

## TEC1100 Series Thermostat

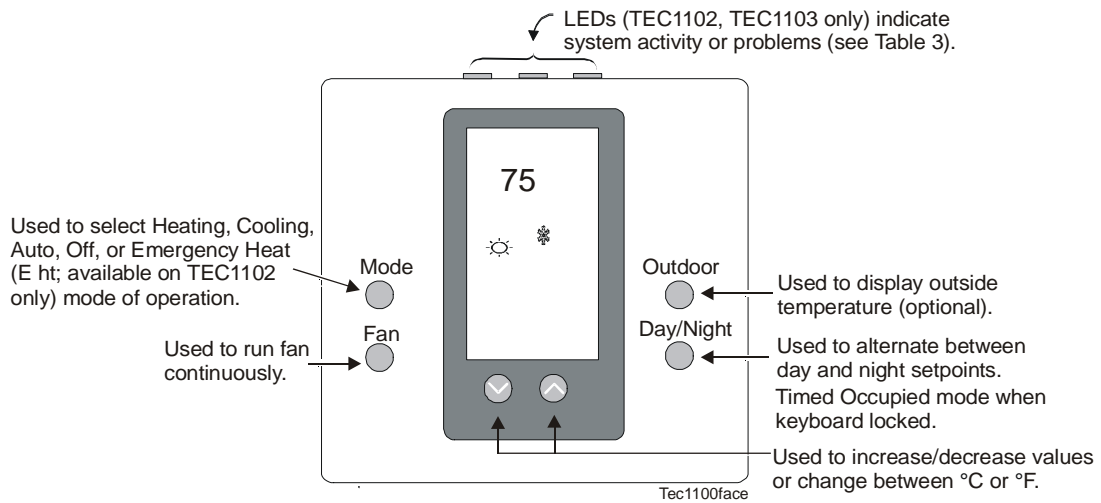
### **Introduction**

In this document, Building Automation System (BAS) is a generic term that refers to the Metasys® Network (Network Control Module [NCM] or N30 series), Companion, and Facilitator® supervisory systems. When you refer to system specific applications, use the specific system names.

### **Description**

The TEC1100 Series includes three non-programmable models: single-stage (TEC1101), heat pump (TEC1102), and multistage (TEC1103). The applications include furnace, air conditioner, heat pump, and rooftop units. The TEC1100 incorporates fuzzy logic for precise control in a thermostat type package.

All TEC1100s have Metasys N2 communication capability. This communication allows the user to view and adjust parameters from a remote workstation. It also provides information, such as outdoor air temperature, to the TEC1100 units on the bus. The thermostat is easy to operate and normally displays room temperature and mode of operation using Cooling (❄) or Heating (🔥) icons. When there is a call for cooling, the Snowflake icon (❄) blinks. Likewise, during a call for heating, the Flame icon (🔥) blinks. When the temperature is satisfied, neither icon blinks. In the Auto mode, both icons (❄ 🔥) appear continuously when satisfied. Light-Emitting Diodes (LEDs) on the top of TEC1102/1103 models use Binary Inputs (BIs) to indicate a clogged filter and external service. A unique temperature alarm (BI 2) indicates that the zone temperature has not been satisfied in 45 minutes.



**Figure 1: TEC1100**

**Table 1: Specifications**

<b>Product</b>	<b>TEC1101-1</b> Thermostat with N2 Bus, 1 Heat/1 Cool <b>TEC1102-1</b> Thermostat with N2 Bus, Heat Pump <b>TEC1103-1</b> Thermostat with N2 Bus, 2 Heat/2 Cool
<b>Power Requirements</b>	20-30 VAC, 50-60 Hz, Class 2, 24 VAC nominal, 2.4 VA maximum not including driven loads
<b>Relay Contact Rating</b>	Maximum Inductive: 1 ampere with surges to 3 amperes, 24 VAC Class 2 Maximum Resistive: 1 ampere, 24 VDC (2000 VA maximum for all outputs) Minimum: 10 mA for 24 VAC circuit; 10 mA for a 24 VDC circuit
<b>Binary Inputs (LED 1, LED 2, CLK1)</b>	20-30 VAC or 22-30 VDC (Negative on 24 V [C] terminal). Switches at 2 VDC.
<b>Recommended Wire Size</b>	18 gauge at 100 feet/22 gauge at 20 feet
<b>Thermostat Measurement Range</b>	0 to 48°C (28 to 124°F)
<b>Outdoor Air Temperature Indication Range</b>	-48 to 48°C (-50 to 124°F)
<b>Control Range</b>	Heating: 5 to 30°C in 1° increments (38 to 88°F in 1° increments) Cooling: 16 to 40°C in 1° increments (60 to 88°F in 1° increments)
<b>Display Resolution</b>	1°C (1°F)
<b>Minimum Deadband</b>	1°C (2°F) (between heating and cooling)
<b>°C/°F Conversion</b>	20°C = 68°F, each Celsius degree above or below 20°C is 2°F
<b>N2 Communications</b>	Isolated bidirectional, RS-485, 9600 baud
<b>Ambient Operating Conditions</b>	0 to 55°C (32 to 131°F); 5 to 90% RH noncondensing
<b>Ambient Storage Temperatures</b>	-34 to 55°C (-30 to 131°F)
<b>Dimensions (H x W x D)</b>	114.3 x 101.6 x 22.2 mm (4-1/2 x 4 x 7/8 in.)
<b>Shipping Weight</b>	0.171 kg (0.37 lb)
<b>UL and cUL Listing</b>	UL 873 Multiple Class 2 Device, UL94HB Plastic Enclosure
<b>CE Compliance</b>	CISPR 22, Residential Class B, CE Directive (89/336/EEC, EN50081/1, EN50082/2) Industrial and Residential
<b>FCC Compliance</b>	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 is required to correct the interference at his/her own expense.

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.

This device complies with Class A Part 15 of the FCC rules. It was also verified to Class B. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

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.

**Table 2: TEC1100 Series Accessory Ordering Information**

Item	Product Code Number
<b>Optional Accessories (includes mounting hardware)</b>	
Replacement Door for non-programmable thermostat (10/box)	TEC10DOOR-NONPROG
Remote or Averaging Indoor Temperature Sensor	SEN-500-1*
Outdoor Air Sensor with Outdoor Air Temperature Communication Module	SEN-500-2**
Duct Mounted Outdoor Air Sensor with Outdoor Air Temperature Communication Module	SEN-500-3**
4- to 5-wire Conversion Module	ACC-500-1***
Thermostat Wall Plate to conceal existing holes	ACC-500-2****
<b>Replacement Parts</b>	
Replacement Outdoor Air Temperature Communication Module	SEN-500-603
Replacement Outdoor Air Temperature Sensor (includes mounting hardware)	SEN-500-604
Replacement Duct Mount Outdoor Air Temperature Sensor (includes mounting hardware)	SEN-500-605
<b>Repair Parts</b>	
3 in. Sensor Probe (use with outdoor air sensor)	SEN-500-601
8 in. Sensor Probe (use with duct-mount outdoor air sensor)	SEN-500-602



\* See *SEN-500-1 Remote Indoor Temperature Sensor Product/Technical Bulletin (LIT-216504)*.

\*\* See *SEN-500-2 and SEN-500-3 Outdoor Air Temperature Sensors Product/Technical Bulletin (LIT-216179)*.

\*\*\* See *ACC-500-1 Conversion Module Product/Technical Bulletin (LIT-216500)*.

\*\*\*\* See *ACC-500-2 Thermostat Wall Plate Product/Technical Bulletin (LIT-216502)*.

