PIR Application Guide for the VT76xxX5x00(X) Series Thermostats

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NOTICE

IMPORTANT NOTICE RELATED TO PRODUCT PART NUMBERS

For the latest model and part numbers, please refer to "VT8000 and VT7000 Series Room Controllers Catalog, version 10" (028-6100-08), which can be found on http://www.viconics.com/.

This document contains information on active and retired products. The latter are no longer sold by Viconics Technologies or its partners.

For additional information on 7000 Series Room Controllers and a list of replacement part numbers, please visit http://www.viconics.com/.

Failure to follow these instructions can result in confusion or order delays.

Product Overview

The VI-PIR Accessory covers with embedded Passive Infra-Red motion detector have been specifically designed to work with all compatible VT76xx series thermostats. Thermostats compatible with VI-PIR covers use the following part number assignments: VT7xxxxX5xxx(X). The 5 identifies the thermostat base thermostat has the necessary onboard polarized PIR connector and the enhanced occupancy functionality added.

When equipped with a VI-PIR accessory cover, a VT76xx series thermostat provides advanced active occupancy logic, which will automatically switches occupancy levels from Occupied to Unoccupied as required by local activity being present or not.

This advanced occupancy functionality provides advantageous energy savings during occupied hours without sacrificing occupant comfort.

Typical applications that can be meet by the new PIR accessory covers range from:

- Any networked water source heatpump fully integrated to BAS system
- Networked or stand-alone conference rooms
- Networked or stand-alone classrooms units
- Any commercial offices that have random occupancy schedules during occupied hours as dictated by the function of the tenant
- Or any controlled piece of HVAC equipment that may yield energy savings with the introduction of an automatic unoccupied level of occupancy.

The additional following documentation is available on www.viconics.com

- PIR cover installation information is available on document: *PIR Cover Installation-Exx*
- Detailed information on the thermostat (VT76xxX5x00x), is available on document: *LIT-VT7600-PIR-E00.doc*
- Detailed information on the thermostat (VT76x7X5x00x), is available on document: *LIT-VT76x7-PIR-E00.doc*
- Information on the BACnet models (VT76xxX5x00B), is available on document *ITG-VT76xx-PIR-BAC-Exx*
- Information on the Wireless models (VT76xx0X5x00W), is available on documents: *ITG-VWG-40-BAC-Exx* and *LIT-VWG-40-SETUP-Exx*

VI- PIR Cover Models Available

Viconics PIR Cover Part Number	Description	Compatible with the Following Thermostats
COV-PIR-RTU-5000	PIR cover for roof-top and heatpump thermostats	VT76xxX50xx(X)

Configuration Parameters Associated with the Viconics PIR Accessory Covers ────────

The following configuration parameter is specifically provided as standard on all VT76xx series thermostats. It is associated with the advanced occupancy functionality introduced with the addition of a PIR cover. This parameter will allow the installer to set the thermostat occupancy functions exactly as required by the application.

Its functionality only becomes active if a PIR accessory cover is connected.

Configuration Parameter	Description of Configuration parameter
Unoccupied Time: Default 0.5 hours	This parameter sets the time delay between the moment where the PIR cover detected the last movement in the area and the time which the thermostat Unoccupied mode and setpoints become active. Adjustable from 0.5 to 24 hours in 0.5hr increments If no movement are detected in the area and the current mode is occupied. This parameter will then set the time delay between the moment where the thermostat toggles to unoccupied due to movement detection and the time which the thermostat unoccupied mode and setpoints become active after the timer expires. The factory value or **0.5 hours:** Adjustable from 0.5 to 24 hours in .5hr increments

Important Notes and Things to Know ────────

When reviewing the following document and planning an application using a Viconics VT76xx thermostat with PIR functionality, please remember the important following notes:

- **VT76xx PIR implementation**s use a 2 level occupancy scheme: Occupied And Unoccupied. The application layer does NOT support stand-By mode.

- **Configuration of PIR Function:** PIR application related configuration parameter (Unoccupied Time) is displayed in the configuration menu or available as an object in the network object list. The advanced occupancy functionality of a PIR attached to a VT76xx thermostat is only enabled if A Viconics VI-PIR cover is installed on the thermostat.

