TB7600 Series Thermostat PIR Application Guide

TB7600 Series Thermostat with Occupancy Sensor

PRODUCT OVERVIEW

This application guide provides PIR occupancy sensor application information for Honeywell TB7600 Series Communicating Thermostats. When equipped with an occupancy sensor cover or a remote PIR sensor (wired to one of the remote inputs), the TB7600 Series thermostat provides advanced active occupancy logic, which automatically switches occupancy levels from Occupied to Unoccupied as required by local activity being present or not. TB7600 Series thermostats can be ordered with an occupancy sensor cover or have one added at a later time (TB-PIR-RTU). All thermostats are PIR ready. The occupancy sensor cover has an embedded passive-infra-red motion detector that has been designed to work with all TB7600 Series thermostats. This advanced occupancy functionality provides advantageous energy savings during occupied hours without sacrificing occupant comfort.

Applications

Typical applications that can be meet by the occupancy sensor:

- Any networked water source heat pump 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
- Any controlled piece of HVAC equipment that may yield energy savings with the introduction of an automatic unoccupied level of occupancy.

More Information

For more information on the TB7600 Series thermostats download these files from Honeywell Buildings Forum (http://buildingsforum.honeywell.com).

- TB7600 Series RTU/Heat Pump Installation Instructions (form number 62-2016)
- TB7600 Series RTU with Humidity Installation Instructions (62-2017)
- Occupancy Sensor Cover for TB7200/TB7300/TB7600 Series Thermostats (62-2021)
- BACnet Integration Manual for TB7600 Series Thermostats (form number 63-4523)
- Wireless Installation and Integration Reference Manual for TB7200, TB7300, and TB7600 Series (form number 63-4522).

Contents

IMPORTANT THINGS TO KNOW

When reviewing the following document and planning an application using a Honeywell TB7600 thermostat with PIR functionality, please remember the important following notes:

- **TB7600 PIR Implementation:** Uses 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 TB7600 thermostat is only enabled if a Honeywell TB-PIR occupancy sensor cover is installed on the thermostat.

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

  Only when the one minute start up 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: 40 to 90 °F (4.5 to 32.0 °C)

    - Cooling setpoints: 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.

Example:
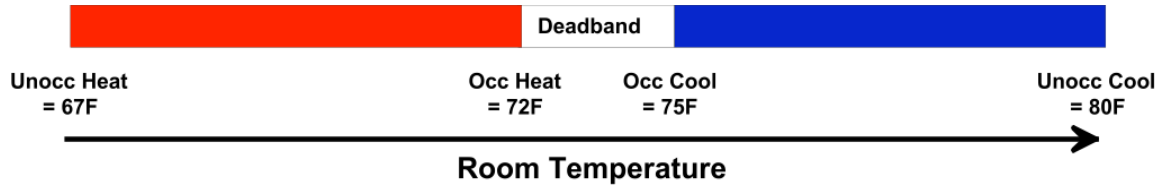
- **Unoccupied Events PIR Triggers:** During unoccupied periods (scheduling models with unoccupied local schedule or Unoccupied network command) any movement detected by the PIR WILL trigger the internal Unoccupied timer. If an occupied event is scheduled during the time the timer is active (scheduling 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:
    - 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
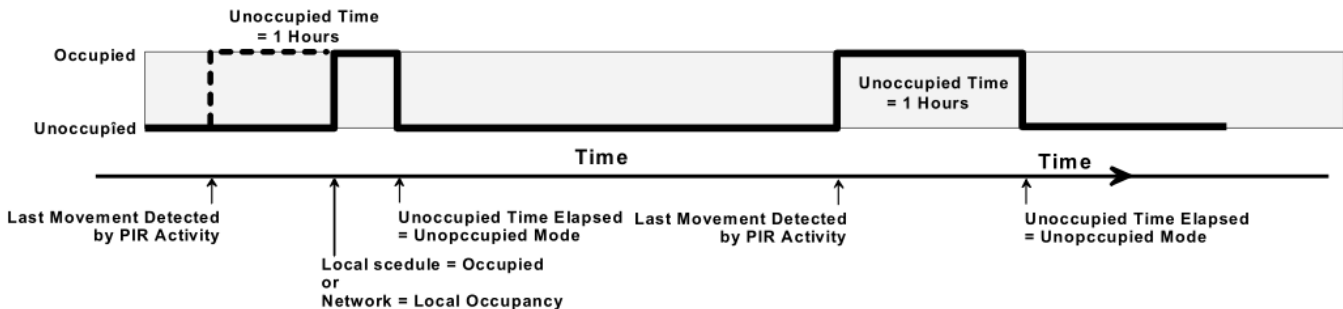
- Network Priority and Local Occupancy Routine:

