

ZFR1800 Series Wireless Field Bus System

Product Bulletin

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The ZFR1800 Series Wireless Field Bus System provides a wireless platform for all Metasys® Field Equipment Controller (FEC) family controllers using BACnet® protocol over 2.4 GHz wireless ISM band.

One ZFR1811 router is required per field controller. This pairing of a router and any FEC family device is referred to as a Wireless-Enabled Field Controller (WEFC). An FEC family device is an Advanced Application Field Equipment Controller (FAC), FEC, Input/Output Module (IOM), or VAV Modular Assembly 16 Series (VMA16) field controller.

A ZFR1800 Series system consists of:

- up to eight ZFR1810 Wireless Field Bus Coordinators per field bus
- up to 35 Wireless Enabled Field Controllers (WEFCs) per coordinator
- up to 100 WEFCs per field bus, depending on the network engine (32 with NCE, 50 with NAE35)
- up to nine WRZ Sensors per FEC or VMA16 field controller
- additional ZFR1811 Wireless Field Bus Routers connected to MS-ZFRRPT-0 Repeater accessories, as required, acting as repeaters

Note: Repeaters extend the wireless transmission distance of the BACnet data communications, fill in any gaps within the wireless mesh network, and provide multiple wireless data transmission pathways.



Figure 1: ZFR1811 Routers (top left), ZFR1810 Coordinator (top center), and WRZ Series Sensors (bottom)

Together, these components create a wireless mesh network that allows the exchange of data between the collection of devices within the ZFR1800 Series system's wireless network and wired BACnet Multidrop Serial Bus/Token-Passing (MS/TP) devices.

The wireless mesh network enhances reliability by providing redundant transmission paths for the data through other routers in the mesh network. The result is a resilient, self-healing network.

Table 1: Features and Benefits (Part 1 of 2)

Features	Benefits
Wireless Communications for a Metasys System	Provide a wireless platform for Metasys BACnet devices across multiple levels of a Metasys Building Automation System (BAS), from supervisory engines, to field controllers, to room sensors; enable wireless devices to coexist with hard-wired devices on the same Metasys network; offer simple add-on hardware to seamlessly enable standard hard-wired Metasys BACnet field controllers to function wirelessly.
Wireless Mesh Network	Enables quick, economical, and low-maintenance installation; minimizes MS/TP BACnet hardwiring; and enhances reliability through automatically forming wireless links and redundant wireless data transmission paths.

Table 1: Features and Benefits (Part 2 of 2)

Features	Benefits
Improved Application Mobility and Flexibility	Provides a wireless alternative to hard-wired counterparts; facilitates easy initial location and relocation with minimal disruption to building occupants; and cost-effectively extends Metasys systems to applications where building aesthetics (such as solid walls or ceilings, temporary walls, or decorative surfaces) normally hinder hardwiring.
Support of up to Nine WRZ Series Wireless Room Sensors per Wirelessly Enabled Field Controller	Facilitates averaging and high/low selection to optimize comfort in larger zones. Installs easily; provides room temperature, setpoint temperature, occupancy status, and low battery status information to a Metasys system; offers extensive battery life of up to 5 years.
Multiple Diagnostic Light-Emitting Diodes (LEDs)	Provide quick and easy visual indication of power, FC bus activity, wireless activity, wireless signal strength, and fault conditions; help locate optimum device positions during installation and aid in troubleshooting.
Compact, Easy-to-Install, and Versatile ZFR1811 Routers	Adapt easily to multiple mounting scenarios; serve multiple functions, including providing wireless interface for numerous Metasys FEC, IOM, and VMA16 controllers; and function as repeaters to extend wireless transmission range.

Applications

IMPORTANT: Use the ZFR1800 Series Wireless Field Bus System only to provide an input to equipment under normal operating conditions. Where failure or malfunction of the sensor 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 the ZFR1800 Series System.

The wireless Metasys products within a Metasys system are ideal for any location where it is cost-prohibitive, difficult, or aesthetically unappealing to hardwire between Metasys products. Examples of these locations include the following:

- hospitals, office buildings, university campuses, educational facilities, correctional facilities, and other commercial structures with brick or solid concrete walls and/or ceilings that impede hard-wired applications
- office buildings, retail stores, and other commercial real estate where tenant turnover is frequent and temporary walls and ceilings are common
- museums, historical buildings, atriums, and other sites where building aesthetics and historical preservation are important

- stadiums, arenas, gymnasiums, convention centers, airports, zoos, and other locations with large, open spaces
- buildings with marble, granite, glass, mirrored, wood veneer, or other decorative surfaces that present challenges to hard-wiring
- buildings with asbestos or other hazardous materials that must not be disturbed
- buildings with occupants sensitive to disruptions to business
- regions with high labor costs

The ZFR1800 Series System is approved by national compliance agencies for use only in the United States and Canada. See [*Technical Specifications*](#).

Applications to Avoid

IMPORTANT: A Network Engine reports an offline alarm within a certain period of time when an associated FEC, IOM, or VMA16 field controller goes offline. For a hard-wired FEC, IOM, or VMA16 device, this time period is a nominal 20 seconds. For a wirelessly enabled FEC, IOM, or VMA16 device within the ZFR1800 Wireless Field Bus System, this time period is 5 minutes.

