

TEC2103-2 Networked Multi-Stage Thermostat

Application

The TEC2103-2 thermostat is an N2 networked thermostat that provides control of multi-stage HVAC equipment. The TEC2103-2 thermostat provides exceptional accuracy through the use of a unique Proportional-Integral (PI) time proportioning algorithm. The algorithm virtually eliminates temperature offset associated with traditional, differential-based on/off thermostats. The TEC2103-2 thermostat also uses an adaptive control logic algorithm to control the space temperature during recovery to minimize overshoot while providing maximum comfort.

The TEC2103-2 thermostat has Metasys® N2 communication capability. This communication allows the user to view and adjust parameters from a remote workstation. Additionally, the menu driven backlit display, plain text menus, and five keys on the TEC2103-2 thermostat make operating the thermostat easy and intuitive.

Note: In this document, Building Automation System (BAS) is a generic term that refers to the Metasys Network (Network Control Module [NCM] or N30 Series), and Companion (CPN) supervisory systems. The specific system names are used when referring to system specific applications.

Installation

Location Considerations

Locate the TEC2103-2 thermostat:

- on a partitioning interior wall, and approximately 5 ft. (1.5 m) above the floor in a location of average temperature
- away from direct sunlight, radiant heat, outside walls, behind doors, air discharge grills, stairwells, or outside doors
- away from steam or water pipes, warm air stacks, unheated/uncooled areas, or sources of electrical interference

To install the thermostat:

1. Remove the security screw on the bottom of the thermostat cover using a Phillips-head screwdriver. Open the thermostat by pulling on the bottom side of the thermostat cover (Figure 1).
2. Unlock the Printed Circuit Board (PCB) by carefully pressing the locking tabs to the right (Figure 2). Open the thermostat's PCB to the left.
3. Pull out approximately 6 in. (152 mm) of wires from the wall and insert the cable through the hole in the base.
4. Align the base on the wall, and using the base as a template, mark the location of the two mounting holes on the wall. Confirm the thermostat base is installed with the proper side up.
5. Use the supplied anchors and screws for mounting on drywall or plaster. Drill two 3/16 in. (4.7 mm) holes at the marked locations and tap nylon anchors flush to wall surface (Figure 3).
6. Position base on the wall, insert screws through mounting base, and fasten into wall anchors. Do not overtighten screws.
7. Swing the thermostat PCB back to the right to close. Gently press on the PCB to secure each of the locking tabs.
8. Pull out the screw terminal blocks using the pull-tabs on each connector (Figure 4).

Note: The number of terminals on the terminal blocks varies depending on the TEC model.

IMPORTANT: Use this TEC2103-2 networked multi-stage thermostat only as an operating control. Where failure or malfunction of the thermostat 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 thermostat.

IMPORTANT : Utiliser ce TEC2103-2 networked multi-stage thermostat uniquement en tant que dispositif de contrôle de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du thermostat 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 thermostat.

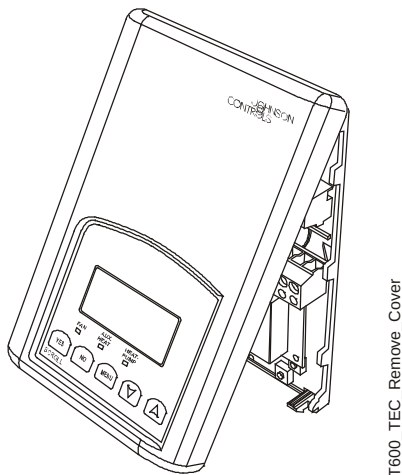


Figure 1: Removing the Thermostat Cover

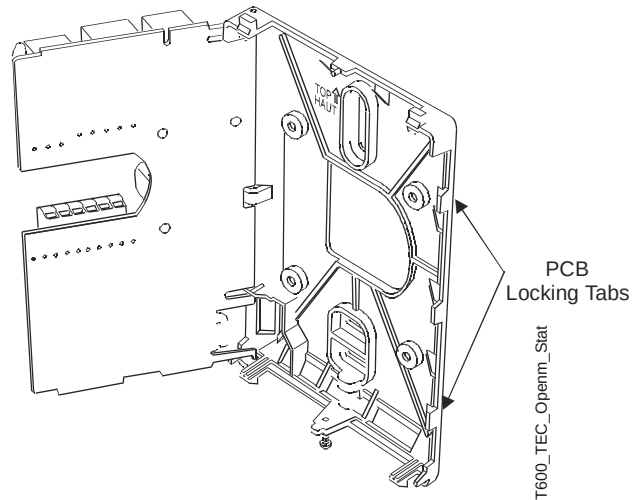


Figure 2: Opening the Thermostat PCB

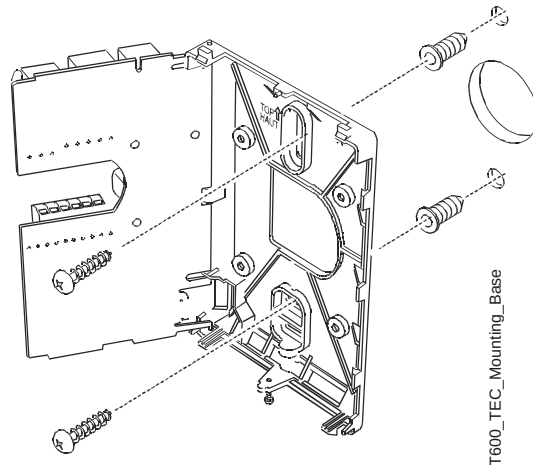


Figure 3: Mounting the Thermostat Base

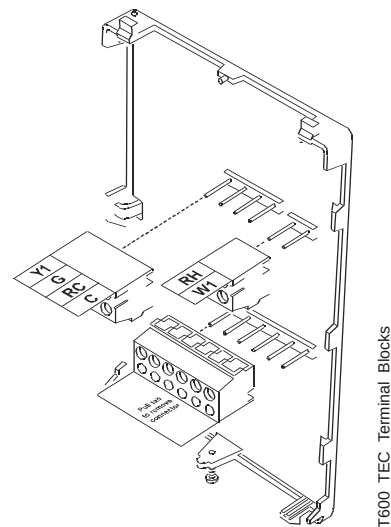


Figure 4: Removing the Terminal Blocks

Wiring



CAUTION: Risk of Electric Shock.

Disconnect the power supply before making electrical connections to avoid electric shock.

MISE EN GARDE : Risque de décharge électrique.

Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

Note: When replacing an existing thermostat, remove and label wires to identify terminal designations. When replacing a TEC2103 thermostat, simply remove the terminal blocks and reinsert onto the new thermostat.

To wire the thermostat:

1. Strip each wire 1/4 in. (6.35 mm) and connect to the appropriate terminal according to the TEC2103-2 thermostat wiring diagram (Figure 5).

