Rooftop Unit, Heat Pump and Indoor Air Quality Application Guide

VT8600 Series Room Controllers

TABLE OF CONTENTS

VICONICS
Beyond Comfort

OVERVIEW

VT8600

The VT8600 Rooftop, Heat Pump and Indoor Air Quality Controller is cost-effective solution for upgrading rooftop unit thermostats. The application allows existing wiring between the rooftop unit and the Room Controller to be re-used, reducing overall costs and installation time. The VT8600 can also add features like CO_2 and fresh air monitoring to the existing functions of a rooftop unit.

The VT8600 Rooftop, Heat Pump, and Indoor Air Quality Controller can be configured to handle a broad variety of applications covering all the standard implementations necessary for rooftop HVAC systems.

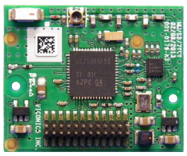
In addition to controlling heating, cooling and air quality, depending on the model and accessories, the VT8600 can handle wireless networking and switches, Passive Infrared (PIR) occupancy detection using either onboard or remote sensors, and can have custom programs implemented to fulfill specific User requirements. The applications described here cover all these features in combination with the VT8600's advanced scheduling and occupancy controls to provide the functionality for any required rooftop HVAC implementation.

VT8600 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY ROOM CONTROLLERS

Commercial and Hospitality Interface (Local Override and Degrees C/F Selection)

Part Number	Description	PIR Sensor	Communication
VT86X0U5X00B	BACnet® fan coil terminal equipment controller	No	BACnet®
VT86X0U5X00B	BACnet® fan coil terminal equipment controller	Yes	BACnet®

ZigBee Pro Module for SE(R)8300 Series

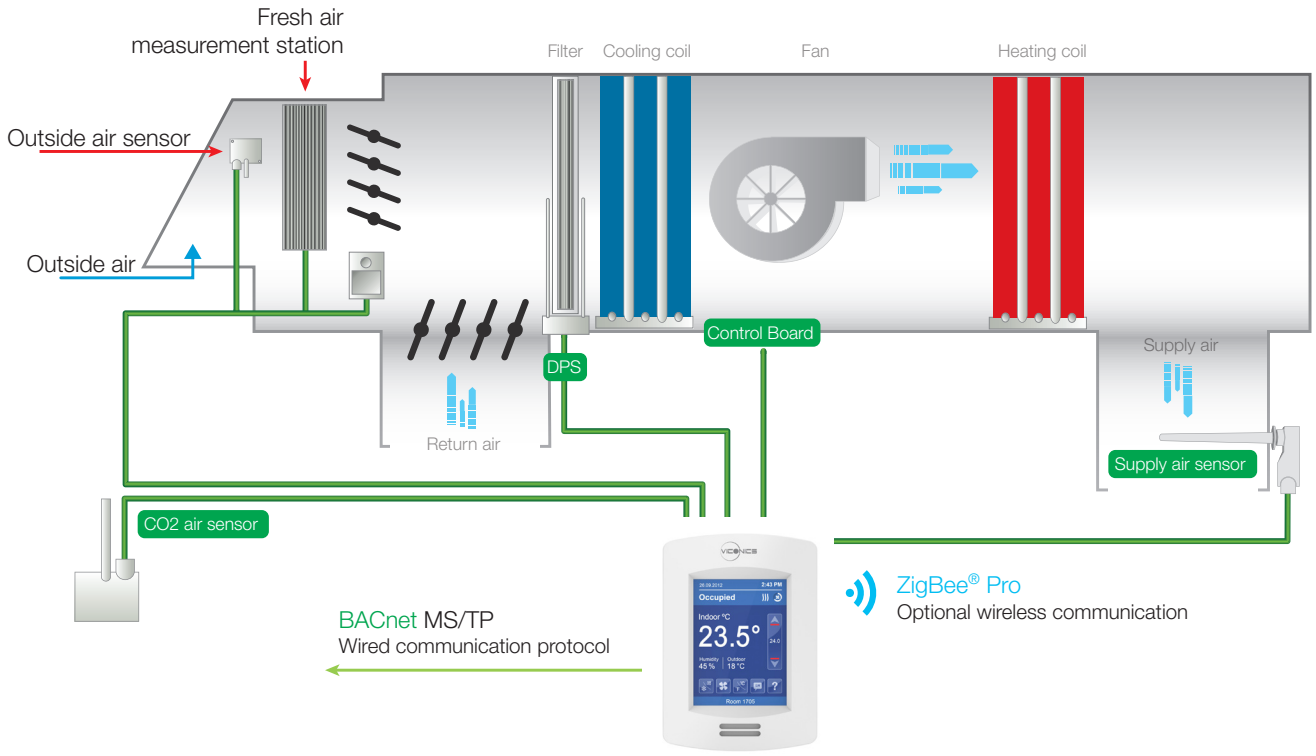


Part Number	Description
VCM8000V5000P	Optional ZigBee Pro module for VT8600 Series room controllers.

Wireless Accessories for VT8600 Series

Part Number	Description
SED-DOR-P-5045	Wireless door switch
SED-WIN-P-5045	Wireless window switch
SED-CMS-P-5045	Wireless ceiling mounted motion sensor
SED-WDS-P-5045	Wireless window and door switch
SED-WMS-P-5045	Wireless wall mounted motion sensor

