

**Day/Night Pneumatic Room
Thermostats with Local Indexing
General Instructions**

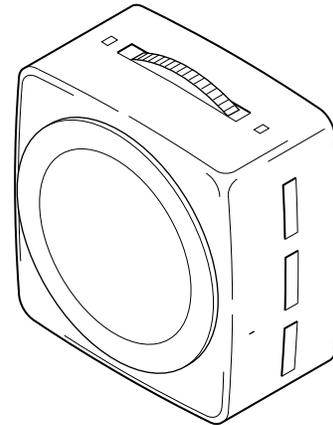
Application

The 2216 Series Pneumatic Room Thermostats are designed for applications requiring separate control points due to varying occupancy or seasonal loads. They are particularly well suited to day/night control in buildings such as schools, hospitals, and shopping malls.

These thermostats have a serrated thumb wheel for setpoint adjustment. They are direct acting and utilize dual bimetals for day and night control. One temperature (day) is controlled when the main pressure is below 17 psig (16 psig normal operating pressure), and the other temperature (night) is controlled when the main pressure is above 21 psig (25 psig normal operating pressure). A switching lever on the thermostat allows manual indexing to the day control point when the main air pressure is in the night mode. Both control points are adjustable and either may be set to control higher or lower than the other. These thermostats use a ball feedback system and a 2:1 relay for accuracy and stability. For unit ventilator applications, these thermostats may be re-configured as three-pipe thermostats, in which case pressure at the "R" port is 0 psig during day operation and equals main air pressure (typically 25 psig) during night operation. Thermostat covers are available in various styles to meet particular requirements.

Features

- Factory-calibrated, stainless steel ball-in-seat provides pneumatic feedback for stable, linear operation.
- Separate factory-calibrated night bimetal and setpoint dial, with fixed 4 °F night throttling range for accurate "night" operation.
- Snap-acting (not gradual) changeover from "day" to "night" operation and vice versa.
- Easy-to-use throttling range adjustment and recalibration.
- Adjustable (patented) bimetal shows actual throttling range in both °F and °C. Adjustable 2 to 12 °F (1 to 6.7 °C).
- Leak-proof, self-closing branch gauge tap.



Full Dial Cover Shown
(Covers must be ordered separately except as noted.)

SPECIFICATIONS

Action: Direct, proportional.

Setpoint Range:

Day, 55 to 85 °F (13 to 29 °C)

Night, 50 to 80 °F (10 to 27 °C).

Throttling Range:

Day, Adjustable 2 to 12 °F

Night, Adjustable 3 to 5 °F.

Supply Air Pressure:

Below 17 psig, Operates at day setpoint.

Above 21 psig, Operates at night setpoint.

Maximum Air Pressure: 30 psig.

Main Air Consumption: 30 scim at 16 psig; 43 scim at 25 psig.

Calibration Point: 9 psig branch line pressure when ambient equals setpoint (factory-set).

Day/Night Indexing: Remote, by changes in main air pressure, or local, with switching lever.

Setpoint Adjustment: Serrated thumbwheel.

Construction:

Mechanical Components, Die cast aluminum, stainless steel, and glass-filled nylon.

Diaphragm, Fabric-reinforced Neoprene.

Air Lines, Connect to thermostat nipples with spring-reinforced plastic tubes.

Branch Connections, Equipped with internal filters.

Environment

Humidity: 5 to 95% relative humidity, non-condensing.

Locations: NEMA Type 1.

ORDERING DATA

Table-1 Model Chart — Thermostats.

Wholesale Number	Replaces Model	Day/Night Action	Description
2216-126	T27-301	Direct/ Direct	Includes (2) 1/4" x 3/16" tubing reducers, 20-693 tubing, 20-714 wall plate, 20-711 mounting plate, and mounting screws.
2216-136 ^a	T27-3011		

^a These models include factory-installed 20-712 dial stop kits.

Table-2 Model Chart — TAC Uni-Kits[®].

Wholesale Number	Replaces Model	Action	Description
2216-526	T27-3011	Direct/ Direct	Includes thermostat with 20-712 dial stop kit, 21-933 full dial cover with blank cover conversion, and 22-022 conversion kit.

