NETWORK thermostat

TEC-N2 Series Thermostat

Introduction

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), Companion™ , and Facilitator™ supervisory systems. The specific system names are used when referring to system specific applications.

Description

The TEC-N2 series includes two nonprogrammable models: multi stage heat pump (HP32-N2) and multi stage gas/electric (GE22-N2). The applications include furnace, air conditioner, heat pump, and rooftop units. The TEC-N2 incorporates fuzzy logic for precise control in a thermostat type package.

All TEC-N2s 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 outside air temperature, to the TEC-N2 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, on a call for heating, the flame icon (◊) blinks. When the temperature is satisfied, neither will blink. In the auto mode, both icons (❄◊) display continuously when satisfied. Light-emitting diodes (LEDs) on the top of both 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.
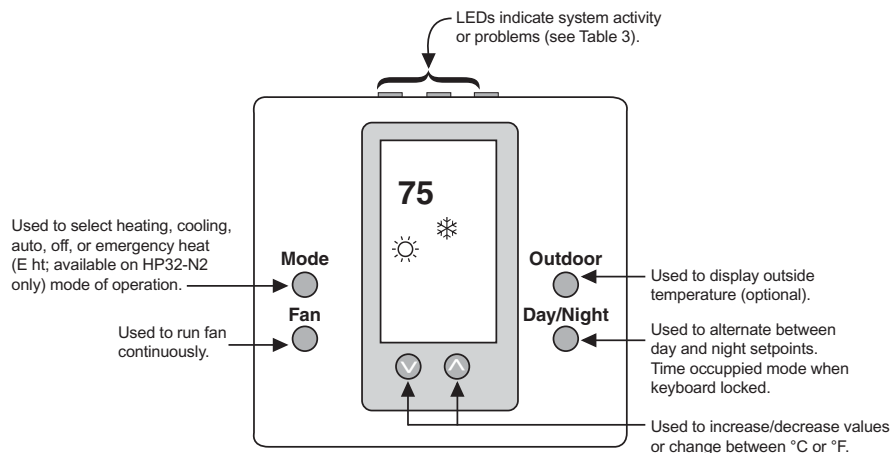

Figure 1: TEC-N2

Table 1: Specifications

Product	HP32-N2	Thermostat with N2 Bus, 3 Heat/2 Cool Heat Pump
	GE22-N2	Thermostat with N2 Bus, 2 Heat/2 Cool
Compatibility	GE22-N2	TEC1101-1 (Johnson Controls)
		TEC1103-1 (Johnson Controls)
	HP32-N2	TEC1102-1 (Johnson Controls)
Power Requirements	20-30 VAC, 50-60 Hz, Class 2, 24 VAC nominal, 2.4 VA maximum not including driven loads	
Relay Contact Rating	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	
Binary Inputs (LED 1, LED 2, CLK1)	20-30 VAC or 22-30 VDC (Negative on 24V [C] terminal). Switches at 2 VDC.	
Recommended Wire Size	18 gauge at 100 feet/22 gauge at 20 feet	
Thermostat Measurement Range	28° to 124°F (0° to 48°C)	
Outdoor Air Temperature Indication Range	-50° to 124°F (-48° to 48°C)	
Control Range	Heating: 38° to 88°F in 1° increments (5° to 30°C in 1° increments) Cooling: 60° to 88°F in 1° increments 16° to 40°C in 1° increments)	
Display Resolution	1°F (1°C)	
Minimum Deadband	1°F (2°C) between heating and cooling	
°C/°F Conversion	20°C = 68°F, each Celsius degree above or below 20°C is 2°F	
N2 Communications	Isolated bi-directional, RS-485, 9600 baud	
Ambient Operating Conditions	32° to 131°F (0° to 55°C); 5% to 90% RH noncondensing	
Ambient Storage Temperatures	-30° to 131°F (-34° to 55°C)	
Dimensions (H x W x D)	4-1/2 x 4 x 7/8 in. (114.3 x 101.6 x 22.2 mm)	
Shipping Weight	0.37 lb (0.171 kg)	
UL and cUL Listing	UL 873 Multiple Class 2 Device, UL94HB Plastic Enclosure	
CE Compliance	CISPR 22, Residential Class B, CE Directive (89/336/EEC, EN50081/1, EN50082/2) Industrial and Residential	
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.	

