APPLICATION
For on-off control of media temperature in ducts, tanks, liquid lines, etc.

SPECIFICATIONS
Setpoint Dial Range: Dial plate is marked as °F on one side and °C on the other. See Table-2 for specific ranges.
Sensing Element: Liquid-filled copper.
Differential: See Table-2.
Dual Bulb Units: One bulb senses the controlled media; the second bulb senses the outside air temperature. The temperature of the controlled media increases as outside air temperature decreases.
Ambient Temperature Limits:
  Case,  
  Shipping -40 to 160°F (-40 to 71°C).
  Operating -40 to 150°F (-40 to 65°C); except return air bulb unit, -40 to 140°F (-40 to 60°C).
Bulb, See Table-2.
Electrical Switch: Snap action SPDT, one per stage.
Ratings, See Table-1.
Connections: Coded screw terminals.
Cover: All metal with 1/2" to 3/4" conduit openings.
Case Locations: NEMA Type 1 indoor only.
Mounting: Case can be mounted in any position. See ACCESSORIES for bulb mounting kits (order separately).
Dimensions:
  Case, 4-5/8" high x 2-1/4" wide x 2" deep (117 mm x 57 mm x 51 mm)
  Element and Capillary, See Table-2.

ACCESSORIES
AT-201 Copper bulb well requires AT-209
AT-203 Stainless steel bulb well requires AT-209
AT-206 Copper bulb well
AT-208 Duct mounting kit
AT-209 Bulb mounting kit
AT-210 Concealed adjustment plate
AT-211 Outside bulb shield

Table-1 Maximum Electrical Rating (All units except TC-4115*)

<table>
<thead>
<tr>
<th>Switch Rating (50/60 Hz)</th>
<th>24V</th>
<th>120V</th>
<th>240V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Load Amps</td>
<td>9.8</td>
<td>9.8</td>
<td>8.0</td>
</tr>
<tr>
<td>Locked Rotor Amps</td>
<td>58.8</td>
<td>58.8</td>
<td>48.0</td>
</tr>
<tr>
<td>Pilot Duty VA</td>
<td>60</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>Non-Inductive Amps (Resistive)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Stage</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Two Stage</td>
<td>16</td>
<td>16</td>
<td>8.0</td>
</tr>
</tbody>
</table>

* TC-4115 for TAC System 8000 and applications requiring less than one (1) amp. Electrical Rating: 1.0 amp at 24 Vac; 0.25 amp at 24 Vdc.