- **PIR Cover Warm-Up Period:** When VI-PIR accessory cover is used and a thermostat is powered up; there will be a 1 minute warm up period before any local movements can being detected and acknowledged by the PIR sensing device. The local status LEDs for the VI-PIR cover will also not be active during that one minute period.

  Only when that 1 minute period has elapsed after initial power up of the thermostat will the PIR functionality and local movement status LEDs be activated.

- **Setpoints:** The implemented occupied and unoccupied heating and cooling setpoints are under the same limitations and restrictions. This means that:
    - They use exactly the same range:
        - Heating setpoints range are: 40 to 90 °F (4.5 to 32.0 °C)
        - Cooling setpoints range are: 54 to 100 °F (12.0 to 37.5 °C)
    - They are always limited by the applied minimum deadband configuration
    - They will be limited by the Heat Maximum and Cool Minimum configuration parameters

All individual cooling setpoints and all individual heating setpoints can be set independently.

The installer must make sure that the difference between the unoccupied and occupied value can be recovered in a timely fashion when movement is detected in the zone and large enough to warrant maximum energy savings.

Ex.:

| Unocc Heat = 67F | Occ Heat = 72F | Occ Cool = 75F | Unocc Cool = 80F |

Room Temperature
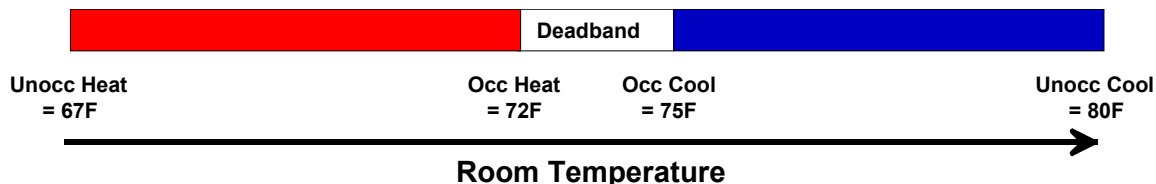
- **Unoccupied Events PIR Triggers:** During unoccupied periods (scheduling models with unoccupied local schedule or Unoccupied network command), any movement detected by the PIR cover WILL trigger the internal Unoccupied timer. If an occupied event is scheduled during the time the timer is active (scheduling models with occupied local schedule or Occupied network command) the local thermostat will operate in Occupied mode for the remaining period as dictated by the timer.

Example if:
- The unoccupied timer is set to 1 hour
- A movement is detected at 6:15 AM
- An occupied event is scheduled at 7:00 AM

Then the local thermostat will be occupied from 7:00 AM to 7:15 AM
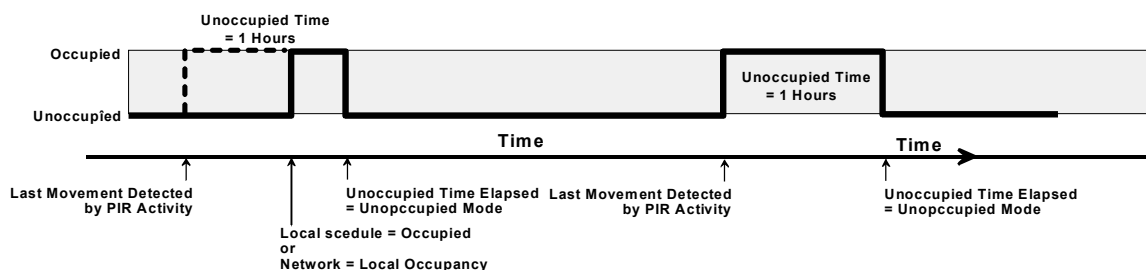
- **Network Priority and Local Occupancy Routine:**

  The internal PIR occupancy logic implementation in conjunction with network commands has been conceived to give the most flexibility while allowing for simple implementation and use.

  Network Occupancy Commands: All VT76xx series thermostat have 3 occupancy command levels. This is valid for all network variations available for the thermostats: LON, BACnet-MS-TP or Wireless.

