

## Introduction

The ZFR1831 Wireless Router (ZFR1831) is a component of the ZFR183x Pro Series Wireless Field Bus System which provides BACnet IP connectivity to compatible Johnson Control Field Controllers, VAV Controllers, Thermostats and Sensors over a wireless mesh network. The ZFR1831 can be used as a wireless Network Coordinator, a Field Controller Router or Stand-alone Repeater.

## Applications

- ▶ **Important:** Where failure or malfunction of an ZFR1831 or loss of communications due to wireless interference could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of a ZFR1831.
- ▶ **Important:** The WRG1830/ZFR183x Series Wireless Field Bus System is not designed or intended for use in mission-critical or life/safety applications.

## North American emissions compliance

### United States

#### Compliance Statement (Part 15.19)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

#### Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### Canada

#### Industry Canada Statement(s)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.



Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage, et
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## Installation

### CAUTION

#### Risk of Electric Shock

Disconnect the power supply before making electrical connections to avoid electric shock.

### ATTENTION

#### Risque de décharge électrique

Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

- **Important:** Do not insert tools into the housing. Be careful not to damage any components when pushing the tabs on either side of the sensor.
- **Important:** Do not remove the printed circuit board (PCB). Removing the PCB voids the product warranty.
- **Important:** The modular phone jack and screw terminal connections cannot be used simultaneously.

## Location Considerations

Follow these guidelines when locating an ZFR1831 within an ZFR183x Pro Series Wireless Field Bus system:

- The ZFR1831 wireless router can be installed on wall, wall box, conduit, or ceiling grid.
- Do not mount inside metal enclosures or on surfaces that can block RF signals.
- Locate the ZFR1831 so that it is easily accessible.
- For best signal transmission, orient the ZFR1831 with at least 50 mm (2 in.) exposed below and clear of any pipes, duct work, or other metal obstructions.
- Locate the ZFR1831 in line-of-sight with as many wireless controllers as possible. At a minimum, two other ZFR1831 Routers.
- Do not mount the ZFR1831 in recessed areas, metal enclosures, or shelving units.
- If feasible, mount the ZFR1831 outside of mechanical rooms, as many mechanical rooms excessively attenuate the radio signal.
- Position WRZ Series sensors within 15m (50ft) of any ZFR1831 Router with the same PAN setting.

- Position ZFR1831 Routers within 75m (250ft) of other Routers with the same PAN setting.
- Locate all wireless devices that have the same PAN setting on the same floor (ZFR1831's, TEC3000's, WRZ's). Communications between floors is typically not advised due to the attenuation of the signal through the decking.
- Avoid metal obstructions and concrete or brick walls between the ZFR1831 and the associated wireless devices.
- Avoid configurations where a microwave oven is located between two wireless devices. At a minimum, ensure no microwave ovens are within 6 m (20 ft) of an ZFR1831 or any wireless controllers or WRZ Sensor.

**Note:** For detailed information on location guidelines for an WRG1830/ZFR183x Series system, and for estimating the number of ZFR1831 Routers needed as repeaters for extending wireless transmission range, refer to the applicable *WRG1830/ZFR183x Series Wireless Field Bus System Technical Bulletin*.

## Parts included

Verify that the following parts shipped with the ZFR Pro Router:

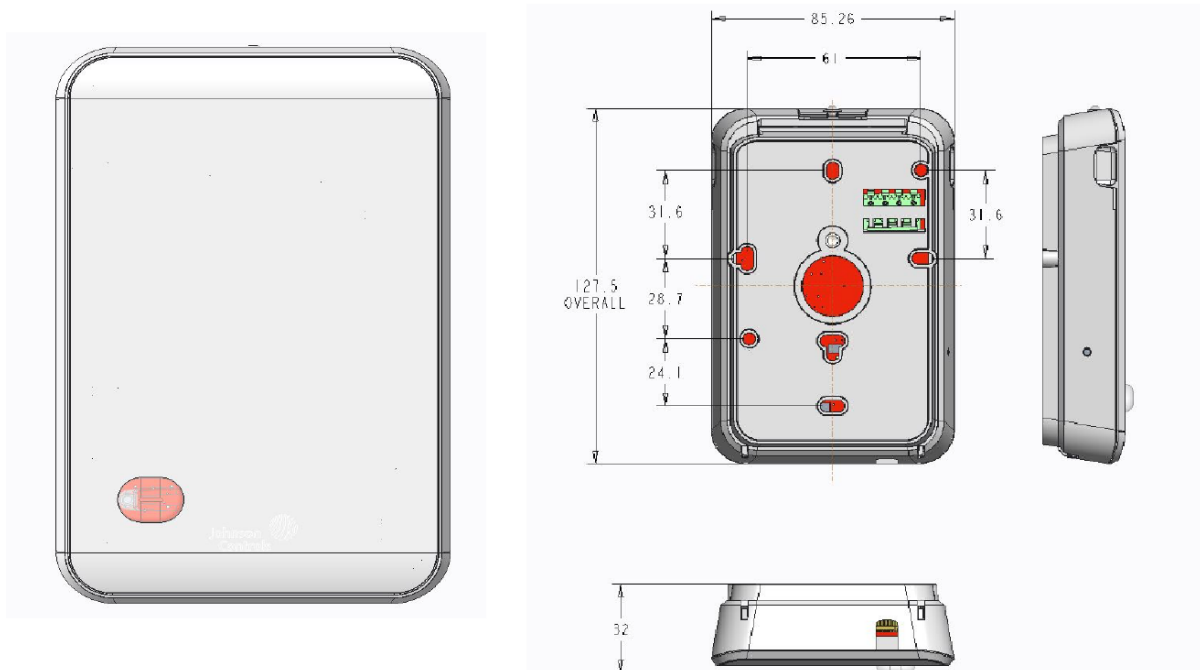
- ZFR1831 Wireless Router
- 3m (10ft) wiring cable
- *ZFR1831 Pro Series Wireless Installation Guide (Part No. 24-11461-00004)*

① **Note:** The ZFR1831 wireless router does include any required hardware for mounting

