# Wzzard™ Sensing Platform
# **Intelligent Edge Nodes**

## User Manual

**ADVANTECH**  **B+B SMARTWORX**

**Document: Wzzard_User_Manual_R4_0313m**

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## WIRELESS CONNECTIVITY WHERE YOU NEED IT

The Wzzard™ intelligent wireless sensor platform makes it quick and easy to connect sensors and communicate their data to your application, on your network or on the Internet, for visualization, analytics or integration into business applications.

The Wzzard platform connects to a vast range of industry-standard sensors.  It uses Intelligent Edge Nodes and a wireless SmartMesh IP network to transmit sensor data to the Spectre Network Gateway.  The Spectre Network Gateway can connect to the Internet via wired connections or the cellular data network.

Wzzard Intelligent Edge Nodes accommodate external sensors with a wide variety of sensor interface options, including general purpose analog inputs, digital input/output and thermocouple.  They can also contain internal sensors like an accelerometer, depending upon the model number.

**Secure, Reliable and Highly Scalable Wireless Networking**
The Wzzard platform uses 802.15.4e wireless SmartMesh IP networking technology to deliver reliable, resilient and scalable communication with advanced network management and comprehensive security features.  The platform uses full SmartMesh IP networking and time-synchronized channel hopping to provide up to 99.999% connectivity, even in the most demanding RF environments.
The Wzzard wireless sensor platform enables rapid network deployment and expansion.  New nodes may be added at any time, and the SmartMesh network dynamically self-configures as new nodes are added or removed.  This process is a function of the mesh network itself, and does not need to be controlled by the network gateway.

**Easy Configuration and Installation**
Configuration of the Wzzard sensor platform is easy via Android smart phones or tablets with Bluetooth BLE 4.0 or Smart LE. Using the Wzzard app, your handheld devices can configure the Wzzard Intelligent Edge Nodes over their Bluetooth connections.  The intelligent edge nodes can be configured with calibration and scaling information, engineering units, friendly names, geolocation and other descriptive information.  The MQTT-SN protocol is used to transport sensor data to the network gateway.  MQTT-SN is a highly efficient publish/subscribe protocol optimized for sending sensor data over wireless networks.

The platform simplifies physical installation as well.  The Wzzard Intelligent Edge Nodes can be attached to any surface using screws or their embedded magnetic bases. The IP66-rated, fiber reinforced polyester PBT housing and the ability to connect to external sensors via conduit fitting cable gland or M12 connector make the units deployable in virtually any industrial or commercial environment.

**Intelligence at the Network Edge**
The Wzzard wireless platform places intelligence at the network edge.  The Wzzard Intelligent Edge Nodes can be configured to communicate data only when specified threshold or alert levels are exceeded.  When reporting, they can associate useful information like geolocation, device name and battery install date.  This eliminates unnecessary network traffic, eases the processing burden on upstream resources, and cuts the cost of cellular data plans when the Gateway is using the cellular data

network. Thanks to low-power wireless technology and programmable time synchronization, the Intelligent Edge Nodes can operate for multiple years on just two AA lithium batteries.

**The Spectre Network Gateway**

The Spectre Network Gateway connects to the SmartMesh IP wireless mesh network and the Wzzard Intelligent End nodes through an integrated 802.15.4e radio. The Spectre Network Gateway receives the incoming data stream from edge nodes in MQTT-SN format and converts the information into MQTT protocol for transport to an MQTT broker on your network or on the Internet.

Uniquely designed with open source LINUX architecture, the Spectre Network Gateway is customizable through installation of software plug-in modules. Users can create their own plug-in modules with common LINUX commands and scripts, or add them from B+B's existing library. Plug-in modules are available for establishing communications with the MQTT broker within a number of IoT application platform providers, including Axeda, Xively, ILS and SeeControl.

The Spectre Network Gateway is built for plug-and-play simplicity with extensive remote management, deployment and customization options.  It connects Ethernet equipment and other devices to the Internet or intranet via either cellular 3G or 10/100 wired Ethernet. The standard configuration includes a 10/100 Ethernet port, USB host port, binary input/output (I/O) port and an 802.15.4e radio.  It also has an auxiliary port that can be configured for other purposes, like Ethernet or RS-232/485/422.

**Secure Connections**

To ensure secure communications the Spectre Network Gateway supports the creation of VPN tunnels using IPsec, OpenVPN and L2TP. The web interface provides detailed statistics about gateway activities, signal strength, etc. The gateway supports DHCP, NAT, NAT-T, DynDNS, NTP, VRRP, control by SMS, and many other routing functions. The Spectre Network Gateway also provides diagnostic functions which include automatically monitoring the PPP connection, automatic restart in case of connection losses, and a hardware watchdog that monitors the Spectre Network Gateway status.

## CONTENTS OF PACKAGE

The Wzzard™ Industrial models package includes:
- Wzzard™ Industrial Intelligent Edge Node
- Sensor wire harness cable - conduit connection models only
- 2 3.6V AA Thionyl Chloride Lithium Batteries
- External Antenna  (some models)
- Quick Start Guide
- Anti-Skid Disk

The WzzardC™ Commercial models package includes:
- WzzardC™ Commercial Intelligent Edge Node
- 2 3.6V AA Thionyl Chloride Lithium Batteries
- Quick Start Guide
- Dual lock adhesive Velcro strips

## CONNECTING YOUR SENSOR, WZZARD INDUSTRIAL MODELS

### CONNECTING YOUR SENSOR TO WZZARD INDUSTRIAL CONDUIT MODELS: ANALOG AND DIGITAL

It is best practice that wiring is done prior to installing batteries or powering up the device.

Remove the four screws that hold the top of the Wzzard node in place.  Thread the wire harness through the conduit.

Plug the included wire harness into the receptacle on the circuit board inside the node.

Connect your sensor to the wires running from the node's conduit. Consult the charts below for wire colors and connections.