  The 3 levels occupancy state level commands are:

State Occupancy Command Levels	Function
Local occupancy	- Releases the thermostat to its own occupancy schemes - This may be a PIR sensing device, a local schedule or an occupancy routine done by one of the digital input - This state command level is used to effectively release the thermostat to use the PIR functions
Occupied	- Leaves the thermostat in occupied mode and cancels any local occupancy functions, including the PIR occupancy routine - This state command level is used to force the zone to be always occupied
Unoccupied	- Leaves the thermostat in unoccupied mode and cancels any local occupancy functions, including the PIR occupancy routine - This state command level is used to force the zone to be always unoccupied. - The only local possible command is a local override if the thermostat is equipped with such an option or if the local keypad lockout allows so

  Notes for scheduling all models: VT7652A5x 0B, VT7652B5x 00B, VT7656B5x 00B, VT7657B5x00B and VT7652H5x0B.

  - A network occupied or unoccupied command ALWAYS has precedence over the local schedule.

  - When the release / local occupancy command is issued, the PIR is only active during Occupied periods as dictated by the local schedule. During the local schedule unoccupied periods, the PIR is not functional and the local thermostat will remain in unoccupied mode.

  Network Effective Occupancy Feedback Status: All VT76xx series thermostats have 3 occupancy feedback levels. This is valid for all network variations available for the thermostats: LON, BACnet-MS-TP or Wireless.

Effective Command State Levels	Function
Override / By-Pass	Indicates that the zone is currently local occupied override mode from the unoccupied state This function will operate like a normal local override and its time value is as dictated by the ToccTime configuration parameter setting
Occupied	Indicates that the zone is currently occupied This effective feedback state may be driven by a local occupancy routine like a PIR sensor or by an occupied network command
Unoccupied	Indicates that the zone is currently unoccupied This effective feedback state may be driven by a local occupancy routine like a PIR sensor or by an unoccupied network command

1) BACnet Object Used for Occupancy Commands and Feedback

Object Name	Object ID	BACnet Index	Text
Occupancy Command	MV 12	1	Local Occupancy (PIR or Internal Schedule)
		2	Occupied
		3	Unoccupied
Effective Occupancy	MV 34	1	Occupied
		2	Unoccupied
		3	Temporary Occupied

2) LON Snivets Used for Occupancy Commands and Feedback

Snivet Name	Notes and Indexes

network input SNVT_occupancy **nviOccCmd**	➢ Default Null Value: OC_NUL = 0xFF Releases the thermostat to its internal Occupancy function: Internal scheduling, PIR, etc….
	➢ Valid Range:
	    0 = OC_OCCUPIED
	    1 = OC_UNOCCUPIED
	    2 = OC_BYPASS – **Not Used**
	    3 = OC_STANDY – **Not Used**
	    0xFF = OC_NUL (Release to PIR or internal schedule)

network output SNVT_occupancy **nvoEffectOccup**	➢ This output network variable is used to indicate the actual occupancy mode of the unit. This information is typically reported to a supervisory controller or provided to another Space Comfort Controller to coordinate the operation of multiple units
	➢ Valid Range:
	    0 = OC_OCCUPIED
	    1 = OC_UNOCCUPIED
	    2 = OC_BYPASS[1]
	    3 = OC_STANDBY – **Not Used**
	Note 1: OC_BYPASS can be initiated by local override. NvoEffectOccup will only be in OC_BYPASS for the duration of the ToccTime (nciGenOpts), until reinitiated by either a transition of the local input or an update to nviOccManCmd.

- **Initial State, PIR Occupancy Routine:** The initial effective occupancy state on power-up with either a PIR cover is present:
  - In stand-alone applications at power-up: Local occupancy mode = Occupied
  - From a previous network unoccupied command: Local occupancy mode = Unoccupied**
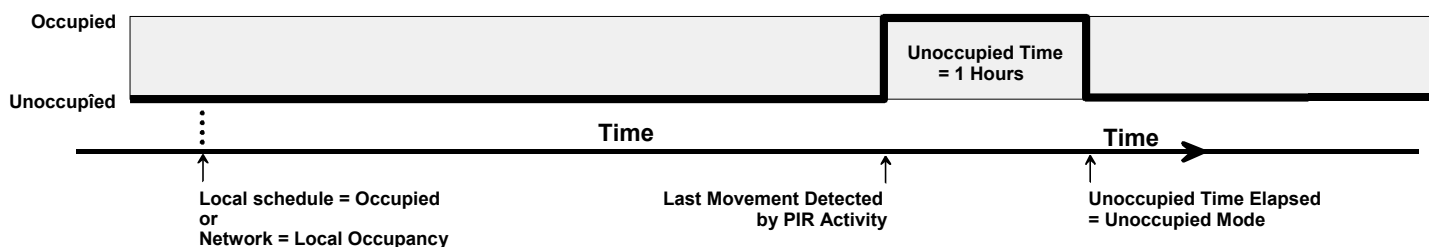 - From a previous network occupied command: Local occupancy mode = Unoccupied**