Locations or applications that prohibit cellular telephones or Wi-Fi systems are unsuitable for the wireless Metasys products. Examples include:

- operating rooms or radiation therapy rooms
- validated environments
- UL 864 applications

- Department of Defense applications requiring Diacap certification (for example, military bases and military hospitals)

Do not use the wireless Metasys products in applications that cannot tolerate intermittent interference, or where:

- critical control features would impact life-safety or result in large monetary loss, including secondary (backup) life-safety applications
- data centers, production lines, or critical areas would be shut down
- loss of critical control would result from loss of data from humidity or temperature sensor communications
- operation of exhaust fans or Air Handling Units (AHUs) would impair a purge or pressurization mode
- missing data would invalidate reporting required by the customer
- security points are monitored

System Overview

Figure 2 illustrates a simple ZFR1800 Series Wireless Field Bus System applied to BACnet field controllers on a Metasys network.

These devices provide wireless monitoring and control of HVAC equipment within multiple levels of a Metasys BACnet system.

Refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)* for information on commissioning and configuring a ZFR1800 Series Wireless Field Bus System for operation.

The MS/TP trunk and device limits for supported NAE35/45/55 or NCE25 models are the same for hard-wired devices, wireless devices, or a combination of hard-wired and wireless devices. For more information, refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*. For information on device quantity limits in a ZFR1800 Series system, see Table 2.

Table 2: ZFR1800 Series System Device Quantity Limits

Device	Quantity Limit
ZFR1810 Coordinator	Up to eight per NAE35/45/55 or NCE25 trunk
ZFR1811 Router Paired with an FEC, IOM, or VMA16 Field Controller	Up to 35 WEFCs per ZFR1810 Coordinator
ZFR1811 Router Used as Repeaters¹	Unlimited ²
WRZ Series Sensor	Up to nine sensors per wireless-enabled field controller

1. Requires use of the MS-ZFRRPT-0 optional repeater accessory.
2. Indiscriminate use of ZFR1811 Routers as repeaters can lead to reduced performance.

Component Descriptions

Network Automation Engine (NAE) and Network Control Engine (NCE)

NAE35/45/55s and NCE25s (NxEs) are Web-enabled, Ethernet-based, supervisory controllers that connect BAS networks to Internet Protocol (IP) networks and the Web. NAEs and NCEs provide scheduling, alarm and event management, trending, energy management, data exchange, dial-out capability, and password protection. With a computer running Windows® Internet Explorer® Version 6.0 (or later), you can browse to a configured NxE, and monitor and control BAS field devices in the Metasys Site Management Portal on the NxE.

ZFR1810 Coordinators

A ZFR1810 Wireless Field Bus Coordinator provides a wireless interface between an NxE supervisory controller on a wired BACnet MS/TP network and wireless-enabled Metasys BACnet FEC, IOM, or VMA field controllers.

Each wireless mesh network requires one ZFR1810 Coordinator, which initiates the formation of the network. Each field bus can support up to eight ZFR1810 Coordinators.

A ZFR1810 Coordinator can operate from either of two power sources:

- a 24 VAC, Class 2 power source
- 15 VDC power provided from the FC Bus Jack on any Field Equipment or Supervisory Controller that is connected directly to the FC Bus

The ZFR1810 Coordinator features a remote-mount antenna and cable to allow transmission when the ZFR1810 Coordinator is mounted inside a metal panel.

ZFR1811 Routers

A ZFR1811 Wireless Field Bus Router is used with any model FEC, IOM, or VMA16 field controller to provide a wireless interface between a field controller and:

- the NAE/NCE supervisory controller (by means of a ZFR1810 Coordinator)
- its associated WRZ Series Sensors

The ZFR1811 Router can also be used as a repeater to extend the range of the data communications within the wireless mesh network, or to fill any gaps within the mesh network, based on the physical layout of the wireless devices, obstacles, and other characteristics of the installation site.

A ZFR1811 Router is powered directly from the connected field controller's 15 VDC output. It can also be powered by the ZFR1811 repeater accessory to serve as a stand-alone repeater, extending the range of the BACnet data communications within the wireless mesh network.

Supported Field Controllers

The ZFR1800 Series Wireless Field Bus System enables wireless BACnet connectivity between all FEC, IOM, or VMA16 controllers and Network Automation Engines, including NAE/35/45/55 and NCEs. In addition, the wireless field bus system provides wireless communication between FEC/VMA16 controllers and WRZ Series wireless sensors.

Note: The ZFR1811 Routers should be at the same Metasys system release version as the wirelessly enabled FEC, IOM, or VMA16 field controller. If there is a version mismatch, the Controller Configuration Tool (CCT) provides indication of this, and the ZFR1811 Router is automatically updated during the main code download to the field controller. For information on uploading or downloading the devices to match, refer to the *Loading Devices* chapter of the *CCT Help (LIT-12011147)*.

Note: Some field controller applications do not support the occupancy/temperature setback function.

Note: Wirelessly enabled FEC and VMA16 field controllers can also use hard-wired NS Series network sensors.

WRZ Series Sensors

Depending on the sensor model, the WRZ Series Sensors transmit temperature, setpoint, humidity, occupancy status, and low battery conditions to an associated field controller by means of a ZFR1811 Router. If the field controller is mapped to the NxE, the data sent by the wireless sensor can be displayed.

Some applications that support the temperature or humidity control functions do not support the occupancy/temperature setback function. Refer to a field controller's commissioning and operation literature to determine if the application supports occupancy or temperature setback functions.