WIRING FOR WZZARD INTELLIGENT EDGE NODES WITH SMARTMESH IP – CONDUIT MODELS

| | 1 Brown | 2 Red | 3 Pink | 4 Yellow | 5 Green | 6 Blue | 7 White | 8 Gray |
|---|---|---|---|---|---|---|---|---|
| WSD2CTJ | 3.3V | | | | | DO2 | GND | GND |
| WSD1CTJ | 3.3V | | | | | DO2 | GND | GND |
| WSD2CTK | 3.3V | | | | | DO2 | GND | GND |
| WSD1CTK | 3.3V | | | | | DO2 | GND | GND |
| WSD2XV0 | 3.3V | | | | | | | GND |
| WSD1XV0 | 3.3V | | | | | | | GND |
| WSD2CA2 | 3.3V | AIN1 | GND | AIN2 | GND | DO2 | 3.3REF | GND |
| WSD1CA2 | 3.3V | AIN1 | GND | AIN2 | GND | DO2 | 3.3REF | GND |
| WSD2CJA | 3.3V | AIN1 | GND | AIN2 | GND | DO2 | 3.3REF | GND |
| WSD2CD2 | 3.3V | DIN1 | DIN2 | DO1 | DO2 | GND | GND | GND |
| WSD1CD2 | 3.3V | DIN1 | DIN2 | DO1 | DO2 | GND | GND | GND |
| WSD2CA3 | 3.3V | AIN1 | GND | AIN2 | GND | AIN3 | GND | GND |
| WSD1CA3 | 3.3V | AIN1 | GND | AIN2 | GND | AIN3 | GND | GND |

3.3V = 3.3V power input
3.3REF= 3.3V output reference
AIN1= Analog Input #1
AIN2= Analog Input #2
AIN3= Analog Input #3
DIN1= Digital Input #1
DIN2= Digital Input #2
D01= Digital Output #1
D02= Digital Output #2
GND= Ground Input

## WIRING FOR WZZARD INTELLIGENT EDGE NODES WITH SMARTMESH IP – M12 MODELS

|  | 1 White | 2 Brown | 3 Green | 4 Yellow | 5 Gray | 6 Pink | 7 Blue | 8 Red |
|---|---|---|---|---|---|---|---|---|
| WSD2MA2 | 3.3V | AIN1 | GND | AIN2 | GND | DO2 | 3.3REF | GND |
| WSD1MA2 | 3.3V | AIN1 | GND | AIN2 | GND | DO2 | 3.3REF | GND |
| WSD2MD2 | 3.3V | DIN1 | DIN2 | DO1 | DO2 | GND | GND | GND |
| WSD1MD2 | 3.3V | DIN1 | DIN2 | DO1 | DO2 | GND | GND | GND |
| WSD2MA3 | 3.3V | AIN1 | GND | AIN2 | GND | AIN3 | GND | GND |
| WSD1MA3 | 3.3V | AIN1 | GND | AIN2 | GND | AIN3 | GND | GND |

3.3V = 3.3V power input
3.3REF= 3.3V output reference
AIN1= Analog Input #1
AIN2= Analog Input #2
AIN3= Analog Input #3
DIN1= Digital Input #1
DIN2= Digital Input #2
D01= Digital Output #1
D02= Digital Output #2
GND= Ground Input

## CONNECTING YOUR SENSOR TO WZZARD INDUSTRIAL M12 MODELS: ANALOG AND DIGITAL

It is best practice that wiring is done prior to installing batteries or powering up the device.

Remove the four screws that hold the top of the Wzzard node in place.

Confirm that the wire harness from the M12 port is connected to the circuit board inside the Wzzard Edge Node.

Wire your M12 cable according to the diagram below.
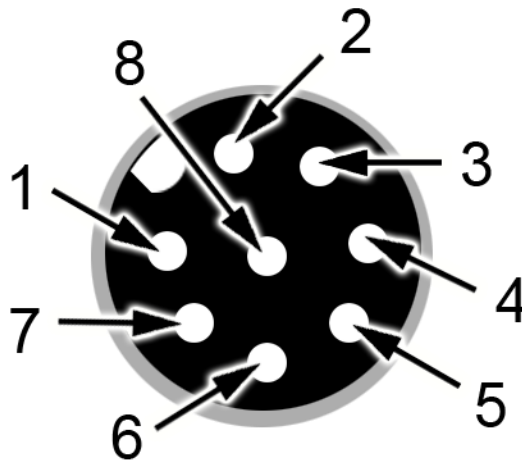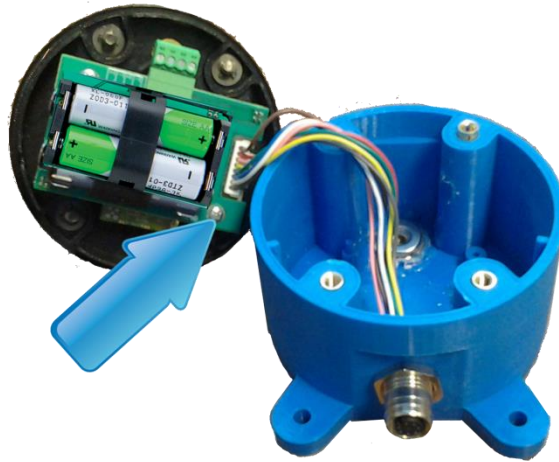




# Wzzard M12 Pinout

## TERMINAL BLOCK CONNECTIONS FOR WZZARD INDUSTRIAL MODELS: THERMOCOUPLE

It is best practice that wiring is done prior to installing batteries or powering up the device.

Remove the 4 screws that hold the top of the Wzzard node in place. Thread the thermocouple wires through the conduit and attach them to the terminal block.  It is best practice that wiring is done prior to installing batteries or powering up the device.

1 = Thermocouple input #1 positive (+)
2 = Thermocouple input #1 negative (-)
3 = Thermocouple input #2 positive (+)
4 = Thermocouple input #2 negative (-)

Close the Wzzard node and replace the 4 screws.
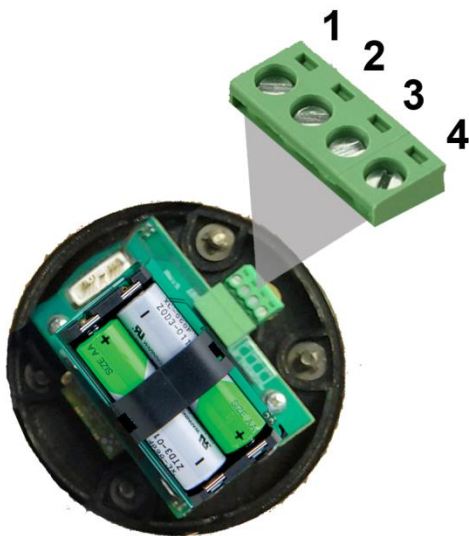
## CONNECTING YOUR SENSOR TO WZZARDC™ COMMERCIAL MODELS

