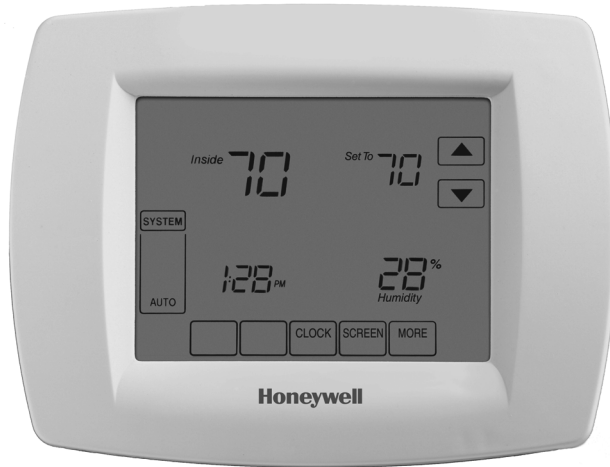


Honeywell

BACnet® Fixed Function Thermostat

FOR FAN COIL/HEAT PUMP/CONVENTIONAL SYSTEMS

INSTALLATION INSTRUCTIONS



Dimensions

The Fixed Function Thermostat consists of a mounting plate and a circuit board with a plastic cover.

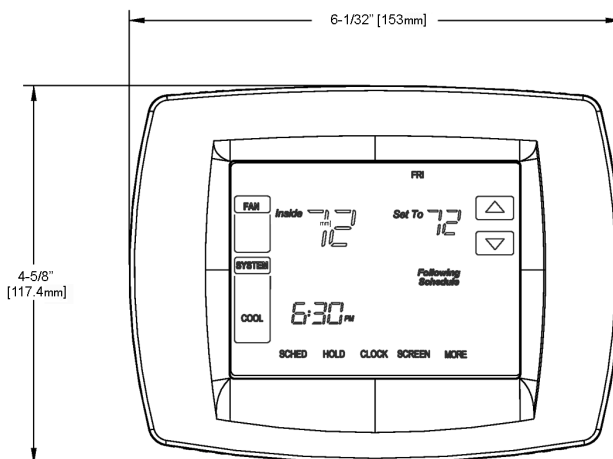


Fig. 1. Fixed Function Thermostat dimensions.

APPLICATION

Honeywell's BACnet® Fixed Function Thermostat, BACnet FF, is a configurable device with 19 pre-loaded applications. The thermostat is a communicating, intelligent sensor-controller combination with built-in temperature and humidity sensors used to control systems such as roof top units, fan-coil units and heat pumps. The thermostat communicates over an MS/TP LAN so it operates as a fully-functioning BACnet controller and easily integrates with the building automation system. The two available models are TB3026B and TB3026B-W, which includes a wireless sensor option.

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check ratings given in instructions and on the product to ensure the product is suitable for the application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.



MERCURY NOTICE

If this control is replacing a control that contains mercury in a sealed tube, do not place your old control in the trash. Dispose of properly.

Contact your local waste management authority for instructions regarding recycling and the proper disposal of an old control. If you have questions, contact Honeywell Customer Care Center.



CAUTION

Electrical Shock or Equipment Damage Hazard.
Can shock individuals or short equipment circuitry.

Disconnect power supply before installation.



31-00093-03

Location

Do not install the thermostat where it can be affected by:

- drafts or dead spots behind doors and in corners.
- hot or cold air from ducts.
- radiant heat from sun or appliances.
- concealed pipes and chimneys.
- unheated (uncooled) areas such as an outside wall behind the thermostat.

IMPORTANT

To avoid electrical interference, which can cause erratic performances, keep wiring runs as short as possible and do not run thermostat wires adjacent to the line voltage electrical distribution systems. Use shielded cable. The cable shield must be grounded only at the controlled equipment case.

WHEN USED TO SENSE ROOM TEMPERATURE

Install the thermostat about 4 ft. (1.2m) above the floor in an area with good air circulation at average temperature. (See Fig. 2.) Confirm mounting height meets Americans with Disabilities Act requirements.

