

## Datasheet

The Sure Cross® wireless system is a radio frequency network with integrated I/O that can operate in most environments and eliminate the need for wiring runs. DX99 wireless networks are formed around a Gateway, which acts as the wireless network master device, and one or more Intrinsically Safe Nodes.



- Wireless industrial I/O device with either one RS-485 input and boost voltage, or two analog inputs and boost voltage
- FlexPower® technology driven by one lithium primary battery integrated into the housing
- DIP switches for user configuration
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture ensure reliable data delivery within the unlicensed Industrial, Scientific, and Medical (ISM) band
- Transceivers provide bidirectional communication between the Gateway and Node, including fully acknowledged data transmission
- Lost RF links are detected and relevant outputs set to user-defined conditions
- DX99 Metal housings are certified for use in Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1; and Zone 0 (Category 1G) and Zone 20 (Category 1D) when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, or applicable local codes/regulations

For additional information, updated documentation, and accessories, refer to Banner Engineering's website, [www.bannerengineering.com/surecross](http://www.bannerengineering.com/surecross).

Models	Frequency	Boost Voltage	I/O
DX99N9X1S1S0V2X0D4	900 MHz ISM Band	13 V	Inputs (Modbus Mode): One RS-485
DX99N2X1S1S0V2X0D4	2.4 GHz ISM Band		Inputs (Voltage Mode): Two analog

These models ship with the battery disconnected. To install the battery, refer to the battery replacement instructions in this datasheet.

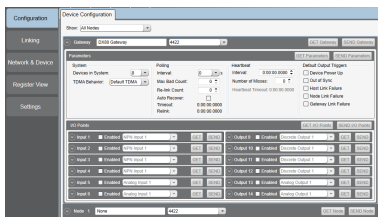


### WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

## Sure Cross® User Configuration Tool

The User Configuration Tool (UCT) offers an easy way to link I/O points in your wireless network, view I/O register values graphically, and set system communication parameters when a host system is not part of the wireless network.



The User Configuration Tool (UCT) software runs on any computer with the Windows 7, Windows 8, or Windows 10 operating system. Use a USB to RS-485 adapter cable to connect a standalone DX80 Gateway to the computer. For DXM Controllers with an internal DX80 radio, connect a computer to the DXM Controller using a USB or Ethernet connection. Download the most recent revisions of the UCT software from Banner Engineering's website: <http://www.bannerengineering.com/wireless>.

The USB to RS-485 adapter cable is not required for the DXM Controller. For standalone DX80 Gateway devices use:

- USB to RS-485 adapter cable model BWA-UCT-900 for 1 Watt radios
- USB to RS-485 adapter cable model BWA-HW-006 for all other radios

## Setting Up Your Wireless Network

To set up and install your wireless network, follow these steps.

Disconnect the power from your Sure Cross devices.



1. Configure the DIP switches of all devices.
2. If your device has I/O, connect the sensors to the Sure Cross devices. If your device does not have I/O, skip this step.
3. Refer to the wiring diagrams to apply power to all devices.
  - For two LED models, the Gateway's LED 1 is solid green and the Node's LED 2 flashes red to indicate there is no radio link to the Gateway.
  - For one LED models, the Gateway's LED is solid green and the Node's LED flashes red to indicate there is no radio link to the Gateway.
4. Form the wireless network by binding the Nodes to the Gateway. If the binding instructions are not included in the datasheet, refer to the product manual for binding instructions.
5. Observe the LED behavior to verify the devices are communicating with each other.
  - For two LED models, the Gateway's LED 1 is solid green and the Node's LED 1 flashes green to indicate it is communicating with the Gateway.
  - For one LED models, the Gateway's LED is solid green and the Node's LED flashes green to indicate it is communicating with the Gateway.
6. Conduct a site survey between the Gateway and Nodes. If the site survey instructions are not included in this datasheet, refer to the product manual for detailed site survey instructions.
7. Install your wireless sensor network components. If installation instructions are not included in this datasheet, refer to the product manual for detailed installation instructions.