2. Gently push excess wire back into the wall, plug the wall hole with fireproof material to prevent drafts from affecting ambient temperature readings, and install screw terminal blocks back onto the PCB.
3. Reattach the thermostat cover to the installed base (top side first) and install the security screw on the bottom.



CAUTION: Risk of Property Damage.

Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

MISE EN GARDE : Risque de dégâts matériels.

Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

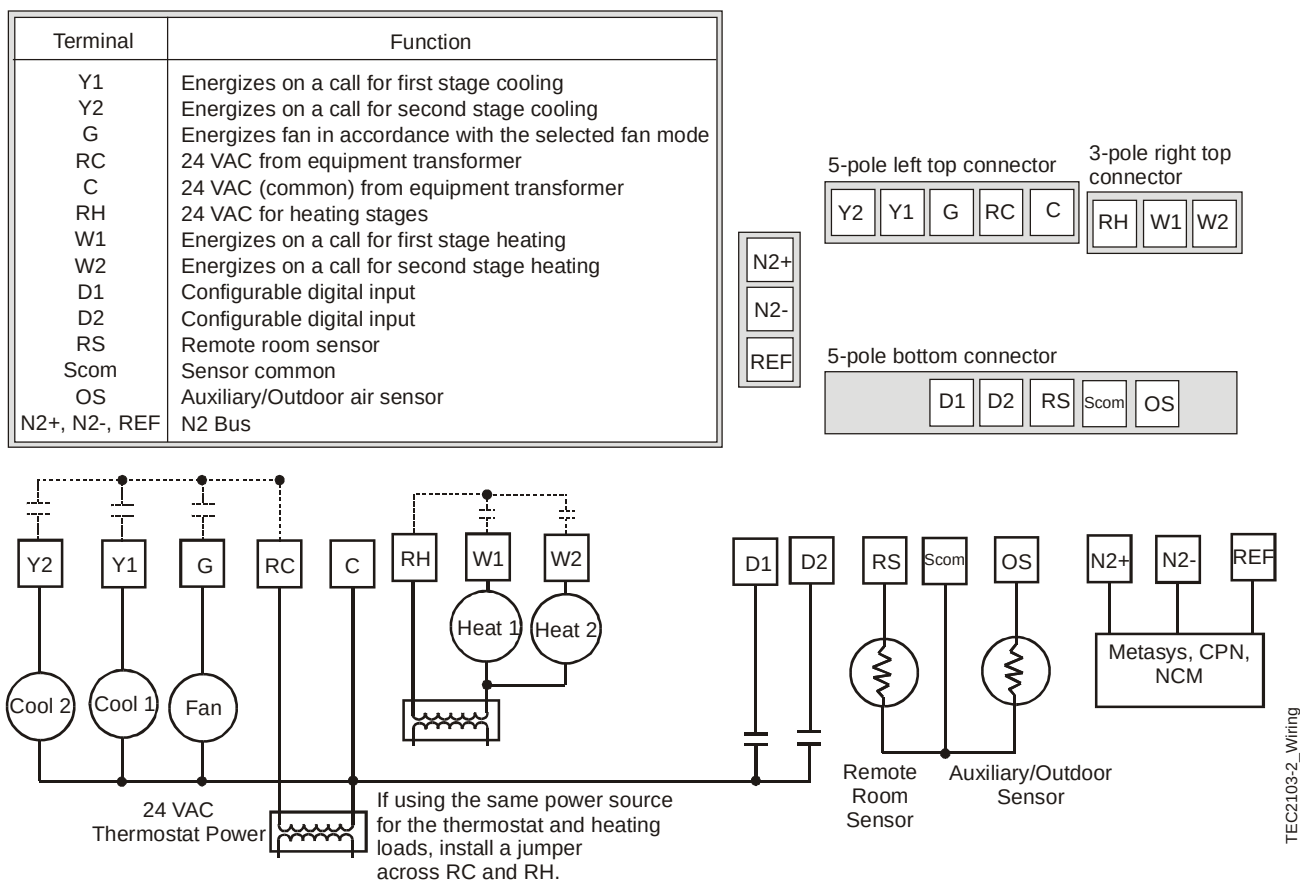


Figure 5: TEC2103-2 Thermostat Wiring Schematic

Connecting the N2 Bus

To connect the N2 Bus:

1. Observe the polarity when connecting the N2 Bus wires to the TEC2103-2 thermostat.

Note: An End-of-Line (EOL) is not needed on the N2 Bus at the TEC2103-2 thermostat. However, one EOL is needed at the BAS (N30, Companion, Network Control Module).

2. Continue this process for each TEC2103-2 thermostat using the daisy chain wiring method.

N2 Device Mapping

When adding the TEC2103-2 thermostat to the Metasys system (Person-Machine Interface [PMI] and Companion system), you must define the TEC2103-2 thermostat as a Vendor Device (VND). For the NCM, except as noted in Table 1, Footnote c, do **not** direct map any points. Run control of these points through the Control System (CS) object. See the *Setting the N2 Address (N2 addr)* section to set the address for the thermostat.

Table 1: N2 Bus Objects

Point Name	TEC Point Type/ Address	N30/NAE Object Type	BAS Model Point Type	Override Range
Room Temp ^a	ADI-1	N2 AI	CSAD	32 to 122°F (0 to 50°C)
Aux Temp / Outdoor Temp ^a	ADI-2	N2 AI	CSAD	-40 to 122°F (-40 to 50°C)
Heating SP ^{a, g} (Occupied Heating SP)	ADI-3	N2 AO	CSAD	40 to 90°F (4.5 to 32°C)
Cooling SP ^{a, g} (Occupied Cooling SP)	ADI-4	N2 AO	CSAD	54 to 100°F (12 to 37.5°C)
Setback Heating SP ^{a, g} (Unoccupied Heating SP)	ADI-5	N2 AO	CSAD	40 to 90°F (4.5 to 32°C)
Setback Cooling SP ^{a, g} (Unoccupied Cooling SP)	ADI-6	N2 AO	CSAD	54 to 100°F (12 to 37.5°C)
Minimum Heat SP	ADI-7	N2 AI	CSAD	40°F (4.5°C)
Maximum Heat SP ^a	ADI-8	N2 AO	CSAD	40 to 90°F (4.5 to 32°C)
Minimum Cool SP ^a	ADI-9	N2 AO	CSAD	54 to 100°F (12 to 37.5°C)
Maximum Cool SP	ADI-10	N2 AI	CSAD	100°F (37.5°C)
Fan ^a	BD-1	N2 BO	CSBD	0 = Auto, 1 = On
Mode ^a	BD-2	N2 MSO ^{d, e}	CSMS	0 = Off, 1 = Cool, 2 = Heat, 3 = Auto
Occupancy ^a	BD-3	N2 BO	CSBD	0 = Unoccupied, 1 = Occupied
W1 State	BD-4	N2 BI	CSBD	0 = Off, 1 = On
W2 State	BD-5	N2 BI	CSBD	0 = Off, 1 = On
Y1 State	BD-6	N2 BI	CSBD	0 = Off, 1 = On
Y2 State	BD-7	N2 BI	CSBD	0 = Off, 1 = On
G State – Fan	BD-8	N2 BI	CSBD	0 = Off, 1 = On
Temp Units ^{a, c} (Local Display Only)	BD-9	N2 BO	See Footnote c.	0 = °C, 1 = °F
Occupancy Override	BD-10	N2 BI	CSBD	0 = No Override, 1 = Override
DI1 ^{b, f}	BI-1	N2 BI	CSBI	0 = Off, 1 = On
Temp Alarm ^b	BI-2	N2 BI	CSBI	0 = Normal, 1 = Alarm
DI2 ^{b, f}	BI-3	N2 BI	CSBI	0 = Off, 1 = On