  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 TB7600 Series thermostat have 3 occupancy command levels. This is valid for BACnet and ZigBee wireless models.

  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 inputs • 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 setting allows.

Notes for scheduling models: TB7652A5x14B, TB7652B5x14B, TB7656B5x14B, TB7657B5x14B and TB7652H5x14B.

- A network occupied or unoccupied command ALWAYS has precedence over the local schedules or the PIR function.

- 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 TB7600 Series thermostats have 3 occupancy feedback levels. This is valid for all network variations available for the thermostats: 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

OCCUPANCY CONFIGURATION PARAMETERS

The following configuration parameter is specifically provided as standard on all TB7600 series thermostats. It is associated with the advanced occupancy functionality introduced with the addition of a PIR cover. This parameter allows the installer to set the thermostat occupancy functions exactly as required by the application.

Functionality of this parameter only becomes active if a PIR accessory cover is connected.

| Configuration Parameter	Description
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 .5 hr increments

MV OBJECTS FOR OCCUPANCY COMMANDS AND FEEDBACK

Object Name	BACnet Object ID*	BACnet/Wireless 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

* MV Object IDs only apply to BACnet thermostats.

- **Initial State, PIR Occupancy Routine:** The initial effective occupancy state on power-up with a PIR cover:
  — 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 Things to Know." When the network releases a thermostat to its local PIR routine from a previous occupied or unoccupied network state, the resulting occupancy state is <u>Unoccupied</u>.
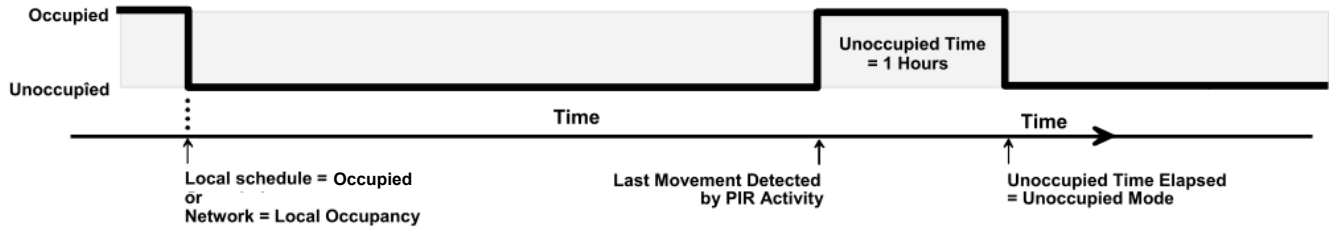
Initial Power-Up, Stand-Alone or Networked
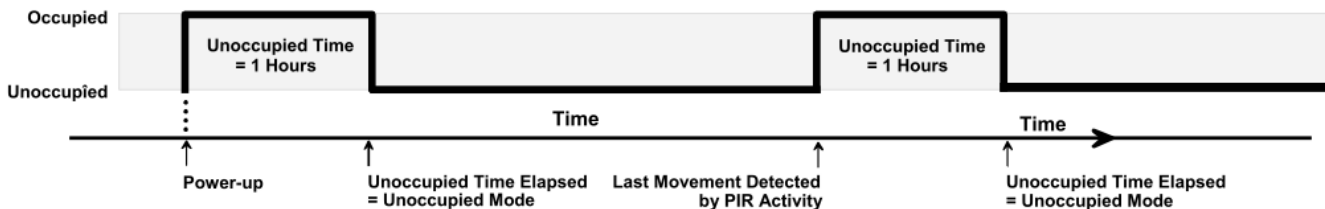
After Receiving the Local Occupancy / PIR Network Command From a Previous Network Unoccupied State
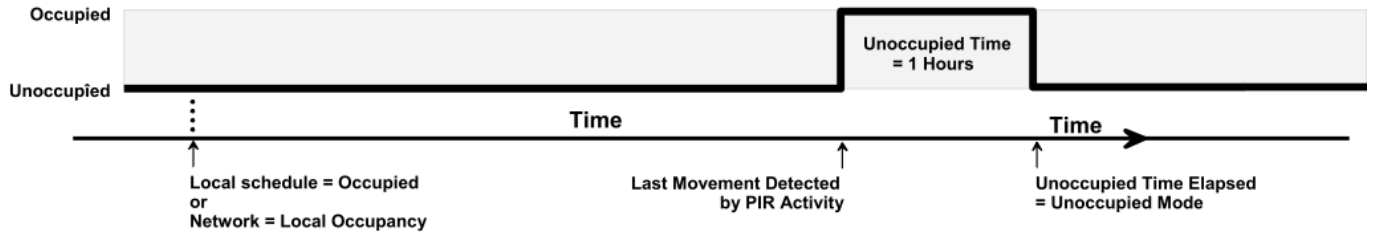