Connect your sensor wires to the terminal block.  Consult the chart below for terminal block pin assignments.
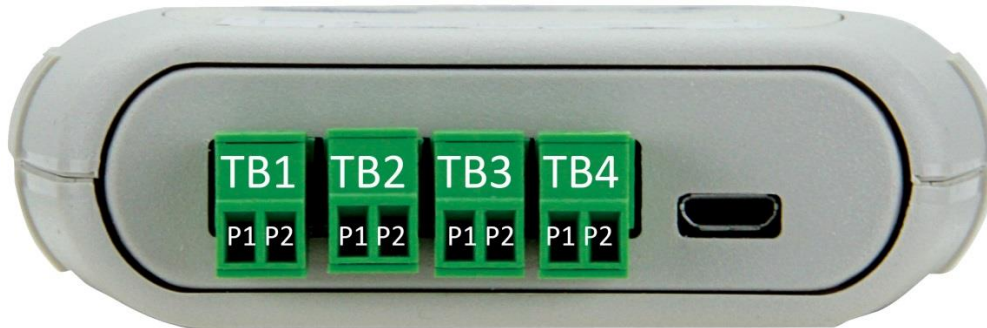


| WIRING FOR WZZARDC™ COMMERCIAL EDGE NODES WITH SMARTMESH IP | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
|  | TB1 Pin 1 | TB1 Pin 2 | TB2 Pin 1 | TB2 Pin 2 | TB3 Pin 1 | TB3 Pin 2 | TB4 Pin 1 | TB4 Pin 2 |
| WCD1TA3 | GND | AIN1 | GND | AIN1 | GND | AIN1 | GND | 3.3V |
| WCD1TD2 | GND | DIN1 | GND | DIN2 | GND | DO1 | GND | DO2 |
| WCD1TTJ | T1+ | T1- | T2+ | T2- | GND | DO2 | N/C | N/C |

3.3V = 3.3V power output
AIN1 = Analog Input #1
AIN2 = Analog Input #2
AIN3 = Analog Input #3
DIN1 = Digital Input #1
DIN2 = Digital Input #2
D01 = Digital Output #1
D02 = Digital Output #2
T1+ = J Type Thermocouple Input #1 positive (+)
T1- = J Type Thermocouple Input #1 negative (-)
T2+ = J Type Thermocouple Input #2 positive (+)
T2- = J Type Thermocouple Input #2 negative (-)
N/C = Not Connected
GND = Ground Input

## POWERING THE WZZARD INDUSTRIAL MODELS

Remove the 4 black screws that hold the top of the node in place.
Install two 3.6 V AA Thionyl Chloride lithium batteries.

In most installations you will only need to place the batteries in the battery holder. But in high vibration environments you should also use the optional battery retaining clip.  Do not use excessive force while placing or removing the clip, as you can break it.

The best way to remove the clip is to insert a small flathead screwdriver between the batteries and the clip, parallel to the batteries, and give the screwdriver a gentle twist.  This will remove the clip without damage.
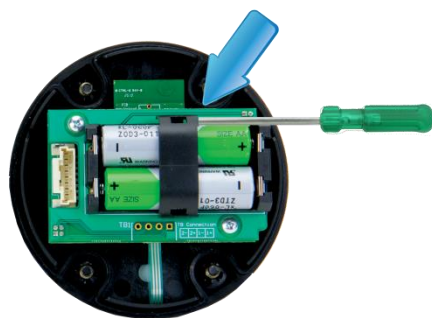
As with all batteries, these are a fire, explosion, and severe burn hazard. Do not burn or expose them to high temperatures. Do not recharge, crush, disassemble, or expose the contents to water. Properly dispose of used batteries according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or other facility qualified to accept lithium batteries.

## POWERING WZZARDC™ COMMERCIAL MODELS



**Postive (+)**

**MicroUSB Port**
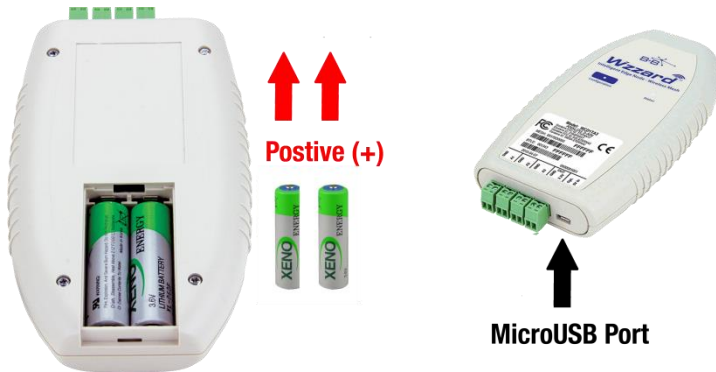
Remove back cover. Insert both batteries with the positive (+) towards the terminal blocks.

(The unit can also be powered through the microUSB connecter)

## LEDS

After you have installed the batteries the LED will begin to blink. This indicates that the Node is attempting to establish a network connection. The LED will cease blinking when a connection is made.

| Status LED | | |
|---|---|---|
| Data | Solid On | Module startup initialization, approx. 10 sec. |
| | Slow Blink | Attempting to establish connection with SmartMesh IP network – 1 sec on/1 sec off |
| | Fast Blink | Firmware Update in progress – 10 blinks per sec |
| | OFF | Unit is connected to wireless network |

Wzzard nodes may be mounted either with screws or with their internal magnets. Attach Anti-Skid disk to bottom of unit to prevent slipping on metal surfaces.

## Flange Mounting

Wzzard nodes may be mounted via their mounting ears.  (M5, #10)

## Magnetic Mounting

Wzzard nodes contain a powerful, internal mounting magnet.  (Pull force 4.7 lbs, 2.13 kg) The magnet is in the base of the Wzzard node.





## MOUNTING WZZARDC™ COMMERCIAL MODELS

## Velcro Mounting

The Wzzard node may be mounted with the supplied dual lock adhesive Velcro strips.

## Holster Mounting

B+B offers a holster mount as an accessory. It may be purchased as part number WCHOLST.

## CONNECTING TO YOUR INTELLIGENT EDGE NODES VIA BLUETOOTH LE

### INSTALL THE WZZARD APP ON YOUR HANDHELD DEVICE

You may install the Wzzard app on your Android handheld device. Your handheld device MUST be compatible with Bluetooth LE 4.0.

