autani
Automating Green

User's Manual
ZigBee to RS485 Bridge (ZRB3)
1000152

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Version	Date	Changed By	Revision Description
1	10-15-2013	MEP	Preliminary

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1.   Description

The ZigBee to RS485 Bridge (ZRB3) provides a cost-effective path to wirelessly enable many devices which still use wired commutations channels. The wireless side of the ZRB3 employs an RF transceiver in the 2.4 GHz ISM band based on the ZigBee IEEE 802.15.4 wireless network protocol. The wired side of the ZRB3 communicates in RS485 full or half duplex differential modes (i.e. RS485 or RS422).

Features

- FCC and IC Certified…… **(Pending)**
- Operational Range: ~1000 feet (LOS)
- **Made in USA**

2.   Ordering Information

Part Number	Description
1000141-01	ZRB3, Aprilaire 8870 Thermostat Interface Module
1000141-02	ZRB3, Jackson System's T-32-P Thermostat Interface Module
1000141-03	ZRB3, Point-to-Point Interface Module
1000141-04	ZRB3, RS485 Back Bone Interface Module
1000141-05	ZRB3, National Meter Interface Module
1000141-06	ZRB3, E50C2 Power Meter Interface Module
1000141-07	ZRB3, Pulse Meter Interface Module
1000141-08	ZRB3, Dent Powerscout Meter Interface Module
1000141-09	ZRB3, Wireless ZigBee Router Interface Module
1000141-10	ZRB3, RS-232 Interface Module
1000152-11	Reserved
1000152-12	Reserved
1000152-13	ZRB3, DTS SMX Meter
1000152-14	ZRB3, Barix R6
1000152-15	ZRB3, Wi5 Point-to-Point RS232 Node
1000152-16	ZRB3, Wi5 Point-to-Point RS232 Master Node
1000152-17	ZRB3, Dry Contact
1000152-18	ZRB3, Wi5 Point-to-Point RS232 Slave Node
1000152-19	ZRB3, Intermatic 8415
1000152-20	ZRB3, SMT-131 (Hotel Stat)
1000152-21	ZRB3, Relay Board
1000152-22	ZRB3, LVRC Board

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	^{o}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	^{o}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	2400		2500	MHz
Maximum Input Signal Strength		0			dBm
Relative Frequency Error		-120		120	ppm
RF Tx Power (CH11-CH26)			TBD		dBm

4. Physical Interface

All signals are from the perspective of the ZRB3.

Wire Number	Color	Signal Name	Description
1	N/A	-	
2	Red	PWR	Input power of the ZRB3
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	Input ground and RS485 reference of the ZRB3
8	N/A	-	

5. Certifications

5.1 FCC – United States

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.

FCC ID: V8NZRB1000152…… (Pending)

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.

5.2 IC – Canada

This device is IC certified.

IC ID: 7737A-ZRB1000152…… (Pending)

6.   Typical Applications
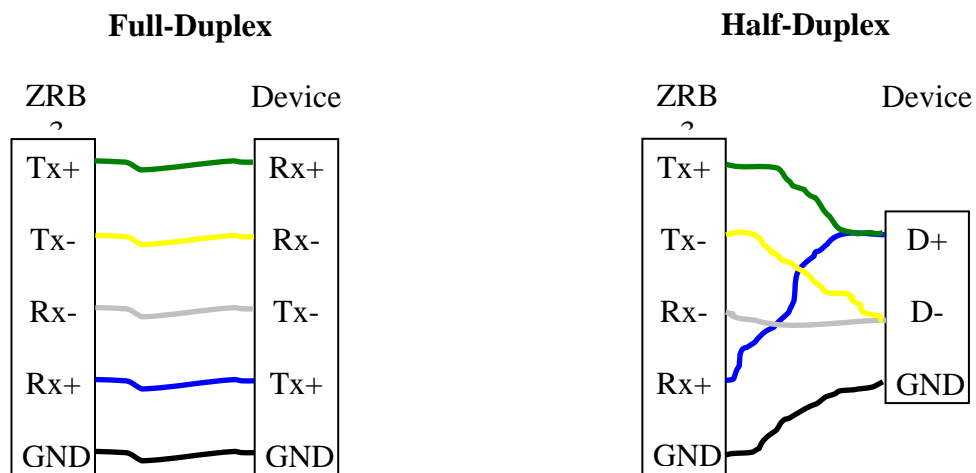
The ZRB3 was designed to be powered from the same voltage that a thermostat or doorbell system operates from, 24VAC or 24VDC. Refer to the Specifications section for more detailed power requirements.