    ** Valid only if no movements are detected by the PIR for a time duration equal to the Unoccupied Time period "prior" to the occupancy event toggle. See last item under **Important Notes and Things to Know**

When the network effectively releases a thermostat to its local PIR routine from a previous occupied or unoccupied network state, the resulting occupancy state is <u>Unoccupied</u>.
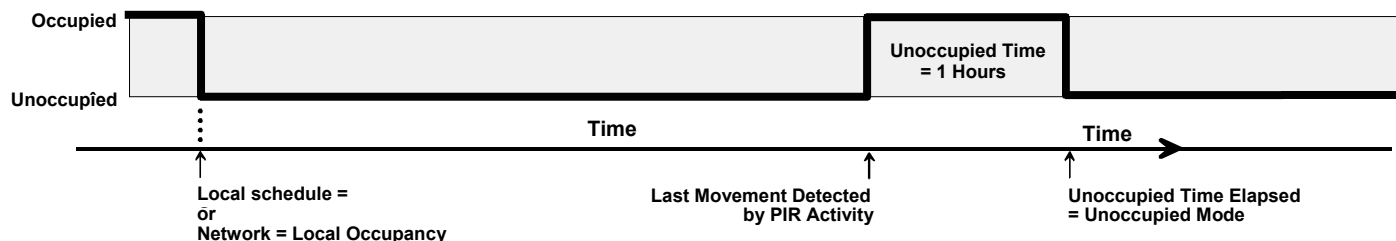
Initial Power-Up, Stand-Alone or Networked

Occupied

Unoccupied Time = 1 Hours

Unoccupied Time = 1 Hours

Unoccupied

Time

Time

Power-up

Unoccupied Time Elapsed = Unoccupied Mode

Last Movement Detected by PIR Activity

Unoccupied Time Elapsed = Unoccupied Mode

After Receiving the *Local Occupancy / PIR* Network Command From a Previous Network Unoccupied State

Occupied

Unoccupied Time = 1 Hours

Unoccupied

Time

Time

Local schedule = Occupied
or
Network = Local Occupancy

Last Movement Detected by PIR Activity

Unoccupied Time Elapsed = Unoccupied Mode

After Receiving the *Local Occupancy / PIR* Network Command From a Previous Network Occupied State

Occupied

Unoccupied Time = 1 Hours

Unoccupied

Time

Time

Local schedule =
or
Network = Local Occupancy

Last Movement Detected by PIR Activity

Unoccupied Time Elapsed = Unoccupied Mode
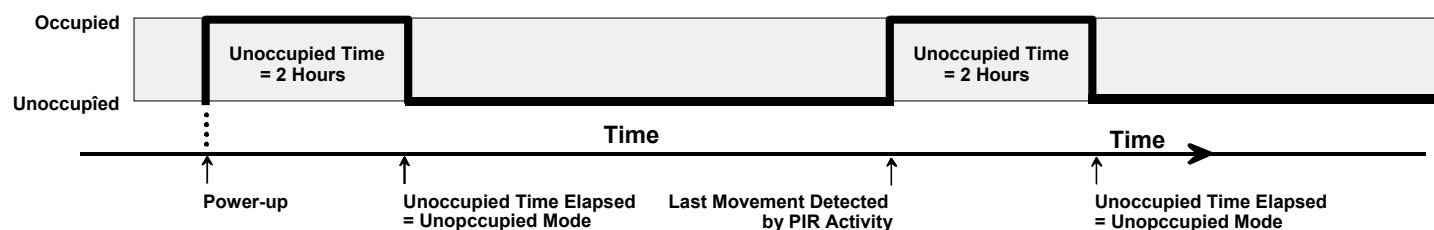
Typical Applications

- **VT760x Stand-alone application using 2 levels of occupancy with a VI-PIR accessory cover**

    Non-Scheduling models

Set-up and Configuration	
Thermostat used	Non-Scheduling VT760xX5000
PIR used	COV-PIR-RTU-C-5000 accessory cover
Unoccupied timer value	2.0 hours
Network interface used	None, stand-alone
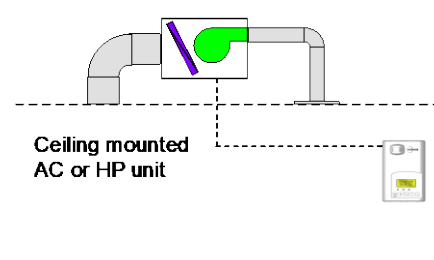
Ceiling mounted
AC or HP unit

Sequence of operation:

At initial power-up, when the thermostat 24 Vac power supply is applied; the initial occupancy of the zone will be occupied mode for 2 hours.

