

**Pneumatic Bulb Thermostats  
General Instructions**

For proportional temperature control of pneumatic valves and actuators to maintain discharge temperature of reheat systems and sampling chamber or return air temperature of terminal units and as a proportional low limit thermostat.

**GENERAL INFORMATION**

Proportional control type of pneumatic instrument, using balanced lever system actuated by a liquid-filled thermal copper element with a 3' (914 mm) capillary.

**Maximum Safe Air Pressure:** 30 psig (207 kPa).

**Maximum Sale Case Temperature:** 140°F (60°C).

**Mounting:** Directly by means of top mounting holes or with a right angle mounting bracket included with thermostat.

**Air Connections:** Post with barb for 1/4" O.D. plastic tubing.

**Air Consumption for Sizing Air Compressor:** .016 scfm (8 ml/s) @ 15 psig (103 kPa), .024 scfm (11 ml/s) @ 20 psig (138 kPa).

**Air Capacity for Sizing Air Mains:** 36 scim (10 ml/s) @ 15 psig (103 kPa), 50 scim (14 ml/s) @ 20 psig (138 kPa).

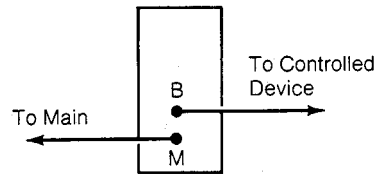
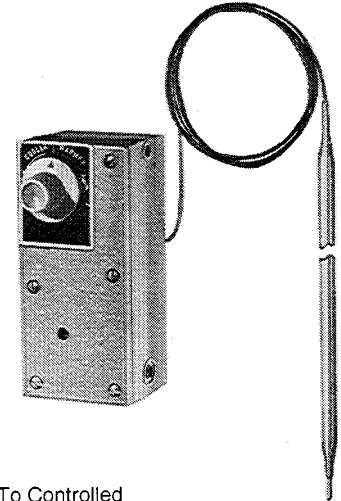
**Dimensions:** 4-5/8" (117 mm) high x 2-1/8" (54 mm) wide x 1-5/8" (41 mm) deep.

**Options**

None

**ACCESSORIES**

AT-208	Duct mounting kit
Tool-95	Pneumatic calibration tool kit



TK-2000, 3000, 4000 except TK-4212-201

**Table-1 Model Chart.**

Part Number	Description and Action <sup>a</sup>	Max. Safe Bulb Temp. °F (°C)	Bulb Style Dimensions in inches (mm)	Control Dial Range °F (°C)	Throttling Range	Supply Air Pressure psig (kPa)
TK-2001	Heating DA <sup>b</sup>	140 (60)	Straight 7/32 x 14 (6 x 356)	Dial Marked Cooler-Warmer 60-90 (15-32)	Adjustable 2-10°F (1-6°C)/10 psi (69 kPa) Factory Set 4°F (2°C)/10 psi (69 kPa)	15 (103)
TK-3001			Coiled 1 x 5 (25 x 127)			
TK-4001			Averaging 1/8 x 48 (3 x 1.2 m)			
TK-2201	Heating-Cooling 20 (138) DA 15 (103) RA	140 (60)	Straight 7/32 x 14 (6 x 356)	Dial Marked Cooler-Warmer 60-90 (15-32)	Adjustable 2-10°F (1-6°C)/10 psi (69 kPa) Factory Set 4°F (2°C)/10 psi (69 kPa)	15 (103) RA <sup>a</sup> Cooling 20 (138) DA <sup>a</sup> Heating
TK-3201			Coiled 1 x 5 (25 x 127)			
TK-2012	Heating DA <sup>b</sup>	230 (110)	Straight 3/16 x 11-1/4 (5 x 286)	Dial Marked Cooler-Warmer 30-90 (-1 to 32)	Adjustable 5-25°F (3-14°C)/10 psi (69 kPa) Factory Set 10°F (6°C)/10 psi (69 kPa)	15 (103)
TK-4012			Averaging 3/32 x 54 (2 x 1.4 m)			
TK-4212	Heating-Cooling 20 (138) DA 15 (103) RA	230 (110)	Averaging 3/32 x 54 (2 x 1.4 m)	Dial Marked Cooler-Warmer 30-90 (-1 to 32)	Adjustable 5-25°F (3-14°C)/10 psi (69 kPa) Factory Set 10°F (6°C)/10 psi (69 kPa)	15 (103) RA <sup>a</sup> Cooling 20 (138) DA <sup>a</sup> Heating
TK-4212-201	Heating-Cooling Low Limit <sup>c</sup> 20 (138) DA Full Output 15 (103)	230 (110)	Averaging 3/32 x 54 (2 x 1.4 m)	Dial Marked Cooler-Warmer 30-90 (-1 to 32)	Adjustable 5-25°F (3-14°C)/10 psi (69 kPa) Factory Set 10°F (6°C)/10 psi (69 kPa)	15 (103) Full Output 20 (138) DA <sup>a</sup> Heating

