



FX-WRZ Series One-to-One Wireless Room Sensing System Technical Bulletin

Document introduction

This document describes how to commission, configure, and troubleshoot the FX-WRZ7860 Receiver, FX-WRZ Series Sensors, and One-to-One wireless room sensing systems.

This document does not describe how to locate or install the FX-WRZ7860 Receiver and the FX-WRZ Series Sensors. In addition, this document does not describe how to install, commission, operate, or troubleshoot any of the FX-PC Series controllers that support One-to-One sensing system applications.

Related documentation

Table 1: FX-WRZ Series One-to-One Wireless Room Sensing System related documents

For information on:	See document	Document number
Applications, features, and benefits of the FX-WRZ7860 Receiver	<i>FX-WRZ7860 One-to-One Wireless Room Temperature Sensing System Product Bulletin</i>	<i>LIT-12011664</i>
Locating, mounting, and wiring the FX-WRZ7860 Receiver	<i>FX-WRZ7860 Receiver for One-to-One Wireless Room Sensing Systems Installation Instructions</i>	<i>Part No. 24-10332-37</i>
Applications, features, and benefits of the FX-WRZ Series Wireless Room Sensors	<i>FX-WRZ Series Wireless Room Sensors Product Bulletin</i>	<i>LIT-12011687</i>
Locating, mounting, and wiring the FX-WRZ Series Wireless Room Sensors	<i>FX-WRZ Series Wireless Room Sensors Installation Instructions</i>	<i>Part No. 24-10563-63</i>
Locating, mounting, and wiring the Occupancy Sensing FX-WRZ Series Wireless Room Sensors	<i>Occupancy Sensing FX-WRZ Series Wireless Room Sensors Installation Instructions</i>	<i>Part No. 24-10332-118</i>
Applications, features, and benefits of the FX-WRZTTB Series Wireless Room Sensors	<i>FX-WRZTTB00-5 Handheld Temperature Room Sensor Product Bulletin</i>	<i>LIT-12011898</i>
Locating, mounting, and wiring the FX-WRZTTB Series Wireless Room Sensors	<i>FX-WRZTTB00-5 Handheld Temperature Room Sensor Installation Instructions</i>	<i>Part No. 24-10724-19</i>
Locating, mounting, and wiring the FX-ZFR1811 Conduit Mount Repeater	<i>FX-ZFR1811 Wireless Field Bus Router Installation Instructions</i>	<i>Part No. 24-10325-10</i>
Locating, mounting, and wiring the FX-ZFR1812 Wall Mount Repeater	<i>FX-ZFR1812 Wireless Field Bus Router Installation Instructions</i>	<i>Part No. 24-10325-45</i>

One-to-One Wireless Room Sensing System overview

The FX-WRZ Series One-to-One Wireless Room Sensing System is designed to interface with supported Facility Explorer BACnet® FX-PC Series controllers to provide wireless control of single-zone, room temperature, humidity, and occupancy applications. The FX-WRZ Series Sensor and FX-WRZ7860 Receiver combination is a functional equivalent to a network sensor, such as an NS-BTP7001-0 network sensor, but eliminates communication wiring, which is usually placed inside the wall.

A simple One-to-One wireless room sensing system consists of one to five FX-WRZ Series Wireless Room Sensors that communicate single-zone temperature and humidity data to an associated FX-WRZ7860 Receiver.

An FX-WRZ7860 Receiver interfaces with a single Facility Explorer FX-PCV or FX-PCG Controller.

See [FX-WRZ Series Wireless Room Sensors](#) for more information on the FX-WRZ Series Sensors .

❶ **Note:** Multiple FX-WRZ Series Sensor models, a single model FX-WRZ7860 Receiver, and the FX-WRZSST-120 Wireless Sensing System Tool are available. All of these components have 10 mW transmission power.

The receiver meets the Institute of Electrical and Electronic Engineers (IEEE) 802.15.4 standard for low power, low duty cycle Radio Frequency (RF) transmitting systems and operates on the 2.4 GHz Industrial, Scientific, Medical (ISM) band. The One-to-One wireless room sensing system is designed for indoor applications only and should not be used for outdoor or inter-building applications.

The FX-WRZ Series Sensors and the FX-WRZ7860 Receiver operate as transceivers to create a bidirectional association between the sensors and the receivers that allows the sensing system to confirm data transmissions between the devices. The sensors and receivers must be located and installed properly to provide adequate RF signal strength to maintain this wireless association.

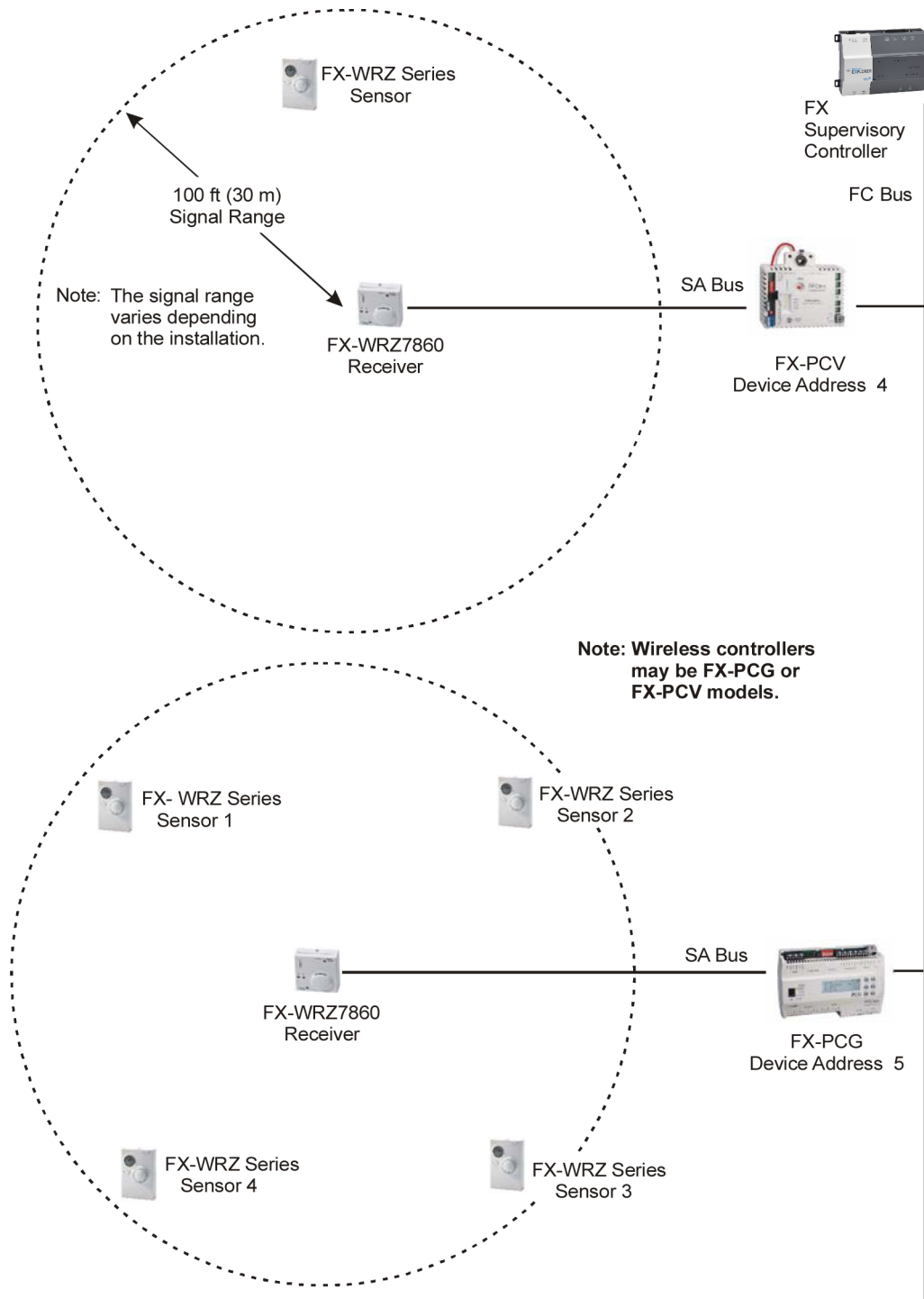
The maximum transmission range for indoor line-of-sight transmissions between an FX-WRZ Series Sensor and an associated FX-WRZ7860 Receiver is 150 ft (45 m). Taking into consideration RF signal absorption and reflection due to metal obstructions, walls, and furniture found in typical building interiors, the practical average indoor line-of-sight transmission range between a sensor and receiver is 100 ft (30 m). See [Related Documentation](#) for references to installation instructions.

