



User's Manual

ZRB4

Model Number: 1000186

Document Number: 80329

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Version	Date	Changed By	Revision Description
1	04-13-2022	MEP	Preliminary
2	04-26-2022	MEP	Revised model number list
3	05-04-2022	MEP	Revised model number list
4	06-10-2022	MEP	Removed product photos
5	06-20-2022	MEP	Added Appendix B

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1. Description

The ZRB4 provides a cost-effective means to create a wireless mesh network to control lighting and HVAC systems for Smart Buildings and IoT devices. The wireless side of the ZRB4 employs an RF transceiver which operates in the 2.4GHz ISM band based on the IEEE 802.15.4 wireless network protocol. The wired side of the ZRB4 communicates in RS485 full or half duplex differential modes and can also be configured for RS232 wired communication.

Features:

- FCC/IC Certified (pending)
 - FCC ID: V8NZRB1000186
 - IC: 7737A-ZRB1000186
- Wireless Signal Range: ~1500 feet (LOS)
- **Made in USA**

2. Ordering Information

Part Number	Description
1000186-01	ZRB4, Wireless Router/Extender
1000186-02	ZRB4, Wireless Router/Extender, Conformal Coated
1000186-03	ZRB4, T-32-P Thermostat
1000186-04	ZRB4, SMT-131 Thermostat
1000186-05	ZRB4, Wave Thermostat, DC Powered
1000186-06	ZRB4, Pulse Meter Module
1000186-07	ZRB4, Pulse Meter Module, Conformal Coated
1000186-08	ZRB4, E50C2 Meter Module
1000186-09	ZRB4, BACnet Gateway Module
1000186-10	ZRB4, Dry Contact Module
1000186-11	ZRB4, Dry Contact Module, Conformal Coated
1000186-12	ZRB4, RS232 Module
1000186-13	ZRB4, RS232, Module Conformal Coated
1000186-14	ZRB4, Core-1
1000186-15	ZRB4, Core External Antenna
1000186-16	ZRB4, Core External Antenna, Conformal Coated
1000186-17	ZRB4, 1-6 Button Momentary Switch Panel Module

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3. Specifications

3.1 Absolute Maximum Ratings

Note: Exceeding the maximum ratings may cause permanent damage to the unit

Parameter	Test Condition	Min.	Max.	Unit
Input Voltage (Vdd)		-50	50	V
Voltage on Signal Pin (Rx+, Rx-, Tx+, Tx-)		-9	14	V
Storage Temperature		-25	70	°C

3.2 Recommended Operating Conditions

Note: Operating conditions outside those listed here may cause inappropriate and unpredictable behavior.

Parameter	Test Condition	Min.	Max.	Unit
Input Voltage (Vdd)	25°C	12	30	VDC
Input Voltage (Vdd)	25°C	9	24	VAC
Operating Temperature		0	60	°C

3.3 DC Electrical Specifications

Test conditions unless otherwise specified: 25°C, Vdd = 24VDC, No load on RS485 Bus, LEDs off.

Parameter	Test Condition	Typ.	Max.	Unit
Input Current (Idd)	25°C	15	50	mA

3.4 RF Electrical Characteristics

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Frequency Range	25°C	2405		2480	MHz
Maximum Input Signal Strength		0			dBm
Relative Frequency Error		-120		120	ppm
RF Tx Power (Ch11-Ch25)		up to +20			dBm
RF Tx Power (Ch26)		disabled			dBm

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4. Physical Interface

All signals are from the perspective of the ZRB4.

Wire Number	Color	Signal Name	Description
1	N/A	-	
2	Red	PWR	Power (24V AC/DC)
3	Blue	Rx+	Positive half of the Receiver differential pair
4	White	Rx-	Negative half of the Receiver differential pair
5	Yellow	Tx-	Negative half of the Transmitter differential pair
6	Green	Tx+	Positive half of the Transmitter differential pair
7	Black	GND	GND/Common
8	N/A	-	

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5. Certifications

5.1 FCC – United States

FCC ID: V8NZRB1000186

This device complies with Part 15 of the Federal Communications Commission rules and regulations. Any modifications to this device may violate the FCC rules and regulations and make operation of this device unlawful.