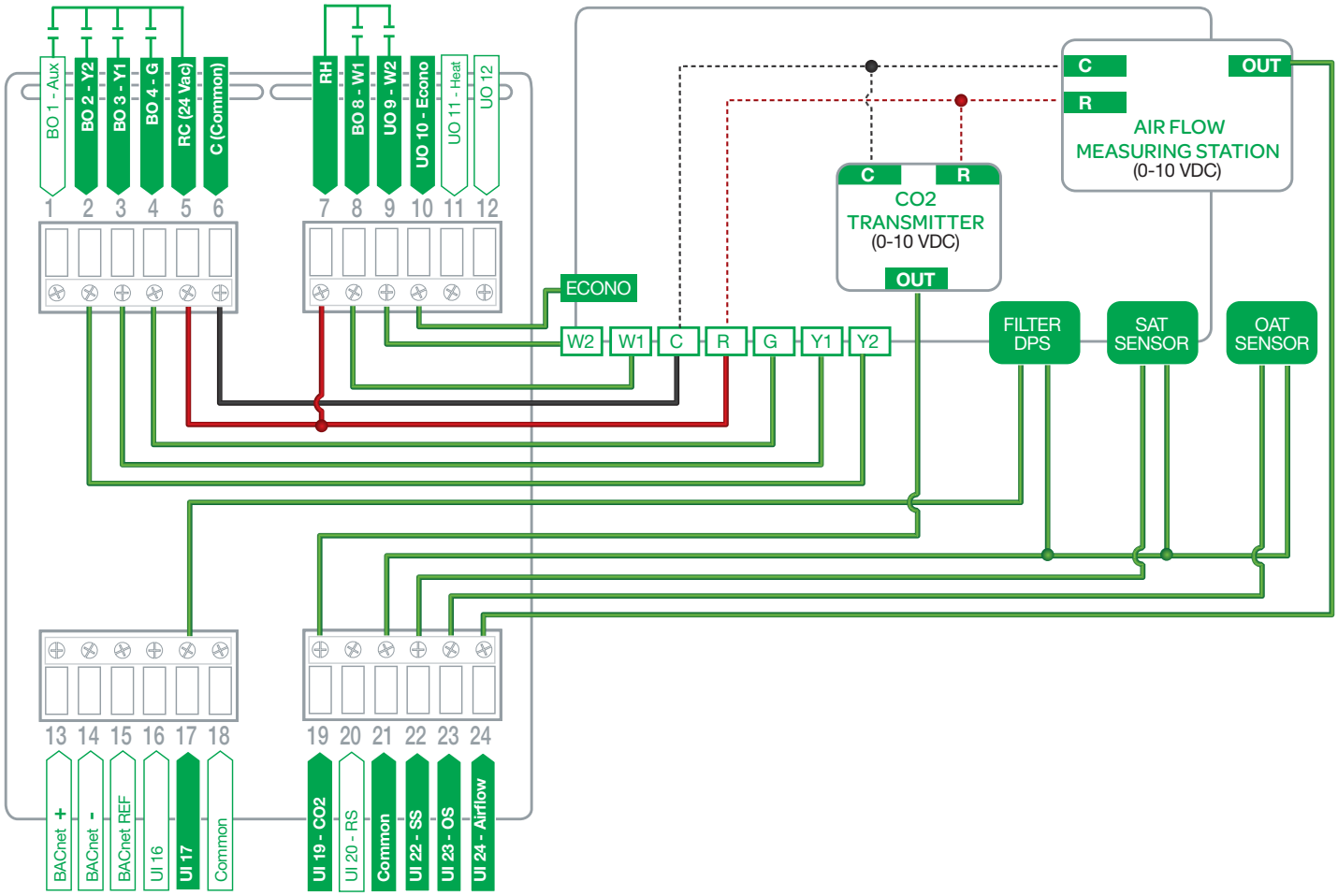
VT86X0U5X00B 2 HEATING / 2 COOLING FOR ROOFTOP UNIT AND INDOOR AIR QUALITY



Configuration Parameter Name	Configuration Settings
UI17	Filter
UI19	CO2
Econo. Config	On
FA Range	Set Max CFM, cannot be zero
Min fresh air	Set Min CFM, cannot be zero
Max fresh air	Set Max CFM, cannot be zero
Min CO2	Set Min CO2, cannot be zero
Max CO2	Set Max CO2, cannot be zero

Note: Only required configuration parameters are listed. Other settings are configurable as needed by user.

VT8600 2 Heating / 2 Cooling



Sequence of Operation and Wiring

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.