**Table 3: Alarm Indicators (TEC1102 Heat Pump and TEC1103 Multistage)**

LED Position	Function	BI
<b>Right</b> (  )	Indicates a fault. Controlled by external switch on LED 2, which displays a wrench icon and reports Change-of-State (COS) to the Metasys system and causes the Network Dial Modem (NDM) to dial out.	1
<b>Center</b> (no symbol)	(TEC1102 heat pump only). Indicates when Emergency (Auxiliary) heat (E h t) is activated. Internally controlled. No COS.	N/A
<b>Left</b> (  )	Indicates filter needs changing. Controlled by external switch on LED 1, which displays the filter icon and reports a COS to the Metasys system and causes the NDM to dial out.	3
<b>Temperature Alarm (no LED)</b>	If the room temperature is more than 1°C (1°F) away from the setpoint after 45 minutes of operation, a COS occurs which causes the NDM to dial out. Once the temperature reaches the setpoint, the alarm returns to normal.	2

Note: Either binary input (LED 1 or LED 2) can be used as a fan-proving switch for other applications.

**Table 4: Applications**

<b>Application</b>	<b>Recommended Model</b>
<b>Fan Coil Unit</b>	TEC1101-1
<b>Heat Pump</b>	TEC1102-1
<b>Unit Heaters</b>	TEC1101-1
<b>Packaged Rooftop</b>	TEC1103-1 and Separate Economizer Package (M130EAA-2 or equal in place of Stage 1). Refer to the <i>AD-DME1702-1 Direct Mount Economizer Controller Technical Bulletin (LIT-6363020)</i> .
<b>Packaged Heating/Cooling</b>	TEC1101-1 or TEC1103-1

---

### ***Installation***

#### **Required Installation Tools**

The tools needed to install the TEC1100 Series thermostats are:

- drill
- 3/16 in. drill bit
- 1/8 in. and 1/4 in. flat-blade screwdrivers
- hammer
- marking pencil
- wire stripper

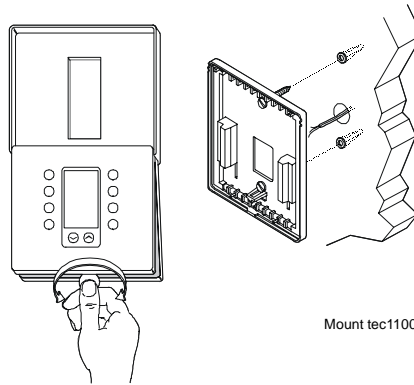
Note: Two plastic anchors with screws and the cover lock are included with the TECs.

#### **Mounting the TEC1100 Series Thermostat**

Mount the TEC1100 Series thermostat on an interior wall, approximately 1.5 m (5 ft) above the floor in a location of average temperature (72°F). Do not mount the thermostat on outdoor walls or behind doors. Be sure to install the thermostat away from direct sunlight or radiant heat, air discharge grills, stairwells, or outdoor doors. Keep the thermostat away from steam or water pipes, warm air stacks, areas with no airflow, or sources of electrical interference.

To mount:

1. Lift the thermostat cover and insert a small coin into the slot located in the bottom center of the thermostat case.
2. Twist 1/4 turn (Figure 2).



**Figure 2: Separating and Mounting the TEC1100**

3. Grasp the base from the bottom two corners, and separate from the thermostat.
4. Swing the thermostat out from the bottom, and lift up and out from the base.

Note: When replacing an existing thermostat, use wire tags to identify terminal designations.

5. Place the rectangular opening in the base over the equipment control wires.
6. Use the base as a template, and mark the location of two mounting holes.
7. Drill two 5 mm (3/16 in.) holes at the marked locations.
8. Tap nylon anchors (included) flush to wall surface.
9. Place thermostat mounting holes over anchors, and screw the thermostat into place using the included anchor screws (Figure 2).
10. Plug the hole in the wall to eliminate air drafts on the sensor with the adhesive foam from the ACC-INSL-x Foam Pad Mounting Kit. If you are not using this kit, use putty or duct tape to plug the hole.

### **Wiring the TEC1100 Series Thermostats**

Follow these steps to wire the TECs:

1. Connect the wires from the existing system to the thermostat terminals. Refer to Figure 4, Figure 6, and Figure 8 for wiring diagrams.
2. Push any extra wire back into the wall. The wires must be flush to the plastic base.
3. Plug the hole in the wall to eliminate air drafts on the sensor.

## Setting the DIP Switches

Select Dual Inline Package (DIP) switches to perform a variety of different functions: fan runtime delay, keyboard disable, and multistage heating or cooling.

Note: Before selecting a minimum On/Off time for the TEC1100 Series, verify the equipment can tolerate the following hourly maximum cycle rates: 7.5 cycles per hour when using 4-minute On/Off (preferred for energy savings) or 15 cycles per hour when using 2-minute On/Off.

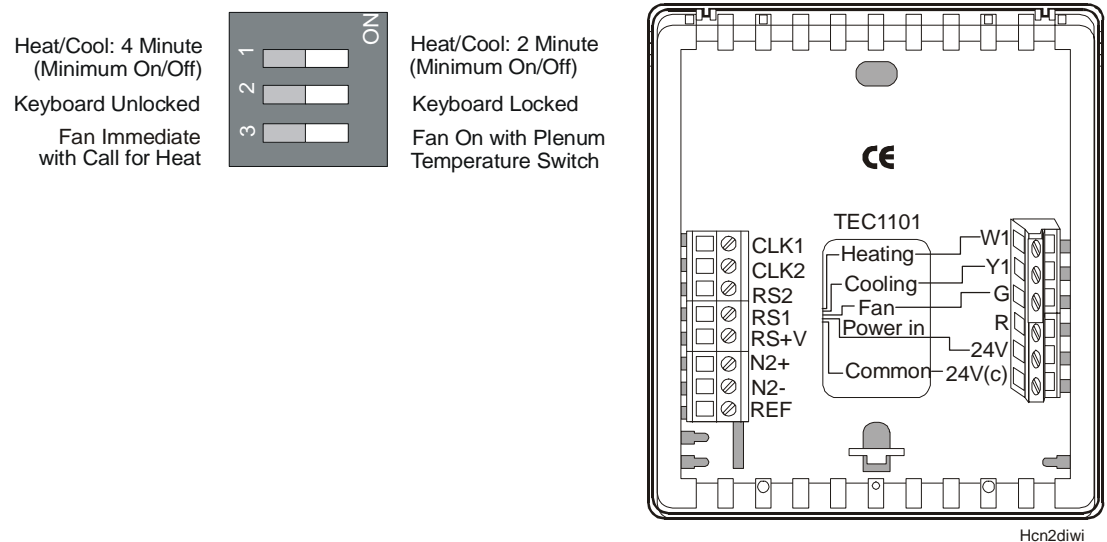
### TEC1101 Single-Stage Wiring Configuration and DIP Switch Settings

Refer to Figure 3, Figure 5, and Figure 7 for DIP switch settings.

**Table 5: TEC1101 Single-Stage DIP Switch Selections**

DIP Switch	Selection	Description
1	On	Allows 2-minute minimum On/Off time for heating or cooling equipment.
	Off	Allows 4-minute (preferred) minimum On/Off time for heating or cooling equipment.
2	On*	Locks the keyboard, disabling buttons to prevent tampering. The <b>Day/Night</b> mode button can select 1-hour override.
	Off	Unlocks the keyboard.
3	On	In Heating mode, with a call for heat, the plenum temperature switch controls fan operation. However, Cooling mode allows the fan to operate immediately with a call for cooling. The temperature switch is wired directly to the fan.
	Off	Heating or Cooling mode allows the fan to operate immediately with a call for heat or cooling.

\* When DIP Switch 2 is on, you can only use the **Day/Night** mode button to select 1-hour override to occupied setpoints if in Night mode. All other buttons are read-only. You can also view the N2 address.