For additional information, including installation and setup, weatherproofing, device menu maps, troubleshooting, and a list of accessories, refer to one of the following product manuals.

- Sure Cross® Wireless I/O Network Instruction Manual: [132607](#)
- Web Configurator Instruction Manual (used with "Pro" and DX83 models): [134421](#)
- Host Controller Systems Instruction Manual: [132114](#)

## Configure the DIP Switches

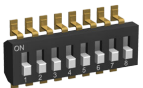
Before making any changes to the DIP switch positions, disconnect the power. DIP switch changes will not be recognized if power isn't cycled to the device. For devices with batteries integrated into the housing, remove the battery for at least one minute.

### Accessing the DIP Switches of a Single-Chamber Metal Housing

The DIP switches are located behind the rotary dials.

To access the DIP switches, follow these steps:

1. Unscrew and remove the top of the DX99 metal housing. The top section is the section with the glass window.
2. Pull the radio cover section off the bracket assembly. Two pins hold the radio cover to the bracket assembly.
3. Gently unplug the ribbon cable from the back of the radio cover.
4. Remove the black cover plate from the bottom of the device's cover.  
The DIP switches are located behind the rotary dials.



After making the necessary changes to the DIP switches, place the black cover plate back into position and gently push into place. Plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin. Mount the cover back onto the bracket assembly.

### DIP Switch Settings (RS-485 Boost)

\* Default configuration

#### Address Mode

The Sure Cross® wireless devices may use one of two types of addressing modes: rotary dial addressing or extended addressing. In rotary dial address mode, the left rotary dial establishes the network ID (NID) and the right rotary dial sets the device address. Extended address mode uses a security code to "bind" Nodes to a specific Gateway. Bound Nodes can only send and receive information from the Gateway they are bound to.

DIP Switches	
1	Device Settings
OFF *	Rotary dial address mode
ON	Extended address mode

Modbus/UCT Configuration or DIP Switch Configuration Mode

In Modbus/UCT Configured mode, the device parameters are changed using the User Configuration Tool (UCT) or a Modbus command. All DIP switch positions are ignored. In DIP Switch Configured mode, use the DIP switches to configure the parameters listed in the table.

DIP Switches	
2	Device Settings
OFF *	Modbus or UCT configured (overrides DIP switches)
ON	DIP switch configured

Modbus or Voltage Input Mode

When operating in Modbus mode, this DX99 device is configured to work with the Siemens Tank Monitoring Level Sensor, Model 2100. When operating in Modbus input configuration mode, DIP switches 4 and 5 are ignored.

To use other sensors, configure this device to operate in voltage input mode. While operating in voltage input mode, use DIP switches 4 and 5 to configure the voltage range for your inputs and the number of inputs available.

DIP Switches			Device Settings
3	4	5	Device Settings
OFF *			Modbus input configuration mode
ON			Voltage input mode
	OFF *		0–10V inputs
	ON		0–5V inputs
		OFF *	One voltage input
		ON	Two voltage inputs

Warm-Up Time and Sample/Report Rate

The warm-up time defines how long the device must power up the sensor before a stable sensor reading is taken. The sample/report rate defines how often the sensor is sampled and the values transmitted to the Gateway.

DIP Switches			Device Settings
6	7	8	Device Settings
OFF *	OFF *	OFF *	10 ms warm-up every 250 ms (sample/report rate)
OFF	OFF	ON	10 ms warm-up every 1 second (sample/report rate)
OFF	ON	OFF	10 ms warm-up every 4 seconds (sample/report rate)
OFF	ON	ON	250 ms warm-up every 4 seconds (sample/report rate)
ON	OFF	OFF	10 ms warm-up every 16 seconds (sample/report rate)

Modbus Register Table for Modbus Input Mode

This model is designed to work with Siemens Tank Monitoring Level Sensor, Model 2100. The registers listed in this table are specific to that sensor. If a Modbus timeout is detected, I/O points 1 through 5 are set to 65535.