Note: Configure the Analog Inputs (AIs) on all WRZ Sensors as SA Bus devices (the same as with hard-wired NS Series Sensors).

Note: The WRZ Series Sensors are designed for indoor, intra-building applications only.

The WRZ Series Sensors require two 1.5 VDC AA alkaline batteries. The WRZ sensors minimize power consumption by transmitting data only once per minute, which yields an expected battery life of approximately 4 to 5 years.

ZFR Checkout Tool (ZCT)

The ZFR Checkout Tool is an optional tool, included with the installation of the Controller Configuration Tool (CCT), that allows you to validate the wireless connectivity and health of wireless devices within a ZFR1800 Series Wireless Field Bus system, helping ensure a reliable mesh network is in place. You can use the information provided by the ZCT to analyze and troubleshoot the wireless mesh network created by a ZFR1800 Series System.

The ZCT gathers information by discovering the wireless field controllers and wireless sensors on your network and analyzing their status and wireless communication paths. The ZCT provides a simple report of wireless network performance, including online status verification and wireless signal strength information. The ZCT also provides wireless device lists, signal strength information, and diagnostic measurements of the wireless mesh network.

Refer to the *Using the ZFR Checkout Tool (ZCT)* chapter of the *CCT Help (LIT-12011147)* for more information on the ZCT.

The ZCT requires a Universal Serial Bus (USB) adaptor with ZFR driver.

Note: You must connect the adaptor to the computer running CCT/ZCT before attempting to scan the network.

ZFR Repeater Kit

The MS-ZFRRPT-0 is an optional repeater accessory for the ZFR1811 Router which allows remote mounting of the ZFR1811 Router without an FEC family controller. The ZFRRPT Repeater contains a 4 x 4 inch (10.16 x 10.16 cm) electrical box with a 24 VAC to 15 VDC converter for powering the ZFR1811 Router.

The ZFRRPT also contains a conduit sleeve for attaching a ZFR1811 to the 4 x 4 inch electrical box.

USB Adaptor with ZFR Driver

The ZFR connection type within CCT requires the USB adaptor with ZFR driver for your laptop computer. The USB adaptor provides a wireless connection to allow wireless commissioning of the wireless-enabled field controllers and allows the use of the ZCT.

See Table 6 to order the ZFR USB adaptor (product code ZFR-USBHA-0). This device is an IEEE 802.154 ZFR to USB Adaptor for the 2.4 GHz ISM Band.

Note: The software driver for the ZFR USB adaptor installs automatically with the CCT.

WRZ-SST-120 Wireless Sensing System Tool

Use the optional, battery-operated WRZ-SST-120 Wireless Sensing System Tool with any model WRZ Series Sensor as a site survey tool to determine the wireless signal strength between potential locations of ZFR1800 system devices to survey your application and adjust ZFR1800 device locations before installing the devices. Refer to the *WRZ-SST-120 Wireless Sensing System Tool Installation Instructions (Part No. 24-10563-12)* for more information on the tool.

ZFR Wireless USB Dongle

The ZFR Wireless USB Dongle allows a laptop computer to connect to a ZFR Field Router wireless field bus for the purpose of commissioning and downloading applications to wirelessly enabled field controllers using the CCT or for analyzing a ZFR wireless mesh using the ZFR Checkout Tool (ZCT). The ZFR Wireless USB Dongle requires a USB software driver which is installed automatically with CCT Version 5.3 or later. No user configuration is required.

For more information, refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*.