Table-3 Covers.

Wholesale Number	Replaces Model	Color	Material	Dial Markings	Setpoint Adjustment	Thermometer
21-923	C1-42	Satin Chrome	Metal	55 to 85 °F	Yes	No
22-1023	C1-48	Euro-white	Plastic	10 to 30 °C		
21-928 ^a	C2-42	Satin Chrome	Metal	Blank	Concealed	
22-1028 ^a	C2-48	Euro-white	Plastic			
21-933	C3-42	Satin Chrome	Metal	55 to 85 °F	Yes	Yes (External)
22-1033	C3-48	Euro-white	Plastic	10 to 30 °C		
21-939 ^a	C4-42	Satin Chrome	Metal	55 to 85 °F	Concealed	
22-1039 ^a	C4-48	Euro-white	Plastic	10 to 30 °C		
21-943	C5-42	Satin Chrome	Metal	Cooler - Warmer	Yes	No
22-1043	C5-48	Euro-white	Plastic			
21-948	C6-42	Satin Chrome	Metal			
22-1048	C6-48	Euro-white	Plastic			
21-957 ^a	C11-42	Satin Chrome	Metal	None	Concealed	Yes (External)
22-1057 ^a	C11-48	Euro-white	Plastic			
21-960 ^a	C14-42	Satin Chrome	Metal	Blank	Concealed	Yes (Internal)
22-1060 ^a	C14-48	Euro-white	Plastic			
2890-010 ^a	Kit	Satin Chrome	Metal	55 to 85 °F or Blank	Yes or Concealed	No
2890-013 ^a	Kit	Euro-white	Plastic	10 to 30 °C or Blank		

^a Thermostat covers with concealed setpoint adjustment, and thermostat cover kits include setpoint adjustment cover 21-800 (black) or 21-801 (Euro-white).

Table-4 Accessories.

Wholesale Number	Replaces Model	Description
20-676	10-18	Aspirating box, stainless steel
20-695	10-15	Aspirating box, satin finish
20-707	10-53	Metal thermostat guard
20-712	10-59	Internal stop kit
20-715	10-62	Clear cover thermostat guard
20-850	—	Thermostat mounting plate
20-881	N2-4	Thermostat calibration wrench
21-473	10-73	Drywall mounting bracket
21-800	10-72	Setpoint adjustment cover (black)
21-801	10-81-48	Setpoint adjustment cover (Euro-white)
21-876	10-76	Opaque cover thermostat guard
22-022	—	Thermostat conversion kit
22-023	—	Thermostat conversion kit

Table-4 Accessories. (Continued)

Wholesale Number	Replaces Model	Description
22-138	MCS-GA	Branch tap gauge adaptor
900-002	—	Thermostat calibration kit

TYPICAL APPLICATIONS (Piping Diagram)

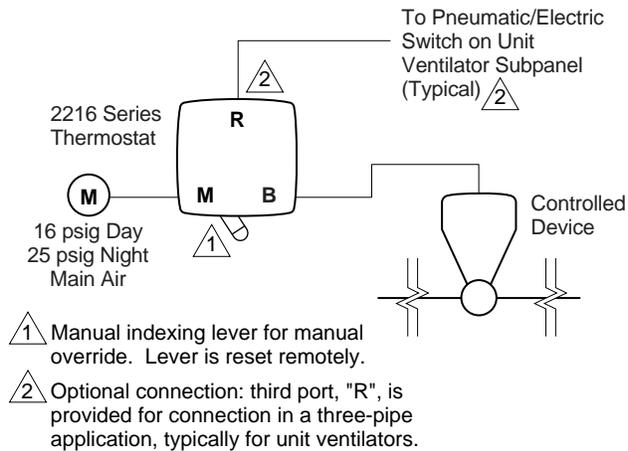


Figure-1 Typical Application.