I/O	Modbus Holding Register		I/O Type	I/O Range		Holding Register Representation	
	Gateway	Any Node		Min.	Max.	Min. (Dec.)	Max. (Dec.)
1	1	1 + (Node# × 16)	Float 1, Reg 43991	0	65535	0	65535
2	2	2 + (Node# × 16)	Float 2, Reg 43992	0	65535	0	65535
3	3	3 + (Node# × 16)	Temperature, Reg 43997	0	65535	0	65535
4	4	4 + (Node# × 16)	Error, Reg 44006	0	65535	0	65535

I/O	Modbus Holding Register		I/O Type	I/O Range		Holding Register Representation	
	Gateway	Any Node		Min.	Max.	Min. (Dec.)	Max. (Dec.)
5	5	5 + (Node# × 16)	Warning, Reg 44007	0	65535	0	65535
6	6	6 + (Node# × 16)					
7	7	7 + (Node# × 16)	Reserved				
8	8	8 + (Node# × 16)	Device Message				
		...					
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

Modbus Register Table for Voltage Input Mode

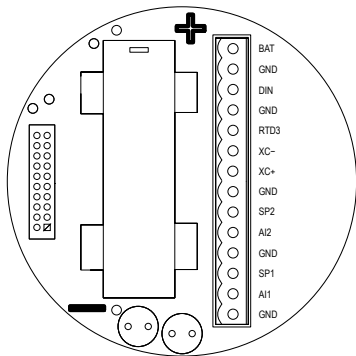
I/O	Modbus Holding Register		I/O Type	I/O Range		Holding Register Representation	
	Gateway	Any Node		Min.	Max.	Min. (Dec.)	Max. (Dec.)
1	1	1 + (Node# × 16)	Analog IN 1	0	65535*	0	65535 *
2	2	2 + (Node# × 16)	Analog IN 2	0	65535 *	0	65535 *
		...					
7	7	7 + (Node# × 16)	Reserved				
8	8	8 + (Node# × 16)	Device Message				
		...					
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

\* When using the 0–5V analog scale, the minimum and maximum register values are represented by 0 (0.00 Volts) to 32786 (5.00 Volts).

Terminal Blocks and Wiring

The complete control drawing is document 141513 at [www.bannerengineering.com](http://www.bannerengineering.com). In the control drawings, this device is the RS-485 Vin model.

The GND connection can be considered the same as the housing ground when using a stainless steel antenna feedthrough (model BWA-HW-016 or BWA-HW-017). When the stainless steel antenna feedthroughs are not used, the GND connection is isolated from the metal housing.

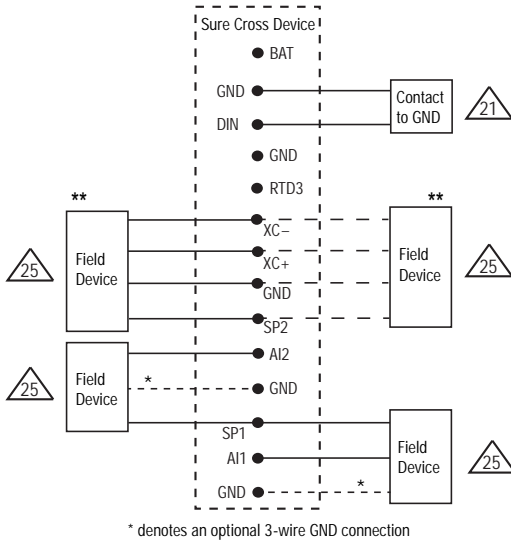


- AIx or Ax. Analog IN x
- BAT. Internal battery connection
- DIx. Discrete IN x
- GND. Ground/dc common connection
- SPx. Switch Power; provides variable power sources for external devices
- XC- and XC+. RS-485 connection. See Control Drawings.

