

Application

- **Important:** Use the A421ABG-212 Electronic Temperature Control only as an operating control. Where failure or malfunction of the temperature control could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the control.
- **Important :** Utiliser ce A421ABG-212 Electronic Temperature Control uniquement en tant que dispositif de contrôle de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du contrôle risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du contrôle.
- **Important:** Do not attempt to alter the factory wiring or programming of this control. Any change to the condition of the control as received voids the manufacturer's warranty and may result in improper control operation.

The A421ABG-212 control is factory-wired and programmed for single-pole, single throw (SPST) resistive self-regulating heating cable applications on insulated polyethylene pipe. The pipe features a diameter of 0.5 in. to 2 in. and a length of less than 300 ft (91 m).

The sensed temperature displays on the control's LCD, and the front panel LED indicates the output relay status. The control includes pre-wired cords with plug and receptacle ends. The control combines remote sensing capability with electronic accuracy in a Type 1, high-impact plastic enclosure. Mount the control on a flat and even surface or on a DIN rail.

Operation

When the sensed temperature decreases to 47°F (8.3°C) the LED indicator illuminates, and the output relay energizes to provide power to the female receptacle end. When the sensed temperature rises to 52°F (11°C), the LED and the output relay de-energize to remove the power from the female receptacle end.

In the event of a sensor failure, the control continuously provides power to the female receptacle end. See Figure 1.

Figure 1: Control relay operation

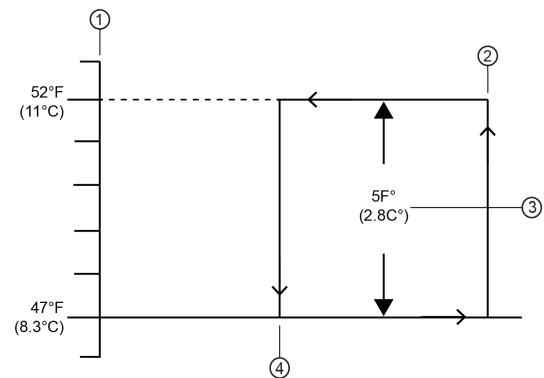


Table 1: Control relay operation

Number	Description
1	Temperature
2	Cut-out (off)
3	Differential
4	Cut-in (on)

Display

The front panel of the control features an LCD and a relay status LED indicator. The keys on the front panel are non-functional in this application. The control is factory-set and any adjustments void the warranty.

LCD

During normal operation, the LCD displays the following information:

- Sensor temperature

- Unit of temperature
- Flame icon to indicate heating mode

See Figure 2. The temperature value on the display ranges from -30°F to 212°F (-34°C to 100°C) in 1° increments.

Relay status indicator LED

A green LED on the control's front panel illuminates when the output relay energizes and the N.O. contacts are closed.

Figure 2: Control front panel and display

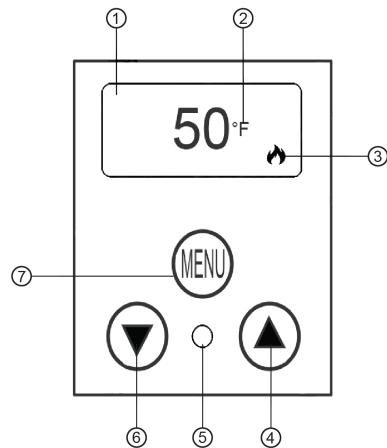


Table 2: Control front panel and display

Number	Description
1	LCD display
2	Fahrenheit or Celsius symbol
3	Heating mode icon
4	Up button (not used)
5	Green LED for relay status
6	Down button (not used)
7	Menu button (not used)

Installation

The control includes a DIN rail to mount the control on a flat surface. See Figure 3. Mount the A421ABG-212 control in a suitable location for wiring.

Figure 3: Dimensions, mm (in.)

