INSTALLATION AND APPLICATION INSTRUCTIONS

BrightStat

Air Conditioner/Heat Pump Room Controller

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

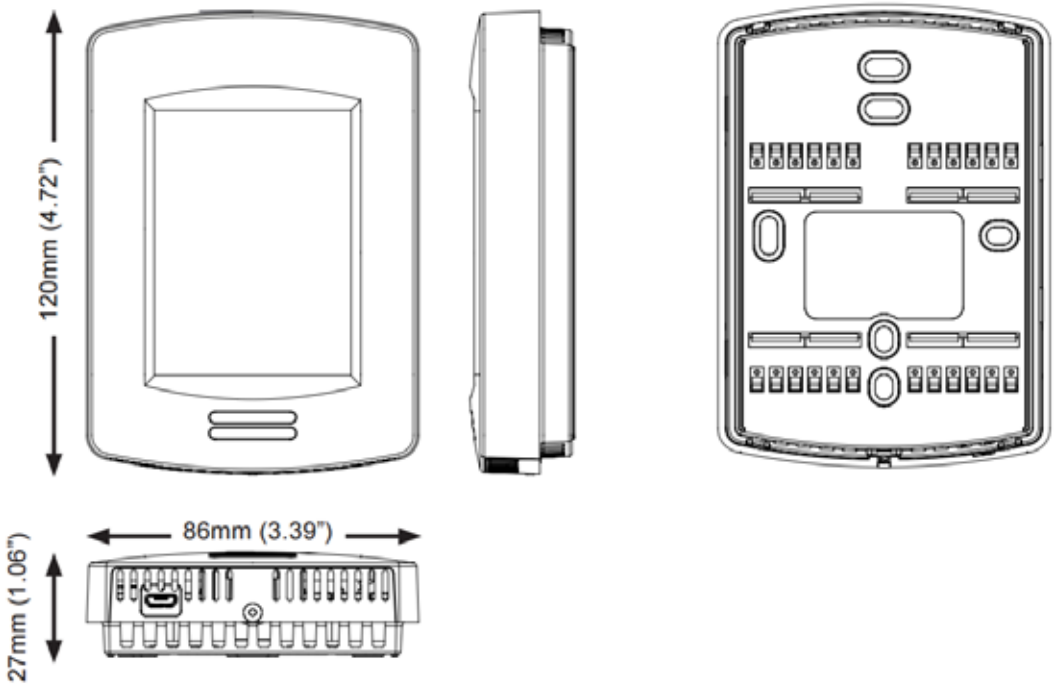
Manual: 2100-680
Supersedes: ***NEW***
Date: 8-29-18

CONTENTS

⚠ IMPORTANT

- ***If replacing an existing room controller, label wires before removal of controller.***
- ***Electronic controls are static sensitive devices. Discharge yourself correctly before manipulating and installing room controller.***
- ***A short circuit or wrong wiring may permanently damage controller or equipment.***
- ***BrightStat controllers are designed for use as operating controls only and are not safety devices. Tampering with the devices or unintended application of the devices will result in a void of warranty.***
- ***This device must be installed to provide a separation distance of at least 8" (20cm) from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.***

Dimensions



Specifications

Dimensions
12cm/4.72in (H) x 8.6cm/3.38in (W) x 2.5cm/1in (D)

Power Requirements
Input: 24Vac ±15%, 50/60Hz
Device consumption: 6 VA
Maximum rating: 100 VA, 4.17 A

Output Ratings
Maximum total output: 94 VA
Relay rating: 28 Vac 50/60Hz, 1.0 Amp., in-rush = 3.0 Amps; pins 1, 2, 3, 4, 5, 8, 9
Digital optomos output rating: 28 Vac 50/60Hz, 0.3 Amp., in-rush = 1.5 Amps; pins 9, 10, 11, 12
Analog: 0 - 10 Vdc in 2 kilo-ohm resistance minimum load (maximum 5 mA); pins 9, 10, 11, 12

Operating Conditions
0 °C - 50 °C (32 °F - 122 °F)
0% - 95% R.H. non-condensing

Storage Conditions
-30 °C - 50 °C (-22 °F - 122 °F)
0% - 95% R.H. non-condensing

Temperature Sensor
Local 10 K NTC type 2 thermistor

Temperature Sensor Resolution
± 0.1 °C (± 0.2 °F)

Temperature Control Accuracy
±0.5 ° C (± 0.9 °F)@ 21 °C (70 °F) typical calibrated

Humidity Sensor and Calibration
Single point calibrated bulk polymer type sensor

Humidity Sensor Precision
Reading range from 10-90 % R.H. non-condensing
10 to 20% precision: 10%
20% to 80% precision: 5%
80% to 90% precision: 10%

Humidity Sensor Stability
Less than 1.0 % yearly (typical drift)

Dehumidification Setpoint Range
30% - 95% R.H.

Occ, Stand-By and Unocc Cooling Setpoint Range
12.0 - 37.5 °C (54 - 100 °F)

Occ, Stand-By and Unocc Heating Setpoint Range
4.5 °C - 32 °C (40 °F - 90 °F)

Room and Outdoor Air Temperature Display Range
-40 °C - 50 °C (-40 °F - 122 °F)

Proportional Band for Room Temperature control
Cooling and Heating: Default: 1.8°C (3.2°F)

Analog Inputs
Modulating 0-10 vdc across UI19 to Common

Binary Inputs
Dry contact across terminals UI16, UI17 and UI19 to Common

Remote Temperature Sensor Requirements
10 K NTC type 2 thermistor

Wire Gauge
Power supply: 18 gauge or larger,
Communications: 24 gauge or larger

Approximate Shipping Weight
0.34 kg (0.75 lb)

Safety Standards All Models
LVD Directive 2006/95/EC
EN 60950-1:2006/A2:2013UL 873
CSA C22.2 No. 24-93

