APPLICATION

The T675 and T678 Temperature Controllers are designed to control the temperature of air or liquids in ducts, pipes, tanks, and boilers. Typical uses include control of dampers and valves in heating, cooling, or heating-cooling systems.

The T675A has 1 spdt switch. It makes or breaks a circuit on a change in temperature at the sensing bulb. Fast-response models with adjustable differential are available for duct installation. They respond approximately 4 times faster than standard models.

The T675B is a low limit temperature controller with 1 spst switch. It breaks a circuit on a temperature fall and must be manually reset.

The T678A has 2 spdt switches which operate 2 independent circuits in sequence. Fast-response models operate 4 times faster than standard models.

INSTALLATION

WHEN INSTALLING THIS PRODUCT . . .

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

CAUTION

Disconnect power supply before beginning installation to prevent electrical shock and equipment damage.

The installation should be made within the limits specified below.

ELECTRICAL RATINGS:

T675A models with adjustable differential and T678A:

	120 Vac	240 Vac	277 Vac
Full Load	8.0 A	5.1 A	4.2 A
Locked Rotor	48.0 A	30.6 A	25.2 A
Pilot Duty	125 VA	125 VA	125 VA

T675A models with fixed differential—125 VA at 120/208/240/277 Vac.

T675B—125 VA pilot duty up to 277 Vac.

T678A—maximum connected load = 2000 VA.

MAXIMUM BULB PRESSURE: 50 psi [344.7 kPa] for direct immersion.

LOCATION AND MOUNTING

The controller may be installed in any convenient position. Mount it with 3 screws through the slotted holes in the back of the case (Fig. 1). Be sure to consider the length of the capillary before mounting the controller.

Install the sensing element where it is exposed to the average temperature of the controlled medium. The sensing bulb may be directly immersed or mounted in a well. T675A or T678A fast-response models must use the capillary holder furnished with the device (Fig. 2). The remote sensing bulb of standard models should be held in place with a capillary holder, immersion well, or compression fitting (Figs. 3-5). Sharp bends or kinks in the capillary tubing affect the efficiency of the controller and must be avoided. Excess capillary should be carefully coiled and left directly beneath the controller.

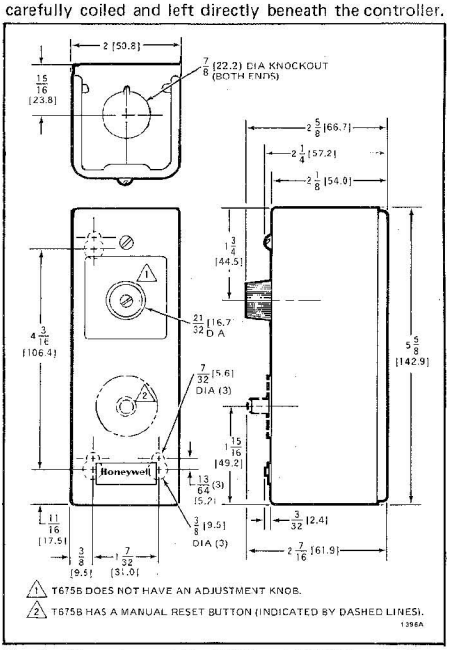


Fig. 1—Dimensions of the T675 and T678 Temperature Controllers, in in. [mm in brackets].

NOTE: When pressure fittings are used in areas of vibration, such as pipe lines, the bulb must be adequately supported.

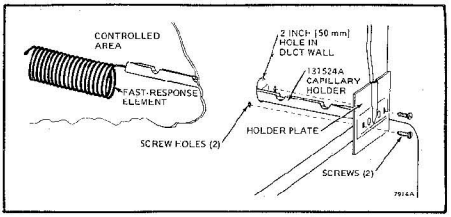


Fig. 2—Mounting a fast-response element in an air duct.

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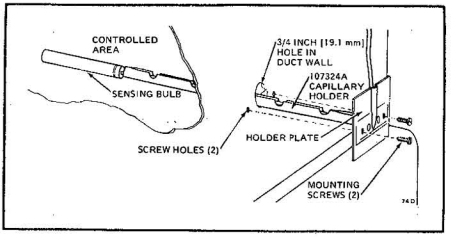


Fig. 3—Mounting the sensing bulb and capillary holder in an air duct.

