T60xDFH-4 and T60xDFH-4+PIR Series Thermostat Controllers with Dehumidification and Occupancy Sensing Capability

Application Note

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T601DFH-4, T602DFH-4, T603DFH-4, T604DFH-4, T605DFH-4,
T601DFH-4+PIR, T602DFH-4+PIR, T603DFH-4+PIR, T604DFH-4+PIR, T605DFH-4+PIR

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Application Note

Document Introduction

This document describes a number of possible application scenarios using the T60xDFH-4 and T60xDFH-4+PIR Series Thermostat Controllers. Each application scenario includes a table that lists the setup and configuration parameters required for that specific application. Refer to the *T60xDFH-4 and T60xDFH-4+PIR Series Thermostat Controllers with Dehumidification and Occupancy Sensing Capability Installation Instructions (Part No. 24-9890-951)* for more information on adjusting the configuration parameters.

For those application scenarios that include a door switch, a Normally Closed (N.C.) door switch is required. With a N.C. door switch, the contact is closed only when the door is closed. In these application scenarios, the term **door toggle** means the door is initially closed, then opened and closed again.

Application Scenarios

Table 1: Applications

Scenario	With Door Switch	Passive Infrared (PIR) Levels of Occupancy	PIR Cover Used	Remote PIR Used
1	No	3	Yes	No
2	No	2	Yes	No
3	No	3	No	Yes
4	No	2	No	Yes
5	No	3	Yes	Yes
6	No	2	Yes	Yes
7	Yes	3	Yes	No
8	Yes	2	Yes	No
9	Yes	3	No	Yes
10	Yes	2	No	Yes
11	Yes	3	Yes	Yes
12	Yes	2	Yes	Yes

Scenario 1: Stand-Alone Fan Coil Application Using 3 Occupancy Levels with a PIR Accessory Cover

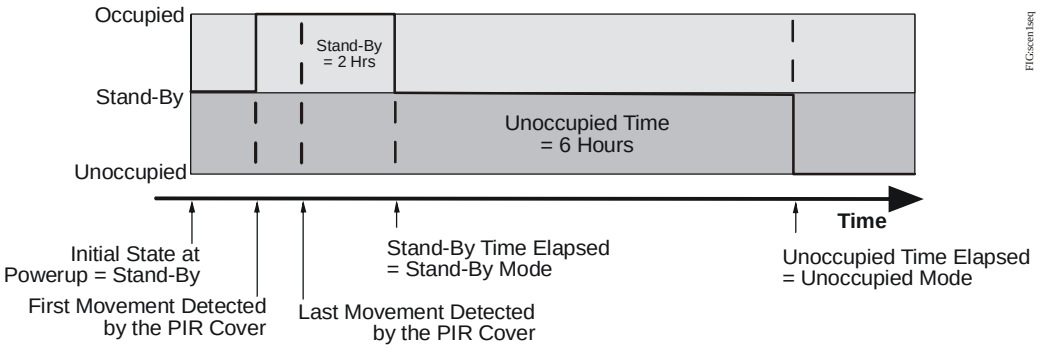

Figure 1: Scenario 1 Sequence of Operation

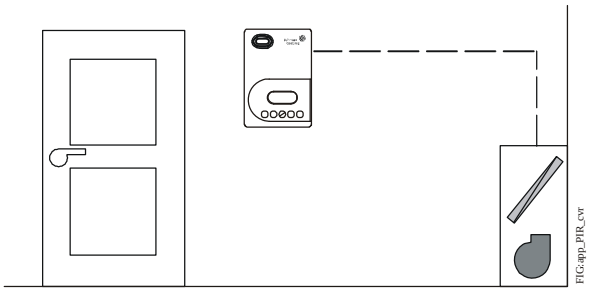

Figure 2: Stand-Alone Fan Coil Application with PIR Accessory Cover

Table 2: Scenario 1 Setup and Configuration

BI1 Configuration	Selection Not Set to **MotionNO** or **MotionNC**
BI2 Configuration	Selection Not Set to **Door Dry**
Stand-By Timer Value	Selection Set to **2.0 Hours**
Unoccupied Timer Value	Selection Set to **6.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon as the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. Any time the PIR device detects local motion, the elapsed stand-by timer value is reset.

If no motion is detected in the zone for the entire stand-by timer duration, the room switches to stand-by mode and the stand-by setpoints are used. While in stand-by mode, if no motion is detected in the zone for the entire unoccupied timer duration, the room switches to unoccupied mode and the unoccupied setpoints are used. If the PIR device senses local movement at any time, the occupancy status switches to occupied and the occupied setpoints are used.

