

Application

These units are used for on-off control of media temperature in ducts, tanks, etc.

Features

- Mechanism enclosed in rugged die cast case with metal cover.
- Large coded terminals.
- Liquid-filled thermal element actuates one snap-acting SPDT per stage.
- Setpoint adjustment knob is clearly marked and has recessed locking screw.
- Copper thermal element is suitable for either immersion or duct mounting.

Applicable Literature

- Cross-Reference Guide, F-23638
- Reference Manual, F-21683
- Application Manual, F-21335
- Electric/Electronic Products Catalog, F-27382
- Material Safety Data Sheet MSDS-1



TC-202, TC-252,
and TC-271 only
are UL Listed.

SPECIFICATIONS

Setpoint Adjustment Range: Setpoint dial marked in °F. See Table-1 for specific ranges.

Sensing Element: Liquid-filled thermal element.

Electrical Switch: One snap-acting SPDT per stage.

Ratings, See Table-1.

Connections: Coded terminals.

Case: Rugged die cast with metal cover. Half inch conduit openings at top and bottom.

Ambient Temperature Limits:

Case, -40 to 140°F (-40 to 60°C).

Bulb, 230°F (110°C).

Output: Switch action is adjustable. See Table-1.

Dimensions:

Case, See Figure-18.

Thermal Element, 3/8" diameter x 9-1/2" long (9.5 mm x 241 mm).

Table-1 Specifications.

| Part Number | Description | Capillary* | Scale (°F)** | Volts | Switch Ratings (AC Only)† | | | | Thermal Differential °F (°C) | |
|-------------|---------------------------------|-------------|--------------|------------|---------------------------|----------|----------------|---------------|------------------------------|---|
| | | | | | FLA Amps | LRA Amps | Resistive Amps | Pilot Duty VA | Factory Set | Adjustable |
| TC-202 | Single stage heating or cooling | 6' copper | 10 to 90 | 120 240 | — | — | 12 | 125 125 | 2 (1.1) | 1 to 15 (0.55 to 8.3) |
| TC-252 | Two stage heating or cooling | 6' copper | 10 to 90 | | | | | | | |
| TC-271 | Two stage heating or cooling | 10' armored | 0 to 160 | | | | | | 2 (1.1) per stage | 2 to 7 (1.1 to 3.8) per stage |
| TC-282 | Three stage heating or cooling | 6' copper | 10 to 90 | 24 | 3.8 | 22.8 | 15 | 26 | 3 (1.66) between stages | 0 to 20 (0 to 11) between high and low stages |
| TC-288 | Four stage cooling only | | | 120 | 3.8 | 22.8 | 15 | 125 | | |
| | | | | 240 | 2.9 | 17.4 | 15 | 125 | | |
| | | | | 277 | — | — | 15 | — | | |

*20' (6 m) and 45' (14 m) capillary lengths are available.

**Celsius scale is available as an option. Specify -216 suffix.

†1600 VA maximum load.

ACCESSORIES

- AT-201 Copper bulb well (provided)
- AT-203 Stainless steel bulb well (provided)
- AT-208 Bulb duct mounting kit (order separately)
- AT-211 Outside bulb shield (order separately)
- AT-401 Housing for hazardous locations

TYPICAL APPLICATIONS

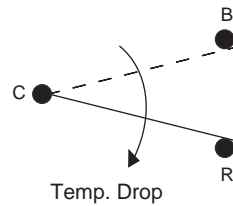


Figure-1 Typical of TC-202, Single Stage.

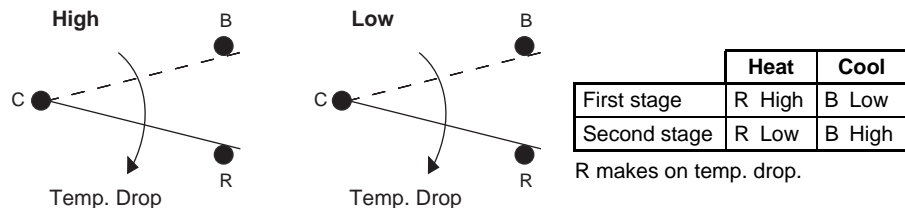


Figure-2 Typical of TC-252 and TC-271, Two Stage.