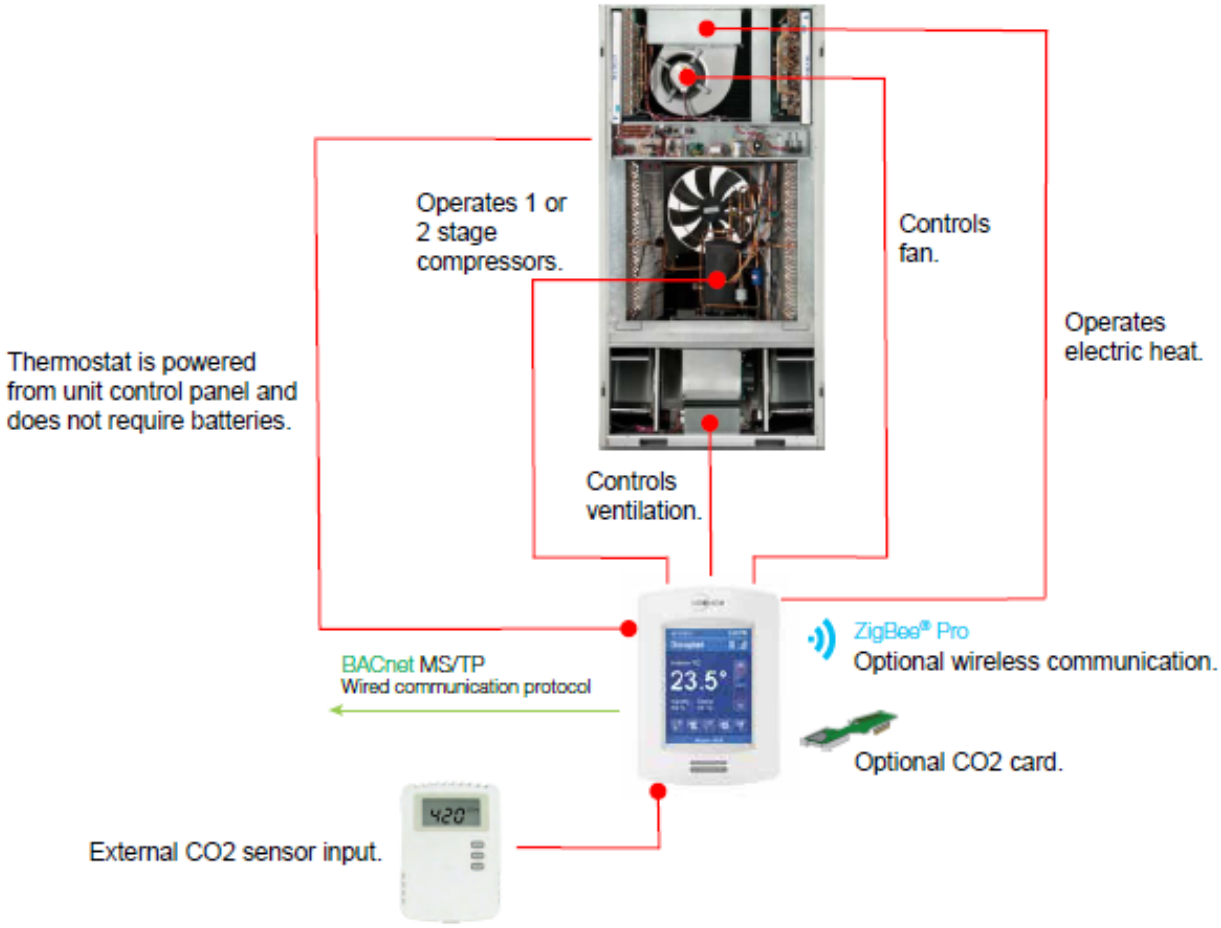
EMC Standards All Models
EMC Directive 2004/108/EC
IEC 61326-1:2005
FCC 15 Subpart B
ICES-003

Radio Standards (Wireless Models)
R&TTE Directive 1999/5/EC
ETSI EN 300 328 V1.8.1
ETSI EN 301 489-1 V1.9.2
ETSI EN 301 328 V1.8.1
FCC 15 Subpart C
RSS 210

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

Check with your local government for instruction on disposal of these products.

OVERVIEW



BrightStat

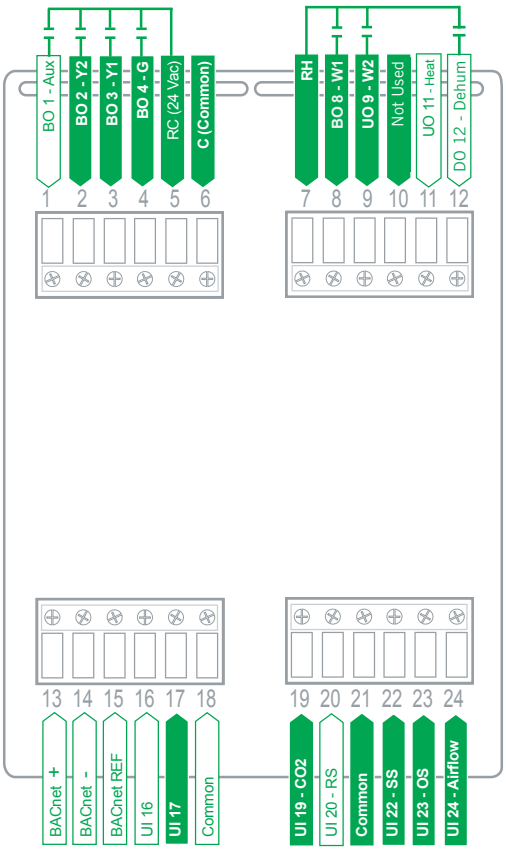
The BrightStat controller is a cost-effective solution for upgrading air conditioner or heat pump thermostats. The application allows existing wiring between the wall-mount unit and the room controller to be re-used, reducing overall costs and installation time. The BrightStat can also add features like CO_2 and fresh air monitoring to the existing functions of a wall-mount unit.

The BrightStat room controller can be configured to handle a broad variety of applications covering all the standard implementations necessary for HVAC systems.

In addition to controlling heating, cooling and air quality, depending on the model and accessories, the BrightStat can handle wireless networking and switches, Passive Infrared (PIR) occupancy detection using either onboard or remote sensors, and can have custom programs implemented to fulfill specific user requirements. The applications described here cover all these features in combination with the BrightStat's advanced scheduling and occupancy controls to provide the functionality for any required HVAC implementation.