Table 2: TEC-N2 Series Accessory Ordering Information

Item	Product Code Number
Optional Accessories (includes mounting hardware)	
Remote or Averaging Indoor Temperature Sensor with Communication Module	NT-IDS
Outdoor Air Sensor with Outdoor Air Temperature Communication Module	NT-ODT
Duct Mounted Supply Air Sensor with Outdoor Air Temperature Communication Module	NT-DSCHG
Duct Mounted Return Air Sensor with Indoor Remote Temperature Communication Module	NT-DUCT

Table 3: Alarm Indicators (AP32-N2 Heat Pump and GE22-N2 Multistage)

LED Position	Function	BI
Right (⚲)	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
Center (no symbol)	(HP32-N2 heat pump only.) Indicates when emergency (auxiliary) heat (`E ht`) is activated. Internally controlled. No COS.	N/A
Left (▦)	Indicates filter needs to be changed. 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
Temperature Alarm (no LED)	If the room temperature is more than 1°F (1°C) away from the setpoint after 45 minutes of operation, a COS will occur 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

Application	Recommended Model
Fan Coil Unit	GE22-N2
Heat Pump	HP32-N2
Unit Heaters	GE22-N2
Packaged Rooftop	GE22-N2
Packaged Heating/Cooling	GE22-N2

Installation

**Required
Installation Tools**

The tools needed to install the TEC-N2 series thermostat 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 TEC-N2s.

*Mounting the
TEC-N2 Series
Thermostat*

Note: Mount the TEC-N2 series thermostat on an interior wall, approximately 1.5 m (5 ft) above the floor in a location of average temperature (e.g., 72°F). Do not mount the thermostat on outside walls or behind doors. Be sure to install the thermostat away from direct sunlight or radiant heat, air discharge grilles, stairwells, or outside 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).

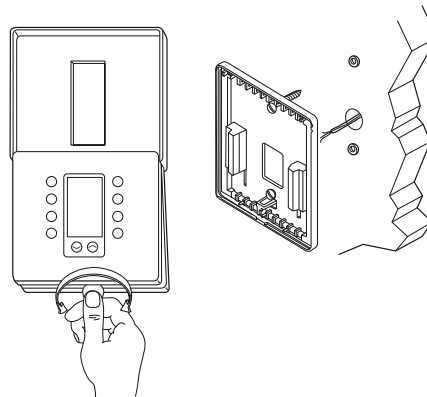3.   Grasp the base from the bottom two corners, and separate from the thermostat.

Figure 2: Separating and Mounting the TEC-N2

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).

Wiring the TEC-N2 Series Thermostats

Follow these steps to wire the TEC-N2s:

1. Connect the wires from the existing system to the thermostat terminals. Refer to Figure 3, and Figure 5 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 TEC-N2 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.

Table 5: HP32-N2 Heat Pump DIP Switch Selections

DIP Switch	Selection	Description
1	On	Compressor/Auxiliary Interlocked: turns off the compressor when the auxiliary heat (E Ht) is on. The compressor will remain 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. **DAY/NIGHT** 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 1°F (0.5°C) for 1.5 hours.
	Off	Economy: minimizes the use of auxiliary heat. If the room temperature error is 1°F (0.5°C) 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.

*Note: When DIP switch 4 is on, only the **DAY/NIGHT** mode button can be used to select 1-hour override to occupied setpoints if in night mode. All other buttons are read-only. The N2 address can also be viewed.
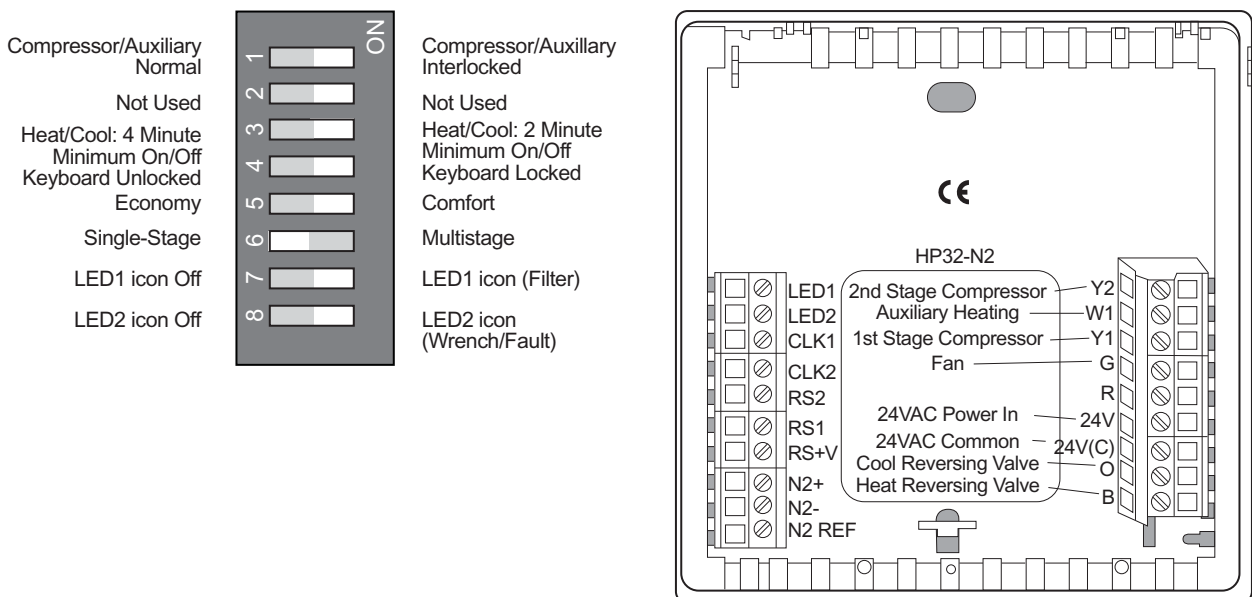