To extend the range, use an FX-ZFRRPTK-H1 Series Wireless Field Bus Router and an FX-ZFRRPTK-H1 Power Supply. Using a repeater can help extend the transmission range through or around obstacles if the line-of-sight installation is not possible.

➤ **Important:** The WNC1800/FX-ZFR1820 Pro Series wireless field bus system and associated hardware (excluding sensors) is not compatible with the FX-WRZ7860 wireless system. FX-WRZ sensors can be used in either FX-WRZ18xx (FX-ZFR or FX-ZFR Pro Series), or the FX-WRZ7860 system, but not in the same instance.

❶ **Note:** The FX-ZFR182x-0 Pro Router/Repeater is not compatible with the FX-WRZ7860 system.

Figure 1: One-to-One Wireless Room Sensing applications



The sensors and receivers are associated to each other with matched unique RF addresses. The RF addresses are established on the devices by setting the switches on address DIP switch blocks on the devices. After the sensor/receiver associations are created, the sensors transmit the following data at 60-second intervals:

- sensed zone temperature occupancy (PIR) and humidity (depending on the FX-WRZ Series Sensor model)

- setpoint temperature (depending on the FX-WRZ Series Sensor model)
- requested zone occupancy override

See [Radio Frequency Addresses for One-to-One Wireless Sensing Applications](#), [Setting the FX-WRZ7860 Receiver RF Address](#), and [Setting the FX-WRZ Series Sensor RF Address](#) for more information on setting RF addresses in One-to-One sensing system applications.

In One-to-One applications with two to five sensors, the receiver passes all the sensors' data to the controller. The FX-PCV or FX-PCG controller can be configured to either average the sensors' temperature or humidity input independently, or select the highest or lowest sensed temperature or humidity for control of the target zone. See the appropriate controller or system documents for additional information.

Note: For FX-WRZ Series Sensors with an LCD display, the humidity value may appear as 0.0% when the sensor is joining a network. This condition is transitory and does not transfer to the Building Automation System (BAS).

The FX-WRZ Series Sensors and the FX-WRZ7860 Receiver also indicate signal strength and other wireless diagnostic data.

Important: The One-to-One wireless room sensing system, FX-WRZ7860 Receiver, and FX-WRZ Series Sensors are not designed or intended for use in mission-critical or life/safety applications.

Important: The FX-WRZ Series Sensors and the FX-WRZ7860 Receiver **are not** compatible with the WRS-TTx Sensors and the TE-7820 or TE-7830 Receivers.

FX-WRZ Series Wireless Room Sensors

The FX-WRZ Series Wireless Room Sensors (Figure 2) sense room/zone temperature and humidity, and transmit wireless temperature/humidity and zone status data to the FX-WRZ7860 Receiver.

The FX-WRZ Series Sensors can transmit the sensed temperature and humidity, setpoint temperature, occupancy override request, and low-battery conditions to an associated receiver. The receiver passes the sensor data to a controller.

The FX-WRZ Series Sensors also provide manual occupancy override and signal strength diagnostic capabilities. See Table 2 for the available FX-WRZ Series Sensor models.

Table 2: FX-WRZ Series Wireless Room Sensors

Product code number	Product description
FX-WRZMHN01-0	Wireless Room Temperature and Humidity Sensor with PIR Occupancy Sensor, Battery Level/Signal Strength LED, Manual Occupancy Override Button, and No Display
FX-WRZMNN01-0	Wireless Room Sensor (No Temperature or Humidity Sensing) with PIR Occupancy Sensor, Battery Level/Signal Strength LED, Manual Occupancy Override Button, and No Display
FX-WRZMTB01-0	Wireless Room Temperature Sensor with PIR Occupancy Sensor, Display, Setpoint Adjustment Dial Scale: 13°C to 29°C (55°F to 85°F), °C /°F Button, and Manual Occupancy Override Button
FX-WRZMTJ01-0	Wireless Room Sensor with PIR Occupancy Sensor, Display, Up/Down Setpoint Adjustment Buttons, and Manual Occupancy Override Button
FX-WRZMTN01-0	Wireless Room Temperature Sensor with PIR Occupancy Sensor, Battery Level/Signal Strength LED, Manual Occupancy Override Button, and No Display