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

NOTE 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

NOTE 2: This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and/or operated with a minimum distance of 20 centimeters between the radiator and your body.

NOTE 3: 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.

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5.2 IC – Canada

IC ID: 7737A-ZRB1000186

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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.

This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and/or operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet équipement est conforme aux limites d'exposition au rayonnement RF de la FCC établies pour un environnement non contrôlé. Cet équipement doit être installé et / ou utilisé à une distance minimale de 20 centimètres entre le radiateur et votre corps.

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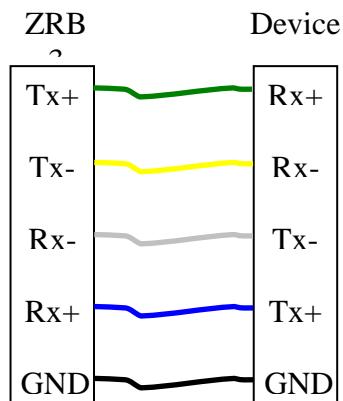
6. Typical Applications

The ZRB4 was designed to be powered from the same voltage that a thermostat or doorbell system operates from, 24VAC or 24VDC. Refer to the Specifications section for more detailed power requirements.

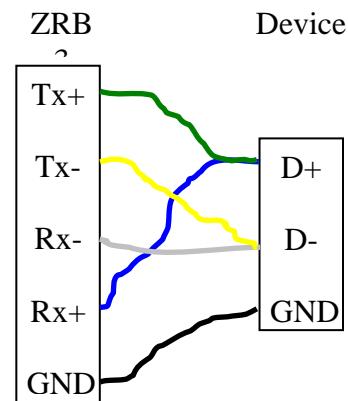
The serial communications port on the ZRB4 is capable of full-duplex and half-duplex operations, depending on firmware loaded into the ZRB4. The ZRB4 can interface with a host of RS485 based protocols such as BACnet, Modbus and other proprietary protocols based on the firmware image programmed into the device. Commands and data can originate from either the wired or wireless sides of the ZRB4. When operating as a full-duplex device the Rx and Tx pairs are connected to the corresponding pair on the communicating device. When operating in half-duplex mode the positive pair and negative pair are attached together to the corresponding connection on the communicating device.

The ZRB4 uses the IEEE 802.15.4 protocol (2.4GHz ISM band) to communicate wirelessly. There are two LEDs on the bottom of the ZRB4 which indicate network status and unit status. The pushbutton is used to leave and join wireless networks. When joined to a wireless network with an Energy Manager the ZRB4 becomes one part of a multifaceted system designed to eliminate wasted energy and increase operating efficiency. When paired with another ZRB4 to replace a wire the communications channel requires no special personnel for installation thereby saving money and time.