Figure 3: HP32-N2 Heat Pump, Factory-Set DIP Switch Settings, and Wiring Configuration

Table 6: HP32-N2 Heat Pump Output Terminal Designations

| Terminal	Function
Y2	Energizes compressor 2 on call for second stage heating or cooling.
W1	Energizes auxiliary heat as third stage heating or emergency heat.
Y1	Energizes compressor 1 on call for first stage heating or cooling.
G	Energizes fan on call for heating or cooling or by pressing **FAN** button.
R	Provides independent switching voltage.
24V	Provides 24 VAC from equipment transformer.
24V(c)	Provides 24 VAC (common) from equipment transformer.
LED 1, LED 2	LED 1 or LED 2 contact closure to 24 VAC from remote switch.
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.
O	Energizes reversing valve in the cooling mode.
B	Energizes reversing valve in the heating mode.
N2+, N2-, Ref	N2 Bus
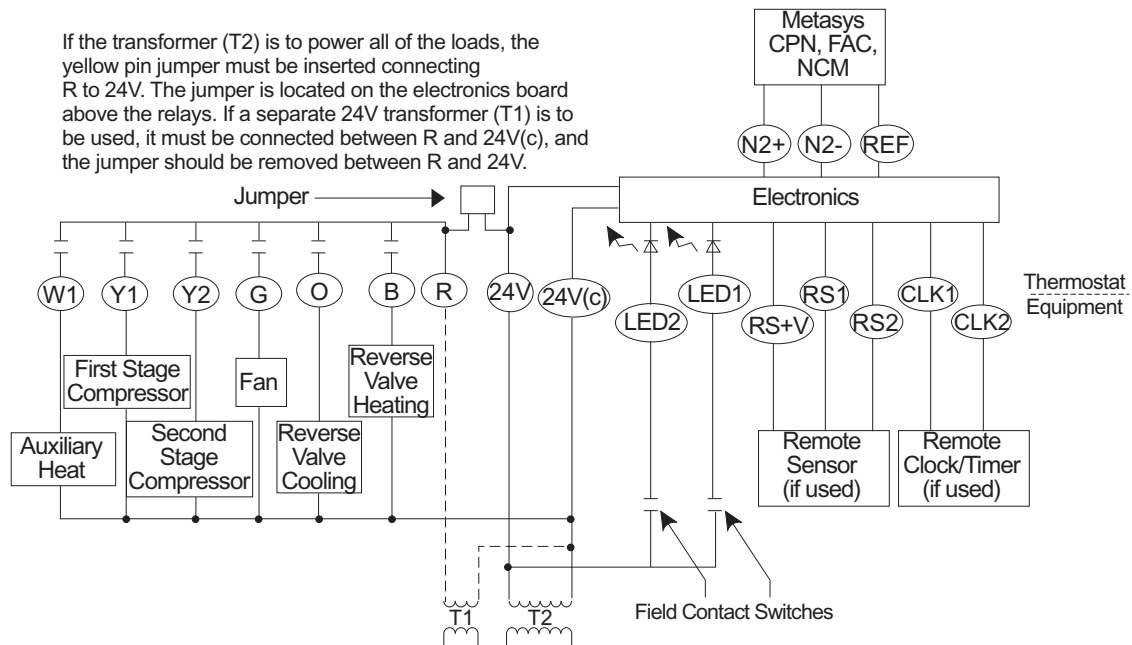
Figure 4: HP32-N2 Heat Pump Wiring Schematic

Table 7: GE22-N2 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 **DAY/NIGHT** 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.