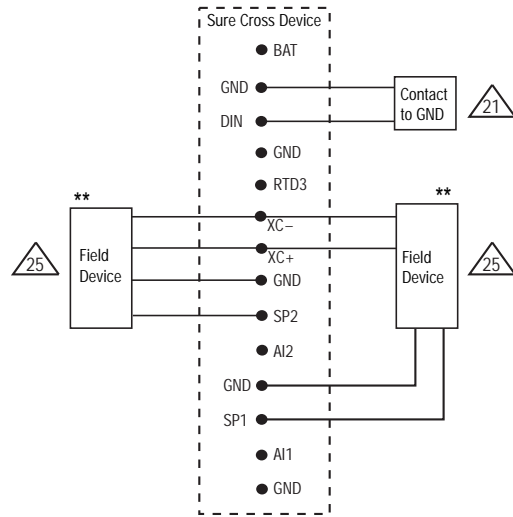
Control Drawings

RS-485 Cin/Vin - Single Chamber Metal Housing (DX99..D)

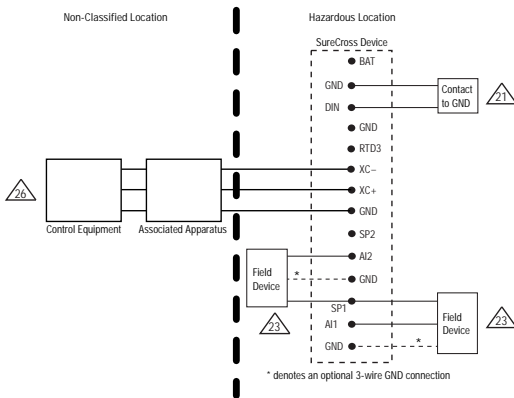
RS-485 Cin/Vin



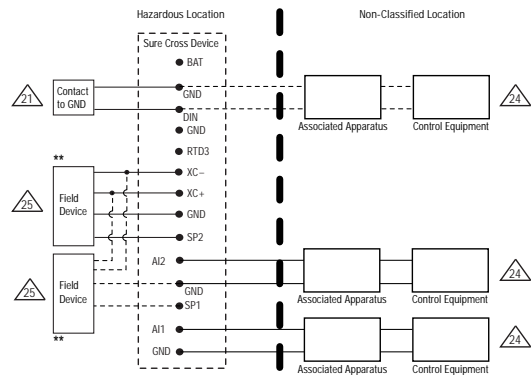
RS-485 Cin/Vin - without Analog I N



RS-485 Cin/Vin - Powered Externally from the FlexPower Node



RS-485 Cin/Vin - Powered Externally from the FlexPower Node



Entity Parameters - 21	
Uo/Voc	5.88 V
Io/Isc	1.80 mA
Po	2.65 mW
Co/Ca	43 µF
Lo/La	12.3 H

Entity Parameters - 24	
Ui/Vmax	30 V
Ii/Imax	120 mA
Pi	840 mW
Ci	0
Li	0

Entity Parameters - 23				
	10 V	13 V	18 V	19 V
Uo/Voc	12.6 V	15.75 V	21 V	23.1 V
Io/Isc	34.89 mA	78.22 mA	94.75 mA	114.56 mA
Po	110 mW	308 mW	498 mW	662 mW
Co/Ca	1104 nF	432 nF	142 nF	94 nF
Lo/La	32.8 mH	6.5 mH	4.4 mH	3.0 mH

Entity Parameters - 25				
		10 V	13 V	18 V
Uo/Voc		12.6 V	15.75 V	21 V
Io/Isc		44.59 mA	87.92 mA	104.45 mA
Po		141 mW	347 mW	549 mW
Co/Ca				
	Group A, B, IIC	1.104 µF	0.432 µF	0.142 µF
	Group C, IIB	7.35 µF	2.83 µF	1.22 µF
	Group D, IIA	26.95 µF	11.55 µF	4.73 µF
Lo/La				
	Group A, B, IIC	20.1 mH	5.1 mH	3.6 mH
	Group C, IIB	80.4 mH	20.6 mH	14.6 mH
	Group D, IIA	160.9 mH	41.3 mH	29.3 mH

Entity Parameters - 26		
Ui/Vmax	18 V	27 V
Ii/Imax	1 A	200 mA
Pi	3.25 W	333 mW
Ci	0	0
Li	0	0

\*\* The number of field devices connected to XC-, XC+, GND, SPx are limited by the following notes 1 and 2.