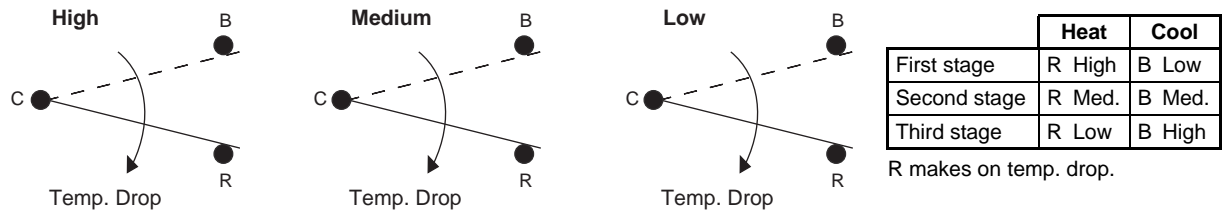
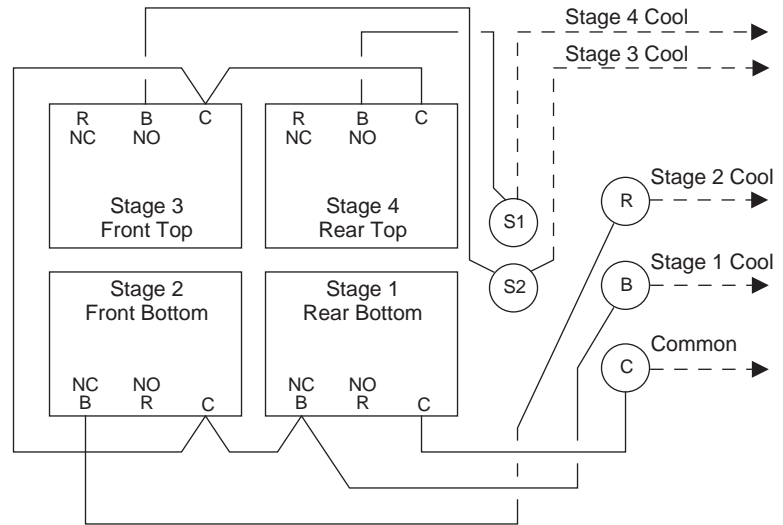


Figure-3 Typical of TC-282, Three Stage.



C is common of a single pole, double-throw switch.
 B closes on rise in temperature (call for cooling).
 R contact, present in switch but not wired, closes on a drop in temperature (call for heat).

Figure-4 Typical of TC-288, Four Stage Cooling.

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Tools (not provided):
 Appropriate Allen wrench
 3/16" open-end wrench
 Screwdriver
- Training: Installer must be a qualified, experienced technician.

Caution

This thermostat may be mounted in any position on any surface not subjected to excessive vibration or extreme ambient temperatures.

To Remove Cover

The cover is held on by friction and locked in place with a cover locking screw. The cover may be removed by loosening the locking screw, gripping the left end of the cover, and pulling it forward away from the thermostat.

Wiring

Terminals are located under thermostat cover. Knockouts for 1/2" conduit connectors at top and bottom of case. Make all electrical connections in accordance with job wiring diagram and in compliance with national and local electrical codes. Use copper wire only.

Bulb Mounting

The remote sensing bulb may be mounted in ducts or liquid lines.

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.

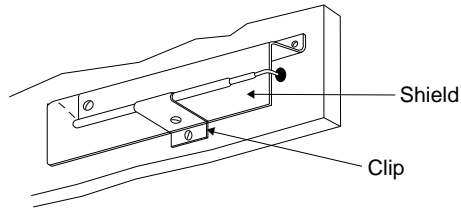


Figure-5 Outdoor Bulb Mounting.

Duct

Install bulb with AT-208 kit as shown in Figure-6 below.

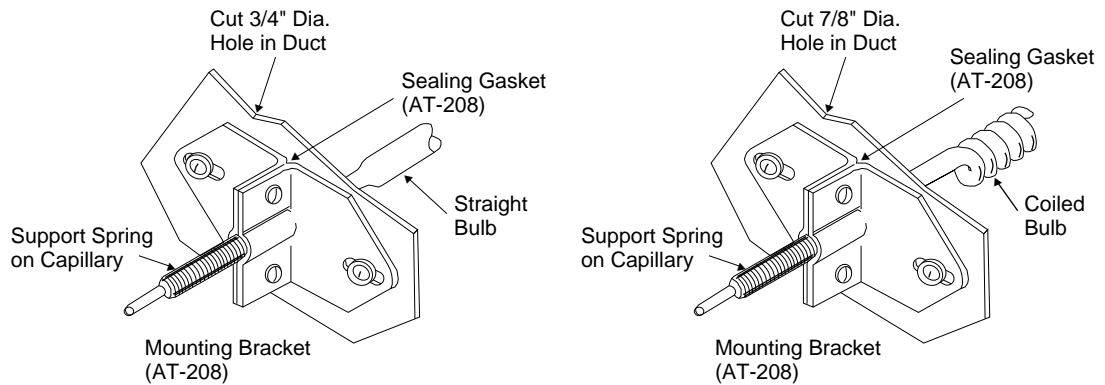
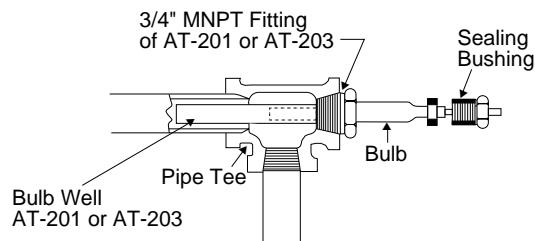


Figure-6 Duct Bulb Mounting.