The Android APP version is available on Google Playstore   Search store for
**"Wzzard Sensor Application."**

1. Open the Wzzard App
2. Press the "Configuration' button on the device for at least 1 second to wake up Bluetooth radio (the LED will come on to signify this)
3. Press the device you would like to view. (This screen lets the user view Bluetooth advertisements from the Nodes.)
4. Press the Configure Device button.
5. Pair with the device. Default username/password is admin/admin.
6. Press the "Radio Setup" button to set the Network ID and Network Join Key. (These must be the same values that you enter in the corresponding network gateway.)
Press the 'Save' button to save the new settings.
7. Refer to the Wzzard Bluetooth App User manual for further node programming instructions.
Documents can be found at http://www.bb-smartsensing.com/technical-documentation

RADIO

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Radio** | | | | |
| | **Network ID** | 1-65534 | 1981 | Unique identifier for the sensor network. This ID must match the ID programmed into the network gateway. |
| | **Network Join Key** | 32 hexa-decimal characters | The keyword 'default' will return this setting back to the factory default value. | 128-bit encryption key for the network which is entered as a 32 hex character string (i.e. 19ABD…). This key must match the key programmed into the network gateway. |
| | **Advertise During Sleep** | On/Off | Off | Enables sensor broadcast messages over the Bluetooth LE interface while the node is asleep. |
| | **Advertise Rate** | 10 seconds to 24 hours | 10 | Time interval in seconds between each set of broadcast messages during sleep. Longer intervals will preserve battery life. |
| | **Username** | 16 characters | admin | Login name for configuring the node. |
| | **Password** | 16 characters | admin | Password for configuring the node. |
| **Radio -> advanced** | **Join Duty Cycle** | 0 – 100 | 25 | The percent of time that the node will be awake searching for a network to join. A higher value allows the node to connect to the gateway faster but uses more battery current. |

## DEVICE CONFIGURATION

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Device Configuration** | | | | |
| | **Description** | 0-40 characters | | User-defined text field to describe the node (max 40 chars). |
| | **Exception-based Measurement Interval** | 0, 10 seconds to 24 hours | 0 | Determines how frequently the node will wake up to check for an alarm level. A value of '0' disables this feature. Non-zero values enable the exception/alert feature for the sensors. |
| | **Publish Interval** | 10 seconds to 24 hours | 1 minute | Determines the interval between publishes to the network gateway. |

## GEOLOCATION

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Geolocation** | | | | |
| | **Latitude** | -90.0 to 90.0 degrees | | Geographical location of the sensor. |
| | **Longitude** | -180.0 to 180.0 degrees | | Geographical location of the sensor. |
| | **Elevation** | -999999.9 to 999999.9 | | Elevation of the sensor. |

## ANALOG INPUTS

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Analog Inputs** | | | | |
| | **Sensor Enable** | On/Off | On | Enables/disables the sensor for use on the node. |
| | **Analog Input Type** | 0-20mA, 4-20mA, 0-5V, 1-5V | 0-5V | The type of sensor connected to the input. |
| | **Sensor Label** | 32 characters | ainx | User-defined text field to describe the sensor input (max 32 chars). |
| | **Measurement Unit** | 8 characters | V | Engineering unit of measure (max 8 chars). |
| | **Sensor Span Point** | -999999.9 to 999999.9 | 5.0 | The value that is reported when the input is at the maximum value. |
| | **Sensor Zero Point** | -999999.9 to 999999.9 | 0.0 | The value that is reported when the input is at the minimum value. |
| | **Enable Exception** | On/Off | Off | Show/hide the exception/alert options for the sensor. Setting the alert values will provide a quick publish (based on the measurement interval) if an alert level is reached. |
| | **Alert High** | -999999.9 to 999999.9 | Lowest of Sensor Span Point, Sensor Zero Point- highest of Sensor Span Point, Sensor Zero Point | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **Alert Low** | -999999.9 to 999999.9 | Lowest of Sensor Span Point, Sensor Zero Point- highest of Sensor Span Point, Sensor Zero Point | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **BLE Advertisement Enable** | On/Off | On | When enabled, the node will broadcast the sensor value over the Bluetooth interface. |

## INTERNAL TEMPERATURE

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Internal Temperature** | | | | |
| | **Sensor Enable** | On/Off | On | Enables/disables the sensor for use on the node. |
| | **Sensor Label** | 32 characters | tempint | User-defined text field to describe the sensor input (max 32 chars). |
| | **Measurement Unit** | C/F | C | Engineering unit of measure (max 8 chars). |
| | **Enable Exception** | On/Off | Off | Show/hide the exception/alert options for the sensor. Setting the alert values will provide a quick publish (based on the measurement interval) if an alert level is reached. |
| | **Alert High** | -999999.9 to 999999.9 | | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **Alert Low** | -999999.9 to 999999.9 | | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **BLE Advertisement Enable** | On/Off | On | When enabled, the node will broadcast the sensor value over the Bluetooth interface. |

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Thermocouple** | | | | |
| | **Sensor Enable** | On/Off | On | Enables/disables the sensor for use on the node. |
| | **Sensor Label** | 32 characters | tempx | User-defined text field to describe the sensor input (max 32 chars). |
| | **Measurement Unit** | C/F | C | Engineering unit of measure (max 8 chars). |
| | **Enable Exception** | On/Off | Off | Show/hide the exception/alert options for the sensor. Setting the alert values will provide a quick publish (based on the measurement interval) if an alert level is reached. |
| | **Alert High** | -999999.9 to 999999.9 | | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **Alert Low** | -999999.9 to 999999.9 | | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **BLE Advertisement Enable** | On/Off | On | When enabled, the node will broadcast the sensor value over the Bluetooth interface. |

## SUPPLY VOLTAGE

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Supply Voltage** | | | | |
| | **Sensor Enable** | On/Off | On | Enables/disables the sensor for use on the node. |
| | **Sensor Label** | 32 characters | vbatt | User-defined text field to describe the sensor input (max 32 chars). |
| | **Measurement Unit** | V | V | Engineering unit of measure (max 8 chars). |
| | **Enable Exception** | On/Off | Off | Show/hide the exception/alert options for the sensor. Setting the alert values will provide a quick publish (based on the measurement interval) if an alert level is reached. |
| | **Alert High** | 3.0 - 4.0 | | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **Alert Low** | 2.4 - 3.0 | Recommended value of 2.6 should be used. | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **BLE Advertisement Enable** | On/Off | On | When enabled, the node will broadcast the sensor value over the Bluetooth interface. |