1. The total capacitance of all field devices/ cables that may be connected to terminals of Group 23 and Group 25 must not exceed the Co/Ca value shown in the table.
2. The total inductance of all field devices/cables that may be connected to terminals of Group 23 and Group 25 must not exceed the Lo/La values shown in the table.

Metal Enclosure	
CSA C/US	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1 Class I, Zone 0, Group IIC
LCIE/ATEX	Group IIC, Zone 0 Dust, Zone 20

Models	
DX99N9X1S1S0V2X0D4	DX99DR9SM-H24D2
DX99N2X1S1S0V2X0D4	DX99DR2SM-H24D2

### LED Behavior for the Nodes

Nodes do not sample inputs until they are communicating with the Gateway. The radios and antennas must be a minimum distance apart to function properly. Recommended minimum distances are:

- 2.4 GHz 65 mW radios: 1 foot
- 900 MHz 150 mW and 250 mW radios: 6 feet
- 900 MHz 1 Watt radios: 15 feet

LED 1	LED 2	Node Status
Flashing green		Radio Link Ok

LED 1	LED 2	Node Status
Flashing red	Flashing red	Device Error
	Flashing red, 1 per 3 sec	No Radio Link

## Storage and Sleep Modes

**Storage Mode** (applies to battery-powered models only)—While in storage mode, the radio does not operate. All Sure Cross® radios powered from an integrated battery ship from the factory in storage mode to conserve the battery. To wake the device, press and hold button 1 for 5 seconds. To put any *FlexPower*® or integrated battery Sure Cross radio into storage mode, press and hold button 1 for 5 seconds. The radio is in storage mode when the LEDs stop blinking, but in some models, the LCD remains on for an additional minute after the radio enters storage mode. After a device has entered storage mode, you must wait 1 minute before waking it.

**Sleep Mode** (applies to both battery and 10–30 V dc powered models)—During normal operation, the Sure Cross radio devices enter sleep mode after 15 minutes of operation. The radio continues to function, but the LCD goes blank. To wake the device, press any button.

## Assembly

Follow these steps to assemble your DX99...D Metal Housing with Dome Antenna model. The DX99 unit ships as a complete unit, including the radio core, housing, and integrated battery. One terminal header is also included in the shipment. To unpack and wire the unit:

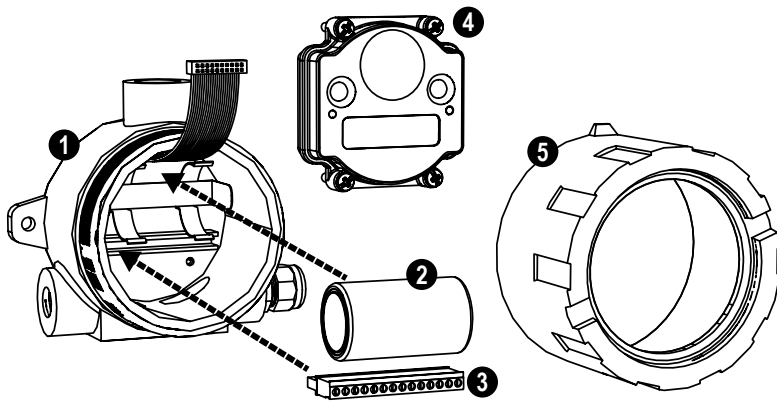


Figure 1. Installing the Battery and Terminal Header

Step 1. Open the end with the glass window (5) and gently lift the radio core unit (4) and the space frame it sits on up. The core unit connects to the space frame using two pins and the radio core is connected to the wiring board with a ribbon cable.

Step 2. Disconnect the ribbon cable from the radio.

Step 3. Insert the battery (2) into the battery holder, verifying the position and negative poles of the battery are positioned according to the markings on the board.

Step 4. Install the terminal header (3) onto the terminal pins.

Step 5. Insert your sensor wires through a cable gland and one of the two 1/2-inch NPT ports. Wire the sensor wires into the terminal header (3) according to the control drawings, p/n 141513. Use a cable gland certified for your region and environment. For a waterproof seal, refer to the waterproofing instructions in Banner document 132607.