*Note: When DIP switch 2 is on, only the **DAY/NIGHT** mode button can be used to select 1-hour override to occupied setpoints if in night mode. All other buttons are read-only. The N2 address can also be viewed.
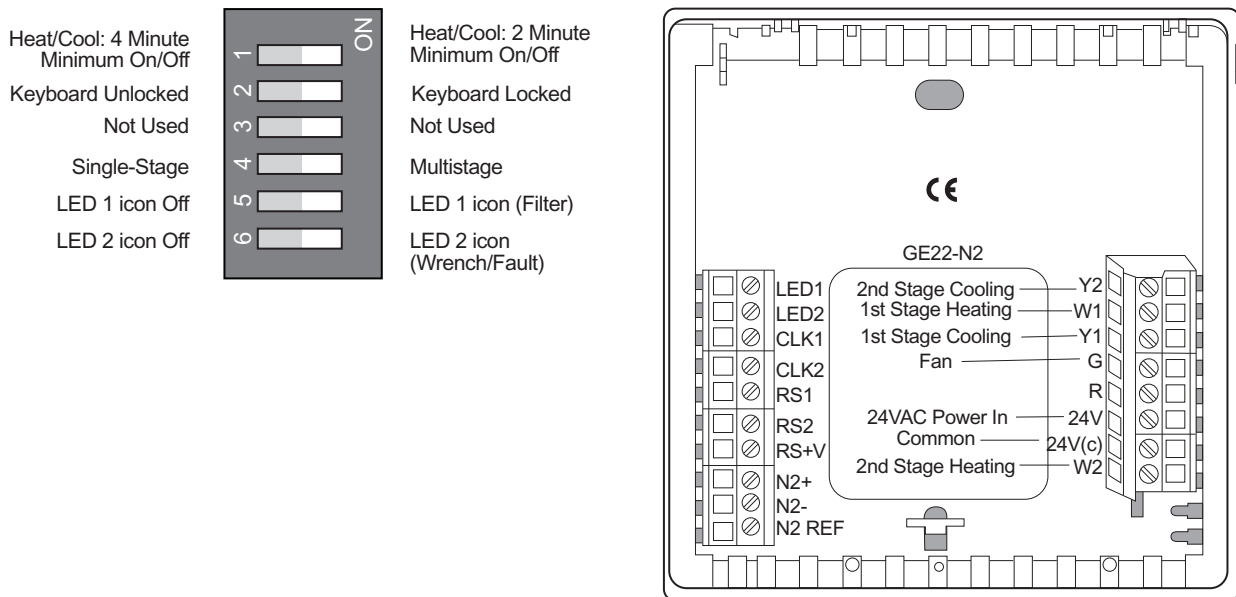

Figure 5: GE22-N2 Multistage Factory-Set DIP Switch Setting and Wiring Configuration

Table 8: GE22-N2 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 **FAN** 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

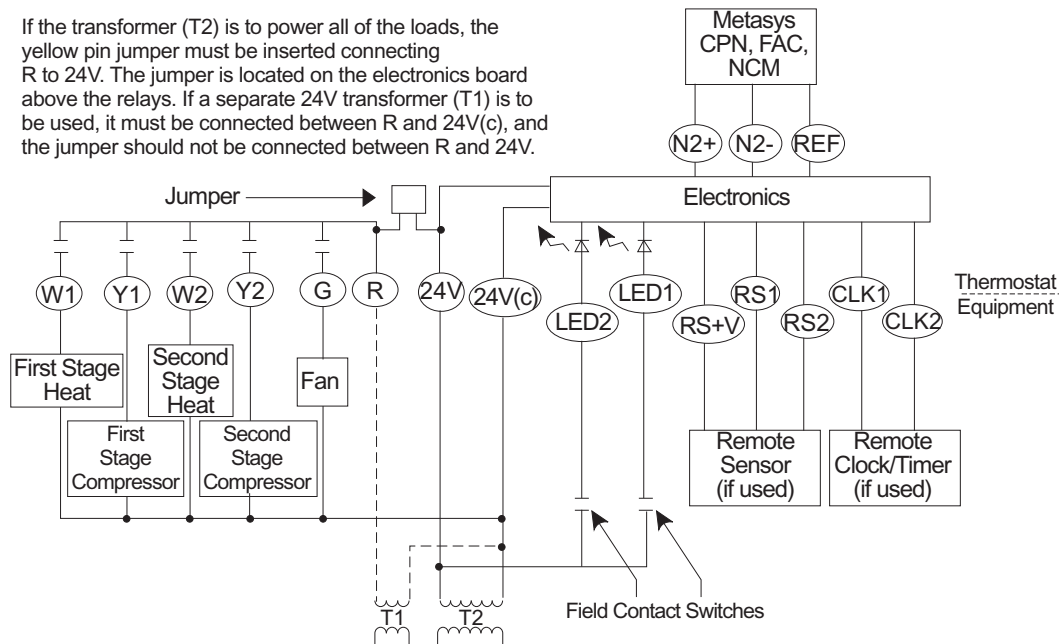**Figure 6: GE22-N2 Multistage Wiring Schematic**

Connecting the N2 Bus

To connect the N2 Bus:

1. Observe the polarity when connecting the N2 Bus wires to the TEC-N2.

    Note: Each TEC-N2 has self-terminating End-of-Line (EOL) resistors. However, one EOL is needed at the BAS (two are preferred at opposite ends).

