



Installation Instructions

Low Temperature Cutout Control

Order Number: 41901084



Low temperature cutout controls are available with single pole/double throw (SPDT) or single pole/single throw (SPST) contact action. Typical applications include the sensing of low temperature conditions to avoid over cooling or icing of hydronic coils, cooling coils, and liquid handling pipes. The controls are compact and sturdy, and include an adjustable temperature setpoint range with a fixed differential. The range adjustment screw is accessible at the bottom of the control and at the top of the control when the cover is removed.

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SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

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1 Cautions, Warnings and Notices

The three types of advisories are defined as follows:

- WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert
- NOTICE** Indicates a situation that could result in equipment or property-damage only accidents.

CAUTION

Use the low temperature cutout control under normal operating conditions. Additional precautions must be designed into the control system where failure or malfunction of the control could lead to personal injury or property damage to the controlled equipment or other property. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, to warn of or protect against failure or malfunction of the control.

2 Specifications

Category	Specification/Description ^(a)
Range Cutout:	35°F to 45°F (2°C to 7°C)
Differential:	Temperature must be 12°F (6.7°C) above cutout point before control can be reset.
Ambient Temperature:	• Minimum: 0°F (-18°C) • Maximum: 140°F (60°C)
Maximum Temperature @Bulb:	250°F (121°C)
Sensing Element:	.125 in. x 20 ft. (3.2 mm x 61 m)
Capillary Length:	4.0 ft. (1.2 m)
Switch:	Snap-acting contacts in a dust protected enclosure
Material:	• Case: 0.6 in. (1.6 mm), cold rolled steel • Cover: 0.3 in. (0.8 mm) cold rolled steel
Finish:	Galvanized steel
Conduit Opening:	0.9 in. (22 mm) hole for .5 in. (12.7 mm) conduit
Mounting Bracket:	Standard on all controls
Shipping Weight:	• Individual pack: 1.8 lb. (0.8 kg) • Overpack of 20 units: 38 lb. (17 kg)
Electrical Rating:	Pilot duty: 125 Va, 24 to 277 Vac
Motor Ratings:	• AC full load ampere: 120 V= 16.0A/ 208 V= 9.2 A/ 240 V= 8.0 A • AC locked rotor ampere: 120 V= 96.0 A/ 208 V= 55.2 A/ 240 V= 48.0 A • Non-inductive ampere: 120 V= 16.0 A/ 208 V= 9.2 A/ 240 V=8.0 A

(a) The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, contact a local Trane office. Trane shall not be liable for damages resulting from misapplications or misuse of its products.

3 Required Tools for Installation

- .5 inch (1.3 cm) EMT bender
- Hole saw
- Tin snips or hack saw
- Vice
- Brackets
- Nylon tie wraps w/holes
- 4.0 inch (10.1 cm) electrical box covers w/center hole knockout **OR** T-752-1001, .5 inch (1.3 cm) duct flanges
- Low temperature cutout control
- .5 inch (1.3 cm) EMT connectors
- .25 inch (6.4 cm) poly tubing
- Copper tubing
- EMT or Unistrut®
- Conduit hangers or Minerallac® straps
- Self-tapping sheet metal screws
- Machine screws and nuts
- TE-6001-8 element mounting bracket

Locating Recommendations

- Locate the bulb on the downstream side of the coil with the bulb exposed to all areas where low temperatures are likely to be encountered. Horizontally serpentine the 20.0 ft (6.1 m) long sensing element across the face of the coil to sense temperatures in all areas. The horizontal pitch of the coil should not exceed five degrees (*one inch per foot*) for those areas to be protected. See Figure 1.
- Do not install controls where the ambient temperature at the control exceeds 140°F (60°C), or falls below 0°F (-18°C). Refer to the section, "Specifications".

