

PI-03/04-AUX

Modulating Digital Thermostat with Programmable Auxiliary Output

INSTALLATION & USER MANUAL

APPLICATION

This PI series is a 24 VAC/VDC Modulating output Digital Thermostat that provides Proportional + Integral (P+I) control for optimum temperature control and comfort in an HVAC system. It also provides an auxiliary on/off output for leveling up the system’s heating or cooling capacity. It can be used with a single speed fan. Other available features include selection of Minimum/Maximum setting (target) temperature, a digital input for energy savings mode, and the selection of idle state display options. A remote temperature sensor can also be provided as an option.

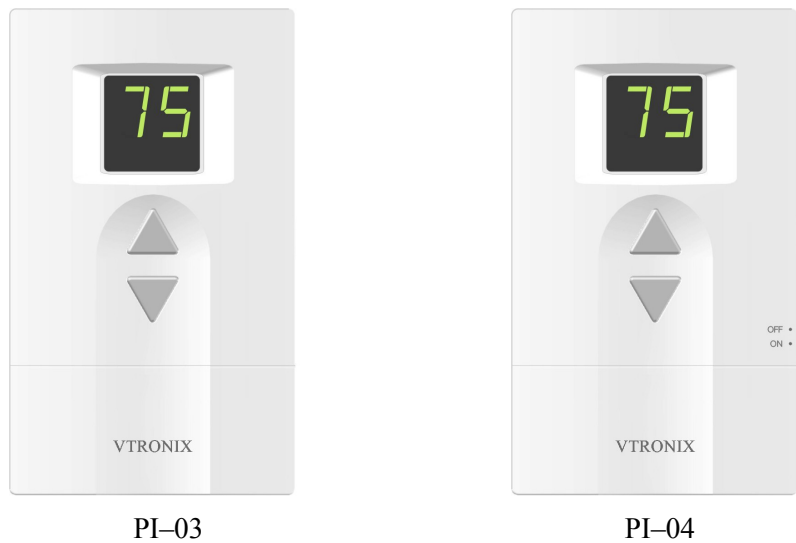


Fig.1 PI-03 & 04

Table 1 : Description of Thermostat

Model	Operating voltage	Type of control	Power on/off switch
PI-03-AUX	24 VAC/VDC	Modulating 0-10V or 2-10V	No
PI-04-AUX	24 VAC/VDC	Modulating 0-10V or 2-10V	Yes

FEATURES

- ❑ Stylish design with digital display.
- ❑ Minimum temperature setting from 5 – 26 °C or 40 – 82 °F (Default 5 °C or 40 °F).
- ❑ Maximum temperature setting from 16 – 37 °C or 60 – 99 °F (Default 37 °C or 99 °F).
- ❑ Heating or Cooling control with Modulating output 0-10V or 2-10V.
- ❑ Auxiliary Heating or Cooling with dry contact output.
- ❑ Kp and T_i setting.
- ❑ Temperature sensor offset adjustment –2 to +2 °C or –4 to +4 °F (Default 0 °C or 0 °F).
- ❑ Digital input for energy savings mode.
- ❑ Options for idle display state: Room temperature, Set temperature or % of Modulating output.
- ❑ Remote sensor (optional) with auto detect of temperature sensor (internal or remote sensor).
- ❑ Sensor error alarm.
- ❑ EEPROM permanently retains user setting in case of power loss.

SPECIFICATIONS

Table 2: Thermostat specifications

Power supply	24 Vac nominal, 18–30Vac, 50/60 Hz. or 24 Vdc nominal, 20-40Vdc
Current consumption	50 mA
Temperature setting range	5 – 37 °C or 40 – 99 °F
Operating temperature & humidity	0 – 50 °C or 32 – 122 °F, 5 to 90 % RH, non-condensing
Outputs	Modulating 0-10V or 2-10V; Aux dry contact and constant fan output 24Vac/dc @ 0.5A
Mounting	Directly onto wall or 2”x 4” vertical junction box

DIMENSIONS

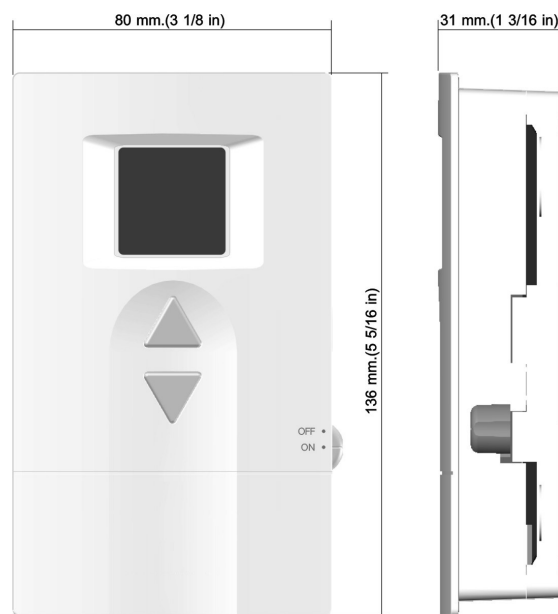


Fig.2 Dimensions

OPERATION

Power on off (for Model PI-04-AUX only)

Use ON/OFF switch to turn on / off the system. This also switches the Fan on/off.