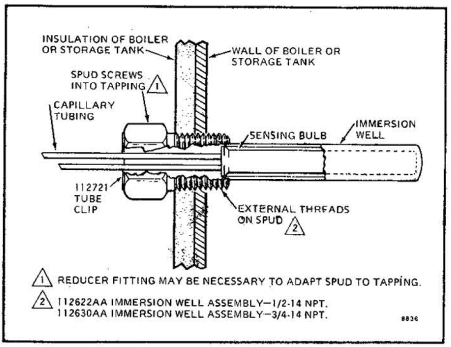


Fig. 4—Mounting the sensing bulb in an immersion well.

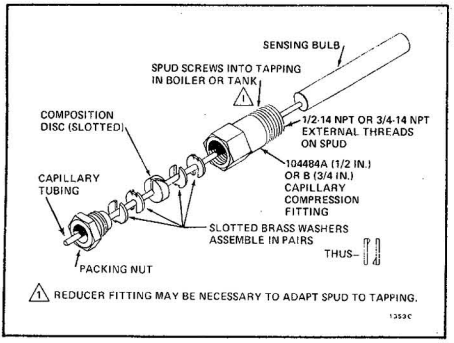


Fig. 5—Mounting the sensing bulb using a capillary compression fitting.

WIRING

Disconnect the power supply before making wiring connections to prevent electrical shock and equipment damage. All wiring must comply with applicable electrical codes and ordinances. If using the controller with a flame safeguard control, use moisture-resistant No. 14 wire suitable for at least 167 F [75 C] for a primary control (such as an RA890), or for at least 194 F [90 C] for a programming control (such as an R4140). *For high temperature installations*, use moisture-resistant No. 14 wire selected for a temperature rating above the maximum operating temperature.

Two knockouts for 1/2 inch conduit are provided—one in the top and one in the bottom of the case. Follow the wiring instructions furnished with the heating or cooling system. Fig. 6 shows the switching action.

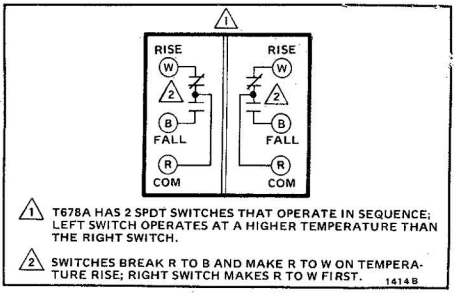


Fig. 6—T678A switching action. T675A is similar, but it has only one spdt switch. T675B has one spst switch that opens on temperature fall.

OPERATION

T675A

As the temperature of the controlled medium falls below the set point less differential, the T675A switch makes terminals R to B and energizes a normally closed solenoid valve to provide heat. In cooling applications, the T675A makes terminals R to W as the temperature rises above the set point, energizing cooling equipment. Fig. 7 shows the operation of the T675A. Fig. 8 shows the location of the adjustment dial on models with an adjustable differential.

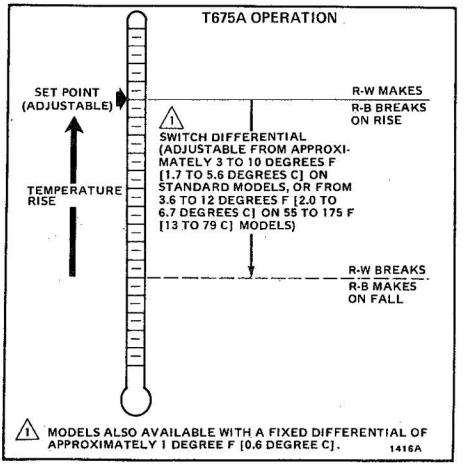


Fig. 7—Operation of the T675A.