Table 2: FX-WRZ Series Wireless Room Sensors

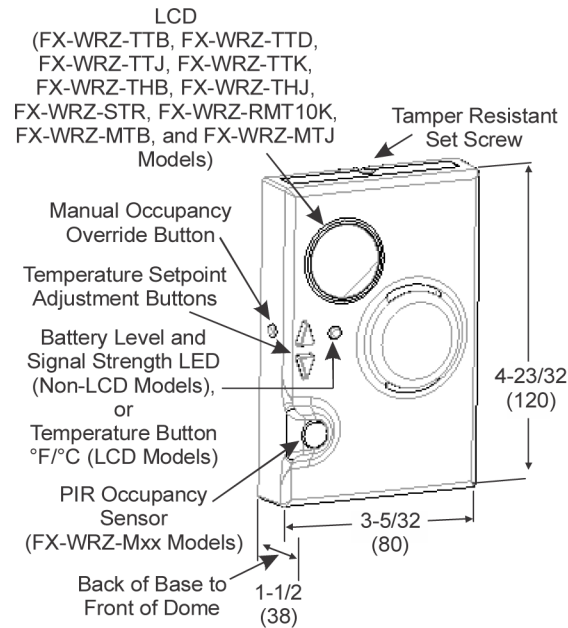
Product code number	Product description
FX-WRZRMT10K-0	Temperature Sensor with Display, Up/Down Setpoint Adjustment Buttons, °C /°F Button, Fan Speed Control Button, and Occupancy Button: Includes One Temperature Transmitter Assembly (One Transmitter, One Mounting Base, and Strips of Double-Sided Adhesive Foam Tape; All Factory Assembled), One Strain Relief Bushing, One DIP Switch Overlay for a Mesh Network Application Using an FX-ZFR181x-x Router, One DIP Switch Overlay for a Non-Mesh Network One-to-One Application Using a FX-WRZ78x0-0 Receiver
FX-WRZSTR00-0 (Non-NIST Certified Model)	Wireless Refrigerator/Freezer Temperature Transmitter and Probe Assembly (NIST Certified), Display, °C /°F Button, and Manual Occupancy Override Button: Includes One Temperature Transmitter Assembly, One Temperature Sensor Probe Assembly (Non-NIST Certified Model), One DIP Switch Overlay for a Mesh Network Application Using an FX-ZFR181x-x Router, One DIP Switch Overlay for a Non-Mesh Network One-to-One Application Using a FX-WRZ78x0-0 Receiver
FX-WRZSTRNIST-0 (NIST Certified Model)	Wireless Refrigerator/Freezer Temperature Transmitter and Probe Assembly (NIST Certified), Display, °C /°F Button, and Manual Occupancy Override Button: Includes One Temperature Transmitter Assembly, One Temperature Sensor Probe Assembly (NIST Certified Model), One DIP Switch Overlay for a Mesh Network Application Using an FX-ZFR181x-x Router, One DIP Switch Overlay for a Non-Mesh Network One-to-One Application Using a FX-WRZ78x0-0 Receiver
FX-WRZTHB00-0	Wireless Room Temperature and Humidity Sensor with Display, Configurable (Absolute Setpoint or Warmer/Cooler) Adjustment Dial, °C / °F Button, Relative Humidity (RH) Button, and Manual Occupancy Override Button
FX-WRZTHJ00-0	Temperature/Humidity Sensor with Display, Up/Down Setpoint Adjustment Buttons, °C /°F Button, Relative Humidity (RH) Button, and Occupancy Button
FX-WRZTHN00-0	Wireless Room Temperature and Humidity Sensor with Manual Occupancy Override Button and Battery Level/Signal Strength LED, and No Display
FX-WRZTHP00-0	Wireless Room Temperature and Humidity Sensor with Warmer/Cooler (+/-), Adjustment Dial, Manual Occupancy Override Button, and Battery Level/Signal Strength LED
FX-WRZTTB00-0	Wireless Room Temperature Sensor with Display, Configurable (Absolute Setpoint or Warmer/Cooler) Adjustment Dial, °C /°F Button, and Manual Occupancy Override Button
FX-WRZTTB00-5	Wireless Handheld Temperature Sensor with Display, Up/Down Setpoint Adjustment Buttons, and Manual Occupancy Override Button for Hospital Use
FX-WRZTTD00-0	Wireless Room Temperature Sensor with Display, Configurable (Absolute Setpoint or Warmer/Cooler) Adjustment Dial, °C /°F Button, Fan Speed Control, and Manual Occupancy Override Button

Table 2: FX-WRZ Series Wireless Room Sensors

Product code number	Product description
FX-WRZTTJ00-0	Temperature Sensor with Display, Up/Down Setpoint Adjustment Buttons, °C /°F Button, and Occupancy Button
FX-WRZTTK00-0	Temperature Sensor with Display, Up/Down Setpoint Adjustment Buttons, °C /°F Button, Fan Speed Control Button, and Occupancy Button
FX-WRZTTP00-0	Wireless Room Temperature Sensor with Warmer/Cooler (+/-) Adjustment Dial, Manual Occupancy Override Button, and Battery Level/Signal Strength LED
FX-WRZTTR00-0	Wireless Room Temperature Sensor with Manual Occupancy Override Button, and Battery Level/Signal Strength LED
FX-WRZTTS00-0	Wireless Room Temperature Sensor with Absolute Setpoint Adjustment Scale 13°C to 29°C (55°F to 85°F), Manual Occupancy Override Button, and Battery Level/Signal Strength LED
FX-WRZSST-120	Wireless Sensing System Tool Kit

FX-WRZ Series Wireless Room Sensors are also designed for use in wireless mesh network systems that use the 802.15.4 standard. The FX-WRZ series sensors are compatible with both the FX-ZFR and FX-ZFR Pro Series Wireless Remote Field Bus Systems. Refer to the *FX-ZFR Series Wireless Field Bus System Technical Bulletin (LIT-12011660)* or the *WNC1800/FX-ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012956)* for more information.

Figure 2: FX-WRZ Series Sensor; LCD with occupancy sensor and setpoint adjustment buttons, physical features and dimensions, in. (mm)



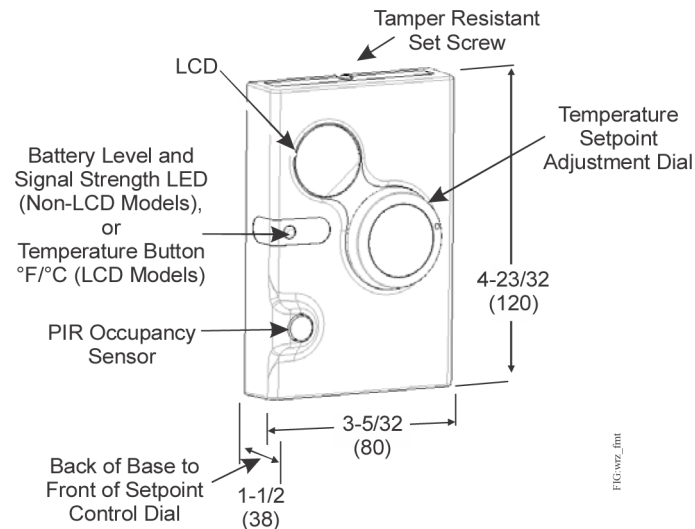
Note: Do not attempt to set up an FX-WRZ Series Sensor to report to more than one FX-WRZ7860 Receiver. One-to-One wireless sensing system applications do not support global sharing of a sensor's data. Attempting to set a single sensor to report to multiple receivers typically results in controller malfunctions and loss of temperature and humidity control in the zones.

Manual occupancy override button

Pressing the manual occupancy override button, which is located on the left side of the sensor, serves two main functions. First, it temporarily sets the space to an occupied state. Second, it checks the wireless signal strength of the sensor. The LED on the sensor flashes 3 times to indicate a strong signal, 2 times to indicate a good signal, or 1 time to indicate a marginal signal. For sensors with an LCD display, a number of bars on the display indicates wireless signal strength (3 bars for a strong signal, 2 bars for a good signal, or 1 bar for a marginal signal).