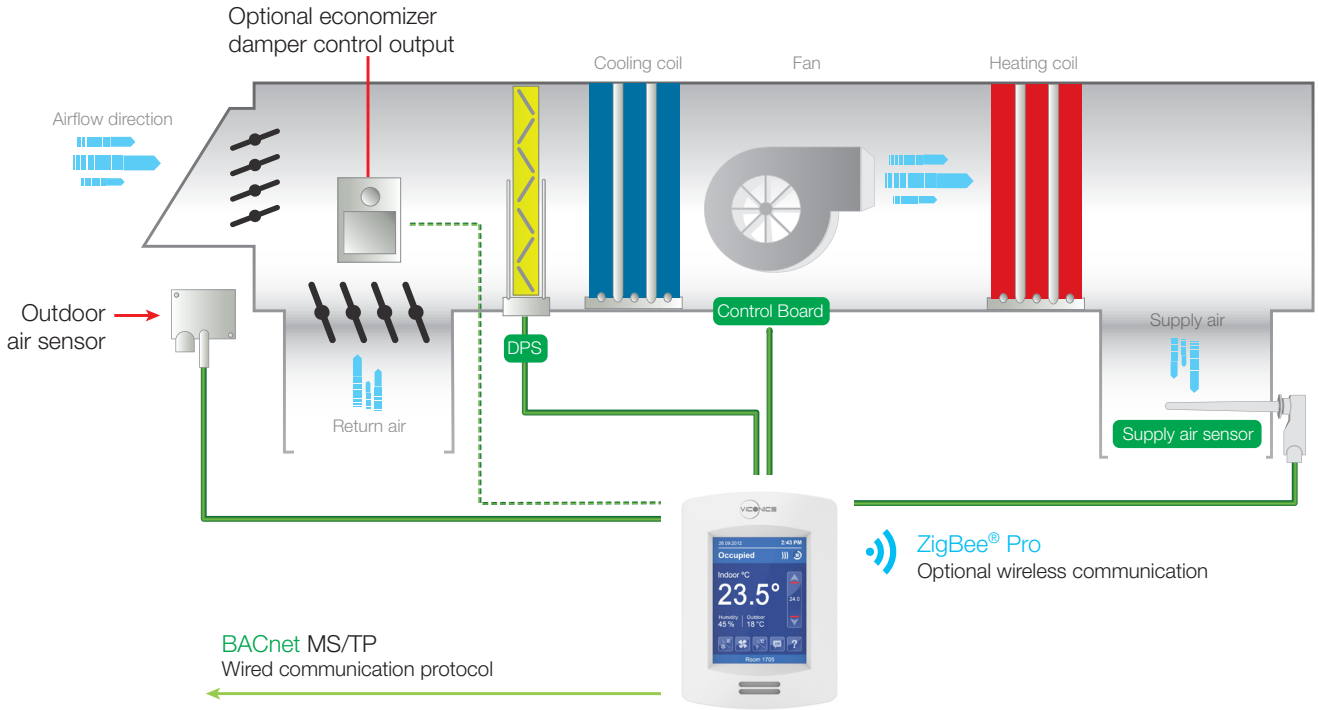
Occupied Override Mode

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

Options

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

VT86X0U5X00B 2 COOLING / MODULATING HEAT FOR ROOFTOP UNIT AND INDOOR AIR QUALITY



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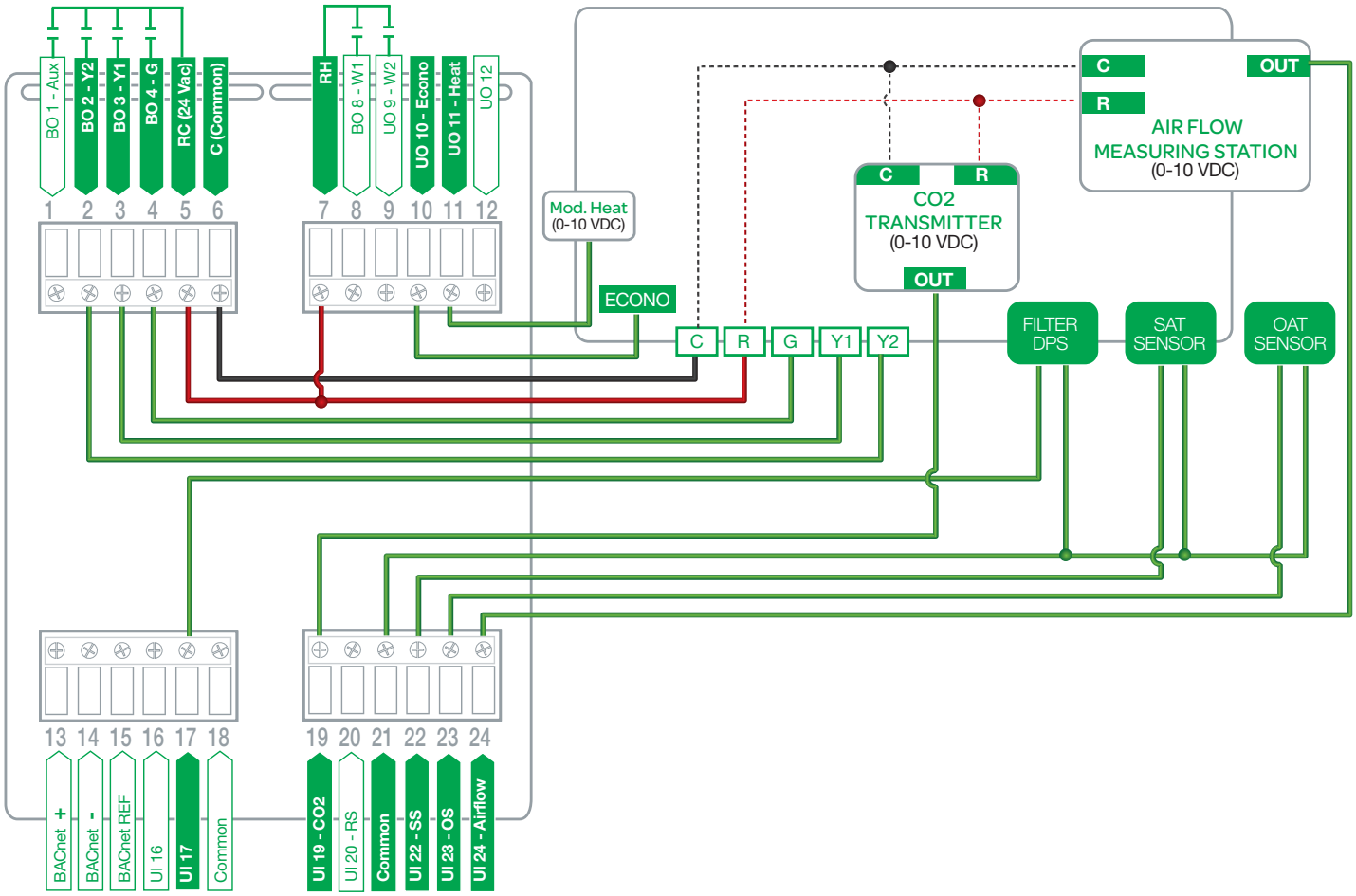
UI17	Filter
UI19	CO2
Econo. Config	On
FA Range	Set Max CFM, cannot be zero
Min fresh air	Set Min CFM, cannot be zero
Max fresh air	Set Max CFM, cannot be zero
Min CO2	Set Min CO2, cannot be zero
Max CO2	Set Max CO2, cannot be zero

Note: Only required configuration parameters are listed. Other settings are configurable as needed by user.

VT8600 2 Cooling / Modulating Heat



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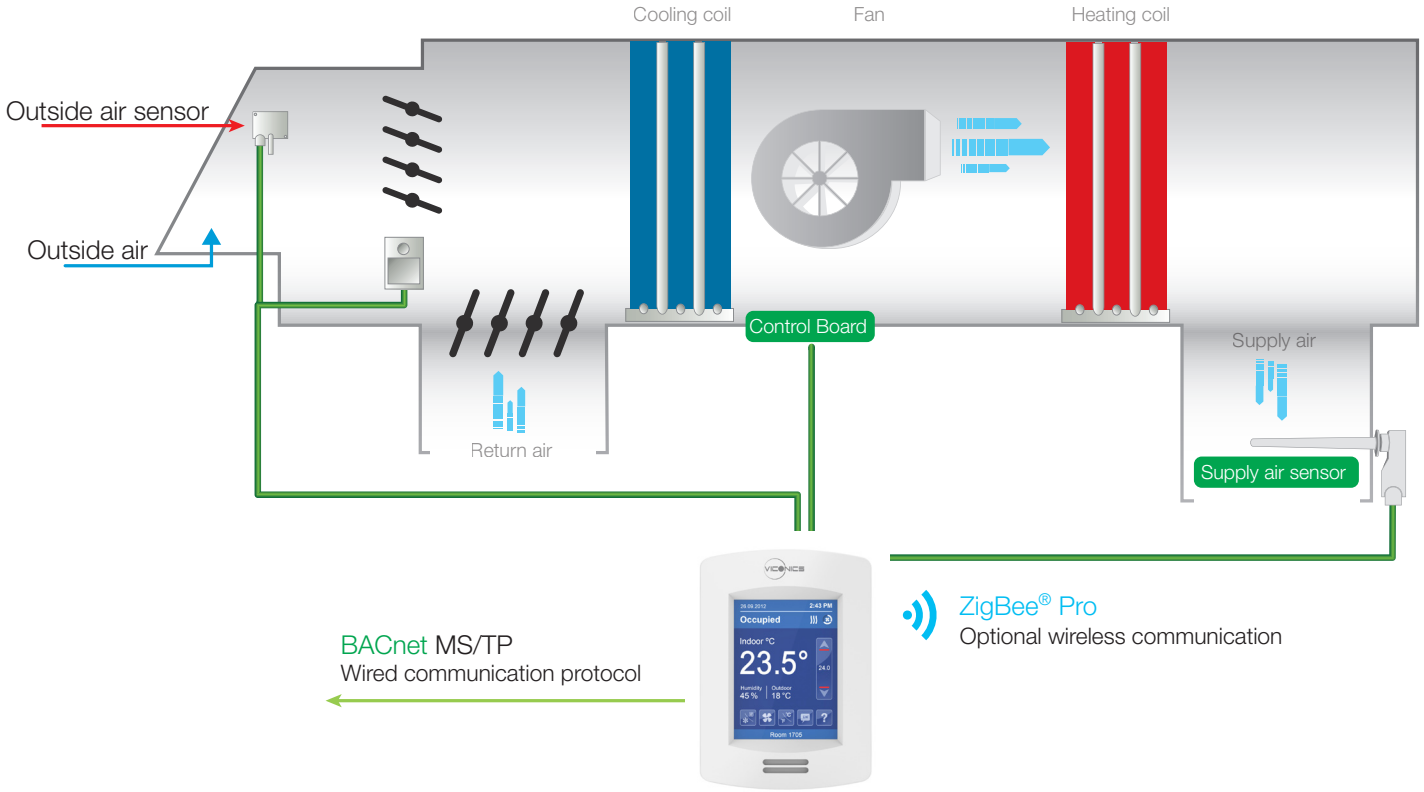
FRESH AIR DAMPER CONTROL SEQUENCES