WHEN NOT USED TO SENSE ROOM TEMPERATURE

When using the remote-mounted temperature (and humidity) sensor(s) to sense ambient conditions, install the thermostat in an area that is accessible for setting and adjusting the temperature and settings.

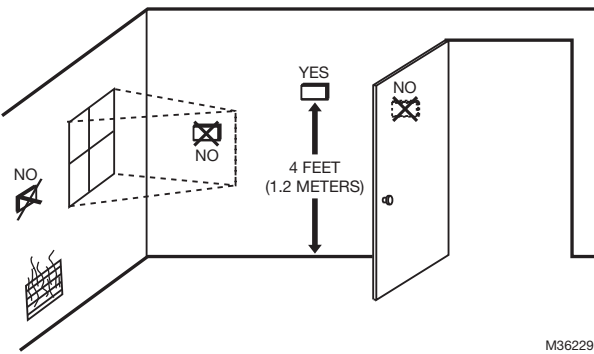


Fig. 2. Typical location of thermostat or remote-mounted sensor.

Mounting Wallplate

The thermostat can be mounted horizontally on the wall or on a 4 in. x 2 in. (101.6 mm x 50.8 mm) wiring box.

1. Position and level the wallplate (for appearance only).
2. Use a pencil to mark the mounting holes (see Fig. 3).
3. Drill two pilot holes in the wall, on the marks. For dry-wall, drill 3/16-in. holes. For firmer material such as plaster, drill 7/32-in. holes. Gently tap anchors (provided) into the pilot holes until flush with the wall.
4. Pull the wires through the wiring opening, and position the wallplate over the mounting holes.
5. Insert the screws into the holes and tighten.

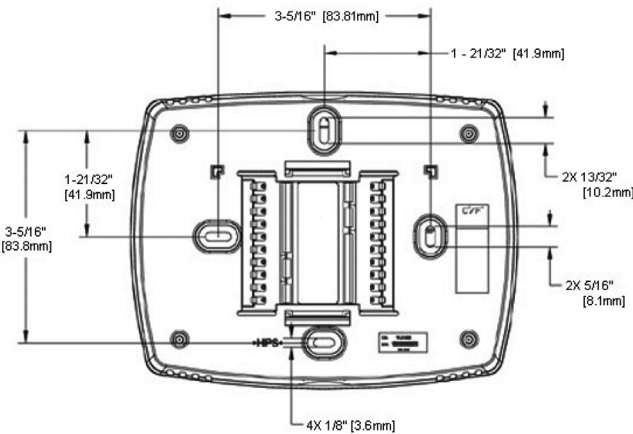


Fig. 3. Wallplate dimensions.

Wiring the Wallplate

IMPORTANT

All wiring must comply with local electrical codes and ordinances.

NOTE: Maximum (and recommended) wire size is 18-gauge. Do not use wire smaller than 22-gauge.

Follow equipment manufacturer wiring instructions when available. A letter code is located near each terminal for identification.



CAUTION

Power must not be connected while wiring. Wiring a unit that is powered may result in electrical shock and/or equipment damage.

1. Connect wires to the terminal blocks. See Fig. 4 for terminal assignments and Table 1 for terminal descriptions.
2. Securely tighten each screw.
3. Push excess wire back into the hole.
4. Plug the hole with non-flammable insulation to prevent drafts from affecting the Fixed Function Thermostat.
5. Check for loose or frayed wire that may cause a short.

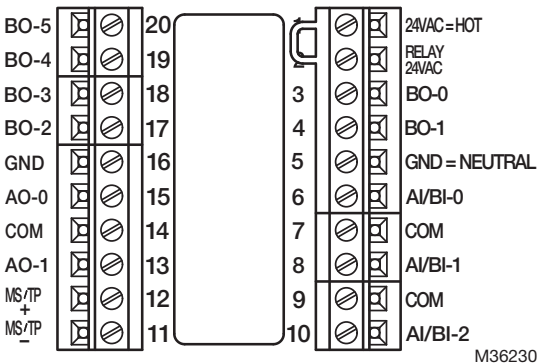


Fig. 4. Fixed Function Thermostat terminal assignments.