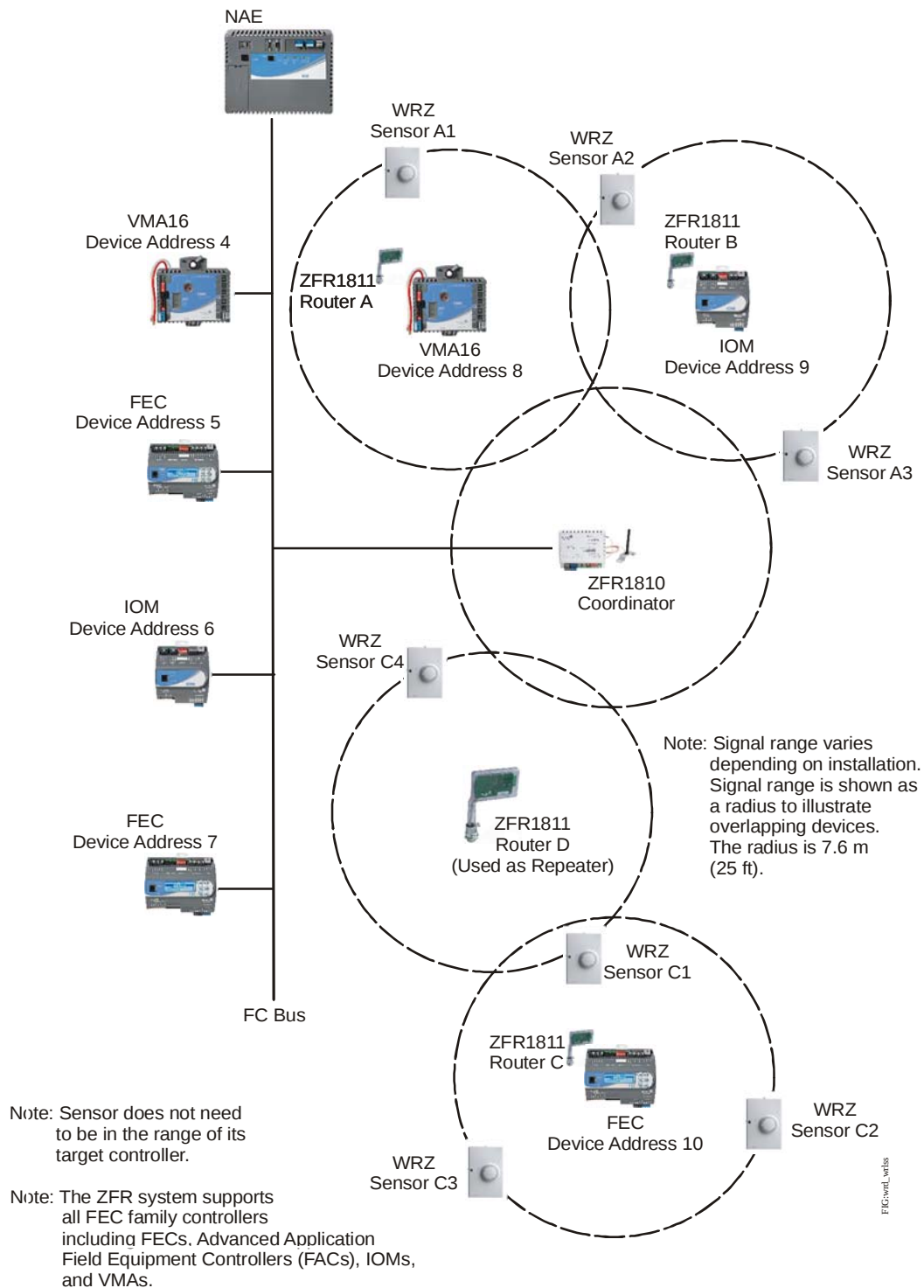


Figure 2: ZFR1800 Series Wireless Field Bus System as Part of a Metasys Network

ZFR1800 Series System Wireless Communication

The ZFR1800 Series System devices create a wireless mesh network using ZFR technology. The mesh network provides redundant wireless paths, enabling the BACnet data to traverse the network through alternate, automatically forming paths and arrive at the target destination device even if a ZFR1811 Router or Repeater within the wireless mesh network experiences interference or drops out of the network.

The ZFR1800 Series System uses Direct Sequence Spread Spectrum (DSSS) Radio Frequency (RF) technology and operates on the globally accepted 2.4 GHz Industrial, Scientific, and Medical (ISM) band. All ZFR1800 Series System components use a transmission power of 10 mW. The WRZ Series sensors meet the Institute of Electrical and Electronics Engineers, Inc. (IEEE) 802.15.4 standard for low power, low duty-cycle wireless transmitting systems and are compatible with wireless mesh networks compliant with the ZigBee standard.

For more information on wireless transmissions, signal strength, and locating devices for optimum signal strength, refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*.

Wireless Signal Transmission Range

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.

Transmission ranges between ZFR1800 Series products can be less than the maximum distances shown in Table 3.

Table 3: Indoor Line-of-Sight Transmission Ranges

Range Type	Transmission Distance	
	ZFR1810 Coordinator, ZFR1811 Router	WRZ Series Sensor
Recommended	15.2 m (50 ft)	15.2 m (50 ft)
Maximum	76.2 m (250 ft)	30 m (100 ft)

Wireless Interference and Security

The ZFR1800 Series Wireless Field Bus System is designed to minimize the potential for wireless interference with other wireless applications. In most commercial environments, the ZFR1800 Series System does not encounter or generate wireless interference, even in environments with cell phones and competing Wi-Fi applications.

ZFR1800 Series Wireless transmissions use different modulation schemes than Wi-Fi applications and use frequencies between popular Wi-Fi bands, enabling Wi-Fi and ZFR1800 Series Wireless networks to exist in the same areas.

For more information on wireless interference and security, refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*.

Physical Features and Dimensions

Figure 3 shows the ZFR1810 Coordinator with the remote-mounted antenna.