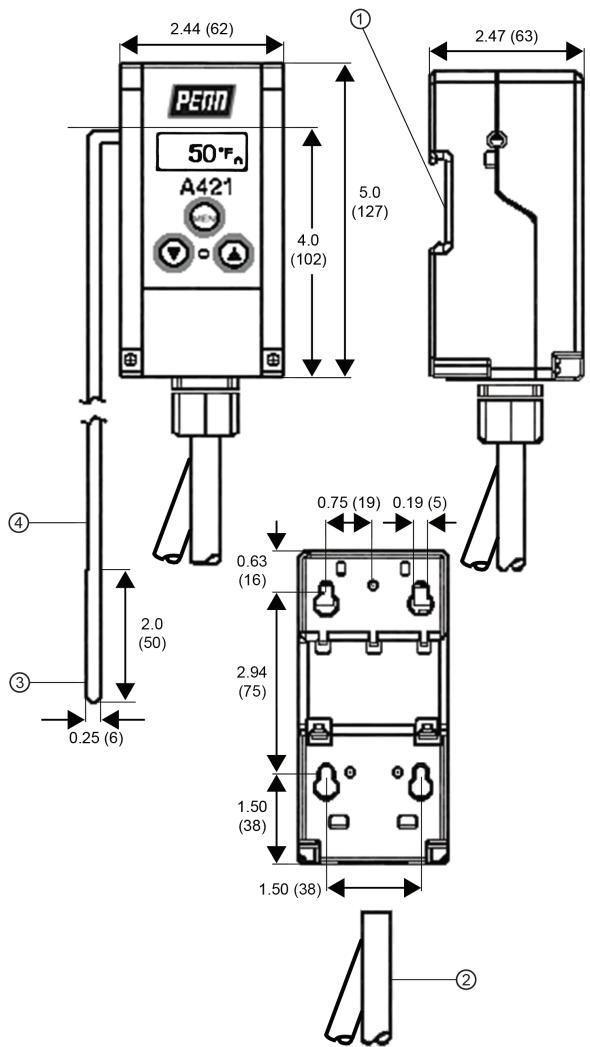


Table 3: Dimensions

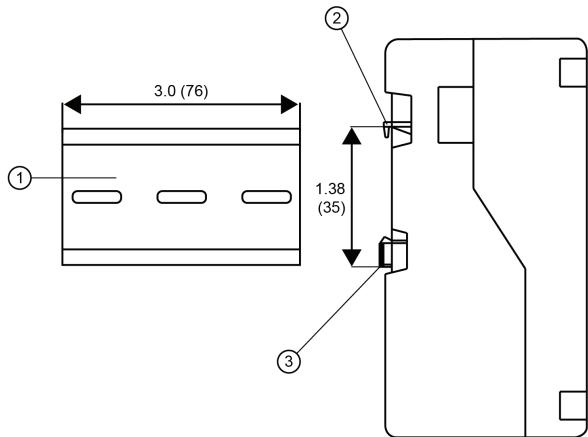
Number	Description
1	DIN rail
2	Electrical cord with combined plug and outlet; 6 ft (1.8 m)
3	Sensor
4	Sensor wire lead; 19 ft 6 in. (6 m)

Mounting

To mount the control, complete the following steps.

1. Hold the DIN rail level against the mounting surface.
2. Use the DIN rail as a template to mark holes or slots.
3. If necessary, drill pilot holes for screws or bolts.
4. To attach the DIN rail to a flat surface, use screws or bolts through the holes or slots. Tighten the screws or bolts flush to the DIN rail.
5. To snap the control onto the DIN rail, place the top mounting clip on top of the DIN rail and press the lower front portion of the control towards the mounting surface. See Figure 3.
6. Secure the control to prevent it from shifting to the side and falling off the DIN rail.

Figure 4: Mounting dimensions side view, mm (in.)



Number	Description
1	DIN rail front view
2	Top mounting clip
3	Bottom mounting clip

Installing the sensor

Before you install the sensor, perform an operational checkout.

1. Install the sensor where it can accurately sense the temperature of the controlled medium.

2. Determine the coldest point along the pipe system, as near as possible to the mounting location of the control. This location is normally the point nearest to the surface of the ground.
3. Place the sensor at the location most likely to freeze, within 19 ft 6 in. (6 m) of the sensor wiring from the control.
4. Mount the temperature sensor opposite the heating cable. Use cable ties or weatherproof tape to fasten the sensor to the pipe before you apply the thermal insulation sleeve. See Figure 5 and Figure 6 for a cross-sectional and cutaway view of the control.