- <sup>a</sup> Direct Acting (DA) - Increase output pressure on temp. rise.  
Reverse Acting (RA) - Decrease output pressure on temp. rise.
- <sup>b</sup> Field changeable to reverse acting.
- <sup>c</sup> AT 20 psi (138 kPa) unit can bleed down a branch line from a controlling thermostat.  
At 15 psi (103 kPa) unit is inoperative, i.e. passes controlling thermostat signal.

**DIMENSIONS**

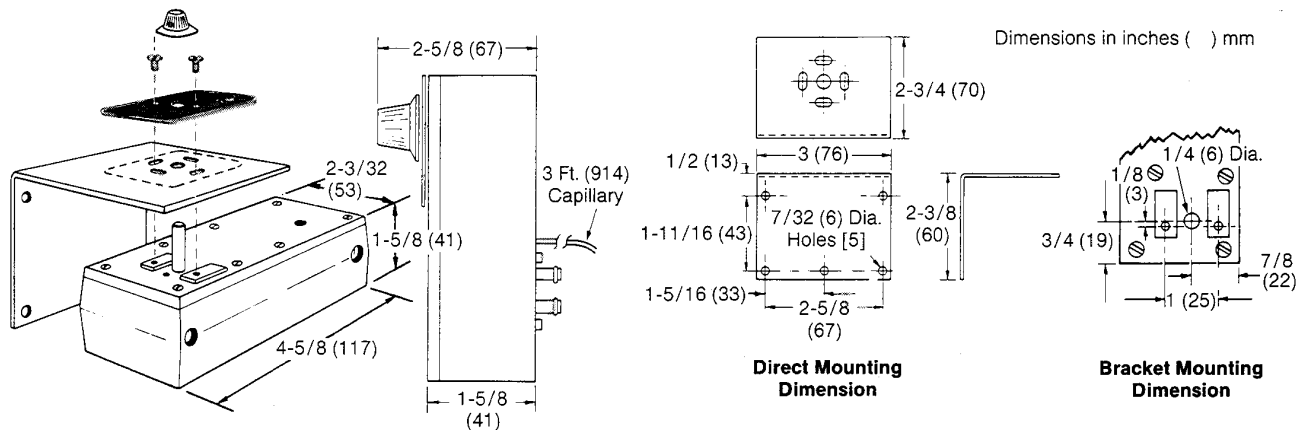


Figure-1 Mounting Dimensions.

## INSTALLATION

### Locating

The thermostat can be mounted in any position. However, it is most common to mount the thermostat with the setpoint adjusting shaft on top. The adjusting mechanism is in the thermostat on the side opposite from the setpoint knob shaft. This area should be readily accessible so that the thermostat can be serviced easily. Locate the bulb in the return air intake in a position where it will sense representative air temperatures.

### Mounting

If the thermostat is mounted directly to the unit air conditioner, drill three holes corresponding to the location of the mounting holes and setpoint shaft in the thermostat. To use bracket, drill three holes to match any three of the five bracket mounting holes selected (Figure 1).

Mount the thermostat using the two #10-32 screws, and the scale plate which indicates the temperature setting. Attach the knob, positioned so that the pointer indicates the cooler (CCW) position on the scale. Rotate setpoint to midscale.

Uncoil the capillary tubing and fasten the bulb in the air stream being controlled as shown in Figures 2 and 3 below. (See Figures 7 and 8 for duct mounting template and assembly).

Attach 1/4" O.D. plastic tube to "m" (main) and "B" (branch) fittings by slightly rotating the tubes back and forth and pushing firmly onto the fitting (see Figure 4).