WARNING

Do not apply line voltage to source pins.

A jumper is pre-installed between pins 1 and 2. The jumper supplies 24 VAC to BO-1, BO-3, and BO-4 relays. It can be removed if those BOs are powered from an external source. (Note: BO-0, BO-2, and BO-5 relays are powered from terminal 1.)

See BACnet Fixed Function Thermostat System Engineering Guide (31-00098) for typical wiring examples.

Table 1. Terminal Identification.

Terminal	Label	Connection
1	24VAC	24 VAC Power
2	RELAY 24VAC	24 VAC Power
3	BO0	Relay Output
4	BO1	Relay Output
5	GND	Ground
6	AI0	Universal Input
7	COM	Common
8	AI1	Universal Input
9	COM	Common
10	AI2	Universal Input
11	MS/TP -	BACnet® Communications
12	MS/TP +	BACnet® Communications
13	AO1	Analog Output
14	COM	Common
15	AO0	Analog Output
16	GND	Ground
17	BO2	Relay Output
18	BO3	Relay Output
19	BO4	Relay Output
20	BO5	Relay Output

MS/TP LAN Wiring

The BACnet FF communicates on the site-wide BACnet system over a twisted-pair MS/TP LAN, which uses the EIA-485 signaling standard. The BACnet FFs are master devices on the MS/TP LAN.

Each BACnet FF employs a high-quality EIA-485 transceiver and exerts 1/4 unit load on the MS/TP LAN.

Table 2. MS/TP LAN Facts.

Transmission speed	9.6, 19.2, 38.4, 76.8Kbps (configured at global controller).
Layout	Bus (daisy chain).
Cabling	BACnet specifies the following. Shielded, twisted-pair cabling with characteristic impedance between 100 and 130Ω. Distributed capacitance between conductors must be less than 30 pF/foot (100 pF/m). Distributed capacitance between conductor and shield must be less than 60 pF/foot (200 pF/m). Foil or braided shield acceptable.
Segment length	4000 ft. (1071 m.) per segment using recommended wire.
Maximum devices overall	Depends on classification of devices as master or slave. Maximum number of master devices is 128. Maximum number of slave devices or devices overall (mixed master and slave) is 255. This includes BACnet FFs, BACnet global controllers (all are considered masters) and any other devices, regardless of their relative unit loads.
Maximum devices per segment	Depends on relative unit load of devices (see "Terminating MS/TP LAN Cabling" on page 3).
Repeaters	Required when making runs longer than 4000 ft. Three repeaters maximum between any two devices.
Terminating resistors	Matched resistors required at each end of segment bus wired across (+) and (-). Use matched precision resistors rated 1/4 W ±1% / 80 - 130 Ohms.
Shield grounding	Ground shield drain wire at single point earth (panel) ground, not BACnet FF ground. Tape off shield drain wire at other end. Tie shield drain wire through at each BACnet FF.

Terminating MS/TP LAN Cabling

MS/TP terminations are located on the lower left of the BACnet FF wallplate.

Maintain polarity of the MS/TP wire run throughout the MS/TP LAN.

Grounding the MS/TP LAN Shield

Proper shield grounding of the MS/TP cabling can help minimize the risk of communications problems and damage to equipment because of transient voltage spikes (for example, lightning strikes).

Follow these guidelines for grounding MS/TP cable shields:

- Each MS/TP segment should have a single point of shield ground, preferably as close to the middle of the cabling run as possible.
- Do not ground the MS/TP shield using a BACnet FF terminal.

- Never ground both ends of a shield; differences in potential between the grounds may induce current on the shield, causing interference.
- At termination connecting points, tie the shield through with a wire nut.
- At ungrounded, exposed shield points (the end of a segment), tape back the shield to the wire jacket or, for optimum transient shunting, use 100V gas discharge tubes or 120V MOVs between shield and ground.