Liquid Line and Tank

1. Install AT-201 or AT-203 bulb well.
2. Install thermal bulb and tighten sealing bushing.



| Part Number | Application Limitations at 250°F Fluid Temp. (Max. 350°F) | |
|-------------|---|------------------------------------|
| | Max. Recom. Velocity (FPS) | Max. Recom. Static Pressure (psig) |
| AT-201 | 11 | 250 |
| AT-203 | 20 | 500 |

Figure-7 Liquid Line and Tank Bulb Mounting.

Bulb Well Installation Limitations

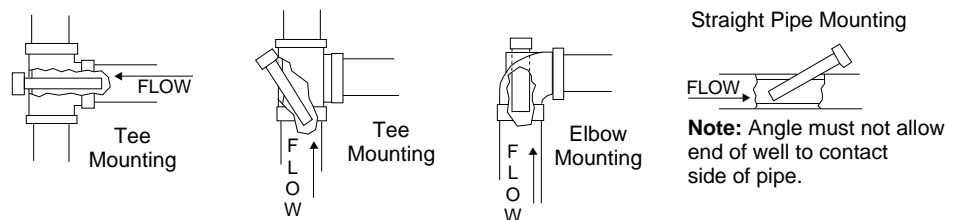


Figure-8 Bulb Well Installation Limitations.

CALIBRATION: SINGLE STAGE THERMOSTATS — TC-202

Adjustments

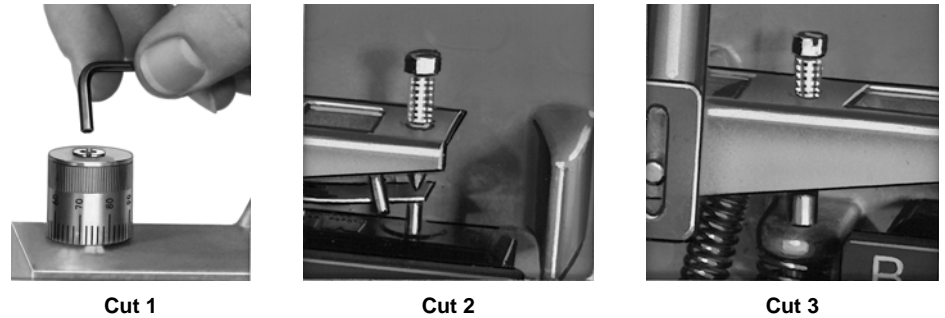


Figure-9 Adjustment of Single Stage Thermostats.

Dial

The dial setting determines the operating point of the thermostat. It may be locked in place by tightening the recessed Allen set screw in the top of the dial shaft (see Cut 1 in Figure-9).

Differential

The differential between the two contacts of the SPDT switch is easily adjusted by means of the differential adjustment screw on the thermostat arm (see Cut 2 in Figure-9). This adjustment screw regulates the distance that the thermostat arm is required to move to trip from one contact to the other. Adjustable from 1° to 15°. Factory set at 2°.

Calibration Procedure

After differential adjustments in the field, the calibration screw (see Cut 3 in Figure-9) may be used to re-calibrate the control as follows:

1. Immerse the sensing bulb for about 10 minutes in a medium of known temperature.
2. Turn dial to setting corresponding to bulb temperature.
3. Turning calibrating screw to the right (CW) lowers control point temperature, and turning to the left (CCW) raises control point temperature. Turn the calibrating screw CW or CCW as required until the switch clicks.
4. Rotate the calibrating screw in the opposite direction until switch clicks again.
5. Set calibrating screw half way between points where switch clicks. (One full turn of calibrating screw represents approximately 12°.)