Temperature setting

Use Δ or ∇ to change the temperature setpoint.

Remote sensor (optional)

A remote sensor can be provided as an option. It can be a temperature module, epoxy or pipe type. The system will automatically detect whether the internal or the remote sensor is used.

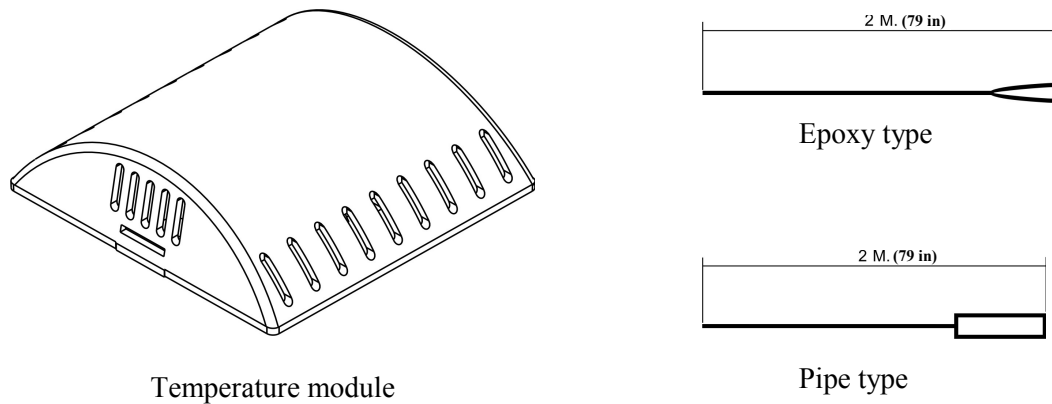


Fig.3 Remote sensor

Specify the type of Remote sensor when ordering.

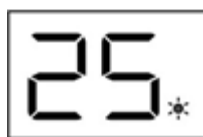
Note: The remote sensors are NTC 6.8kΩ @25°C(77°F) with B-value ($B_{25/85}$) = 3975K.

Digital input for energy savings

There are two digital input terminals provided to switch to energy savings mode. If the input is open, the thermostat will operate in its normal mode. If the input is closed, after a delay of 2 minutes it will:

- ◆ If in heating mode, it will lower the controlled setpoint temperature by 2 °C or 4 °F.
- ◆ If in cooling mode, it will raise the controlled setpoint temperature by 2 °C or 4 °F.

Note: If the up or down arrow key is pressed to see the setpoint, the thermostat will display the user setpoint (in non-Energy Savings mode)



A dot LED after the second digit will light to indicate the thermostat is operating in energy savings mode

Sensor error alarm

If the temperature sensor (either internal or remote) fails, the display will show **Er** blinking.

INSTALLATION

Read these instructions thoroughly before installing the product. Failure to follow these instructions could damage the product or cause a hazardous condition. Check the voltage and current ratings on the product to ensure that it is suitable for your application. Installer must be a trained, experienced, service technician. Check the product for proper operation after installation.



CAUTION

Damage to the HVAC system may occur. Disconnect power from the equipment at the main breaker/fuse block while installing the thermostat.

Mounting Location.

Mount the thermostat approximately 5 ft. (1.5 m) above the floor in a location that is free from direct sunlight, heat from appliances, hot or cold air from ducts, concealed pipes and chimneys, and drafts or dead spots behind doors or in corners. Do not mount on an exterior wall, if possible. Failure to locate thermostat mounting as indicated will result in poor temperature control.

NOTE: Leveling the thermostat while mounting is for appearance only, and is not required for proper thermostat operation.

Mounting the Thermostat

Take off the back plate by removing the locking screw (if set) at the bottom of the thermostat. Use a flat head screwdriver to unlock the snaps. Lift and pull it up to remove the back plate.