4 Mounting Considerations

The primary purpose of a low limit cutout is to prevent a coil from freezing. Therefore, before mounting the control, consider the following bullet points that will help protect the coil from freezing:

- Cool air drops to the bottom of the unit. This is why protection in the lower bottom of the unit (lower 6.0 in. [15.2 cm]) is vital.
- If the tubes in the coil freeze, the coil can crack and begin leaking. As water leaks from the coil, the control system may sense the reduced water pressure and increase the flow of water to compensate for the loss, causing even more damage.
- Install low limit controls in a very specific manner to perform their intended task. The low limit controls incorporate a vapor-charged sensing element.
- The vapor in the element creates a change in pressure with a change in temperature within the sensing element, eventually causing the electrical switch in the device to **OPEN** or **CLOSE**. This design feature is the reason that the device must be installed properly so that it functions as intended.
- The size of the duct work or air handling unit system in which the device is installed may require more than one low limit control to adequately protect the entire coil.
- System accessibility affects how the device is mounted. Larger air handling units (AHUs) often provide access to the coil, allowing to effectively serpentine the capillary across its face (refer to the section, "Mounting in an Accessible Location"). Smaller AHUs or duct work may not provide direct accessibility. Pre-assembly of the control is required before installation (refer to the section, "Mounting in an Inaccessible Location").
- Mount the sensing element with a slight decline of approximately 1.0 inch (25 mm) for every 1.0 foot (305 mm) of drop (refer to the following illustration and Table 1).

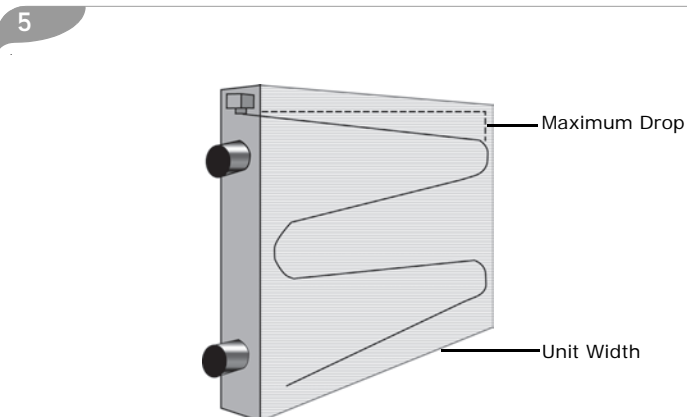


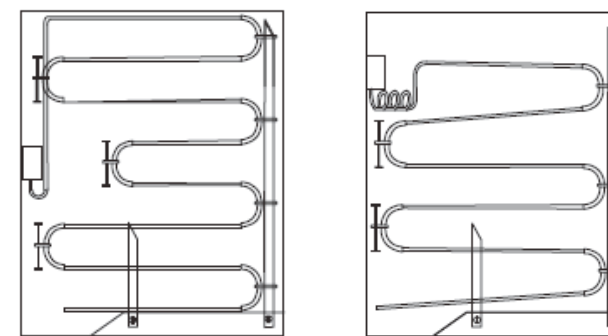
Table 1. Maximum Drop by Unit Width

Unit Width (Feet/Meters)	Maximum Inch (mm) of Drop per Segment ^(a)
5.0 ft. (1.5 m)	5.25 in. (133.4 mm)
10.0 ft. (3.0 m)	10.50 in. (266.7 mm)
15.0 ft. (4.5 m)	15.75 in. (400.1 mm)
20.0 ft. (6 m)	21.00 in. 533.4 mm)
25.0 ft. (7.6 m)	26.25 in. (666.8 mm)
30.0 ft. (9.1 m)	31.50 in. (800.1 mm)

(a) Allow for 1.0 inch (25 mm) of drop per 1.0 foot (305 mm) of run.

- Alternative mounting types are shown in Figure 1 and Figure 2. When selecting these installation methods, mount the temperature control above the sensing element whenever possible. Otherwise, mount the control above the element, loop the capillary/element slightly below the control, and then route the element toward the top of the coil. Serpentine a loop in a downward direction from the top of the coil.
- Keep the loop as short as possible (*maximum of 4.0 feet*). When mounting the control below the sensing element, prevent possible nuisance alarms by mounting the control in a conditioned space. When using the control, coil the excess capillary (*small capillary between the control and sensing element*) inside the conditioned space and secure.

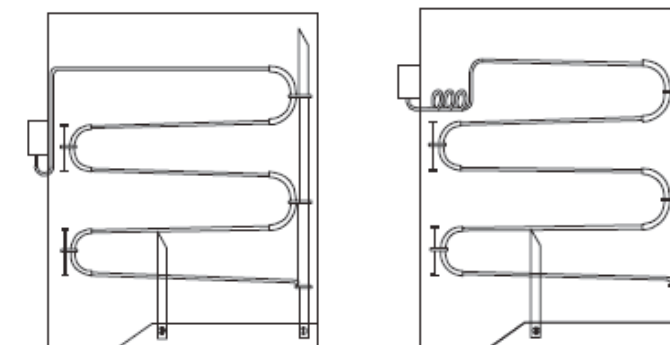
Figure 1. Inside Duct Mounting



Inside duct mounting: Space surrounded by unconditioned space.