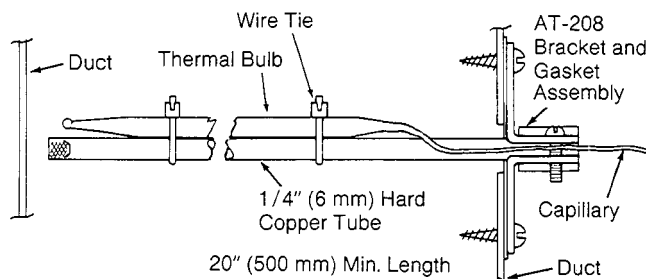


Figure-2 Mounting TK-2000 Series Bulb.

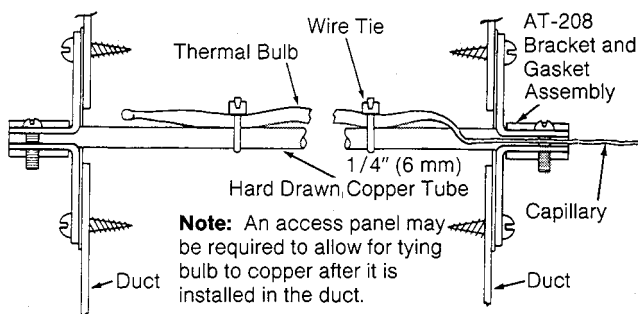


Figure-3 Mounting TK-4000 Series Bulb.

## CONVERSION OF DIRECT ACTING THERMOSTAT TO REVERSE ACTING

1. Remove direct acting calibration screw complete with tension nut (Figure 4).
2. Insert screw into threaded hole where reverse acting screw is shown in Figure 4.
3. Tighten tension nut carefully until it is snug.

**Caution:** DO NOT overtighten as this will ruin nut.

4. Calibrate per instructions shown below.

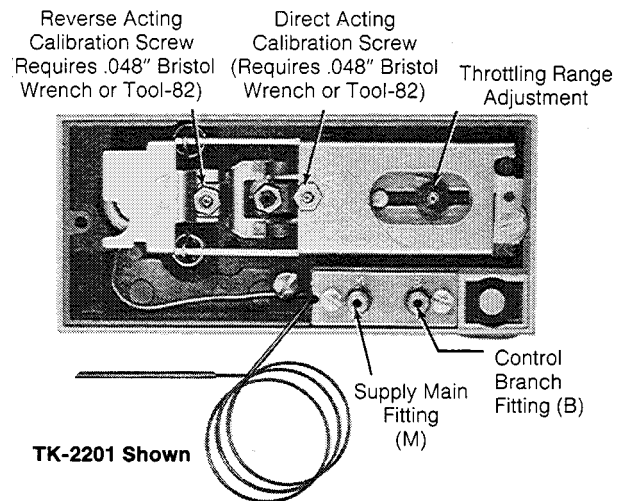


Figure-4

## THROTTLING RANGE ADJUSTMENT

The throttling range should be set at the lowest value which will allow the thermostat to control the system without cycling under normal load conditions. The most satisfactory setting will vary with the type of control system.

The throttling range is changed by sliding the throttling range adjustment pivot in the flapper to its proper position (see Figure 4). Calibration of the thermostat should be checked after the throttling range has been changed. When making the throttling range adjustment, care should be taken to prevent excessive side forces on the flapper lever (see Figure 6).

**Caution:** In no case should the pivot point be raised when the adjustment is made (see Figure 6).

## CALIBRATION

After the throttling range adjustment is made, the thermostat should be checked for calibration. As a nominal calibration, the controlled branch pressure should be 8 psig (55 kPa) when the setpoint is equal to the bulb temperature, indicated by a thermometer located near the bulb. In some applications, a value other than 8 psig (55 kPa) will be required to get the desired control results. Change the 8 psig (55 kPa) designation as used in the calibration procedure, should this be the case.

Calibrate the thermostat as follows (See Figure 5):

Disconnect the branch line at the thermostat and attach a test gauge to the fitting (B). Push the tubing on as far as it will go, approximately 1/4" (6 mm). The tubing for this test gauge should be approximately 6" (150 mm) long to permit bringing the gauge out from the test point to a place where it can be easily read. The supply pressure to the thermostat should be 15 psig (103 kPa).