Full-Duplex



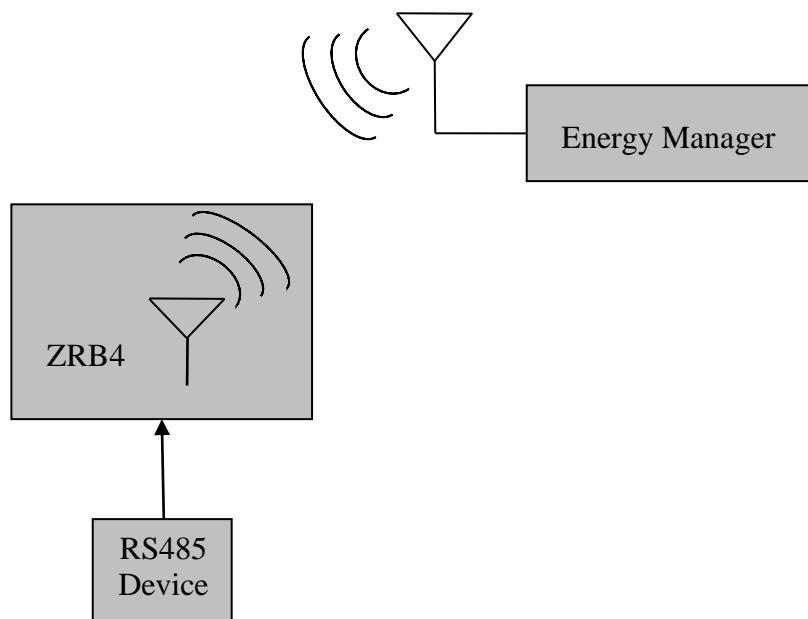
Half-Duplex



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6.1 Network Mode



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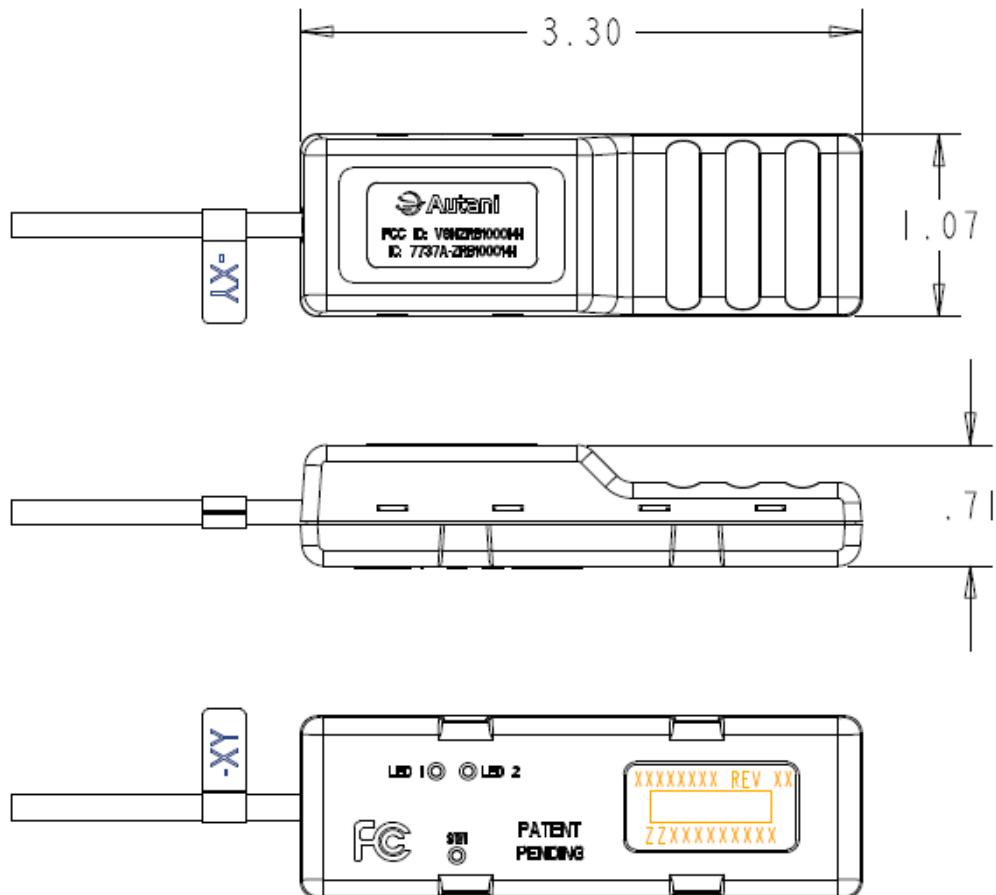
6.2 LED and Pushbutton Switch Functions

Network Mode	
LED1 (blinking)	<p>Red – Node is searching for a network.</p> <p>Amber – Node has joined a network and is waiting for permission to stay from network coordinator.</p> <p>Green – Node has joined a network and has received permission to stay from network coordinator.</p>
LED2	Not Used.
SW1	<p>Note: The state/color of the LED will change to indicate a Short or Long press.</p> <p>Short Press – Press and hold SW1 until the LED color has changed state <u>once</u> and release immediately. This will start network search mode.</p> <p>Long Press – Press and hold SW1 until the LED color has changed state <u>twice</u> and release immediately. This causes the node to leave the current network and look for a network using the extended pan id “_Autani_” to join.</p>

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7. Mechanical Details (optional enclosure)



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8. Appendix A: Installation

Turn power off at service panel before beginning installation. If this is an upgrade, the existing wiring can be utilized as needed as long as all local wiring codes are followed. It is recommended to have a licensed electrician install the ZRB4.