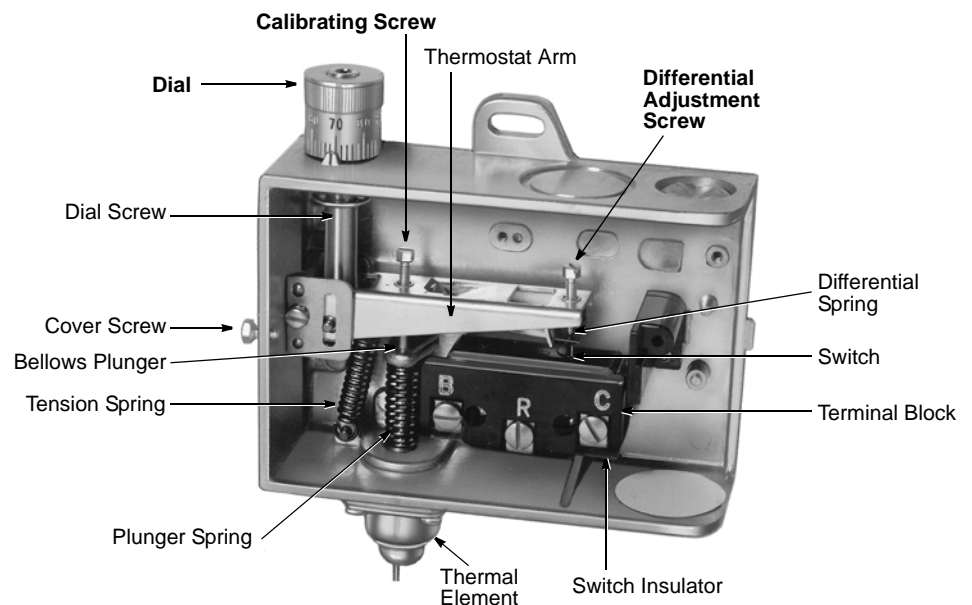


Figure-10 Part Identification of Single Stage Thermostats.

CALIBRATION: TWO STAGE THERMOSTATS — TC-252 and TC-271

Adjustments



Figure-11 Dial Adjustment of Two Stage Thermostats.

Dial

The dial setting determines the operating point of the low stage switch. It may be locked in place by tightening the recessed Allen set screw in the top of the dial shaft (see Figure-9).

Differential

The differential between the “R” and “B” contacts of the SPDT switches is easily adjusted by moving the contact spring on the thermostat arm (see Figure-12). The differential may be varied by loosening the differential nut and sliding the contact spring to the left to increase the differential (or to the right to decrease the differential). This varies the tension brought to bear on the switch trip pin and adjusts the differential between approximately 1.5°F and 7°F. Factory set at minimum. Each division represents approximately 1°F. This adjustment may have some effect on the differential between stages and therefore should be the first adjustment made in resetting the differential of the controls.

Differential between Stages

The differential between high and low stages is easily adjusted by loosening the lock screw and rotating the eccentric stud (see Figure-12), which physically changes the distance between the trip pins on the high stage and low stage switches. Turning this eccentric stud CW decreases differential while turning CCW increases differential. Adjustable between approximately 0°F and 20°F. Factory set at 3°F. Each division equals approximately 5° differential between stages.

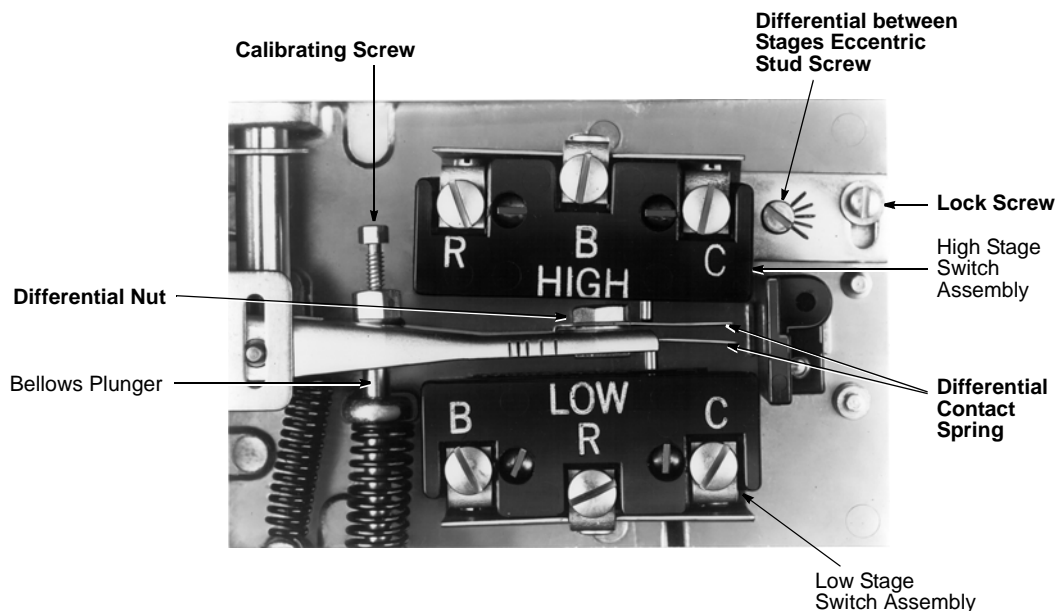


Figure-12 Adjusting Differential between Stages.