Notes:

- Commandable.
- Can be a Change-of-State (COS) alarm to the BAS or N2 Dialer Module (NDM) to initiate a dial-out.
- On the Metasys NCM system, map BD9 **Temp Units Mode** as a Binary Output (BO) object with Auto Restore and Local Control set.
- The Multiple Command Output (MCO) object is used to schedule multiple Multi-State Objects (MSOs).
- When defining the N2 MSO object, select TEC Mode from the States Text Menu. Type 4 for the TEC2103-2 thermostat.
- The state of DI1 and DI2 is communicated over the N2 network even if the digital inputs are configured as **None** through the local interface at the thermostat.
- The Heating and Cooling SP cannot be overridden simultaneously (this also applies to the Unocc Heating SP and Unocc Cooling SP). The overridden setpoint must be released prior to overriding the other setpoint. Additionally, if one setpoint is overridden, the other setpoint may be automatically adjusted by the TEC2103-2 thermostat to maintain the minimum deadband between the two setpoints.

The Controller Point Type is the fixed-point definition inside the controller. The BAS Model Point type is the definition inside the model file. Use an NCM CS object to retrieve the data.

The most recent N2 command received by any of the N2 Bus Objects listed in Table 1 controls the thermostat.

If an AD object is overridden by the Metasys system, all local changes attempted through the thermostat keypad for that AD object are ignored until the override is released. For example, if the Metasys system sends a write command to turn System Mode Off, then the occupant selects System Mode On at the TEC keypad, the TEC ends up with the System Mode On; however, if the Metasys system sends an override command to turn System Mode Off, then the occupant selects System Mode On at the TEC keypad, the TEC keeps the System Mode Off.

Once an override is released, the AD object may once again be changed through the thermostat keypad, but the thermostat does not retain any data entered at the TEC keypad during the override.

Only one of the setpoints (Heating Setpoint or Cooling Setpoint) can be overridden at a time.

- The value for Heating SP (ADI-3) and Setback Heating SP (ADI-5) must stay within the limits established in the controller by Minimum Heat SP (ADI-7 read-only) and Maximum Heat SP (ADI-8).
- The value for Cooling SP (ADI-4) and Setback Cooling SP (ADI-6) must stay within the limits established in the controller by Minimum Cool SP (ADI-9) and Maximum Cool SP (ADI-10 read-only).

If a setpoint is overridden, the TEC, if necessary, adjusts the other setpoint to maintain the minimum 2 F° deadband between the setpoints. The setpoints can be spread further apart but can never be adjusted closer than 2 F° apart.

Failure to stay within the limits for a command results in an N2 Negative Acknowledge (NAK) error from the TEC2103-2 thermostat.

Overrides take precedence over any local adjustment or command in the TEC2103-2.

You must not have a Relinquish Default for the setpoints if you want to change them from the thermostat display.

If there is a Relinquish Default for the setpoints, the Network Automation Engine (NAE) always has an Override for either an Adjusted value or the Relinquish Default value. You should use Operator Override and Release Operator Override if you want to command the setpoint and release it to local control.

Once all the NAE commands are released, the Override Status in the Hardware tab should be False. At that time, the user should be able to change the setpoint from the local display.

All overrides are released automatically after 10 minutes of no communications (for example, network cable is removed from the TEC causing loss of network communications).

Setup and Adjustments

Thermostat Operation Overview

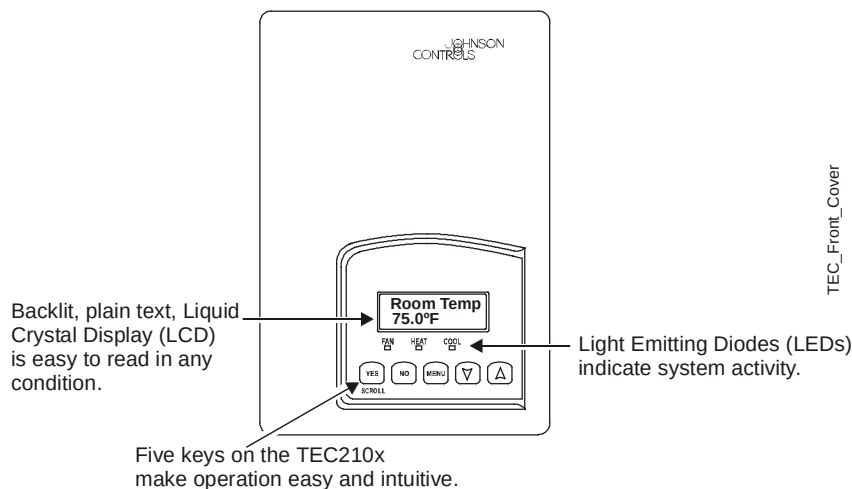


Figure 6: TEC2103-2 Thermostat Front Cover

Thermostat Interface Keys

The TEC2103-2 thermostat interface consists of five keys on the front cover and one configuration key (Figure 7) that are accessed by removing the front cover. The functions of the keys are as follows. Use the:

- YES/SCROLL key to:
 - confirm menu selections, and to advance to the next menu item
 - stop the Status Display Menu from scrolling and to manually scroll to the next parameter on the menu. When left unattended for 45 seconds, the display resumes scrolling.
- NO key when you do not desire a parameter change, and to advance to the next menu item
- MENU key to access the Main User Menu or exit the menu
- UP/DOWN arrow keys to:
 - adjust values
 - activate a Temporary Setpoint

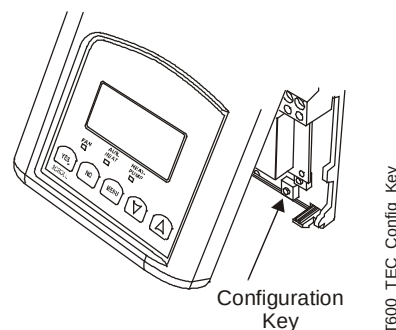


Figure 7: Configuration Key Location

Backlit Liquid Crystal Display (LCD)

The TEC2103-2 thermostat uses a two-line, eight-character backlit display. Low-level backlighting is present during normal operation and it brightens when any user interface key is pressed. The backlight returns to the lower level when the thermostat is left unattended for 45 seconds.