Figure 5: Cross-sectional view

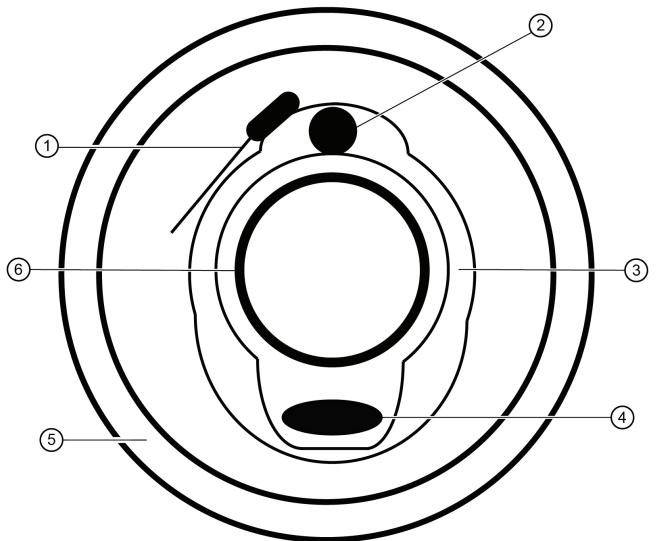


Table 4: Cross-sectional view

Number	Description
1	Cable ties or weatherproof tape
2	Temperature sensor
3	Pipe sleeve
4	Self-regulating heating cable
5	Thermal insulation sleeve
6	Water pipe

Figure 6: Cutaway view

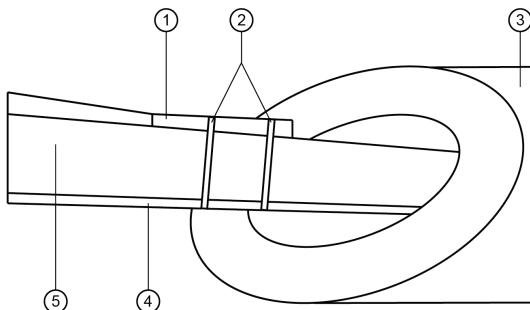


Table 5: Cutaway view

Number	Description
1	Thermal sensor
2	Cable ties or weatherproof tape
3	Thermal insulation sleeve
4	Self-regulating heating cable under pipe sleeve
5	Water pipe with pipe sleeve

Wiring

All wiring must conform to the National Electrical Code (NEC) and local regulations. Use the following procedure to connect power to the control and controlled equipment. See Figure 4 for a side view of the control's mounting dimensions.

1. Plug the 3-prong male plug from the self-regulating heating cable assembly into the shorter cord from the control with the 3-prong female receptacle.
2. Plug the longer cord from the control with the 3-prong male plug into a 120 VAC grounded outlet.

Checkout procedure

⚠ WARNING

Risk of Electric Shock.

Disconnect or isolate all power supplies before making electrical connections. More than one disconnection or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

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⚠ Avertissement

Risque de décharge électrique.

Débrancher ou isoler toute alimentation avant de réaliser un branchement électrique. Plusieurs isolations et débranchements sont peut-être nécessaires pour couper entièrement l'alimentation de l'équipement. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

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To perform an operational checkout of the A421ABG-212 control, complete the following steps.

1. Use an AC voltmeter to check the voltage in the 3-prong female receptacle in the shorter cord from the control.
 - a. If the ambient air temperature is less than 47°F (8.3°C), the relay should energize.

- b. If the ambient air temperature is between 47°F (8.3°C) and 52°F (11°C), the relay should not be energized.
- c. If the ambient air temperature is greater than 52°F (11°C), the relay should not energize.

2. Insert the sensor into a cup of ice water. When a temperature of less than 47°C (8.3°C) displays, the relay should energize.

3. Insert the sensor into a cup of hot water. When a temperature of greater than 52°C (11°C) displays, the relay should de-energize.

Troubleshooting

If the LCD displays an alarm or fault code, see the following table for troubleshooting information.

Table 6: Troubleshooting

Fault code	Definition	Output status	Solution
SF flashes alternately with OP	Open temperature sensor or sensor wiring	Output functions according to the selected SF mode	See Troubleshooting procedure . Cycle power to reset the control.
SF flashes alternately with SH	Shorted temperature sensor or sensor wiring		
EE	Program failure	Output is off	To reset the control, press MENU . If problems persist, replace the control.

Troubleshooting procedure

1. Check for proper voltage to the control.
 - a. To remove the cover, loosen the two captive cover screws.
 - b. To check the voltage between the common (COM) and 120 V, use an AC voltmeter. The voltage must be between 102 VAC and 132 VAC for 120 VAC applications.
 - c. If the voltage reading is not within the required range, check the power source and input power wires for problems.
2. Check for proper sensor operation.