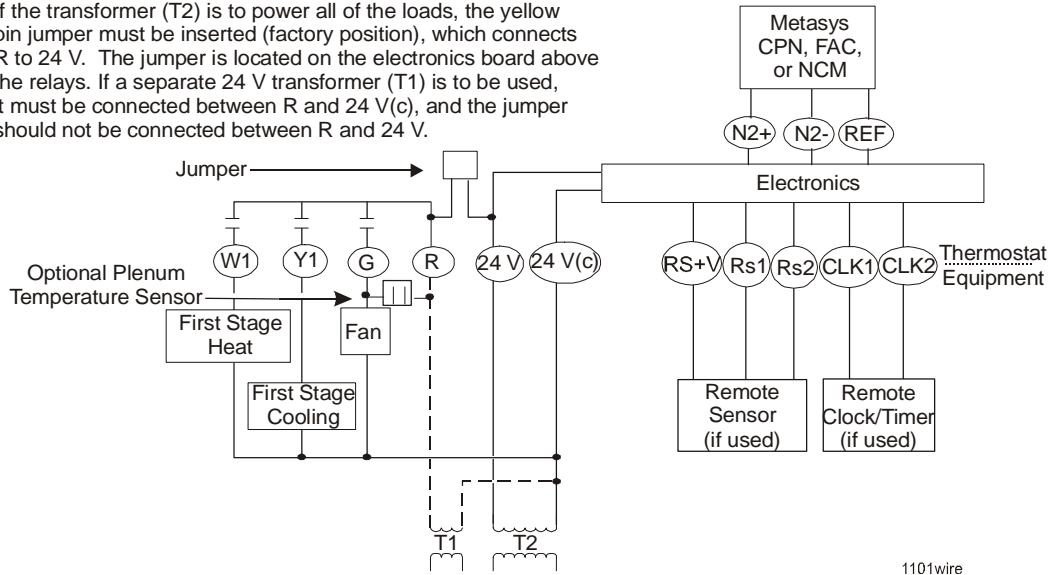


**Figure 3: TEC1101 Single-Stage, Factory-Set DIP Switch Settings and Wiring Configuration**

**Table 6: TEC1101 Single-Stage Output Terminal Designations**

Terminal	Function
W1	Energizes on call for heating.
Y1	Energizes on call for cooling.
G	Energizes fan on call for heating or cooling or by pressing the <b>Fan</b> button.
R	Provides independent switching voltage.
24V	Provides 24 VAC from equipment transformer.
24V(c)	Provides 24 VAC (common) from equipment transformer.
CLK1, CLK2	Connects remote clock/timer for alternate setpoints.
RS2, RS1, RS+V	Connects outdoor air temperature or indoor remote sensors; refer to instructions included with sensors.
N2+, N2-, REF	Metasys N2 Bus connections



If the transformer (T2) is to power all of the loads, the yellow pin jumper must be inserted (factory position), which connects R to 24 V. The jumper is located on the electronics board above the relays. If a separate 24 V transformer (T1) is to be used, it must be connected between R and 24 V(c), and the jumper should not be connected between R and 24 V.



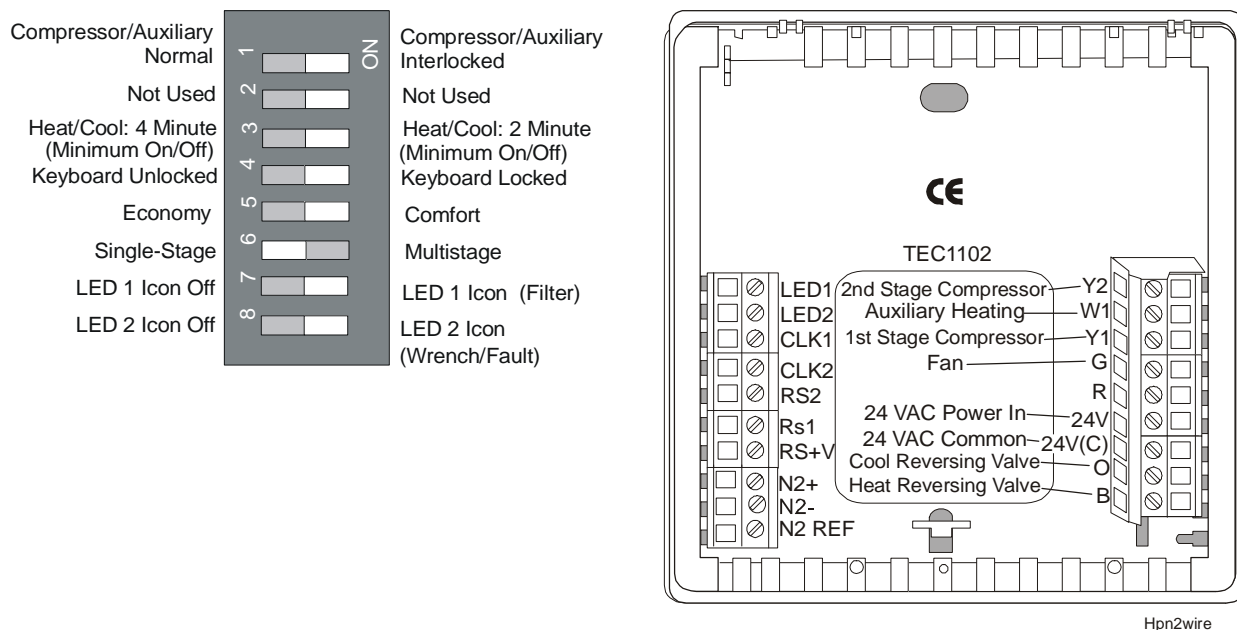
**Figure 4: TEC1101 Single-Stage Wiring Schematic**

## TEC1102 Heat Pump Wiring Configuration and DIP Switch Settings

**Table 7: TEC1102 Heat Pump DIP Switch Selections**

DIP Switch	Selection	Description
1	On	Compressor/Auxiliary Interlocked: turns off the compressor when the auxiliary heat (E h t ) is on. The compressor remains off for 2 minutes after the auxiliary heat is turned off to ensure that the heat pump coil has cooled.
	Off	Compressor/Auxiliary Normal: allows the compressor and auxiliary heat to be on simultaneously.
2	Off	Not used. Switch should remain in the Off position.
3	On	Allows 2-minute minimum On/Off time for heating or cooling equipment.
	Off	Allows 4-minute minimum On/Off time for heating or cooling equipment (preferred).
4	On*	Locks the keyboard, disabling buttons to prevent tampering. <b>Day/Night</b> mode button can select 1-hour override.
	Off	Unlocks the keyboard.
5	On	Comfort: allows the Auxiliary Heat to be energized when the room temperature error is greater than 0.5°C (1°F) for 1.5 hours.
	Off	Economy: minimizes the use of Auxiliary Heat. If the room temperature error is 0.5°C (1°F) for 3 hours, auxiliary heat is energized.
6	On	Allows multistage heating or cooling.
	Off	Allows single-stage heating or cooling.
7	On	Liquid Crystal Display (LCD) filter icon (  ) turns on with LED 1 contact closure to 24 VAC.
	Off	No filter icon.
8	On	LCD wrench icon (  ) turns on with LED 2 contact closure to 24 VAC.
	Off	No wrench icon.

\* When DIP Switch 4 is on, you can only use the **Day/Night** mode button to select 1-hour override to occupied setpoints if in Night mode. All other buttons are read-only. You can also view the N2 address.