If no movement is detected after the 2 hours timer expires, the thermostat occupancy will switch to unoccupied mode.

As soon as the PIR device detects a movement or motion, the occupancy status switches to occupied mode and the occupied setpoints are used.

Anytime the PIR device detects local motion, the elapsed unoccupied timer value will be reset. If no motion is detected in the zone for the entire unoccupied timer duration, then the room switches to unoccupied mode and the unoccupied setpoints are used.

At anytime, if the PIR device detects a local movement or motion, the occupancy status switches to occupied mode and the occupied setpoints are used.
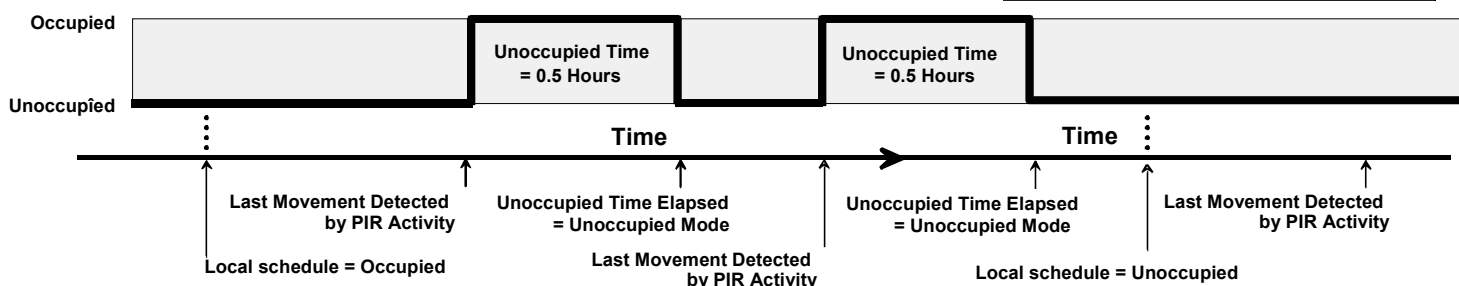
- **VT765x Stand-alone application using 2 levels of occupancy with a VI-PIR accessory cover**

Scheduling models

Set-up and Configuration	
Thermostat used	Scheduling VT765xX5000
PIR used	COV-PIR-RTU-C-5000 accessory cover
Unoccupied timer value	0.5 hours
Network interface used	None, stand-alone
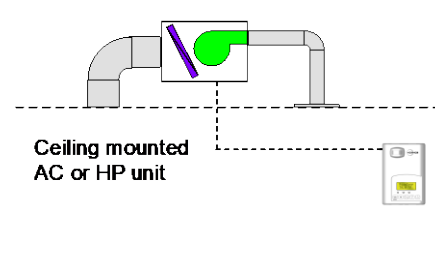
Ceiling mounted
AC or HP unit

Sequence of operation:

At initial power-up, when the thermostat 24 Vac power supply is applied; the initial occupancy of the zone will be as dictated by the local thermostat schedule.

If the thermostat schedule is Unoccupied, then the local occupancy mode will be unoccupied and the unoccupied setpoints will be used.

During unoccupied periods by the schedule, the PIR function is not used and the device will remain unoccupied independently of movements or motion detected.

During an unoccupied periods by the schedule, a local override can me made by a user by using the "Override Schedule Y/N?" question prompt In the menu. The override duration will be equivalent to the value set in the "ToccTime" configuration parameter. The PIR function is not used during the local override period.

The PIR function is only used when the local thermostat is in occupied mode as dictated by the local schedule.

During the occupied period as dictated by the local schedule; as soon as the PIR device detects a movement or motion, the occupancy status switches to occupied mode and the occupied setpoints are used.

if no movement is detected after the 0.5 hour timer expires, the thermostat occupancy will switch to unoccupied mode.