Terminating Resistors

Matched terminating resistors wired across MS/TP+ and MS/TP- are required at the last device on each end of the MS/TP segment for signal integrity (Fig. 5).

Optimum segment performance typically requires “tuning,” a process by which the value of the terminating resistors is selected based on the wave form of signals on the segment. View wave forms using an industrial scope meter. The goal is to have as square a wave form as possible with an amplitude greater than 200 mV. Resistors affect the wave form as follows:

- When the resistance value decreases, the amplitude of the wave form decreases and becomes more square.
- When the resistance value increases, the amplitude of the wave form increases and becomes less square.

Typically, precision resistors in the range 80-130 Ohms (+1%) yield acceptable results. Ideally, the value of the terminating resistors should match the rated characteristic impedance of the installed cable. For example, if the installed MS/TP cable has a listed characteristic impedance of 100 Ohm, install 100 Ohm matched precision resistors.

CAUTION

Do not mismatch terminating resistors.

Ensure that both resistors on a segment have the same value.

NOTE: Typically, White is Data - and Black is Data +.

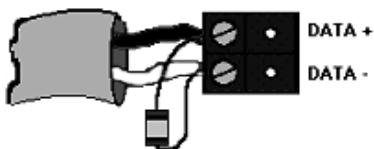


Fig. 5. Terminating resistor detail.

Mounting Thermostat to Wallplate

1. Align the terminal screw blocks with the pins on the back of the thermostat.
2. Push the thermostat straight onto the wallplate.

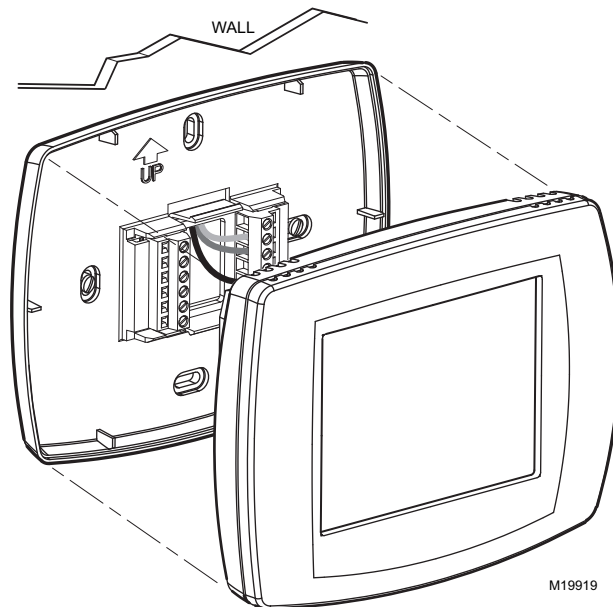


Fig. 6. Thermostat mounting.

NOTE: To remove the thermostat from the wall, first pull out at the bottom of the thermostat; then remove the top.

CONFIGURATION

Once the BACnet FF is mounted and wired, it can be configured using the local touchscreen and a configuration wizard using Niagara Framework® software. When using the software, BACnet data is transmitted to and from the device and building management system using analog values (AVs) and binary values (BVs). Listings of these AVs and BVs can be found in their entirety in the BACnet Fixed Function Thermostat System Engineering Guide (31-00098) and a limited listing can be found on page 6.

Adjusting the Date and Time

When the controller is first powered up, the date and time might need to be set. These are set at the factory, but the on-board power supply may have run down. If this happens, adjust the date and time.

TO ADJUST THE TIME

1. Touch Clock at the bottom of the screen.
2. Use the arrows to adjust the year, month, and day.
3. Press DONE.
4. Adjust the time and press DONE.

Setting the MAC Address and Device Instance

The MS/TP MAC address for each device must be set to a unique value in the range of 0-127 on an MS/TP network segment. The MAC address is set using the installer setup menu through the device's display. The factory default MAC address is 0.