BrightStat Controller Models		
Bard Part Number	**Description**	**Part Number Found on Back of Controller**
8403-081	With Humidity and Motion Sensors	VT8650U5500B
8403-082	With Motion Sensor	VT8600U5500B
8403-083	With Humidity Sensor	VT8650U5000B
8403-084	Temperature Only	VT8600U5000B

NOTE: *RC (5) and RH (7) must both be powered for heating and cooling operation.*



Terminal	Designation	Function
1	BO 1	ON/OFF VENT OUTPUT PER SCHEDULE
2	BO 2	Y2 COMP OUTPUT
3	BO 3	Y1 COMP OUTPUT
4	BO 4	G OUTPUT
5	RC	COOL 24VAC IN
6	C	24VAC COM
7	RH	HEAT 24VAC IN
8	BO 8	W1 OUTPUT
9	UO 9	W2, OB VALVE OUTPUT
10	UO 10	0-10V CO2 VENT OUTPUT
11	UO 11	EMERGENCY HEAT OUTPUT
12	DO 12	DEHUMIDIFICATION
13	BACnet+	BACNET
14	BACnet-	BACNET
15	BACnet ref	BACNET
16	UI 16	NOT USED
17	UI 17	SERVICE ALARM
18	Common	NOT USED
19	UI 19	0-10V AUX CO2 INPUT
20	UI 20	24VAC OUT
21	Common	24VAC COM
22	UI 22	NOT USED
23	UI 23	NOT USED
24	UI 24	NOT USED

Sequence of Operation

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

Options

- Wireless adapter modules for BACnet models are available.
- Three (3) universal inputs can be used and configured for advanced functionality as required by the application.

In all Occupancy Modes

If room relative humidity is higher than the user-defined dehumidification setpoint, both Dehumidification (DO12) and Fan (BO4) outputs are energized to reach the RH% setpoint and the room controller.

NOTE: *A relay is installed in the unit which will disable dehumidification on a call for cooling or heating.*

See page 41 of ***Advanced Programming & User Interface Setup Guide*** (manual 2100-681) for occupied and unoccupied settings adjustments.

Wiring

Reference unit installation manual for wiring instructions.

INSTALLATION

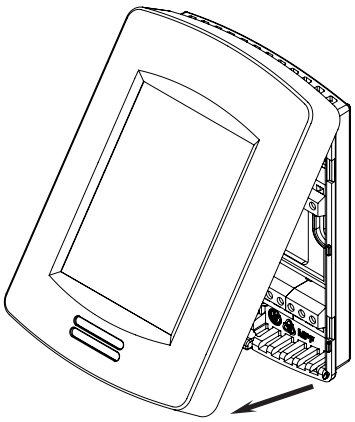
Location

- Do not install on outside wall.
- Do not install in areas with direct heat source.
- Do not install near any air discharge grill.
- Do not install in areas exposed to direct sunlight.
- Ensure room controller has sufficient air circulation.
- Ensure wall surface is flat and clean.

Installation

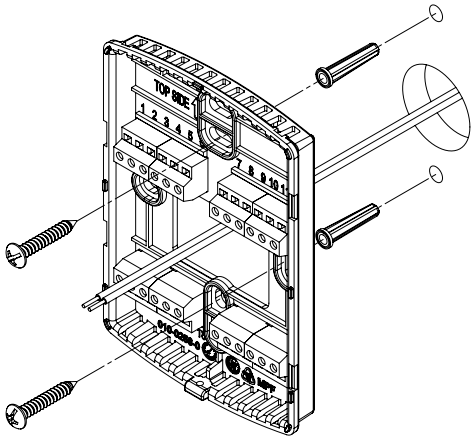
1. Remove security screw on bottom of room controller cover (if applicable).
2. Open unit by pulling on bottom side of room controller (see Figure 1).

FIGURE 1
Open Cover



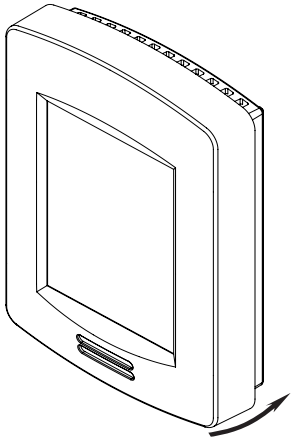
3. Read FCC ID and IC label installed in cover before installing any wireless product.
4. Ensure correct side of base faces up.
5. Pull cables 6" (15 cm) out from wall.
6. Align base and mark location of two mounting holes on wall (see Figure 2).

FIGURE 2
Install Base



7. Install anchors in wall.
8. Insert cable in central hole of base.
9. Insert screws in mounting holes on each side of base.
10. Strip each wire 1/4" (0.6 cm) from end.
11. Insert each wire and screw according to wiring chart (see page 4).
12. Gently push excess wiring back into hole.
13. Insulate hole to prevent draft.
14. Gently align cover to top of base and snap in place from bottom (see Figure 3).

FIGURE 3
Re-Install Cover



15. Install security screw.

TABLE 2
Remote Sensor Accessories

Model Number	Description
8612-058	Wall-Mounted Temperature Sensor
8612-059	Wall-Mounted Temperature Sensor with Override Button and Occupancy Status LED

NOTE: *If one or multiple sensor(s) is/are connected into the RS terminal, the internal temperature sensor is automatically disabled. Disconnecting the sensor(s) in RS terminal will re-activate the internal sensor.*

Remote mount temperature sensors inputs use 10K type 2 NTC thermistors.

Features

- Each sensor can be configured for various averaging combinations.