- ① **Note:** Not all features shown on Figure 2 and Figure 3 are available on all models. See Table 2 for a list of features on each model.

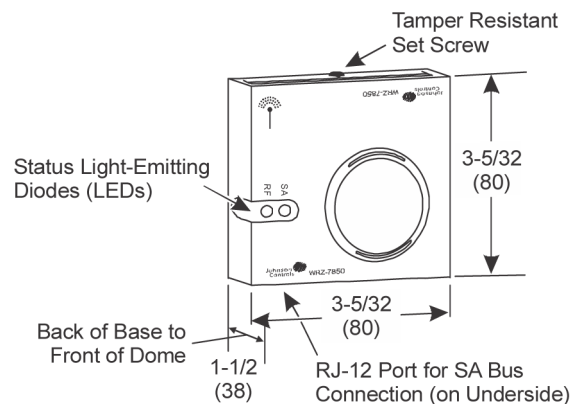
Figure 3: FX-WRZ Series Sensor; LCD with occupancy sensor and setpoint adjustment dial, physical features and dimensions, in. (mm)



FX-WRZ7860 Receiver

The FX-WRZ7860 Receiver (Figure 4) receives wireless data messages from FX-WRZ Series Sensors and communicates that data through a hard-wired Sensor Actuator (SA) Bus connection to a Johnson Controls® FX-PCV or FX-PCG controller.

Figure 4: FX-WRZ7860 Receiver physical features and dimensions, in. (mm)



The FX-WRZ7860 Receiver collects wireless data transmissions that contain the sensed zone temperature and humidity, the zone temperature setpoint, the zone occupancy override request, signal strength measurements, and sensor low-battery conditions from one to five associated FX-

WRZ Series Wireless Sensors. The receiver then processes the zone data and delivers that data directly to a single controller through a hard-wired SA Bus interface.

The FX-WRZ7860 Receiver has a 6-pin RJ-12 port for the SA Bus interface with a controller, two LEDs that indicate RF signal and SA Bus status, and two DIP switch blocks for setting the **TRANSMITTER ID** address and **AREA** address (Figure 5). The RF signal LED also changes from green to red if any of the associated sensors reports a low battery voltage level. The receiver obtains nominal 15 VDC power from the SA Bus.

RF interference and security in One-to-One applications

The FX-WRZ Series Sensors, FX-WRZ7860 Receiver, and the one-to-one wireless sensing system are designed to virtually eliminate RF interference with other wireless applications. In most commercial environments, the One-to-One system does not encounter or generate significant RF interference, even in environments that are saturated with cell phones and competing Wireless Fidelity (Wi-Fi) applications.

The FX-WRZ Series Sensors and FX-WRZ7860-0 Receiver operate on multiple discrete channels within the 2.4 GHz ISM band and use multi-frequency Direct-Sequence, Spread-Spectrum (DSSS) technology.

Cell phones do not operate on the 2.4 GHz ISM band, and cell phones do not interfere with One-to-One wireless room sensing systems, except when a cell phone is operated within 3 ft (1 m) of an FX-WRZ Series Receiver. When One-to-One wireless room sensing systems encounter most other Wi-Fi transmissions in the 2.4 GHz ISM band, the transmissions merely appear as noise and do not significantly impact wireless sensing system communication.

Using DSSS technology, the FX-WRZ Series Sensor is designed to transmit a data message to the associated receiver every 60 seconds. When a single data burst is successfully received and acknowledged, the sensor goes dormant for 60 seconds and then repeats the transmission burst sequence.

When the One-to-One wireless room sensing system encounters RF interference, the system changes to a different channel to enhance reliability. The FX-WRZ7860 Receiver establishes the RF network, using one of several channels in the 2.4 GHz ISM band. The sensors then try transmitting on each of the channels until they locate the receiver. Operation continues on that channel until communication problems develop. If the receiver cannot communicate with the sensors, it restarts the network on a different channel. The sensors then locate the receiver on the new channel and continue operating on that channel as long as reliable communications occur.

These data-transmission sequences greatly enhance the success of the wireless room sensing system data transmissions. Transmitting short, high-speed data messages at periodic intervals also reduces RF data-transmission collisions and interference with other Wi-Fi and Bluetooth transmissions. The DSSS technology also prevents the most malicious RF interference.

RF interference and transmission failures can also be prevented by maintaining an adequate distance between RF transmitting devices. Restrictions to distance between devices are listed in the following examples:

- FX-WRZ Series Sensor should not be mounted less than 3 ft (1 m) from a FX-WRZ7860 Receiver.
- Cell phones should not be used within 3 ft (1 m) of an FX-WRZ Series Sensor or FX-WRZ7860 Receiver.
- Wi-Fi access points should be mounted at least 20 ft (6 m) from any FX-WRZ Series Sensor or FX-WRZ7860 Receiver.
- Other low-power Wi-Fi transmitting devices should be mounted at least 3 ft (1 m) from any FX-WRZ Series Sensor or FX-WRZ7860 Receiver.
- 2.4 GHz cordless phones and some older phone headsets can cause interference and should not be used anywhere near a One-to-One wireless room sensing system.
- Avoid areas where microwave ovens are located between the FX-WRZ sensor and the FX-WRZ7860 receiver.

To secure One-to-One RF wireless messages, the FX-WRZ Series Sensors and FX-WRZ7860 Receiver, use a custom Johnson Controls message protocol that prevents deciphering any One-to-One data transmissions received or intercepted by any other receiving devices.

Radio frequency addresses for One-to-One Wireless Sensing applications

To establish wireless RF associations in One-to-One Wireless Sensing applications, you must assign and configure the same, unique RF address on the FX-WRZ7860 Receiver and the FX-WRZ Series Sensor or sensors associated with that receiver.

The RF address for an FX-WRZ7860 Receiver is configured manually by positioning the numbered switches on the **TRANSMITTER ID** address DIP switch block and the **AREA** address DIP switch block on the receiver. See [Setting the FX-WRZ7860 Receiver RF Address](#).

The RF address (**TRANSMITTER ID** and **AREA**) for each FX-WRZ Series Sensor associated with an FX-WRZ7860 Receiver must match the receiver RF address. The FX-WRZ Series Sensor's RF address is configured by positioning the numbered switches on the **TRANSMITTER ID** DIP switch block and the **AREA** address DIP switch block on the sensor. See [Setting the FX-WRZ Series Sensor RF Address](#).

The RF **TRANSMITTER ID** and **AREA** DIP switch blocks on the sensor and receiver are binary switch blocks. The **TRANSMITTER ID** switches on each switch block are assigned numbers (1, 2, 4, 8, 16, 32, 64, and 128). The **TRANSMITTER ID** address is a number from 0 to 255, which is equal to the sum of the numbers of the switches that are in the **ON** position. As an example, placing Switches 1, 4, 8, and 32 in the ON position establishes a **TRANSMITTER ID** address of 45 for the device.

