

WRZ Series One-to-One Wireless Room Sensing System

Technical Bulletin

WRZ-7860-0, WRZ-THx0000-0, WRZ-TTx0000-x

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WRZ Series One-to-One Wireless Room Sensing System

Technical Bulletin

Document Introduction

This document describes how to commission, configure, and troubleshoot the WRZ-7860-0 Receiver, WRZ Series Sensors, and One-to-One wireless room sensing systems.

This document does not describe how to locate or install the WRZ-7860-0 Receiver and the WRZ Series Sensors. Nor does this document describe how to install, commission, operate, or troubleshoot any of the digital field controllers that support One-to-One sensing system applications.

Related Documentation

**Table 1: WRZ Series One-to-One Wireless Room Sensing System
Related Documents**

For Information On	See Document	Document Number
Applications, Features, and Benefits of the WRZ-7860-0 Receiver	<i>WRZ-7860-0 Receiver for One-to-One Wireless Room Sensing Systems Product Bulletin</i>	<i>LIT-12011640</i>
Locating, Mounting, and Wiring the WRZ-7860-0 Receiver	<i>WRZ-7860-0 Receiver for One-to-One Wireless Room Sensing Systems Installation Instructions</i>	<i>Part No. 24-10563-47</i>
Applications, Features, and Benefits of the WRZ Series Wireless Room Sensors	<i>WRZ Series Wireless Room Sensors Product Bulletin</i>	<i>LIT-12011653</i>
Locating, Mounting, and Wiring the WRZ Series Wireless Room Sensors	<i>WRZ Series Wireless Room Sensors Installation Instructions</i>	<i>Part No. 24-10332-2</i>
Locating, Mounting, and Wiring the Occupancy Sensing WRZ Series Wireless Room Sensors	<i>Occupancy Sensing WRZ Series Wireless Room Sensors Installation Instructions</i>	<i>Part No. 24-10332-96</i>
Applications, Features, and Benefits of the WRZ-TTB Series Wireless Room Sensors	<i>WRZ-TTB0000-5 Handheld Temperature Room Sensor Product Bulletin</i>	<i>LIT-12011866</i>
Locating, Mounting, and Wiring the WRZ-TTB Series Wireless Room Sensors	<i>WRZ-TTB0000-5 Handheld Temperature Room Sensor Installation Instruction</i>	<i>Part No. 24-10724-0</i>

One-to-One Wireless Room Sensing System Overview

The WRZ Series One-to-One Wireless Room Sensing System is designed to interface with supported Johnson Controls® BACnet® Master-Slave/Token-Passing (MS/TP) controllers to provide wireless control of single-zone, room temperature and humidity applications. The WRZ Series Sensor and WRZ-7860-0 Receiver combination is a functional equivalent to a network sensor, such as an NS-BTP7001-0, 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 WRZ Series Wireless Room Sensors communicating single-zone temperature and humidity data to an associated WRZ-7860-0 Receiver.

A WRZ-7860-0 Receiver interfaces with a single Johnson Controls VMA16 Series Controller or Field Equipment Controller (FEC).

See *WRZ Series Wireless Room Sensors* for more information on the WRZ Series Sensors.

Note: Multiple WRZ Series Sensor models, a single model WRZ-7860-0 Receiver, and the WRZ-SST-120 Wireless Sensing System Tool are available. All of these components have a 10 mW transmission power.

The receiver meets the 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 WRZ Series Sensors and the WRZ-7860-0 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 a WRZ Series Sensor and an associated WRZ-7860-0 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.

Note: To extend the range, use an MS-ZFR1811-0 Wireless Field Bus Router and an MS-ZFRRPT-0 Power Supply.