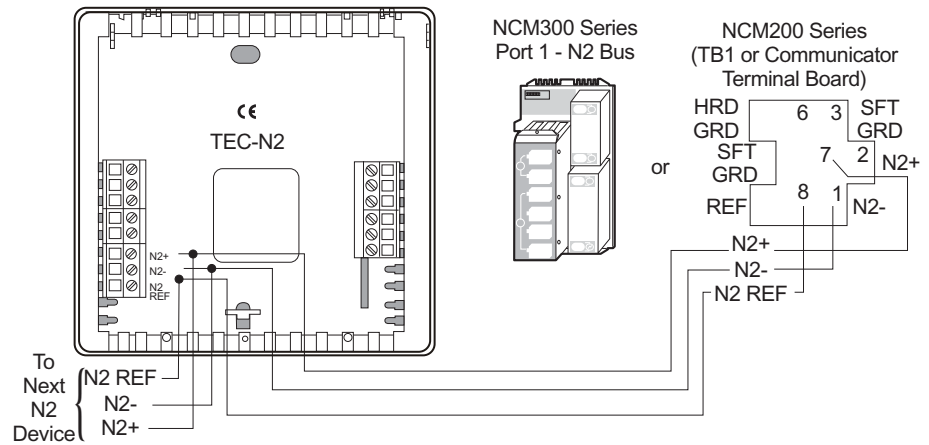2. Continue this process for each TEC-N2 using the daisy chain wiring method (Figure 7).

Figure 7: Connecting the TEC-N2 to an NCM
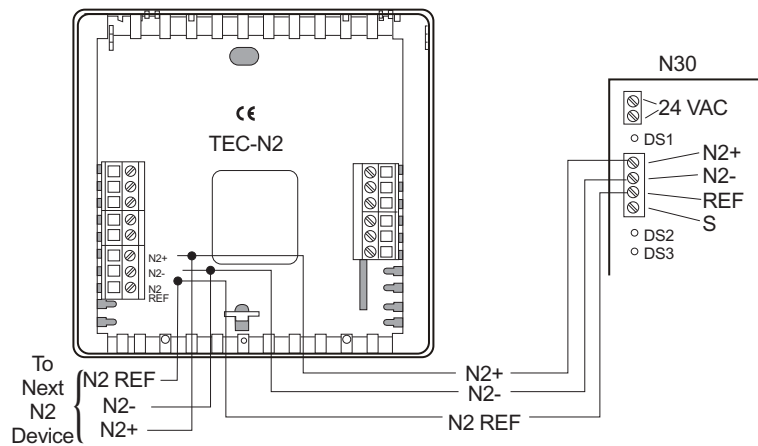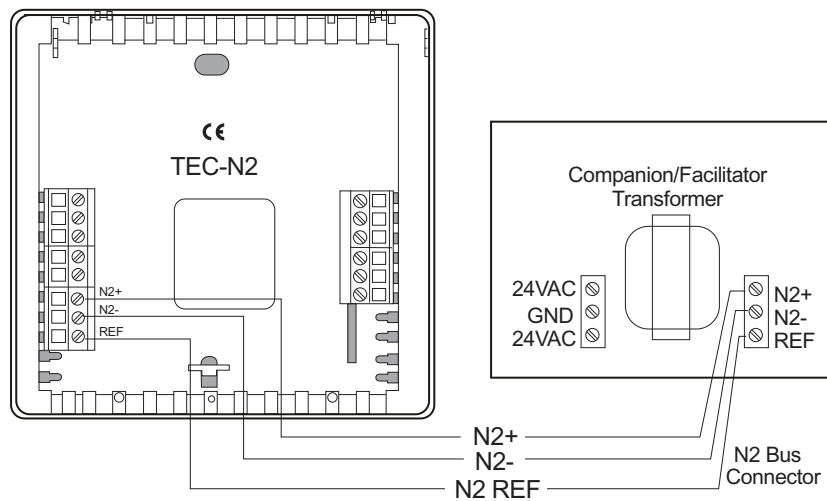
Connecting to N30 Series