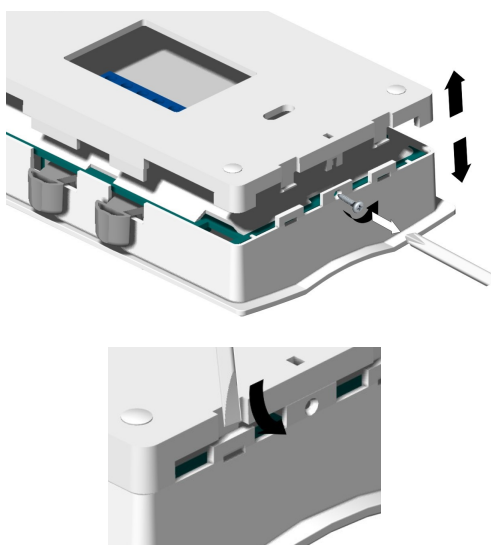


Fig.4 Taking out back plate

Using the back plate as a guide, mark two mounting holes on the wall. Drill at the two mounting hole marks. Place anchors (provided) into the holes until flush with the hole. Position the back plate on the wall and thread the wires from the heating and cooling equipment through the wiring hole. Holding the back plate in place on the wall, secure it to the wall using mounting screws (provided).

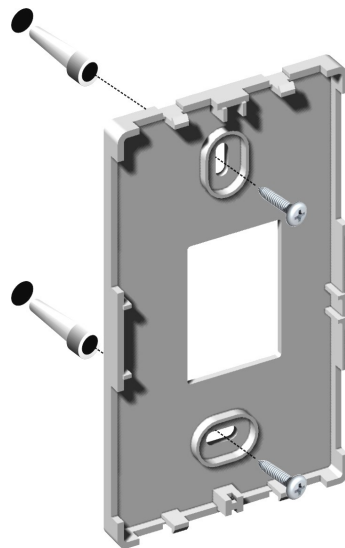


Fig.5 Installing back plate

Wiring

18-22 Gauge solid wire is recommended for wiring.

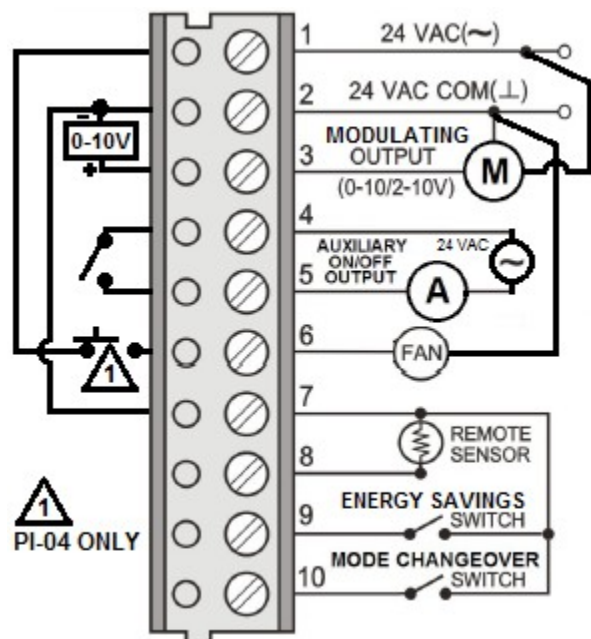


Fig.6 Wiring diagram

Loosen the terminal screws, strip the wires and connect them as shown in fig. 8. Firmly tighten the terminal screws when finished.

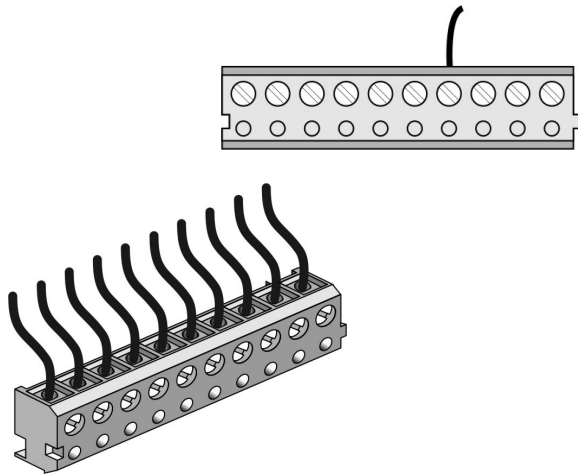


Fig.7 Connecting the wires

Making sure that the thermostat has the same orientation as shown in the picture. Snap the thermostat onto its back plate.



Fig.8 Installing the thermostat

Secure the thermostat by tightening the screw provided to protect the thermostat from unwanted access.



Fig.9 Secure the front cover

INSTALLER SETUP

The following instructions provide information on setting up and changing this thermostat's operating parameters from the factory settings.