The Device Instance Number must be unique across the entire BACnet system network because it is used to uniquely identify the BACnet devices. It may be used to conveniently identify the BACnet device from other devices during installation. The Device Instance Number is set using the installer setup menu through the device's display or over the BACnet network. The Device Instance Number can be changed by the user, which may be necessary when integrating with a third party or when attempting to replace an existing device and it is desired to maintain the existing Device Instance Number. The factory default Device Instance Number is 0009999 and can range from 0-4194302.

NOTE: The device instance can also be set over the BACnet network.

TO SET THE MAC ADDRESS AND DEVICE INSTANCE AT THE DISPLAY

1. From the home screen, press SYSTEM (left side of the screen). Five blank touch keys will appear at the bottom of the screen.
2. Press and hold the two blank keys on either side of the center key for approximately five seconds (see Fig. 7).

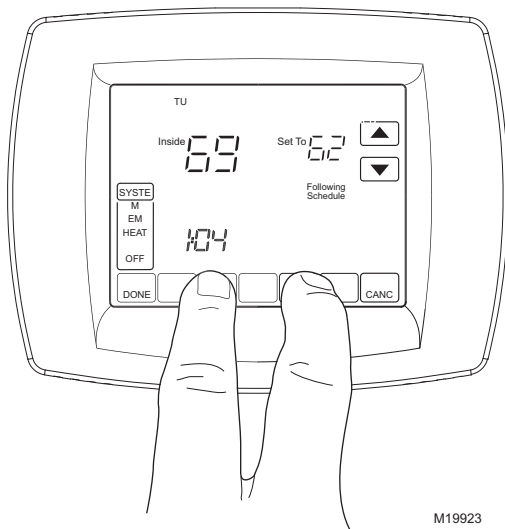


Fig. 7. Entering ISU mode.

The installer setup (ISU) screen appears. An ISU code is displayed in the lower left. It is a four-digit code beginning with zero. The current setting is displayed in the lower right.

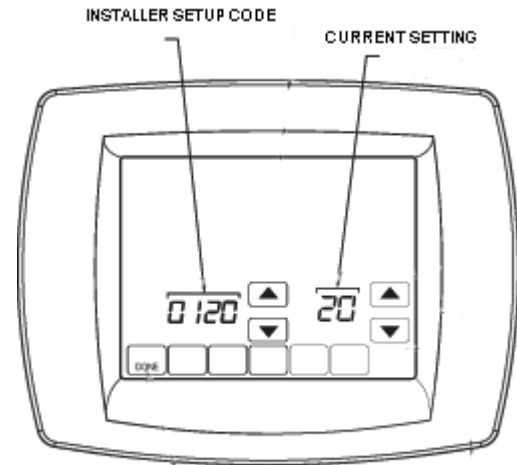


Fig. 8. ISU screen.

3. Use the down arrow next to the installer setup code to advance to ISU code 800.
4. Use the up and down arrows next to the current setting to set ISU code 800 (MAC address) to a value between 0 and 127.

NOTE: Set ISU code 801 (first digit of device instance) to a value between 0 and 4.

5. The device instance is set by entering values in four separate ISU codes. See example on page 5.
6. Set ISU code 802 (second and third digits of device instance) to a value between 00 and 99.
7. Set ISU code 803 (fourth and fifth digits of device instance) to a value between 00 and 99.
8. Set ISU code 804 (sixth and seventh digits of device instance) to a value between 0 and 99.
9. Press Done to exit installer setup.

For example, if the MAC address is 15 and the device instance to 1876, use these settings:

15	0	00	18	76
800	801	802	803	804
MAC ADDRESS	DEVICE INSTANCE NUMBER			

M36231

Fig. 9. Setup codes and device configuration.

Installer Setup (ISU) Codes

Installer setup mode provides access to functions specific to installation of a BACnet FF. Some BACnet FF configuration parameters can be altered from the ISU screens. The ISU parameters can also be accessed via BACnet.

