



SureCross™ DX99 Intrinsically Safe (IS) FlexPower™ Node with Integrated Battery

Configurable Node with an integrated battery and metal housing for 2 discrete inputs and 2 analog inputs



DX80...B Models



DX80...D Models

The SureCross™ DX99 is a radio frequency network system built around a Gateway and one or more Intrinsically Safe Nodes.

- Wireless industrial I/O device with two discrete inputs and two analog inputs
- 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 (Group IIC) and Zone 20 (Group II) when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, LCIE/ATEX, or applicable local codes/regulations
- Integrated lithium battery for up to five years of service
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific, and Medical (ISM) bands
- Transceivers provide two-way communication between the Gateway and Node, including fully acknowledged data transmission; lost RF links are detected and relevant outputs set to user-defined conditions
- Internal or external antenna

Model	Frequency	Antenna	Housing	Boost Voltage	I/O
DX99N9X1S2N0M2X0B2	900 MHz ISM Band	External	Metal, dual chamber	18V	Discrete Inputs: Two Selectable Analog Inputs: Two 0–20 mA
DX99N9X1W2N0M2X0B2		Internal			
DX99N9X1S2N0M2X0D2		External	Metal, single chamber		
DX99N9X1W2N0M2X0D2		Internal			
DX99N2X1S2N0M2X0B2	2.4 GHz ISM Band	External	Metal, dual chamber		
DX99N2X1W2N0M2X0B2		Internal			
DX99N2X1S2N0M2X0D2		External	Metal, single chamber		
DX99N2X1W2N0M2X0D2		Internal			
DX99N9X1S2N0M2X0B1	900 MHz ISM Band	External	Metal, dual chamber	10V	
DX99N9X1W2N0M2X0B1		Internal			
DX99N9X1S2N0M2X0D1		External	Metal, single chamber		
DX99N9X1W2N0M2X0D1		Internal			
DX99N2X1S2N0M2X0B1	2.4 GHz ISM Band	External	Metal, dual chamber		
DX99N2X1W2N0M2X0B1		Internal			
DX99N2X1S2N0M2X0D1		External	Metal, single chamber		
DX99N2X1W2N0M2X0D1		Internal			

(Models table continued on next page.)



WARNING . . . Not To Be Used for Personnel Protection

Never use these products for personnel protection. Doing so could lead to serious injury or death.

These products do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A failure or malfunction can cause either an energized or de-energized output condition. Consult your current Banner Safety Products catalog for safety products that meet OSHA, ANSI, and IEC standards for personnel protection.



SureCross™ DX99 Wireless FlexPower™ Node

Model	Frequency	Antenna	Housing	Boost Voltage	I/O
DX99N9X1S2N0V2X0B2	900 MHz ISM Band	External	Metal, dual chamber	18V	Discrete Inputs: Two Selectable Analog Inputs: Two 0-10V
DX99N9X1W2N0V2X0B2		Internal			
DX99N9X1S2N0V2X0D2		External	Metal, single chamber		
DX99N9X1W2N0V2X0D2		Internal			
DX99N2X1S2N0V2X0B2	2.4 GHz ISM Band	External	Metal, dual chamber		
DX99N2X1W2N0V2X0B2		Internal			
DX99N2X1S2N0V2X0D2		External	Metal, single chamber		
DX99N2X1W2N0V2X0D2		Internal			
DX99N9X1S2N0V2X0B1	900 MHz ISM Band	External	Metal, dual chamber	10V	
DX99N9X1W2N0V2X0B1		Internal			
DX99N9X1S2N0V2X0D1		External	Metal, single chamber		
DX99N9X1W2N0V2X0D1		Internal			
DX99N2X1S2N0V2X0B1	2.4 GHz ISM Band	External	Metal, dual chamber		
DX99N2X1W2N0V2X0B1		Internal			
DX99N2X1S2N0V2X0D1		External	Metal, single chamber		
DX99N2X1W2N0V2X0D1		Internal			

Hookup Diagrams

Modbus Register Block (mA Models)