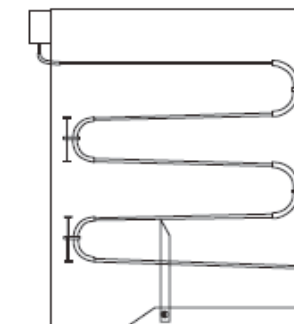
Inside duct mounting: Space surrounded duct is unconditioned.

7 Figure 2. Outside Duct Mounting



Outside duct mounting: Duct work installed inside conditioned space only.

Outside duct mounting: Duct work installed inside heated space only.



Outside duct mounting: Duct work installed inside heated/unheated space only.

Mounting Notices and Guidelines

Follow these Notices and guidelines when mounting the low temperature cutout control:

NOTICES

Risk of Environmental and Property Damage!

- Avoid sharp bends in capillary tubes. Sharp bends can weaken or kink capillary tubes.
- Coil and secure excess capillary tubing away from contact with sharp or abrasive objects or surfaces. Vibration and sharp or abrasive objects in contact with capillary tubes can cause damage that results in release of the chemical charge in the sensing element.
- Do not dent or deform the sensing bulb. Dents or deformations in the sensing bulb can change the calibration, may cause the control to operate at temperatures other than the setpoint.

Failure to follow the above bullet points could result in refrigerant leaks, and damage to the property or environment.

Coil and Internal Components Damage!

- Be careful when drilling holes or driving screws while mounting sensing elements to avoid puncturing or damaging hydronic coils.
- Use only the mounting screws supplied with the Universal Mounting Bracket to avoid damaging internal components. Be careful not to distort or bend the control case when mounting the control to an uneven surface. Using other screws or bending the control case voids the warranty.

Equipment Damage!

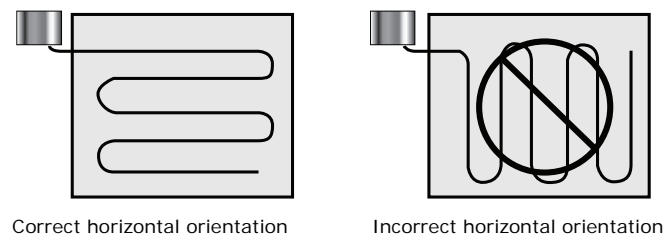
- Locate Low temperature cutout controls in areas protected from the effects of weather. If the control is mounted in an area that is exposed to the weather or other wet environments, it must be equipped with an outdoor enclosure. Failure to properly enclose the control in an outdoor environment could result in equipment damage.

Important: Locate the control case and bellows where the ambient temperature is always warmer than the setpoint. The control operates only from the lowest temperature along any 14.0 to 16.0 in. length of the sensing element. Mount the low temperature cutout control in the correct location. The capillary must be exposed to all areas on the coil where a risk of low temperatures are present.

Guidelines

- Mount the control upright in an accessible location, where the control body, capillary tube, and sensing bulb are not subject to damage, and the control is in the highest possible position of the entire installation.
- Mount the control upstream from mixed air or chilled water coils.
- Mount the control downstream from preheat coils.
- Mount the control upright on flat, vertical, or horizontal surfaces using accessory brackets. These controls have NEMA 1 enclosures.
- Mount the capillary in a serpentine pattern so that it slopes gently downward (*not to exceed 5°*). Ensure that there are no dips, bends, or kinks. Install the last segment within 6.0 in. (15.2 cm) of the bottom of the coil. Refer to Figure 3. for correct capillary orientation.