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 screwdriver for mounting the thermostat
 - 20-881 Thermostat calibration and cover screw wrench (or 1/16" and 1/4" hex wrenches)
- Training: Installer must be a qualified, experienced technician
- Appropriate accessories
- Piping diagrams

Location

Caution:

- Do not locate the thermostat near sources of heat or cold, such as lamps, motors, sunlight, or concealed ducts or pipes. Doing so will affect the accuracy of the thermostat.
- Avoid installing the thermostat on outside walls. If such a location is necessary, mount the thermostat on an insulated back plate (accessory item).
- Mount thermostats *only after the wall surfaces have been finished.*

Locate the thermostat where it will be exposed to an unrestricted circulation of air, which represents the average temperature of the controlled space.

Mounting

Standard Mounting Options

1. Mount the thermostat according to the applicable figure (Figure-2 through Figure-8). See Figure-10 for mounting dimensions.

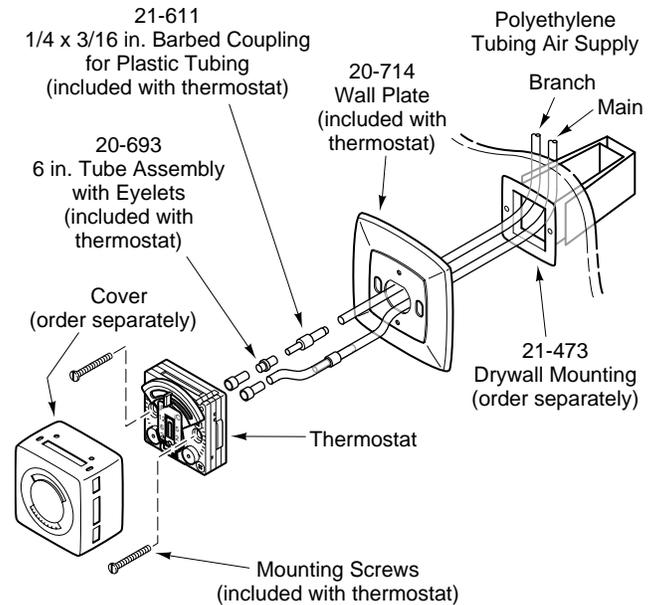


Figure-2 Flush Mounting of Thermostat,
Using Drywall Mounting Bracket.

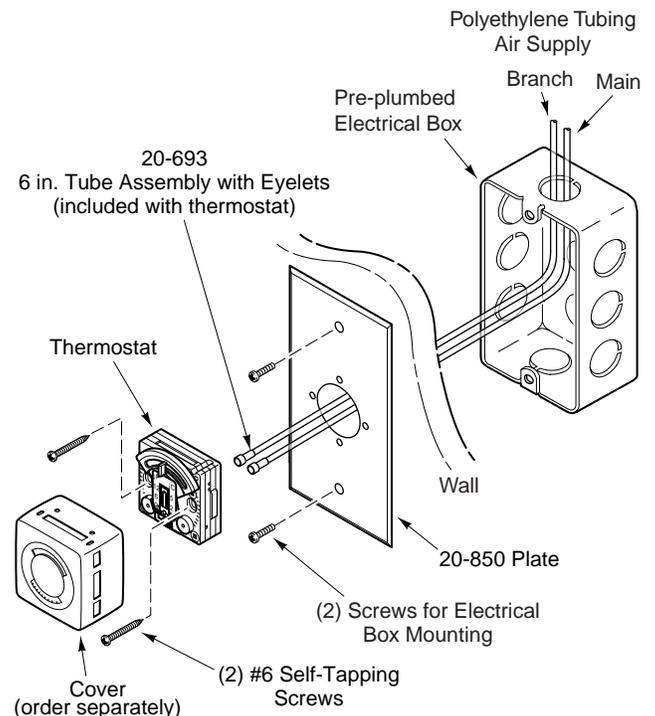


Figure-3 Flush Mounting of Thermostat, Using 20-850 Plate
and Pre-Plumbed Electrical Box.