Anytime the PIR device detects local motion during the occupied period as dictated by the local schedule, the elapsed unoccupied timer value will be reset. If no motion is detected in the zone for the entire unoccupied timer duration, then the room switches to unoccupied mode and the unoccupied setpoints are used.

At anytime, if the PIR device detects a local movement or motion during the occupied period as dictated by the local schedule, the occupancy status switches to occupied mode and the occupied setpoints are used.

When the thermostat switches to an unoccupied periods as dictated by the local schedule, the PIR function is not used and the device will remain unoccupied independently of movements or motion detected.
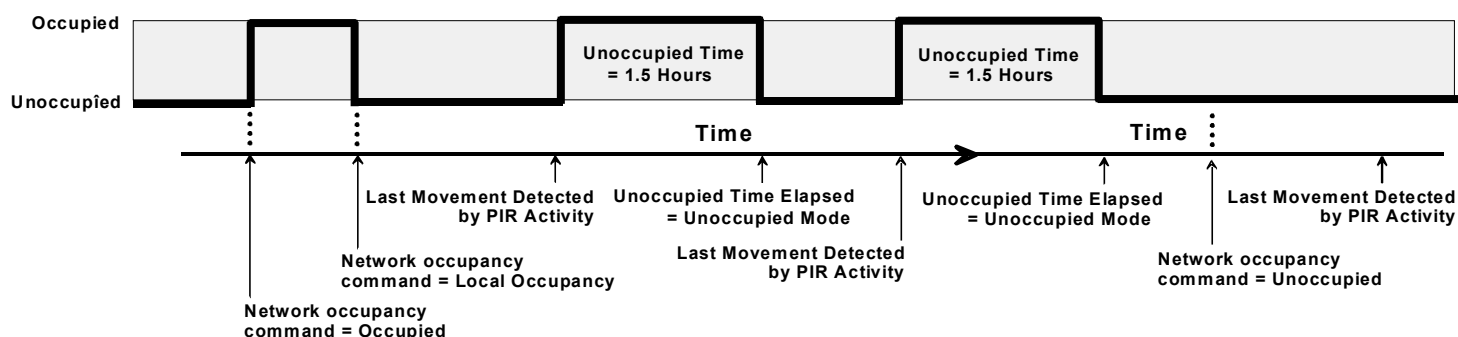
- **VT760x Networked application using 2 levels of occupancy with a VI-PIR accessory cover**

  Non-Scheduling models

Set-up and Configuration	
Thermostat used	Non-Scheduling VT760xX5000X
PIR used	COV-PIR-RTU-C-5000 accessory cover
Unoccupied timer value	1.5 hours
Network interface used	None, stand-alone
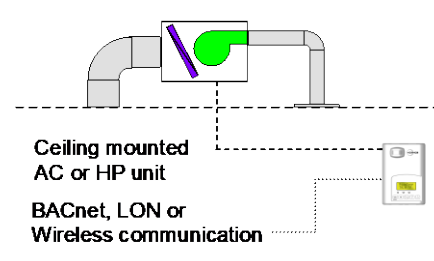
Ceiling mounted
AC or HP unit

BACnet, LON or
Wireless communication

Sequence of operation:

At initial power-up, when the thermostat 24 Vac power supply is applied; the initial occupancy of the zone will be occupied mode for 1.5 hours unless a Network Occupied or Unoccupied command is received.

If a Network Occupied Command is received, the PIR function is not used and the device will remain occupied independently of movements or motion detected.

If a Network Unoccupied Command is received, the PIR function is not used and the device will remain unoccupied independently of movements or motion detected.

During a Network Unoccupied Command period, a local override can me made by a user by using the "Override Schedule Y/N?" question prompt In the menu. The override duration will be equivalent to the value set in the "ToccTime" configuration parameter. The PIR function is not used during the local override period.

The PIR function is only used if the local thermostat receives a Network Local Occupancy Command as dictated by the remote BAS front end schedule.