Figure-1 Switch Action and Terminal Identification.
### Table-2 Specifications.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Type</th>
<th>Setpoint Adjustment Range °F (°C)</th>
<th>Dual² Bulb Ratio</th>
<th>Dimensions</th>
<th>Capillary Copper ft. (m)</th>
<th>Bulb Copper in. (mm)</th>
<th>Differential °F (°C)</th>
<th>Safe Bulb Temperature Range °F (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC-4111</td>
<td>Single Stage Single Bulb</td>
<td>-40 to 120 (-40 to 49)</td>
<td></td>
<td></td>
<td>6 (1.8)</td>
<td>20 (6)</td>
<td>-40 to 170 (-40 to 77)</td>
<td></td>
</tr>
<tr>
<td>TC-4112</td>
<td>Single Stage Single Bulb</td>
<td>100 to 260 (38 to 127)</td>
<td></td>
<td></td>
<td>6 (1.8)</td>
<td>3/8 x 4 (9.5 x 102)</td>
<td>Factory Set 3 (2) Adj. 3 to 16 (2 to 9)</td>
<td></td>
</tr>
<tr>
<td>TC-4115⁰</td>
<td>Single Stage Single Bulb</td>
<td>-40 to 120 (-40 to 49)</td>
<td></td>
<td></td>
<td>10 (3) Amored</td>
<td></td>
<td>-40 to 170 (-40 to 77)</td>
<td></td>
</tr>
<tr>
<td>TC-4121</td>
<td>Single Stage Single Bulb</td>
<td>100 to 260 (38 to 127)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-40 to 170 (-40 to 77)</td>
<td></td>
</tr>
<tr>
<td>TC-4122</td>
<td>Single Stage Single Bulb</td>
<td>190 to 350 (88 to 176)</td>
<td>1:1-1/2² Each Bulb</td>
<td>30 (9)</td>
<td>3/8 x 4 (9.5 x 102)</td>
<td>3/8 x 5-1/2 (9.5 x 140)</td>
<td>Factory Set 3 (2) Adj. 1-1/2 to 10 (1 to 5)</td>
<td></td>
</tr>
<tr>
<td>TC-4123</td>
<td>Single Stage Single Bulb</td>
<td>70 to 120 (21 to 49)</td>
<td>1:1-1/2² Each Bulb</td>
<td>30 (9)</td>
<td>3/8 x 4 (9.5 x 102)</td>
<td>3/8 x 4 (9.5 x 102)</td>
<td>Factory Set 3 (2) Adj. 3 to 16 (2 to 9)</td>
<td></td>
</tr>
<tr>
<td>TC-4166</td>
<td>Single Stage Return Air Bulb</td>
<td>50 to 90 (10 to 32)</td>
<td>None</td>
<td></td>
<td>Coiled 2-1/2 x 2 (64 x 51)</td>
<td>Fixed 2 (1)</td>
<td>-40 to 145 (-40 to 63)</td>
<td></td>
</tr>
<tr>
<td>TC-4211</td>
<td>Two Stage Single Bulb</td>
<td>-40 to 120 (-40 to 49)</td>
<td></td>
<td></td>
<td>6 (1.8)</td>
<td></td>
<td>-40 to 170 (-40 to 77)</td>
<td></td>
</tr>
<tr>
<td>TC-4221</td>
<td>Two Stage Single Bulb</td>
<td>100 to 260 (38 to 127)</td>
<td></td>
<td></td>
<td>10 (3) Amored</td>
<td></td>
<td>-40 to 310 (-40 to 154)</td>
<td></td>
</tr>
<tr>
<td>TC-4223</td>
<td>Two Stage Single Bulb</td>
<td>190 to 350 (88 to 176)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-40 to 310 (-40 to 154)</td>
<td></td>
</tr>
<tr>
<td>TC-4251</td>
<td>Two Stage Dual Bulb</td>
<td>70 to 120 (21 to 49)</td>
<td>1:1-1/2² Each Bulb</td>
<td>30 (9)</td>
<td>3/8 x 4 (9.5 x 102)</td>
<td>3/8 x 5-1/2 (9.5 x 140)</td>
<td>Per Stage Fixed 3 (2) Between Stages Set 3 (2) Adj. 2 to 10 (1 to 5)</td>
<td></td>
</tr>
<tr>
<td>TC-4252</td>
<td>Two Stage Dual Bulb</td>
<td>70 to 120 (21 to 49)</td>
<td>1:1-1/2² Each Bulb</td>
<td>30 (9)</td>
<td>3/8 x 4 (9.5 x 102)</td>
<td>3/8 x 4 (9.5 x 102)</td>
<td>Per Stage Fixed 3 (2) Between Stages Set 3 (2) Adj. 1.5 to 6.5 (1 to 4)</td>
<td></td>
</tr>
<tr>
<td>TC-4266</td>
<td>Two Stage Return Air Bulb</td>
<td>50 to 90 (10 to 32)</td>
<td>None</td>
<td></td>
<td>Coiled 2-1/2 x 2 (64 x 51)</td>
<td>Each Stage Fixed 2 (1) Between Stages Set 3 (2) Adj. 1 to 5 (0.5 to 3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**a** First number of reset ratio typically indicates outdoor air temperature change required to increase the setpoint by the second number.