Figure 8: Connecting the TEC-N2 to the N30 Series

Connecting to the Companion/Facilitator System

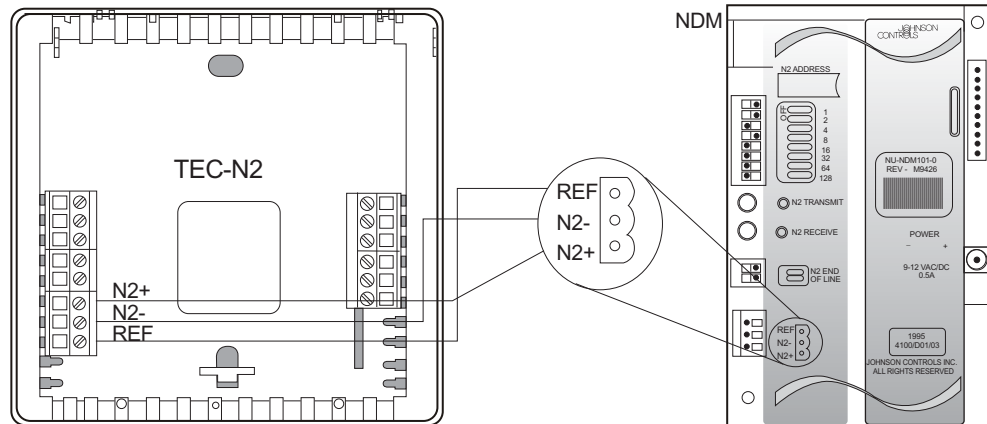**Figure 9: Connecting the TEC-N2 to the Companion/Facilitator System**

Connecting to NDM

Figure 10: Connecting the TEC-N2 to the NDM

Setting the N2 Address

To set the N2 Address:

1. Push the **FAN** and **MODE** buttons simultaneously for ten seconds after power up. The lower section of the display shows the current N2 address.

2. Push the ∨ or ∧ buttons to change the address (1-253). Map the TEC-N2 into CPN/FAC/NCM/N30 series as a vendor device (VND).

3. Push any button to exit this mode, or wait five 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 TEC-N2 as a VND. For the NCM, do **not** direct map any points. Run control of these points through the Control System (CS) object only.

Note: For the TEC-N2, do not use the Adjust command with the Companion/Facilitator (CPN/FAC) system, since it is not supported. The TEC-N2 responds with an offline message but continues to operate normally.

Table 9: N2 Bus Objects

Point Name	TEC-N2 Point Type/ Addr	N30 (CPN/ FAC) Object Type	BAS Model Point Type	Override Range	HP32-N2	GE22-N2
Room Temp	ADI-1	N2 AI (AI)[d]	CSAD ADI1	0° to 48°C (28° to 124°F)	♦	♦
Outdoor Temp[a]	ADI-2	N2 AI (AI)[d]	CSAD ADI2	-48° to 48°C (-54° to 124°F)	♦	♦
Heating SP[a]	ADI-3	N2 AO (AO)	CSAD ADI3	1° to 47°C (29° to 99°F)	♦	♦
Cooling SP[a]	ADI-4	N2 AO (AO)	CSAD ADI4	1° to 47°C (29° to 99°F)	♦	♦
Setback Heating SP[a]	ADI-5	N2 AO (AO)	CSAD ADI5	1° to 47°C (29° to 99°F)	♦	♦
Setback Cooling SP[a]	ADI-6	N2 AO (AO)	CSAD ADI6	1° to 47°C (29° to 99°F)	♦	♦
Minimum Heat SP[a]	ADI-7	N2 AO (AO)	CSAD ADI7	1° to 47°C (29° to 99°F)	♦	♦
Maximum Heat SP[a]	ADI-8	N2 AO (AO)	CSAD ADI8	1° to 47°C (29° to 99°F)	♦	♦
Minimum Cool SP[a]	ADI-9	N2 AO (AO)	CSAD ADI9	1° to 47°C (29° to 99°F)	♦	♦
Maximum Cool SP[a]	ADI-10	N2 AO (AO)	CSAD ADI10	1° to 47°C (29° to 99°F)	♦	♦
Fan[a]	BD-1	N2 BO (BO)	CSBD BD1	0 = Off/Auto, 1 = On/MAN	♦	♦
Mode[a]	BD-2	N2 MSO[ef] (AO)	CSMS BD2	0 = Off 1= Cool, 2 = Heat, 3= Auto, 4 = E Ht (Aux Heat)[f]	Mode 0-4	Mode 0-3
Occupancy[a]	BD-3	N2 BO (BO)	CSBD BD3	0 = Unoccupied, 1 = Occupied	♦	♦
W1 State	BD-4	N2 BI (BI)	CSBD BD4	0 = Off, 1 = On	E Heat	Heat 1
W2 State or Heat Pump O/B	BD-5	N2 BI (BI)	CSBD BD5	0 = Off, 1 = On	Heat Pump O/B	Heat 2
Y1 State	BD-6	N2 BI (BI)	CSBD BD6	0 = Off, 1 = On	Comp 1	Cool 1
Y2 State	BD-7	N2 BI (BI)	CSBD BD7	0 = Off, 1 = On	Comp 2	Cool 2
G State – Fan	BD-8	N2 BI (BI)	CSBD BD8	0 = Off, 1 = On	♦	♦
Temp Units[ac]	BD-9	N2 BO (BO)	CSBD BD9	0 = °C, 1 = °F	♦	♦
Wrench BI[b]	BI-1	N2 BI (BI)	CSBI BI1	0 = Normal, 1 = Alarm	♦	♦
Temp Alarm[b]	BI-2	N2 BI (BI)	CSBI BI2	0 = Normal, 1 = Alarm	♦	♦
Filter[b]	BI-3	N2 BI (BI)	CSBI BI3	0 = Normal, 1 = Alarm	♦	♦