Calibration Procedure

After differential adjustments have been made, the unit should be calibrated as follows:

1. Immerse the sensing bulb for about 10 minutes in any medium of known temperature.
2. Turn dial to setting corresponding to bulb temperature.
3. Turn calibration screw (see Figure-12) until the switch actuating points, as indicated by the dial of the low stage switch, straddle the bulb temperature. For example, if differential of the switch is set at 2°F and bulb temperature is 70°F, the readings for "R" and "B" switch action on the low stage switch would be 69°F and 71°F, respectively.
4. If thermostat calibration point is low, turn calibration screw slightly in a CCW direction. If high, turn slightly in CW direction.
5. To check differential between stages:
 - a. Move dial well above calibration point.
 - b. Start turning dial slowly towards calibrating temperature until the low stage switch just clicks (makes to "B").
 - c. Record dial reading at this point.
 - d. Continue turning dial in same direction until the high stage switch clicks (makes to "B").
 - e. Record dial reading at this point.
 - f. The difference between the two recorded temperatures is the differential between stages. For example, if the low and high stage switch just clicks (makes to "B") at 71°F and 77°F, respectively, then the differential between stages is 6°F.

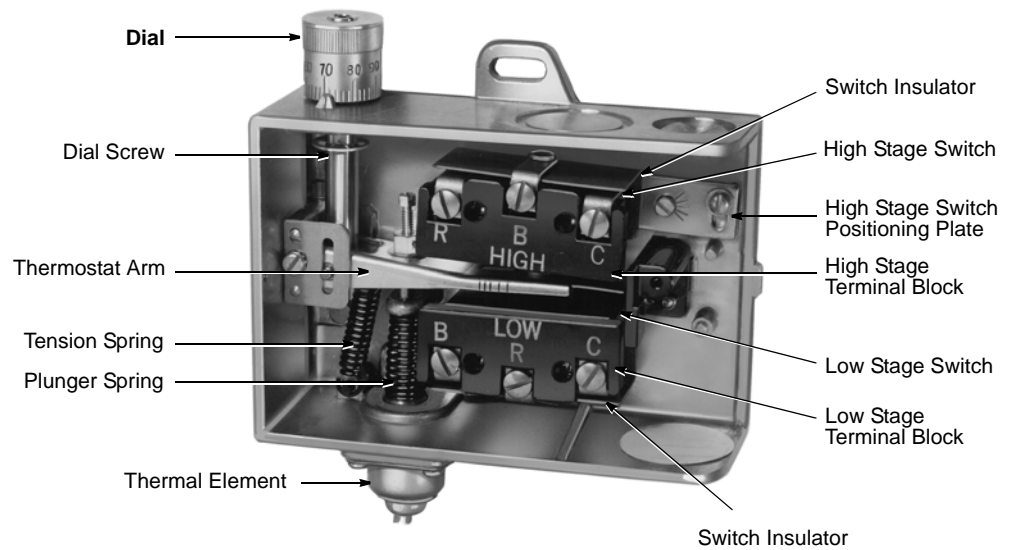


Figure-13 Part Identification of Two Stage Thermostats.

CALIBRATION: THREE STAGE THERMOSTATS — TC-282

Adjustments



Figure-14 Dial Adjustment of Three Stage Thermostats.

Dial

The dial setting determines the operating point of the low stage switch. It may be locked in place by tightening the recessed Allen set screw in the top of the dial shaft (see Figure-9).

Differential

The differential between the “R” and “B” contacts of the SPDT switches is easily adjusted by moving the contact spring on the thermostat arm (see Figure-15). The differential may be varied by loosening the clamp nut and sliding the contact spring to the left to increase the differential of all three switches (or to the right to decrease the differential). This varies the tension brought to bear on the switch trip pins and adjusts the differential between 2°F and 7°F ($\pm 0.5^\circ\text{F}$). Factory set at minimum. Each division represents approximately 1°F. This adjustment may have some effect on the differential between stages and therefore should be the first adjustment made in resetting the differential of the controls.