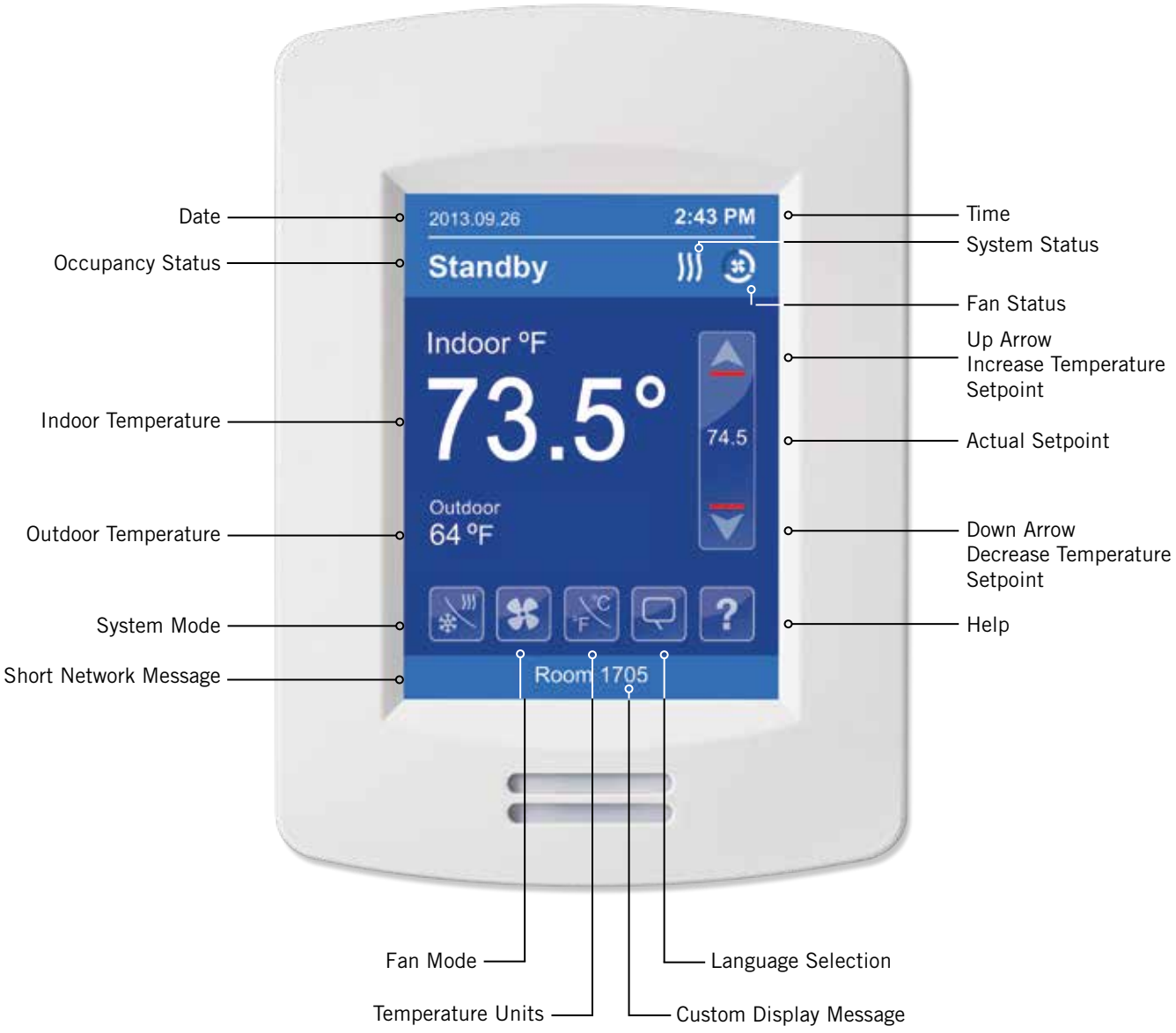
See ***Advanced Programming & User Interface Setup Guide*** (manual 2100-681) for configuration instructions.

TABLE 3
Temperature vs. Resistance for 10K Ohm NTC Thermistor
(R25˚C = 10KΩ±3%, B25/85˚C = 3975K±1.5%)

˚C	˚F	Kohm
-40	-40	324.3197
-35	-31	234.4009
-30	-22	171.3474
-25	-13	126.6109
-20	-4	94.5149
-15	5	71.2430
-10	14	54.1988
-5	23	41.5956
0	32	32.1910
5	41	25.1119
10	50	19.7390
15	59	15.6286
20	68	12.4601
25	77	10.0000
30	86	8.0694
35	95	6.5499
40	104	5.3467
45	113	4.3881
50	122	3.6202
55	131	3.0016

HOME SCREEN DISPLAY

Typical Hospitality User Interface Shown



NOTE: *User Home Menu and Interface (HMI) is configurable and allows display functions such as outdoor temperature, setpoint and other buttons to be enabled or disabled by setting various parameters in the setup screens.*

* What is displayed is dependent on the User Home Menu and Interface (HMI) selected during the setup process. See BrightStat Advance Programming & User Interface Setup Guide 2100-681.

HOW TO ENTER SET-UP SCREEN

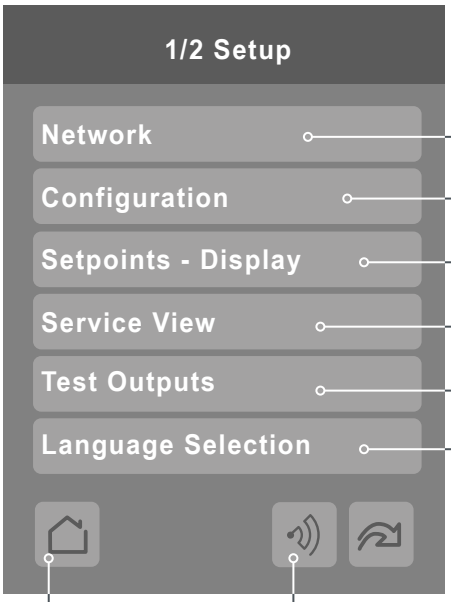
Touch and hold this point
for 3 seconds to enter set-up mode.

NOTE: *If a configuration/installer password is activated to prevent unauthorized access to the configuration menu parameters, a password entry prompt shows to prevent access to device configuration components. Controller is shipped without password protection.*

For more information on using and configuring the functions of the thermostat, refer to the BrightStat User Interface Guide 2100-681 and BrightStat User Interface Quick Start Guide 2100-679.

SET-UP SCREEN DISPLAY

NOTE: *The "Network" button does not show if no BACnet® or ZigBee® card is installed.*



Enter BACnet® and ZigBee® network settings

Enter parameter configuration menu

Enter setpoint and display settings

Enter status and service view

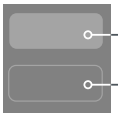
Enter output testing mode

Enter language selection

Return to
home screen

Discover Mode
The controller becomes discoverable on the wireless ZigBee® network for 1 minute (this button is hidden if ZigBee® settings are not configured).