Precautions:

- **CAUTION: RISK OF ELECTRICAL SHOCK. Turn power off at service panel before beginning installation. Never wire energized electrical components.**
- **CAUTION: USE COPPER CONDUCTORS ONLY.**
- **NOTICE:** For installation by a licensed electrician in accordance with National and/or local Electrical Coded and the following instructions.
- **NOTICE:** There are no user-serviceable parts inside the device. Unauthorized dismantling or repairing of the device will void the warranty.
- **NOTICE:** Do not install if any damage to product is noticed.
- **NOTICE:** For indoor use only.
- Confirm that device ratings are suitable for application prior to installation.
- Read and understand all instructions before beginning installation.

ZRB4 Installation:

1. Turn power OFF at service panel.
2. Connect the Red wire to Power (24V AC/DC) and Black wire to GND/Common.
3. Connect the remaining wires to an RS485 device as shown below.
4. Turn power ON at service panel.

Connector Pin	Wire Color	Full-Duplex	Half-Duplex
1	-	-	-
2	Red	24V AC/DC	24V AC/DC
3	Blue	RX+	*COM (A)
6	Green	TX+	
4	Yellow	TX-	*COM (B)
5	White	RX-	
7	Black	GND/Common	GND/Common
8	-	-	-

*The Blue & Green wires (COM-A) are connected together and the Yellow & White wires (COM-B) are connected together for Half-Duplex configuration.

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9. Appendix B: Module Certification

1 Requirement of FCC KDB 996369 D03 for module certification:

1.1 List of applicable FCC rules:

This module complies with FCC Part 15.247

1.2 Summarize the specific operational use conditions:

This module has been certified for Fixed, Mobile, Portable applications. This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

1.3 Limited module procedures:

This module has its own RF shielding, which belong to Limited Module Standard requires: Clear and specific instructions describing the conditions, limitations, and procedures for third-parties to use and/or integrate the module into a host device. (see Comprehensive integrations instructions below).

1.4 Trace antenna design:

This module contains a PCB Etched Antenna. The antenna is fixed and cannot be changed or altered in any way.

1.5 RF exposure considerations:

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. The antenna used for this transmitter must not be collocated or operated in conjunction with any other antenna or transmitter.

Note: The host product manual must include a statement in order to alert the users of FCC RF exposure compliance.

1.6 Antenna:

Type	Gain	Frequency Bands	Modulation Mode
PCB Etched Antenna	3-5dBi	2400-2483.5 MHz	O-QPSK

The antenna is permanently attached, can't be replaced.

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1.7 Label and compliance information:

FCC:

This device complies with Part 15 of the Federal Communications Commission rules and regulations. Any modifications to this device may violate the FCC rules and regulations and make operation of this device unlawful.

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

NOTE 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/ TV technician for help.

NOTE 2: This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and/or operated with a minimum distance of 20 centimeters between the radiator and your body.

NOTE 3: 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.

IC Canada:

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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

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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.

This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and/or operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet équipement est conforme aux limites d'exposition au rayonnement RF de la FCC établies pour un environnement non contrôlé. Cet équipement doit être installé et / ou utilisé à une distance minimale de 20 centimètres entre le radiateur et votre corps.

The system integrator must place an exterior label on the outside of the final product housing the **V8NZRB1000186** module. Below is the content that must be included on this label.

1.8 The host product Labeling Requirements:

NOTICE: The host product must make sure that the FCC requirements are met. This includes clearly visible exterior label on the outside of the final product housing that displays the contexts shown below.

Contains FCC ID: V8NZRB1000186
Contains IC ID: 7737A-ZRB1000186

1.9 Information on test modes and additional testing requirements:

When testing the host product, the host manufacturer should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

1.10 Additional testing, Part 15 Subpart B disclaimer:

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

1.11 Information on test modes and additional testing requirements:

When testing host product, the host manufacturer should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements.

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