**After Receiving the Local Occupancy / PIR Network Command From a Previous Network Occupied State**

TYPICAL APPLICATIONS

1. **TB760x networked application using 2 levels of occupancy with an occupancy sensor cover**

Set-up and Configuration	
Thermostat used	TB760xX5014X
PIR used	TB-PIR-RTU
Unoccupied timer value	1.5 hours
Network interface used	BACnet MS/TP or wireless
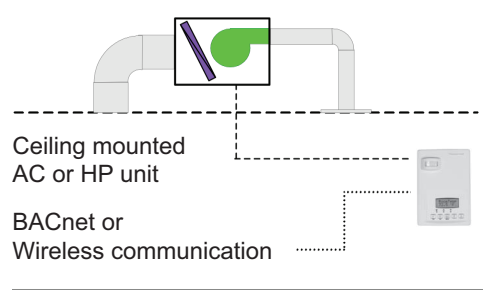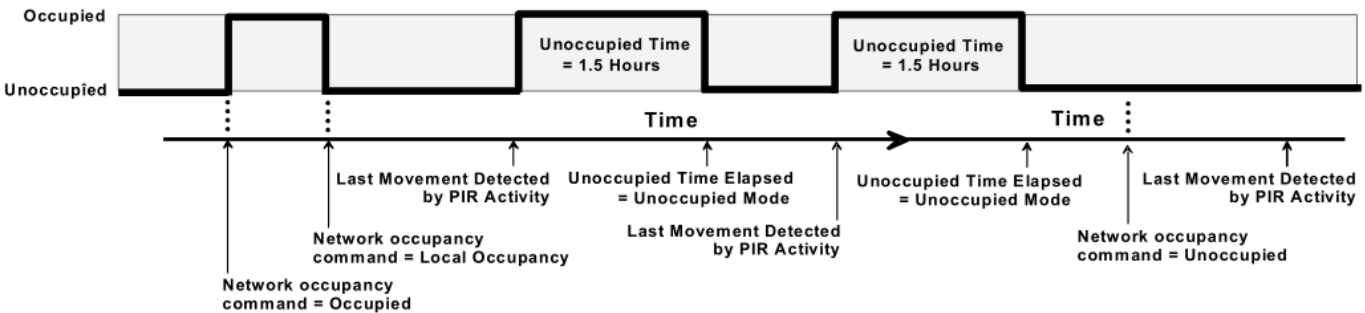
Ceiling mounted
AC or HP unit