General Note



Adjustable parameter

Non-adjustable parameter

POWER OUTAGE CLOCK RESET

In the event of a power outage, BrightStat Room Controllers will retain the correct time as long as the duration of the power outage is not prolonged. Depending on the duration of the power outage, the room controller's internal clock may need to be updated or reset completely. The following table gives an indication of the expected clock performance after a power outage.

TABLE 4
Expected Clock Performance After Power Outage

Outage Duration	Room Controller Behavior
0-24 Hours	Clock functions are normal.
24-36 Hours	Clock accuracy not guaranteed, time may need to be adjusted.
36-72 Hours	Clock no longer increments and must be adjusted when power is restored.
72+ Hours	Clock functions are fully reset and must be re-initialized as per new installation.

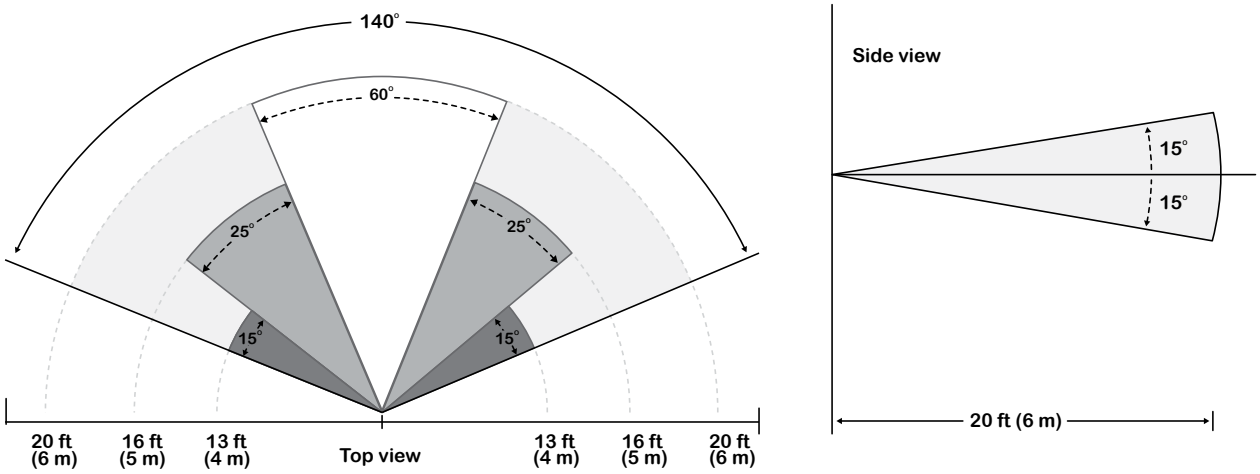
Initially, the room controller is in Stand-by mode and Stand-by setpoints are used. When the Passive Infra-Red (PIR) sensor detects motion, the Occupancy status switches to Occupied and the Stand-By Time timer is reset. The Occupied setpoints are used for this operation. If no motion is detected in the room for the entire Stand-By Time duration (adjustable parameter), the room switches to Stand-by mode and Stand-by setpoints are used. While in Stand-by mode, if no motion is detected for the entire Unoccupied Time period (adjustable parameter), the room switches to Unoccupied mode and uses its Unoccupied setpoints.

While in Stand-By or Unoccupied mode, any motion switches the room back to Occupied mode.

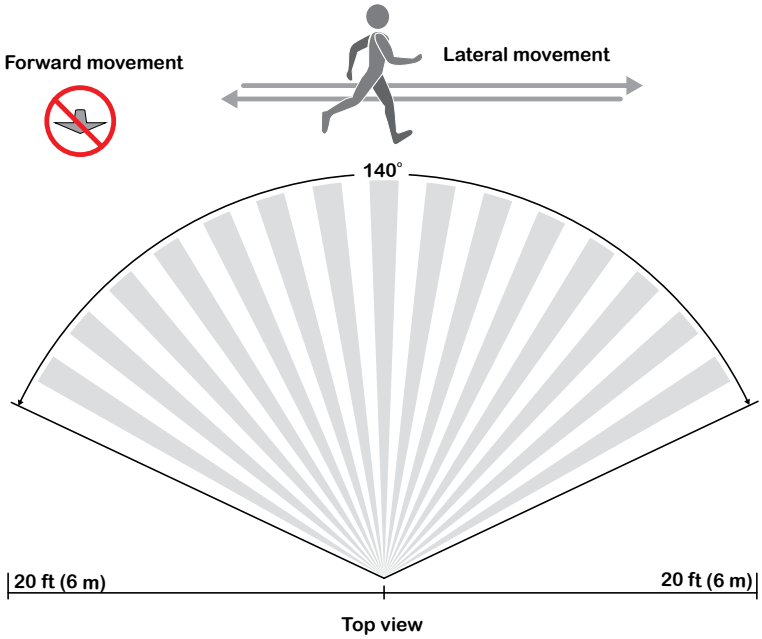
The PIR sensor is located near the bottom of the front of the BrightStat controller. Make sure there are no obstructions in front of the sensor.

PIR ranges measure 20' (6 meters) at 140° and 13' (4.5 meters) minimum between 15° to 30° laterally. A typical installation height of approximately 5' (1.5 meters) is considered in these measurements.

The below illustrates the resolution.

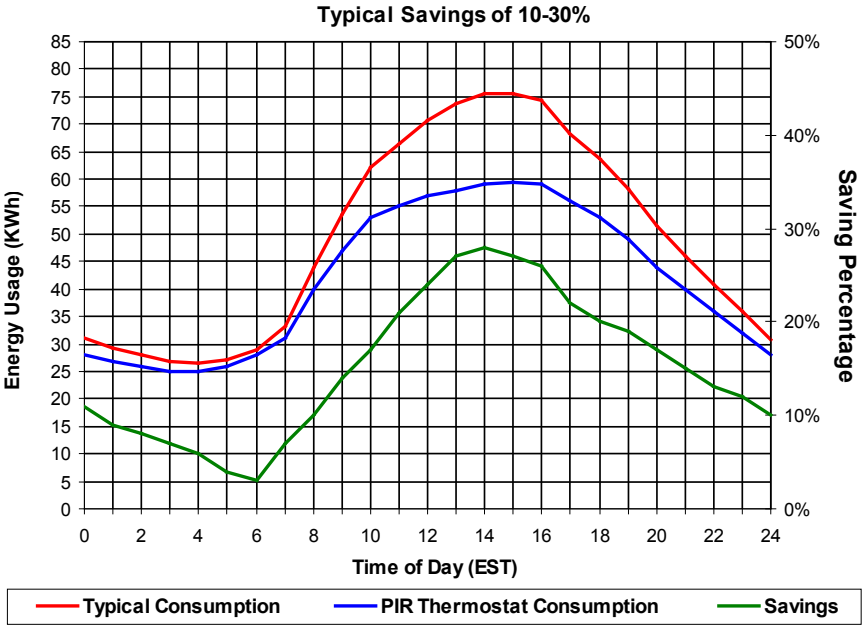


Fresnel lens beam and detection field



Energy Savings

PIR can maximize energy saving from 10-30% by adjusting temperature setpoints in unoccupied zones during scheduled periods.