Figure 3. Capillary Orientation



Correct horizontal orientation

Incorrect horizontal orientation

Mounting in an Accessible Location

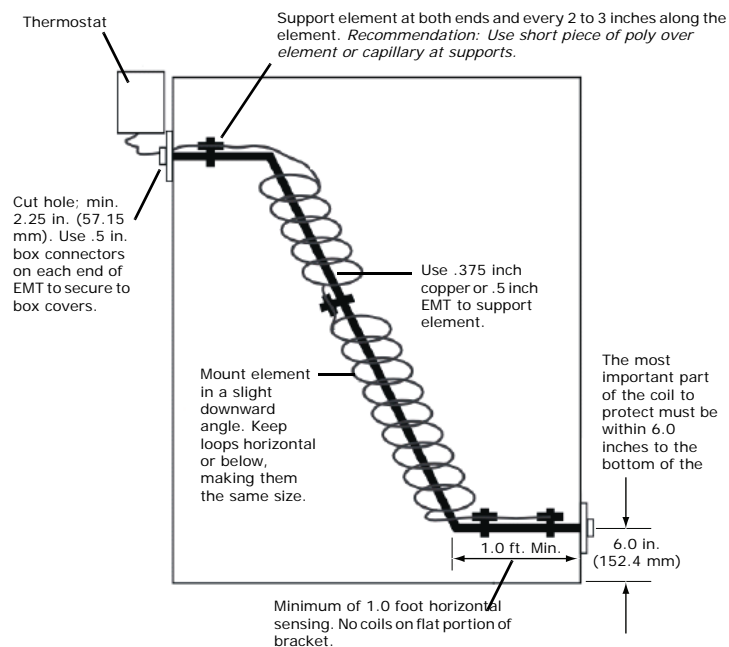
At times, the coil face may not have anything that can hold the tie-wrapped sensing element. In these situations, use .5 in. (1.3 cm) EMT, hard copper tubing, or Unistrut® to build supports to be used for fastening the sensing element. Fastening the sensing element to fixed supports holds the element in place and prevents movement in the air stream.

Field-fabricated supports often take the form of a rack with vertical supports. After determining the proper location, use the following guidelines (*in order*) to mount the low temperature cutout control (refer to Figure 1):

- Use two screws or bolts through the two outer holes on the back of the control case when mounting the control directly to a flat vertical surface.
 - Use the two inner holes with the mounting bracket (*with supplied screws*) when mounting the control to a flat horizontal surface.
 - Determine the best mounting location for the low temperature cutout control. Locate the control as high as possible on the side of the duct or on a nearby wall, panel, or structural support. The desired mounting position is with the element bellows pointing down.
 - Build and install any field-fabricated supports that are necessary to hold the sensing element in place.
 - Use the control mounting bracket as a template and mark the location for the mounting screws.
 - Drill a .3125 in. (8 mm) entry hole for the sensing element.
 - Feed the entire length of the sensing element through the entry hole.
- Important:** On the low temperature cutout control, the brass tubing just below the bellows is not temperature sensitive and can be mounted in ambient temperature. Below the solder bead, the copper sensing element begins. This part is temperature-sensitive and must be properly positioned to work correctly.
- Fasten the control to the side of the duct using the mounting bracket and self-tapping screws.
 - Secure the far end of the sensing element, starting at the bottom of the coil.
 - Secure the sensing element with .25 in. (6.4 mm) poly sleeve and tie wraps.
 - Position and mount the sensing element within 6.0 in. (15.2 cm) of the bottom of the coil.

Mounting in an Inaccessible Location

- Determine the mounting location for the low limit control.
 - Stay clear of any moving parts within the duct, such as dampers.
 - When the duct is covered with insulation, mount the control to a standard electrical 4-Square box and cover.
- Referring to the illustration below, measure the duct and calculate the required length and height of the element support.



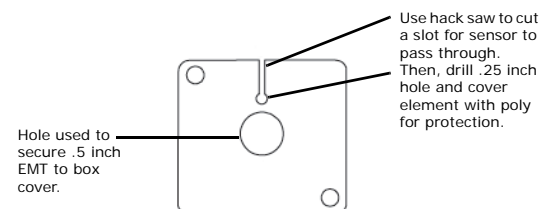
Note: When the duct is covered with insulation, mount the stat to the standard electrical box and cover.

- Using .5 in. (1.3 cm) EMT, build the support assembly outside of the duct.

Note: A .375 in. (1 cm) hard copper tubing can be substituted for .5 in. (6.4 mm) EMT when building the support. These instructions assume the use of EMT.