Scenario 2: Stand-Alone Fan Coil Application Using 2 Occupancy Levels with a PIR Accessory Cover

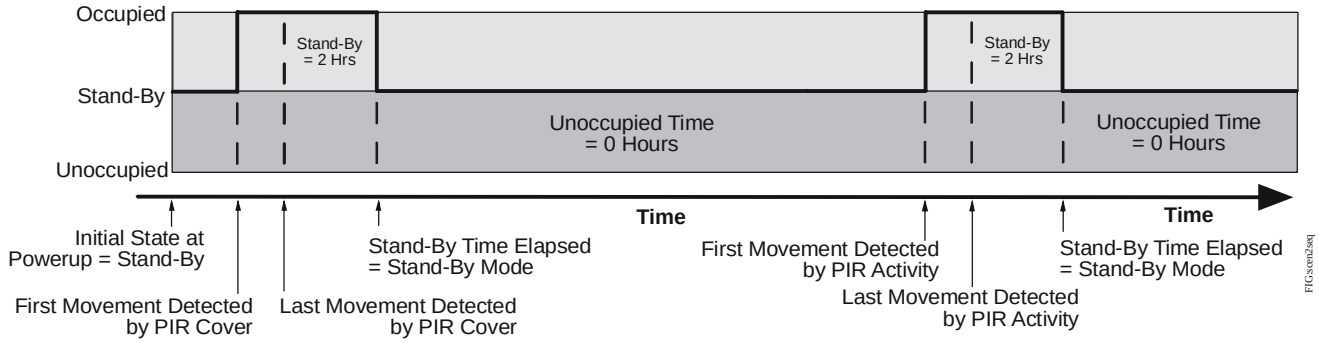

Figure 3: Scenario 2 Sequence of Operation

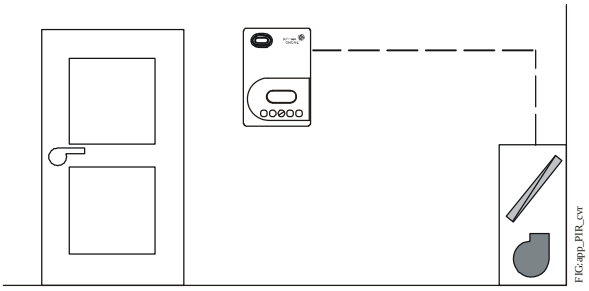

Figure 4: Stand-Alone Fan Coil Application with PIR Accessory Cover

Table 3: Scenario 2 Setup and Configuration

BI1 Configuration	Selection Not Set to **MotionNO** or **MotionNC**
BI2 Configuration	Selection Not Set to **Door Dry**
Stand-By Timer Value	Selection Set to **2.0 Hours**
Unoccupied Timer Value	Selection Set to **0.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon as the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. Any time the PIR device senses local motion, the elapsed stand-by timer value is reset.

If no motion is detected in the zone for the entire stand-by timer duration, the room switches to stand-by mode and the stand-by setpoints are used. If the PIR device senses local movement at any time, the occupancy status switches to occupied and the occupied setpoints are used. The local zone never goes into unoccupied mode and the unoccupied setpoints are never used.

Scenario 3: Stand-Alone Fan Coil Application Using 3 Occupancy Levels with a Remote PIR Sensor

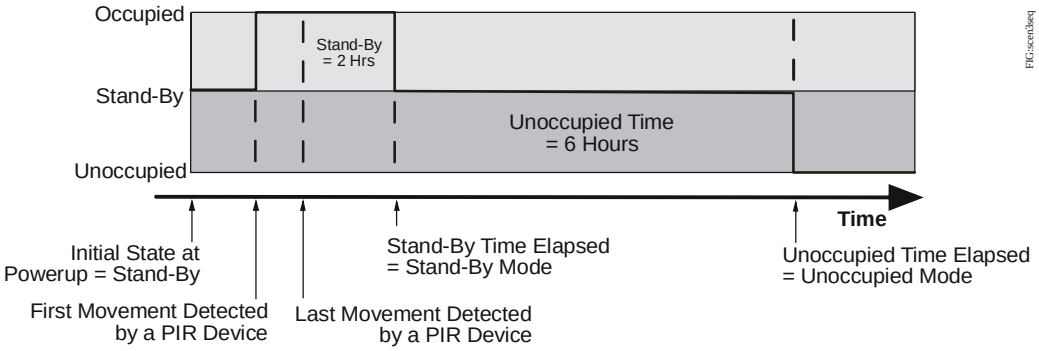

Figure 5: Scenario 3 Sequence of Operation

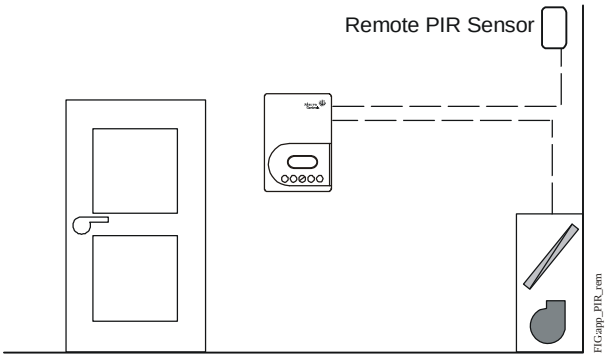

Figure 6: Stand-Alone Fan Coil Application with Remote PIR Sensor

Table 4: Scenario 3 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Not Set to **Door Dry**
Stand-By Timer Value	Selection Set to **2.0 Hours**
Unoccupied Timer Value	Selection Set to **6.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon as the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. Any time the PIR device detects local motion, the elapsed stand-by timer value is reset.