The fresh air damper can be controlled through more than one sequence to achieve different control strategies such as free cooling (economizer mode), minimum fresh air control and CO2 level control. Here are the control sequences available:

Note: For the sequences mentioned below, the following conditions must be met in order for the sequences to be performed as stated:

- **Max Pos parameter value must be greater than Min Pos Parameter value.**
- **Mac CO2 parameter value must be greater than Min CO2 Parameter value.**
- **Max FA parameter value must be greater than Min FA Parameter value.**

Economizer Control Mode Only

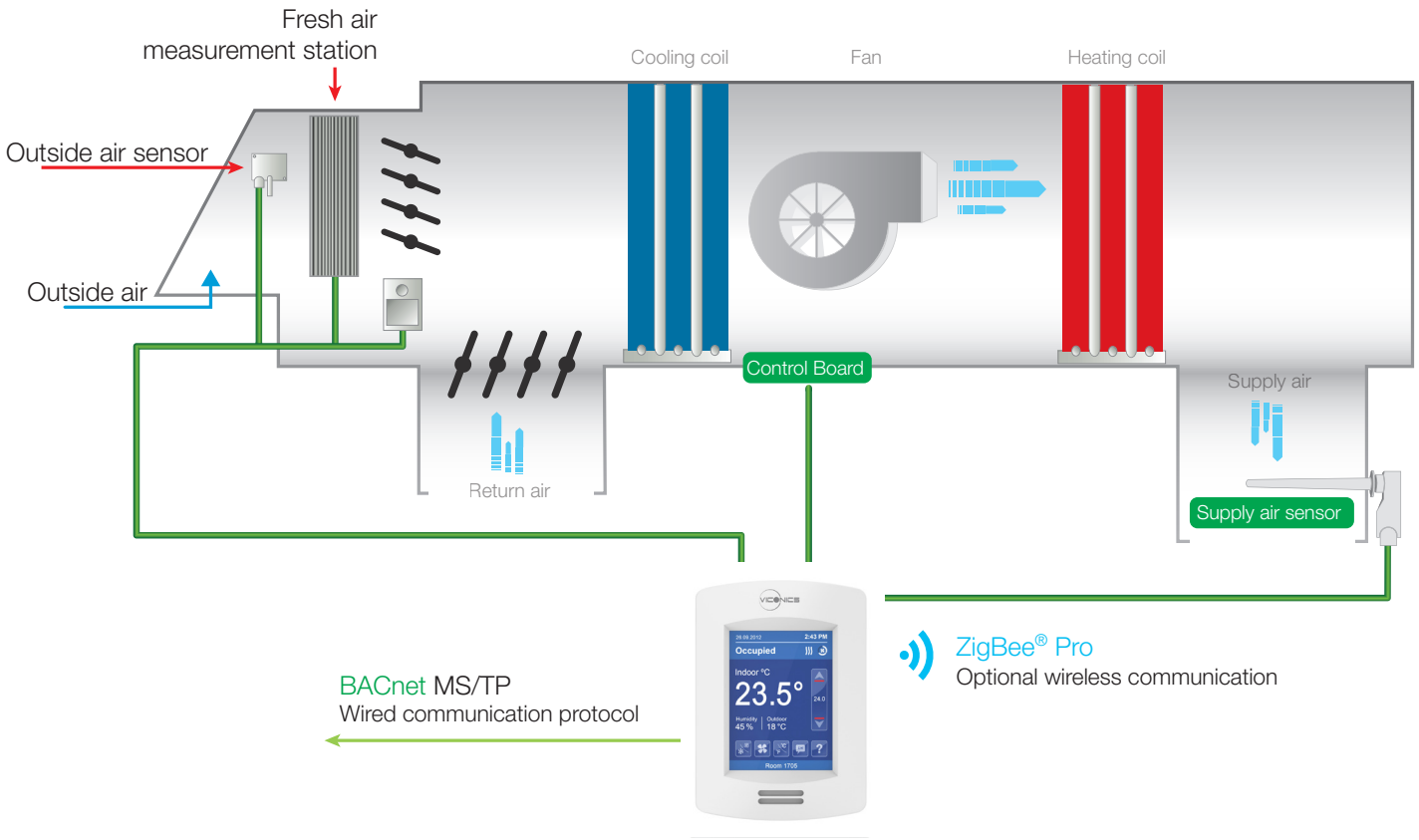


If the fresh air damper is to be used only for free cooling purposes (economizer mode, without fresh air measurement station or CO2 control), only the Min Pos parameter and the free cooling sequence will be active.

- **The FA Range parameter should be set to 0 CFM. (Default Value = 0 CFM)**
- **Set the Chngstpt parameter to desired value which free cooling is enabled. (Default Value = 55°F)**

If the outside air temperature is greater than the changeover setpoint, then normal mechanical cooling will be used. If the outside air temperature is less than or equal to the changeover setpoint, then free cooling will be enabled and mechanical cooling stages will be locked out.