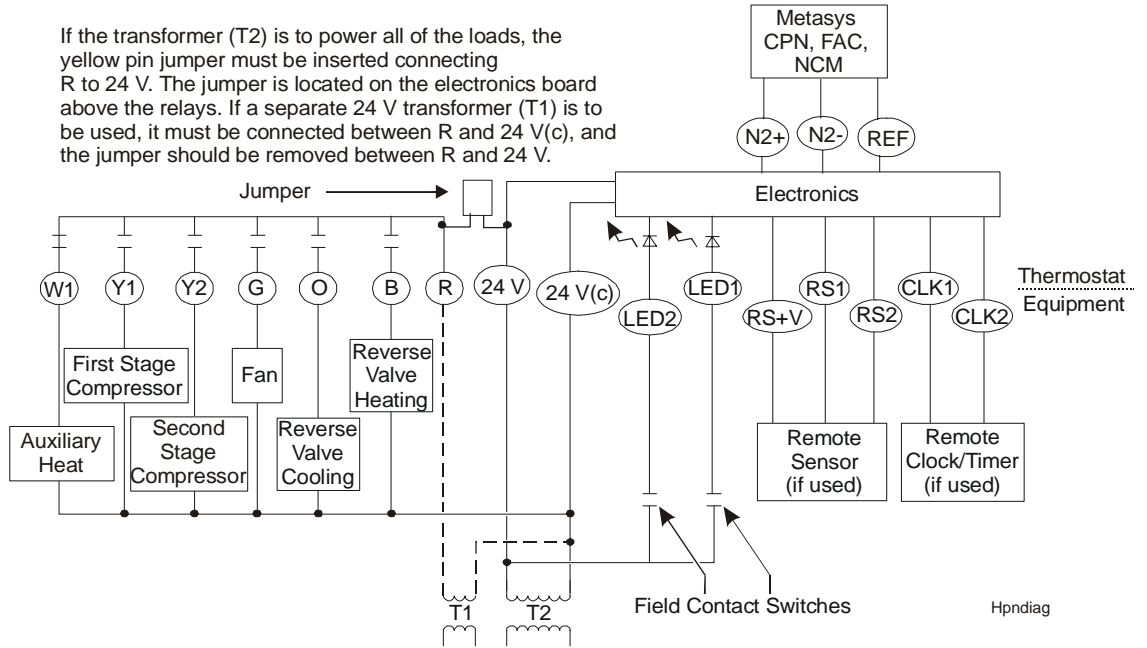


**Figure 5: TEC1102 Heat Pump, Factory-Set DIP Switch Settings, and Wiring Configuration**

**Table 8: TEC1102 Heat Pump Output Terminal Designations**

Terminal	Function
<b>Y2</b>	Energizes Compressor 2 on call for second stage heating or cooling.
<b>W1</b>	Energizes auxiliary heat as third stage heating or emergency heat.
<b>Y1</b>	Energizes Compressor 1 on call for first stage heating or cooling.
<b>G</b>	Energizes fan on call for heating or cooling or by pressing <b>Fan</b> button.
<b>R</b>	Provides independent switching voltage.
<b>24V</b>	Provides 24 VAC from equipment transformer.
<b>24V(c)</b>	Provides 24 VAC (common) from equipment transformer.
<b>LED 1, LED 2</b>	LED 1 or LED 2 contact closure to 24 VAC from remote switch.
<b>CLK1, CLK2</b>	Connects remote clock/timer for alternate setpoints.
<b>RS2, RS1, RS+V</b>	Connects outdoor air temperature or indoor remote sensors; refer to instructions included with sensors.
<b>O</b>	Energizes reversing valve in the Cooling mode.
<b>B</b>	Energizes reversing valve in the Heating mode.
<b>N2+, N2-, Ref</b>	N2 Bus



If the transformer (T2) is to power all of the loads, the yellow pin jumper must be inserted connecting R to 24 V. The jumper is located on the electronics board above the relays. If a separate 24 V transformer (T1) is to be used, it must be connected between R and 24 V(c), and the jumper should be removed between R and 24 V.



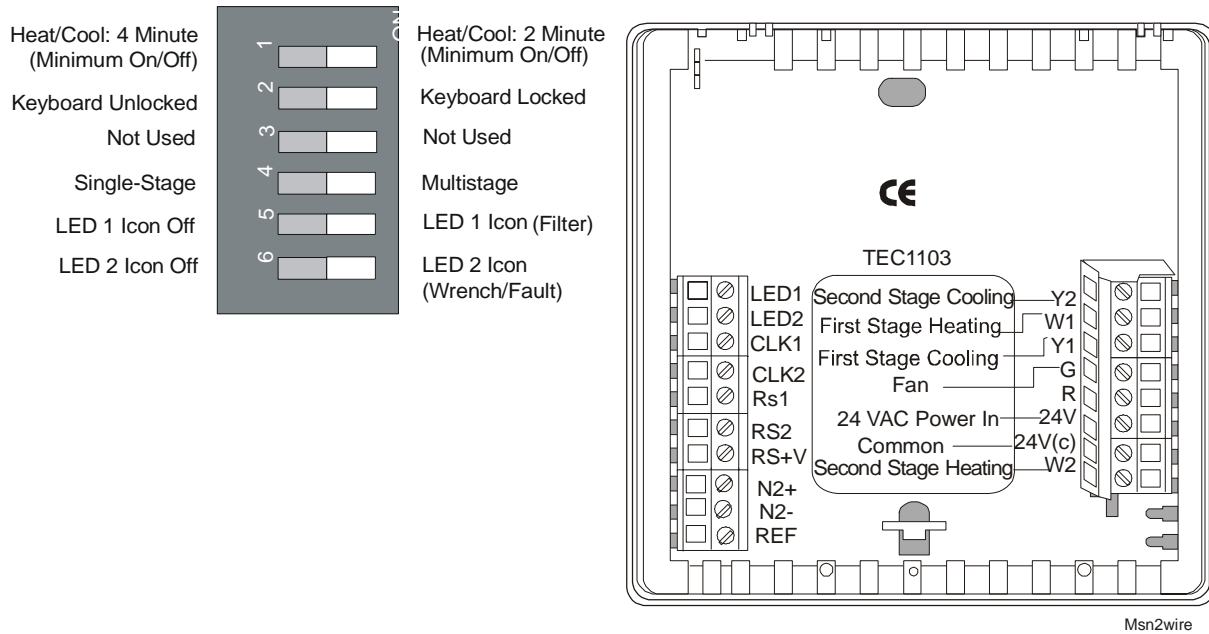
**Figure 6: TEC1102 Heat Pump Wiring Schematic**

## TEC1103 Multistage Wiring Configuration and DIP Switch Settings

**Table 9: TEC1103 Multistage DIP Switch Selections**

DIP Switch	Selection	Description
1	On	Allows 2-minute minimum On/Off time for heating or cooling equipment.
	Off	Allows 4-minute minimum On/Off time for heating or cooling equipment (preferred).
2	On*	Locks the keyboard, disabling buttons to prevent tampering. The <b>Day/Night</b> mode button can select 1-hour override.
	Off	Unlocks the keyboard.
3	Off	Not used. Switch should remain in the Off position.
4	On	Allows multistage heating or cooling.
	Off	Allows single-stage heating or cooling.
5	LED 1 Icon On/Off	Optional selection: LCD filter icon (  ) comes on with LED 1 contact closure to 24 VAC.
6	LED 2 Icon On/Off	Optional selection: LCD wrench icon (  ) comes on with LED 2 contact closure to 24 VAC.

\* When DIP Switch 2 is on, you can only use the **Day/Night** mode button to select 1-hour override to occupied setpoints if in Night mode. All other buttons are read-only. You can also view the N2 address.