If no motion is detected in the zone for the entire stand-by timer duration, the room switches to stand-by mode and the stand-by setpoints are used. While in stand-by mode, if no motion is detected in the zone for the entire unoccupied timer duration, the room switches to unoccupied mode and the unoccupied setpoints are used. If the PIR device senses local movement at any time, the occupancy status switches to occupied and the occupied setpoints are used.

Scenario 4: Stand-Alone Fan Coil Application Using 2 Occupancy Levels with a Remote PIR Sensor

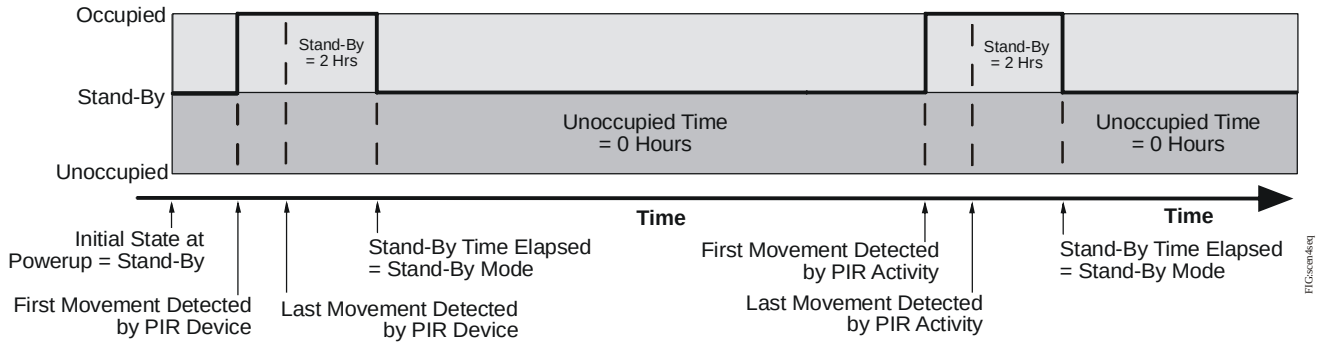

Figure 7: Scenario 4 Sequence of Operation

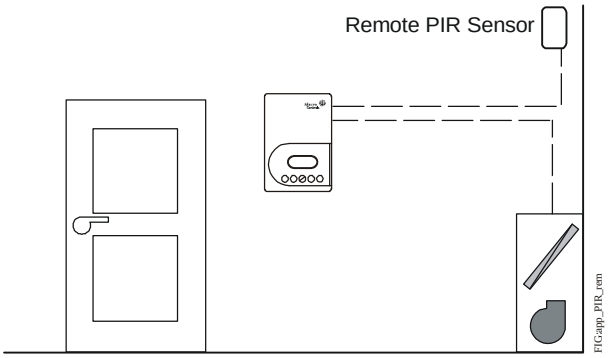

Figure 8: Stand-Alone Fan Coil Application with Remote PIR Sensor

Table 5: Scenario 4 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Not Set to **Door Dry**
Stand-By Timer Value	Selection Set to **2.0 Hours**
Unoccupied Timer Value	Selection Set to **0.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon as the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. Any time the PIR device senses local motion, the elapsed stand-by timer value is reset.

If no motion is detected in the zone for the entire stand-by timer duration, the room switches to stand-by mode and the stand-by setpoints are used. If the PIR device senses local movement at any time, the occupancy status switches to occupied and the occupied setpoints are used. The local zone never goes into unoccupied mode and the unoccupied setpoints are never used.

Scenario 5: Stand-Alone Fan Coil Application Using 3 Occupancy Levels with Dual PIR Sensors