A password (PIN) can be required to access ISU mode by setting AV-133 to a non-zero, four-digit number.

For a complete application configuration guide, refer to the BACnet Fixed Function Thermostat System Engineering Guide (31-00098) and WEBs-AX Configuration Guide (31-00097)

TO ACCESS THE ISU SCREENS

1. From the home screen, press SYSTEM (left side of the screen). Five blank touch keys will appear at the bottom of the screen.
2. Press and hold the two blank keys on either side of the center key for approximately five seconds (see Fig. 7).

3. If a password (PIN) code is required, use the top arrows to select the first two digits of the code and the bottom arrows to select the third and fourth digits of the code, and then press DONE.

The ISU screen appears.

4. Use the arrows to select parameters and values. See Table 3 for details.
5. Press DONE.

NOTE: After five minutes of inactivity, the ISU screen reverts to the main screen.

Table 3. ISU Parameters.

ISU Parameter Code	Description	Allowed Values
120	Year, first 2 digits	19-21
130	Year, second 2 digits	00-99 (00-54 if ISU 200=21)
140	Month	1-12
150	Day	1-31
160	Schedule format BV-133	0 – not programmable (BV-133=0) 4 – 7 day programmable (BV-133=1)
280	Backlight control BV-79	0 – on for 20 seconds after keypress 1 – low always on, bright after keypress
320	Swap English/Metric BV-69	1 – show opposite units to specified in DDC header
330	Daylight saving AV-127	0 – off; no automatic adjustments 1 – pre 2007 scheme 2 – 2007 and later scheme
500	Filter change reminder AV-124	0 – reminder not used 1 – 10 days 2 – 30 days 3 – 60 days 4 – 90 days 5 – 120 days 6 – 365 days
510	Hum pad change reminder AV-125	0 – reminder not used 1 – 90 days 2 – 180 days 3 – 365 days
520	UV lamp change reminder AV-126	0 – reminder not used 1 – 365 days
540	Program periods AV-129	2 – Wake/Sleep 4 – Wake/Leave/Return/Sleep
640	Clock format BV-83	12 – 12 hour (BV-83=0) 24 – 24 hour (BV-83=1)
670	Keypad lock AV-128	0 – no lock 1 – access temperature settings only 2 – fully locked
700	Sensed room temperature offset (AV-138)	-4 to +4 degrees F
701	Sensed room humidity offset (AV-139)	-5% TO +5% Humidity cannot be adjusted above 100% or below 0%.
702	Sensed outside air temperature offset (AV-140)	-4 to +4 degrees F
703	Sensed outside humidity offset (AV-141)	-5% TO +5% Humidity cannot be adjusted above 100% or below 0%.
800	MS/TP MAC	0-127

Table 3. ISU Parameters.

ISU Parameter Code	Description	Allowed Values
801	BACnet Device Instance - first digit	0-4
802	BACnet Device Instance second and third digits	00-99
803	BACnet Device Instance forth and fifth digits	00-99
804	BACnet Device Instance sixth and seventh digits	00-99

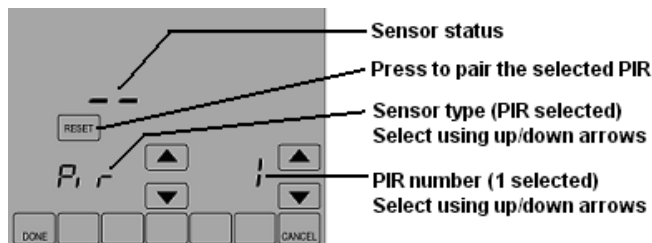
Pairing a Sensor to a Wireless BACnet FF (TB3026B-W Only)

BACnet FFs and sensors ship unpaired, verified by two dashes in the Sensor Status field on the BACnet FF's Wireless Sensor Setup screen. To pair them, issue a pairing command from the BACnet FF and then activate the sensor.