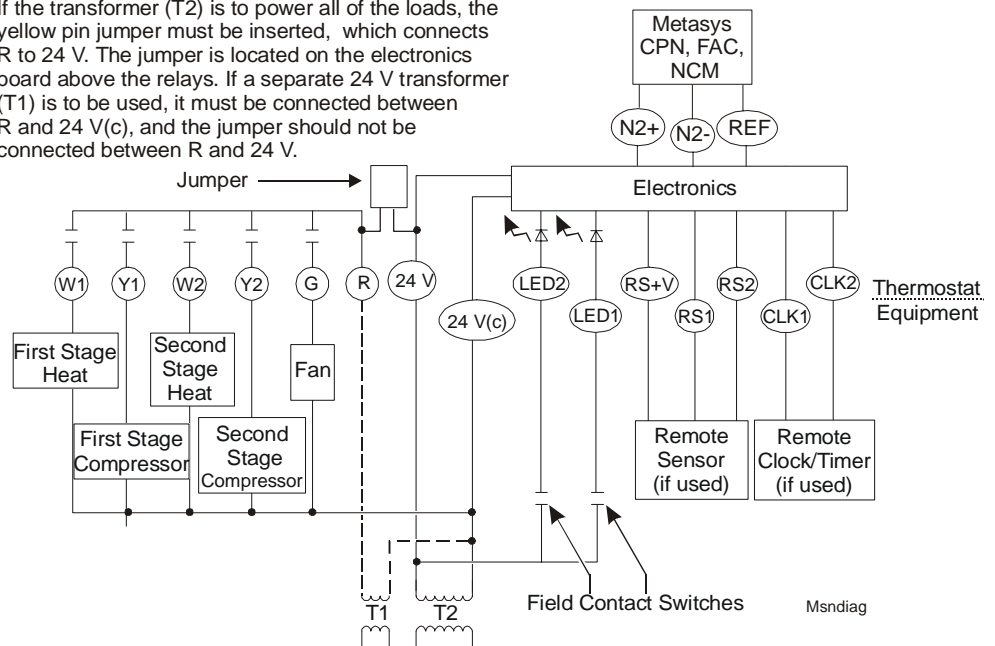


**Figure 7: TEC1103 Multistage Factory-Set DIP Switch Setting and Wiring Configuration**

**Table 10: TEC1103 Multistage Output Terminal Designations**

Terminal	Function
W2	Energizes on call for second stage heat.
Y2	Energizes on call for second stage cooling.
W1	Energizes on call for first stage heat.
Y1	Energizes on call for first stage cooling.
G	Energizes fan on call for heating or cooling or by pressing the <b>Fan</b> button.
R	Independent switching voltage
24V	24 VAC from equipment transformer
24V(c)	24 VAC (common) from equipment transformer
LED 1, LED 2	Input connection that energizes LED 1 or LED 2 from remote status device to 24 VAC
CLK1, CLK2	Connections for remote clock/timer for alternate setpoints
RS2, RS1, RS+V	Connection for outdoor temperature sensor and/or indoor remote sensor option; refer to instructions included with sensors.
N2+, N2-, REF	Metasys N2 Bus connections

If the transformer (T2) is to power all of the loads, the yellow pin jumper must be inserted, which connects R to 24 V. The jumper is located on the electronics board above the relays. If a separate 24 V transformer (T1) is to be used, it must be connected between R and 24 V(c), and the jumper should not be connected between R and 24 V.



**Figure 8: TEC1103 Multistage Wiring Schematic**

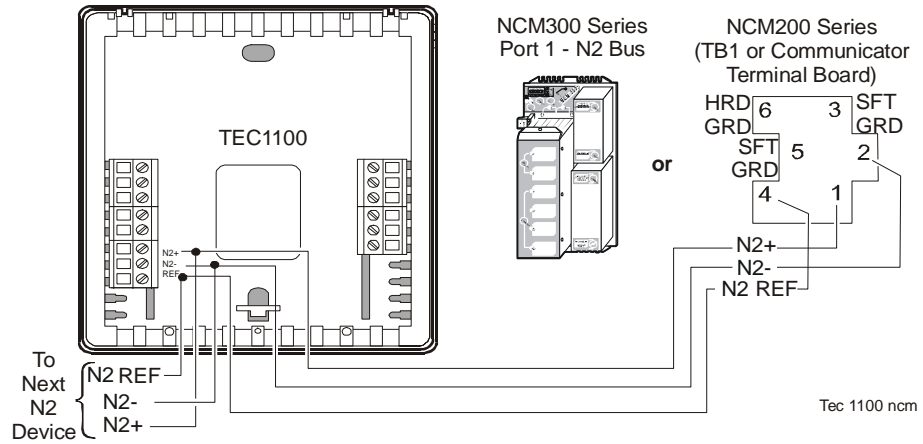
**Connecting the N2 Bus**

To connect the N2 Bus:

1. Observe the polarity when connecting the N2 Bus wires to the TEC1100.

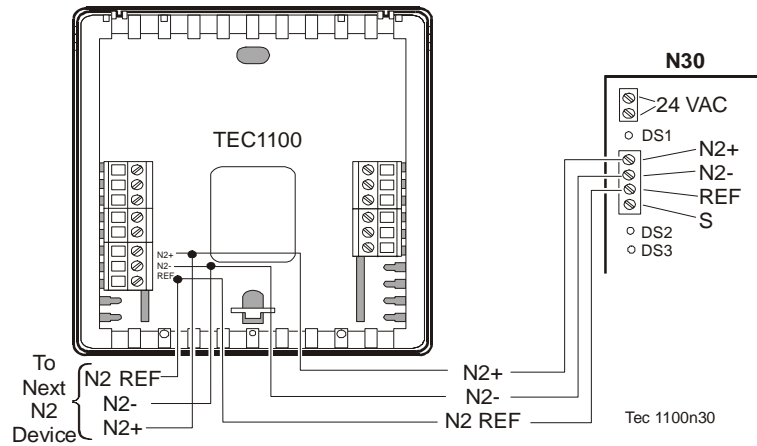
Note: Each TEC has self-terminating End-of-Line (EOL) resistors. However, one EOL resistor is needed at the BAS (two are preferred at opposite ends).

2. Continue this process for each TEC1100 using the daisy-chain wiring method (Figure 9).



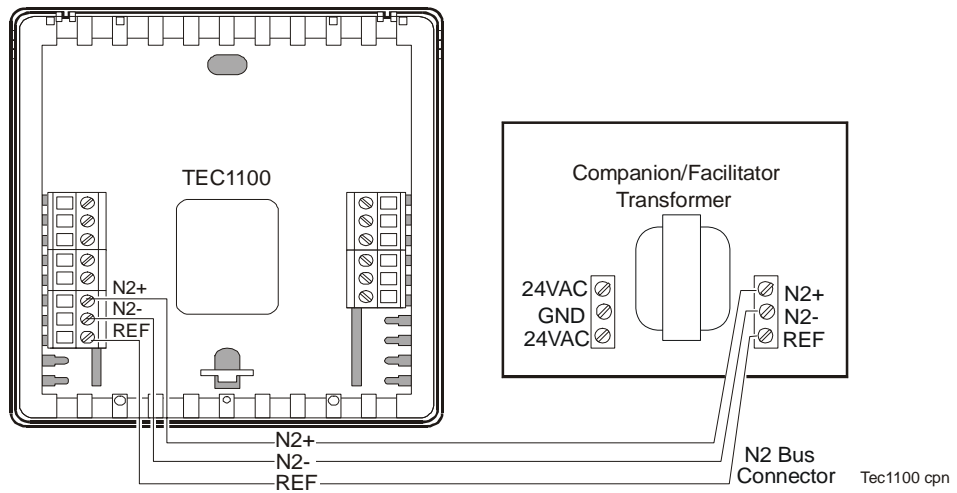
**Figure 9: Connecting the TEC1100 to an NCM**

**Connecting to N30 Series**



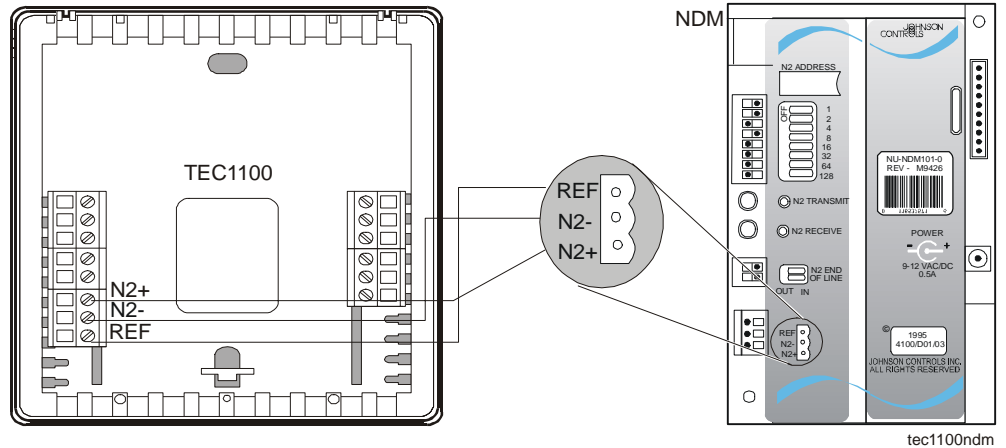
**Figure 10: Connecting the TEC1100 to the N30 Series**