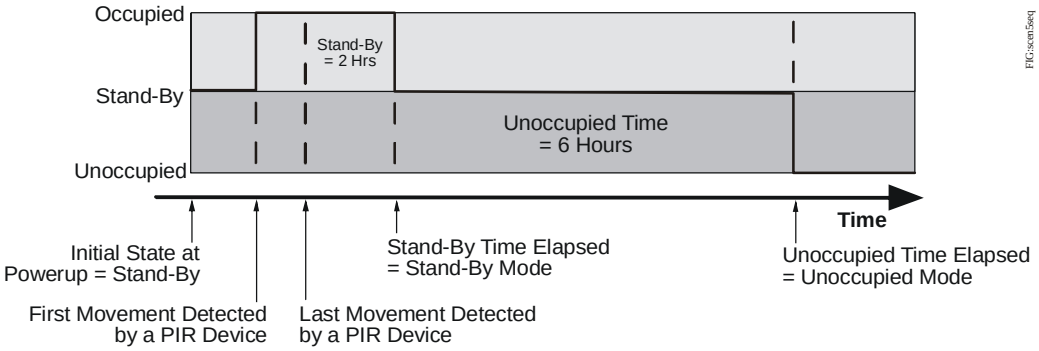

Figure 9: Scenario 5 Sequence of Operation

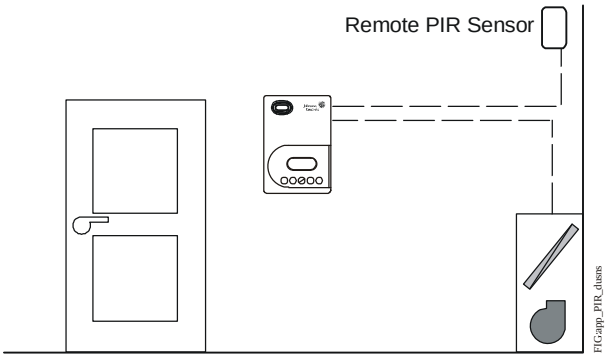

Figure 10: Stand-Alone Fan Coil Application with Dual PIR Sensors

Table 6: Scenario 5 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Not Set to **Door Dry**
Stand-By Timer Value	Selection Set to **2.0 Hours**
Unoccupied Timer Value	Selection Set to **6.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR devices do not detect any movement. As soon as either of the PIR devices detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. Any time a PIR device senses local motion, the elapsed stand-by timer value is reset.

If no motion is detected in the zone for the entire stand-by timer duration by either PIR device, the room switches to stand-by mode and the stand-by setpoints are used. While in stand-by mode, if no motion is detected in the zone for the entire unoccupied timer duration, the room switches to unoccupied mode and the unoccupied setpoints are used. If one of the PIR devices senses local movement at any time, the occupancy status switches to occupied and the occupied setpoints are used.

Scenario 6: Stand-Alone Fan Coil Application Using 2 Occupancy Levels with Dual PIR Sensors

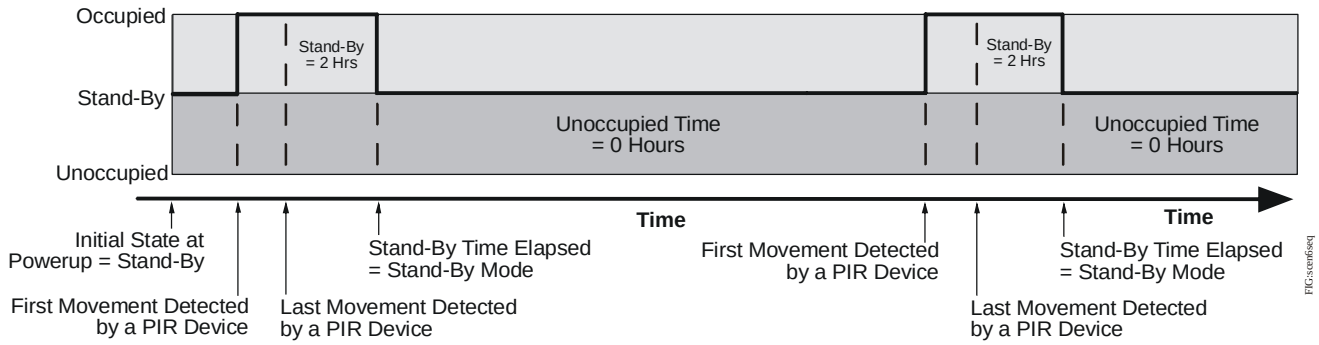

Figure 11: Scenario 6 Sequence of Operation

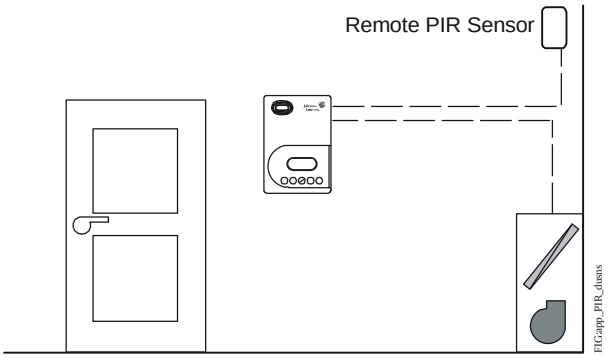

Figure 12: Stand-Alone Fan Coil Application with Dual PIR Sensors

Table 7: Scenario 6 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Not Set to **Door Dry**
Stand-By Timer Value	Selection Set to **2.0 Hours**
Unoccupied Timer Value	Selection Set to **0.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR devices do not detect any movement. As soon as either of the PIR devices detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. Any time a PIR device senses local motion, the elapsed stand-by timer value is reset.

If no motion is detected in the zone for the entire stand-by timer duration by either PIR device, the room switches to stand-by mode and the stand-by setpoints are used. If one of the PIR devices senses local movement at any time, the occupancy status switches to occupied and the occupied setpoints are used. The local zone never goes into unoccupied mode and the unoccupied setpoints are never used.