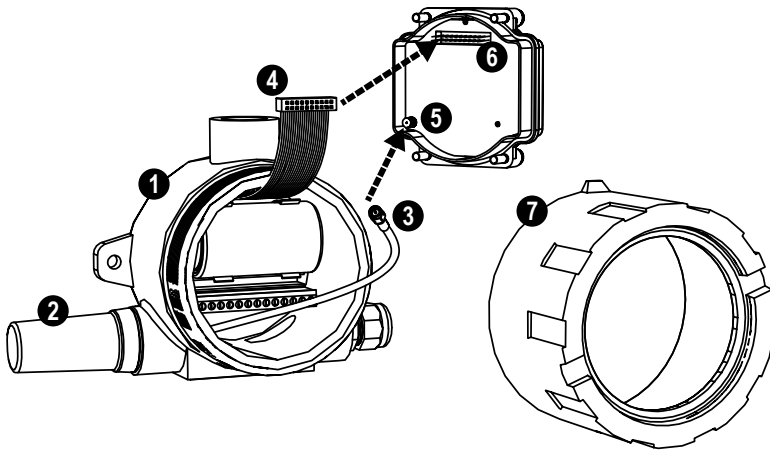


Figure 2. Installing and Connecting the Antenna

Step 6. To install the dome antenna (2), thread the antenna cable through the 1/2-inch NPT port and screw the dome antenna to the 1/2-inch NPT port.

Step 7. Connect the antenna cable (3) to the radio unit's antenna connector (5). (You may need to separate the space frame from the radio to do this.)

Step 8. Gently install the ribbon cable (4) into the ribbon cable pins (6), verifying the ribbon cable is seated on both rows of pins.

Step 9. Reconnect the space frame (not shown) to the radio core unit.

Step 10. Place the radio unit into the housing and gently push down until the spacer frame pin holes rest on the edge of the metal housing.

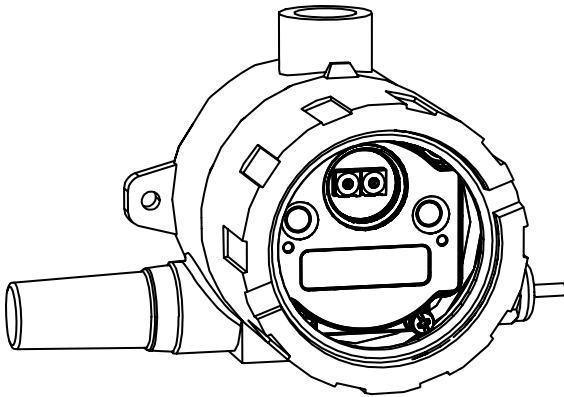


Figure 3. Final Assembly

Step 11. Close the metal cover firmly and lock closed using the set screw.

## Replacing the Battery (DX99...D Models)

To replace the lithium "D" cell battery in the metal housings, follow these steps.

1. Unscrew the lid of the metal enclosure.
2. Lift the radio out of the metal enclosure and pull the spacer frame off the back side of the radio.
3. Disconnect the radio by unplugging the ribbon cable from the radio board and set aside the radio and spacer frame.
4. Remove the discharged battery.
5. Replace with a new battery. Only use a 3.6 V lithium battery from Xeno, model number XL-205F.
6. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case. Caution: There is a risk of explosion if the battery is replaced incorrectly.



7. Wait two minutes.
8. Insert the ribbon cable through the center of the spacer frame, then plug the ribbon cable back into the radio board.
9. Insert the radio back onto the spacer frame pins. Push the radio and spacer frame assembly back into the enclosure until it is seated.
10. Screw on the lid and tighten.
11. After replacing the battery, allow up to 60 seconds for the device to power up.
12. Properly dispose of your used battery 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.



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.

The battery may be replaced in explosive gas atmospheres. Replacement battery model number: BWA-BATT-001. For pricing and availability, contact Banner Engineering.