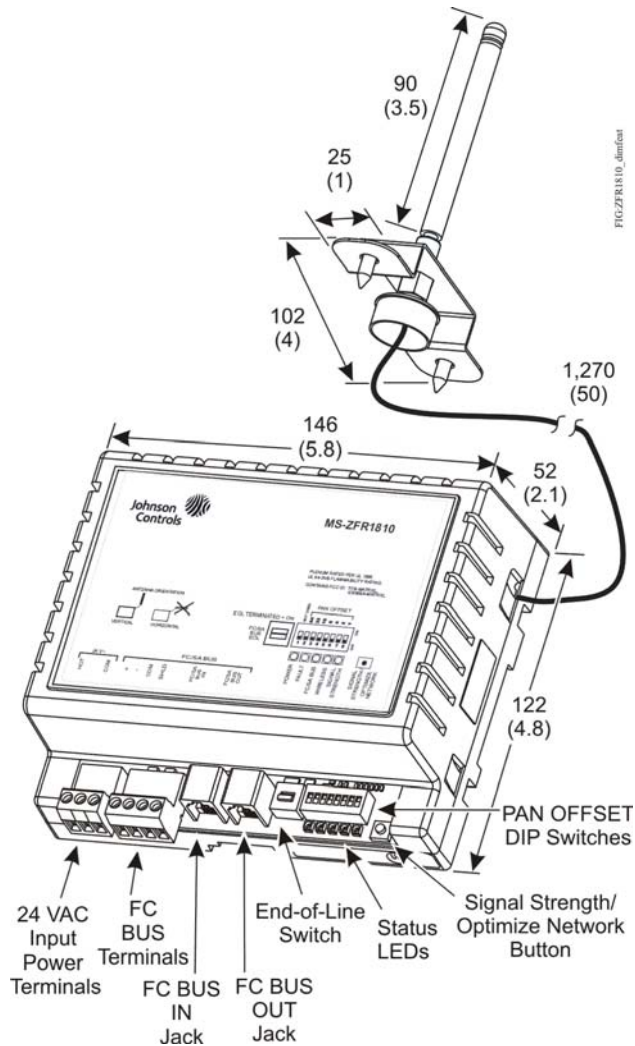


Figure 3: ZFR1810 Wireless Field Bus Coordinator, Physical Features and Dimensions, mm (in.)

Figure 4 shows the ZFR1811 Router.

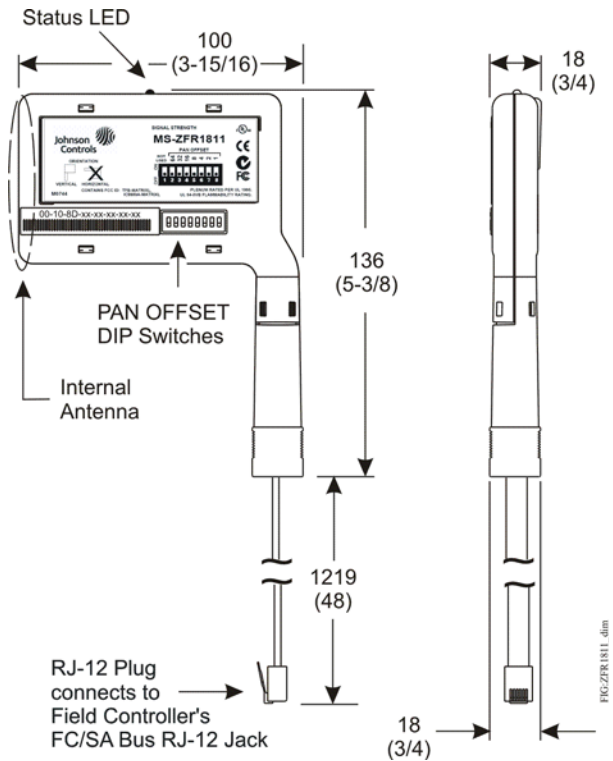


Figure 4: ZFR1811 Wireless Field Bus Router, Physical Features and Dimensions, mm (in.)

Figure 5 shows the WRZ Series Sensor.

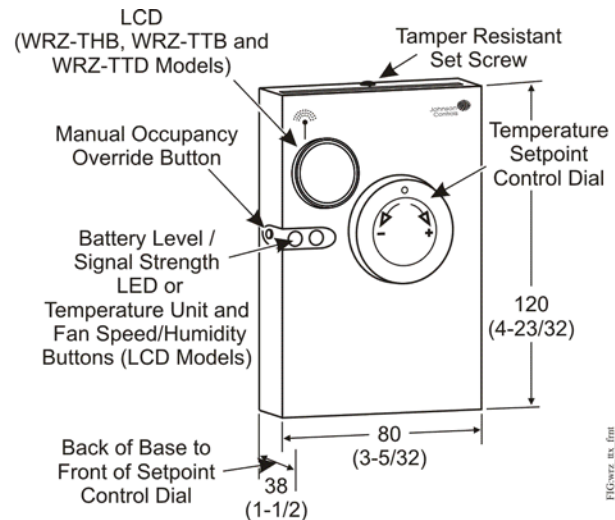


Figure 5: WRZ Series Sensor, Physical Features and Dimensions, mm (in.)

Ordering Information

For ZFR1800 Series System product ordering information, see Table 4 and Table 5. For ZFR1800 Series System accessories product ordering information, see Table 6. For supported models of the Metasys BACnet field controllers, see Table 7.

Contact the nearest Johnson Controls® representative to order the products in Table 4 through Table 7. Specify the desired product code number from these tables.

Refer to the *Network Automation Engine (NAE) Product Bulletin (LIT-1201160)* and the *Metasys System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)* for additional information on related products.

Repair Information

If a ZFR1800 Series Wireless Field Bus System component fails to operate within its specifications, replace the unit. For a replacement ZFR1800 Series System component, contact the nearest Johnson Controls representative.