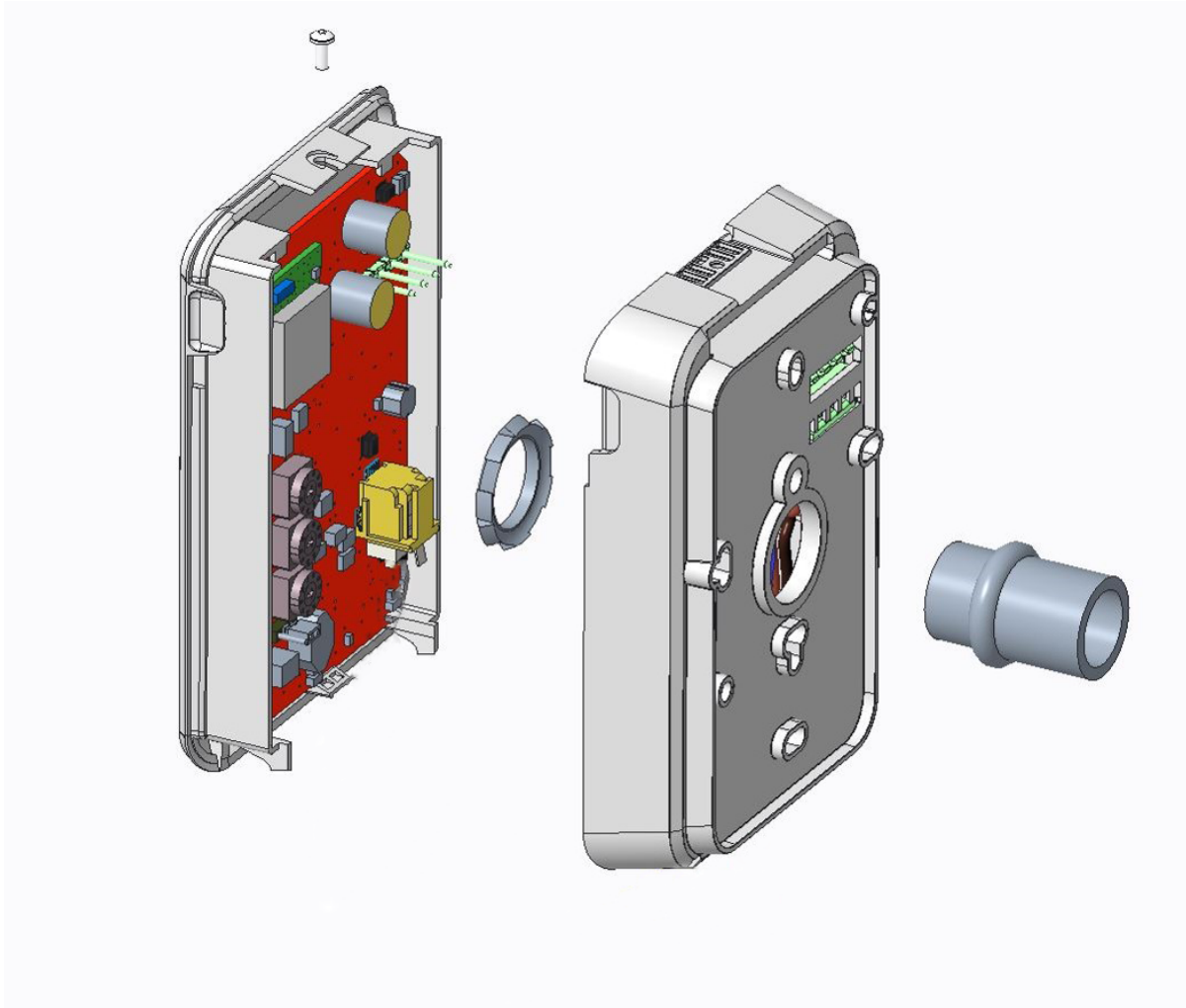
## Materials and special tools needed

A 1.5 mm (1/16 in.) Allen wrench or a Johnson Controls® T-4000-119 Allen-Head Adjustment Tool is required for tightening or loosening the security screw on the ZFR1831.

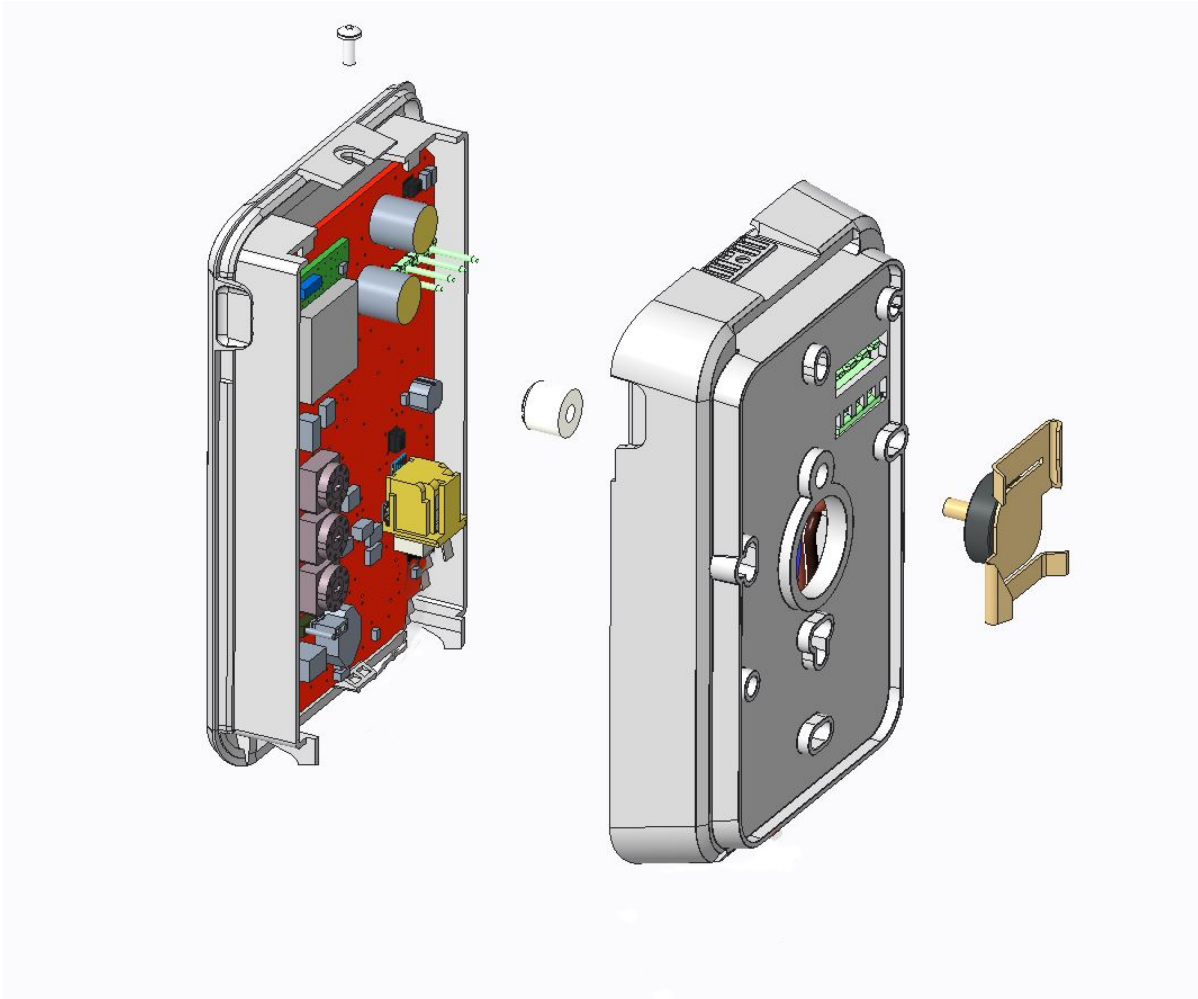
**Figure 1: ZFR1831 Router front and back view with dimensions**