Light-Emitting Diodes (LEDs)

Three LEDs are used to indicate the status of the fan, call for heat, or call for cooling. When:

- the fan is on, the FAN LED lights up
- heating is on, the HEAT LED lights up
- cooling is on, the COOL LED lights up

Programming Overview

There are three menus used to view, program, and configure the TEC2103-2 thermostat: Status Display, Main User, and Installer Configuration Menus.

The **Status Display Menu** displays during normal thermostat operation. The menu continually scrolls through the following parameters.

- Room Temperature
- System Mode
- Schedule Status (Occupied/Unoccupied/Override)

Note: Override displays only when in the Override mode.

- Auxiliary Temperature (Displays outdoor or other auxiliary temperatures. Requires the sensor to be wired to the Auxiliary/Outdoor Air Sensor terminal OS [Figure 5]). The maximum temperature displayed is 122°F (50°C). The actual temperature may be above this point.
- Applicable Alarms (the backlight lights up as an alarm condition is displayed)

To temporarily stop the scrolling, press the YES/SCROLL key.

Use the **Main User Menu** to access and change the thermostat's basic operating parameters. Access the menu by pressing the MENU key during normal thermostat operation.

Use the **Installer Configuration Menu** to set up the thermostat for application specific operation. Access the menu by removing the front cover and pressing the configuration key, labeled CONFIG (Figure 7).

Configuring the TEC2103-2 thermostat

The TEC2103-2 thermostat ships from the factory with default settings for all configurable parameters. The default settings are shown in Table 2. To reconfigure the parameters, follow the steps in this section for the corresponding parameters. The parameters must be set up first by accessing the Installer Configuration Menu. Access the Installer Configuration Menu by removing the front cover and pressing the configuration key (Figure 7).

Exit the Installer Configuration Menu any time by pressing the MENU key and, at the exit prompt, pressing the YES key. To pass over a parameter without changing it press the NO key.

When the thermostat is in the Installer Configuration Menu and left unattended for 45 seconds, it reverts to the Status Display Menu.

Table 2: Installer Configuration Menu

RoomTemp 75.0 °F	Remove the cover and press the CONFIG key from the Status Display Menu to enter the Installer Configuration Menu.
DI1 set? Y/N	Configures Digital Input 1 Default: No Function (None) See the <i>Configuring the Digital Inputs (DI1 and DI2)</i> section.
DI2 set? Y/N	Configures Digital Input 2 Default: No Function (None) See the <i>Configuring the Digital Inputs (DI1 and DI2)</i> section.
Lockout set? Y/N	Sets Keypad Lockout Level Default: No Lockout (0) See the <i>Enabling the Keypad Lockout (Lockout)</i> section.
Pwr del set? Y/N	Sets Power-up Delay Default: Ten Seconds (10.0 sec) See the <i>Setting the Power-Up Delay (Pwr del)</i> section.
Frost pr set? Y/N	Enables/Disables Frost Protection Default: Disabled (Off) See the <i>Enabling Frost Protection (Frost pr)</i> section.
Heat max set? Y/N	Sets the Maximum Heating Setpoint Default: 90.0°F (32.0°C) See the <i>Setting the Maximum Heating Setpoint (Heat max)</i> section.
Cool min set? Y/N	Sets the Minimum Cooling Setpoint Default: 54.0°F (12.0°C) See the <i>Setting the Minimum Cooling Setpoint (Cool min)</i> section.
Anticycl set? Y/N	Sets the Anti-Short Cycle Timer Default: Two Minutes (2.0 min) See the <i>Setting the Anti-Short Cycle Timer (Anticycl)</i> section.
Heat cph set? Y/N	Sets the Heating Cycles per Hour Default: Four (4.0) See the <i>Setting the Maximum Heating Stage Cycles per Hour (Heat cph)</i> section.
Cool cph set? Y/N	Sets the Cooling Cycles per Hour Default: Four (4.0) See the <i>Setting the Maximum Cooling Stage Cycles per Hour (Cool cph)</i> section.
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Table 2: Installer Configuration Menu (Cont.)	
Deadband set? Y/N	Sets the Minimum Heating/Cooling Deadband Default: 2.0°F (1.1°C) See the <i>Setting the Heating/Cooling Deadband (Deadband)</i> section.
Fan cont set? Y/N	Determines how the Fan Activates in Response to a call for Heat Default: Thermostat Controls Fan (On) See the <i>Setting the Fan Control (Fan cont)</i> section.
Fan del set? Y/N	Delays Fan Termination at Cycle's End for 60 Seconds Default: No Delay (Off) See the <i>Setting the Fan Delay (Fan del)</i> section.
N2 addr set? Y/N	Sets the N2 Address Default: 253 See the <i>Setting the N2 Address (N2 addr)</i> section.
TOccTime set? Y/N	Sets the Duration for Temporary Occupancy Time Default: Three Hours (3.0 hrs) See the <i>Establishing the Temporary Occupancy Time (TOccTime)</i> section.
Cal RS set? Y/N	Room Air Sensor Calibration (Offset) Default: 0.0°F (0.0°C) See the <i>Room Air Sensor Calibration (Cal RS)</i> section.
Cal OS set? Y/N	Auxiliary/Outdoor Air Sensor Calibration (Offset) Default: 0.0°F (0.0°C) See the <i>Auxiliary Temperature/Outdoor Air Sensor Calibration (Cal OS)</i> section.
H Stage set? Y/N	Disable/Enable Second Heating Stage Default: Two Stages See the <i>Disable/Enable Second Heating Stage (H Stage)</i> section.
C Stage set? Y/N	Disable/Enable Second Cooling Stage Default: Two Stages See the <i>Disable/Enable Second Cooling Stage (C Stage)</i> section.
H lock set? Y/N	Disables Heating Operation based on Auxiliary/Outdoor Air Temperature Default: 123°F (51°C) See the <i>Setting the Heating Lockout (H lock)</i> section.
C lock set? Y/N	Disables Cooling Operation based on Outdoor Air Temperature Default: -40°F (-40°C) See the <i>Setting the Cooling Lockout (C lock)</i> section.

Configuring the Digital Inputs (DI1 and DI2)

Press the configuration menu access key. The first prompt is to program Digital Inputs DI1 and DI2.

The digital inputs display an alarm condition when the input is closed. An alarm message is included on the scrolling Status Display Menu and when the message is displayed, the backlight momentarily lights up.

Each digital input can be programmed in one of four conditions.

- **None** – No function is associated with the input.
- **Service** – A Service alarm is displayed.
- **Filter** – A Filter alarm is displayed.
- **RemOVR** – Remote Override (OVR) contact. This disables all override menu functions of the thermostat. The override function is now controlled manually by a remote, momentarily closed contact. When configured in this mode, the input operates in a toggle mode. With this function enabled, it is now possible to toggle between unoccupied and occupied setpoints for the amount of time set by the temporary occupancy time parameter.