## DIGITAL INPUTS

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Digital Inputs** | | | | |
| | **Sensor Enable** | On/Off | On | Enables/disables the sensor for use on the node. |
| | **Sensor Label** | 32 characters | dinx | User-defined text field to describe the sensor input (max 32 chars). |
| | **Measurement Unit** | 8 characters | | Engineering unit of measure (max 8 chars). |
| | **Digital Input Type** | bool, count, rate | bool | The type of sensor connected to the input - either a Boolean input, a counter/totalizer, or a rate meter. |
| | **Enable Exception** | On/Off | Off | Show/hide the exception/alert options for the sensor. Setting the alert values will provide a quick publish (based on the measurement interval) if an alert level is reached. |
| | **Alert High** | Boolean: 1 Rate: 0.0 to 999999.9 | | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **Alert Low** | Boolean: 0 Rate: 0.0 to 999999.9 | | The node will send a publish to the network gateway when the input reaches this value. A blank field (or no value) disables this alert. |
| | **Invert Input** | True/False | False | Changes the input from an active high input to an active low input. |
| | **BLE Advertisement Enable** | On/Off | On | When enabled, the node will broadcast the sensor value over the Bluetooth interface. |
| | **True Message** | 8 characters | | Message that is displayed when the Boolean input is true. |
| | **False Message** | 8 characters | | Message that is displayed when the Boolean input is false. |
| | **Period** | seconds | 1.0 | Measurement period for determining the rate for the rate meter. (Read only at this time) |
| | **Multiplier** | 0.000001 to 999999.9 | 1.0 | The scale factor for the counter and rate meter. |

## DIGITAL OUTPUTS

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Digital Outputs** | | | | |
| | **Sensor Enable** | On/Off | On | Enables/disables the sensor for use on the node. |
| | **Sensor Label** | 32 characters | dox | User-defined text field to describe the sensor input (max 32 chars). |
| | **Invert Output** | True/False | False | Inverts the level of the output. |
| | **BLE Advertisement Enable** | On/Off | On | When enabled, the node will broadcast the sensor value over the Bluetooth interface. |

## ACCELEROMETER

| Configuration Screen | Parameter | Parameter Range | Default Value | Description |
|---|---|---|---|---|
| **Accelerometer** | | | | |
| | **Sensor Enable** | On/Off | On | Enables/disables the sensor for use on the node. |
| | **Sensor Label** | 32 characters | accel1 | User-defined text field to describe the sensor input (max 32 chars). |
| | **Measurement Unit** | 8 characters | [g] | Engineering unit of measure. |
| | **BLE Advertisement Enable** | On/Off | On | When enabled, the node will broadcast the sensor value over the Bluetooth interface. |
| | **Accelerometer Granularity** | 2G, 4G, 8G | 4G | Measurement range of the accelerometer. A lower value will increase the sensitivity of the accelerometer. |
| | **Accelerometer Interval** | 12.5, 25, 50, 100, 200, 400Hz | 100Hz | Frequency Response of the accelerometer. A higher value will allow the accelerometer to capture faster events. |

**Output increases with acceleration in the direction of the arrows**
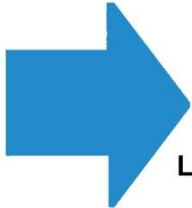
**X**
Left / Right

**Y**
Forward / Back

**Z**
Up / Down

## CONFIGURATION BUTTON

When you press and hold the "Configuration" button on the Node for more than 5 seconds:

- It will cause the LED to flash quickly a couple of times
- It will restore the BLE login and password to factory settings.
- It will restart the device.

This action will not reset the device back to all factory settings.

When you press and hold the "Configuration" button on the node for at least 1 second but less than 5 seconds:

- LED will turn on (hold button until LED is seen)
- It will Wake-up the device and turn on the BLE radio
- This will enable the Wzzard App to communicate to the node

WZZARD INDUSTRIAL MODELS



| Power Supply | |
|---|---|
| Sources | 2 Lithium Primary Cells in parallel. Optional External Supply |
| External Input Voltage | 3.3 VDC +/- 5% |
| Connectors | M12 |
| | 1/2" Conduit, sensor interface cable included; 8 wire, 26 gage, 6 ft. |
| Battery Life | Multiple years based on 1 min sensor sampling and reporting |
| **Environmental --** Intended for indoor and outdoor use. | |
| Operating Temperature | -40 to 80°C (-40 to 176°F) |
| Storage Temperature | -40 to 85°C (-40 to 185°F) |
| Operating Humidity | 0 to 95% non-condensing |
| **LED indicators** | |
| Data | Color = Green |
| | Blink = Attempting to establish network connection |
| | Off = Device connected to network |
| **Enclosure Rating** | |
| Rating | IP66-rated, fiber reinforced polyester PBT |
| Mounting | Mountable by use of built-in magnets or mounting ears |
| **Certifications** | |
| **FCC/IC** | |
| FCC Part 15 Class A | |
| FCC - Part 15.247 | |
| Industry Canada - RSS210 | |
| **CE** | |
| EN55022 | CISPR (EN55022) Class A |
| EN 61000-6-2:2005 | Generic immunity standard for (heavy) industrial environments |
| | |
| EN 61000-6-4:2006 +A1:2011 | Emission standard for (heavy) industrial environments |
| EN61000-4-2 | ESD +/- 8kV air, +/- 4kV contact |
| EN61000-4-3 | RFI |
| EN61000-4-4 | EFT |
| EN61000-4-5 | Surge |
| EN61000-4-6 | CI |
| EN60255-21-1 | Vibration, 2g, 10-500Hz 0.3mm displacement |
| EN60255-21-2 | Shock, 50g, 11ms half sine wave, 18 shocks |
| **Safety** | |
| UL/CSA Class 1, Division 2 Groups A, B, C, D | |

| Environmental | |
|---|---|
| IEC 60068-2-6:2007 | Vibration, 2g, 10-500 Hz,1.5mm displacement |
| IEC 60068-2-27:2008 | Shock, 50g, 11ms half sine wave, 18 shocks |
| **Regulatory Approvals** | |
| RoHS and WEEE Compliant | |