During the Network Local Occupancy Command period as dictated by the local schedule; as soon as the PIR device detects a movement or motion, the occupancy status switches to occupied mode and the occupied setpoints are used.

if no movement is detected after the 1.5 hour timer expires, the thermostat occupancy will switch to unoccupied mode.
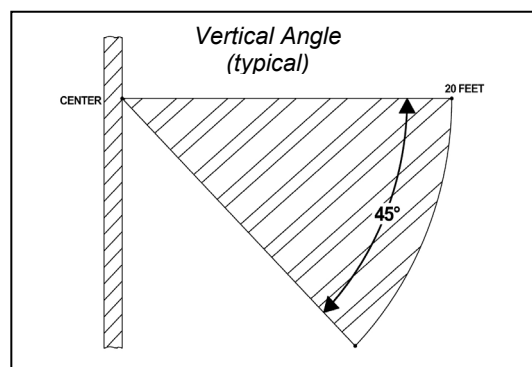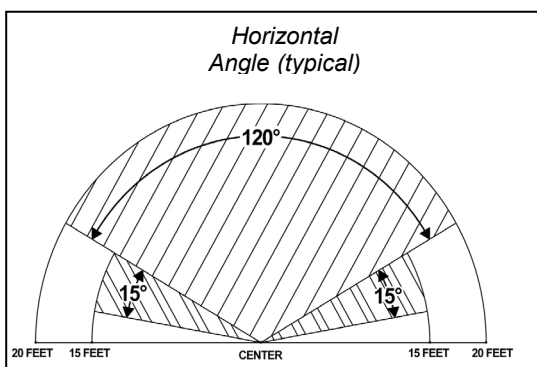
Anytime the PIR device detects local motion during the Network Local Occupancy Command period as dictated by the remote BAS front end schedule, the elapsed unoccupied timer value will be reset. If no motion is detected in the zone for the entire unoccupied timer duration, then the room switches to unoccupied mode and the unoccupied setpoints are used.

At anytime, if the PIR device detects a local movement or motion during the Network Local Occupancy Command period as dictated by the remote BAS front end schedule, the occupancy status switches to occupied mode and the occupied setpoints are used.

If a Network Occupied Command is received, the PIR function is not used and the device will remain occupied independently of movements or motion detected.

If a Network Unoccupied Command is received, the PIR function is not used and the device will remain unoccupied independently of movements or motion detected.

Typical Detection Pattern for VI-PIR Lens ————————————————————————

Horizontal Angle (typical)

120°

15°   15°

20 FEET   15 FEET   CENTER   15 FEET   20 FEET

Vertical Angle (typical)

CENTER   20 FEET

45°

Installation Tips ————————————————————————

Tip Type	Area Of Interest	Explanation
General Installation	PIR Connector	Polarized connector is located at bottom left hand corner of VT7000 series thermostat
	Security Screw	A security screw has been provided in the thermostat box. This screw should be carefully installed in the intended mounting position located bottom center of thermostat cover.
Tip Type	**Area Of Interest**	**Explanation**
Initial Power Up & Commissioning	PIR Warm up period	PIR Sensor may take up-to 60 seconds after initial warm up period to detect movement consistent with typical detection pattern.
	Visual indication (Status of PIR)	Visual indication of PIR activity for commissioning has been provided via a blinking LEDs located on the thermostat cover under the PIR lens. LEDs will be active while occupant is in field of detection pattern for a period of 30 minutes after initial power up.

VI-PIR Cover Installation

- Remove security screw on the bottom of the current thermostat cover.
- Open up by pulling on the bottom side of thermostat. (Fig. 3)

A) Identify current thermostat model type:
- Use appropriate cover accessory part number as identified on the first page by referring to the thermostat model number
- The male polarized PIR connector is located at bottom left corner of thermostat (Fig. 4)

B) Installation:
- Hinge new PIR thermostat cover into position (fig. 3).
- Insert polarized connector into PIR female connector located on thermostat base (Fig 4 and 6)
- Snap PIR thermostat cover into place and re-install the security screw (Fig. 5)
- Make appropriate parameter settings related to your application within the configuration menu as identified in the thermostat installation