Scenario 7: Stand-Alone Fan Coil Application Using 3 Occupancy Levels with a PIR Accessory Cover and Door Switch

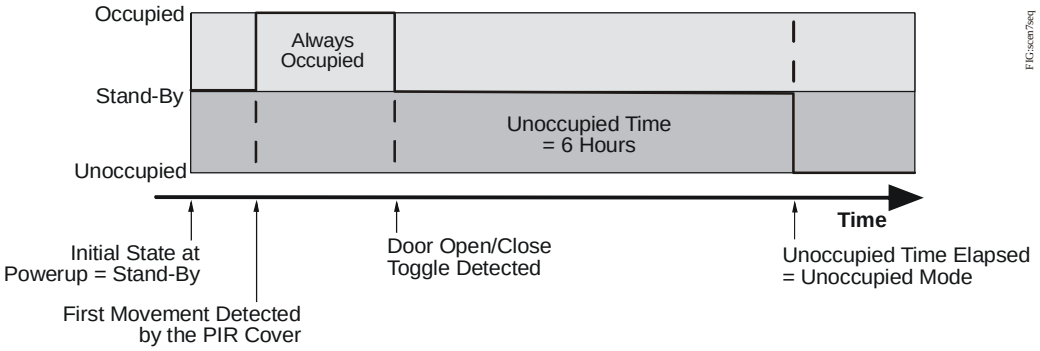

Figure 13: Scenario 7 Sequence of Operation

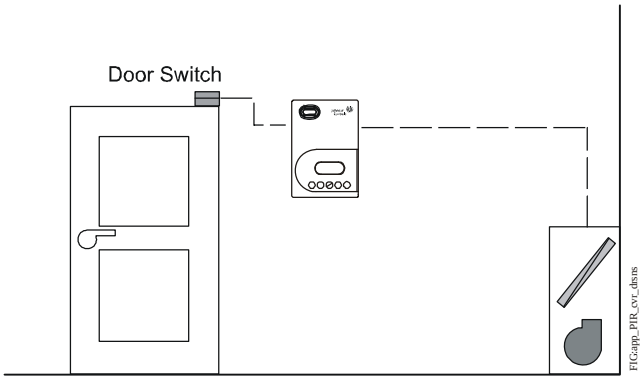

Figure 14: Stand-Alone Fan Coil Application with PIR Accessory Cover and Door Switch

Table 8: Scenario 7 Setup and Configuration

BI1 Configuration	Selection Not Set to **MotionNO** or **MotionNC**
BI2 Configuration	Selection Set to **Door Dry**
Stand-By Timer Value	Not Used
Unoccupied Timer Value	Selection Set to **6.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. The room is in occupied mode until a door toggle is detected.

If a door toggle is detected, the room switches to stand-by mode and the stand-by setpoints are used. If any occupants remain in the room, local movements must be seen to resume the occupied mode. While in stand-by mode, if no motion is detected in the zone for the entire unoccupied timer duration, the room switches to unoccupied mode and the unoccupied setpoints are used. If the PIR device senses local movement any time the door is closed, the occupancy status switches to occupied and the occupied setpoints are used.

Scenario 8: Stand-Alone Fan Coil Application Using 2 Occupancy Levels with a PIR Accessory Cover and Door Switch

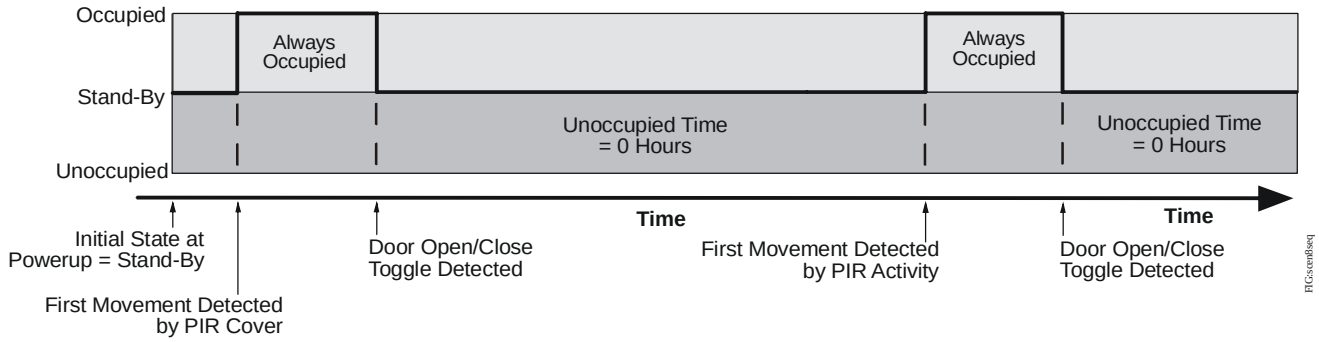

Figure 15: Scenario 8 Sequence of Operation

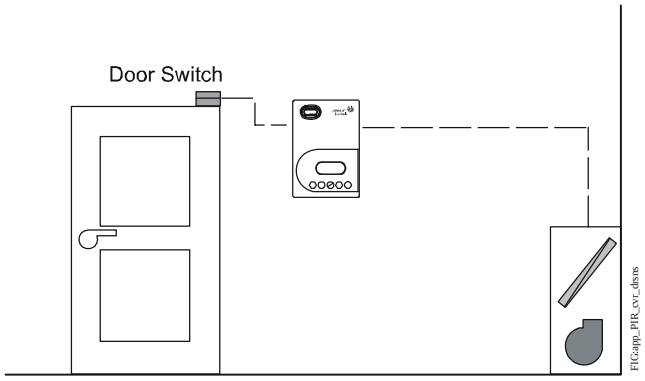

Figure 16: Stand-Alone Fan Coil Application with PIR Accessory Cover and Door Switch