## WZZARDC™ COMMERCIAL MODELS



| Power Supply | |
|---|---|
| Sources | 2 Lithium Primary Cells in parallel or MicroUSB input |
| External Input Voltage | 3.3 VDC +/- 5% |
| Connectors | 3.5 mm terminal blocks<br>Analog Input (0 - 5 VDC, 0 – 20 mA, 4 – 20 mA)<br>Digital Input (0-48 VDC)<br>Digital Input Frequency 1-1K Hz, Accuracy +/- 1Hz |
| Battery Life | Multiple years based on 1 min sensor sampling and reporting |
| **Environmental -- Intended for indoor use.** | |
| Operating Temperature | 0 to 65°C (32 to 149°F) |
| Storage Temperature | -0 to 70°C (32 to 158°F) |
| Operating Humidity | 0 to 95% non-condensing |
| **LED indicators** | One Green LED |
| Data | Color = Green<br>Blink = Attempting to establish network connection<br>Off = Device connected to network |
| **Enclosure Mounting** | |
| Mounting | Mountable by use of adhesive Velcro strips or holster mount part # WCHOLST |
| **Certifications** | |
| **FCC/IC** | |
| FCC Part 15 Class A | |
| FCC - Part 15.247 | |
| Industry Canada - RSS210 | |
| **CE** | |
| EN55022 | CISPR (EN55022) Class A |
| EN 61000-6-1:2007 | Generic immunity standard for residential, commercial and light-industrial environments |
| EN 61000-6-3:2006 +A1:2011 | Emission standard for residential, commercial and light-industrial environments |
| EN61000-4-2 | ESD +/- 8kV air, +/- 4kV contact |

| EN61000-4-3 | RFI |
|---|---|
| EN61000-4-4 | EFT |
| EN61000-4-6 | CI |
| **Regulatory Approvals** ||
| RoHS and WEEE Compliant ||

## ALL WZZARD MODELS

| **Digital Inputs** ||
|---|---|
| Voltage range | 0 – 48 VDC |
| $V_{IL}$ | 0.97V Maximum |
| $V_{IH}$ | 1.8V Minimum |
| Pull up current | 32uA |
| Type | Sourcing (PNP)/Sinking (NPN) Software selectable input |
| Isolation | None |
| **Rate/Frequency Inputs** ||
| Frequency | Does a 1 second measurement at each measurement/publish interval |
| | 1-1K Hz   (Accuracy + or – 1 Hz) |
| | Uses the falling edge or rising edge based on the Invert Enabled setting |
| **Counter Input** ||
| Channels | Actively counts either the falling edge (Invert enabled) or rising edge (Invert disabled) |
| | Can use a multiplier to convert to a unit type or count |
| | 2 selectable/shared with Digital inputs |
| | Rolls over at 999999.9 |
| **Analog Inputs** ||
| Input ranges | 0-5 VDC, 0–20 mA |
| Accuracy @ 25°C | Voltage: 0.10% full scale reading, 0.20% max. |
| | Current: 0.11% full scale reading, 0.24% max. |
| Resolution | 12 bit |
| Input load resistance | 100 Mega ohm (0-5VDC), 250 ohm (0-20ma) |
| **Thermocouple Input** ||
| Types Supported | J and K (Industrial Model Only) |
| Ranges Supported | Type J -210 to +1,200 °C |
| | Type K -270 to +1,372 °C |
| Resolution | 0.25°C |
| Accuracy | Typical +/-2°C |
| | +/-6°C over the temperature range of -40 to 80°C (Industrial) 0-65°C (Commercial) |
| **Digital Outputs** ||

| | |
|---|---|
| Voltage range | 0-30 VDC |
| Output Type | Open Drain |
| Output Current | Not to be less than 100ma |
| Protection | Current Limit Protection |
| Isolation | None |

## RADIO SPECIFICATIONS

**SmartMesh IP 802.15.4e RADIO SPECIFICATIONS**

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Frequency Band | | 2,400 | | 2,4835 | GHz |
| Number of Channels | | | 15 | | |
| Channel Separation | | | 5 | | MHz |
| Channel Clear Frequency | | | 2405 + 5*(k-11) | | MHz |
| Modulation | IEEE 802.15.4 Direct Sequence Spread Spectrum (DSSS) | | | | |
| Raw Data Rate | | | 250 | | kbps |
| Range | 25 °C, 50% RH, +2dBi Omni-Directional Antenna, Antenna 2 m above ground | m | | | |
| | Indoor | | 100 | | m |
| | Outdoor | | 300 | | m |
| | Free Space | | 1200 | | m |
| Receiver Sensitivity | Packet Data Error Rate (PER) = 1% | | | -93 | dBm |
| Receiver Sensitivity | PER = 50% | | | -95 | dBm |
| Output Power | Delivered to a 50 Ω load | | | 8 | dBm |

**BLUETOOTH LE RADIO SPECIFICATIONS**

| No | Characteristics | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Operation Frequency Range | | | 2402 | | 2480 | MHz |
| 2 | Channel Spacing | | | | 2 | | MHz |
| 3 | Output Power | | | | 4 | | dBm |
| 4 | Sensitivity, High Gain Mode | High Gain Mode | | | -93.0 | -70 | dBm |
| | | Standard Mode | | | -92.5 | -70 | dBm |

| THIONYL CHLORIDE LITHIUM BATTERIES (2 SUPPLIED WITH PRODUCT) | |
|---|---|
| Characteristics | Conditions |
| Temperature Range | -40 to 85°C |
| Nominal Capacity | 2.4 Ah |
| Nominal Voltage | 3.6 V |
| Diameter | 14.5 mm |
| Height | 50.5 mm |
| *Potential hazard: Do not recharge, crush, disassemble or heat above 212°F (100°C) | |