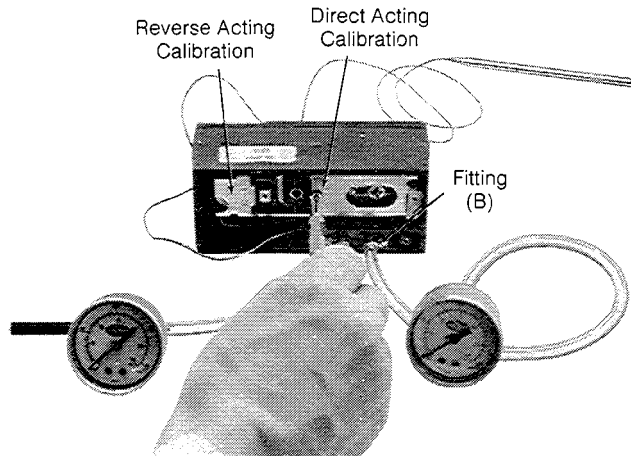


Figure-5

## One Temperature Thermostats

These thermostats are factory adjusted to operate at the midpoint of the dial span, when the adjusting dial is in its mid-position. Whenever the throttling range is changed, the thermostat calibration should be checked and adjusted if necessary as follows:

1. The scale on the thermostat represents 30°F (17°C) or 60°F (33°C) span (see page 1) with the desired control point in the center. Each division is equal to 5°F (3°C) for 30°F (17°C) span units and 10°F (6°C) for 60°F (33°C) span units.
2. Observe the temperature of the bulb using a test thermometer. Turn the knob of the thermostat to the point on the scale which would correspond to the bulb temperature. Read the branch line pressure. It should be 8 psig  $\pm$ 1 psig (55 kPa  $\pm$ 7 kPa).
3. If the pressure is not 8 psig (55 kPa) use a .048" Bristol wrench (TOOL-82) in the calibrating screw and adjust the screw to obtain 8 psig (55 kPa). The proper screw holes for the reverse acting or direct acting calibration are labeled on the main lever (Figure 5).

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**Caution:** Care should be taken when adjusting the reverse acting setpoint screw. Avoid unnecessary side motions and particularly avoid lifting the lever to which the screw is attached. Burrs on the Bristol wrench could cause it to stick in the screw. Note also, that the hex nuts on the adjusting screws are used to provide tension only and should not be loosened when making calibration adjustments.

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4. When the calibration has been completed, turn the knob to the desired setpoint and remove the gauge, reconnect the branch line and replace the cover.

## Heating-Cooling Thermostats

1. Adjust the supply line pressure for the system to 25 psig (172 kPa).
2. Connect a pressure regulator into the supply main between the main and the thermostat at the thermostat location.
3. Adjust the regulator to 20 psig (138 kPa); at this supply pressure the thermostat is direct acting.
4. Set the dial knob on the thermostat to the bulb temperature setting and observe the branch line control air pressure. This pressure should be 8 psig  $\pm$ 1 psi (55 kPa  $\pm$ 7 kPa).
5. If not, adjust the direct acting screw to obtain 8 psig (55 kPa) branch line control pressure using a .048" Bristol wrench (Tool-82).

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**Caution:** Do not loosen the hex nut on the screw. This nut is for friction purposes only; it does not lock the screw.

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6. Adjust the regulator in the main line to 15 psig (103 kPa). At this supply pressure the temperature is reverse acting.
7. Observe the branch line control air pressure. If this pressure is not 8 psig (55 kPa), use a .048" Bristol wrench (TOOL-82) and adjust the reverse acting calibrating screw to obtain an 8 psig (55 kPa) branch line control pressure.

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**Caution:** The lever to which this screw is attached contains a spring hinge and is pivoted on the switch point adjusting spring. Undue side motion or forces tending to lift the switch lever off the main lever can damage the hinge or unseat the lever.

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8. Recheck calibration by switching the supply pressure between 15 and 20 psig (103 and 138 kPa) several times and observe the control pressure. If it varies from the desired pressure, repeat the calibration procedures.
9. Calibration is now complete. Turn the adjusting knob to the desired setpoint. Remove the test gauge and regulator, reconnect the main and branch lines and replace the cover.

## Heating-Cooling Low Limit TK-4212-201

A special Heating-Cooling Thermostat is available for unitary heating-cooling applications. This thermostat is very similar to the TK-4212 except:

1. The restriction plate has been removed making the unit a one pipe thermostat. The air signal to the main connection actuates only the switchover parts.
2. The R.A. calibration screw has been removed. Therefore, when the main pressure is reduced to 15 psig (103 kPa), there is no calibration screw to contact the main lever and the flapper closes the nozzle completely and the thermostat is inoperative.