When override is enabled through the digital inputs, an **Override** message appears in the Status Display Menu.

To configure the digital inputs while in the Installer Configuration Menu:

1. Press YES to configure Digital Input 1 or NO to advance to Digital Input 2.
2. Use the UP/DOWN arrow keys to locate the desired function for the Digital Input 1. Press YES to select the desired function.
3. Press YES to configure Digital Input 2 or NO to advance to the keypad lockout setup prompt.
4. Use the UP/DOWN arrow keys to locate the desired function for the Digital Input 2. Press YES to select the desired function.

The display now shows the keypad lockout setup prompt. See the *Enabling the Keypad Lockout (Lockout)* section for instructions.

Note: Regardless of the digital input configuration (**None**, **Service**, **Filter** or **RemOVR**) established through the local interface at the TEC2103-2 thermostat, the states of DI1 and DI2 are communicated over the N2 network. This enables the ability to communicate alarm conditions over the network without local annunciation on the TEC2103-2 thermostat display.

Enabling the Keypad Lockout (Lockout)

The TEC2103-2 thermostat has four levels of keypad lockout. The levels and degree of lockout are shown in Table 3.

To set the keypad lockout level while in the Installer Configuration Menu:

1. Answer NO to all prompts until the keypad lockout setup prompt appears in the display. Press YES to enter the keypad lockout menu.
2. Use the UP/DOWN arrow keys to locate the desired lockout level. Press YES to select the level.

The display now shows the power delay setup prompt. See the *Setting the Power-Up Delay (Pwr del)* section for instructions.

Table 3: Keypad Lockout Levels

Function	Level 0	Level 1	Level 2
Occupancy Override	Yes access	Yes access	No access
Temperature Setpoints	Yes access	No access	No access
System Mode Setting	Yes access	Yes access	No access
Fan Mode Setting	Yes access	Yes access	No access

Setting the Power-Up Delay (Pwr del)

On initial power-up of the TEC2103-2 thermostat (or each time power is removed and reapplied), there is a delay before any operation is authorized (fan, cooling, and heating). The delay time is adjustable between 10 and 120 seconds. This parameter can also be used to sequence the startup of multiple units in one location.

Note: When adjusting the time with the UP/DOWN arrow keys, holding the keys down changes the time by 10-second intervals.

To set the delay time while in the Installer Configuration Menu:

1. Answer NO to all prompts until the power delay setup prompt appears in the display. Press YES to enter the power delay setup menu.
2. Use the UP/DOWN arrow keys to adjust the power-up delay setting. Press YES to store the setting.

The display now shows the frost protection setup prompt. See the *Enabling Frost Protection (Frost pr)* section for instructions.

Enabling Frost Protection (Frost pr)

Frost protection establishes a minimum heating setpoint of 42°F (5.5°C) to prevent freezing in the zone controlled by the thermostat. If enabled, frost protection is activated even if the thermostat is set to the Off System Mode. If frost protection is active, it is displayed as an alarm (**Frost on** with the backlight lit) on the Status Display Menu.

To enable frost protection while in the Installer Configuration Menu:

1. Answer NO to all prompts until the frost protection setup prompt appears in the display. Press YES to enter the frost protection menu.
2. Use the UP/DOWN arrow keys to select **off** or **on**. Press YES to store the selection.

The display now shows the maximum heating setpoint prompt. See the *Setting the Maximum Heating Setpoint (Heat max)* section for instructions.

Setting the Maximum Heating Setpoint (Heat max)

The maximum heating setpoint establishes the maximum temperature in the heating setpoint range that can be adjusted from the Main User Menu. The parameter is adjustable from 40 to 90°F (4.5 to 32°C).

Note: When adjusting the temperature, holding the keys down changes the temperature by 5 F/C° increments.

To set the maximum heating setpoint while in the Installer Configuration Menu:

1. Answer NO to all prompts until the maximum heating setpoint prompt appears in the display. Press YES to enter the maximum heating setpoint menu.
2. Use the UP/DOWN arrow keys to adjust the maximum heating setpoint temperature. Press YES to store the value.

The display now shows the minimum cooling setpoint prompt. See the *Setting the Minimum Cooling Setpoint (Cool min)* section for instructions.

Setting the Minimum Cooling Setpoint (Cool min)

The minimum cooling setpoint establishes the minimum temperature in the cooling setpoint range that can be adjusted from the Main User Menu. The parameter is adjustable from 54 to 100°F (12 to 37.5°C).

Note: When adjusting the temperature, holding the keys down changes the temperature by 5 F/C° increments.

To set the minimum cooling setpoint while in the Installer Configuration Menu:

1. Answer NO to all prompts until the minimum cooling setpoint prompt appears in the display. Press YES to enter the minimum cooling setpoint menu.
2. Use the UP/DOWN arrow keys to adjust the minimum cooling setpoint temperature. Press YES to store the value.

The display now shows the anti-short cycle timer prompt. See the *Setting the Anti-Short Cycle Timer (Anticycl)* section for instructions.

Setting the Anti-Short Cycle Timer (Anticycl)

The anti-short cycle timer establishes the minimum on/off times for the cooling and heating stages. The timer is adjustable from 0 to 5 minutes in 1-minute increments. Set the anti-short cycling to 0 minutes for equipment that possesses its own anti-short cycling timer.



CAUTION: Risk of Property Damage.

Do not set the TEC2103-2 thermostat's anti-short cycling timer to 0 minutes if the controlled equipment is not protected by its own internal anti-short cycling timer. Setting the anti-short cycling timer to 0 minutes may result in damage to the controller.

MISE EN GARDE : Risque de dégâts matériels.

Ne pas régler le temporisateur anti court-cycle de l' TEC2103-2 thermostat sur 0 minute si l'équipement contrôlé n'est pas protégé par son propre temporisateur anti court-cycle interne. Le réglage du temporisateur anti court-cycle sur 0 minute risque d'endommager le régulateur.

To set the anti-short cycle time while in the Installer Configuration Menu:

1. Answer NO to all prompts until the anti-short cycle timer prompt appears in the display. Press YES to enter the anti-short cycling timer menu.
2. Use the UP/DOWN arrow keys to adjust the minimum on/off times for the heating and cooling stages. Press YES to store the value.

The display now shows the heating cycles per hour setup prompt. See the *Setting the Maximum Heating Stage Cycles per Hour (Heat cph)* section for instructions.

Setting the Maximum Heating Stage Cycles per Hour (Heat cph)

The heating cycles per hour establishes the maximum number of times the equipment or stages are turned on and off in one hour. The selection ranges from three to eight cycles per hour.