Deployment

Placement of the room controller must be given consideration. It is recommended to install the room controller as close to a door as possible (but not so as to be blocked by the door), or in an area with high occupant movement.

Ideally the room controller should be installed 5' above the floor surface to ensure maximum detection range is achieved. As well, room controller placement should ensure the occupant crosses the lens beam in a perpendicular path within the prescribed detection zone.

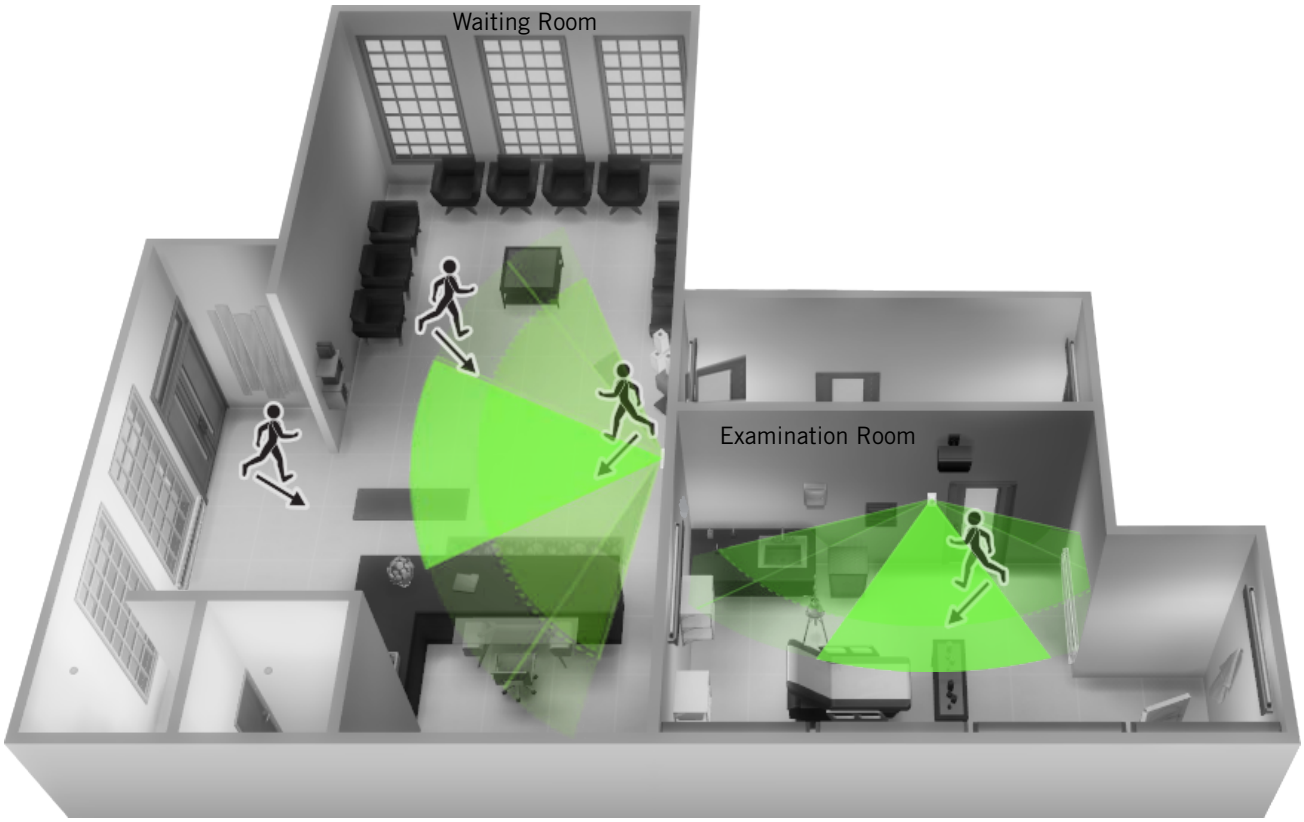
Example of Recommended Deployment

The illustration below shows room controllers installed in ideal locations for two rooms.

The examination room shows one room controller installed adjacent to the door. In this area of the room, occupant traffic is high and ensures the occupant will almost always cross the PIR detection path laterally and within the detection range.

The waiting room shows one room controller installed beside a door in the middle of the room. As shown in the illustration, occupant traffic is high in several areas of the room including the entrance, waiting room, access to the door and activity around the reception desk. Moreover, for each case aforementioned, occupant movement almost always moves lateral to the PIR, which ensures detection by the PIR, as well as respecting the PIR detection range.