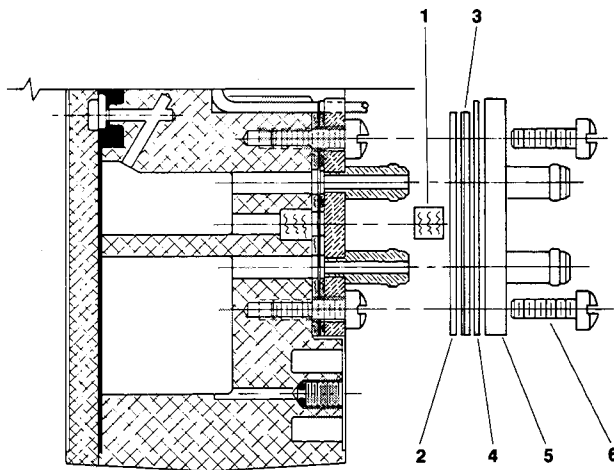
To calibrate apply 20 psig (138 kPa) to the main and full branch pressure from the primary controller to the branch connection of the TK-4212-201. Then calibrate as a single temperature D.A. thermostat.

## MAINTENANCE

This is a quality product. Regular maintenance of the total system is recommended to assure sustained optimum performance.

### AT-529 Restrictor Kit

Item No.	Description	Quantity in Kit
1	Filter	2
2	Restrictor Gasket	1
3	Restrictor	1
4	Restrictor Gasket	1
5	Air Connector	1
6	Screws	2



## FIELD REPAIR

Repair is not recommended except for replacement of restrictor assembly. Use AT-529 restrictor kit (see Figure 6) if restrictor replacement is required. Otherwise, replace thermostats if system is not operating correctly and the cause is traced to the thermostat.

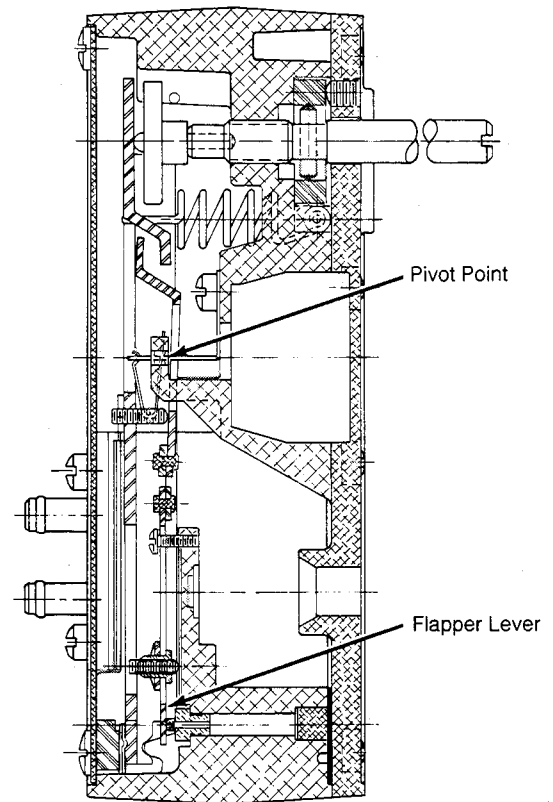


Figure-6

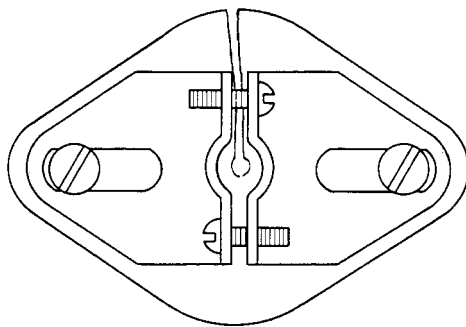


Figure-7 AT-208 Duct Mounting Kit.

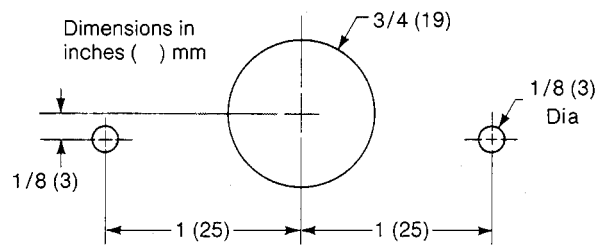


Figure-8 Bulb Mounting Hole Arrangement for Drilling Ductwork.

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