Accessed from Field Service Mode (See "Field Service Mode" on page 7), the BACnet FF's Wireless Sensor Setup Mode includes diagnostic screens for configuration and checkout of associated sensors. With :UC displayed in Field Service Mode, press the blank key (blank area) just to the left of the blank center key, and then press the down arrow key next to the :UC parameter.

Door/window sensors may be paired to any available sensor number in the range 1-8. When cycling through sensor numbers on the Wireless Sensor Setup screen, unpaired sensor numbers show a status of --.

PIR sensors may be paired to any available sensor number in the range 1-3.

**Fig. 10. Wireless Sensor Setup screen.**

TO PAIR A SENSOR TO A BACNET FF

1. Make sure the battery is installed and activated in the sensor.
2. If the sensor is a door/window switch, align the magnet so that the sensor is in the closed position. If the sensor is a PIR sensor, cover the PIR.

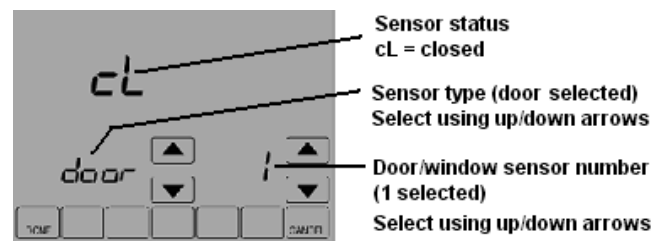
IMPORTANT

Verify that the sliding door/window contact is closed and cover all other PIRs to prevent interference during the pairing process.

3. On the BACnet FF select the sensor to pair and then press Reset. The RESET key disappears and WAIT is displayed indicating that the BACnet FF is waiting to pair the sensor with the next device that receives a radio signal.
4. Activate the sensor to be paired.

NOTE: Pairing times out after 10 seconds of no pairing activity.

5. Verify that the BACnet FF and sensor successfully paired. Paired = sensor status is displayed, replacing --. Timed out = RESET is displayed and sensor status is --.

**Fig. 11. Door sensor number 1 paired and in closed status.**

TO ERASE SENSOR-TO-BACNET FF PAIRINGS

1. While viewing any sensor status screen while pairing is not taking place, press the blank key to the left of CANCEL.
2. Press the blank key to the right of DONE. The sensor status field displays --, indicating unpaired.

FIELD SERVICE MODE

Fixed Field Service Codes

Field service mode enables technicians to query and command key operating variables in the BACnet FF while at the BACnet FF touchscreen. A technician presses a particular key sequence at the BACnet FF to enter field service mode. In field service mode a technician uses the left arrows to scroll through data codes and the right arrows to change the value associated with a code.

The lower left of the LCD shows the two-digit data code and the main area displays the data value. A pre-defined list of data codes is available within the description of each application. See BACnet Fixed Function Thermostat System Engineering Guide (31-00098) for the complete list of setup codes.

Users can be denied access to field service mode by setting BV-68 to ON. A password can also be required to enter field service mode by setting AV-132 to the desired PIN.

Field service mode ends automatically if there is no key activity for five minutes.

Setting Field Service Codes

To set field service codes

1. From the home screen, press SYSTEM. Five blank touch keys will appear at the bottom of the screen.
2. Press and hold the center bottom key for approximately five seconds (see Fig. 12).

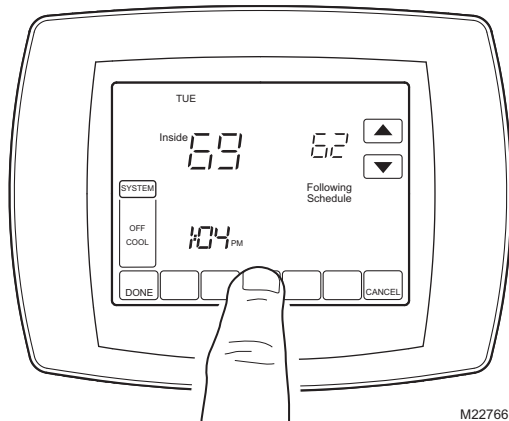


Fig. 12. Entering Field Service mode.