The **AREA** address switches on each switch block are assigned numbers (1, 2, 4, and 8). The **AREA** address is a number from 0 to 15, which is equal to the sum of the numbers of the switches that are in the ON position. Typically, the **AREA** address may be used to distinguish different floors, wings, or areas of a building. Together, the **TRANSMITTER ID** and **AREA** DIP switches provide 4,096 unique RF addresses.

- ① **Note:** To use an FX-ZFR18xx Series Wireless Field Bus Router, set all of the **AREA** DIP switches on the FX-WRZ7860 Receiver to the off (0) position. (The **AREA** DIP switch is not used on the FX-ZFR18xx Series Wireless Field Bus Router.) In addition, set the most significant bit of the **TRANSMITTER ID** to the OFF position on both the FX-WRZ7860 Receiver and FX-ZFR18xx Series Wireless Field Bus Router. This setting provides 128 transmitter IDs to use with a repeater. Since these 128 transmitter IDs overlap those of the FX-ZFR or FX-ZFR Pro mesh system, take care to select a **TRANSMITTER ID** that is not in use in the local area.

In multiple-sensor applications, two or more FX-WRZ Series Wireless Sensors have the same **TRANSMITTER ID** and **AREA** addresses, but are distinguished by the **SENSOR #** selection on the FX-WRZ Series Wireless Sensor. The **SENSOR #** may be 199, 200, 201, 202, or 203.

If the FX-WRZ7860 Receiver fails to respond to an FX-WRZ Series Wireless Sensor with a matching RF address, the receiver may have already locked onto another sensor with the same RF address. To clear the receiver from an incorrect association, while the receiver has power, momentarily change the receiver's RF address to a different RF address and then back again to the original RF address.

Never use the same RF address (**TRANSMITTER ID** and **AREA**) for two receivers that are in the same building or general location. RF signals can reflect off objects or pass through glass windows, and it is possible for RF signals to travel between buildings or reach receivers several floors away.

- ① **Note:** In single-sensor and multiple-sensor applications, a One-to-One Wireless sensing system interfaces with only one supported controller. Since the FX-WRZ7860 Receiver and FX-WRZ Series Sensor combination effectively replaces a network sensor, the same controller applications where a network sensor would otherwise be used are supported.

Using an FX-ZFR181x (FX-ZFR) Series Wireless Field Bus Router as a repeater in a One-to-One Wireless Sensing application

To use an FX-ZFR Wireless Field Bus Router as a repeater in a One-to-One Wireless Sensing application:

1. Set the **AREA** DIP switches on the FX-WRZ7860 Receiver and the FX-WRZ Series Sensor to the OFF position.
2. Set the **TRANSMITTER ID** DIP switches on the FX-WRZ7860 Receiver and the FX-WRZ Series Sensor to the desired RF address.
3. Set the PAN OFFSET DIP switches on the FX-ZFR or FX-ZFR Pro Series Wireless Field Bus Router to the same RF address as the **TRANSMITTER ID** DIP switches.
4. Apply power to the FX-WRZ7860-0 Receiver and wait approximately 5 seconds.
5. Apply power to the FX-ZFR Wireless Field Bus Router and wait approximately 30 seconds for it to associate with the FX-WRZ7860 Receiver.
6. Apply power to the FX-WRZ Series Sensor and wait approximately 30 seconds for it to associate with the RF network.
7. Turn the FX-WRZ7860 Receiver to the off position and wait approximately 2 minutes. Waiting for 2 minutes gives the FX-WRZ Series Wireless Sensor time to discover the loss of the FX-WRZ7860-0 Receiver, and to associate with the FX-ZFR Wireless Field Bus Router.
8. Turn the FX-WRZ7860 Receiver to the ON position. Communication reestablishes with the FX-WRZ7860 Receiver, and the FX-WRZ Series Sensor messages are sent through the FX-ZFR Wireless Field Bus Router.
 - ① **Note:** If the FX-WRZ7860 Receiver, FX-WRZ Series Sensor, and FX-ZFR Wireless Field Bus Router are within range but fail to communicate with each other, reset each device. With power applied to each device, change any DIP switch for a few seconds and then move it back to its original position. Each device resets and erases any former network settings.

One-to-One wireless room sensing system commissioning overview

A One-to-One wireless room sensing system using the FX-WRZ7860 Receiver and FX-WRZ Series Sensor combination is relatively simple to install, commission, configure, and troubleshoot. See [Related Documentation](#).

- See [Related Documentation](#) for references to documents with information on locating and installing FX-WRZ Series Sensors and the FX-WRZ7860 Receiver.
- Refer to the supported controller's documentation for information on installing, commissioning, configuring, and troubleshooting the target controller.

Commissioning procedure requirements

To commission a One-to-One wireless room sensing system application, you need the following items:

- One to five FX-WRZ Series Sensors
- One FX-WRZ7860 Receiver

- An installed, commissioned, and configured FX-PCV or FX-PCG controller
- An SA Bus interface cable (available pre-configured in various lengths, or you can fabricate other length cables as desired)

Commissioning procedure workflow

The procedure required to commission and configure a One-to-One wireless room sensing system can be performed in a variety of sequences. The job site and workflow dictate the order in which these procedures are performed. The following procedure order is a typical sequence.

To commission and configure a One-to-One Wireless Sensing system, you must perform the following procedures:

- Install, commission, and configure the target FX-PC controller.
- Commission/address and install the FX-WRZ7860 Receiver.
- Connect the FX-WRZ7860 Receiver to the target controller.
- Install and address the FX-WRZ Series Sensors.
- Test the RF signal strength between the associated devices.
- Test and confirm operation of the complete application.

Planning and record keeping

When commissioning and configuring a control system with several One-to-One wireless room sensing systems and multiple sensors, receivers, and controllers, we strongly recommend that you obtain a set of the building plans, the HVAC plans, and the building specifications.

Use the building plans and specifications to determine the best line-of-sight RF pathways, and the potential locations for the sensors and receivers. Test the potential device locations to determine if the RF signal strength is adequate; then, adjust the device locations as necessary.

- ① **Note:** A successful wireless field bus system requires that a minimum wireless signal strength is maintained between system components. Component location is an important part of system design. Distance, metal objects, and other obstructions can reduce or completely block the wireless signal transmissions.

You should create a sensor/receiver association table to record all of the device addresses, and a device map that shows the locations of all sensors, receivers, and supported FX-PC controllers for the final as-built control system.

- ① **Note:** Do not create duplicate RF addresses on any of the receivers at your job site. Duplicate RF addresses can cause a variety of problems in One-to-One applications.