**Figure 2: ZFR1831 Router conduit installation mounting view**



**Figure 3: ZFR1831 Router ceiling grid installation mounting view**



① **Note:** Use Grainger item #45DN38 or equivalent. For more information visit <https://www.grainger.com/>

## Wireless signal transmission considerations

The effective transmission range/distance for indoor applications varies because of wireless signal absorption and reflection due to metal obstructions, walls (or floors), and furniture found in typical building interiors.

Transmissions may use up to 30 hops to transmit a message to the coordinator. In a well- designed system, the layout design should minimize the required hops based on the recommended transmission ranges and should typically be kept below five. Information on determining the numbers of hops being used is covered in the *WRG1830 Wireless Gateway Users Guide (LIT-12013550)*.

The WRZ sensors list a lower line of sight range because they transmit at a lower power (10mW) than the wireless routers (100mW) and are typically mounted in the occupied spaces where there is more attenuation due to occupants and furnishings.

**Table 1: Indoor transmission ranges**

Range type	Maximum transmission distance		
	ZFR Pro Coordinator Radio, ZFR Pro Router/Repeater	TEC3000 Series Controller	WRZ Series Sensor
Typical	75 m (250 ft)	75 m (250 ft)	15 m (50ft)
Maximum line of sight	1200 m (4000 ft)	1200 m (4000 ft)	30 m (100 ft)

Indoor line-of-sight transmission ranges between products can be less than those in the table above. The effective transmission distances and signal quality can vary for each application because of wireless signal absorption and reflection due to metal obstructions, walls, ceilings, floors, and furniture found in typical building interiors.

Transmission ranges between ZFR183x Pro Series products can be less than the maximum distances shown in the table above.

## Wiring

### Wiring considerations and guidelines

#### **Wiring Considerations and Guidelines**

Follow these guidelines when wiring a ZFR1831:

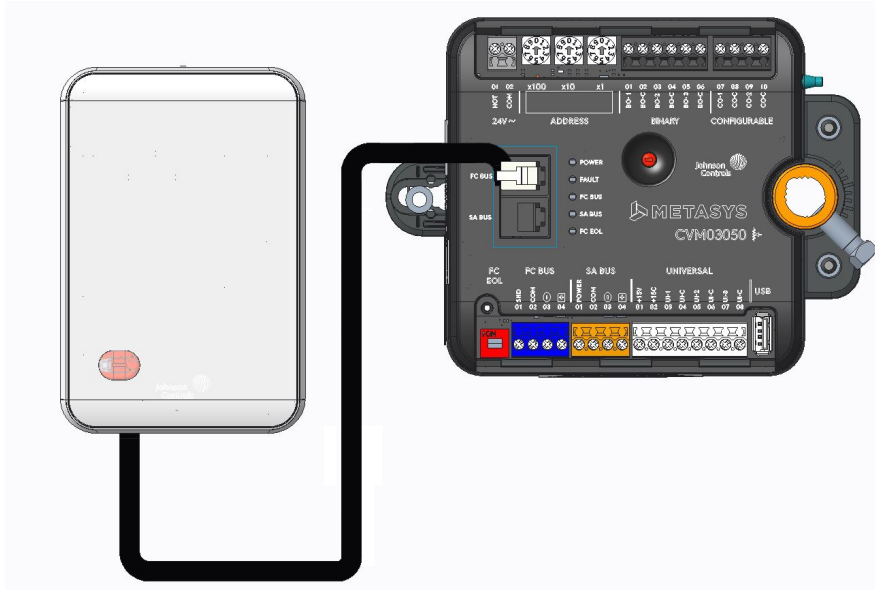
- Route the wires at least 50 mm (2 in.) away from the sides of the ZFR1831 housing.
- Provide slack in the wires. Keep wires routed neatly around the ZFR1831 to promote good ventilation, LED visibility, and ease of service.
- **Important:** Do not connect supply power to the ZFR1831 before finishing wiring and checking all wiring connections. Short circuits or improperly connected wires may result in permanent damage to the ZFR1831.
- **Important:** Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations. The ZFR1831 is a low-voltage (less than 30 VAC) device. Do not exceed the ZFR1831's electrical ratings.
- **Important:** Prevent any static electric discharge to the ZFR1831. Static electric discharge can damage the ZFR1831 and void any warranties.
- **Important: Do not** connect the ZFR1831 to the power supply before setting the PAN OFFSET rotary switches.

## Power input and communication

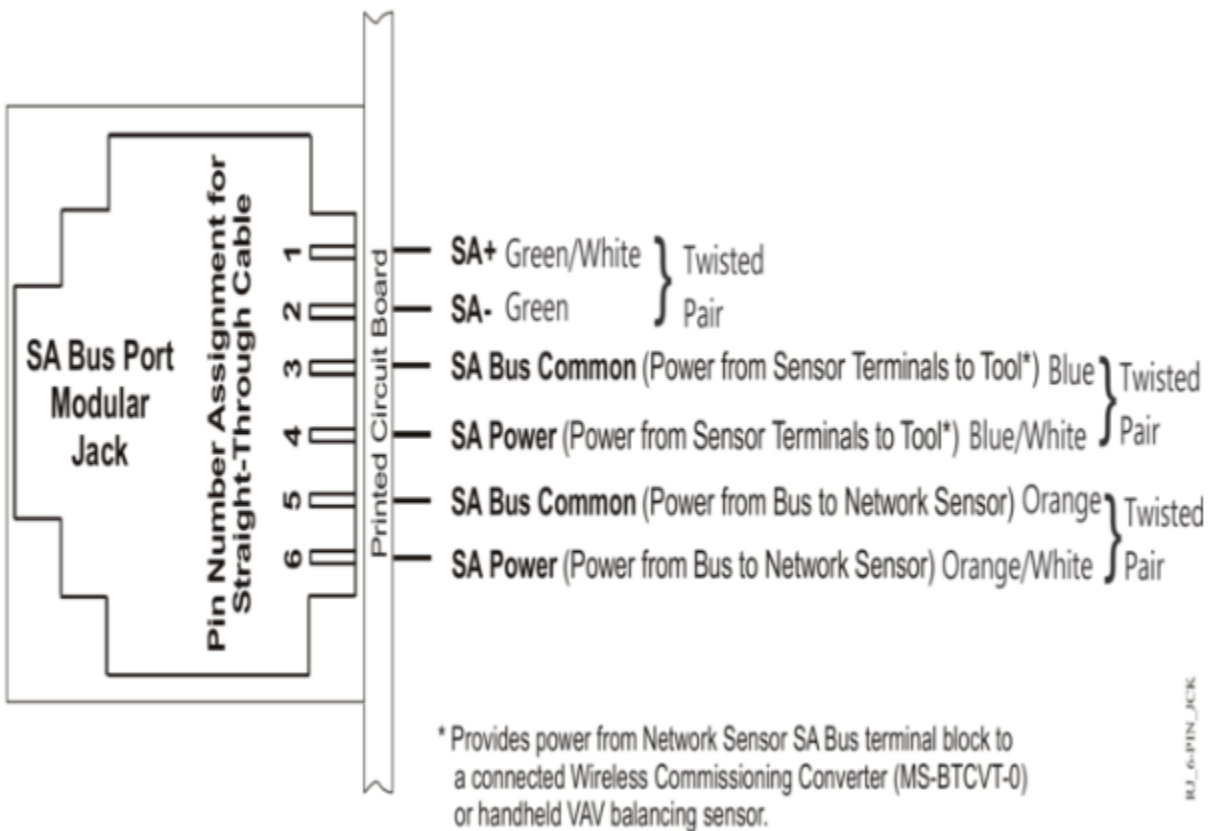
### Using as a Router connected to a Field Controller