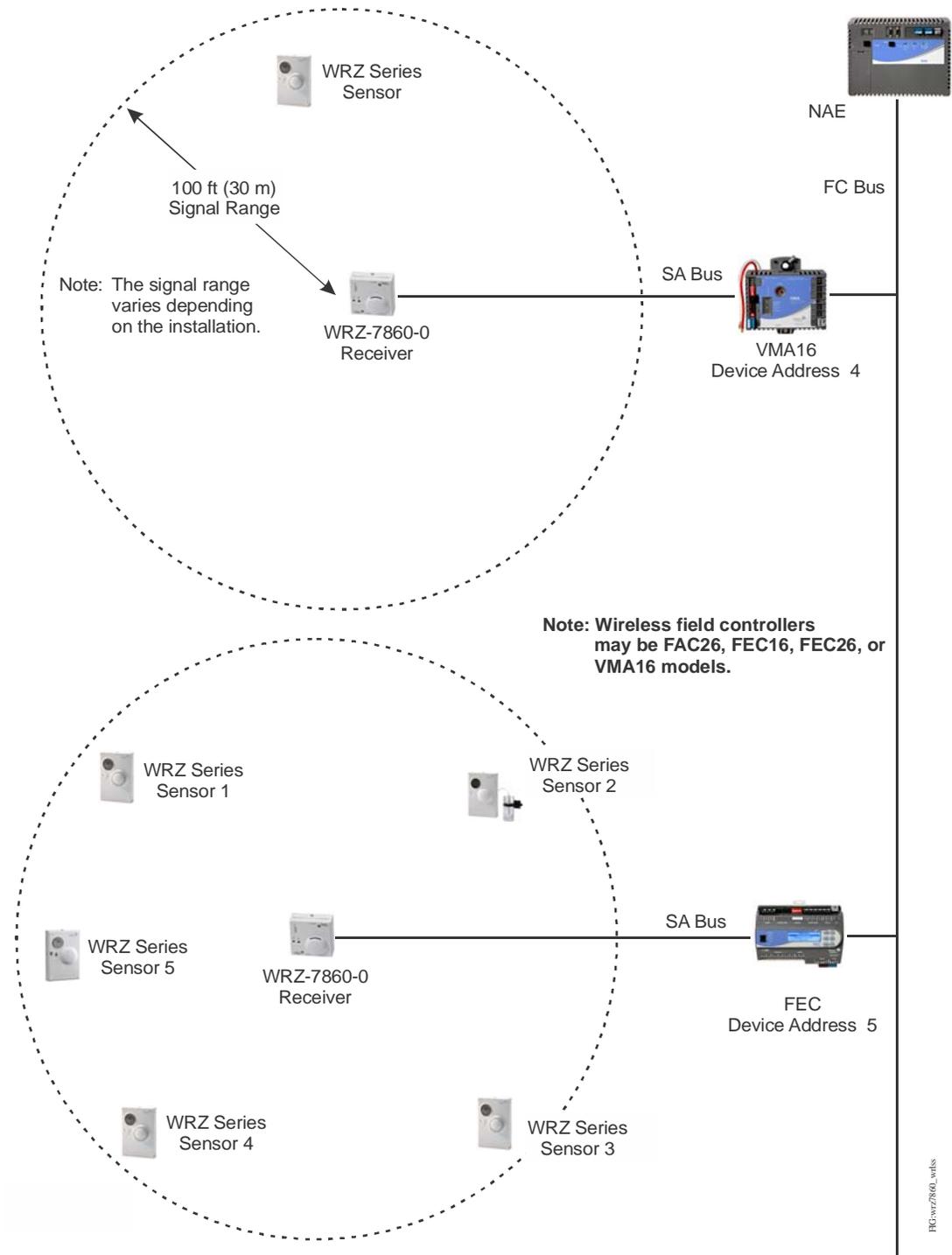


Figure 1: One-to-One Wireless Room Sensing Applications

The sensors and receivers are associated with 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 data at 60-second intervals:

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

See *Radio Frequency Addresses for One-to-One Applications*, *Setting the WRZ-7860-0 Receiver RF Address*, and *Setting the 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 VMA16 or FEC 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.

The WRZ Series Sensors and the WRZ-7860-0 Receiver also provide signal strength indication and other wireless diagnostic data.

IMPORTANT: The One-to-One wireless room sensing system, WRZ-7860-0 Receiver, and WRZ Series Sensors are not designed or intended for use in mission-critical or life/safety applications.

Note: The WRZ Series Sensors and the WRZ-7860-0 Receiver **are not** compatible with the WRS-TTx Sensors and the TE-7820 or TE-7830 Receivers.