I/O Point*	Modbus Holding Register		I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway	Any Node			Min. Value	Max. Value	Min. (Decimal)	Max. (Decimal)	
1	1	1 + (node# × 16)	Discrete IN 1	-	0	1	0	1	DI1
2	2	2 + (node# × 16)	Discrete IN 2	-	0	1	0	1	DI2
3	3	3 + (node# × 16)	Analog IN 1	mA	0.0	20.0	0	65535	A1+
4	4	4 + (node# × 16)	Analog IN 2	mA	0.0	20.0	0	65535	A2+
5	5	5 + (node# × 16)							
6	6	6 + (node# × 16)							
7	7	7 + (node# × 16)	Reserved						
8	8	8 + (node# × 16)	Device Message						
9	9	9 + (node# × 16)							
10	10	10 + (node# × 16)							
11	11	11 + (node# × 16)							
12	12	12 + (node# × 16)							
13	13	13 + (node# × 16)							
14	14	14 + (node# × 16)							
15	15	15 + (node# × 16)	Control Message						
16	16	16 + (node# × 16)	Reserved						

* These are the I/O points as displayed on the device LCD.

5-pin M12 Euro Hookup



FlexPower™

3	Blue	dc common (GND)
5	Gray	3.6V dc

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).

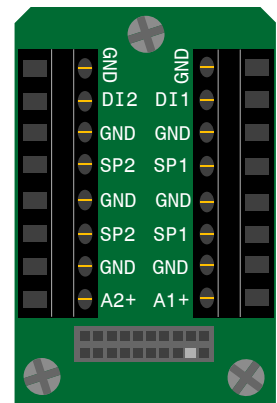
When the stainless steel antenna feedthroughs are not used, the GND connection is isolated from the metal housing.

Wiring Diagrams

For CSA C/US and LCIE/ATEX approved wiring procedures and to check the Entity Parameters (Safety Parameters), refer to the complete

Additional Information

For additional information, including installation and setup, weatherproofing, device menu maps, troubleshooting, and a list of accessories, please refer to the SureCross™ DX80 Wireless I/O



Label	Function
GND	Ground.
DIx	Discrete IN x.
SPx	Switch Power. Provides variable power sources for external devices.
Ax+	Analog IN. Analog inputs for devices requiring more than one connection, such as thermocouples and RTDs.
Ax-	

Example Installation



The DX99 unit ships as a complete unit, including the radio core, housing, and integrated battery. A small bag containing a black flexible antenna extension cable and three mounting screws is also included in the shipment.

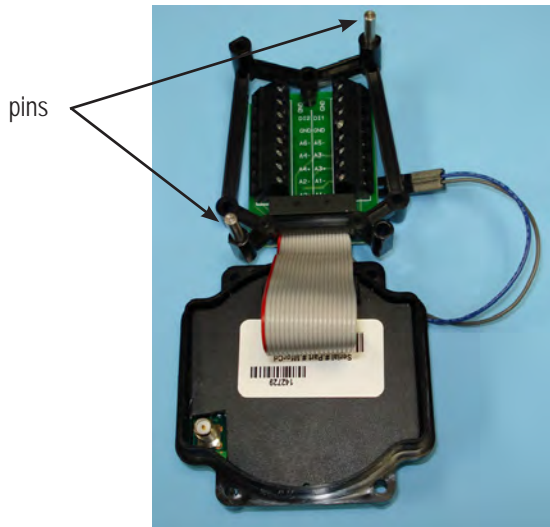
(For internal antenna models, the flexible antenna extension cable is not included.)

To unpack and wire the unit:

1. Open the end with the glass window and remove the radio core. This core unit ships from Banner placed within the compartment without being fastened down.



2. Gently pull the radio cover away from the screw terminal board. These two components are held together using pins, not screws.