Economizer Control Mode and Fresh Air Measurement Station



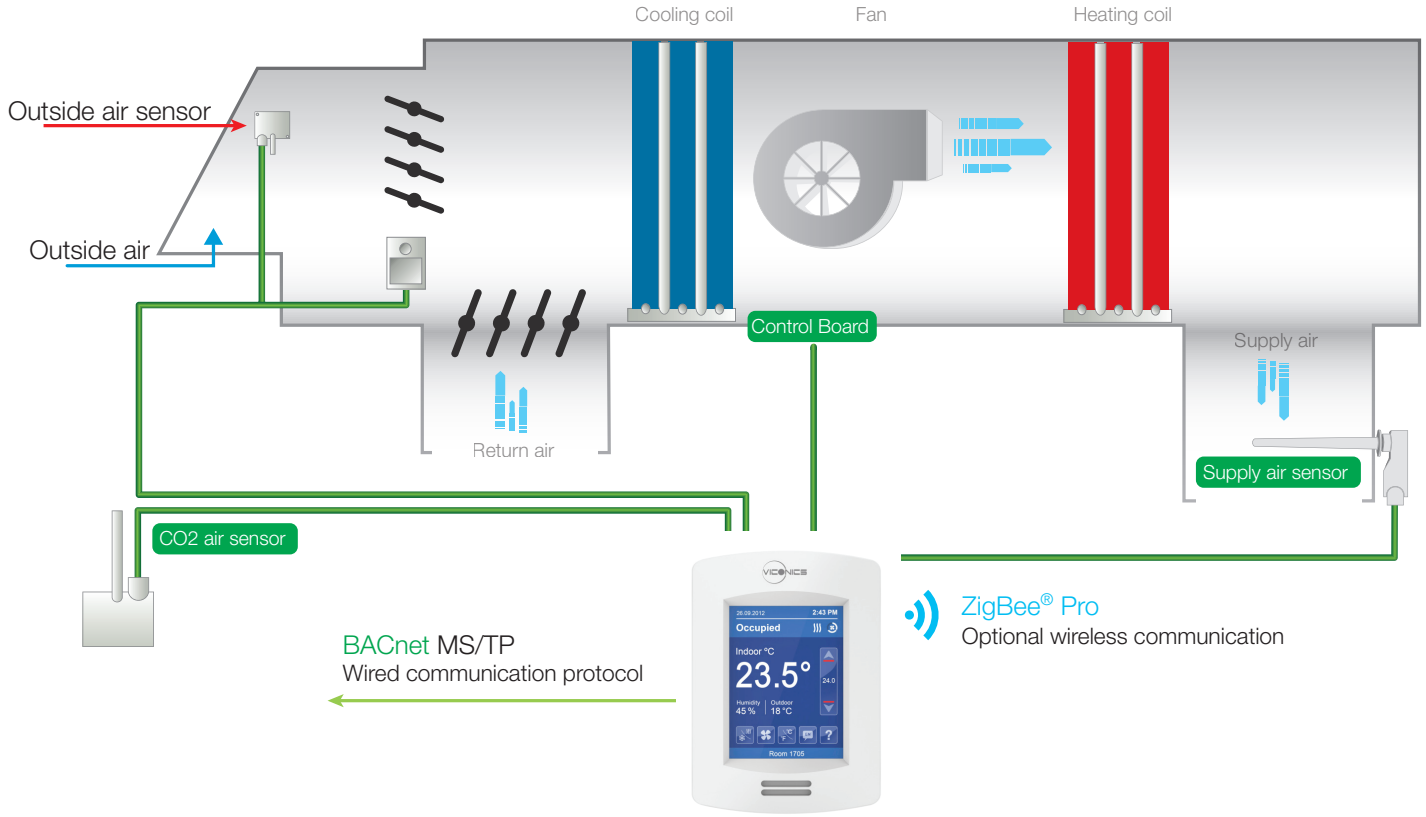
If the fresh air damper is to be used for both free cooling and minimum fresh air volume control (economizer mode and fresh air measurement station, but without CO2 level control), only the Min FA parameter and the free cooling sequence will be active.

- **The FA Range parameter should be set to a value higher than 0 CFM (0 CFM disables the fresh air control).**
- **Min FA (minimum fresh air) parameter should be set to the desired level.**

The FA Range parameter value should be set to the maximum capacity of the fresh air measurement station. Therefore the relationship between air volumes and input signals can be established. For example, if the fresh air station capacity is 10000 CFM, set FA Range to 10000.

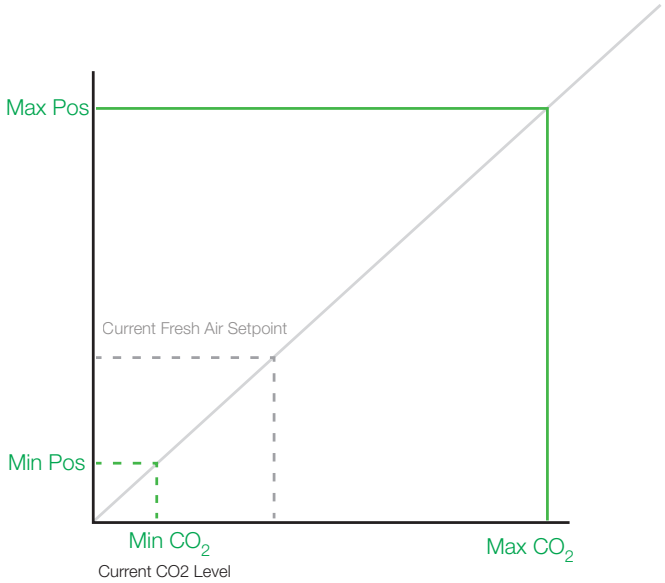
This will set the relationship of **0 VDC = 0 CFM** and **10VDC = 10000 CFM**.

Economizer Control Mode and CO2 Level Control



If the fresh air damper is to be used for both free cooling and CO2 level control (economizer mode and CO2 level control, but without fresh air measurement station), only the Min Pos, Max Pos, Min CO2 and Max CO2 parameters as well as the free cooling sequence will be active.

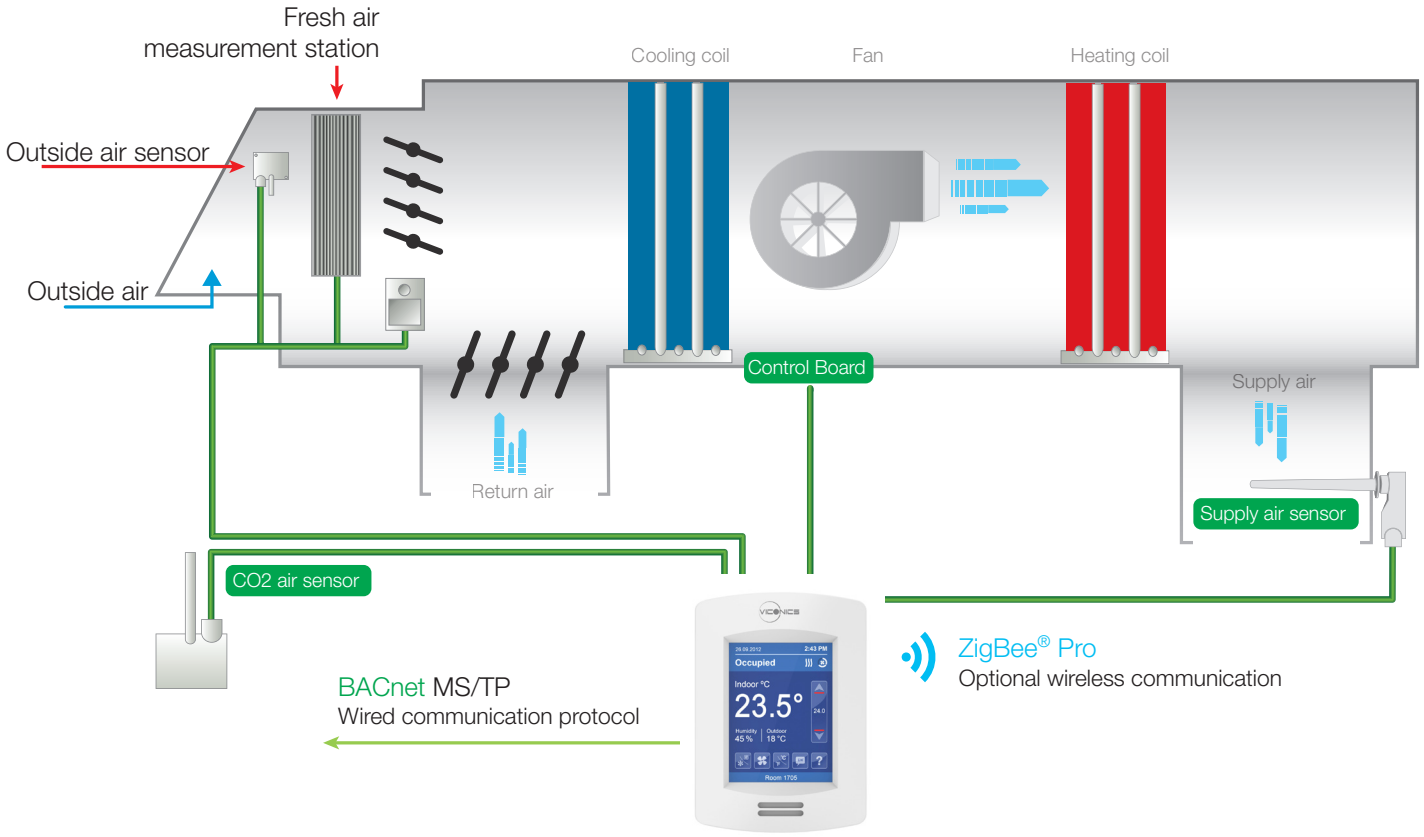
- **The FA Range parameter should be set to 0 CFM.**
- **Set AI1 parameter to CO2 (0 VDC = 0ppm ; 10VDC = 2000ppm)**