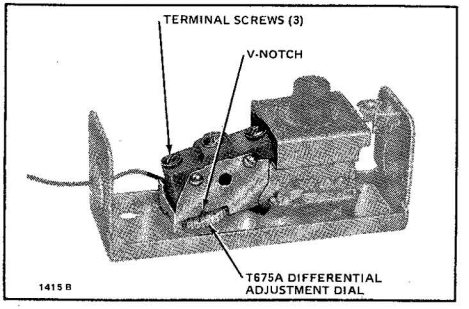


Fig. 8—Location of the adjustment dial on T675A models with an adjustable differential.

FREEZE-UP PROTECTION

When using the T675A (auto-recycling) for freeze-up protection, the recommended set point is 38 F [3.3 C] plus the switch differential.

Example: Set point of 38 F [3.3 C] plus 1 degree F [0.6 degree C] (fixed differential model) equals an actual set point of 39 F [3.9 C].

Example: Set point of 38 F [3.3 C] plus 3 degrees F [1.7 degrees C] (adjustable differential model) equals an actual set point of 41 F [5 C].

This provides an adequate safety factor for freeze-up protection.

NOTE: The T675B is a manual reset device specifically designed for freeze-up protection.

T675B

Used as a low limit controller, the T675B interrupts the operation of equipment if the temperature of the controlled medium falls below the set point. The device is reset manually after a rise in temperature of approximately 10 degrees F [5.6 degrees C]; push in the manual reset button on the front of the case. The operation of the T675B is shown graphically in Fig. 9.

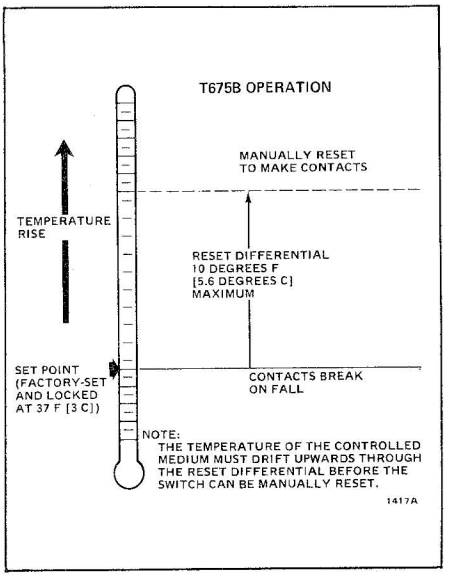


FIG. 9–OPERATION OF THE T675B.

T678A

When the temperature at the sensing element rises above the set point of the controller, the switch on the right makes R-W. Should the temperature continue to rise through the preselected interstage differential of the controller, the switch on the left will make R-W.

Conversely, on a temperature fall, the switch on the left makes R-B, providing first step switching. If the temperature continues to fall, the switch on the right makes R-B to provide sequencing of equipment.

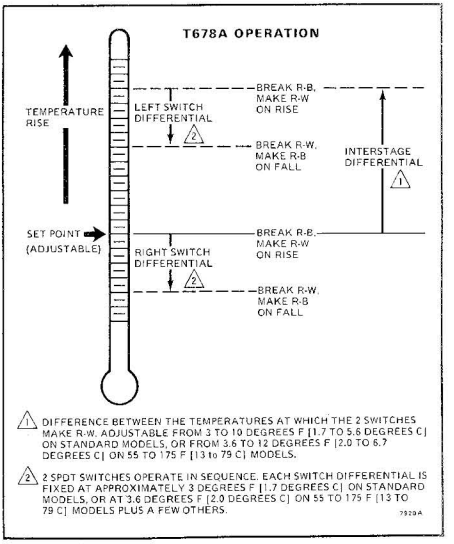


Fig. 10–Operation of the T678A.

The T678A Temperature Controller has an adjustable interstage differential. The set point adjustment knob determines the temperature at which the right switch operates. The left switch can be adjusted to operate from 3 to 10 degrees F [1.7 to 5.6 degrees C] (or 3.6 to 12 degrees F [2.0 to 6.7 degrees C] on some models) above the point of operation of the right switch. An illustration depicting the operation of the T678A is shown in Fig. 10. The interstage differential is adjusted by turning the star wheel with a narrow screwdriver inserted into the rectangular hole in the chassis (Fig. 11).