Table 4: ZFR1800 Series Wireless Field Bus System Components

Product Code Number	Product Description
MS-ZFR1810-x	Wireless Field Bus Coordinator, 10 mW Transmission Power; functions with NAE35, NAE45, NAE55, and NCE25 Models
MS-ZFR1811-x	Wireless Field Bus Router, 10 mW Transmission Power; functions with Metasys BACnet FECs, IOMs, VMA16s, and WRZ Series Sensors
WRZ-MHN0100-0	Wireless Remote Transmitter with Temperature, Relative Humidity (RH) and Occupancy Motion Detector (PIR) only, No Display
WRZ-MNN0100-0	Wireless Remote Transmitter with Occupancy Detection (PIR), No Display
WRZ-MTB0100-0	Wireless Remote Transmitter with Display, Temperature, Relative Humidity (RH), and Occupancy Detection only, Warmer/Cooler (+/-) Setpoint Adjustment (setpoint configured in the Metasys system)
WRZ-MTN0100-0	Wireless Remote Transmitter with Temperature and Occupancy Detection only, No Display
WRZ-RMT10K-0	Wireless Remote Temperature Transmitter designed to operate with a TE-6300 Series 10k ohm Johnson Controls® Type II Thermistor Sensor (order separately) to sense temperature in warmer applications up to 158°F (70°C). Includes one Transmitter, one Mounting Base, strips of Double-Sided Adhesive Foam Tape (all factory assembled), and one Strain Relief
WRZ-STR0000-0	Wireless Transmitter and Temperature Sensor with Display and F/C Button. Includes Temperature Probe encased in a Clear Acrylic Cylinder, 9 ft (2.7 m) Wire Lead, one Probe Mounting Strap, and a strip of Double-Sided Adhesive Foam Tape, 10 mW Transmission Power
WRZ-STRNIST-0	NIST Rated Wireless Transmitter and Temperature Sensor with Display and F/C Button. Includes Temperature Probe encased in a Clear Acrylic Cylinder, 9 ft (2.7 m) Wire Lead, one Probe Mounting Strap, and a strip of Double-Sided Adhesive Foam Tape, 10 mW Transmission Power
WRZ-THB0000-0	Wireless Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, Relative Humidity (RH) Button and Occupancy Button, 10 mW Transmission Power
WRZ-THN0000-0	Wireless Temperature/Humidity Sensor, Occupancy Button, No Temperature adjustment and No LCD temperature/humidity display, 10 mW Transmission Power
WRZ-THP0000-0	Wireless Temperature/Humidity Sensor, Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button, No LCD temperature/humidity display, 10 mW Transmission Power
WRZ-TTB0000-0	Wireless Temperature Sensor with Display and F/C Button, 10 mW Transmission Power
WRZ-TTD0000-0	Wireless Temperature Sensor with Display, F/C Button and Fan Speed Control, 10 mW Transmission Power
WRZ-TTP0000-0	Wireless Room Temperature Sensor, Warmer/Cooler (+/-) Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTR0000-0	Wireless Room Temperature Sensor, No Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTS0000-0	Wireless Room Temperature Sensor, Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, 10 mW Transmission Power

Table 5: WRZ Sensor Model Comparison

Sensor Model	Temperature	3% Humidity	Display	F/C Button	Fan Control	Occupancy Motion Detection (PIR)	Occupancy Override	Setpoint Adjustment Dial ¹
WRZ-MHN0100-0	X	X				X		
WRZ-MNN0100-0						X		
WRZ-MTB0100-0	X					X		
WRZ-MTN0100-0	X		X			X		ABSOL
WRZ-RMT10K-0	X							
WRZ-STR0000-0	X		X	X				
WRZ-STRNIST-0	X		X	X				
WRZ-THB0000-0	X	X	X	X			X	Both
WRZ-THN0000-0	X	X					X	
WRZ-THP0000-0	X	X					X	W/C
WRZ-TTB0000-0	X		X	X			X	Both
WRZ-TTD0000-0	X		X	X	X		X	Both
WRZ-TTP0000-0	X						X	W/C
WRZ-TTR0000-0	X						X	
WRZ-TTS0000-0	X						X	ABSOL

1. Either Absolute Scale (ABSOL), Warmer/Cooler (W/C), or Both (BOTH).

Table 6: Accessories

Product Code Number	Product Description
MS-ZFRRPT-0	Optional Repeater Accessory for use with ZFR1811 Router as a repeater. Includes 20 to 28 VAC or 16 to 30 VDC input power, 12 VDC output power supply (regulated at 500 mA maximum, 6 VA), and 4 x 4 in. (10.16 x 10.16 cm) electrical box with cover. Kit does not include a ZFR1811 Router.
MS-ZFRCBL-0	Wire Harness with Connectors for use with MS-ZFR1811-x Router for Wireless Field Bus. Allows ZFR1811 Router to function with FEC1620 controller; and with FEC1610, VMA1610, or VMA1620 controllers in conjunction with NS Series Sensors, MS-BTCVT-1 Wireless Commissioning Converter, or DIS1710 Local Controller Display.
ZFR-USBHA-0	Universal Serial Bus (USB) Dongle with ZFR Driver provides a wireless connection through the CCT to allow wireless commissioning of the wirelessly enabled FEC, IOM, and VMA16 Series Field Controllers. Also used for the ZFR Checkout Tool (ZCT) in CCT.
ZFR-1810ANT-700	Replacement antenna kit for ZFR1810 Wireless Field Bus Coordinator. Includes antenna, coaxial cable, and mounting hardware
WRZ-SST-120	Optional Wireless Sensing System Tool to be used with a WRZ Series Sensor to indicate wireless signal strength between potential locations of ZFR1800 System devices.
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology
MS-DIS1710-0	Local Controller Display for FEC1610 and FEC2610 models
TP-2420	Transformer, Wall Plug Mount, 120 VAC to 24 VAC, 20 VA, Class 2
Y65T31-0 ¹	Transformer, 120/208/240 VAC to 24 VAC, 40 VA, Class 2, Foot Mount, 20 cm (8 in.) Primary Leads and Secondary Screw Terminals
T-4000-119	1.6 mm (1/16 in.) Allen-Head Adjustment Tool (30 per Bag) for Accessing and Securing WRZ Series Sensors
MAGNET-BASE-PLW	Magnetic Backplate for Mounting a Transmitter on Metal Surfaces; 5 Magnetic Backplates per Package
1.5 VDC, AA Alkaline Battery	Replacement Battery for WRZ Series Sensors (Purchase Locally)