3. The field service screen appears.

NOTE: If a password is required, use the top arrows to select the first two digits of the code and the bottom arrows to select the third and fourth digits of the code, and then press DONE.

4. Press the left up or down arrows until the desired code appears.
5. Press the right up or down arrows to adjust the value associated with the code.
6. Press the left up or down arrows to accept the change and scroll to a different code.
7. Press DONE to exit field service mode.

TECHNICAL DATA

Power

24VAC power from a UL Listed Class-2 24VAC transformer (not provided). The BACnet FF uses a half-wave rectifier to convert the AC power supply to onboard power. This enables multiple devices with half-wave power supplies to be powered from a single, grounded transformer.

⚠ WARNING

Half wave devices and full wave devices must not use the same AC transformer. You must maintain wiring polarity. Failure to do so can result in equipment damage.

If the HVAC equipment has an internal circuit board that is powered by the same transformer that will power the BACnet FF, verify that it is NOT full wave.

Min. Load = 17VA (all BOs OFF).

Max. Load = 89VA (all BOs ON).

If BO power jumper is not removed, then all BOs are powered from the controller's transformer.

Minimum load includes controller and analog outputs at full load (20mA into 500 Ohms).

All BOs are N.O. (Normally Open) contacts with a maximum switch rating of 24VAC @ 0.5A (12VA).

Maximum load assumes all 6 relay output loads are powered from the controller transformer and connected loads are the maximum allowed (24VAC @ 0.5A). Actual power requirements depend on connected loads.

Wireless Receiver (TB3026B-W only)

433.92 Mhz; range is 50 feet.

Inputs

3 universal inputs with 12-bit accuracy, providing controlled voltage, current and resistive modes. Requires a 10k type 2 thermistor when using remote sensors.

Internal Sensors

1 internal temperature sensor, 0–120 deg. F (–17.8–48.9 deg. C); 1 internal humidity, 5–95% RH, non-condensing.

Relay Outputs

6 relay outputs; normally open contacts with a maximum switch rating of 24VAC @ 0.5A (12VA). BO-0, BO-2 and BO-5 are powered from the controller transformer. BO-1, BO-3 and BO-4 are powered from control transformer through removable jumper, allowing these BOs to be powered from a separate power source.

Universal Analog Outputs

2 outputs with 12-bit resolution. Each auto-detects for 0–10VDC or 4–20mA. 4–20mA outputs are sourced by the BACnet FF. Connected loads must return to the BACnet FF ground. The BACnet FF automatically switches from 0–10V mode to 4–20mA current mode when it detects a load value of less than 500 Ohms.

Processor & Memory

Powerful 32-bit processor with extensive flash memory and RAM resources. Flash memory provides nonvolatile program and data storage, and allows for encrypted updates to the program for future product enhancements.

Environmental

Residential, commercial and light-industrial environments. 0–120 deg. F (–17–49 deg. C). 0–95% RH, non-condensing.

Communications

BACnet MS/TP LAN up to 76.8Kbps.

NOTE: MS/TP is Master Slave/Token Passing.

Ratings

Listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the UL Standard for Safety 916; listing includes both U.S. and Canadian certification.

EMC Directive (European CE Mark) EN 60950 (TB30326B-W model only).

FCC Part 15, Class B.

Accessories

50037735-001 Wireless door/window sensor

50037736-001 Wireless passive infrared (PIR) motion sensor.

More Information

To learn more about these products, visit
<http://customer.honeywell.com>

- BACnet Fixed Function Thermostat Product Data (Form No. 31-00096)
- BACnet Fixed Function Thermostat WEBs-AX Configuration Wizard Guide (Form No. 31-00097)
- BACnet Fixed Function Thermostat System Engineering Guide (Form No. 31-00098)

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Automation and Control Solutions

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