3. Insert your sensor wires through a cable gland and one of the two 1/2" NPT ports. Wire the sensor wires into the screw terminals

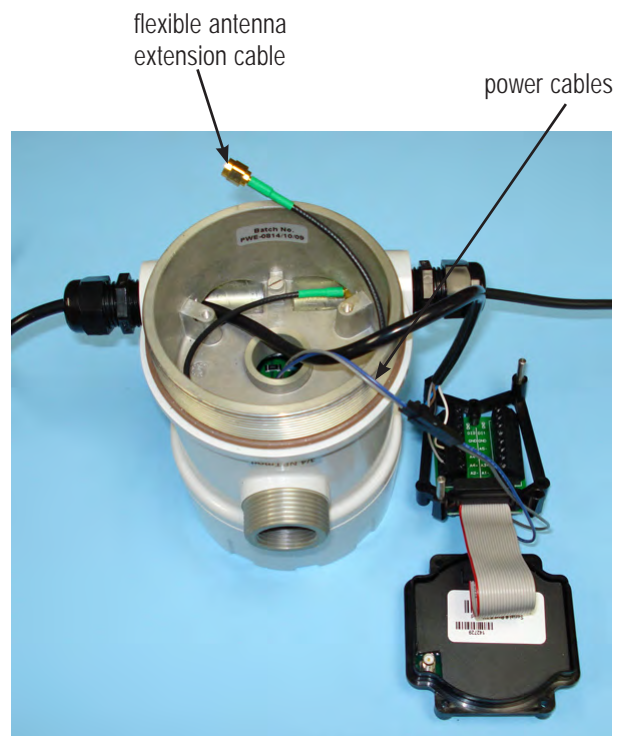
Use a cable gland certified for your region and environment.

4. Thread your antenna cable through a cable gland and into the other 1/2" NPT port. Use a cable gland certified for your region and environment. (Not applicable for internal antenna models.)

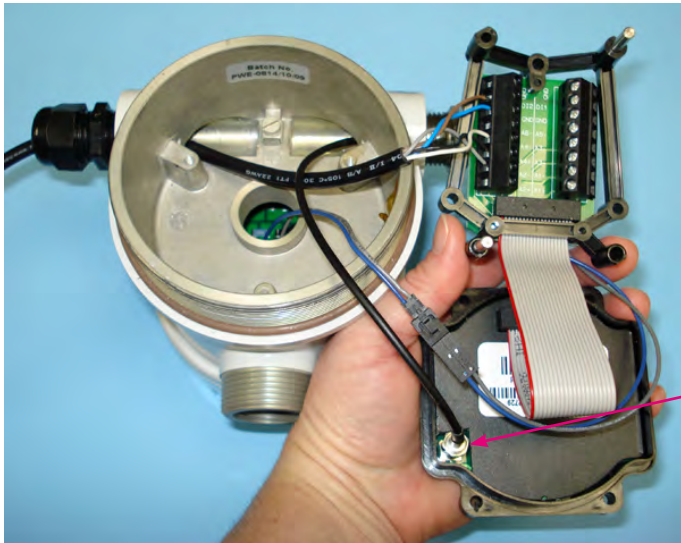
When using the stainless steel antenna feedthrough (sold separately), thread the antenna cable through the port and thread the stainless steel antenna feedthrough into the port. For a waterproof seal, refer to the waterproofing instructions in Banner document 132607.

5. Connect the end of your antenna cable to the supplied flexible antenna extension cable or to the antenna connector on the stainless steel antenna feedthrough. (The supplied flexible antenna extension cable remains inside the DX99 housing.)

6. Connect the blue and gray power wires coming from inside the battery compartment to the power wires attached to the bottom of the board.