BACnet 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 be 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.
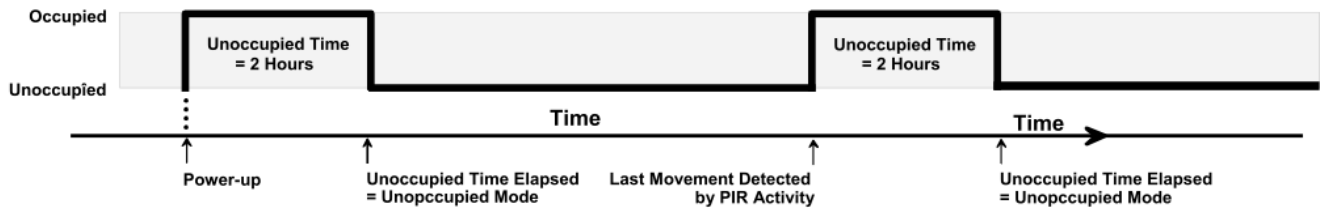
2. TB760x stand-alone application using 2 levels of occupancy with the occupancy sensor cover

   Non-scheduling models

Set-up and Configuration	
Thermostat used	Non-Scheduling TB760xX5014
PIR used	TB-PIR-RTU
Unoccupied timer value	2.0 hours
Network interface used	None, stand-alone
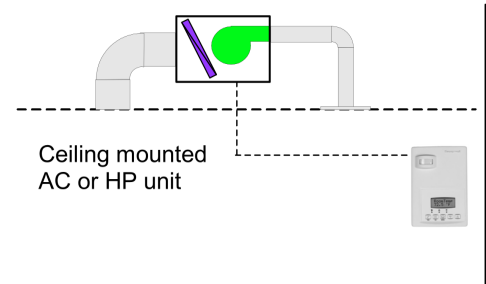
Ceiling mounted
AC or HP unit

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-hour 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 local movement or motion, the occupancy status switches to occupied mode and the occupied setpoints are used.
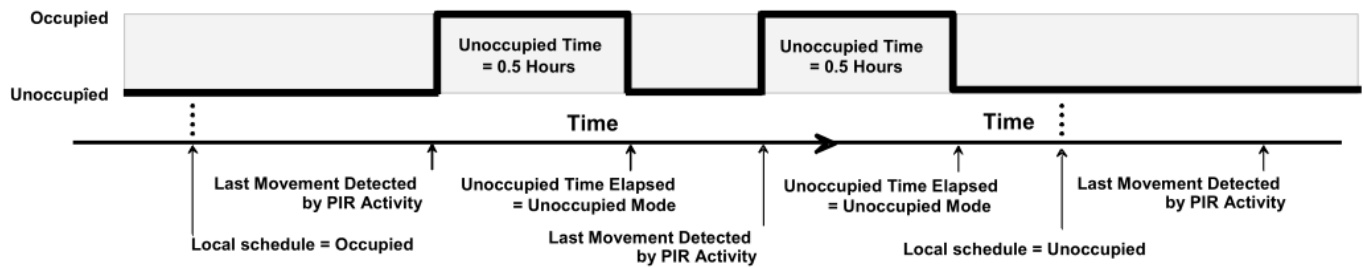
3. TB765x stand-alone application using 2 levels of occupancy with an occupancy sensor cover

Scheduling models

Set-up and Configuration	
Thermostat used	Scheduling TB765xX5014
PIR used	TB-PIR-RTU
Unoccupied timer value	0.5 hours
Network interface used	None, stand-alone
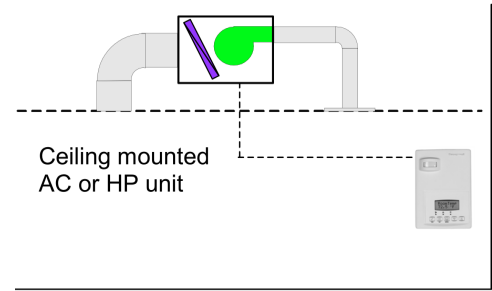
Ceiling mounted
AC or HP unit