1. Additional Y60 Series Transformers are available from Johnson Controls.

Table 7: Related Field Controllers

Product Code Number	Product Description¹
MS-FAC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Real-Time Clock
MS-FAC2612-1	18-Point Advanced Application Field Equipment Controller with 5 UI, 4 BI, 4 CO, and 5 RO
MS-FAC2612-2	18-Point Advanced Application Field Equipment Controller with 5 UI, 4 BI, 4 CO, and 5 RO. Line voltage input power 90 VAC to 230 VAC.
MS-FAC3611-0	26-Point Advanced Application Field Equipment Controller with 8 UI, 6 BI, 6 BO, and 6 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock; Improved Fast Persistence
MS-FEC1611-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, 4 CO, 24 VAC, and SA Bus
MS-FEC1621-0	Field Equipment Controller Cover with 2 UI, 1 BI, 3 BO, 4 CO, 24 VAC, and SA Bus with LCD Screen, with Mounting Base
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with LCD Screen
MS-IOM1711-0	4-Point IOM with 4 BI, FC Bus, and SA Bus Support
MS-IOM2711-0	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support
MS-IOM2721-0	10-Point Analog IOM with 8 UI, 2 AO, FC Bus, and SA Bus Support
MS-IOM3711-0	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support
MS-IOM3721-0	16-Point Binary IOM with 16 BI, FC Bus, and SA Bus Support
MS-IOM3731-0	16-Point Binary IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support
MS-IOM4711-0	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base
MS-VMA1610-0	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling Only), FC Bus, and SA Bus
MS-VMA1620-0	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), FC Bus, and SA Bus

1. Universal Input (UI), Binary Input (BI), Binary Output (BO), Analog Output (AO), Configurable Output (CO), Sensor Actuator (SA), and Relay Output (RO).

Technical Specifications

ZFR1810 Wireless Field Bus Coordinator (Part 1 of 2)

Product Code Number	MS-ZFR1810-x
ZFR1810-x Power Supply Input	One of the following: 24 VAC +10%/-15%, 50/60 Hz, Class 2. Transformer allowance should be 2.5 VA maximum, 2 VA typical. Provided through the three-position 24 V~ screw terminal pluggable block. 15 VDC, 180 mA (7 to 18 VDC, 185 mA maximum current draw) on the FC Bus provided through the FC BUS IN RJ-12 jack from the FC Bus jack on a field controller or NxE Supervisory Engine.
Power Supply Output	15 VDC; Provided through the FC/SA BUS OUT RJ-12 jack for external devices. Note: You can only use the power supply output when the ZFR1810 device is powered from the 24 VAC power supply input.
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Line-of-Sight 15 m (50 ft) Recommended
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing Storage: -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing
Materials	White Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	Two spade terminals with three-position screw terminal pluggable block for 24 VAC power supply input. Four spade terminals with four-position screw terminal pluggable block for RS-485 communications. RJ-12 IN jack for 15 VDC power supply and communications connection from an NxE or FEC FC Bus jack. RJ-12 OUT jack supplies 15 VDC and communications to BTCVT Wireless Commissioning Converter.
Dimensions	146 x 122 x 52 mm (5.8 x 4.8 x 2.1 in.)

ZFR1810 Wireless Field Bus Coordinator (Part 2 of 2)

Mounting Hardware	Four No. 6 Trade Size Sheet Metal Screws
Shipping Weights	0.45 kg (1.0 lb)
Compliance	United States: Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB 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 ZFR1810-0: FCC: TFB-MATRIXL Transmitter Identification ZFR1810-1: FCC: OEJ-WRZRADIO Canada: CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada (IC) RSS-210 Transmitter Identification ZFR1810-0: 5969A-MATRIXLP Transmitter Identification ZFR1810-1: 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 and the EMC Directive 2004/108/EC. Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant

ZFR1811 Wireless Field Bus Router (Part 1 of 2)

Product Code Number	MS-ZFR1811-x
Supply Voltage	8 to 18 VDC, 15 VDC nominal, provided from the FC/SA BUS RJ-12 jack on the FEC, IOM, or VMA1600
Current Consumption	90 mA maximum
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Line-of-Sight 15 m (50 ft) Recommended
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing Storage: -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing
Materials	Translucent Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	RJ-12 plug for connection to FEC or VMA1600 FC/SA Bus jack
Dimensions	136 x 100 x 18 mm (5-3/8 x 3-15/16 x 3/4 in.)
Mounting Hardware	1/2 in. trade size Electrical Mechanical Tubing (EMT) connector
Shipping Weights	0.095 kg (0.21 lb)

ZFR1811 Wireless Field Bus Router (Part 2 of 2)