Note: A higher number of heating cycles per hour results in more accurate temperature control but could accelerate the wear of mechanical components in the equipment.

To set the maximum number of heating cycles per hour while in the Installer Configuration Menu:

1. Answer NO to all prompts until the heating cycles per hour prompt appears in the display. Press YES to enter the heating cycles per hour menu.
2. Use the UP/DOWN arrow keys to adjust the maximum number of heating cycles per hour. Press YES to store the value.

The display now shows the cooling cycles per hour setup prompt. See the *Setting the Maximum Cooling Stage Cycles per Hour (Cool cph)* section for instructions.

Setting the Maximum Cooling Stage Cycles per Hour (Cool cph)

The cooling cycles per hour establishes the maximum number of times the equipment or stages are turned on and off in one hour. The selection ranges from three to four cycles per hour.

Note: A higher number of cooling cycles per hour results in more accurate temperature control but could accelerate the wear of mechanical components in the equipment.

To set the maximum number of cooling cycles per hour while in the Installer Configuration Menu:

1. Answer NO to all prompts until the cooling cycles per hour prompt appears in the display. Press YES to enter the cooling cycles per hour menu.
2. Use the UP/DOWN arrow keys to adjust the maximum number of cooling cycles per hour. Press YES to store the value.

The display now shows the minimum heating/cooling deadband prompt. See the *Setting the Heating/Cooling Deadband (Deadband)* section for instructions.

Setting the Heating/Cooling Deadband (Deadband)

The heating/cooling deadband setting establishes the minimum difference between the heating and cooling setpoints. The range is adjustable from 2 to 4 F° (1 to 2 C°).

To change the minimum deadband between the heating and cooling setpoints while in the Installer Configuration Menu:

1. Answer NO to all prompts until the deadband setpoint prompt appears in the display. Press YES to enter the deadband setpoint menu.
2. Use the UP/DOWN arrow keys to adjust the minimum deadband between the heating and cooling setpoints. Press YES to store the value.

The display now shows the fan control prompt. See the *Setting the Fan Control (Fan cont)* section for instructions.

Setting the Fan Control (Fan cont)

This parameter controls how the fan activates in response to a call for auxiliary heating.

When the fan is in Auto Mode (as selected on the Main User Menu):

- Selecting **on** enables the thermostat to control the fan on a call for heating or cooling.
- Selecting **off** enables the thermostat to energize the fan on a call for cooling only. On a call for auxiliary heating, the fan is controlled by the equipment fan limit control.

To set the fan control while in the Installer Configuration Menu:

1. Answer NO to all prompts until the fan control prompt appears in the display. Press YES to enter the fan control menu.
2. Using the UP/DOWN arrow keys, select **on** or **off**. Press YES to store the selection.

The display now shows the fan delay prompt. See the *Setting the Fan Delay (Fan del)* section for instructions.

Setting the Fan Delay (Fan del)

The fan delay extends the fan operation by 60 seconds after the call for heating or cooling has ended. This feature is only active when the fan is in the **Auto** mode.

To enable the fan delay while in the Installer Configuration Menu:

1. Answer NO to all prompts until the fan delay prompt appears in the display. Press YES to enter the fan delay menu.
2. Using the UP/DOWN arrow keys, select **on** or **off**. Press YES to store the selection.

The display now shows the N2 address prompt. See the *Setting the N2 Address (N2 addr)* section for instructions.

Setting the N2 Address (N2 addr)

To adjust the N2 address (adjustable from 1 to 253) while in the Installer Configuration Menu:

1. Answer NO to all prompts until the setting the N2 address prompt appears in the display. Press YES to set the address.
2. Use the UP/DOWN arrow keys to display the desired address. Press YES to store the address.

The display now shows the temporary occupancy time prompt. See the *Establishing the Temporary Occupancy Time (TOccTime)* section for instructions.

Note: Pressing the YES and NO keys simultaneously for 5 seconds on the user interface of the TEC2103-2 thermostat temporarily displays the N2 address of the thermostat.

Establishing the Temporary Occupancy Time (TOccTime)

The temporary occupancy is the length of time the occupied mode setpoints are used when the override function is enabled (the override function can be enabled from the Main User Menu **when the thermostat is in unoccupied mode** or from one of the digital inputs) or a temporary setpoint is entered. The range is adjustable from 0 to 12 hours.

To change the temporary occupancy time while in the Installer Configuration Menu:

1. Answer NO to all prompts until the temporary occupancy time prompt appears in the display. Press YES to enter the temporary occupancy time menu.
2. Use the UP/DOWN arrow keys to adjust the length of time the temporary occupancy setpoint should be in effect. Press YES to store the time.

The display now shows the room sensor calibration prompt. See the *Room Air Sensor Calibration (Cal RS)* section for instructions.

Room Air Sensor Calibration (Cal RS)

An offset can be added or subtracted to the actual displayed room temperature as needed. The range is $\pm 5.0\text{ F}^\circ$ ($\pm 2.5\text{ C}^\circ$), adjustable in increments of 1 F° (0.5 C°).

To change the room sensor calibration/offset while in the Installer Configuration Menu:

1. Answer NO to all prompts until the room sensor calibration prompt appears in the display. Press YES to enter the room sensor calibration menu.
2. Use the UP/DOWN arrow keys to adjust the correction that should be applied to the sensor reading. Press YES to store the offset.

The display now shows the auxiliary temperature/outdoor air sensor calibration prompt.

See the *Auxiliary Temperature/Outdoor Air Sensor Calibration (Cal OS)* section for instructions.

Auxiliary Temperature/Outdoor Air Sensor Calibration (Cal OS)

An offset can be added or subtracted to the actual displayed auxiliary/outdoor air temperature as needed. The range is $\pm 5.0\text{ F}^\circ$ ($\pm 2.5\text{ C}^\circ$), adjustable in increments of 1 F° (0.5 C°).

To change the sensor calibration/offset while in the Installer Configuration Menu:

1. Answer NO to all prompts until the auxiliary/outdoor sensor calibration prompt appears in the display. Press YES to enter the auxiliary/outdoor sensor calibration menu.
2. Use the UP/DOWN arrow keys to adjust the correction that should be applied to the sensor reading. Press YES to store the offset.

The display now shows the heating stage setting prompt. See the *Disable/Enable Second Heating Stage (H Stage)* section for instructions.

Disable/Enable Second Heating Stage (H Stage)

This parameter reverts the operation of two stage thermostats to a single stage when the second heating stage is not needed.

To enable or disable the second heating stage while in the Installer Configuration Menu:

1. Answer NO to all prompts until the setting heating stages prompt appears in the display. Press YES to enter the setting heating stages menu.
2. Using the UP/DOWN arrow keys; select **1.0** or **2.0** stages. Press YES to store the selection.

The display now shows the cooling stage setting prompt. See the *Disable/Enable Second Cooling Stage (C Stage)* section for instructions.