SureCross™ DX99 Wireless FlexPower™ Node

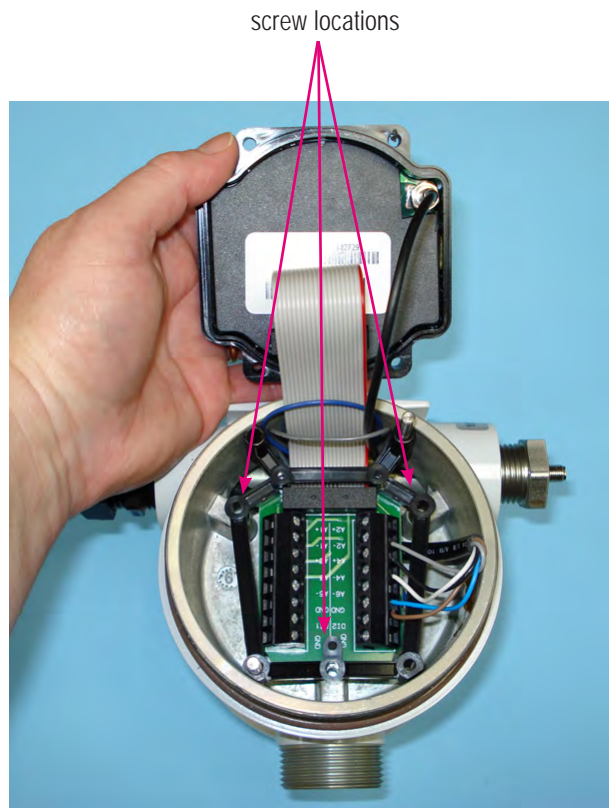


7. Attach the flexible antenna extension or antenna feedthrough cable to the radio unit's antenna connector. (Not applicable for internal antenna models.)
8. Allow both the flexible antenna extension cable and the sensor cable to feed under the screw terminal board in the direction of the antenna connector (shown).
9. Feed any excess power wires back into the battery compartment.

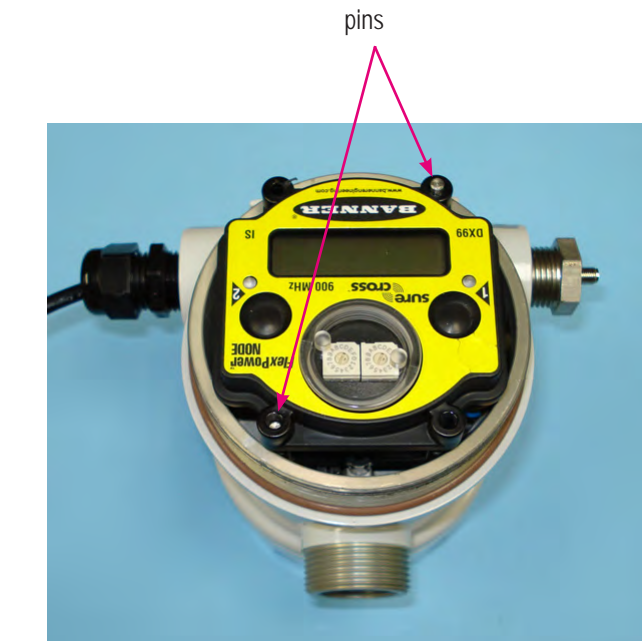
antenna connector

10. Using the three screws that shipped with the flexible antenna extension cable, mount the screw terminal board to the metal housing.

11. Pull any excess antenna cable or sensor cables out of the metal housing.



screw locations



pins

12. Align the radio cover's pin holes onto the pins in the screw terminal board and reconnect the two components together.

The plastic gland is shown as an example. Use glands appropriate for your application.



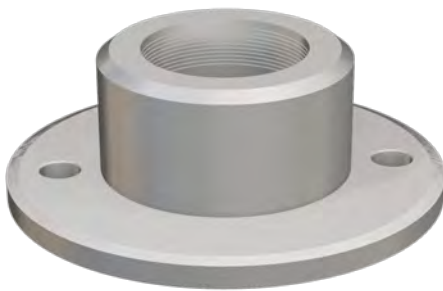
This stainless steel antenna feedthrough with antenna extension cable attached is an accessory and does not ship with the metal housing models.

set screw

Seal all openings:

13. To seal all ports, use glands appropriate for your application. Tighten all glands according
14. Close the metal cover firmly and lock closed using the set screw.