WRZ Series Wireless Room Sensors

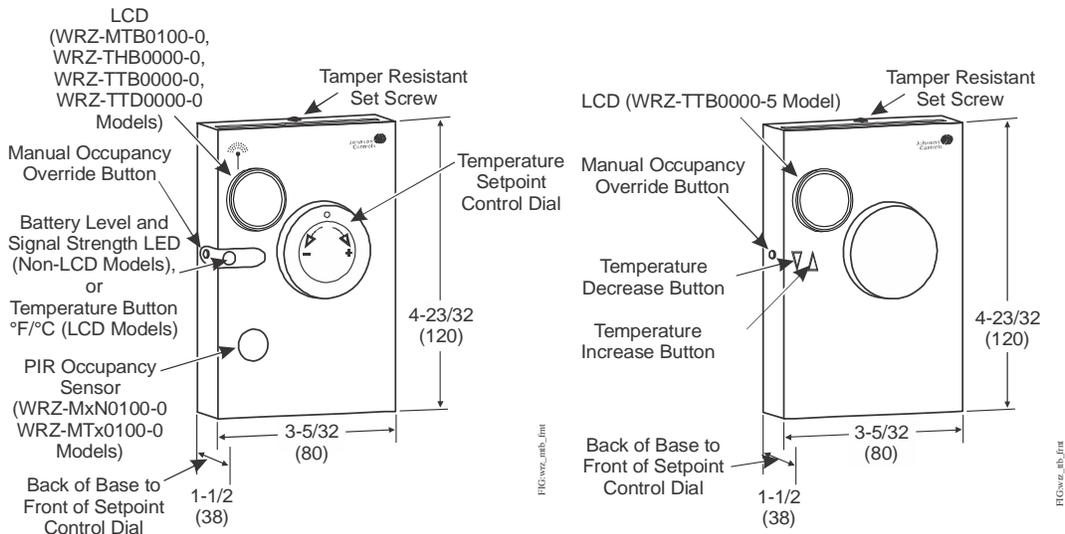
The WRZ Series Wireless Room Sensors (Figure 2) are designed to sense room/zone temperature and humidity, and transmit wireless temperature/humidity and zone status data to the WRZ-7860-0 Receiver.

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

Table 2: WRZ Series Wireless Room Sensors

Product Code Number	Product Description
WRZ-MHN0100-0	Wireless Room Temperature and Humidity Sensor with PIR Occupancy Sensor, Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-MNN0100-0	Wireless Room Sensor (No Temperature or Humidity Sensing) with PIR Occupancy Sensor, Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-MTB0100-0	Wireless Room Temperature Sensor with PIR Occupancy Sensor, Display, Setpoint Adjustment Scale: 55 to 80°F (13 to 27°C), F/C Button, and Manual Occupancy Override Button
WRZ-MTN0100-0	Wireless Room Temperature Sensor with PIR Occupancy Sensor, Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-RMT10K-0	Wireless Remote Temperature Transmitter: 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 a ZFR1811 Router, One DIP Switch Overlay for a Non-mesh Network One-to-One Application Using a WRZ-78x0-0 Receiver
WRZ-STR0000-0 (Non-NIST Certified Model)	Wireless Refrigerator/Freezer Temperature Transmitter and Probe Assembly: Includes One Temperature Transmitter Assembly, One Temperature Sensor Probe Assembly (Non-NIST Certified Model), One DIP Switch Overlay for a Mesh Network Application Using a ZFR1811 Router, One DIP Switch Overlay for a Non-mesh Network One-to-One Application Using a WRZ-7860-0 Receiver
WRZ-STRNIST-0 (NIST Certified Model)	Wireless Refrigerator/Freezer Temperature Transmitter and Probe Assembly: Includes One Temperature Transmitter Assembly, One Temperature Sensor Probe Assembly (NIST Certified Model), One DIP Switch Overlay for a Mesh Network Application Using a ZFR1811 Router, One DIP Switch Overlay for a Non-mesh Network One-to-One Application Using a WRZ-7860-0 Receiver
WRZ-THB0000-0	Wireless Room Temperature and Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 55 to 85°F (13 to 27°C), F/C Button, Relative Humidity (RH) Button, and Manual Occupancy Override Button Note: The display of warmer/cooler setpoint or absolute setpoint is controlled by the configuration of the field controller.
WRZ-THN0000-0	Wireless Room Temperature and Humidity Sensor with Battery Level/Signal Strength LED and Manual Occupancy Override Button
WRZ-THP0000-0	Wireless Room Temperature and Humidity Sensor, Warmer/Cooler (+/-) Setpoint Adjustment, F/C Button, Relative Humidity (RH) Button, and Manual Occupancy Override Button
WRZ-TTB0000-0	Wireless Room Temperature Sensor with Display, F/C Button, and Manual Occupancy Override Button
WRZ-TTB0000-5	Handheld Temperature Sensor with Display, Temperature Increase and Decrease Buttons, and Manual Occupancy Override Button
WRZ-TTD0000-0	Wireless Room Temperature Sensor with Display, F/C Button, Fan Speed Control, and Manual Occupancy Override Button
WRZ-TTP0000-0	Wireless Room Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment, Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-TTR0000-0	Wireless Room Temperature Sensor with Battery Level/Signal Strength LED, Manual Occupancy Override Button, and No Setpoint Adjustment
WRZ-TTS0000-0	Wireless Room Temperature Sensor with Setpoint Adjustment Scale: 55 to 80°F (13 to 27°C), Battery Level/Signal Strength LED, and Manual Occupancy Override Button