Differential between Stages

The differential between the low stage and middle stages is easily adjusted by turning the middle stage adjustment screw (see Figure-15) CW to decrease differential and CCW to increase differential. Factory set at 3°F. The differential between high and middle stages is easily adjusted by loosening the lock screw and rotating the eccentric stud (see Figure-15), physically changing the distance between the trip pins of the high and middle stage switches. Turning this eccentric stud CW decreases differential and turning CCW increases differential. The total differential available between the low and high stages is adjustable between 0°F and 20°F. The differential between the low, middle, and high stages can be varied but the total may never exceed 20°F. For example, if the differential between the low and middle stage is set at 12, then 8°F is the maximum differential that can be obtained between the middle and high stages.

Calibration Procedure

After differential adjustments have been made, the unit should be calibrated as follows:

1. Immerse the sensing bulb for about 10 minutes in any medium of known temperature.
2. Turn dial to setting corresponding to bulb temperature.
3. Turn calibration screw (see Figure-15) until the low stage switch actuating points (indicated by the dial) straddle the bulb temperature. For example, if bulb temperature is 70°F, turn calibrating screw until low stage switch actuating points (clicks) are an equal number of degrees from 70°F, namely 68°F and 72°F.

If dial setting is higher than actual bulb temperature, turn calibrating screw slightly in a CCW direction. If dial setting is lower than bulb temperature, turn screw in a CW direction.

4. To check differential between stages:
 - a. Turn dial well above calibration point.
 - b. Start turning dial slowly toward calibration point until the low stage switch just clicks (makes to “B”) and note dial reading at this point.
 - c. Continue turning dial in the same direction until middle stage switch clicks (makes to “B”) and note dial reading at this point.

- d. Continue moving dial in same direction until high stage switch just clicks (makes to "B") and note dial reading at this point.
- e. The difference in dial readings, as noted, indicates the differential between stages. For example, if the high, middle, and low stages click (make to "B") at 71°F, 77°F, and 84°F, respectively, then the differential between the high and middle stages is 6°F (77 – 71) and between the middle and low stages is 7°F (84 – 77). Total differential between the low and high stages is then 13°F (84 – 71).

NOTE

If differential between stages is changed after the instrument is calibrated, the calibration has to be rechecked to make certain that the change in differential did not affect the calibration. Recheck calibration point (step 3).