1. Follow the mounting instructions above for mounting to either wall, conduit, or ceiling grid.
2. Connect the ZFR1831 to a compatible Field Controller using either the RJ-12 connector (shown) or the 4 pin FC Bus terminal connection. This connection provides both power and communication to the ZFR1831.

**Figure 4: ZFR1831 wired to a Field Controller via RJ12**

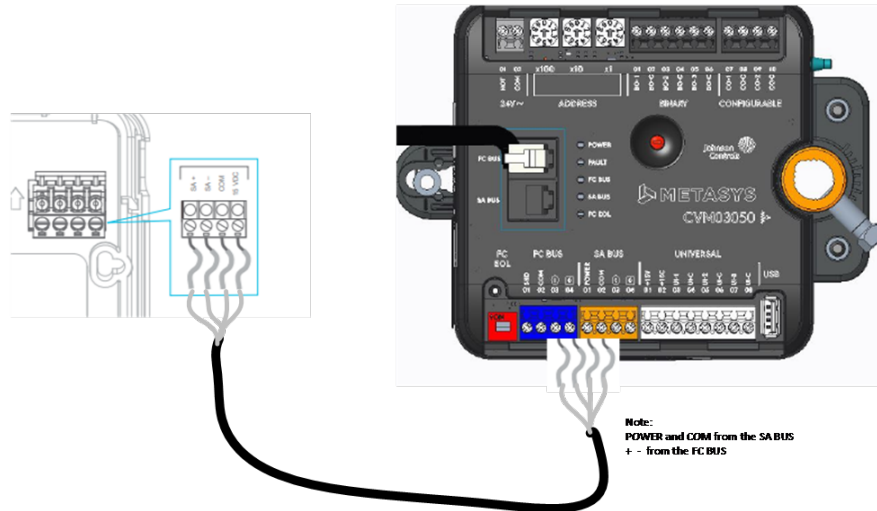


**Figure 5: RJ12 pin out on the controller**



① **Note:** See *MS/TP Communications Bus Technical Bulletin (LIT-12011034)* for more information.

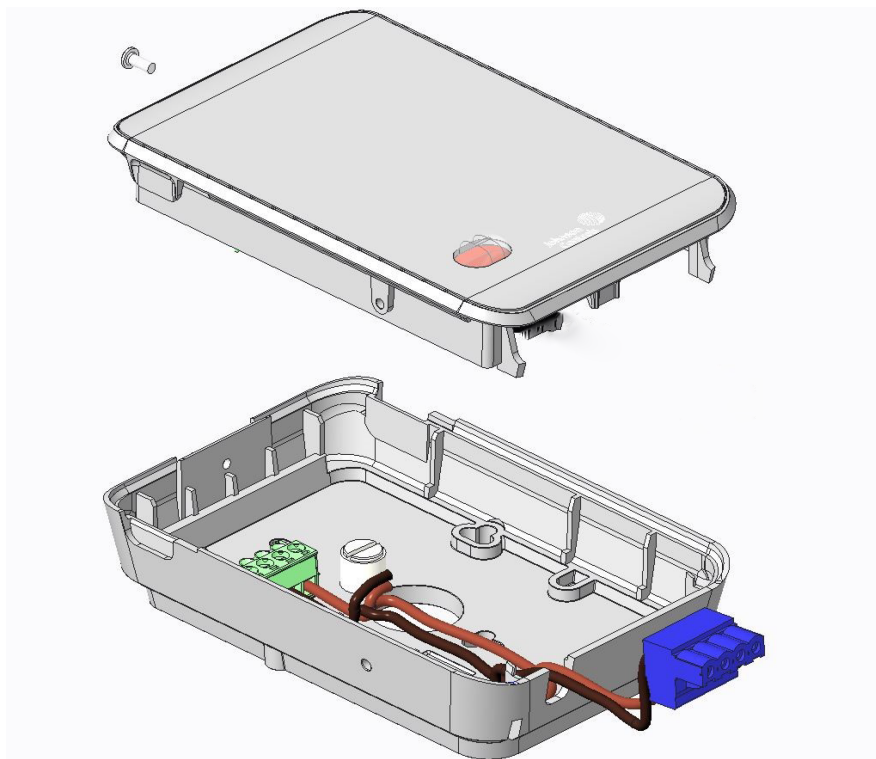
**Figure 6: ZFR1831 wired to a field controller via screw terminal**