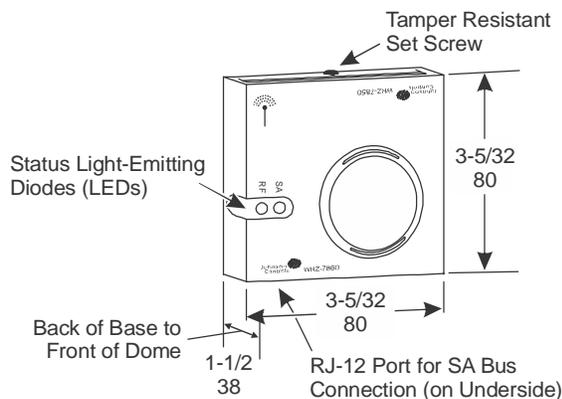
**Figure 2: WRZ Series Wireless Room Sensors
Physical Features and Dimensions, in. (mm)**

WRZ Series Wireless Room Sensors are also designed for use in wireless mesh network systems that use ZigBee™ protocol. Refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)* for more information.

Note: Do not attempt to set up a WRZ Series Sensor to report to more than one WRZ-7860-0 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.

WRZ-7860-0 Receiver

The WRZ-7860-0 Receiver (Figure 3) is designed to receive wireless data messages from WRZ Series Sensors, and communicate that data via a hard-wired Sensor Actuator (SA) Bus connection to a Johnson Controls VMA16 Series Field Controller or an FEC.



**Figure 3: WRZ-7860-0 Receiver
Physical Features and Dimensions, in. (mm)**

The WRZ-7860-0 Receiver collects wireless data transmissions containing 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 WRZ Series Wireless Sensors. The receiver then processes the zone data and delivers that data directly to a single controller via a hard-wired MS/TP SA Bus interface.

The WRZ-7860-0 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 4). The RF signal LED also goes from green to red if any of the associated sensors has reported that its battery voltage level is low. The receiver obtains nominal 15 VDC power from the SA Bus.

RF Interference and Security in One-to-One Applications

The WRZ Series Sensors, WRZ-7860-0 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 (WiFi) applications.

The WRZ Series Sensors and WRZ-7860-0 Receiver operate on 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 phone interference is not a problem with One-to-One wireless room sensing systems, except potentially when a cell phone is operated within 3 ft (1 m) of a WRZ Series Receiver. When One-to-One wireless room sensing systems encounter most other WiFi transmissions in the 2.4 GHz ISM band, the transmissions appear as merely noise and do not significantly impact wireless sensing system communication.

Using DSSS technology, the 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 RF interference is encountered, the One-to-One wireless room sensing system changes to a different frequency to enhance reliability. The WRZ-7860-0 Receiver establishes the RF network, using one of several frequencies in the 2.4 GHz ISM band. The sensors then try transmitting on each of the frequencies until they locate the receiver. Operation continues on that frequency until communication problems develop. If the receiver cannot communicate with the sensors, it restarts the network on a different frequency. The sensors then locate the receiver on the new frequency, 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 60-second intervals also reduces RF data-transmission collisions and interference with other WiFi 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. Some examples include:

- WRZ Series Sensor should not be mounted less than 3 ft (1 m) from a WRZ-7860-0 Receiver.
- Cell phones should not be used within 3 ft (1 m) of a WRZ Series Sensor or WRZ-7860-0 Receiver.
- WiFi access points should be mounted at least 20 ft (6 m) from any WRZ Series Sensor or WRZ-7860-0 Receiver.
- Other low-power WiFi transmitting devices should be mounted at least 3 ft (1 m) from any WRZ Series Sensor or WRZ-7860-0 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.

To secure One-to-One RF wireless messages, the WRZ Series Sensors and WRZ-7860-0 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 Applications

To establish wireless RF associations in One-to-One applications, you must assign and configure the same, unique RF address on the WRZ-7860-0 Receiver and the WRZ Series Sensor or sensors associated with that receiver.

The RF address for a WRZ-7860-0 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 WRZ-7860-0 Receiver RF Address* on page 14.