Detailed procedures

Setting the FX-WRZ7860 Receiver RF address

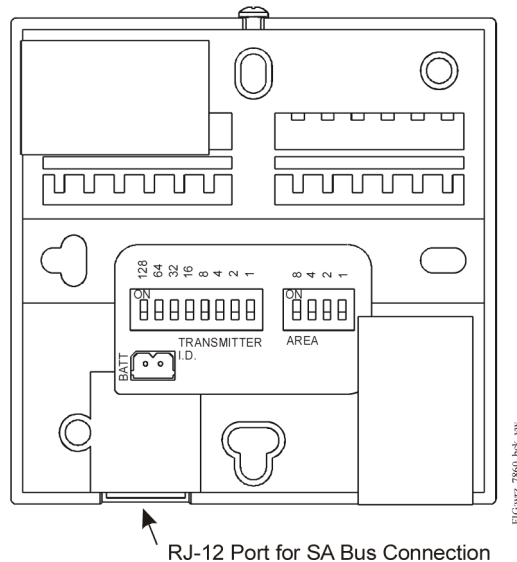
The FX-WRZ7860 Receiver requires a unique RF address to communicate with associated FX-WRZ Series Sensors. Set the RF address for the receiver by positioning the numbered switches on the **TRANSMITTER ID** address DIP switch block and the **AREA** address DIP switch block. See [Radio Frequency Addresses for One-to-One Wireless Sensing Applications](#) for more information.

To manually set the FX-WRZ7860 Receiver RF address:

1. Disconnect the power to the SA Bus.
2. Set the numbered switches on the **TRANSMITTER ID** address DIP switch block and the **AREA** address DIP switch block to the desired RF address (Figure 5).

- ① **Note:** To use an FX-ZFR or FX-ZFR Pro Series Field Bus Router, set all the **AREA** DIP switches on the FX-WRZ7860 to the **OFF** (0) position. (The **AREA** DIP switch is not used on the FX-ZFR or FX-ZFR Pro Series.) In addition, set the most significant bit of the **TRANSMITTER ID** to the **OFF** position on both the FX-WRZ7860 and FX-ZFR Series. This setting provides 128 transmitter IDs to use with a repeater. Since these 128 transmitter IDs overlap those of the FX-ZFR or FX-ZFR Pro mesh system, take care to select a **TRANSMITTER ID** that is not in use in the local area.

Figure 5: TRANSMITTER ID and AREA DIP switch blocks on an FX-WRZ7860 Receiver



3. Check the **AREA** DIP switch block on the back of the associated sensor and be sure that the **POWER** switch is set in the **OFF** position (Figure 8). See [Setting the FX-WRZ Series Sensor RF Address](#) for more information.
4. Connect the SA Bus to the FX-WRZ7860 Receiver.
5. Set the sensor's controller POWER switch to the ON position. Five seconds after the power is applied, the red LED flashes to indicate the firmware revision. For example, firmware revision 3 is indicated by the LED flashing three times during the startup process.
6. Repeat this procedure for each receiver in your application.
 - ① **Note:** Do not create duplicate addresses on any of the receivers at your job site. Duplicate addresses can cause a variety of problems in One-to-One Wireless Sensing applications.

Setting the FX-WRZ Series Sensor RF address

Associate the FX-WRZ Series Wireless Sensors to an FX-WRZ7860 Receiver by setting the **TRANSMITTER ID** DIP switches and the **AREA** DIP switches on the sensors to the same positions as the **TRANSMITTER ID** DIP switches and the **AREA** DIP switches on the target FX-WRZ7860 Receiver so that the RF address setting on both devices match. See [Radio Frequency Addresses for One-to-One Wireless Sensing Applications](#) for more information.

Most One-to-One Wireless Sensing applications use a single sensor. Therefore, select 199 on the SENSOR # DIP switch. However, if two or more sensors are used in your One-to-One application, then the first sensor should be set for 199, the second set for 200, the third set for 201, the fourth set for 202, and the fifth set for 203.

To set the FX-WRZ Series Sensor RF address (**TRANSMITTER ID** and **AREA**) and select the sensor number (**SENSOR #**):

1. Remove the FX-WRZ Series Sensor housing from the sensor mounting base as illustrated in Figure 6.

Figure 6: Removing the sensor housing from its mounting base

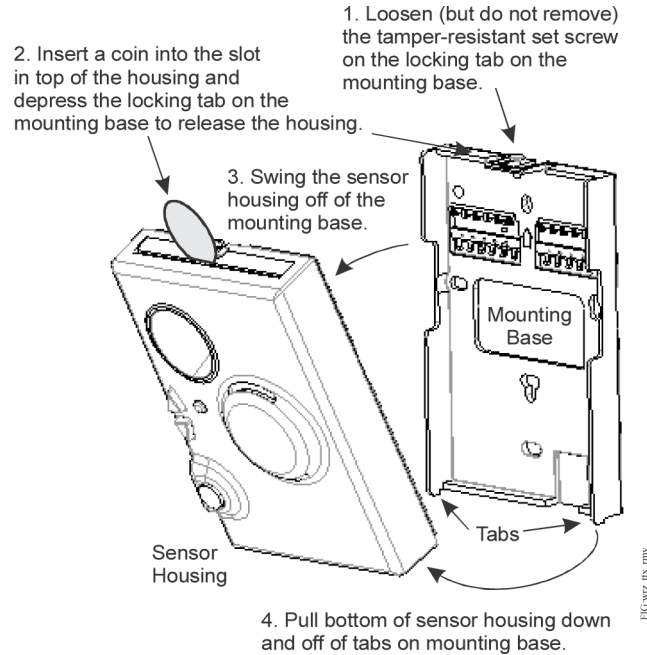
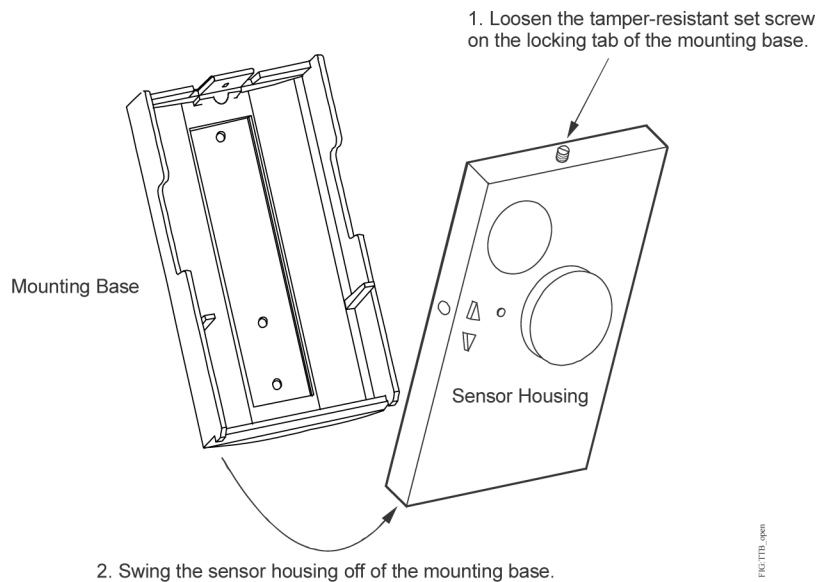