## MECHANICAL DRAWING
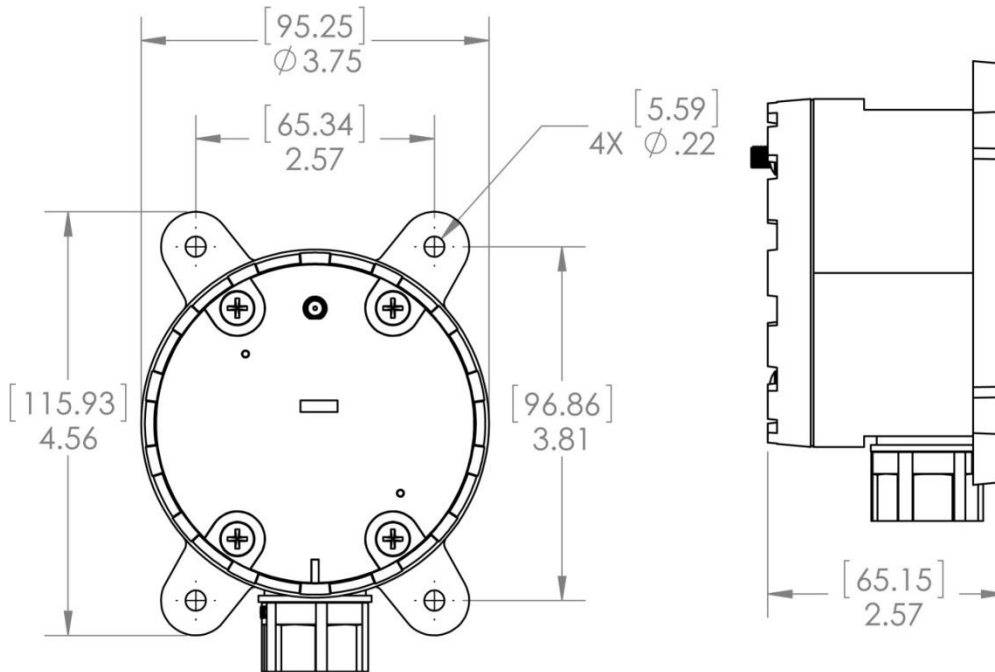
**Wzzard Industrial Models**



Figure 1: Mechanical drawing for Industrial models
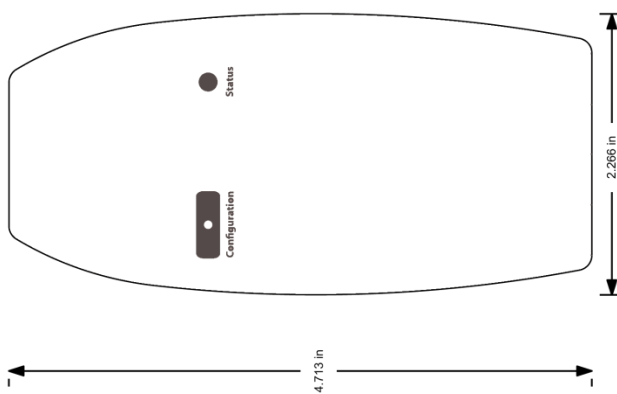
**WzzardC™ Commercial Models**



Figure 2: Mechanical drawing for WzzardC™ Commercial models

## MODEL NUMBERS

### WZZARD INDUSTRIAL MODELS

| Wzzard Intelligent Edge Nodes with SmartMesh IP and Bluetooth LE ||
|---|---|
| Model Number | Thermocouple |
| WSD2CTJ | Wireless Mesh 802.15.4e; 2 Thermocouple J-type Inputs,  1 Digital Output; External Antenna, Conduit Connector |
| WSD1CTJ | Wireless Mesh 802.15.4e; 2 Thermocouple J-type Inputs,  1 Digital Output; Internal Antenna, Conduit Connector |
| WSD2CTK | Wireless Mesh 802.15.4e; 2 Thermocouple K-type Inputs,  1 Digital Output; External Antenna, Conduit Connector |
| WSD1CTK | Wireless Mesh 802.15.4e; 2 Thermocouple K-type Inputs,  1 Digital Output; Internal Antenna, Conduit Connector |
| Model Number | Accelerometer |
| WSD2XV0 | Wireless Mesh 802.15.4e  Integrated Accelerometer; External Antenna |
| WSD1XV0 | Wireless Mesh 802.15.4e Integrated Accelerometer;  Internal Antenna |
| Model Number | Analog Inputs |
| WSD2MA2 | Wireless Mesh 802.15.4e; 2 Analog Inputs, 1 Digital Output; External Antenna, M12 Connector |
| WSD1MA2 | Wireless Mesh 802.15.4e; 2 Analog Inputs, 1 Digital Output; Internal Antenna, M12 Connector |
| WSD2CA2 | Wireless Mesh 802.15.4e; 2 Analog Inputs, 1 Digital Output; External Antenna, Conduit Connector |
| WSD1CA2 | Wireless Mesh 802.15.4e; 2 Analog Inputs, 1 Digital Output; Internal Antenna, Conduit Connector |
| WSD2CJA | Wireless Mesh 802.15.4e; 2 Analog Inputs, 1 Digital Output, 2 Thermocouple J-type inputs; External Antenna, Conduit Connector |
| WSD2MA3 | Wireless Mesh 802.15.4e; 3 Analog Inputs;  External Antenna, M12 Connector |
| WSD1MA3 | Wireless Mesh 802.15.4e; 3 Analog Inputs;  Internal Antenna, M12 Connector |
| WSD2CA3 | Wireless Mesh 802.15.4e; 3 Analog Inputs;  External Antenna, Conduit Connector |
| WSD1CA3 | Wireless Mesh 802.15.4e; 3 Analog Inputs;  Internal Antenna, Conduit Connector |
| Model Number | Digital Inputs |
| WSD2MD2 | Wireless Mesh 802.15.4e; 2 Digital Inputs, 2 Digital Outputs; External Antenna, M12 Connector |
| WSD1MD2 | Wireless Mesh 802.15.4e; 2 Digital Inputs, 2 Digital Outputs; Internal Antenna, M12 Connector |
| WSD2CD2 | Wireless Mesh 802.15.4e; 2 Digital Inputs, 2 Digital Outputs; External Antenna, Conduit Connector |
| WSD1CD2 | Wireless Mesh 802.15.4e; 2 Digital Inputs, 2 Digital Outputs; Internal Antenna, Conduit Connector |

### WZZARDC™ COMMERCIAL MODELS

| Wzzard Intelligent Edge Nodes with SmartMesh IP and Bluetooth LE ||
|---|---|
| Model Number | |
| WCD1TA3 | Wireless Mesh 802.15.4e; 3 Analog Inputs |
| WCD1TD2 | Wireless Mesh 802.15.4e; 2 Digital Inputs, 2 Digital Outputs |
| WCD1TTJ | Wireless Mesh 802.15.4e; 2 Thermocouple J-type Inputs, 1 Digital Output |