- **Min Pos, Max Pos, Min CO2 and Max CO2 parameters should be set according to the required setting.**

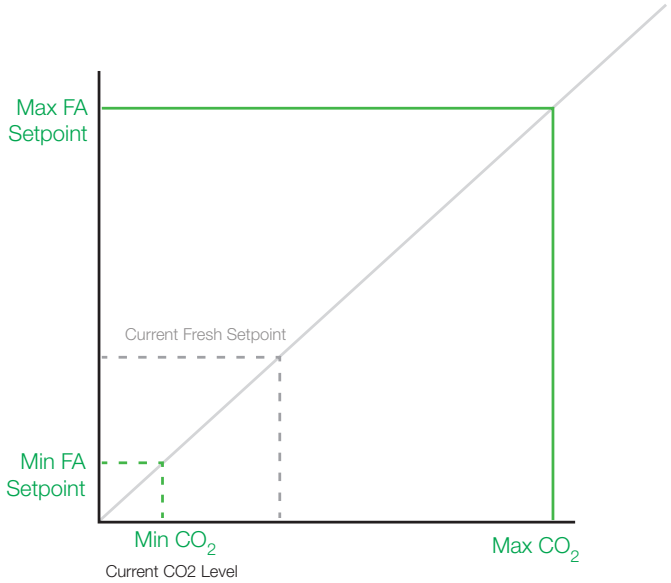
The highest value between free cooling demand output and interpolation output for the fresh air setpoint will be the output to the fresh air damper.

Economizer Control Mode, CO2 Level Control and Fresh Air Measurement Station



If the fresh air damper is to be used for both free cooling and CO2 level control with a fresh air measurement station, only the Min FA, Max FA, Min CO2 and Max CO2 parameters as well as the free cooling sequence will be active.

- **The FA Range parameter should be set to something other than 0 CFM.**
- **Use an air flow transmitter to read fresh air level with AI2 input (0-5 VDC input)**
- **Min FA, Max FA, Min CO2 and Max CO2 parameters should be set according to the required setting.**



The highest value between free cooling demand output and interpolation output for the fresh air setpoint based on the CO2 level will be the output to the fresh air damper.

APPENDIX A PASSIVE INFRA-RED (PIR) MOTION DETECTOR COVER SPECIFICATIONS

PIR cover sequence of operation

Initially, the controller is in Stand-by mode. Stand-by setpoints are used at the controller. As soon as the PIR detects motion, the Occupancy status switches to Occupied and the Stand-By Time timer is reset. The Occupied setpoints are used.
If no motion is detected in the room for the entire Stand-By Time duration (adjustable parameter), the room then 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 will switch the room back to Occupied mode. For this reason, avoid installing PIR sensors near heat vents or other sources of moving warm air in order to avoid false detections.

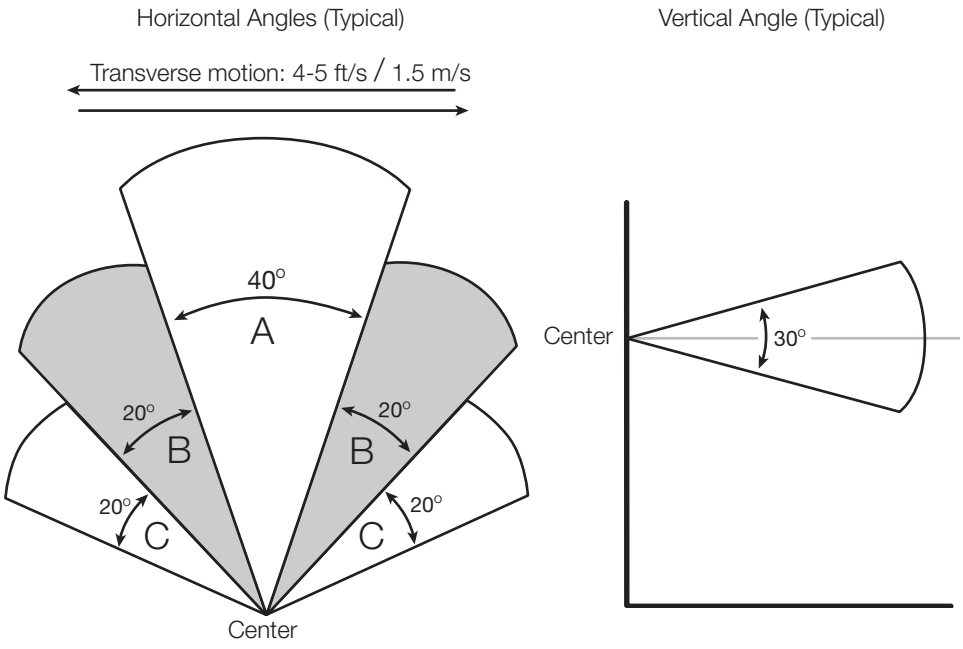
Typical Detection Pattern for PIR Lens

Recommended installation height for PIR sensor:

4 - 5 ft. / 1.2-1.5 m

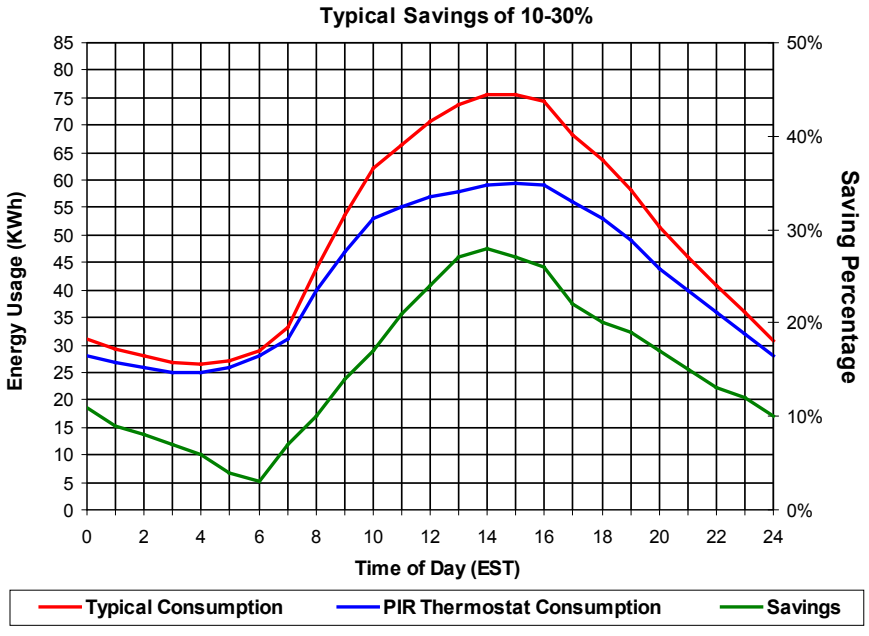
Sensor Ranges

A = 20 ft. / 6.1 m
B = 14 ft. / 4.3 m
C = 11 ft. / 3.4 m



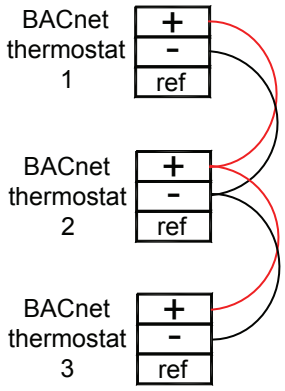
Energy savings

The PIR can maximize your energy saving from 10-30% by relaxing temperature set points in unoccupied zones during scheduled periods.



APPENDIX B OPTIONAL NETWORK SET-UP

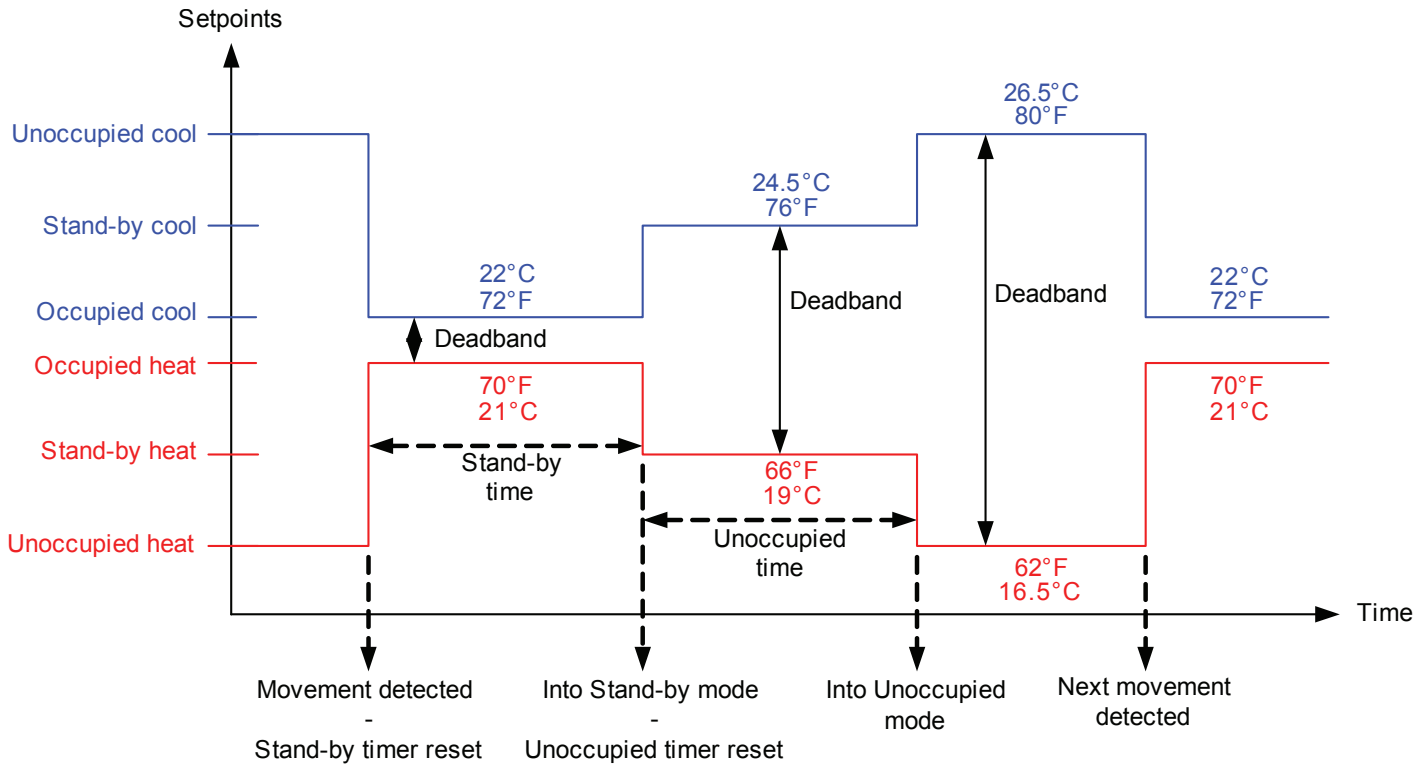
BACnet® communication wiring



Notes:
- Wiring should be daisy chained
- Respect polarity
- If using 2 conductors 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

APPENDIX C CONTROLLERS' OCCUPANCY SEQUENCE OF OPERATION SCHEMATIC



APPENDIX D SED SERIES WIRELESS SENSORS

Wireless ZigBee® Pro Motion Sensors and Door/Window Switch

Wireless door switches used with an onboard or remote PIR sensor provide advanced local occupancy routines allowing for increased energy savings during occupied hours without sacrificing occupant comfort.
Wireless window switches are used to monitor exterior windows or patio/balcony doors when opened to prevent unnecessary energy consumption.

Rooftop Unit, Heat Pump, and Indoor Air Quality Controllers with SED Series 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 twenty SED-WIN or SED-DOR ZigBee wireless switches can be used with a VT8600 Room Controller Up to 10 different ZigBee motion sensors and switches (SED-WMS, SED-CMS, or SED-WDS) can be used with a VT8600 Room Controller. Note that if a ZigBee wireless window switch is used, the VT8600 Room Controller cannot also use a remote PIR motion sensor, whether wired or wireless. Using one or more wireless remote PIR motion sensors means that a wired PIR motion sensor cannot be used, and vice versa.