- Starting at the bottom of the coil, distribute the sensing element around the support and tie-wrap it securely in place. Keep the loops horizontal or inclined slightly downward (*not to exceed 5°*) and uniform in size (refer to the previous illustration).
- Consider the use of Minerallac® conduit hangers or equivalent to provide anchoring points on the support where needed.
- Place a .5 in. (1.3 cm) EMT connector on each end of the support. These connectors protrude through the knockout hole on the 4.0 in. (10.1 cm) box covers, which are used as mounting plates at each end of the support.
- At the upper end of the duct, using a large hole saw (2.25 in. [5.7 cm]) minimum, drill the entry hole for the sensing element/support assembly.
- At the lower end of the duct, drill another hole (*use the same hole saw as used to cut the entry hole*).
- A larger hole allows easier access for mounting. Position this hole to allow the lower portion of the sensing element to be within 6.0 in. (15.3 cm) of the bottom of the coil.
- Cut a notch in another 4.0 in. (10.1 cm) box cover. The notch is used to secure the upper end of the support assembly. Locate the notch so that you can position the capillary (*whip*) close to the support (*refer to the following illustration*).
- Place a 4.0 in. (10.1 cm) box cover, with the center knockout removed, over the upper end of the support assembly, and use a lock nut to fasten the support to the box cover.
- Feed the sensing element/support assembly through the entry hole at the upper end, and position the lower end of the support to protrude through the exit hole at the bottom on the far side.

- Place a 4.0 in. (10.1 cm) box cover with the center knockout removed over the end of the support. Using a lock nut, fasten the support in place at the lower end.



- Carefully place the capillary tube in the slot and apply a short piece of .25 in. (6.4 mm) poly tubing, slit lengthwise, around the capillary where it passes through the notch.
- Screw down the corners of the box cover to hold the upper end of the support assembly in place.
- Using the mounting bracket, fasten the control to the side of the duct using self-tapping screws, ensuring a downhill element all the way to the bottom of the control.

Wiring

CAUTION

Hazardous Voltage! Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in minor to moderate injury and equipment damage.

For most AHU installations, it is more cost-effective to wire the Low Limit (and other safeties) with low voltage Class 2 wiring and add a shutdown relay at the Motor Starter. This practice allows the control to share raceways with other low voltage cables for the system.

- Work backwards towards the bellows, stringing the sensing element in a serpentine fashion horizontally across the face of the coil (refer to Figure 3).
- Successive horizontal runs of the sensing element should be inclined slightly upward.
- Ensure that horizontal runs of the sensing element are no more than 12.0 in. (30.5 cm) away from each other.

Note: On a wide coil, there may be a very small *S* to get back up to the control. Locate this topmost bend in the correct position to use up any remaining slack in the length of the sensing element. It may require fabrication of a support for the bracket at that turning point.

- To prevent damage caused by vibration or abrasion, place a short piece of .25 in. (3.2 mm) poly sleeve around the capillary at the point where it passes through the entry hole in the duct work. Slit the tubing lengthwise to permit easy installation. Caulking or sealant is normally not required when using the right size hole and tubing.
- At the bends, use a **TE-6001-8 Averaging Element Mounting Bracket** to obtain the correct radius and protect the sensing element. The radius of each bend of the sensing element must be at least 3.0 in. (7.6 cm), but not to exceed 14.0 in. (35.5 cm).

Important: All wiring must be in accordance with the National Electrical Code™ (NEC) and local codes.

Setup and Adjustments

NOTICE

Do not adjust the pointer beyond the highest or lowest indicator marks on the control's temperature scale. Adjusting the pointer beyond the indicator marks may damage screw threads, may cause inaccurate control operation, and voids the warranty. Also, most controls with spot sensitive sensing elements used for coil protection are set and sealed at 35°F (1.6°C). Attempting to set them lower can damage the control.

Adjust the setpoint by turning the adjustment screw until the pointer is opposite the desired cutout point. Access the adjustment screw at the bottom of the control or at the top when the cover is removed.

Important: After adjusting the control settings and before leaving installation, verify equipment and control operation, and verify control setpoint with a reliable thermometer.

Checkout Procedure

Before leaving the installation, observe at least three complete operating cycles to be sure that all components are functioning correctly. When used as a low temperature cutout control, simulate operation by actuating contacts to confirm that electrical connections are correct.

Repair Information

Contact the nearest Trane office for control failure or replacement.

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