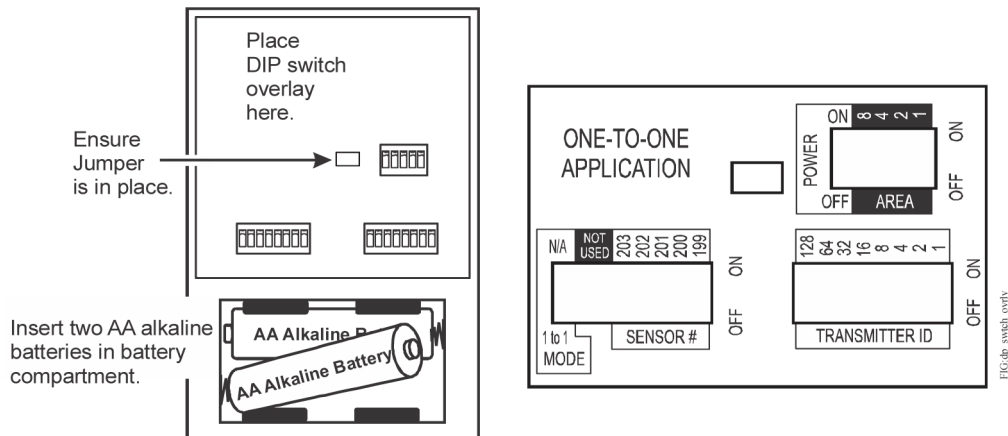
Figure 7: Removing the FX-WRZTTB00-5 Series Sensor housing from its mounting base (temperature only model shown)



2. Move the **ONE-TO-ONE APPLICATION** DIP switch overlay card over the DIP switches (Figure 8).
3. Locate the power switch on the left side of the **AREA** DIP switch block, and set it to the **OFF** position.

4. Set the FX-WRZ Series Sensor **MODE** DIP switch on the far left of the SENSOR # DIP switch block to the 1-to-1 (down) position.
5. Set the SENSOR # to 199 for applications with only one sensor for each controller.
 - ⓘ **Note:** Use the other settings for applications with a single controller performing temperature or humidity averaging or high/low selection within a zone.
6. Match the receiver RF address by setting the numbered switches on the **AREA** DIP switch block and on the **TRANSMITTER ID** DIP switch block to the same positions as the numbered switches on the **AREA** and **TRANSMITTER ID** DIP switch block on the associated receiver (Figure 8) .

Figure 8: Back of the FX-WRZ Series Sensor housing and One-to-One application DIP switch overlay



7. Ensure the batteries are installed correctly and move the sensor **POWER** switch to the **ON** position (if you are putting the sensor into operation).
8. Reinstall the sensor housing to the wall-mounted base.
9. If the associated receiver is configured and powered on, you can press the sensor occupancy button to determine if the sensor and receiver are communicating. See [Checking a One-to-One Wireless Sensing System Application RF Signal Strength](#).

Connecting an FX-WRZ7860 Receiver to the supported controllers

Connect an SA Bus interface cable between the SA Bus port on the FX-PCV or FX-PCG and the SA Bus port on the FX-WRZ7860 Receiver (Figure 5). Various length pre-made SA Bus cables are available (for example, CBL-NETWORK6).

Configuring supported controllers for One-to-One applications

The FX-PCV and FX-PCGs interpret the FX-WRZ7860 Receiver and FX-WRZ Series Sensor combination as a network sensor (for example, an NS-BTP7001-0 network sensor). Therefore, configure the controllers to use network sensors.

Troubleshooting

Checking a One-to-One Wireless Sensing System application RF signal strength

You should verify adequate RF signal strength between sensors and receivers, especially in applications with excessive distances or metal barriers, such as ductwork, concrete with metal reinforcements, equipment rooms, or elevator shafts. The RF signal strength in One-to-One wireless sensing system applications can be checked before you set up your system as follows:

1. Set the DIP switches on the sensor and receiver (or the wireless sensing system tool) to the same RF address (**TRANSMITTER ID** and **AREA**).
2. Use the battery pack of the FX-WRZSST-120 Wireless Sensing System Tool to provide power to the FX-WRZ7860 Receiver (two-pin connector on the back of the FX-WRZ7860, just below the **TRANSMITTER ID** DIP switch block). See Figure 5.
Note: The battery pack contains a small power switch.
3. Hold the FX-WRZ Series Sensor near its desired mounting location in the zone, with the battery installed and the power switch set to ON.
4. Observe the RF LED on the receiver. Every 60 seconds, an RF transmission occurs and the LED blinks. You can force the sensor into Rapid Transmit Mode (RTM) by pressing the FX-WRZ Series Sensor's manual occupancy override button for 5 seconds or more. In RTM, the sensor transmits a signal every 10 seconds for a period of 5 minutes. After each transmission, the occupancy override LED on the sensor flashes on (one, two, or three times) to indicate the signal strength between the sensor and the receiver. Also, the signal strength LED on the receiver blinks off to indicate the relative signal strength between the sensor and receiver. The LED flashes indicate the following:
 - Three consecutive flashes (of the sensor LED) or blinks (of the receiver LED) every 10 seconds indicate an excellent signal strength.
 - Two consecutive flashes (of the sensor LED) or blinks (of the receiver LED) every 10 seconds indicate a good signal strength.
 - One flash (of the sensor LED) or blink (of the receiver LED) every 10 seconds indicates a weak signal strength. A weak signal strength may result in sporadic loss of data. Therefore, move the sensor and/or receiver mounting locations until the signal strength improves.
 - You may need to relocate the sensor or receiver to improve the RF signal reception. The FX-WRZ7860 Receiver may be wired (SA Bus) up to 100 ft (30.5 m) from a supported Johnson Controls controller or an FX-ZFR181x-x Repeater can be installed to extend the range between the FX-WRZ sensor and FX-WRZ7660 receiver.
5. Check the receiver for adequate RF signal strength after the building occupant moves into the space. Checking a second time ensures that none of the occupant furnishings or equipment interferes with RF signal reception.

See Table 3 for troubleshooting additional problems or symptoms.