**Connecting to the Companion/Facilitator System**



**Figure 11: Connecting the TEC1100 to the Companion/Facilitator System**

## Connecting to Network Display Module (NDM)



**Figure 12: Connecting the TEC1100 to the NDM**

## Setting the N2 Address

To set the N2 Address:

1. Push the **Fan** and **Mode** buttons simultaneously for 10 seconds after the machine is turned on. The lower section of the display shows the current N2 address.
2. Push the  $\vee$  or  $\wedge$  buttons to change the address (1-253). Map the TEC1100 into CPN/FAC/NCM/N30 series as a vendor device (VND).
3. Push any button to exit this mode, or wait 5 seconds and the TEC automatically returns to normal operation.

Note: You can lock the keyboard using the DIP switch to prevent address change, however, this disables access to other functions except temporary occupancy.

## N2 Device Mapping

When adding the TEC to the Metasys system (Person-Machine Interface [PMI] and Companion system), you must define the TEC1100 as a Vendor Device (VND). For the NCM, except as noted in Table 11, Footnote c, do **not** direct map any points. Run control of these points through the Control System (CS) object.

Note: For the TEC110x-0, do not use the Adjust command with the Companion/Facilitator (CPN/FAC) system. This command is not supported. The TEC110x-0 responds with an offline message but continues to operate normally.

**Table 11: N2 Bus Objects**

Point Name	TEC Point Type/ Addr.	N30 (CPN/ FAC) Object Type	BAS Model Point Type	Override Range	TEC 1101	TEC 1102	TEC 1103
Room Temp	ADI-1	N2 AI (AI) <sup>d</sup>	CSAD ADI1	0 to 48°C (28 to 124°F)	◆	◆	◆
Outdoor Temp <sup>a</sup>	ADI-2	N2 AI (AI) <sup>d</sup>	CSAD ADI2	-48 to 48°C (-54 to 124°F)	◆	◆	◆
Heating SP <sup>a</sup>	ADI-3	N2 AO (AO)	CSAD ADI3	1 to 47°C (29 to 99°F)	◆	◆	◆
Cooling SP <sup>a</sup>	ADI-4	N2 AO AO	CSAD ADI4	1 to 47°C (29 to 99°F)	◆	◆	◆
Setback Heating SP <sup>a</sup>	ADI-5	N2 AO (AO)	CSAD ADI5	1 to 47°C (29 to 99°F)	◆	◆	◆
Setback Cooling SP <sup>a</sup>	ADI-6	N2 AO (AO)	CSAD ADI6	1 to 47°C (29 to 99°F)	◆	◆	◆
Minimum Heat SP <sup>a</sup>	ADI-7	N2 AO (AO)	CSAD ADI7	1 to 47°C (29 to 99°F)	◆	◆	◆
Maximum Heat SP <sup>a</sup>	ADI-8	N2 AO (AO)	CSAD ADI8	1 to 47°C (29 to 99°F)	◆	◆	◆
Minimum Cool SP <sup>a</sup>	ADI-9	N2 AO (AO)	CSAD ADI9	1 to 47°C (29 to 99°F)	◆	◆	◆
Maximum Cool SP <sup>a</sup>	ADI-10	N2 AO (AO)	CSAD ADI10	1 to 47°C (29 to 99°F)	◆	◆	◆
Fan <sup>a</sup>	BD-1	N2 BO (BO)	CSBD BD1	0 = Off/Auto, 1 = On/MAN	◆	◆	◆
Mode <sup>a</sup>	BD-2	N2 MSO <sup>ef</sup> (AO)	CSMS MS1	0 = Off 1= Cool, 2 = Heat, 3= Auto, 4 = E Ht (Aux Heat) <sup>f</sup>	Mode 0-3	Mode 0-4	Mode 0-3
Occupancy <sup>a</sup>	BD-3	N2 BO (BO)	CSBD BD2	0 = Unoccupied, 1 = Occupied	◆	◆	◆
W1 State	BD-4	N2 BI (BI)	CSBD BD3	0 = Off, 1 = On	Heat 1	E Heat	Heat 1
W2 State or Heat Pump 'O/B'	BD-5	N2 BI (BI)	CSBD BD4	0 = Off, 1 = On		Heat Pump O/B	Heat 2
Y1 State	BD-6	N2 BI (BI)	CSBD BD5	0 = Off, 1 = On	Cool 1	Comp 1	Cool 1
Y2 State	BD-7	N2 BI (BI)	CSBD BD6	0 = Off, 1 = On		Comp 2	Cool 2
G State – Fan	BD-8	N2 BI (BI)	CSBD BD7	0 = Off, 1 = On	◆	◆	◆
Continued on next page . . .							

Point Name (Cont.)	TEC Point Type/ Addr.	N30 (CPN/ FAC) Object Type	BAS Model Point Type	Override Range	TEC 1101	TEC 1102	TEC 1103
Temp Units <sup>ac</sup>	BD-9	N2 BO (BO)	See Footnote c.	0 = °C, 1 = °F	◆	◆	◆
Wrench BI <sup>b</sup>	BI-1	N2 BI (BI)	CSBI BI1	0 = Normal, 1 = Alarm		◆	◆
Temp Alarm <sup>b</sup>	BI-2	N2 BI (BI)	CSBI BI2	0 = Normal, 1 = Alarm	◆	◆	◆
Filter <sup>b</sup>	BI-3	N2 BI (BI)	CSBI BI3	0 = Normal, 1 = Alarm		◆	◆

Notes:

- a Commandable
- b Can be a COS alarm to the BAS or NDM to initiate a dial-out.
- c On the Metasys NCM system, map BD9 **Temp Units Mode** as a Binary Output (BO) object with Auto Restore and Local Control set.
- d AIs are commandable in the Companion/Facilitator system.
- e The Multiple Command Output (MCO) object is used to schedule multiple Multi-State Objects (MSOs).
- f When defining the N2 MSO object, select TEC Mode from the States Text Menu. Type 5 in the Number of States field if you're using the TEC1102 Heat Pump model, or type 4 for any other model. Mode 4, or Emergency (Auxiliary) Heat (displayed as E ht), is only available on the TEC1102 Heat Pump model.

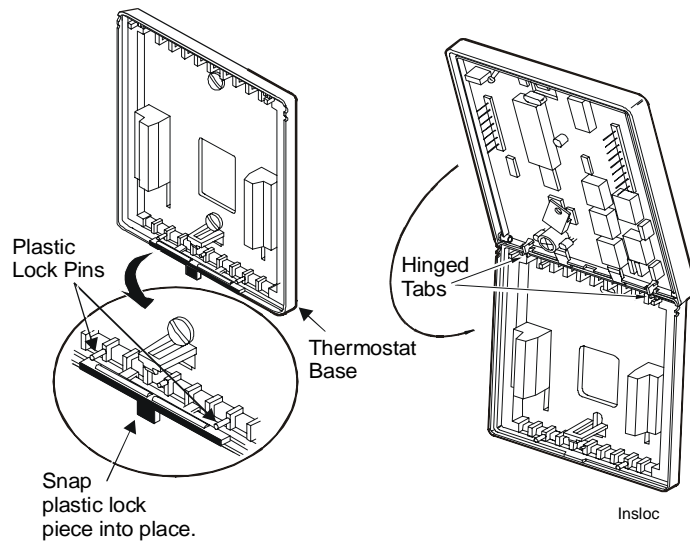
The Controller Point Type is the fixed point definition inside the controller. The CPN/FAC point is the software point definition inside the Companion software. The BAS Model Point type is the definition inside the model file. An NCM CS object must be used to retrieve the data.