Disable/Enable Second Cooling Stage (C Stage)

This parameter reverts the operation of two-stage thermostats to a single stage when the second cooling stage is not needed.

To enable or disable the second cooling stage while in the Installer Configuration Menu:

1. Answer NO to all prompts until the setting cooling stages prompt appears in the display. Press YES to enter the setting cooling stages menu.
2. Using the UP/DOWN arrow keys; select **1.0** or **2.0** stages. Press YES to store the selection.

The display now shows the heating lockout prompt. See the *Setting the Heating Lockout (H lock)* section for instructions.

Setting the Heating Lockout (H lock)

This feature disables heating operation based on auxiliary or outdoor air temperature (requires temperature sensor to be connected to the Auxiliary/Outdoor Air Sensor terminal OS for the function to be enabled). If the outdoor air temperature is above the heating lockout temperature, heating operation is disabled.

The heating lockout temperature parameter is adjustable from -15 to 123 F° (-26 to 51 C°) in increments of 5 F/C° .

IMPORTANT: Setting the heating lockout to 123 F° (51 C°) disables the heating lockout feature.

If this parameter is being set at 123 F° (51 C°) to monitor discharge air temperature or temperatures above 122 F° (50 C°), note that the maximum temperature displayed for auxiliary temperature during operation is 122 F° (50 C°). The actual temperature may be above this point.

To change the auxiliary/outdoor air temperature heating lockout while in the Installer Configuration Menu:

1. Answer NO to all prompts until the heating lockout prompt appears in the display. Press YES to enter the heating lockout menu.
2. Use the UP/DOWN arrow keys to adjust the lockout temperature. Press YES to store the value.

The display now shows the cooling lockout prompt. See the *Setting the Cooling Lockout (C lock)* section for instructions.

Setting the Cooling Lockout (C lock)

This feature disables cooling operation based on outdoor air temperature (requires outdoor air temperature sensor to be connected for the function to be enabled). If the outdoor air temperature is below the cooling lockout temperature, cooling operation is disabled.

The cooling lockout temperature parameter is adjustable from -40 to 95 F° (-40 to 35 C°) in increments of 5 F/C° .

To change the outdoor air temperature cooling lockout while in the Installer Configuration Menu:

1. Answer NO to all prompts until the cooling lockout prompt appears in the display. Press YES to enter the cooling lockout menu.
2. Use the UP/DOWN arrow keys to adjust the lockout temperature. Press YES to store the value.

3. The exit menu appears. Press YES to exit the Installer Configuration Menu or press NO to return to the beginning of the menu (digital input configuration).

Operation

Programming/Operating the TEC2103-2 Thermostat

Once the TEC2103-2 thermostat is configured through the Installer Configuration Menu, the thermostat's operating parameters can be programmed through the Main User Menu (access the Main User Menu by pressing the MENU key during normal thermostat operation). The Main User Menu contains the basic operating features of the TEC2103-2 thermostat. The Main User Menu uses Auto Help. When there is a pause in programming activity, Auto Help automatically appears in the Main User Menu. To exit Auto Help, continue with the Programming selection.

When the thermostat is in the Main User Menu and is left unattended for 45 seconds, it reverts to the Status Display Menu.

Enabling Override Schedule (only appears when in Unoccupied Mode)

The override schedule prompt only appears when the thermostat is in the unoccupied state. This menu selection gives the user the option of overriding the unoccupied setpoints with the occupied setpoints at the local user interface for the amount of time specified under the *Establishing the Temporary Occupancy Time (TOccTime)* parameter (see the *Configuring the TEC2103-2 thermostat* section).

To override the unoccupied state while in the Main User Menu:

1. Answer NO to all prompts until the Override Schedule prompt appears. If the thermostat is in the unoccupied state, this is the first prompt.
2. Press YES to enable the temporary override. The TEC2103-2 thermostat returns to the Status Display Menu.

When scrolling through the Status Display Menu, **Override** now appears for the schedule status parameter.

Resuming the Programmed Schedule (only appears when in the Override Mode)

To resume the schedule while in the Main User Menu:

1. Answer NO to all prompts until the Resume Schedule prompt appears. If the thermostat is in the override state, this is the first prompt.
2. Press YES to resume the programmed schedule.

The TEC2103-2 thermostat returns to the Status Display Menu.

Entering Permanent Temperature Setpoints

The first prompt appearing in the Main User Menu of the TEC2103-2 thermostat is to set the permanent temperature setpoints. Permanent setpoints are permanently stored in the programmed schedule.

To enter the permanent heating and cooling setpoints for the occupied and unoccupied modes, follow the steps in Table 4. When changing the temperatures, pressing the keys once changes the temperature 0.5 F/C° and holding down the keys changes the temperature by 5 F/C° increments.

Note: Locally entered permanent setpoints revert to the programmed N2 network settings with each change of schedule status.

Table 4: Entering Permanent Temperature Setpoints

RoomTemp 75.0°F	Press MENU from the Status Display Menu to enter the Main User Menu.
Temperat set? Y/N	Answer NO to all prompts until the temperature set prompt appears in the display (it may be the first prompt). Press YES to enter temperature setting menu.
Cooling set? Y/N	Press YES to change occupied cooling setpoint. Press NO to advance to occupied heating setpoint menu.
Cooling 75.0°F	Use the UP/DOWN arrow keys to set temperature. Press YES to store value and advance to next menu.
Continued on next page. . .	

Table 4: Entering Permanent Temperature Setpoints (Cont.)	
Heating set? Y/N	Press YES to change the occupied heating setpoint. Press NO to advance to unoccupied cooling setpoint menu.
Heating 68.0°F	Use the UP/DOWN arrow keys to set temperature. Press YES to store value and advance to next menu.
Unocc CL set? Y/N	Press YES to change the unoccupied cooling setpoint. Press NO to advance to the unoccupied heating setpoint.
Unocc CL 80.0°F	Use the UP/DOWN arrow keys to set temperature. Press YES to store value and advance to next menu.
Unocc HT set? Y/N	Press YES to change the unoccupied heating setpoint. Press NO to advance to temperature display units.
Unocc HT 62.0°F	Use the UP/DOWN arrow keys to set temperature. Press YES to store value and advance to next menu.
°F/°C set? Y/N	Press YES to set the display units to °F or °C. Press NO to advance to temperature setpoint type menu. This only changes the local display.
Exit? Y/N	Press YES to return to the Status Display Menu or NO to re-enter the temperature setting menu.

Entering Temporary Temperature Setpoints

To temporarily change the setpoint, press the UP/DOWN arrow keys to change the temporary setpoint for the current mode of operation.

Note: Whether the thermostat is heating or cooling, the respective setpoint will be temporarily adjusted.

Note: To toggle between the temporary heating and cooling setpoints, press the NO key while changing the temporary setpoints.

Note: If a setpoint is overridden over the N2 network, it appears the setpoint value can be changed through the TEC2103-2 thermostat, but the setpoint is actually still held at the overridden value.