Notes: See following page.

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 in a Control System (CS) object with Autorestore 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 HP32-N2 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 HP32-N2 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 11).

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.
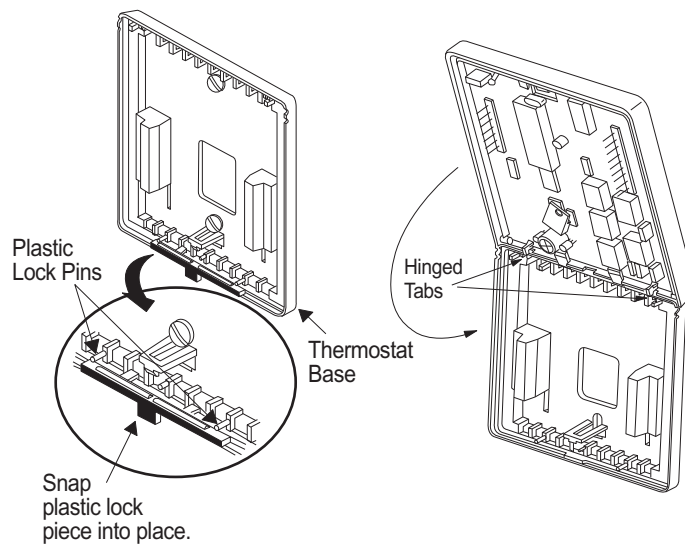

Figure 11: Installing the Thermostat Cover Lock

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 plastic lock snaps in place (Figure 11).

Table 10: TEC-N2 Features

Feature	Description
Control Algorithm	Over time, the TEC-N2 learns how long it takes the system to meet the load. If the system can change the room temperature quickly, the TEC-N2 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 TEC-N2 does not allow the temperature to drift as far from setpoint. The TEC-N2 also takes into account the minimum on/off times.
	The 2-minute on/off time allows the equipment to cycle more frequently at smaller differentials than the 4-minute on/off time.
	For multistage applications, the TEC-N2 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 *Verifying Proper Thermostat Operation* section).
Clock Terminals CLK1 - CLK2	The TEC-N2 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.
	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 **DAY/NIGHT** button when the thermostat is in night mode will switch 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 **DAY/NIGHT** button and will change 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 will stay in the day mode. When the contacts close again the following night, the thermostat will switch to night setpoints.
Temporary Occupied with Keyboard Lock	When in night mode, select this feature by pushing **DAY/NIGHT** button to put TEC-N2 in 1-hour timed override to occupied setpoints.
Remote Sensor	When using a remote sensor (NT-IDS), the TEC-N2 internal sensor is disabled. If two to six remote sensors are connected, then they can be used for temperature averaging.
Outdoor/Duct Temperature Sensor	There are two separate analog inputs on the TEC-N2, which are the room sensor and a duct or outdoor air sensor on a slave bus. The duct temperature displays when the **OUTDOOR** button is pushed. On the GE22-N2, the outdoor/duct sensor simply is a monitor of temperature. On the HP32-N2, the outdoor temperature provides a low temperature lockout (see Displaying Outdoor/Duct Air Temperature under the Commissioning section later in this document). Both of these can be displayed on the LCD at the Metasys system. The outdoor temperature can be a global N2 override from a single sensor.
Power Failures or N2 Failures	In the event of a power failure, or ten 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.
N2 Dial Module (NDM)	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 will cause a COS if the zone temperature is moving away from the setpoint after 45 minutes. The COSs
N2 Address	Push **FAN** and **MODE** buttons simultaneously and hold for ten seconds to view address.