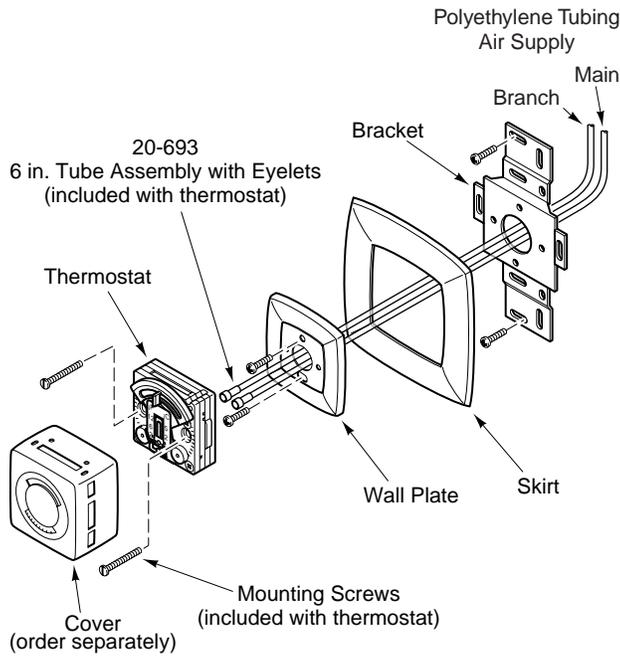
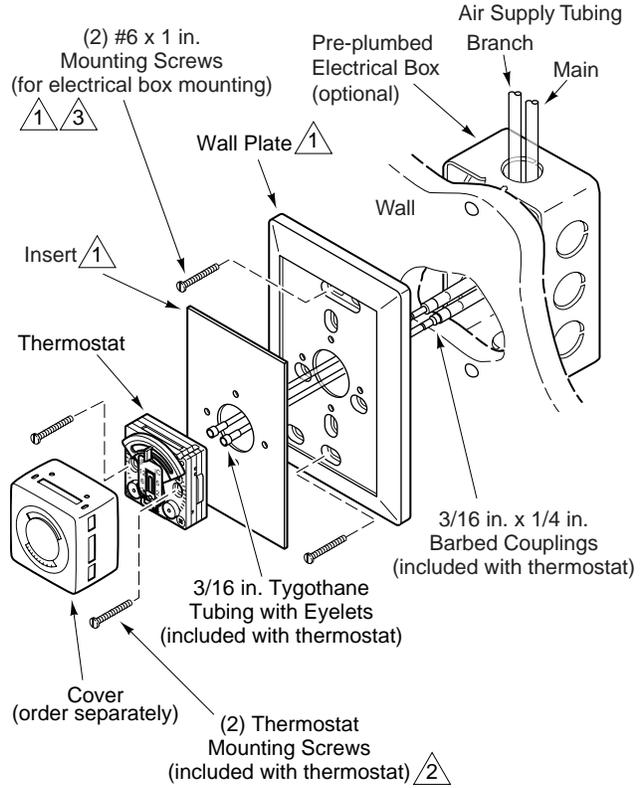


Figure-4 Thermostat Mounted with 22-022 Conversion Kit, Using Wall Plate and Skirt, to Replace Competitive Thermostats.



- 1 Provided in the 22-023 thermostat conversion kit.
- 2 Optionally, the thermostat may be mounted with the #6 x 1 in. self-tapping screws provided in the 22-023 kit.
- 3 Use the #8 x 1 in. mounting screws provided in the 22-023 kit when mounting the wall plate directly to the wall, without an electrical box.

Figure-6 Thermostat Mounted with 22-023 Thermostat Conversion Kit.