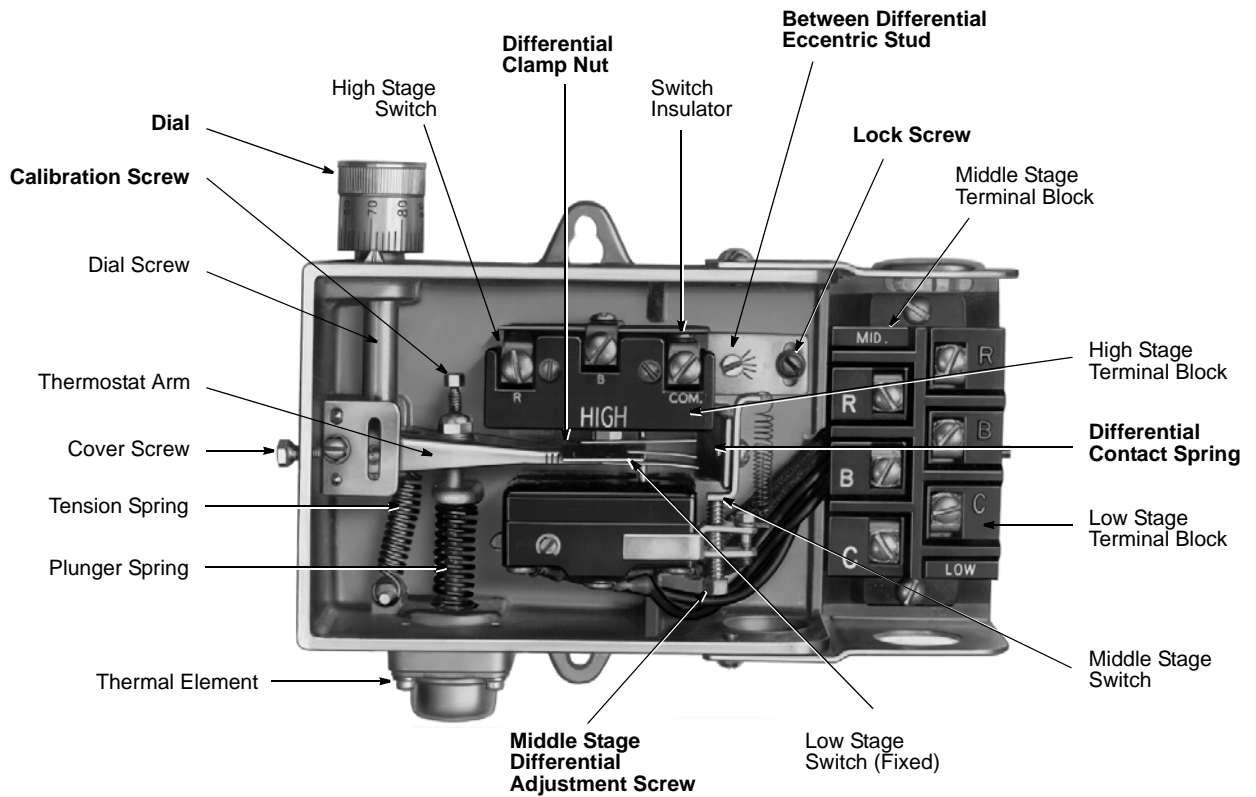


Figure-15 Part Identification of Three Stage Thermostats.

CALIBRATION: FOUR STAGE THERMOSTATS — TC-288

Adjustments

Dial

The dial (a) setting (see Figure-17) determines the operating point of the first, or low, stage switch. It may be locked in place by tightening the recessed Allen set screw in the top of the dial shaft (see Figure-16).



Figure-16 Dial Adjustment of Four Stage Thermostats.

Differential between Switches

The differential between the “R” and “B” contacts of the SPDT switches is easily adjusted by moving the differential contact springs (b) on the thermostat arm (c) (see Figure-17). The differential may be varied by loosening the differential nut (d). Use a 5/16" open-end wrench, and slide the contact springs to the left to increase the differential of all four switches (or to the right to decrease the differential). This varies the tension brought to bear on the switch pins and adjusts the differential between 3° and 7°. (Differential factory set at 3° minimum.) Each division on the thermostat arm represents approximately 1°. This adjustment may have some effect on the differential between stages and therefore should be the first adjustment made in resetting the differential of the control.

Differential between Stages

The differential between the first and second stage switches is easily adjusted by turning the second stage adjustment screw (AA) (see Figure-17). Use a 3/16" open-end wrench, turning to the left to decrease the differential and to the right to increase the differential. (Differential is factory set at 3° minimum.)

The differential between the second and third stage switches is adjusted by turning the third stage differential adjustment screw (BB) to the right to decrease the differential and to the left to increase the differential. (Differential is factory set at 3° minimum.)

The differential adjustment between the third and fourth (or high) stage switches is accomplished by loosening the lock screw (CC) and rotating the eccentric stud, which is just to the left of the lock screw, thereby physically changing the distance between the trip pins of the first and fourth stage switches. Turning this eccentric stud CW decreases the differential and turning it CCW increases the differential.

The total differential between the first and fourth stages is adjustable between 0° and 20°. The differential between the first, second, third, and fourth stages may be varied but the total may never exceed 20°. For example, if the differential between the first and second stages is set at 4° and the differential between the second and third stages is set at 6°, then 10° is the maximum differential that can be obtained between the third and fourth stages.

Calibration Procedure

The use of test lights is strongly suggested. However, as they may not always be available, the control should be calibrated as follows:

1. Immerse the sensing bulb for about 10 minutes in any medium of known temperature before proceeding. (A pail of water may be used and temperature determined with an accurate thermometer).
2. Turn regulating knob to setting corresponding to bulb temperature.
3. Turn calibrating screw (DD) (see Figure-17), using a 3/16" open-end wrench, either to the right or to the left, until the first stage switch actuating points straddle the bulb temperature (indicated by the dial). For example, if the bulb temperature is 70°, turn the calibrating screw until the first stage switch actuating points (clicks) are an equal number of degrees from 70°, namely 68° and 72°.

4. To check differential between stages:
 - a. Turn regulating knob well above calibration point.
 - b. Start turning knob slowly toward calibration point until the first stage switch just clicks (makes to "B") and note dial reading at this point.
 - c. Continue turning knob in same direction until the second stage switch clicks (makes to "B") and note dial reading at this point.
 - d. Continue turning knob in the same direction until the third stage switch clicks (makes to "B") and note dial reading at this point.
 - e. Again, turn knob in the same direction until the fourth stage switch just clicks (makes to "B") and note dial reading at this last point.
 - f. The difference in dial readings, as noted, indicates the differential between stages. For example, if the fourth, third, second, and first stages click (make to "B") at 84°, 80°, 77°, and 71°, respectively, then the differential between the fourth and third stages is 4° (84 – 80), between the third and second stages is 3° (80 – 77), and between the second and first stages is 6° (77 – 71). Total differential between the first, or low, stage and the fourth, or high, stage is then 13° (84 – 71).
5. If it is desired to raise or lower all four switch actions, and the differential between all stages is satisfactory, turn the calibrating screw to the left to raise the setpoints and to the right to lower the setpoints. All four switches will retain their differentials and will remain in sequence.