Table 3: Troubleshooting One-to-One Wireless Sensing applications

Problem or symptom	Cause or action
<p>FX-WRZ Series Wireless Sensor is not associated with the target receiver. (This problem is indicated by no flashes on the occupancy override LED after the manual occupancy override button is released. While the manual occupancy override button is pressed, the LED indicates battery status – on if the battery is good.)</p>	<p>The FX-WRZ Series Sensor batteries may be low. Replace the sensor batteries. Refer to the <i>FX-WRZ Series Wireless Room Sensors Installation Instructions (Part No. 24-10332-37)</i> for information on replacing the batteries.</p>
	<p>The sensor and receiver RF addresses may not match. Check/reconfigure the RF addresses on the sensor and the associated receiver. See Setting the FX-WRZ7860 Receiver RF Address and Setting the FX-WRZ Series Sensor RF Address for more information.</p>
	<p>The sensor and receiver may be out of RF signal range, or there may be an RF signal obstruction between them. Check the RF signal strength and path between the sensor and the receiver using the FX-WRZSST-120 Wireless Sensing System Tool.</p>
	<p>The receiver antenna may be positioned poorly. Reposition the sensor and the FX-WRZ7860 Receiver, ensuring that the antenna symbol is oriented vertically, either up or down. Recheck the sensor/receiver association at the sensor.</p>
	<p>The receiver may have been used with other sensors and does not allow new associations. With power applied to the receiver, change any DIP switch for a few seconds and then move it back to its original position. The receiver resets and erases any former network settings.</p>
<p>The FX-WRZ7860 Receiver may not have power or appears dead (for example, the SA LED does not flicker as expected for SA Bus activity, and the RF LED is off).</p>	<p>Verify that the controller is powered and configured as if for a hard-wired network sensor. Ensure that the SA Bus cable is properly connected, or that its plugs are properly crimped. With one end connected to the powered controller, check the plug end that connects to the FX-WRZ7860 Receiver. Pin 6 should be about 15 VDC positive with respect to Pin 5.</p>
<p>Zone temperature and humidity control and/or zone temperature setpoint is incorrect, unreliable, or erratic.</p>	<p>The FX-WRZ Series Sensor batteries may be low. Replace the sensor batteries. Refer to the <i>FX-WRZ Series Wireless Room Sensors Installation Instructions (Part No. 24-10332-37)</i> for information on replacing the batteries.</p>
	<p>More than one sensor may have the same RF address as the receiver and set with the same sensor number. Check the sensor and receiver addresses. See Setting the FX-WRZ7860 Receiver RF Address and Setting the FX-WRZ Series Sensor RF Address for more information.</p>
	<p>An obstruction may have been placed in the RF path between the sensor and the receiver. Check the RF path and signal strength between sensor and receiver.</p>
	<p>New RF/Wi-Fi interference may have been introduced into the One-to-One environment. Check for changes to the RF/Wi-Fi environment and new sources of RF interference.</p>

Table 3: Troubleshooting One-to-One Wireless Sensing applications

Problem or symptom	Cause or action
	Two receivers may have duplicate RF addresses and overlapping signal coverage with associated sensors. Check for duplicate RF addresses and ensure there is no signal overlap in applications with duplicate RF addresses.
	Wiring between the receiver and the controller may be incorrect or damaged. Check the wiring between the receiver and the controller.
	Sensor may be defective or damaged. Turn off the suspect sensor and configure a new sensor with the receiver address; then, check the operation of the new sensor with the receiver.

Technical specifications

Table 4: FX-WRZ Series Wireless Room Sensors

Power Requirements	3 VDC Supplied by Two 1.5 VDC AA Alkaline Batteries (Included with Sensor); Typical Battery Life: 48 Months (36 Months Minimum)
Addressing	DIP Switches, Field Adjustable: Area, Transmitter ID, Sensor #, MS/TP Address, Network Number, and Zone Address (Depending on model)
Ambient Conditions	Operating: 0°C to 50°C (32°F to 122°F), 5% to 95% RH, Noncondensing Storage: -40°C to 71°C (-40°F to 160°F), 5% to 95% RH, Noncondensing
RF Band	Direct-Sequence, Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	Wireless Mesh Network Application: 100 ft (30 m) Maximum Indoor Line-of-Sight; 50 ft (15 m) Practical Average Indoor One-to-One Application: 150 ft (45 m) Maximum Indoor Line-of-Sight; 100 ft (30 m) Practical Average Indoor
Transmissions	Every 60 Seconds (±20 Seconds)
Temperature Sensor Accuracy (Temperature Only Models, and Temperature and Humidity Models)	0.6°C/1.0°F Over the Range of 13°C to 29°C (55°F to 85°F); 0.9°C/1.5°F ° Over a Range of 0°C to 13°C (32°F to 55°F) and 29°C to 43°C (85°F to 110°F)
Humidity Measurement Range (Temperature and Humidity Models)	Full Range: 0% to 100% RH Calibrated Range: 10% to 90% RH at 23°C (74°F)
Humidity Sensor Accuracy (Temperature and Humidity Models)	±3% RH across the Range of 20% to 80% RH, ±6% RH across the Range of 10% to 20% RH and 80% to 90% RH; within the Temperature Range of 13°C to 29°C (55°F to 85°F)

Table 4: FX-WRZ Series Wireless Room Sensors



Temperature Sensor Type (Temperature Only Models, and Temperature and Humidity Models)	Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Humidity Sensor Type (Temperature and Humidity Models)	Planar Capacitive Polymer Sensor
PIR Occupancy Sensor Motion Detection (Models with PIR Occupancy Sensor)	Minimum 94 Angular Degrees up to a Distance of 15 ft (4.6 m); Based on a Clear Line of Sight
Materials	NEMA 1 White Plastic Housing
	United States: Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters; Transmitter FCC Identification: TFB-MATRIXL or OEJ-WRZRADIO
	Canada: Industry Canada IC: 5969A-MATRIXL or 279A-WRZRADIO
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the RED, EMC, LVD, and RoHS Directives.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	Japan: Transmission complies with Article 38-24 Paragraph 1 of the Radio Law Certification Number: ATCB012834
Shipping Weight	0.3 lb (0.14 kg)

Table 5: FX-WRZ7860 Receiver for One-to-One Wireless Room Sensing Systems

FX-PC Controller Interface	Power and SA Bus Interface between FX-WRZ7860 Receiver and FX-PCV or FX-PCG Controller
Supply Voltage	Nominal 15 VDC through the SA Bus; 6.7 to 16.5 VDC Required
Current Consumption	10 mA Maximum
Addressing	DIP Switches, Field Adjustable for up to 4,096 Unique RF Addresses
Ambient Limits	Operating: 0°C to 13°C (32°F to 55°F), 5% to 95% RH, Noncondensing Storage: -40°C to 71°C (-40°F to 160°F, 5% to 90% RH, Noncondensing
RF Band	Direct-Sequence, Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	150 ft (45 m) Maximum Indoor Line-of-Sight; 100 ft (30 m) Practical Average Indoor
Receiver Outputs	One RJ-12 Port for SA Communication Bus Output (Sensed Zone Temperature and Humidity, Temperature Setpoint, and Occupancy Override Data)

Table 5: FX-WRZ7860 Receiver for One-to-One Wireless Room Sensing Systems

Temperature System Accuracy	FX-WRZ Series Wireless Room Sensor: 0.6C°/1.0F° Over the Range of 13°C to 29°C (55°F to 85°F); 0.9C°/1.5F° Over a Range of 0°C to 13°C (32°F to 55°F) and 29°C to 43°C (85°F to 110°F)
Sensor Type	FX-WRZ Series Wireless Room Sensor: Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Shipping Weight	0.2 lb (0.09 kg)
Materials	NEMA 1 White Plastic Housing; UL94-5VB and V-0 Plenum Flammability Rated
	United States: Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters; Transmitter FCC Identification: TBF-MATRIXL or OEJ-WRZRADIO
	Canada: Industry Canada IC:5969A-MATRIXL or 279A-WRZRADIO
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the RED, EMC, LVD, and RoHS Directives.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

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