NE+WORK *thermostat*

Verifying Proper Thermostat Operation

To verify proper thermostat operation:

1. Press the **MODE** button to select the heating or cooling mode.

2. Press the ∨ or ∧ 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 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 (HP32-N2 model only).

Selecting an Operation Mode

Press the **MODE** button to select from the modes listed in Table 11.

Table 11: TEC-N2 Series Thermostat Modes

Mode	Description
❄ **COOL**	When the snowflake icon (❄) and the word COOL are displayed, the thermostat is in the cooling mode. When the thermostat is calling for cooling, the snowflake blinks.
🔥 **HEAT**	When the flame icon (🔥) and the word HEAT are displayed, the thermostat is in the heating mode. When the thermostat is calling for heating, the flame blinks.
🔥 **E Ht**	When the flame icon (🔥) and E Ht (emergency heat) are displayed, the thermostat operates using the emergency heat with the compressor locked out (HP32-N2 Heat Pump only).
❄ 🔥 **Auto**	When the snowflake (❄) and the flame (🔥) icons and the word Auto are displayed, the thermostat automatically changes over between heating and cooling.
OFF	When OFF is displayed, the equipment does not operate.

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

Selecting a Temperature Scale	Press the ∨ and ∧ buttons simultaneously to alternate between Celsius and Fahrenheit display. This will 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-N2 reverts to the last network command (in this example, °F).
Selecting Fan Operation	For continuous operation, press the **FAN** button and the fan icon (♣≈) appears. 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 TEC-N2 thermostat or if the outdoor air temperature is available from the N2 network, press the **OUTDOOR** button. The temperature will be displayed along with corresponding icons (♣↓). The Metasys BAS can display the outdoor duct air temperature when mapped back. The HP32-N2 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 outside temperature above the high balance point locks out the auxiliary heat, and any outside temperature below the high balance point allows the auxiliary heat to run when called for by the thermostat. Similarly, any outside temperature below the low balance point will lock 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 ∨ and ∧ 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 ∨ and ∧ buttons to set the low balance point temperature.

5. Press the **MODE** button to resume operation.

Selecting Day or Night Mode (☼ ☽)

When the TEC-N2 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 or night mode, the corresponding symbol will be displayed.

To select day or night mode:

• Use BAS to schedule the day or night modes through the occupancy binary data point, or

• Press the **DAY/NIGHT** button (☼ ☽), 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 ∨ and ∧ buttons. The temperature is shown on the lower display to the hundredths 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 ∨ or ∧ 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 ∨or ∧ 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-N2 into occupied setpoints for one hour. All the TEC-N2 values may be overridden from the Operator Workstation (OWS).

N2 Bus Configuration Troubleshooting

See Table 12 if the TEC-N2 thermostat does not function properly during N2 Bus Configuration.

Table 12: N2 Bus Configuration Troubleshooting

Error/Trouble Condition	Possible Causes	Solution
TEC-N2 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 *Johnson Controls N2 Communications BusTechnical Bulletin (LIT-636018)*.
TEC-N2 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.
	TEC-N2 does not have power.	Apply power to the TEC-N2.
	N2 cable runs are broken.	Locate and correct the wiring.
	Device type is incorrect.	TEC1100 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 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 13 helps locate the cause of zone temperature control problems with TEC-N2 series thermostats.

Table 13: TEC-N2 Series Thermostat Troubleshooting

Symptom	Possible Cause	Corrective Action
No display/faint display.	Supply voltage incorrect.	Use a voltmeter to check the voltage between the 24V and 24V(c) terminals. Voltage should be between 20-30 VAC. If voltage is less than 20 VAC, disconnect the thermostat and check the voltage between 24V 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 24V 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.
Keyboard inoperative. 🔒	Keyboard is locked.	Switch the keyboard DIP switch to the unlocked position.
Thermostat does not call for heat.	Short cycle delay still in progress.	Wait 2 to 4 minutes for the equipment short cycle protection to complete.
	Thermostat setpoint is satisfied.	Press **MODE** button until thermostat is in heat mode. Raise the heating setpoint using the Ÿ button.
Thermostat does not call for cooling.	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 ⁄ button.
Fan does not turn on with the system.	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 will not turn on until the plenum is up to its preset temperature. Replace the plenum switch.
AC is flashing in the LCD.	20-30 VAC absent from R and C terminals.	Using a voltmeter, measure voltage between the 24V and 24V(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.
LCD shows missing or extra segments.	LCD failure.	Replace the unit.
-55 appears when OUTDOOR button is pushed.	The sensor wire is open inside the outdoor/duct sensor module.	Repair or replace the sensor element.
-- -- -- appears.	Miswired outdoor air sensor or N2 override missing.	Add the sensor. Check the N2 command.