The RF address (**TRANSMITTER ID** and **AREA**) for each WRZ Series Sensor associated with a WRZ-7860-0 Receiver must match the receiver RF address. The 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 WRZ Series Sensor RF Address* on page 15.

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, 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, 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.

Note: To use a ZFR1811 Wireless Field Bus Router, set all the **AREA** DIP switches on the WRZ-7860-0 Receiver to the **OFF** (0) position. (The **AREA** DIP switch is not used on the ZFR1811.) In addition, set the most significant bit of the **TRANSMITTER ID** to the **OFF** position on both the WRZ-7860-0 and ZFR1811. This setting provides 128 **TRANSMITTER IDs** to use with a repeater. Since these 128 **TRANSMITTER IDs** overlap those of the ZigBee 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 WRZ Series Sensors have the same **TRANSMITTER ID** and **AREA** addresses, but are distinguished by the **SENSOR #** selection on the WRZ Series Sensor. The **SENSOR #** may be 199, 200, 201, 202, or 203.

If the WRZ-7860-0 Receiver fails to respond to a WRZ Series 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, momentarily change the receiver's RF address to a different RF address and then back again to the original RF address, all while power is applied to the receiver.

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.

Note: In single-sensor and multiple-sensor applications, a One-to-One sensing system interfaces with only one supported controller. Since the WRZ-7860-0 Receiver and 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 MS-ZFR1811-0 Wireless Field Bus Router as a Repeater in a One-to-One Application

To use an MS-ZFR1811-0 Wireless Field Bus Router as a repeater in a One-to-One application:

1. Set the **AREA** DIP switches on the WRZ-7860-0 Receiver and the WRZ Series Sensor to the **OFF** position.
2. Set the **TRANSMITTER ID** DIP switches on the WRZ-7860-0 Receiver and the WRZ Series Sensor to the desired RF address. Set the **PAN OFFSET** DIP switches on the MS-ZFR1811-0 Wireless Field Bus Router to the same RF address.
3. Apply power to the WRZ-7860-0 Receiver and wait approximately 5 seconds.
4. Apply power to the MS-ZFR1811-0 Wireless Field Bus Router and wait approximately 30 seconds for it to associate with the WRZ-7860-0 Receiver.
5. Apply power to the WRZ Series Sensor and wait approximately 30 seconds for it to associate with the RF network.
6. Turn the WRZ-7860-0 Receiver to the **OFF** position and wait approximately 2 minutes. Doing so gives the WRZ Series Sensor time to discover the loss of the WRZ-7860-0 Receiver, and to associate with the MS-ZFR1811-0 Wireless Field Bus Router.
7. Turn the WRZ-7860-0 Receiver to the **ON** position. Communication reestablishes with the WRZ-7860-0 Receiver, and the WRZ Series Sensor messages are sent via the MS-ZFR1811-0 Wireless Field Bus Router.

Note: If the WRZ-7860-0 Receiver, WRZ Series Sensor, and MS-ZFR1811-0 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.

Detailed Procedures

One-to-One Wireless Room Sensing System Commissioning Overview

A One-to-One wireless room sensing system using the WRZ-7860-0 Receiver and WRZ Series Sensor combination is relatively simple to install, commission, configure, and troubleshoot. Some of the required procedures are presented in other documentation.

- See Table 1 for references to documents with information on locating and installing WRZ Series Sensors and the WRZ-7860-0 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:

- one to five WRZ Series Sensors
- one WRZ-7860-0 Receiver
- an installed, commissioned, and configured VMA16 or supported field 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 system, you must perform the following procedures:

- Install, commission, and configure the target field controller.
- Commission/address and install the WRZ-7860-0 Receiver.
- Connect the WRZ-7860-0 Receiver to the target controller.
- Install and address the WRZ Series Sensors.
- Test the RF signal strength between the associated devices.
- Test and confirm operation of the complete One-to-One 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, and adjust the device locations as necessary.

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 field controllers for the final as-built control system.

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.

Setting the WRZ-7860-0 Receiver RF Address

The WRZ-7860-0 Receiver requires a unique RF address to communicate with associated 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 Applications* for more information.

To manually set the WRZ-7860-0 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 4).