Recommended Installation



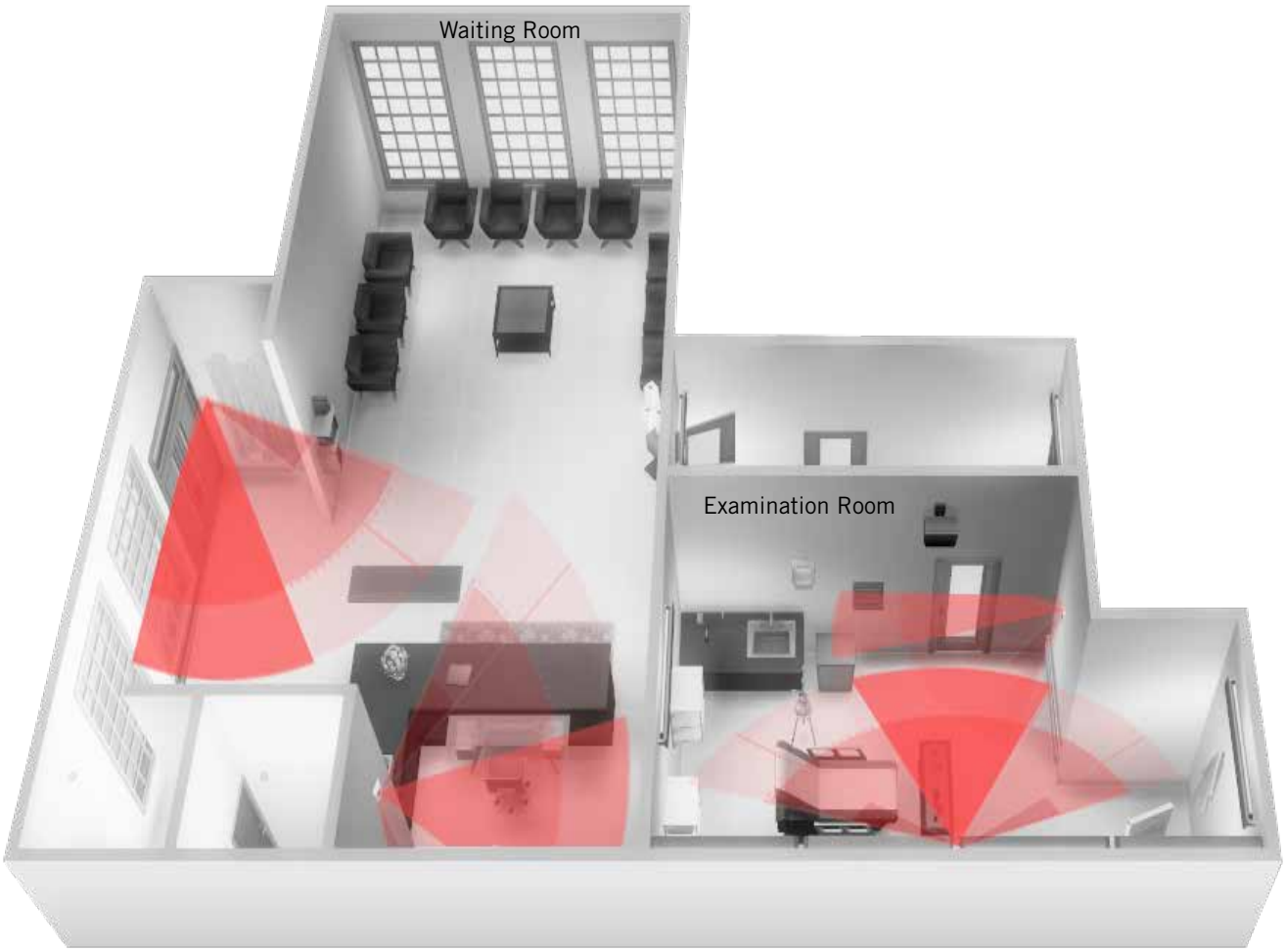
Example of Non-Recommended Deployment

The illustration below shows four room controllers (two for each room) installed in non-ideal locations for the two rooms.

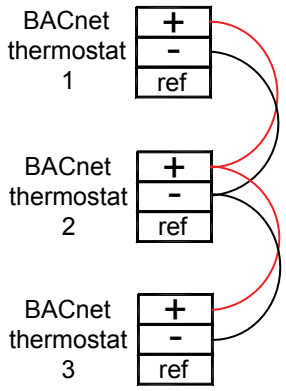
The examination room shows one room controller installed in a low traffic area near the door, and a second room controller installed on the wall directly opposite the door. For the room controller installed in the corner wall, the PIR could be blocked by the opened door, while occupant traffic could also be minimal in this area of the room. For the second room controller installed opposite the door, the PIR detection could fall outside the specified detection zone, while at the same time most occupant movement would not be lateral to the PIR, thereby not respecting optimal crossing patterns for PIR detection.

The waiting room shows one room controller installed in the corner of the room, and a second room controller installed beside the reception area. For the room controller installed in the corner, the opening/closing of the door creates high probability that the PIR would get blocked, and therefore, occupancy going undetected. For the room controller installed beside the reception area, occupant traffic could fall outside the detection zone, and the receptionist would often be below the 5' recommended installation height for the room controller.