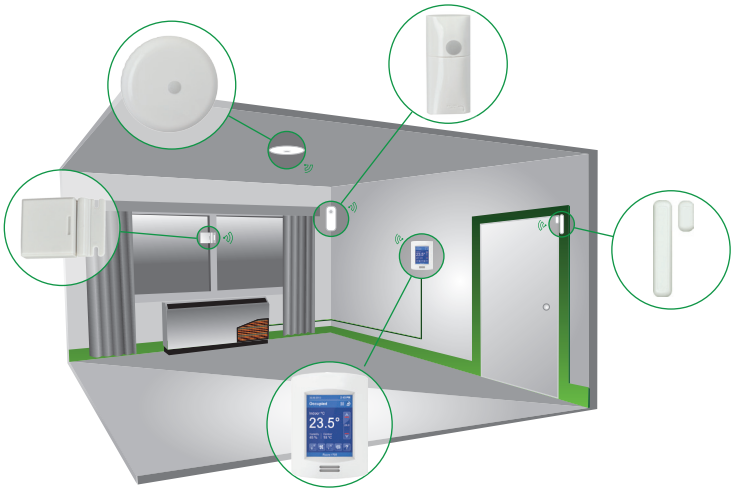
The SED Series sensors are factory delivered with batteries and are ready to be installed, configured, and used right out of the box. Due to the extremely small current consumption of the sensors, the expected battery life is approximately 10 years, which is equivalent to the battery shelf life. No tools 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 VT8600 user interface has screens used to pair and configure ZigBee devices (SED-WMS, SED-CMS, or SED-WDS only). Local information for battery life and connectivity (heartbeat) are also displayed through the ZigBee® Pro wireless network.

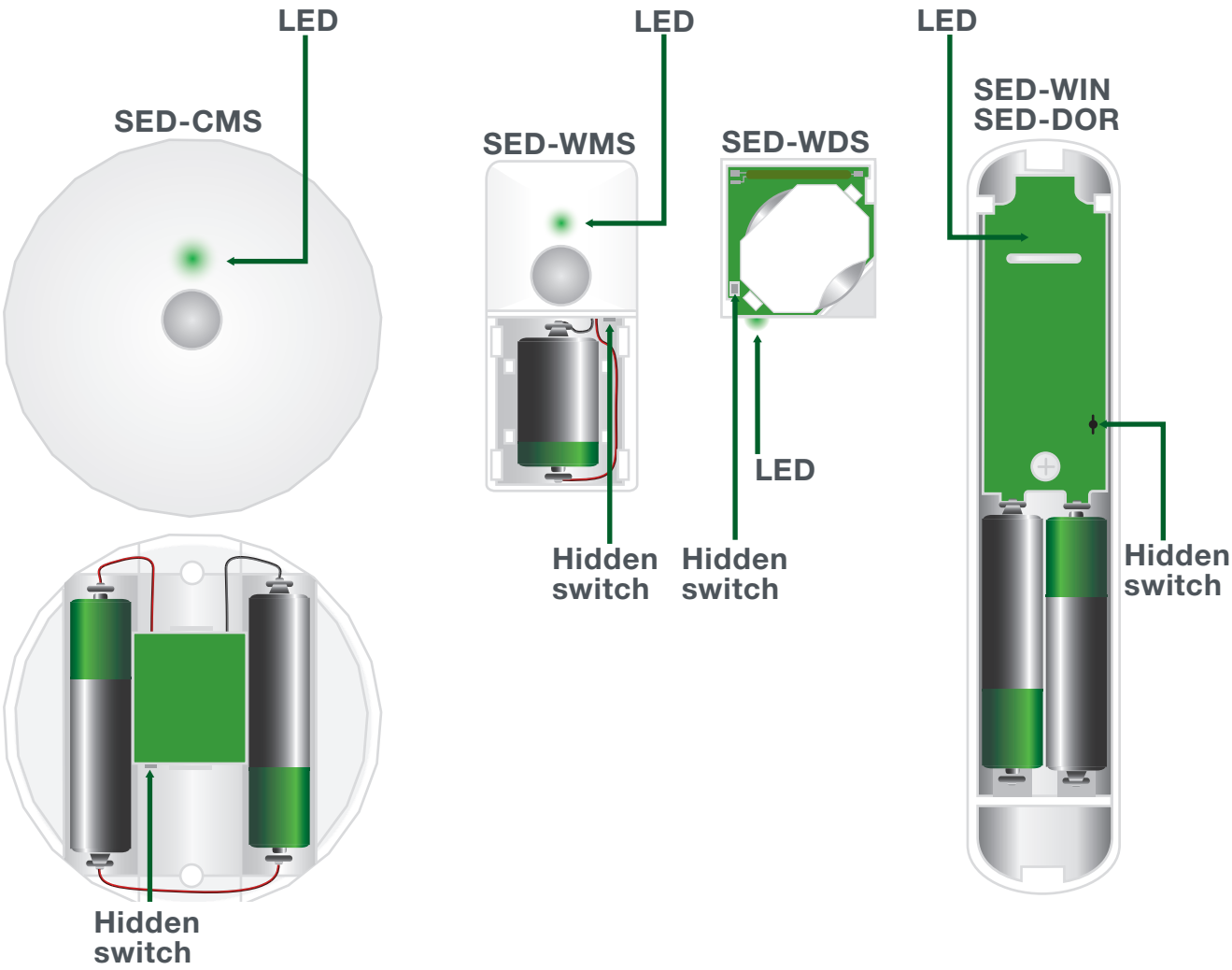
For more information about using the SED-WIN and SED-DOR switches, consult the **SED-WIN / SED-DOR Wireless Door and Window Switch Installation Guide**.

For more information about using the SED-WDS, SED-WMS and SED-CMS wireless switches and sensors, consult the **Pairing VT8000 Series Room Controllers with ZigBee Sensors Installation Guide and Procedure.**

Model Selection

Window Switch	Door Switch
Door switch	SED-DOR-P-5045
Window switch	SED-WIN-P-5045
Door/window switch	SED-WDS-P-5045
Wall mounted motion sensor	SED-WMS-P-5045
Ceiling mounted motion sensor	SED-CMS-P-5045





APPENDIX E TERMINAL CORRESPONDENCE

The terminals of an VT8600 are identified differently and have a wider range of possible functions compared to those of any of the VT7000 series Room Controllers. Nonetheless, there is a direct correspondence of functions between the terminals of the VT7000 series and the VT8600 series. Consult the table below to verify the appropriate terminal when replacing a VT7000 Room Controller with a VT8600 Room Controller.

VT7000		VT8600	
Terminal name	**Terminal ID**	**Terminal name**	**Terminal ID**
Binary Input 1	BI1	Universal Input 16	UI16
Binary Input 2	BI2	Universal Input 17	UI17
Universal Input 3	UI3	Universal Input 19	UI19
Sensor Common	Scom	Terminal 18 Common	COM
Remote Sensor	RS	Universal Input 20	UI20 - RS
Sensor Common	Scom	Terminal 21 Common	COM
Mix/Supply Sensor	MS	Universal Input 22	UI22 - SS