Enter Installer Setup

Press and hold Δ and ∇ key simultaneously for 5 seconds to enter installer setup. The dot between the two-digit display lights to show the thermostat is in the Installer Setup mode. If there is no activity for 15 seconds in this mode, the thermostat will revert to its regular operating mode.



The first digit shows the Programming number.
The second digit shows the Parameter setting.

The following steps are used to change each of the settings. Each time you press Δ key, you will advance to the next Programming number. The ∇ key is used to cycle through the Parameter settings.

Program 1: Minimum temperature setting

To set the minimum temperature setpoint (5-26 °C or 40-82 °F) allowed for user selection.

- Press Δ key until the first digit is **1**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2	3	4	5	6	7	8	9
Min. temp. setting	5/40	10/50	12/54	14/58	16/62	18/66	20/70	22/74	24/78	26/82

Note : Default setting is 0 (5°C or 40 °F).

Program 2: Maximum temperature setting

To set the maximum temperature setpoint (16-37 °C or 60-99 °F) allowed for user selection.

- Press Δ key until the first digit is **2**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2	3	4	5	6	7	8	9
Min. temp. setting	16/60	18/64	20/68	22/72	24/76	26/80	28/84	30/88	32/92	37/99

Note : Default setting is 9 (37°C or 99°F).

Program 3: Default operation mode and selection of Outputs

To program the thermostat to match with the system's heating or cooling function and type of outputs used.

- Press Δ key until the first digit is **3**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2	3	4	5	6	7
Default Mode	COOL	HEAT	COOL	HEAT	COOL	HEAT	COOL	HEAT
PI output	0-10V	0-10V	2-10V	2-10V	0-10V	0-10V	2-10V	2-10V
Aux. on/off output*	Active	Active	Active	Active	Off	Off	Off	Off

Note : Factory setting is **1 (HEAT, 0-10V, Aux output used while in Heat)**.

* If the Mode changeover switch input is closed with settings 3.1 or 3.3, the operating mode will switch from the default mode, but the auxiliary output will be deactivated. This can be used for systems that employ an emergency back up heat while in heat mode. If the Mode changeover switch input is closed with settings 3.0 or 3.2, the operating mode will switch from the default mode, while the auxiliary output will continue to be active. This can be used with cooling /heating systems that drive an auxiliary fan in both modes. For settings 3.4 through 3.7, the auxiliary output is always deactivated.

Program 4: Auxiliary on/off output activation

This program is used to set the activation of the auxiliary output which depends on the percentage of the PI output. The output will be on when this percentage is above or reached. And it will be off when this percentage is dropped by 10% from the full scale of the PI output (1V for 0-10V; 0.8 V for 2-10V)

- Press Δ key until the first digit is **4**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2	3	4	5	6	7	8	9
Percentage of PI	100	10	20	30	40	50	60	70	80	90

Note : Default setting is 1 (10%.)

Program 5: K_p setting

K_p is the proportional factor that controls the opening of the valve/damper. The higher the K_p , the faster the room temperature is brought to the set temperature. However, the fluctuation of the room temperature will also be higher.

- Press Δ key until the first digit is **5**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2	3	4	5	6	7	8	9
K_p	0.1	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8

Note: Default setting is 5 ($K_p = 1.0$).

Program 6: T_i setting

T_i is the integral factor that controls the opening of the valve/damper. The higher the T_i, the slower the room temperature is brought to the set temperature. However, the fluctuation of the room temperature will be less.

- Press Δ key until the first digit is **6**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2	3	4	5	6	7	8	9
T _i	40	50	60	70	80	90	100	120	160	200

Note: Default setting is 4 (T_i = 80).

Program 7: Temperature offset

The temperature offset of the sensor's reading can be set in a range of -2 to 2 °C (or -4 to 4 °F) with the resolution of 0.5 °C or 1 °F. This offset will apply not only for display purpose, but for control purpose as well.

- Press Δ key until the first digit is **7**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2	3	4	5	6	7	8
Offset temp. (°C/°F)	-2/-4	-1.5/-3	-1/-2	-0.5/-1	0	0.5/1	1/2	1.5/3	2/4

Note: Default setting is 4 (0).

Program 8: Selection of idle state display

The user can set the Display to show:

- Room temperature, or
- Set temperature, or
- Valve/damper opening in % (PI Output)
- Press Δ key until the first digit is **8**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1	2
Display	Room temp.	Set temp.	% valve/damper

Note: Default setting is 0 (Room temp).

Program 9: Temperature unit

The temperature unit can be set to be °C or °F.

- Press Δ key until the first digit is **9**.
- Press ∇ key until the second digit is as required. See table below.

Second digit displays	0	1
Temperature unit	°C	°F

Note : Default setting is 1 (°F) .