Table 9: Scenario 8 Setup and Configuration

BI1 Configuration	Selection Not Set to **MotionNO** or **MotionNC**
BI2 Configuration	Selection Set to **Door Dry**
Stand-By Timer Value	Not Used
Unoccupied Timer Value	Selection Set to **0.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon as the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. The room is in occupied mode until a door toggle is detected.

If a door toggle is detected, the room switches to stand-by mode and the stand-by setpoints are used. If any occupants remain in the room, local movements must be seen to resume the occupied mode. If the PIR device senses local movement any time the door is closed, the occupancy status switches to occupied and the occupied setpoints are used. The local zone never goes into unoccupied mode and the unoccupied setpoints are never used.

Scenario 9: Stand-Alone Fan Coil Application Using 3 Occupancy Levels with a Remote PIR Sensor and Door Switch

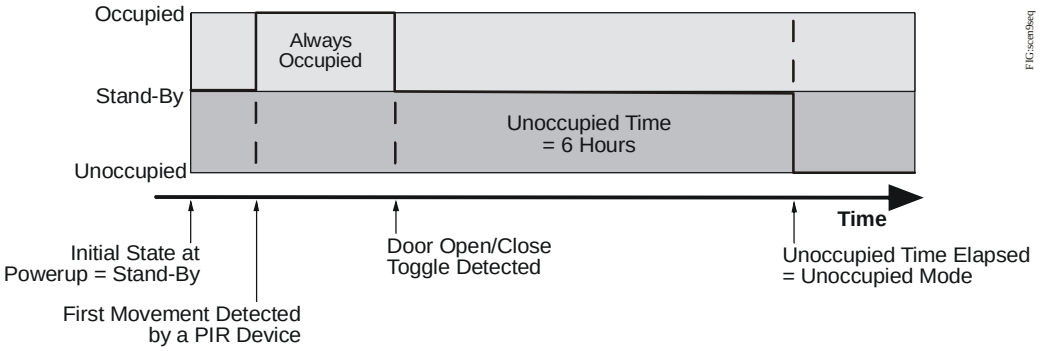

Figure 17: Scenario 9 Sequence of Operation

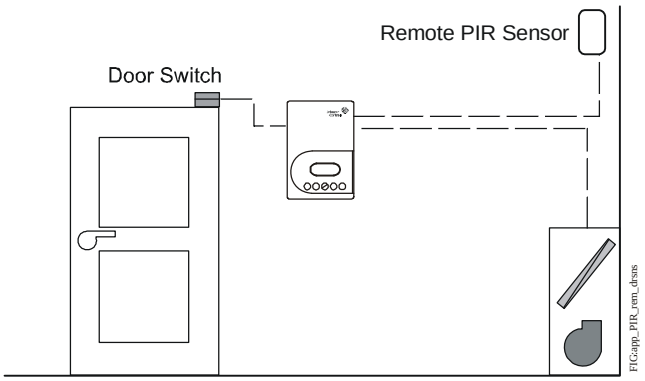

Figure 18: Stand-Alone Fan Coil Application with Remote PIR Sensor and Door Switch

Table 10: Scenario 9 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Set to **Door Dry**
Stand-By Timer Value	Not Used
Unoccupied Timer Value	Selection Set to **6.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon as the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. The room is in occupied mode until a door toggle is detected.

If a door toggle is detected, the room switches to stand-by mode and the stand-by setpoints are used. If any occupants remain in the room, local movements must be seen to resume the occupied mode. While in stand-by mode, if no motion is detected in the zone for the entire unoccupied timer duration, the room switches to unoccupied mode and the unoccupied setpoints are used. If the PIR device senses local movement any time the door is closed, the occupancy status switches to occupied and the occupied setpoints are used.

Scenario 10: Stand-Alone Fan Coil Application Using 2 Occupancy Levels with a Remote PIR Sensor and Door Switch