The serial communications port on the ZRB3 is capable of full-duplex and half-duplex operations, depending on firmware loaded into the ZRB3. The ZRB3 can interface with a host of RS485 based protocols such as LonWorks, 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 ZRB3. 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.
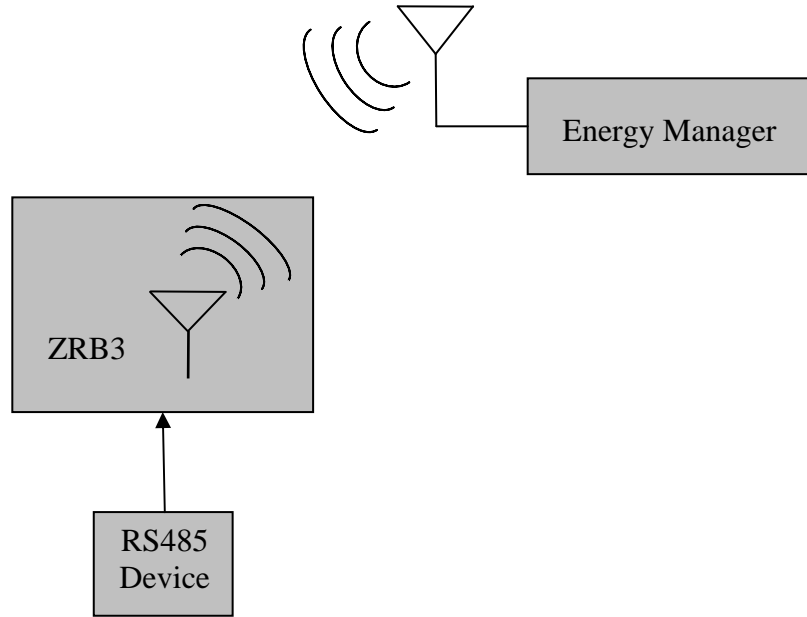
The ZRB3 uses ZigBee in the 2.4 GHz ISM band to communicate wirelessly. There are two LEDs on the bottom of the ZRB3 which indicate network status and unit status. The pushbutton is used to leave and join ZigBee networks. When joined to a ZigBee network with an Energy Manager the ZRB3 becomes one part of a multifaceted system designed to eliminate wasted energy and increase operating efficiency. When paired with another ZRB3 to replace a wire the communications channel requires no special personnel for installation thereby saving money and time.

Full-Duplex   **Half-Duplex**

ZRB3   Device   ZRB3   Device

Tx+	—	Rx+
Tx-	—	Rx-
Rx-	—	Tx-
Rx+	—	Tx+
GND	—	GND

ZRB3 (Half-Duplex):
Tx+, Tx-, Rx-, Rx+, GND connected to Device: D+, D-, GND

6.1   Network Mode

6.2   LED and Pushbutton Switch Functions

|	**Network Mode**
LED1 (blinking)	**Red** – Node is searching for a network. **Amber** – Node has joined a network and is waiting for permission to stay from network coordinator. **Green** – Node has joined a network and has received permission to stay from network coordinator.
LED2	Not Used.
SW1	Note: The state/color of the LED will change to indicate a Short or Long press. **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. **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.

7. Mechanical Details
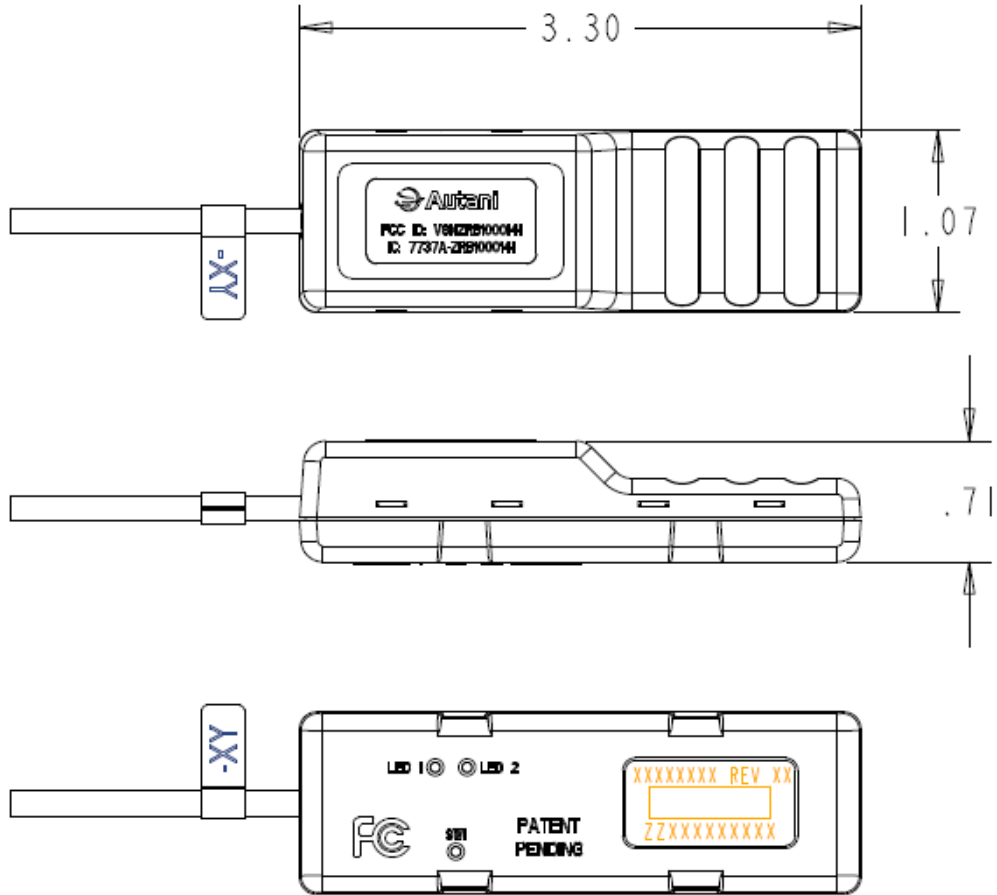
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8. Appendix A: Installation Instructions

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 ZRB3.

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 warrantee.
- **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.

ZRB3 Installation:

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

ZRB3	Cable	Full-Duplex	Half-Duplex
J1-2	Red	24VAC/24VDC	24VAC/24VDC
J1-3	Blue	RX+	*COM (A)
J1-6	Green	TX+	*COM (A)
J1-7	Black	GND/Common	GND/Common
J1-4	Yellow	TX-	*COM (B)
J1-5	White	RX-	*COM (B)

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