Note: To use a ZFR1811 Wireless Field Bus Router, set all the **AREA** DIP switches on the WRZ-7860-0 to the **OFF** (0) position. (The **AREA** DIP switch is not used on the ZFR1811.) In addition, set the most significant bit of the **TRANSMITTER ID** to the **OFF** position on both the WRZ-7860-0 and ZFR1811. This setting provides 128 **TRANSMITTER IDs** to use with a repeater. Since these 128 **TRANSMITTER IDs** overlap those of the ZigBee mesh system, take care to select a **TRANSMITTER ID** that is not in use in the local area.

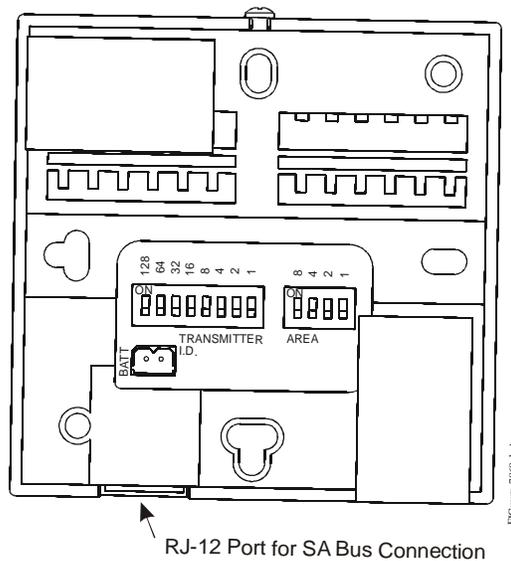


Figure 4: TRANSMITTER ID and AREA DIP Switch Blocks on a WRZ-7860-0 Receiver

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 7). See *Setting the WRZ Series Sensor RF Address* for more information.

4. Connect the SA Bus to the WRZ-7860-0 Receiver.
5. Set the field 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.

Repeat this procedure for each receiver in your application.

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 applications.

Setting the WRZ Series Sensor RF Address

Associate the WRZ Series Sensors to a WRZ-7860-0 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 WRZ-7860 Receiver so that the RF address setting on both devices match. See *Radio Frequency Addresses for One-to-One Applications* for more information.

In most One-to-One applications, a single sensor is used, and 199 should be selected 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 WRZ Series Sensor RF address (**TRANSMITTER ID** and **AREA**) and select the sensor number (**SENSOR #**):

1. Remove the WRZ Series Sensor housing from the sensor mounting base as shown in Figure 5 or Figure 6.

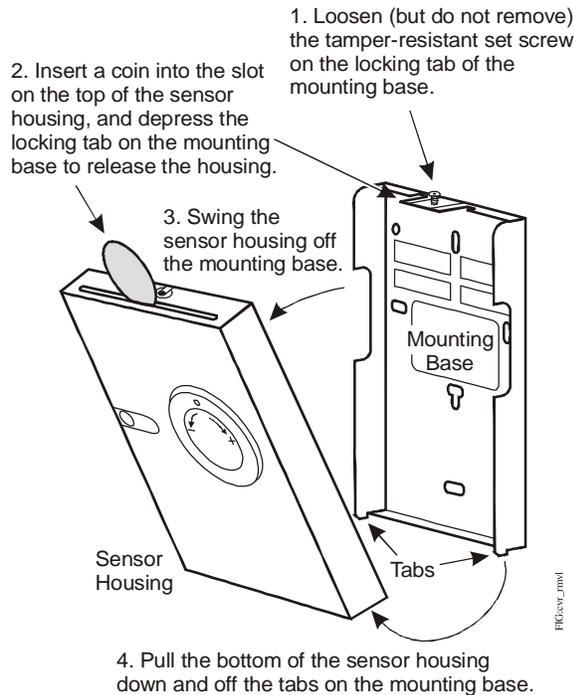


Figure 5: Removing the WRZ Series Sensor Housing from Its Mounting Base (Temperature and Humidity Model Shown)