Fig.3

⚠️
- Electronic controls are static sensitive devices. Discharge yourself properly before manipulation and installing the thermostat and its accessories.
- Short circuit or wrong wiring may permanently damage the thermostat or the equipment.
- All VT7000 series thermostats are to be used only as operating controls. Whenever a control failure could lead to personal injury and/or loss of property, it becomes the responsibility of the user to add safety devices and/or alarm system to protect against such catastrophic failures.
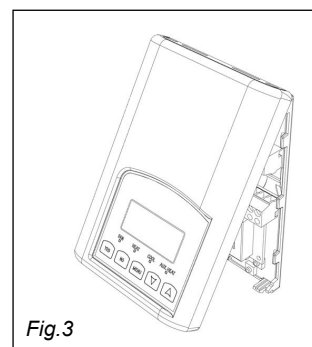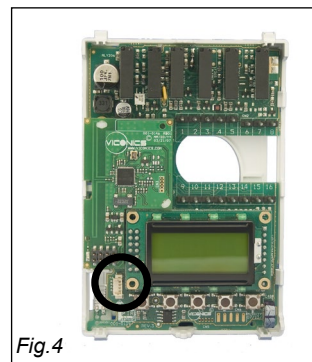

Fig.4

Specifications

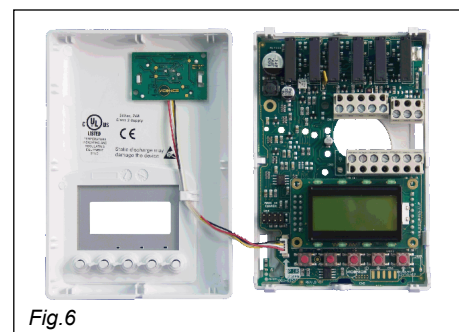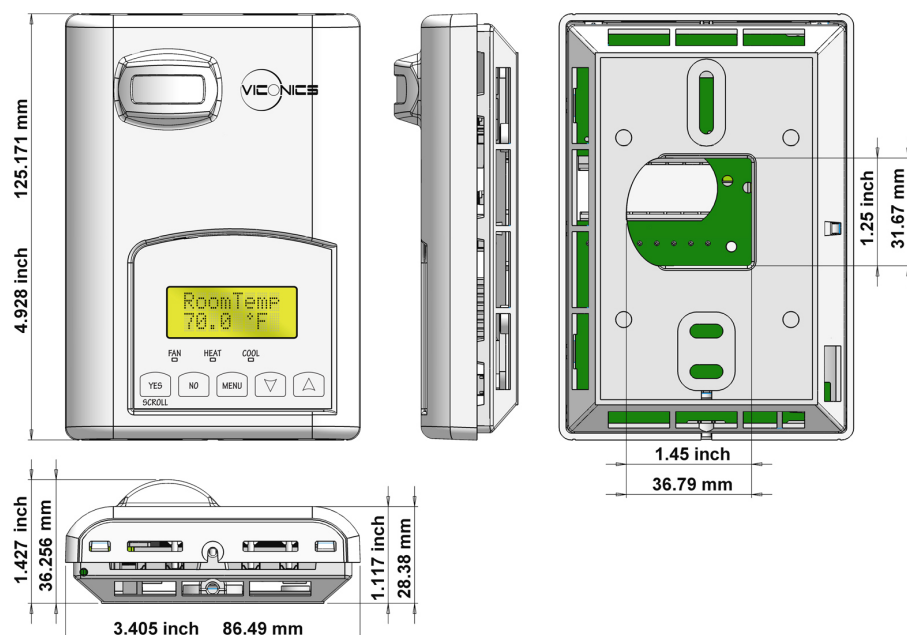|	
PIR cover power requirements:	5 Vdc Max current draw of 7mA
Operating conditions:	0 °C to 50 °C (32 °F to 122 °F)
	0% to 95% R.H. non-condensing
Storage conditions:	-30 °C to 50 °C (-22 °F to 122 °F)
	0% to 95% R.H. non-condensing
Sensor:	Local Passive Infra Red Sensor
Dimensions with Thermostat:	4.94" x 3.38" x 1.13"
Approximate shipping weight with Thermostat:	0.75 lb (0.34 kg)
Agency Approvals:	
UL	UL 873 (US) and CSA C22.2 No. 24 (Canada), File E27734 with CCN XAPX (US) and XAPX7 (Canada)
FCC	Compliant to CFR 47, Part 15, Subpart B, Class A (US)
Industry Canada	ICES-003 (Canada)
CE	EMC Directive 89/336/EEC (Europe Union)
C-Tick	AS/NZS CISPR 22 Compliant (Australia / New Zealand)
	Supplier Code Number N10696

Fig.5

Drawing & Dimensions

Fig.6