### Using as a Repeater (stand-alone mode)

1. Follow the mounting instructions above for mounting to either wall, conduit, or ceiling grid.
2. Connect a 15VDC to 24 VAC source to the wireless router's screw terminal pin connectors.

**Figure 7: ZFR1831 wired as Stand-alone Repeater**



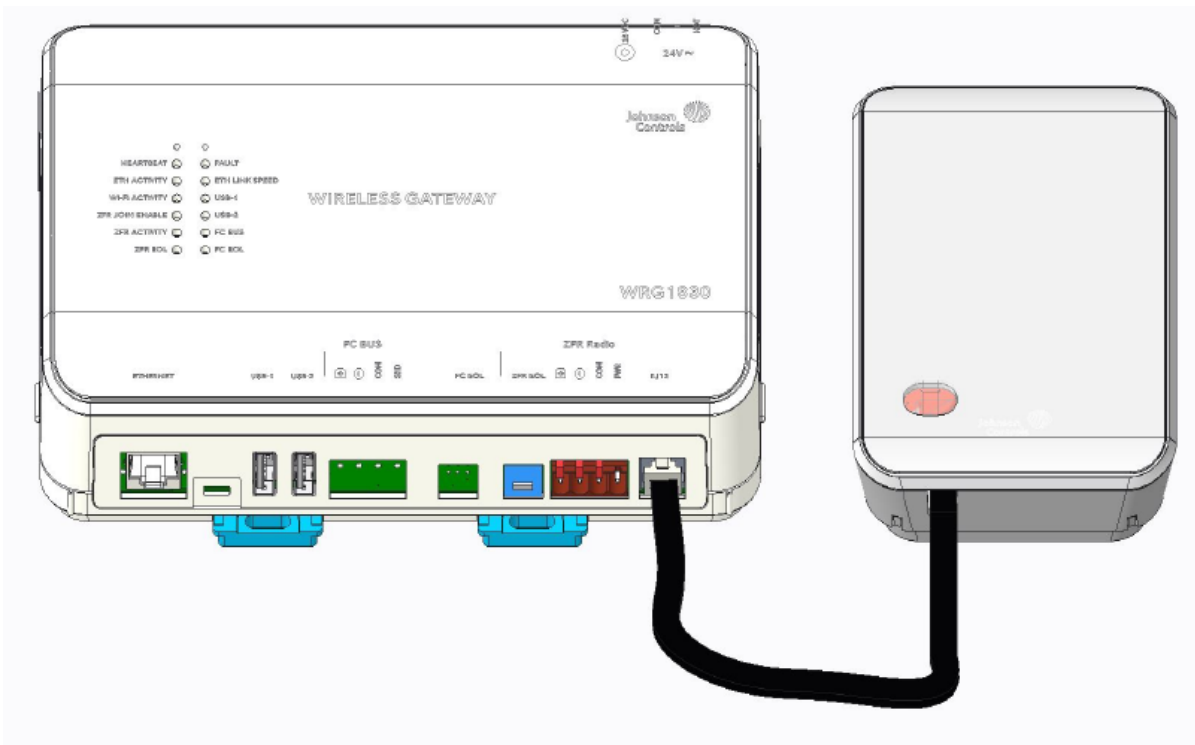
### Using as a coordinator connected to WRG

1. Follow the mounting instructions above for mounting to either wall, wall box, conduit or ceiling grid.



2. Connect the ZFR1831 to the WRG1830 using either the RJ-12 connector (shown) or the 4 pin ZFR Radio terminal connection. This connection provides both power and communication to the ZFR1831.