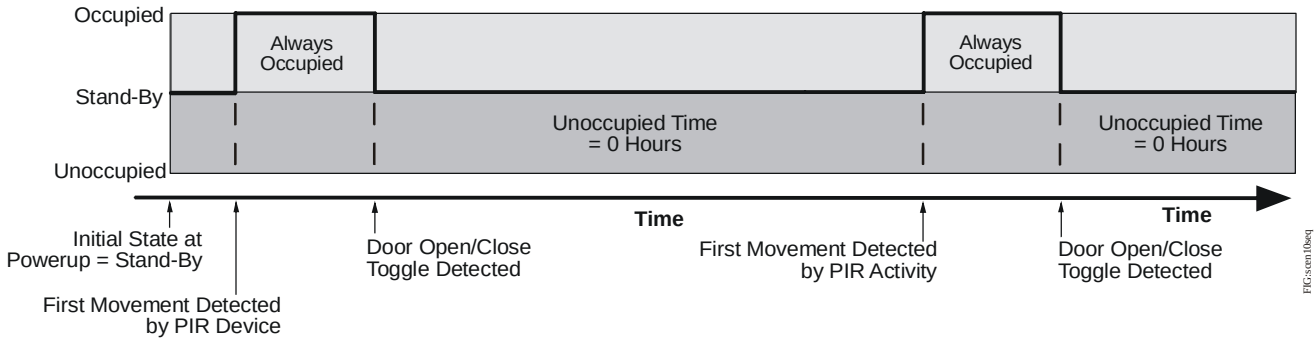

Figure 19: Scenario 10 Sequence of Operation

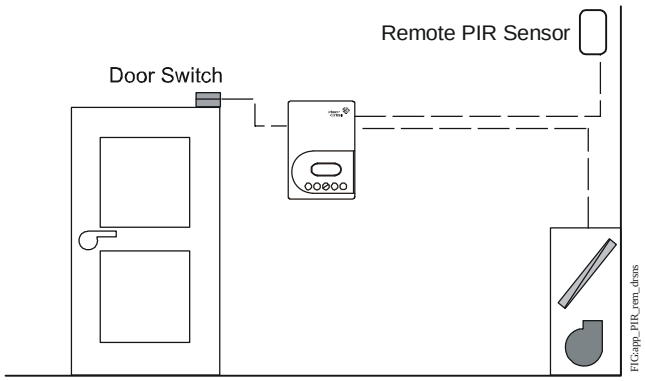

Figure 20: Stand-Alone Fan Coil Application with Remote PIR Sensor and Door Switch

Table 11: Scenario 10 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Set to **Door Dry**
Stand-By Timer Value	Not Used
Unoccupied Timer Value	Selection Set to **0.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR device does not detect any movement. As soon as the PIR device detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. The room is in occupied mode until a door toggle is detected.

If a door toggle is detected, the room switches to stand-by mode and the stand-by setpoints are used. If any occupants remain in the room, local movements must be seen to resume the occupied mode. If the PIR device senses local movement any time the door is closed, the occupancy status switches to occupied and the occupied setpoints are used. The local zone never goes into unoccupied mode and the unoccupied setpoints are never used.

Scenario 11: Stand-Alone Fan Coil Application Using 3 Occupancy Levels with Dual PIR Sensors and Door Switch

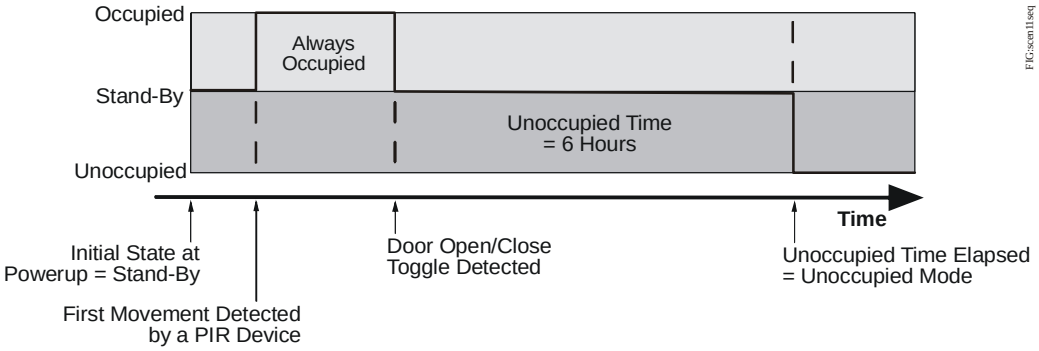

Figure 21: Scenario 11 Sequence of Operation

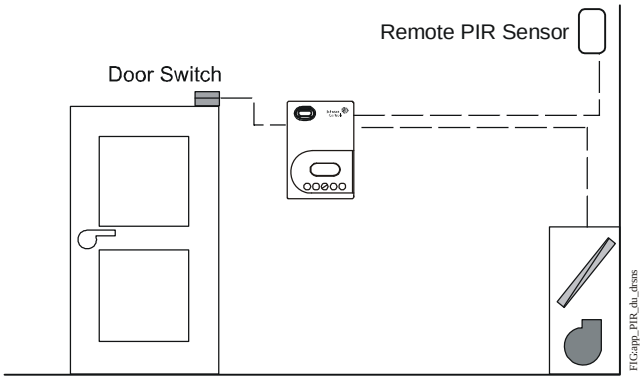

Figure 22: Stand-Alone Fan Coil Application with Dual PIR Sensors and Door Switch

Table 12: Scenario 11 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Set to **Door Dry**
Stand-By Timer Value	Not Used
Unoccupied Timer Value	Selection Set to **6.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR devices do not detect any movement. As soon as either of the PIR devices detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. The room is in occupied mode until a door toggle is detected.