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 unoccupied periods by the schedule, a local override can be 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 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 period as dictated by the local schedule, the PIR function is not used and the device will remain unoccupied independently of movements or motion detected.
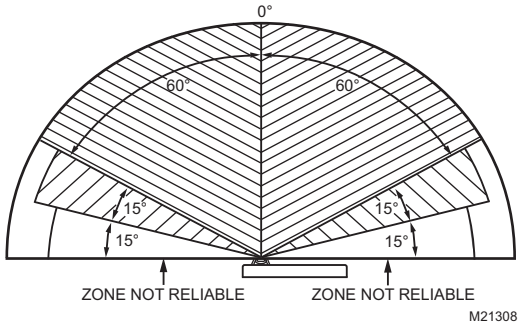
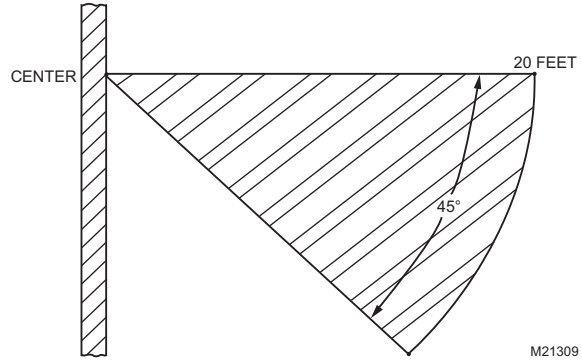## Typical PIR Detection Pattern

Fig. 1. Typical Horizontal Angle

Fig. 2. Typical Vertical Angle

INSTALLATION

⚠ WARNING

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 TB7200/7300/7600 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.

Table 1. Installation Tips

Tip Type	Area Of Interest	Explanation
General Installation	PIR Connector	Polarized connector is located at bottom left hand corner of TB7600 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.
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 is 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.

TB-PIR Cover Installation

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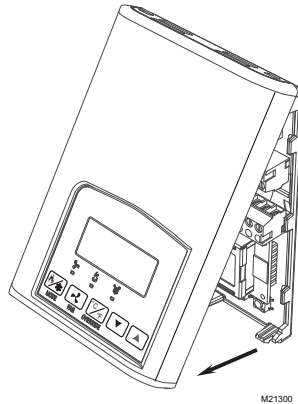2. Open up by pulling on the bottom side of thermostat. (Fig. 3)

M21300

Fig. 3. Removing cover.

3. Insert polarized connector from new cover into PIR female connector located on thermostat base. (Fig. 4)

PIR
Connector

Fig. 4. PIR connector

4. Snap PIR thermostat cover into place and re-install the security screw. (Fig. 5)
5. Make appropriate parameter settings related to your application within the configuration menu or through the WEBStation-AX as identified in the thermostat installation instructions.

Fig. 5. Replacing cover.

PIR STATUS LED'S

The PIR covers have 2 green status LEDs behind the PIR lens that can be used for diagnostic purposes during commissioning or servicing. (Fig. 6)

These LEDs are used to indicate a local movement detected by the PIR cover.
— The status LEDs start to function to indicate movement 1 minute after the initial power up of the thermostat.
— The status LEDs will only remain active to indicate sensed movement 30 minutes after the initial power up of the thermostat.
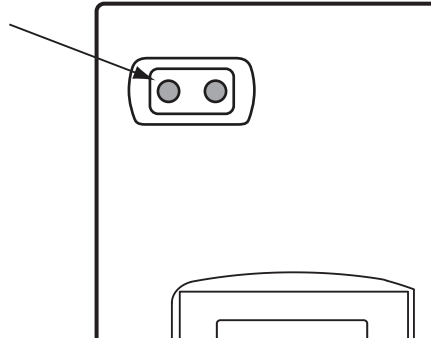
Fig. 6. LED status lights.

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 Infrared Sensor

Dimensions: 4.94 in. x 3.38 in. x 1.0 in.

Approximate shipping weight: 0.1 lb

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)

Honeywell