**B+B SMARTWORX**

## Declaration of Compliance

The undersigned representing the following supplier:

B+B Smartworx
707 Dayton Road
Ottawa, Illinois 61350 USA

Herewith declare under our sole responsibility:

| | |
|---|---|
| Model Numbers | WSDxxxx, WSBxxxx, where xxxx are alphanumeric characters. |
| Description | Wzzard Intelligent Edge Node |
| | Wzzard Basic Edge Node |

**The standards referenced below have been applied:**

| | | |
|---|---|---|
| EMC: | EN 61000-6-2:2005 | Immunity standard for industrial environments |
| | EN 61000-6-4:2007 | Emission standard for industrial environments |
| | FCC Part 15 CFR Title 47:2014 | |
| | ICES-003: 2012 Digital Apparatus (Industry Canada) | |
| | EN 61326-1:2012 | Electrical equipment for measurement, control and laboratory use – EMC requirements |
| | EN 55022:2010 +AC:2011 | Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement |
| | CISPR 22 Ed. 6.0b:2008 | Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement |
| | EN 55024:2010 | Information Technology Equipment – Immunity Characteristics – Limits and methods of measurement |
| | CISPR 24:2013 | Information Technology Equipment – Immunity Characteristics – Limits and methods of measurement |
| | IEC/EN 61000-4-2:2009 | ESD Immunity |
| | IEC/EN 61000-4-3:2006+A2:2010 | Radiated Immunity |
| | IEC/EN 61000-4-4:2012 | EFT/Burst Immunity |
| | IEC 61000-4-5:2005 | Surge Immunity |
| | EN 61000-4-5:2006 | Surge Immunity |
| | IEC/EN 61000-4-6:2009 | RF Conducted Immunity |

| | | |
|---|---|---|
| Environmental: | EN60068-2-6:2008 | Mechanical Vibration, 2G, 0.012in. displacement, 10-500 Hz |
| | EN60068-2-27:2009 | Mechanical Shock, 50G, 11ms. |

FCC Class B Notice: 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. 2. This device must accept any interference received, including interference that may cause undesired operation.

I hereby declare that the products named above meet the essential requirements of and are in conformity with the Standards listed.

Mike Fahrion
Director of Product Management
B+B Smartworx

Date:    July 6, 2015
Place:  Ottawa, Illinois, USA

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# B+B SmartWorx

## Declaration of Compliance

The undersigned representing the following supplier:

B+B Smartworx
707 Dayton Road
Ottawa, Illinois 61350 USA

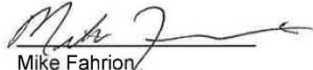Herewith declare under our sole responsibility:

| | |
|---|---|
| Model Numbers | WCDxxxx, , where xxxx are alphanumeric characters. |
| Description | WzzardC Intelligent Edge Node – Commercial |

**The standards referenced below have been applied:**

EMC:

| | |
|---|---|
| EN 61000-6-1:2007 | Immunity standard for light industrial environments |
| EN 61000-6-3:2006+A1:2011 | Emission standard for light industrial environments |
| FCC Part 15 CFR Title 47:2014 | |
| ICES-003:2012 Digital Apparatus (Industry Canada) | |
| EN 61326-1:2012 | Electrical equipment for measurement, control and laboratory use – EMC requirements |
| EN 55022:2010 +AC:2011 | Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement |
| CISPR 22 Ed. 6.0b:2008 | Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement |
| EN 55024:2010 | Information Technology Equipment – Immunity Characteristics – Limits and methods of measurement |
| CISPR 24:2013 | Information Technology Equipment – Immunity Characteristics – Limits and methods of measurement |
| IEC/EN 61000-4-2:2009 | ESD Immunity |
| IEC/EN 61000-4-3:2006+A2:2010 | Radiated Immunity |
| IEC/EN 61000-4-4:2012 | EFT/Burst Immunity |
| IEC/EN 61000-4-6:2009 | RF Conducted Immunity |

FCC Class B Notice: 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. 2. This device must accept any interference received, including interference that may cause undesired operation.

I hereby declare that the products named above meet the essential requirements of and are in conformity with the Standards listed.

Mike Fahrion
Director of Product Management
B+B Smartworx

Date:   July 9, 2015
Place:  Ottawa, Illinois, USA

**B+B SMARTWORX**

$CE$

## Declaration of Conformity

The undersigned representing the following supplier:

B+B Smartworx
707 Dayton Road
Ottawa, Illinois 61350 USA

Herewith declare under our sole responsibility:

| | |
|---|---|
| Model Numbers | WSDxxxx, WSBxxxx, WCDxxxx where xxxx are alphanumeric characters. |
| Description | Wzzard Intelligent Edge Node |
| | WzzardC Intelligent Edge Node (Commercial) |
| | Wzzard Basic Edge Node |

**These products are in conformity with the provisions of the following directives when used in accordance with the instructions contained in the product documentation.**

| | |
|---|---|
| 1999/5/EC | Radio and Telecommunications Terminal Equipment (R&TTE) Directive |
| 2011/65/EU | Reduction of Hazardous Substances Directive |

**The standards referenced below have been applied:**

| | | |
|---|---|---|
| EMC: | EN55022:2010+AC:2011 | Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement |
| | EN55024:2010 | Information Technology Equipment – Immunity Characteristics – Limits and methods of measurement |
| | EN61000-4-2:2009 | ESD Immunity |
| | EN61000-4-3:2006+A2:2010 | Radiated Immunity |
| | EN61000-4-4:2012 | EFT/Burst Immunity |
| | EN61000-4-5:2006 | Surge Immunity (n/a for WzzardC) |
| | EN61000-4-6:2009 | RF Conducted Immunity |

The authorized representative located within the community maintains a copy of the technical documentation required by the directives: B+B Smartworx, Westlink Commercial Park, Oranmore, Co. Galway, Ireland, Phone: +353 91 792444, Email: eSales@bb-elec.com.

I hereby declare that the product named above meets the essential requirements of, is in conformity with, and the CE mark has been applied according to, the relevant European directives listed above using the relevant sections of the European Standards and other normative documents listed above.

Mike Fahrion
Director of Product Management
B+B Smartworx

Date:    July 9, 2015
Place:  Ottawa, Illinois, USA