If the heating and cooling setpoints are overridden such that the deadband is violated, the TEC2103-2 thermostat automatically changes one of the setpoints to maintain the deadband.

Ending Temporary Temperature Setpoints

The temporary setpoints remain in effect for the duration set in the Temporary Occupancy Time parameter (TOccTime) or until manually released.

To release the temporary setpoint prior to the TOcc time, while in the main User Menu, answer YES to the first prompt to appear.

Press MENU again and YES to exit the Main User Menu, or leave the thermostat unattended for 45 seconds, and the display resumes scrolling.

The setpoint reverts to the Permanent Temperature Setpoint.

Selecting the System Mode

The TEC2103-2 thermostat has four system modes.

- **Automatic Mode (auto)**
Automatic changeover between heating and cooling. This is the default setting.
- **Cooling Mode (cool)**
Cooling operation only.
- **Heating Mode (heat)**
Heating operation only.
- **Off Mode (off)**
The TEC2103-2 thermostat is off; however, if frost protection is enabled and frost conditions are detected, the thermostat still calls for heat even if the system mode is set to Off.

To set the system mode while in the Main User Menu:

1. Answer NO to all prompts until the system mode prompt appears in the display. Press YES to set the system mode.
2. Use the UP/DOWN arrow keys to locate the desired system mode. Press YES to select the desired system mode.
3. Press YES to return to the Status Display Menu or NO to return to the system mode selection menu.

Fan Mode Setting

The TEC2103-2 thermostat has three fan mode settings:

- **On Fan Mode (on)**
Energizes the fan all the time for both occupied and unoccupied periods (even if the system mode is set to **off**).
- **Automatic Fan Mode (auto)**
Operates the fan only on a call for heating or cooling for both occupied and unoccupied periods.
- **Smart Fan Mode (smart)**
Energizes the fan all the time for occupied periods and only on a call for heating and cooling in unoccupied periods. This is the default setting.

To set the fan mode while in the Main User Menu:

1. Answer NO to all prompts until the fan mode prompt appears in the display. Press YES to set the fan mode.
2. Use the UP/DOWN arrow keys to locate the desired fan mode. Press YES to select the desired fan mode.
3. Press YES to return to the Status Display Menu or NO to return to the fan mode selection menu.

Accessories

Using the information in Table 5, contact the nearest Johnson Controls branch office or wholesale distributor to order these accessories.

**Table 5: Optional Accessories
(Includes Mounting Hardware)**

Item	Product Code Number
Remote Indoor Temperature Sensor	SEN-600-1
Outdoor Air Temperature Sensor	SEN-600-2
Duct Mount Temperature Sensor	SEN-600-3
Remote Indoor Temperature Sensor with Occupancy Override and LED	SEN-600-4

Note: Review specifications of optional accessories prior to using in an application.

Troubleshooting

Table 6: N2 Bus Configuration Troubleshooting

Error/Trouble Condition	Possible Causes	Solution
TEC2103-2 thermostat cycles online and offline.	Two or more controllers have the same address.	Change each duplicate address to a unique number.
	There are Y or T taps or the repeater lost power or is wired incorrectly.	Refer to the <i>N2 Communications Bus Technical Bulletin (LIT-636018)</i> .
TEC2103-2 thermostat does not come online.	Two or more controllers have the same address.	Change each duplicate address to a unique number.
	N2 Bus contains too many devices.	The maximum of N2 devices allowed on the N2 Bus is as follows: 100 devices per NCM, 32 devices per N30, 32 devices per N31, 150 devices per the Companion/Facilitator system.
	TEC2103-2 thermostat does not have power.	Apply power to the TEC2103-2 thermostat.
	N2 cable runs are broken.	Locate and correct the wiring.
	Device type is incorrect.	TEC2103-2 thermostat address must be VND device type.
Entire N2 Bus is offline.	EOL jumpers on MM-CVT101 or NCM are not installed.	Install EOL jumpers properly.
	MM-CVT101 is not plugged into the Personal Computer (PC) or 120 VAC source.	Plug MM-CVT101 into PC or plug it into a 120 VAC source.
	Wiring near the Bus is broken.	Repair the wiring.
	No point mapping entered.	Define the BAS dataset.

Table 7: Alarm Messages

Display	Function
Frost ON	Indicates heating is energized by the low limit frost protection (42°F [5.5°C]).
Service	Indicates there is a service alarm in accordance with one of the programmable Digital Inputs (DI1 or DI2).
Filter	Indicates the filter (or filters) are dirty in accordance with one of the programmable Digital Inputs (DI1 or DI2).

Note: There is a temperature alarm message that appears at the headend control should the setpoint not be reached within 45 minutes (there is no indication locally at the TEC2103-2 thermostat).

Preliminary—This information may change.

Technical Specifications

Product	TEC2103-2 Thermostat with N2 Bus, Multi-stage
Power Requirements	20-30 VAC, 50/60 Hz, 24 VAC nominal, 2 VA (RC and C) Class 2 or Safety Extra Low Voltage (SELV)
Relay Contact Rating Maximum Inductive	1 ampere with in-rush surges up to 3 amperes, 30 VAC maximum, Class 2
Digital Inputs	Relay dry contact only across the C terminal to DI1 or DI2
Recommended Wire Size	18 gauge maximum, 22 gauge recommended
Thermostat Measurement Range	-40 to 122°F (-40 to 50°C)
Sensor Type: Resolution: Control Accuracy	Local 10 K ohm NTC thermistor ±0.2 F° (±0.1 C°) ±0.9 F° (±0.5 C°) @ 70°F (21°C) typical calibrated
Auxiliary/Outdoor Air Temperature Indication Range	-40 to 122°F (-40 to 50°C)
Control Range	Cooling: 54 to 100°F (12 to 37.5°C) in 1/2 degree increments Heating: 40 to 90°F (4.5 to 32°C) in 1/2 degree increments
Minimum Deadband	(Between heating and cooling) 2 F° or 1 C°
Ambient Operating Conditions	32 to 122°F (0 to 50°C); 0 to 95% RH noncondensing
Ambient Storage Conditions	-22 to 122°F (-30 to 50°C); 0% to 95% RH noncondensing
Dimensions (H x W x D)	4.94 x 3.38 x 1.13 in. (125 x 86 x 29 mm)
Shipping Weight	0.75 lb (0.34 kg)
UL and cUL Listing	File E27734 with CCN's XAPX (US, UL 873) and XAPX7 (Canada, CSA C22.2 No. 24)
FCC Compliance	This equipment has been tested and found to comply with the limits for a Class A digital device and verified to Class B pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.
Industry Canada	This Class A digital apparatus meets all of the requirements of the Canadian Interference-Causing Equipment Regulations. Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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APAC Single Point of Contact:

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C/O CONTROLS PRODUCT
MANAGEMENT
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