**WARNING:**

- Do not replace battery when an explosive dust atmosphere may be present.
- The replacement battery **MUST** be a Banner approved battery, model number BWA-BATT-001. Use of a different battery will **VOID** the intrinsic safety rating of this device and may result in an explosion!
- When replacing the battery, the negative end of the battery holder is the side by the large capacitors. This side is marked with a minus (–) sign.
- Do not attempt to recharge the battery. These batteries are not rechargeable. Recharging may cause serious injury to personnel or damage the equipment. Replace only with factory recommended batteries.

## Specifications

**Radio Range<sup>1</sup>**

900 MHz, 150 mW: Up to 4.8 km (3 miles)  
 2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

**Minimum Separation Distance**

900 MHz, 150 mW: 2 m (6 ft)  
 2.4 GHz, 65 mW: 0.3 m (1 ft)

**Transmit Power**

900 MHz, 150 mW: 21 dBm (150 mW) conducted  
 2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

**900 MHz Compliance**

FCC ID TGUDX80 - This device complies with FCC Part 15, Subpart C, 15.247  
 IC: 7044A-DX8009

**2.4 GHz Compliance**

FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247  
 ETSI EN 300 328 V1.8.1 (2012-06)  
 IC: 7044A-DX8024

**Supply Voltage**

3.6 V dc low power option from an internal battery

**Power Consumption**

Consumption: Application dependant

**Housing**

Glass and cast aluminium w/ chromating and chemically resistant paint (outside only)

**Antenna Connection**

Ext. Reverse Polarity SMA, 50 Ohms  
 Max Tightening Torque: 0.45 N-m (4 lbf-in)

**Spread Spectrum Technology**

FHSS (Frequency Hopping Spread Spectrum)

**Interface**

Indicators: Two bi-color LEDs  
 Buttons: Two  
 Display: Six character LCD

**Wiring Access**

Two 1/2-inch NPT ports, one 3/4-inch NPT port (internal threads)

<sup>1</sup> Radio range is with the 2 dB antenna that ships with the product. High-gain antennas are available, but the range depends on the environment and line of sight. Always verify your wireless network's range by performing a Site Survey.

**Siemens Tank Monitoring Level Sensor Inputs**

Float 1, Float 2, and Temp Sample Rate: 2 minutes  
 Float 1, Float 2, and Temp Report Rate: 2 minutes  
 Float 1, Float 2, and Temp Warmup Time: 250 ms  
 Error and Warning Sample Rate: 15 minutes  
 Error and Warning Report Rate: 15 minutes  
 Error and Warning Warmup Time: 250 ms

The RS-485 inputs were designed to be used with Siemens Tank Monitoring Level Sensor, model 2100.

**RS-485 Inputs**

Interface: 2-wire half-duplex RS-485  
 Baud Rates: 9.6k, 19.2k (default), or 38.4k  
 Data Format: 8 data bits, no parity, 1 stop bit (even and odd parity selection are available)

**Analog Inputs**

Rating for 0-10V inputs: 10 V  
 Rating for 0-5V inputs: 5V  
 Sample Rate: 250 milliseconds  
 Report Rate: 250 milliseconds  
 Accuracy: 0.1% of full scale +0.01% per °C  
 Resolution: 15-bit

**Environmental Rating**

IEC IP68<sup>2</sup>

**Operating Conditions<sup>3</sup>**

-40 °C to +65 °C (-40 °F to +149 °F) (Electronics); -20 °C to +80 °C (-4 °F to +176 °F) (LCD)  
 95% maximum relative humidity (non-condensing)  
 Radiated Immunity: 10 V/m (EN 61000-4-3)

**Shock and Vibration**

IEC 68-2-6 and IEC 68-2-27  
 Shock: 30g, 11 millisecond half sine wave, 18 shocks  
 Vibration: 0.5 mm p-p, 10 to 60 Hz

**Certifications**



CSA: Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 (Ex ia IIC T4 / AEx ia IIC T4)  
 Certificate: 2008243