- a. Disconnect all power sources to the control.
- b. Use a thermometer to take a temperature reading at the sensor location.
- c. Disconnect the sensor from the control.
- d. Use an ohmmeter to measure the resistance across the two sensor leads when the sensor is at the temperature measured in Step 2b.
- e. See Figure 7 to verify that the measured temperature and resistance conform to established temperature and resistance values.
- f. If the measured values conform to the values in Figure 7, proceed to Step 3.

g. If the sensor's measured resistance value is substantially different from the expected value for that temperature, check the sensor wiring. If the sensor wiring is correct, replace the sensor.

3. Check the control for correct operation.

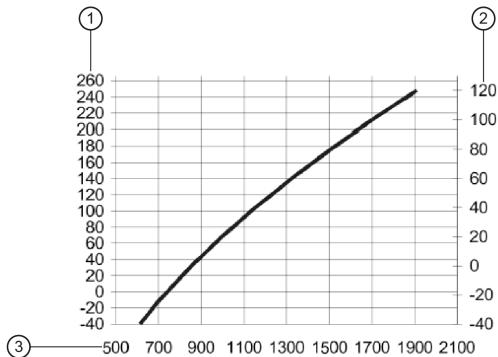
① **Note:** Before you perform this step, complete troubleshooting Steps 1 and 2.

- a. Disconnect the load from the output relay terminals.
- b. Make sure that you install the parameter adjustments jumper so that you have unrestricted access to adjust parameters.
- c. Reconnect the sensor leads and supply power to the control.
- d. Replace the cover.
- e. Check the control settings for the correct values.
- f. Press **MENU** until **On** appears. Press **MENU** again to display the on value.
- g. Press **Down** or **Up** to change the on temperature above and below the sensor temperature until the relay energizes and de-energizes.

① **Note:** If the anti-short cycle delay is set to a value other than 0 minutes, when you power on the control, the relay does not energize until the time delay elapses.

- h. If the output relay does not perform as expected, replace the control.
- i. If you verify correct operation of the control, reconnect the load and consult the equipment manufacturer's instructions to troubleshoot the controlled equipment.

Figure 7: Temperature versus sensor resistance



Number	Description
1	Temperature (°F)
2	Temperature (°C)
3	Resistance in ohms

A421ABG-212 Electronic Temperature Control technical specifications

Table 7: A421ABG-212 Electronic Temperature Control technical specifications

Specification	Description
Power consumption	1.8 VA maximum
Supply power	110/120 VAC, 50/60 Hz
Ambient conditions	<ul style="list-style-type: none"> • Operating: -40°F to 150°F (-40°C to 66°C), 0% to 95% RH noncondensing • Shipping and storage: -40°F to 185°F (-40°C to 85°C), 0% to 95% RH noncondensing
Temperature control range	-40°F to 212°F (-40°C to 100°C)

Table 7: A421ABG-212 Electronic Temperature Control technical specifications

Specification	Description
Input signal	1,035 ohm at 77°F (25°C) for A99 positive temperature coefficient (PTC) temperature sensors
Sensor offset range	± 5°F or ± 3°C
Enclosure material	Type 1, IP20 high-impact thermoplastic
Compliance	North America: cULus Listed, UL 60730, File E27734, Vol. 1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, contact Heat-Line Corporation at (800) 584-4944. Heat-Line Corporation shall not be liable for damages resulting from misapplication or misuse of its products.

Table 8: A421ABG-212 control with power cords output relay contacts electrical ratings

Specification	Description
Agency and file	UL 60730
Applied AC voltage at 50/60 Hz	120 VAC
Full load amperes LC/LNO	12 A
Locked rotor amperes LC/LNO	72 A
Resistive amperes LC/LNO	10 A
Pilot duty VA LC/LNO	125 VA

Table 9: UL conformity declaration information

Specification	Description
Purpose of control	Sensing or operating control
Construction of control	Electronic free-standing control, inline cord control
Number of cycles	30,000
Mounting control method	Mounting screws or DIN rail
Earthing method	Attachment plug

Table 9: UL conformity declaration information

Specification	Description
Cord connection	Type Y
Type 1 or Type 2 connection	Type 1.B, micro-disconnection
External pollution situation	Pollution degree 3
Internal pollution situation	Pollution degree 2
Heat and fire resistance category	D
Rated impulse voltage	4,000 V
Ball pressure temperature	128°C

North American Emissions

Compliance

United States

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Canada

This Class (B) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (B) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Contact information

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