**b** See Electrical Rating.

**c** For 1:1/2:1 ratio, reverse bulbs and use extra dial supplied with unit.

### Table-3 Ratio Selection Table.

<table>
<thead>
<tr>
<th>Outdoor Temperature in °F</th>
<th>Ratio</th>
<th>Change in Water Temperature for Different Ratios as Outdoor Temperature Drops from 70°F to Design Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dial Set at 70°F</td>
</tr>
<tr>
<td>-30</td>
<td>1 to 1</td>
<td>70 to 220</td>
</tr>
<tr>
<td></td>
<td>1 to 1/2</td>
<td>70 to 170</td>
</tr>
<tr>
<td></td>
<td>1 to 1</td>
<td>70 to 137</td>
</tr>
<tr>
<td>-20</td>
<td>1 to 1</td>
<td>70 to 205</td>
</tr>
<tr>
<td></td>
<td>1 to 1/2</td>
<td>70 to 160</td>
</tr>
<tr>
<td></td>
<td>1 to 1</td>
<td>70 to 130</td>
</tr>
<tr>
<td>-10</td>
<td>1 to 1</td>
<td>70 to 190</td>
</tr>
<tr>
<td></td>
<td>1 to 1/2</td>
<td>70 to 150</td>
</tr>
<tr>
<td></td>
<td>1 to 1</td>
<td>70 to 123</td>
</tr>
<tr>
<td>0</td>
<td>1 to 1</td>
<td>70 to 175</td>
</tr>
<tr>
<td></td>
<td>1 to 1/2</td>
<td>70 to 140</td>
</tr>
<tr>
<td></td>
<td>1 to 1</td>
<td>70 to 117</td>
</tr>
<tr>
<td>+10</td>
<td>1 to 1</td>
<td>70 to 160</td>
</tr>
<tr>
<td></td>
<td>1 to 1/2</td>
<td>70 to 130</td>
</tr>
<tr>
<td></td>
<td>1 to 1</td>
<td>70 to 110</td>
</tr>
<tr>
<td>+20</td>
<td>1 to 1</td>
<td>70 to 130</td>
</tr>
<tr>
<td></td>
<td>1 to 1/2</td>
<td>70 to 120</td>
</tr>
<tr>
<td></td>
<td>1 to 1</td>
<td>70 to 110</td>
</tr>
<tr>
<td>+30</td>
<td>1 to 1</td>
<td>70 to 130</td>
</tr>
<tr>
<td></td>
<td>1 to 1/2</td>
<td>70 to 120</td>
</tr>
<tr>
<td></td>
<td>1 to 1</td>
<td>70 to 110</td>
</tr>
</tbody>
</table>

°C = (°F - 32) / 9.
DUAL BULB SELECTION

On the dual bulb units, indoor and outdoor bulbs are determined by the ratio selected (see Table-2). Ratio refers to the outdoor air temperature change compared to the water temperature change. The dial setpoint is the water temperature setpoint when the outdoor temperature is 70°F.

To select ratio, it is necessary to know only: (1) outdoor design temperature, (2) maximum water temperature at outdoor design temperature, and (3) desired water temperature at 70°F outdoors. Use Table-3 to determine the required ratio based on this information and set the dial per item (3).

Note: If a 1-1/2:1 ratio is selected, the extra dial supplied with the unit must be used.

Example: Select ratio for an installation with a -10°F design temperature and estimated supply water temperature of 75°F at 70°F outdoors and 125°F at -10°F outdoors. From Table-3, -10°F for 1-1/2:1 ratio, note by interpolation (70°F to 123°F with dial at 70°F, 80°F to 133°F with dial at 80°F) that water temperature varies from 75°F to 128°F as outdoor temperature drops from 70°F to -10°F.

For this application, the 1-1/2:1 ratio should be selected. The extra dial supplied with the unit would be used, and the dial set at 75°F.

PRE-INSTALLATION

Inspection

Visually inspect the carton for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the carton and visually inspect the device for obvious defects. Return damaged or defective products.

Required Installation Items

- Wiring diagram
- Tools (not provided):
  Volt-ohm meter
  Room temperature thermometer on °F or °C
  Appropriate screwdriver(s) for cover, terminals and mounting screws
  Appropriate drill and drill bit for mounting screws

INSTALLATION

Caution:
1. Installer must be a qualified, experienced technician.
2. Disconnect power supply before installation to prevent electrical shock and equipment damage.
3. Make all connections in accordance with the electrical wiring diagrams, and in compliance with national and local codes. Use copper conductors only.
4. Do not exceed ratings of the device.
5. Avoid locations where excessive moisture, corrosive fumes or vibrations are present.

Location

Locate the device allowing proper distance to the bulb location. The case can be mounted in any position. Refer to Figure-2 for case dimensions.

Figure-2 Case Dimensions.

Procedure for Remote Bulb Mounting

Air Bulb Models — Mounting in Return Air Duct

1. Remove cover and provide two holes for #10 round head screws using the housing as the template or by using the dimensions shown in Figure-2.
2. Partially insert the mounting screws in the screw holes. Fit the housing over the screws, slide housing down on the screws and tighten the screws.

Air Bulb Models — Mounting Outside of Return Air Duct

1. Prepare duct for mounting by cutting hole and providing mounting screw holes per Figure-2.
2. Fabricate a cover as shown in Figure-3.
3. Carefully roll bulbs toward back of unit and insert through 2-1/4" x 2-1/2" (57 mm x 64 mm) hole.
4. Remove cover and attach unit to duct with #10 screws.
5. Attach cover over 2-1/4" x 2-1/2" (57 mm x 64 mm) hole.
Duct and Outdoor Mounting

Maximum insertion length is 6 inches.