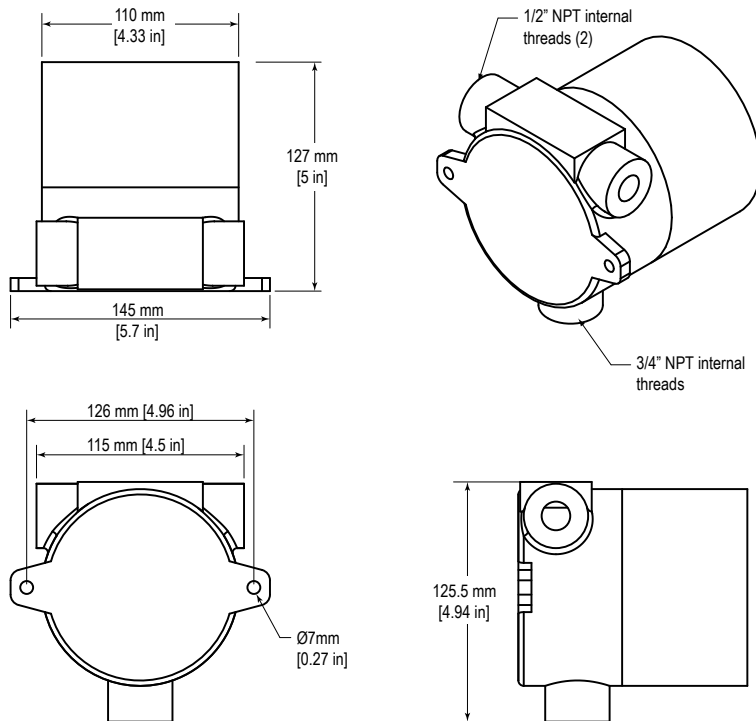


LCIE/ATEX: Zone 0 (Category 1G) and 20 (Category 1D), Temperature Class T4 (II 1 GD / Ex ia IIC T4 Ga / Ex ia IIIC T82°C Da IP68) Certificate: LCIE 08 ATEX 6098 X

Special Conditions for Safe Use imposed by Intrinsic Safety Certificate LCIE 08 ATEX 6098 X: Ambient temperature range is -40 to 70 °C. Sure Cross® DX99 FlexPower devices can only be connected to Intrinsically Safe certified equipment or simple apparatus as defined by EN 60079-11. All connected equipment must comply with the Entity Parameters (Safety Parameters) listed in the *Control Drawings* (p/n 141513). The device must only use a lithium battery manufactured by XENO, type XL-205F.



**Metal Housing Dimensions**



<sup>2</sup> Refer to the *Sure Cross® Wireless I/O Networks Instruction Manual* (p/n 132607) for installation and waterproofing instructions.  
<sup>3</sup> Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

## Included with Device (Metal Housing with Dome Antenna)

	Model	Qty	Item
Dome Antenna	BWA-902-001, or BWA-202-001	1	Dome Antenna, 902-928 MHz, 2 dBd Omni, 1/2-inch NPT, 18" cable, or Dome Antenna, 2.4 GHz, 2 dBd Omni, 1/2-inch NPT, 18" cable
	BWA-HW-024	1	Terminal strip header, 14 position

## Warnings

Install and properly ground a qualified surge suppressor when installing a remote antenna system. Remote antenna configurations installed without surge suppressors invalidate the manufacturer's warranty. Keep the ground wire as short as possible and make all ground connections to a single-point ground system to ensure no ground loops are created. No surge suppressor can absorb all lightning strikes; do not touch the Sure Cross® device or any equipment connected to the Sure Cross device during a thunderstorm.

Exporting Sure Cross® Radios. It is our intent to fully comply with all national and regional regulations regarding radio frequency emissions. Customers who want to re-export this product to a country other than that to which it was sold must ensure the device is approved in the destination country. A list of approved countries appears in the *Radio Certifications* section of the product manual. The Sure Cross wireless products were certified for use in these countries using the antenna that ships with the product. When using other antennas, verify you are not exceeding the transmit power levels allowed by local governing agencies. Consult with Banner Engineering Corp. if the destination country is not on this list.

Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. For the most recent version of any documentation, refer to: [www.bannerengineering.com](http://www.bannerengineering.com). © Banner Engineering Corp. All rights reserved.

## Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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