NOTE

If differential between stages is changed after the control has been calibrated, the calibration will have to be rechecked to make certain that the change in differential did not affect the calibration. Recheck calibration point (steps 1, 2, and 3).

Use caution in handling this instrument and when changing differential. Carelessness can result in erratic operation.

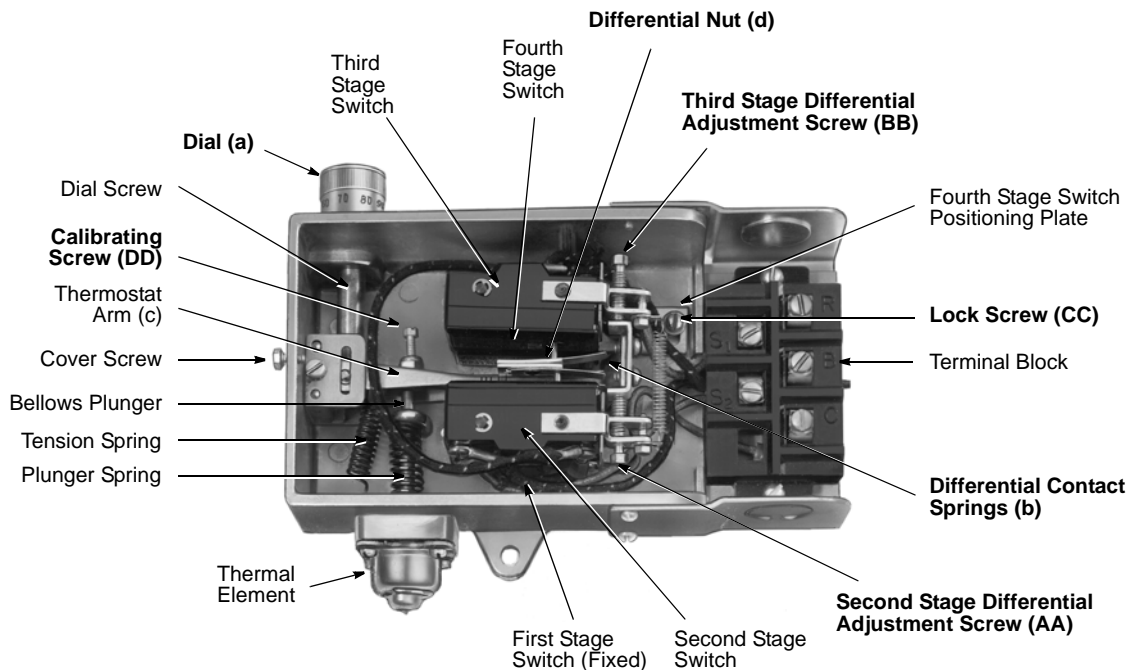
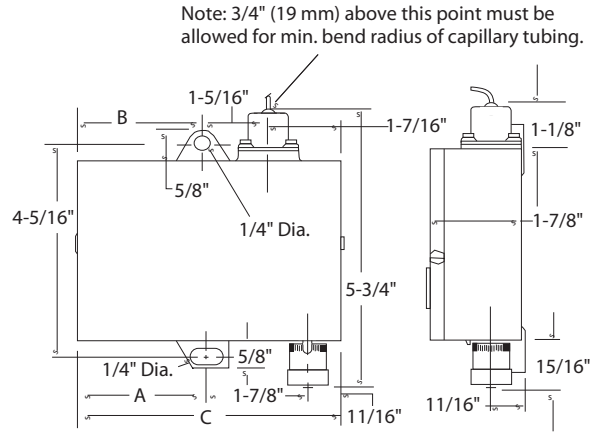


Figure-17 Part Identification of Four Stage Thermostats.

DIMENSIONAL DATA



| Stages | Dimensions (inches) | | |
|-------------|---------------------|-------|-------|
| | A | B | C |
| Single, two | 2-11/16 | 2-1/2 | 5-1/4 |
| Three, four | 4-9/16 | 4-3/8 | 7-1/8 |

Figure-18 Mounting Dimensions.

On October 1st, 2009, TAC became the Buildings business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

Copyright 2009, Schneider Electric
All brand names, trademarks and registered trademarks are the property of their respective owners. Information contained within this document is subject to change without notice.

Schneider Electric
1354 Clifford Avenue
P.O. Box 2940
Loves Park, IL 61132-2940
www.schneider-electric.com/buildings

Schneider
Electric