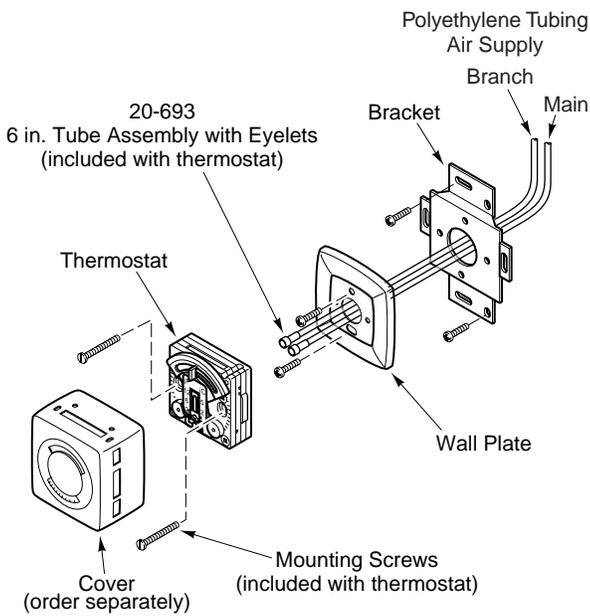


Figure-5 Thermostat Mounted with 22-022 Conversion Kit, Using Wall Plate Only, to Replace Competitive Thermostats.

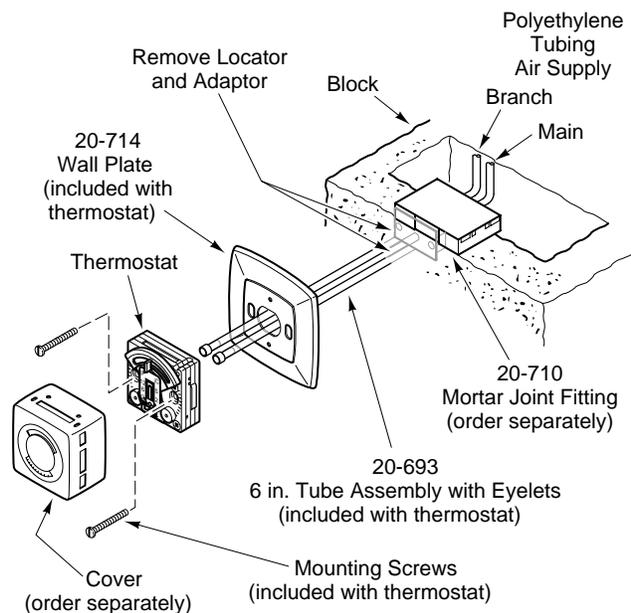


Figure-7 Thermostat Installation Using Pipehead in Masonry Wall.

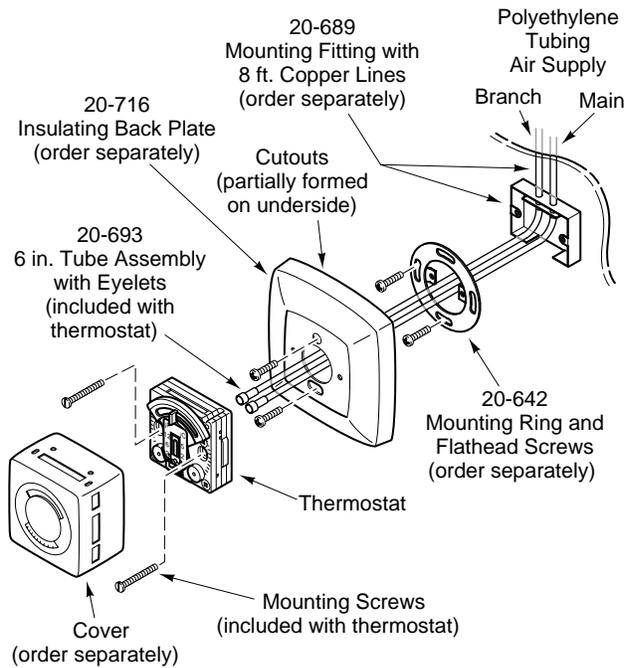


Figure-8 Surface Mounting of Thermostat, Pipehead Application.

Optional Mounting

Eliminate the pipehead fitting by using the 22-022 thermostat conversion kit and the included instructions, plus:

1/4" Plastic Air Lines: Install the 1/4" barbed couplings into the air lines. Connect the tube assembly to the 3/16" end of these couplings.

1/4" Copper Air Lines: Solder the barbed couplings into the copper lines. The tube assembly can then be connected to the 3/16" end of the couplings.