**Figure 8: ZFR1831 wired to WRG1830 Gateway**



## Setup and adjustments

### Selecting a PAN OFFSET for a Wireless Network

When selecting a PAN OFFSET for a wireless network, keep these points in mind:

- All devices within one wireless mesh network must be set to the same PAN setting.
- Select PAN settings that are unique for the site.
- The AREA rotary switch should be set to 0.

**Figure 9: ZFR1831 Router Rotary Switches**



- **Important:** To avoid interference, assign a unique PAN setting to each wireless network in a building. Using a unique PAN setting is particularly important if you have PANs on adjacent floors of a building. **Do not use the same PAN OFFSET on multiple wireless networks in a building, even if the PANs do not overlap.**

## Router LEDs Functional Definition

**Table 2: Router LEDs Functional Definition**

ZFR1831 State	Color	Description
Off Network	Blue/Green	Powering up
	Blue/Blip	Searching for Network to join
On Network - Normal State	Green	Normal Operation
On Network - Warning State	Purple Steady Dim	Warning (Lost Coordinator)
On Network - Commissioning State	Red Blink	Open for Joining
	Yellow Blink	Standby (PB Enabled)
	Green Blink	Normal
	Purple Blink	Warning (Lost Coordinator)
Miscellaneous	White	Join PB being pressed (user feedback)
	Aqua	Firmware Update in progress

## Technical specifications

**Table 3: ZFR1831 Router (used as Coordinator, Controller, and Repeater)**

<b>Product code number</b>	ZFR1831-0: Wireless Field Bus Router
<b>Power supply input</b>	15VDC with cable connected to field controller, or 24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2.
<b>Addressing</b>	Rotary Switches, Field Adjustable
<b>Wireless band</b>	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
<b>Transmission power</b>	100 mW Maximum (selectable)
<b>Transmission range</b>	75m (250ft) Maximum at 100mW 1200m (4000ft) Maximum Line-of-Sight
<b>Ambient conditions</b>	<b>Operating:</b> -40°C to 75°C (-40°F to 167°F), 5% to 95% RH, Noncondensing <b>Storage:</b> -40°C to 85°C (-50°F to 185°F), 5% to 95% RH, Noncondensing
<b>Materials</b>	White Plastic Housing with Plenum rating per UL2043, UL94-5VA Flammability Rating
<b>Terminations</b>	RJ-12 plug or 4-pin terminal
<b>Dimensions</b>	127 mm x 85.7 mm x 31.75 mm (5 in. x 3-3/8 in. x 3/4 in.)
<b>Mounting hardware</b>	Conduit: 1/2 in. trade size Electrical Mechanical Tubing (EMT) connector Wall or Gang Box: Screw mounted Ceiling Grid: T-Track clip (Grainger Item #45DN38 or equivalent). See <a href="https://www.grainger.com/">https://www.grainger.com/</a> for more information.

**Table 3: ZFR1831 Router (used as Coordinator, Controller, and Repeater)**

<b>Shipping weights</b>	.387 kg (.852 lbs)
<b>Purpose of control</b>	Operating Control
<b>Construction of control and whether the control is electronic</b>	Independently Mounted
<b>TYPE 1 or TYPE 2 action</b>	TYPE 1
<b>External Pollution Situation</b>	Pollution Degree 2
<b>RATED IMPULSE VOLTAGE</b>	330 V
<b>15 VDC External Power Supply (Not required if module is provided/ shipped with power supply)</b>	Intended for connection to Johnson Controls field controllers supporting the standard JCI SA Bus implementation
<b>Compliance</b>	<p><b>United States:</b>                      UL 60730-1, UL Standard for Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements; Energy Management Equipment.                      Plenum rated per UL2043 UL94-5VA Flammability Rating                      FCC Compliant to CFR47, Part 15, Subpart B, Class A                      Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters                      Transmitter Identification ZFR1831: FCC: OEJ-ZFRRADIO</p> <p><b>Canada:</b>                      CAN/CSA-E60730-1:15, Canadian Standard For Automatic electrical controls for Household and Similar use — Part 1: General requirements; Energy Management Equipment.                      Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits                      Industry Canada (IC) RSS-210                      Transmitter Identification ZFR1831: 279A-ZFRRADIO</p>

*The performance specifications are nominal and conform to acceptable industry standard. 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.*

## Single point of contact

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