**Duct**: Install bulb with AT-208 kit as shown in Figure-4.

**Outdoor**: Install with AT-211 kit as shown in Figure-5.

1. Mount bulb to outside wall or surface with bulb clip.
2. Place shield over bulb and fasten to mounting surface.

Bulb Mounting — Liquid Line and Tank

**Tee Mounting**

**Elbow Mounting**

**Straight Pipe Mounting**

**NOTE**: Angle must not allow end of weir to connect side of pipe.

AT-201 or AT-203 Installation

1. Install bulb well or adaptor from AT-209 into 3/4" FNPT opening.
2. Place packing nut, washers and packing from AT-209 over bulb support section and insert bulb well or AT-209 adaptor.
3. Push interlocking washers and packing into well or adaptor and tighten packing nut until firmly sealed.

AT-206 Installation

1. Install AT-206 bulb well into 1/2" FNPT opening.
2. Place packing (included with AT-206) over bulb support section and insert bulb into well.
3. Push packing into nut on well using a screwdriver.

Concealed Setpoint and Lock Cover Screw

Order AT-210 concealed adjustment kit separately.

1. Peel off adhesive film from the concealed adjustment plate and place into the recess of cover.
2. Remove screw from cover.
3. Install lock cover screw provided with AT-210.
The thermostat has one 1/2" to 3/4" conduit opening in the bottom of the housing. Terminal coding and switch action are shown in Figures-9 and 10.

**WIRING**

The thermostat has one 1/2" to 3/4" conduit opening in the bottom of the housing. Terminal coding and switch action are shown in Figures-9 and 10.

**TYPICAL APPLICATIONS**

Figures-11 and 12 show typical heating and cooling applications for single stage units. Figures-13 and 14 show typical heating and cooling applications for two stage units.

### Table-4 Bulb Mounting Installation Hardware And Application Limitations.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Mounting Fitting</th>
<th>Insertion Size in. (mm)</th>
<th>Application Limitations at 250° F (121°C) Fluid Temperature(^a)</th>
<th>Installation per Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT-201(^b)</td>
<td>Copper Bulb Well</td>
<td>3/4&quot; MNPT</td>
<td>1/2 (13) dia. O.D. 9-1/2 (241) long</td>
<td>Max. Recommended Velocity fps (m/s) 11 (3.3)</td>
<td>Max. Recommended Static Press. psig (kPa) 250 (1728)</td>
</tr>
<tr>
<td>AT-203(^b)</td>
<td>Stainless Steel Bulb Well</td>
<td>1/2&quot; MNPT</td>
<td>1/2 (13) dia. O.D. 4-1/2 (114) long</td>
<td>20 (6.1)</td>
<td>500 (3448)</td>
</tr>
<tr>
<td>AT-206</td>
<td>Copper Bulb Well</td>
<td></td>
<td></td>
<td>11 (3.3)</td>
<td>250 (1728)</td>
</tr>
</tbody>
</table>

\(^a\) Max. recommended fluid temperature is 350 F (177°C).

\(^b\) Requires AT-209.
CHECKOUT

After installing a thermostat, make an initial check of the switching action. Verify the switch action by listening to the switch contacts.

1. Turn the setpoint dial to a temperature above ambient. This should cause the thermostat to switch, making orange to brown.
2. Turn the setpoint dial setting down gradually. Orange to brown must break, making orange to red.
3. Compare the differential of the device to the differential shown on the performance charts by turning the dial. The differential of the device is the difference in dial reading between the make of orange to brown and the make of orange to red on single switch units.

ADJUSTMENTS

Setpoint

Screwdriver adjustment. Scales dual marked °F on front and °C on back. To change scale, remove spring retaining ring, select scale and replace retaining ring.

Differential

The differential is adjustable by turning the adjustor located on the side of the device (see Figure-15).

To adjust interstage differential:
1. Disconnect power to unit.
2. Remove cover.
3. Turn adjustor to approximately desired position.
4. Check out by turning dial and noting dial readings where switch contacts make.
5. After changing interstage differential, recalibrate. See CALIBRATION.

CALIBRATION

1. With all power disconnected, soak bulb(s) for 10 minutes at known temperature (must be 70°F for dual bulb).
2. Turn dial and note where switch contacts make.
3. Turn dial midway between click points.
4. Turn the calibration nut (located under dial) until the temperature of the bulb is indicated on the dial (see Figure-15).

Note: On two stage units follow above procedure. LO switch is first stage on cooling applications. HI switch is first stage on heating applications.

MAINTENANCE

Regular maintenance of the total system is needed to assure sustained optimum performance. Thermostats should be periodically inspected for dirt or blockage of air over the elements.

REPAIR

Field repair is not recommended. Replace defective device.