CALIBRATION

The 2216 series thermostats are factory calibrated with day sensor throttling range set at 3 °F. They should not require calibration upon installation. However, if necessary, change the throttling range, calibration, or switch point setting as follows:

1. Remove the thermostat cover. Install a 22-138 branch tap gauge adaptor into the branch pressure tap hole (Figure-9).
2. Measure the ambient temperature with an accurate thermometer. This temperature *must be within the range of the thermostat*. Take care not to breathe on, or place a hand near the bimetals, as this will result in an inaccurate reading.

Day Setpoint Calibration

1. Position the day setpoint cam (Figure-9) to match the ambient temperature.
2. Set the main air pressure to 15 psig and adjust the day calibrating screw, using a 20-881 thermostat wrench (1/16" hex wrench), until the branch tap gauge reads 9 ± 1 psig. Clockwise rotation increases the branch line pressure. Counterclockwise rotation lowers the branch line pressure.

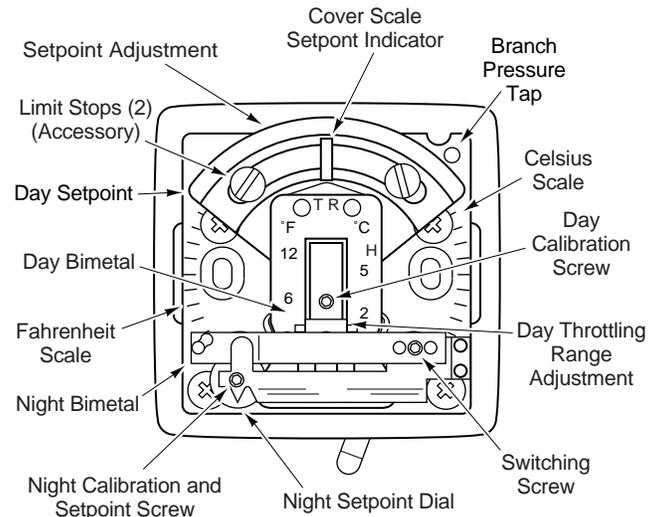


Figure-9 Thermostat Calibration Features and Limit Stop Accessory.

Night Setpoint Calibration

1. Increase the main air pressure to 25 psig.
2. Using a 20-881 thermostat wrench (1/16" hex wrench), rotate the night calibration screw until the branch tap gauge reads 9 ± 1 psig. Clockwise rotation increases the branch line pressure. Counterclockwise rotation decreases the branch line pressure.
3. The night setpoint is in calibration when the night setpoint dial indicates the ambient temperature within ± 2 °F. If not, adjust as follows:
 - a. Rotate the night setpoint screw until the dial gently contacts its stop. Clockwise rotation increases the ambient temperature reading, and counterclockwise rotation decreases the ambient temperature reading.
 - b. Continue rotating the setpoint screw approximately 1/8 turn, slipping the screw inside the dial.
 - c. Turn the screw back and check for 9 ± 1 psig branch air pressure, with the dial indicating the ambient temperature within ± 2 °F.
 - d. Repeat steps a, b, and c, as necessary, until night setpoint calibration is obtained.
4. The night setpoint screw may now be used to position the dial to the desired night control point.

Switching Adjustment

The 2216 series thermostats are factory calibrated to switch from day to night action at a pressure between 17 and 21 psig. If necessary, adjust the switch point as follows:

Note:

- The switch point adjustment should be made on a test bench at which a variable main air supply is available.
- It is necessary to read the branch line pressure while making the switch point adjustment.

1. Set the main air supply to the thermostat to the desired switch over point. For example, if system pressure is 13 psig day and 18 psig night, the desired switch over point would be between 15 and 16 psig.

- Position the day setpoint at the 55 °F setting and the night setpoint at the 80 °F setting.
- Verify that the branch line pressure gauge or branch pressure tap reads approximately the main air pressure being fed to the thermostat. If not, recheck the day setpoint calibration.
- To lower the switch over point, use a 20-881 thermostat wrench (1/16" hex wrench) to turn the switching screw clockwise, 1/8 turn at a time, until the branch line pressure falls. To raise the switch over point, turn the switching screw counterclockwise in the same manner.