Control of the Analog Data (AD) objects is the last command received is the one that controls the thermostat. For example, if the Metasys system sends a Night override, but the occupant selects Day mode, the TEC goes into Day mode.

## Installing the Thermostat Cover Lock

To install the thermostat cover lock:

1. Place the ends of the lock piece (included with unit) under the lock pins extending from the bottom of the mounted base. The tab in the middle of the lock piece extends downward from the mounted base (Figure 13).
2. Press the lock piece up and into the base while gently prying open the thermostat to release the lock. Use caution to avoid cracking the thermostat base or cover.



**Figure 13: Installing the Thermostat Cover Lock**

### **Reattaching the Thermostat**

To reattach the thermostat:

1. Position the thermostat inside the cover, and attach on the hinged tabs located at the top of the base.
2. Swing the thermostat and cover down.
3. Press on the bottom center edge until the plastic lock snaps in place (Figure 13).

**TEC1100  
Features**

**Table 12: TEC1100 Features**

<b>Feature</b>	<b>Description</b>
<b>Control Algorithm</b>	<p>Over time, the TEC1100 learns how long it takes the system to meet the load. If the system can change the room temperature quickly, the TEC1100 allows the thermostat to drift further from setpoint before starting the equipment. If the system takes a longer period of time to change the room temperature, the TEC1100 does not allow the temperature to drift as far from setpoint. The TEC1100 also takes into account the minimum On/Off times.</p> <p>The 2-minute On/Off time allows the equipment to cycle more frequently at smaller differentials than the 4-minute On/Off time.</p> <p>For multistage applications, the TEC1100 does not bring on the next stage of cooling or heating if it knows that the system can change the temperature by 6° in one hour or 1° in 10 minutes. To verify thermostat operation, force the next stage on by changing the setpoint by more than 2° (see the <i>Verifying Proper Thermostat Operation</i> section).</p>
<b>Clock Terminals CLK1 - CLK2</b>	<p>The TEC1100 thermostat accepts a contact closure for a clock/timer to allow the use of alternate or setback heating and cooling setpoints in place of a BAS.</p> <p>When the contact is open, the Day icon (☀) appears, and the thermostat adjusts to the day setpoint. When the contact is closed, the Night icon (☾) appears, and the thermostat adjusts to the night setpoint. Pressing the <b>Day/Night</b> button when the thermostat is in Night mode switches the thermostat to Day mode, even if a clock/timer is used. The Clock (CLK) contacts on the thermostat are in parallel with the thermostat <b>Day/Night</b> button and changes to the next command given by the clock. Therefore, if the thermostat is in Night mode (contacts closed) and the thermostat is switched to the Day mode from the front panel, then at the next clock control time, the thermostat stays in the Day mode. When the contacts close again the following night, the thermostat switches to night setpoints.</p>
<b>Temporary Occupied with Keyboard Lock</b>	<p>When in Night mode, select this feature by pushing <b>Day/Night</b> button to put TEC1100 in 1-hour timed override to occupied setpoints.</p>
<b>Remote Sensor</b>	<p>When using a remote sensor (SEN-500-1), the TEC1100 internal sensor is disabled. If two to six remote sensors are connected, then they can be used for temperature averaging. See the <i>SEN-500-1 Remote Indoor Temperature Sensor Product/Technical Bulletin (LIT-216504)</i> for more information.</p>
<b>Outdoor/Duct Temperature Sensor</b>	<p>There are two separate analog inputs on the TEC1100, which are the room sensor and a duct or outdoor air sensor on a slave bus. The duct temperature appears when the <b>Outdoor</b> button is pushed. On the TEC1101 and TEC1103, the outdoor/duct sensor is simply a monitor of temperature. On the TEC1102, the Outdoor temperature provides a low temperature lockout (see <i>Displaying Outdoor/Duct Air Temperature</i> under the <i>Commissioning</i> section later in this document). Both of these can be displayed on the LCD or at the Metasys system. The Outdoor temperature can be a global N2 Override from a single sensor. For wiring information, refer to the <i>SEN-500-2 and SEN-500-3 Outdoor Air Temperature Sensors Product/Technical Bulletin (LIT-216179)</i>.</p>
<b>Power Failures or N2 Failures</b>	<p>In the event of a power failure, or 10 minutes after an N2 communication loss, the thermostat retains the last setpoints. When power is restored, it remains in normal operation and does not require resetting. If power was lost when the thermostat was in Night mode, it returns to Day mode.</p>
<b>N2 Dial Module (NDM)</b>	<p>There are three binary input points to cause a COS that triggers the remote NDM to dial out. Binary Inputs 1 and 3 (wrench and filter) are general purpose inputs powered by 24 VAC or 22-30 VDC. Binary Input 2 is the Temperature Alarm binary data point that causes a COS if the zone temperature is moving away from the setpoint after 45 minutes. The COSs operate regardless of which stages are on. Overrides remain after the NDM hangs up.</p>
<b>N2 Address</b>	<p>Push <b>Fan</b> and <b>Mode</b> buttons simultaneously and hold for 10 seconds to view address.</p>

---

## Commissioning

### Verifying Proper Thermostat Operation

To verify proper thermostat operation:











1. Press the **Mode** button to select the Heating or Cooling mode.
2. Press the  $\vee$  or  $\wedge$  buttons to raise the setpoint above or below the current ambient temperature. The thermostat calls for either heating or cooling.

To energize each stage of heating quickly, set the heating setpoint 2°F above the present room temperature. Wait for the Heat icon displayed on the Liquid Crystal Display (LCD). For example, if the room temperature is 70°F, set the heating setpoint to 72°F. The first stage of heating should energize. Once the Heat icon is off, readjust the setpoint 2°F above the last setpoint (for example, 74°F). When the Heat icon is off, adjust the setpoint 2°F higher (76°F), to energize the auxiliary heat (TEC1102 model only).

### Selecting an Operation Mode

Press the **Mode** button to select from the modes listed in Table 13.

**Table 13: TEC1100 Series Thermostat Modes**


Mode	Description
 <b>COOL</b>	When the Snowflake icon (  ) and the word <b>COOL</b> are displayed, the thermostat is in the Cooling mode. When the thermostat is calling for cooling, the snowflake blinks.
 <b>HEAT</b>	When the Flame icon (  ) and the word <b>HEAT</b> are displayed, the thermostat is in the Heating mode. When the thermostat is calling for heating, the flame blinks.
 <b>E Ht</b>	When the Flame icon (  ) and <b>E Ht</b> (emergency heat) are displayed, the thermostat operates using the emergency heat with the compressor locked out (TEC1102 Heat Pump only).
  <b>Auto</b>	When the Snowflake (  ) and the Flame (  ) icons and the word <b>Auto</b> are displayed, the thermostat automatically changes over between heating and cooling.
<b>OFF</b>	When <b>OFF</b> is displayed, the equipment does not operate.

Note: The thermostat never allows less than 1°C (2°F) difference between cooling and heating setpoints. Use caution when using the OFF mode in extremely cold weather.



### Selecting a Temperature Scale

Press the  $\vee$  and  $\wedge$  buttons simultaneously to alternate between Celsius and Fahrenheit display. This does not affect the BAS display. For example, hotel room temperature can be displayed in °F on the Companion system, but a hotel guest can switch the local display to °C. If power loss occurs, the TEC reverts to the last network command (in this example, °F).