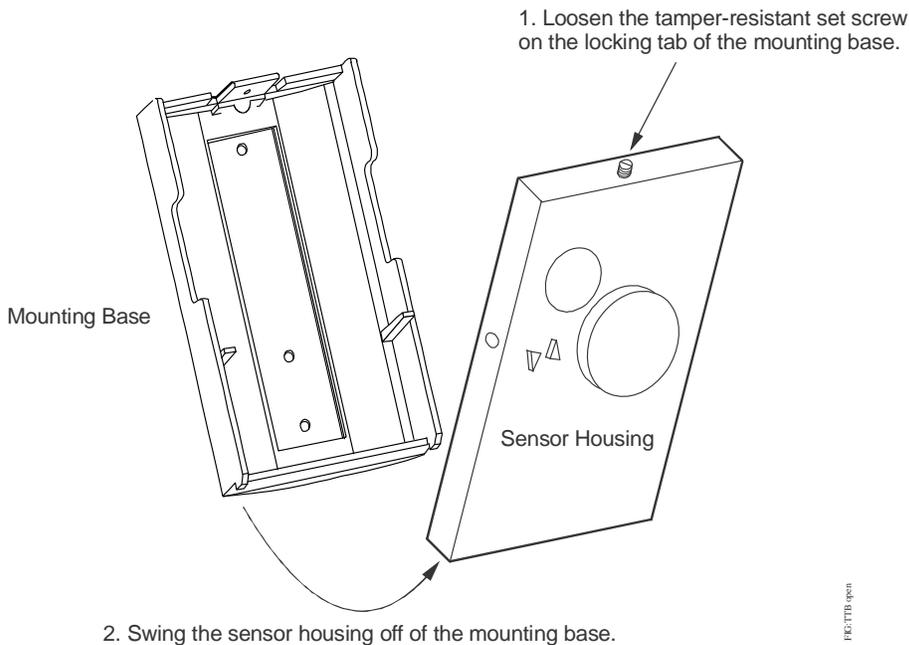


Figure 6: Removing the WRZ-TTB0000-5 Series Sensor Housing from Its Mounting Base (Temperature Only Model Shown)

2. Move the **ONE-TO-ONE APPLICATION** DIP switch overlay card over the DIP switches (Figure 7).
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 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 per 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 7).

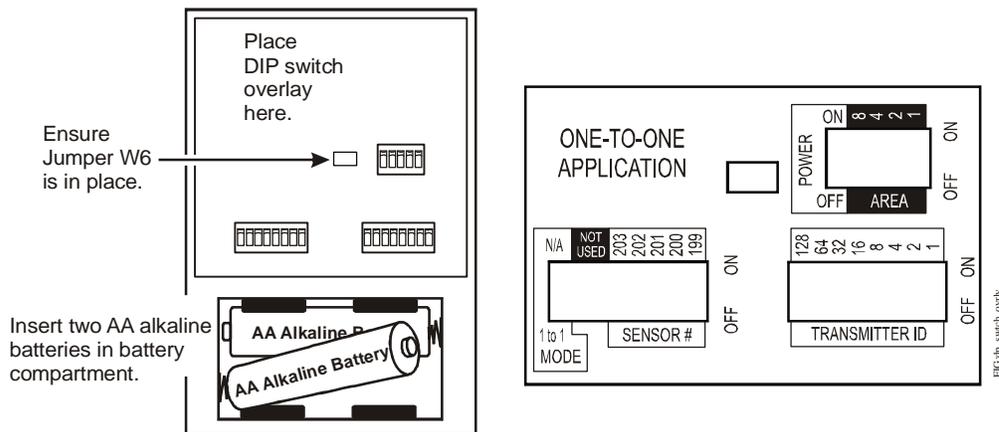


Figure 7: Back of the WRZ Series Sensor Housing and One-to-One Application DIP Switch Overlay

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 mounting 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 Application's RF Signal Strength*.

Connecting a WRZ-7860-0 Receiver to the Supported Controllers

Connect an SA Bus interface cable between the SA Bus port on the VMA16 or FEC and the SA Bus port on the WRZ-7860-0 Receiver (Figure 4). Various length pre-made SA Bus cables are available (for example, CBL-NETWORK6-0).

Configuring Supported Controllers for One-to-One Applications

The VMA16 and FECs see the WRZ-7860-0 Receiver and WRZ Series Sensor combination as a network sensor (for example, NS-BTP7001-0). Therefore, configure the controllers to use network sensors.

Troubleshooting

Checking a One-to-One Application's 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 ahead of time 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 WRZ-SST-120 Wireless Sensing System Tool to provide power to the WRZ-7860-0 (two-pin connector on the back of the WRZ-7860-0, just below the **TRANSMITTER ID** DIP switch block). See Figure 4.

Note: The battery pack contains a small power switch.

3. Hold the 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. Approximately every 60 seconds, an RF transmission occurs and the LED blinks. You can force the sensor into Rapid Transmit Mode (RTM) by pressing the 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.

- 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 WRZ-7860-0 Receiver may be wired (SA Bus) up to 100 ft (30.5 m) from a supported Johnson Controls controller.

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, possible causes, and suggested courses of action.