Caution: Do not force the calibrating screws. If the desired action is not obtained when the screws are rotated, check to be sure the direction of rotation is correct.

- Lower the main air pressure to the desired system day pressure and observe the branch line pressure. The branch line pressure should rise to approximately the main air pressure.
- Raise the main air pressure to the night setting and observe the thermostat for proper function. As the main air pressure rises past the switch over point, the branch line pressure should drop off to zero.
- Lower the main air pressure and verify that the branch line pressure rises from zero as the main air pressure drops below the switch over point.
- Reinstall the thermostat cover and recheck the calibration at both day and night settings.

Manual Indexing Lever

After making the switching adjustment, check the operation of the manual indexing lever as follows:

- Set the main pressure to 25 psig.
- Move the manual indexing lever to the right. The day control point should now be active.
- Slowly reduce the main pressure and note the pressure at which the lever snaps back to the left. This should be at the switch over point, between 17 and 21 psig. If the switch over point was changed, this pressure should correspond to the new switch over setting.
- If the manual indexing lever does not snap back at the correct switch over setting, check and adjust the switch over point as outlined in Switching Adjustment.

Three-Pipe Applications

The 2216 series thermostats are equipped with a third port, labeled "R", which may be used in three-pipe applications (typically unit ventilators). As supplied from the factory, the end of this port connection is closed. For three-pipe applications, open this port connection as follows:

- Note that the "R" port connection is longer than the "M" and "B" connections. Cut approximately 1/16" (1.6 mm) from the end of this port connection, to open the port.

- When the 2216 series is used as a three-pipe thermostat, the pressure at the "R" port is 0 psig during day operation and equals main air pressure (typically 25 psig) during night operation. If 21 psig or greater main air pressure is available and the manual indexing lever is moved to the right, the pressure at the "R" port will drop to 2 psig or less.

Internal Stop Kit (Accessory)

The internal stop kit, model 20-712, consists of two screws and two nuts (Figure-9). Install this kit as follows:

- Move the setpoint adjustment to one extreme limit.
- Place a nut in the depression in the top plate and move the adjustment cam over the nut, to where the slot in the cam exposes the threads of the nut.
- Thread a stop screw into the nut far enough to allow the stop to slide in the slot. Repeat on the other side.
- Move the setpoint adjustment to the desired temperature, using the internal setpoint indicator.
- Slide the stops to the desired limits. Tighten both screws.

MAINTENANCE

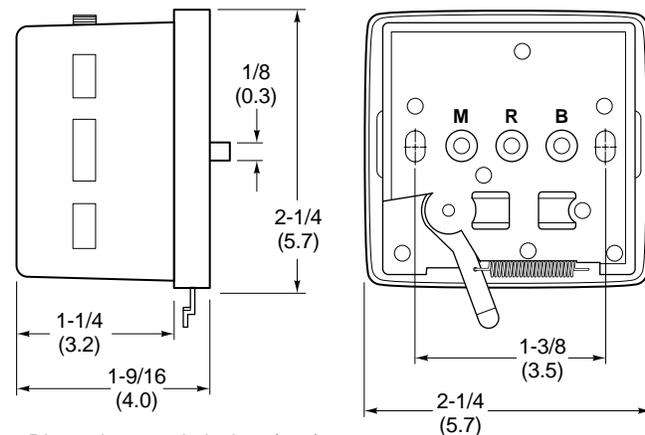
The thermostat requires no maintenance.

Regular maintenance of the total system is recommended to assure sustained, optimum performance.

FIELD REPAIR

Replace an inoperative thermostat with a functional unit.

DIMENSIONAL DATA



Dimensions are in inches (mm).

Figure-10 Mounting Dimensions.

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TAC
1354 Clifford Avenue
P.O. Box 2940
Loves Park, IL 61132-2940
www.tac.com

t.a.c. [®]
by **Schneider** Electric

1.800.561.8187

www.**itm**.com

information@itm.com