### Selecting Fan Operation

For continuous operation, press the **Fan** button and the Fan icon (). If the **Fan** button has not been selected, the fan operates automatically on a call for heat or cool (no fan symbol appears).

### Displaying Outdoor/Duct Air Temperature

When an outdoor or duct temperature sensor (order separately) is connected to the TEC1100 thermostat or if the outdoor air temperature is available from the N2 network, press the **Outdoor** button. The temperature is displayed along with corresponding icons ( ). The Metasys BAS can display the Outdoor Duct Air temperature when mapped back. The TEC1102 uses the outdoor air sensor or N2 value for low temperature compressor lockout and high temperature heating lockout. When there is no N2 command and the sensor option is not connected, the thermostat displays --- when the button is pushed.

### Setting the Electronic Outdoor High and Low Balance Points

To use outdoor air lockout, you must set the high and low balance points. Any outdoor temperature above the high balance point locks out the auxiliary heat, and any outdoor temperature below the high balance point allows the auxiliary heat to run when called for by the thermostat. Similarly, any outdoor temperature below the low balance point locks out the compressor, and any temperature above the low balance point allows the compressor to run when called for by the thermostat. Both balance points can be set from -48 to 50°C (-55 to 125°F).

Note: To set the high and low balance points, an outdoor sensor must be attached to the unit.

To set the high and low balance points for outdoor air lockout:

1. Press and hold the **Outdoor** button, then press the **Mode** button. **HibP** appears in the display, meaning high balance point, along with the current balance setpoint.
2. Press the  $\vee$  and  $\wedge$  buttons to set the high balance point temperature.
3. Press the **Outdoor** button. **LobP** appears in the display, meaning low balance point, along with the current balance setpoint.
4. Press the  $\vee$  and  $\wedge$  buttons to set the low balance point temperature.
5. Press the **Mode** button to resume operation.

## Selecting Day or Night Mode (☀ ☾)

When the TEC1100 Series thermostat is first installed, or after a power loss, the display shows the Day icon (☀) and the temperature. Once the BAS overrides the Day/Night mode, the corresponding symbol appears.

To select Day or Night mode:

- use BAS to schedule the Day/Night modes through the occupancy binary data point, or
- press the **Day/Night** icon (☀ ☾), or
- install a time clock using the CLK1 and CLK2 terminals, to activate the thermostat's Night mode

## Sensor Calibration

The internal and remote sensors can be calibrated to eliminate wire resistance errors or to match another reference.

To calibrate the thermostat:

1. Press and hold the **Fan** button for 10 seconds.
2. Adjust the temperature with the  $\vee$  and  $\wedge$  buttons. The temperature is shown on the lower display to the hundredth place. For example, 72°F on the large display is shown as 72 13.
3. Press the **Fan** button again to accept the reading.

## Setting the Thermostat Setpoints

To set the thermostat setpoints:

1. Press the **Day/Night** button until the Day icon (☀) appears.
2. Set the mode to Cool (❄).
3. Select the desired temperature for equipment to maintain during the day while in the Cooling mode, using the  $\vee$  or  $\wedge$  buttons. The cooling setpoint range is 16 to 40°C (60 to 88°F).
4. Set the mode to Heat (🔥).
5. Select the desired temperature for equipment to maintain during the day while in the Heating mode using the  $\vee$  or  $\wedge$  buttons. The heating setpoint range is 5 to 30°C (38 to 88°F).
6. Press the **Day/Night** button until the Night icon (☾) appears.
7. Repeat Steps 2 through 5 for the night setpoints.
8. Verify N2 address is not inadvertently changed.

## Keyboard Locked

The Keyboard Lock is selected by setting the DIP switch. The Locked icon (🔒) appears on the display when any button is pressed. Use keyboard lock to put the TEC into occupied setpoints for one hour. All the TEC values may be overridden from the Operator Workstation (OWS).

## Troubleshooting

### N2 Bus Configuration Troubleshooting

See Table 14 if the TEC1100 thermostat does not function properly during N2 Bus Configuration.


**Table 14: N2 Bus Configuration Troubleshooting**

Error/Trouble Condition	Possible Causes	Solution
<b>TEC1100 cycles online and offline.</b>	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> .
<b>TEC1100 does not come online.</b>	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.
	TEC1100 does not have power.	Apply power to the TEC1100.
	N2 cable runs are broken.	Locate and correct the wiring.
	Device type is incorrect.	TEC1100 address must be VND device type.
<b>Entire N2 Bus is offline.</b>	EOL jumpers on MM-CVT101 or NCM are not installed.	Install EOL jumpers properly.
	MM-CVT101 is not plugged into Personal Computer (PC) or 120 VAC source.	Plug MM-CVT101 into PC or plug it into a 120 VAC source.
	Wiring near the BAS is broken.	Repair the wiring.
	No point mapping entered	Define the BAS database.

**Occupant  
Hot/Cold  
Complaints  
Troubleshooting**

Zone temperature control problems, usually reported as occupant hot/cold complaints, can have causes ranging from the building or mechanical system to the control components. Table 15 helps locate the cause of zone temperature control problems with TEC1100 Series thermostats.

**Table 15: TEC1100 Series Thermostat Troubleshooting**

Symptom	Possible Cause	Corrective Action
<b>No display/faint display</b>	Supply voltage incorrect.	Use a voltmeter to check the voltage between the 24 V and 24 V(c) terminals. Voltage should be between 20-30 VAC. If voltage is less than 20 VAC, disconnect the thermostat and check the voltage between 24 V and the other system wires; see possible causes below. If voltage is greater than 30 VAC, troubleshoot the power source and replace the thermostat.
	System transformer weak or overloaded.	Check and/or replace with a suitable 24 V transformer.
	Thermostat damaged because system voltage was greater than 30 VAC.	Replace with new thermostat, and ensure new thermostat is isolated from the system using suitable relays and a transformer of the proper rating.
<b>Keyboard inoperative.</b> 	Keyboard is locked.	Switch the keyboard DIP switch to the unlocked position.
<b>Thermostat does not call for heat.</b>	Short cycle delay still in progress	Wait 2 to 4 minutes for the equipment short cycle protection to complete.
	Thermostat setpoint is satisfied.	Press <b>Mode</b> button until thermostat is in heat mode. Raise the heating setpoint using the $\wedge$ button.
<b>Thermostat does not call for cooling.</b>	Short cycle delay still in progress	Wait 2 to 4 minutes for the equipment short cycle protection to complete.
	Thermostat setpoint is satisfied.	Lower the cooling setpoint using the $\vee$ button.
<b>Fan does not turn on with the system.</b>	Fan failure	Place a wire between Terminals R and G. Fan should turn on. If it does not, troubleshoot the fan system. If fan contact does not energize, replace the thermostat.
	Plenum temperature switch failure	In Heat mode with a separate plenum switch, the fan does not turn on until the plenum is up to its preset temperature. Replace the plenum switch.
<b>“AC” is flashing in the LCD.</b>	20-30 VAC absent from R and C terminals	Using a voltmeter, measure voltage between the 24 V and 24 V(c) terminals. If the reading is less than 20 VAC, check system transformer. If the voltage is between 20 and 30 VAC, replace the thermostat.
<b>LCD shows missing or extra segments.</b>	LCD failure	Replace the unit.
<b>-55 appears when Outdoor button is pushed.</b>	The sensor wire is open inside the outdoor/duct sensor module.	Repair or replace the sensor element (SEN-500-604 or SEN-500-605; see the <i>SEN-500-2 and SEN-500-3 Outdoor Air Temperature Sensors Product/Technical Bulletin [LIT-216179]</i> for more information).
<b>“-- -- --” appears.</b>	Miswired outdoor air sensor or N2 override missing	Add the sensor. Check the N2 command.



Controls Group  
507 E. Michigan Street  
P.O. Box 423  
Milwaukee, WI 53201

www.johnsoncontrols.com  
Printed in U.S.A.