-N     | No. Req'd | I-542-P     | No. Req'd | I-542-Q     |
|------------------|----------|-----------|--------------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
| Cover            | 1        | 1         | 98461-B            | 1         | 98461-B     | 1         | 98461-B     | 1         | 98461-B     | 1         | 98461-B     | 1         | 98461-B     | 1         | 98461-B     | 1         | 98461-B     |
| Screw            | 2        | 8         | 23373              | 8         | 23373       | 8         | 23373       | 8         | 23373       | 8         | 23373       | 8         | 23373       | 8         | 23373       | 8         | 23373       |
| Washer           | 3        | 2         | 36602-L0612        | 2         | 36602-L0612 | 2         | 36602-L0612 | 2         | 36602-L0612 | 2         | 36602-L0612 | 2         | 36602-L0612 | 2         | 36602-L0612 | 2         | 36602-L0612 |
| Screw            | 4        | 2         | 33713-G0909        | 2         | 33713-G0909 | 2         | 33713-G0909 | 2         | 33713-G0909 | 2         | 33713-G0909 | 2         | 33713-G0909 | 2         | 33713-G0909 | 2         | 33713-G0909 |
| Set Screw        | 5        | 2         | 36713-G1328        | 1         | 36713-G1328 | 1         | 36713-G1328 | 2         | 36713-G1328 | 2         | 36713-G1328 | 2         | 36713-G1328 | 1         | 36713-G1328 | 2         | 36713-G1328 |
| Housing          | 6        | 1         | 23368              | 1         | 23367       | 1         | 23367       | 1         | 23368       | 1         | 23368       | 1         | 23368       | 1         | 23367       | 1         | 23368       |
| Bushing          | 7        |           |                    |           |             |           |             | 1         | 13835-A1    |           |             | 1         | 13835-A1    | 1         | 13835-A1    |           |             |
| Lock Nut         | 8        |           |                    |           |             |           |             | 1         | 13834       |           |             | 1         | 13834       | 1         | 13834       |           |             |
| Bracket          | 9        |           |                    |           |             |           |             | 1         | 15423       |           |             | 1         | 15423       | 1         | 15423       |           |             |
| Thermo Element   | 10       | 1         | 98465-A            | 1         | 98465-A     |           |             | 1         | 98469-A     | 1         | 98465-A     | 1         | 98469-A     | 1         | 98469-A     |           |             |
| Pressure Element | 11       | 1         | 98545              |           |             | 1         | 98466-A     | 1         | 98545       | 1         | 98545       | 1         | 98545       | 1         |             | 2         | *           |
| Switch           | 12       |           | SEE SWITCH RATINGS |           |             |           |             |           |             |           |             |           |             |           |             |           |             |
| Adjusting Wrench | 13       |           | NOT SHOWN 14588    |           |             |           |             |           |             |           |             |           |             |           |             |           |             |

\* Pressure Element  
 98466-A1 1/2-14 NPT )  
 98466-A2 3/4-14 NPT )  
 98545 7/16-20 UNF-2A )

ANY COMBINATION AVAILABLE

# Robertshaw

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