Table 3: Troubleshooting One-to-One Wireless Sensing Applications (Part 1 of 2)

Problem or Symptom	Cause/Action
WRZ Series Sensor is not associated with the target receiver. (This 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 in, the LED indicates battery status – on if the battery is good.)	The WRZ Series Sensor batteries may be low. Replace the sensor batteries. Refer to the instructions included with the wireless room sensor for information on replacing the batteries.
	The sensor and receiver RF addresses may not match. Check/reconfigure the RF addresses on the sensor and the associated receiver. See <i>Setting the WRZ-7860-0 Receiver RF Address</i> and <i>Setting the WRZ Series Sensor RF Address</i> for more information.
	The sensor and receiver may be out of RF signal range or may be an RF signal obstruction between them. Check the RF signal strength and path between the sensor and the receiver using the WRZ-SST-120 Wireless Sensing System Tool.
	The receiver antenna may be positioned poorly. Reposition the sensor and the WRZ-7860-0 Receiver, ensuring that the antenna symbol is oriented vertically, either up or down. Recheck the sensor/receiver association at the sensor.
	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.
The WRZ-7860-0 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.	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 WRZ-7860-0 Receiver. Pin 6 should be about 15 VDC positive with respect to Pin 5.

Table 3: Troubleshooting One-to-One Wireless Sensing Applications (Part 2 of 2)

Problem or Symptom	Cause/Action
<p>Zone temperature and humidity control and/or zone temperature setpoint is incorrect, unreliable, or erratic.</p>	<p>The WRZ Series Sensor batteries may be low. Replace the sensor batteries. Refer to the instructions included with the wireless room sensor 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 <u>Setting the WRZ-7860-0 Receiver RF Address</u> and <u>Setting the WRZ Series Sensor RF Address</u> 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/WiFi interference may have been introduced into the One-to-One environment. Check for changes to the RF/WiFi environment and new sources of RF interference.</p>
	<p>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.</p>
	<p>Wiring between the receiver and the field controller may be incorrect or damaged. Check the wiring between the receiver and the field controller.</p>
	<p>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.</p>

Technical Specifications

WRZ Series Wireless Room Sensors (Part 1 of 2)

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: 32 to 122°F (0 to 50°C), 5 to 95% RH, Noncondensing Storage: -40 to 160°F (-40 to 71°C), 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)	1.0F°/0.6C° Over the Range of 55 to 85°F (13 to 29°C); 1.5F°/0.9C° Over a Range of 32 to 55°F (0 to 13°C) and 85 to 110°F (29 to 43°C)
Humidity Measurement Range (Temperature and Humidity Models)	Full Range: 0 to 100% RH Calibrated Range: 10 to 90% RH at 74°F (23°C)
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 55 to 85°F (13 to 29°C)
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

WRZ Series Wireless Room Sensors (Part 2 of 2)

	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, Inc. declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC.
	Australia and New Zealand: Australia/NZ Emissions Compliant (C-Tick Mark)
	Japan: Transmission complies with Article 38-24 Paragraph 1 of the Radio Law Certification Number: ATCB012834
Shipping Weight	0.3 lb (0.14 kg)

WRZ-7860-0 Receiver for One-to-One Wireless Room Sensing Systems

Field Controller Interface	Power and SA Bus Interface between WRZ-7860-0 Receiver and VMA16 Series Controller or FEC
Supply Voltage	Nominal 15 VDC via 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: 32 to 122°F (0 to 50°C), 5 to 95% RH, Noncondensing Storage: -40 to 160°F (-40 to 71°C), 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)
Temperature System Accuracy	WRZ Series Wireless Room Sensor: 1.0F° (0.6C°) over the Range of 55 to 85°F (13 to 29°C); 1.5F° (0.9C°) over the Range of 32 to 55°F (0 to 13°C) and 85 to 110°F (29 to 43°C)
Sensor Type	WRZ Series Wireless Room Sensor: Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Materials	NEMA 1 White Plastic Housing; UL94-5VB and V-0 Plenum Flammability Rated
Compliance 	United States: Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters; Transmitter FCC Identification: TBF-MATRIXL
	Canada: Industry Canada IC:5969A-MATRIXL or 279A-WRZRADIO
	Europe: CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC.
	Australia and New Zealand: Australia/NZ Emissions Compliant (C-Tick Mark)
	Japan: Transmission complies with Article 38-24 Paragraph 1 of the Radio Law Certification Number: ATCB012834
Shipping Weight	0.2 lb (0.09 kg)

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, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



Building Efficiency

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