Non-Recommended Installation



BACnet® Communication Wiring

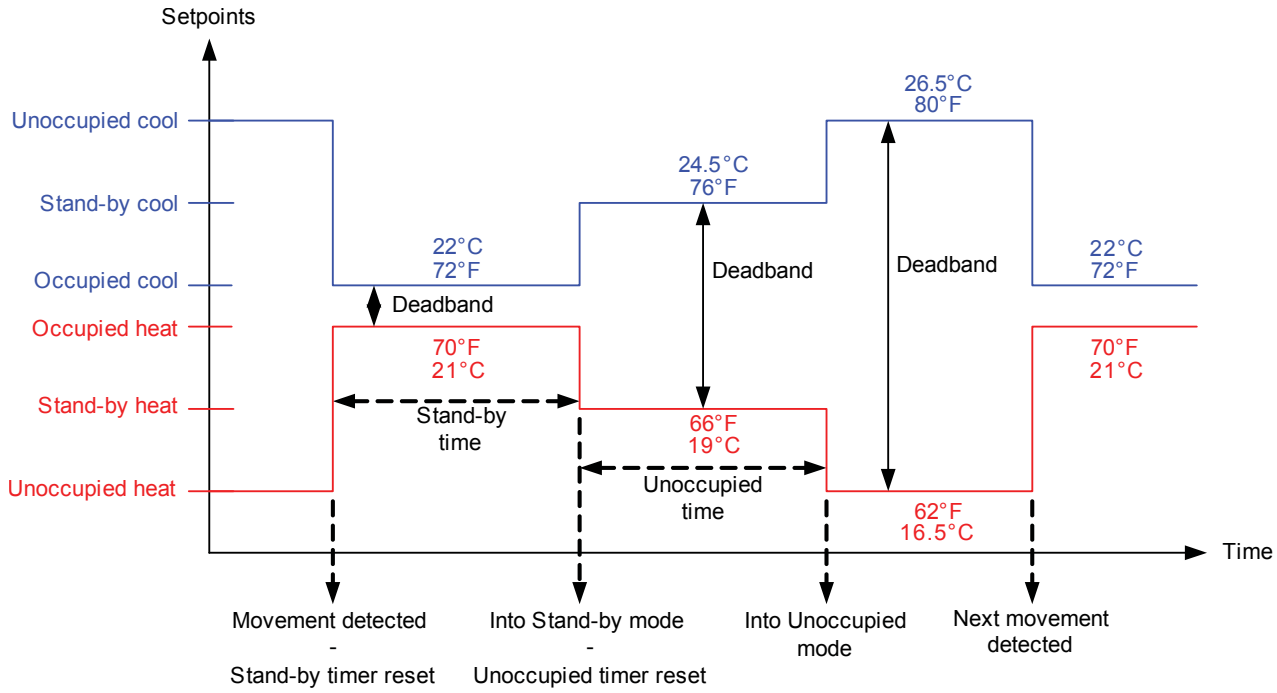


Notes:
- Wiring should be daisy chained
- Respect polarity
- If using 2 conductor shielded wires, connect the shield of each feed together on the back of the controller. ONLY ground the shield at one location. DO NOT connect the shield to the ref terminal.

Wireless Communication

No communication wires required

CONTROLLERS' OCCUPANCY
SEQUENCE OF OPERATION SCHEMATIC



Wireless ZigBee Pro Motion Sensors

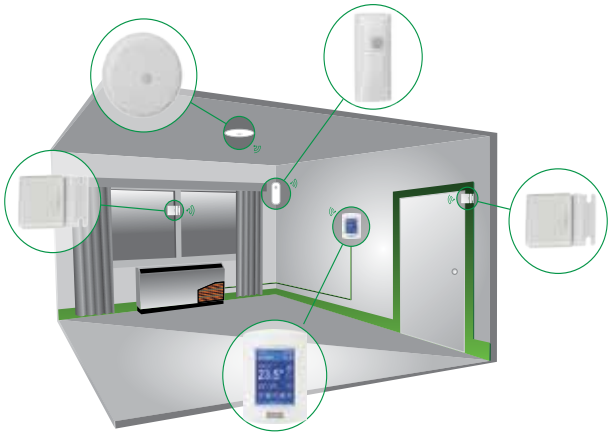
BrightStat controllers with ZigBee Pro wireless sensors can be used in stand-alone mode, or with integration to a central management system, to allow for advanced functions such as central reservation and occupancy functions.

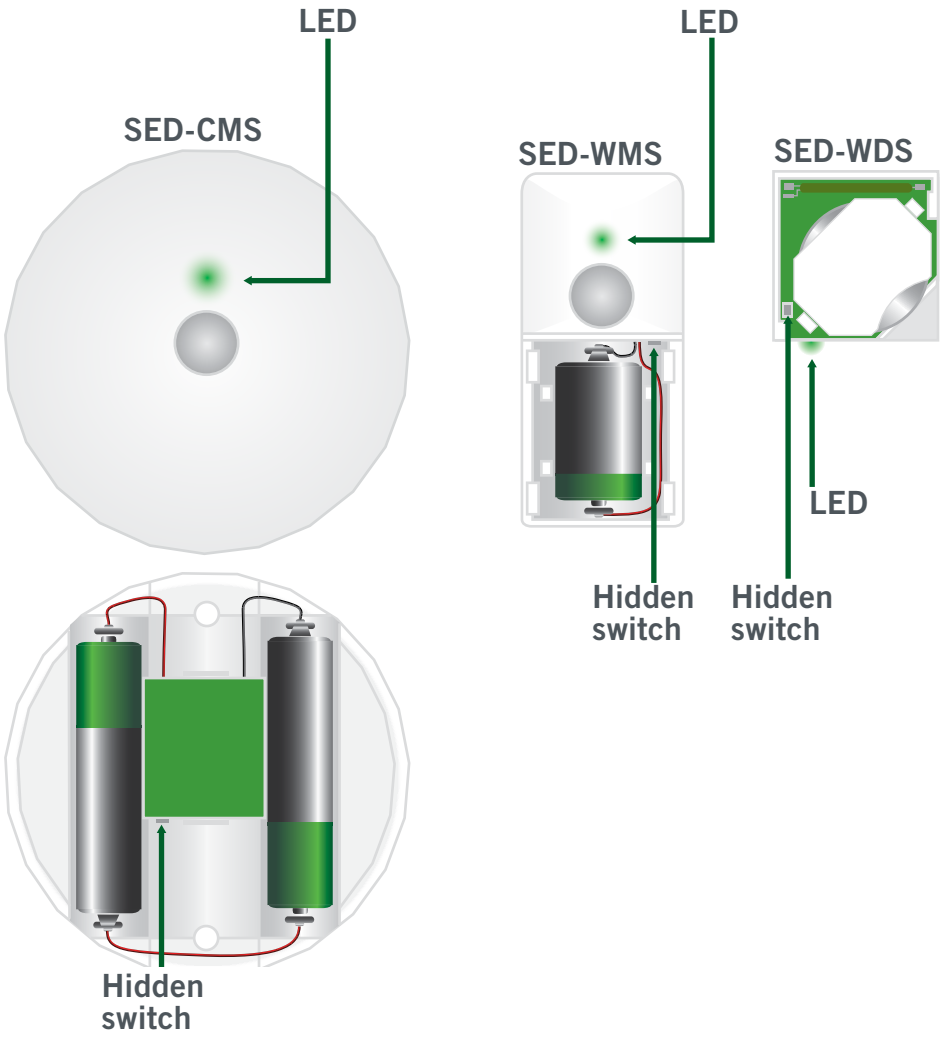
Up to 10 different ZigBee motion sensors can be used with a BrightStat room controller.

No tools are required for commissioning or servicing the ZigBee devices. A simple interface on the devices with an on-board LED and hidden switch provides all required functions for local interaction. The controller user interface has screens used to pair and configure ZigBee devices (see below). Local information for battery life and connectivity (heartbeat) are also displayed through the ZigBee Pro wireless network.

Model Selection

Window Switch	Door Switch
Door/window switch	8612-053
Wall mounted motion sensor	8612-057
Ceiling mounted motion sensor	8612-055




LED
SED-CMS
LED
SED-WMS
SED-WDS
LED
Hidden switch
Hidden switch
Hidden switch