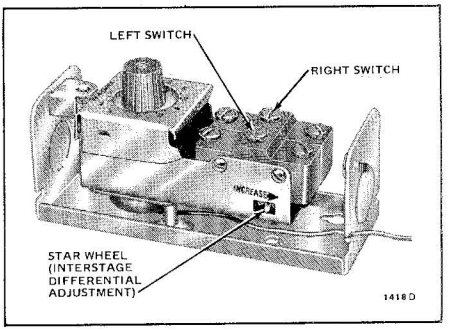


Fig. 11–Interstage differential adjustment on a T678A.

CALIBRATION

All controllers are carefully tested and calibrated at the factory under controlled conditions. If the controller is not operating at a temperature corresponding to the scale setting and differential setting, check to see that the sensing bulb senses the average temperature of the medium controlled. If the temperature of the controlled medium is changing rapidly, the differential will appear wider than its setting.

(continued on page 4)

For calibration, an accurate temperature reading of the controlled medium must be taken. Place an accurate thermometer near the sensing bulb, or refer to a thermometer that has been installed as part of the system. If the sensing bulb is installed in an inaccessible area, or if the controlled medium is unstable, the bulb should be removed and placed in a controlled bath for accurate calibration.

T675A

These controllers are calibrated so that the dial setting, indicated by the pointer on the adjustment knob, is the point at which the R-W switch contacts make on a temperature rise. Measure the temperature at the bulb. Rotate the adjustment knob counterclockwise from the top of the scale, simulating a temperature rise, until the R-W switch contacts make. Note the dial reading. If it differs from the bulb temperature, calibrate the dial as follows:

1. Determine the number of degrees difference between the bulb temperature and the dial reading at which the R-W switch contacts make.

2. Remove the adjustment knob and slip the fingers of the calibration wrench (accessory, Part No. 801534) into the slots of the dial. Rotate the dial until the fingers of the wrench drop into the slots of the calibration nut under the dial. Note the dial indication at this point. Turn the dial and the calibration nut up or down scale the number of degrees that the bulb temperature differs from the point at which the contacts make (determined in step 1). For example, move the dial from 45 to 65 if the dial reading in step 1 was 45 degrees and the bulb temperature was 65 degrees.

3. Check the calibration adjustment by moving the adjustment knob up and down the scale while listening for the contacts to make and break. If the dial is still out of calibration, repeat the calibration procedure.

T675B

NOTE: The cover must be removed to see the dial. All T675B models have been factory-set and locked at 37 F [3 C].

These controllers are calibrated so that the dial setting, indicated by the fixed pointer at the top of the dial, is the point at which the switch contacts break on temperature fall.

Measure the temperature at the bulb. Remove the cover of the controller. Loosen the locking screw. Insert a screwdriver in the slot in the center of the dial. Start with the dial at the bottom of the scale, and rotate the dial counterclockwise to simulate a temperature fall until the switch contacts break. Note the dial reading. If it differs from the bulb temperature, follow the calibration procedure outlined for the T675A. Tighten the locking screw and replace the cover.

T678A

These controllers are calibrated so that the dial setting, indicated by the pointer on the adjustment knob, is the point at which the R-W contacts of the right switch make on a temperature rise. If the temperature continues to rise, the R-W contacts of the left switch make at the dial setting *plus* the interstage differential. (The interstage differential is adjustable as shown in Figs. 10 and 11.)

Measure the temperature at the bulb. Rotate the adjustment knob counterclockwise from the top of the scale, simulating a temperature rise, until the R-W contacts of the right switch make. Note the dial reading. If it differs from the bulb temperature, follow the calibration procedure outlined for the T675A.

After calibrating the dial, check the setting of the interstage differential. Set the adjustment knob at the bulb temperature. Then rotate the adjustment knob counterclockwise, simulating a temperature rise, until the R-W contacts of the left switch make. Note the dial reading. The difference between this reading and the bulb temperature is the interstage differential. The interstage differential may be adjusted if necessary (Fig. 11).

CHECKOUT

Check the operation of the controller by raising and lowering the set point through the temperature range of the air or liquid being controlled. Make sure that the controlled equipment operates as intended.

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