Compliance 	United States: Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB 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 ZFR1811-0: FCC: TFB-MATRIXL; Transmitter Identification ZFR1811-1: FCC: OEJ-WRZRADIO; Canada: CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada (IC) RSS-210 Transmitter Identification ZFR1810-0: 5969A-MATRIXLP Transmitter Identification ZFR1810-1: 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 and the EMC Directive 2004/108/EC. Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
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WRZ Series Sensors (Part 1 of 2)

Product Codes	WRZ-MHN0100-0: Temperature/Humidity Sensor with Occupancy Motion Detection (PIR) WRZ-MNN0100-0: Occupancy Sensor with Occupancy Motion Detection (PIR) WRZ-MTB0100-0: Temperature/Humidity Sensor with Display and Occupancy Motion Detection (PIR) with Warmer/Cooler (+/-) Setpoint Adjustment (setpoint configured in the Metasys system) WRZ-MTN0100-0: Temperature Sensor with Occupancy Motion Detection (PIR) with No Display WRZ-RMT10K-0: Temperature Transmitter designed to operate with a TE-6300 Series 10k ohm Johnson Controls® Type II Thermistor Sensor (order separately) to sense temperature in warmer applications up to 158°F (70°C) WRZ-STR0000-0: Transmitter and Temperature Sensor with Display and F/C Button WRZ-STRNIST-0: NIST Rated Transmitter and Temperature Sensor with Display and F/C Button WRZ-THB0000-0: Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, RH Button and Occupancy Button WRZ-THN0000-0: Temperature/Humidity Sensor with Occupancy Button WRZ-THP0000-0: Temperature/Humidity Sensor with Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button WRZ-TTB0000-0: Temperature Sensor with Display and F/C Button WRZ-TTD0000-0: Temperature Sensor with Display, F/C Button and Fan Speed Control WRZ-TTP0000-0: Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment WRZ-TTR0000-0: Temperature Sensor with No Setpoint Adjustment WRZ-TTS0000-0: Temperature Sensor with Setpoint Adjustment Scale: 13 to 29°C (55 to 85°F)
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. MS/TP Address, PAN Number, and Zone Address
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing Storage: -40 to 71°C (-40 to 160°F), 5 to 95% RH, Noncondensing

WRZ Series Sensors (Part 2 of 2)

Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Band
Transmission Power	10 mW Maximum
Transmission Range	30 m (100 ft) Maximum Line-of-Sight; 15 m (50 ft) Recommended
Transmissions	Every 60 Seconds (± 20 Seconds)
Temperature System Accuracy	0.6°C/1.0°F Over the Range of 13 to 29°C (55 to 85°F); 0.9°C/1.5°F Over a Range of 0 to 13°C (32 to 55°F) and 29 to 43°C (85 to 110°F)
Temperature Sensor Type	Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Humidity Calibrated Range	10% to 90% RH at 23°C (73°F)
Humidity Accuracy	$\pm 3\%$ RH across the Range of 20% to 80% RH, $\pm 6\%$ RH across the Range of 10% to 20% RH and 80% to 90% RH; within the Temperature Range of 13 to 29°C (55 to 85°F)
Materials	NEMA 1 White Plastic Housing
Mounting	Screw Mount or Double-Sided Adhesive Foam Tape Mount; Double-Sided Adhesive Foam Tape Included
Dimensions	120 x 80 x 38 mm (4.7 x 3.1 x 1.5 in.)
Shipping Weight	0.14 kg (0.3 lb)
Compliance	United States: Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL Canada: Industry Canada IC: 5969A-MATRIXL 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 and the EMC Directive 2004/108/EC. Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant

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.

USB ZFR Dongle

Product Code Number	ZFR-USBHA-0
Electrical Specifications	Operating Voltage: USB std 5 VDC Standby Current: 50 mA Tx Current: 190 mA Rx Current: 50 mA
RF Specifications	RF Frequency: 2.4 - 2.4835 GH Channels: 16 Modulation: DSSS (O-QPSK) Data Rate: 250 Kbps Tx Power: 8 dBm Rx Sensitivity: - 85 dBm Antenna Type: Built-in Antenna Coverage Range: 100 meter (328 feet) line of sight. This distance is limited by the maximum line of sight transmission distance of the ZFR system. Actual line of sight distances may be lower.
Physical Specifications	Dimensions: 63.5 mm x 27.5mm x 10.5 mm Operating Temperature: Range -10°C (14°F) to 50°C (122°F)

United States Emissions Compliance

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.

RF Exposure (OET Bulletin 65) *To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.*

Canadian Emissions Compliance

Industry Canada Statement

The term IC before the certification/registration number only signifies that the Industry Canada technical specifications were met.

Le terme « IC » précédant le numéro d'accréditation/inscription signifie simplement que le produit est conforme aux spécifications techniques d'Industry Canada.

Section 5.5 of RSS-210 *This device has been designed to operate with an antenna having a maximum gain of 2 dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.*

Cet appareil a été conçu pour fonctionner avec une antenne d'un gain maximum de 2 dBi. En application des réglementations d'Industry Canada, l'utilisation d'une antenne de gain supérieur est strictement interdite. L'impédance d'antenne requise est de 50 ohms.

Section 5.11 of RSS-210 *To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.*

Pour réduire les interférences radio potentielles avec les dispositifs d'autres utilisateurs, le type d'antenne et son gain doivent être choisis de façon à ce que la puissance isotrope rayonnée équivalente (PIRE) ne soit pas supérieure à la puissance nécessaire pour une bonne communication.



Building Efficiency

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