If a door toggle is detected, the room switches to stand-by mode and the stand-by setpoints are used. If any occupants remain in the room, local movements must be seen to resume the occupied mode. While in stand-by mode, if no motion is detected in the zone for the entire unoccupied timer duration, the room switches to unoccupied mode and the unoccupied setpoints are used. If one of the PIR devices senses local movement any time the door is closed, the occupancy status switches to occupied and the occupied setpoints are used.

Scenario 12: Stand-Alone Fan Coil Application Using 2 Occupancy Levels with Dual PIR Sensors and Door Switch

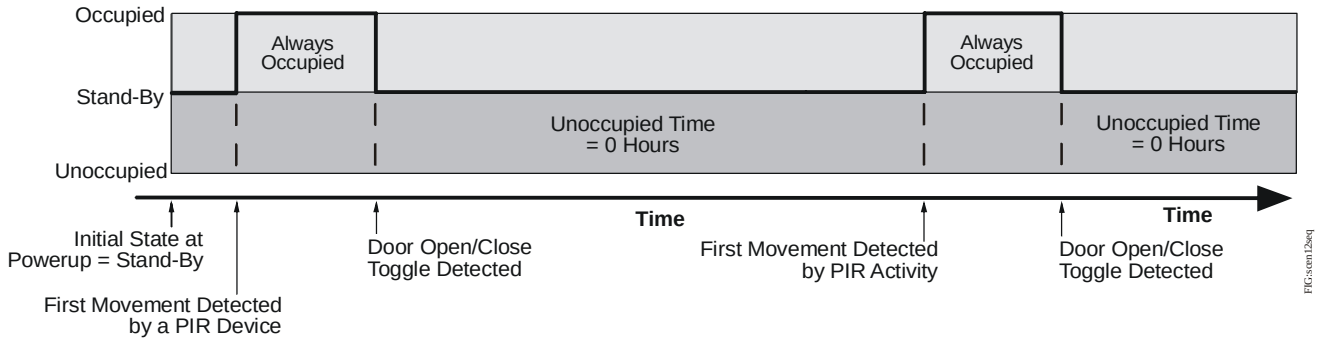

Figure 23: Scenario 12 Sequence of Operation

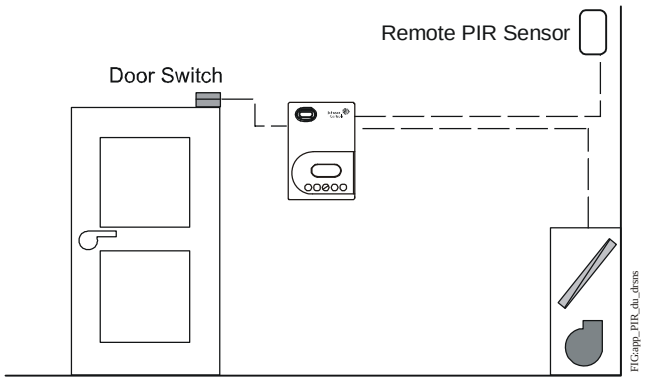

Figure 24: Stand-Alone Fan Coil Application with Dual PIR Sensors and Door Switch

Table 13: Scenario 12 Setup and Configuration

BI1 Configuration	Configured for Remote PIR Sensor
BI2 Configuration	Selection Set to **Door Dry**
Stand-By Timer Value	Not Used
Unoccupied Timer Value	Selection Set to **0.0 Hours**
Network Interface Used	None, Stand-Alone

At initial powerup, when the thermostat controller 24 VAC power supply is applied, the initial occupancy of the zone is in stand-by mode if the PIR devices do not detect any movement. As soon as either of the PIR devices detects a movement, the occupancy status switches to occupied and the occupied setpoints are used. The room is in occupied mode until a door toggle is detected.

If a door toggle is detected, the room switches to stand-by mode and the stand-by setpoints are used. If any occupants remain in the room, local movements must be seen to resume the occupied mode. If one of the PIR devices senses local movement any time the door is closed, the occupancy status switches to occupied and the occupied setpoints are used. The local zone never goes into unoccupied mode and the unoccupied setpoints are never used.

Troubleshooting a T60xDFH-4 or T60xDFH-4+PIR Series Thermostat Controller

Table 14: Troubleshooting Tips

Topic	Explanation
PIR Connector	The polarized PIR connector is located at the bottom left corner of the thermostat controller base.
Security Screw	A security screw is provided in the thermostat controller box. This screw should be carefully installed in the intended mounting position, located in the bottom center of the thermostat controller cover.
PIR Warm-Up Period	The PIR sensor may take up to 60 seconds after the warm-up period to detect movement consistent with the typical detection pattern.
Visual Indication (Status of PIR)	Visual indication of PIR activity for commissioning is provided via blinking Light-Emitting Diodes (LEDs) located on the thermostat controller cover under the PIR lens. The LEDs are active while the occupant is in the field of detection pattern for a period of 30 minutes after initial powerup.

Johnson Controls

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