Accessories



Banner Part No: 12533
Model No: BWA-HW-019
Description: M36 Flange Mount
Price Ea: \$68

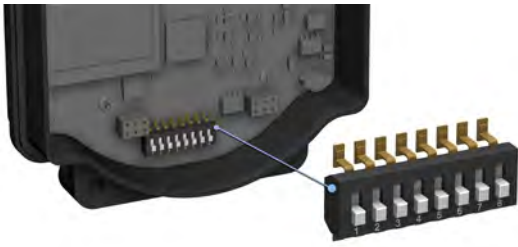


Banner Part No: 12534
Model No: BWA-HW-020
Description: U-Bolt Mounting Bracket
Price Ea: \$63



Banner Part No: 11834
Model No: BWA-HW-016
Description: Antenna Feedthrough, SS, 1/2" NPT
Price Ea: \$62
Banner Part No: 11835
Model No: BWA-HW-017
Description: Antenna Feedthrough, SS, 3/4" NPT
Price Ea: \$66

Device Configuration



Device Settings	Switches	
	1	2
Rotary Switch Address Mode	OFF	
DX80 Extended Address Mode	ON	
Analog Configuration		OFF
Discrete Configuration		ON

Accessing the DIP Switches (Metal Housing)

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 screw terminal board base. The radio cover is held to the screw terminal board using two pins.

The DIP switches are located behind the rotary dials. Mount the radio cover back onto the pins attached to the screw terminal board.

Address Mode

The SureCross wireless devices may use one of two types of addressing modes: rotary switch addressing or extended addressing. In **rotary switch** address mode, the left rotary dial establishes the network ID and the right rotary dial sets the device ID. The wireless network is restricted to a maximum of 16 devices.

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. In extended address mode, wireless networks may contain up to 56 radio devices. For more information on extended address mode, refer to the SureCross™ Wireless I/O Network product manual.

The device ships in rotary switch address mode by default, with the DIP switch in the OFF position. To use extended address mode, change the DIP switch to the ON position.

Turn the Power Off

Before making any changes to the DIP switch positions, disconnect the power. For devices with batteries integrated into the housing, remove the battery.

Host Configured

Selecting “Host Configured (override switches)” uses the factory’s default configuration for this device or allows a host system to set parameters. If the host configured option is not selected, use the DIP switches to configure the device parameters.

Warm-Up Time

The warm-up time defines how long the device must power up the sensor before a stable sensor reading is taken.

Discrete Input Type

Select the discrete input type: sourcing (PNP) or sinking (NPN).

Analog or Discrete Configuration

Select between an analog configuration or a discrete configuration using the DIP switch specified in the table. The default switch settings for this device are all in the OFF position.

Sample and Report Rates

The sample rate defines how often the Node samples the sensor. The report rate defines how often the Node communicates the I/O status to the Gateway. For FlexPower™ applications, setting the sample and/or report rates to slower rates extends the battery life.

Change of state reporting sets the system to report only when the value crosses the threshold setting.

Analog Configuration - 10V Boost Models

For analog configuration, DIP switch 2 is in the OFF position (factory default). Analog configuration has analog IN 1 linked to switch power 1 (SP1) and is programmable using switches four through eight. Sample and report rates for analog input 2 are listed in the specifications. Discrete inputs 1 and 2 are also active in this configuration and the input types are defined using switch 3. Two sinking discrete outputs are active for this configuration.

Analog Configuration, Switch 2 OFF	DIP Switches					
Descriptions	3	4	5	6	7	8
Discrete Sinking (NPN)	OFF*					
Discrete Sourcing (PNP)	ON					
Warm-up Time 10 ms		OFF*	OFF*			
Warm-up Time 62.5 ms		OFF	ON			
Warm-up Time 125 ms		ON	OFF			
Warm-up Time 2 seconds		ON	ON			
Sample/Report Rate 1 second				OFF	OFF	OFF
Sample/Report Rate 2 second				OFF	OFF	ON
Sample/Report Rate 4 second				OFF	ON	OFF
Sample/Report Rate 16 second				OFF	ON	ON
Sample/Report Rate 64 second				ON	OFF	OFF
Sample/Report Rate 5 minutes				ON	OFF	ON
Sample/Report Rate 15 minutes				ON	ON	OFF
Host Configured (override switches)				ON	ON	ON

Analog IN 2, Discrete IN 1, and Discrete IN 2 are not powered from switched power terminals.

Discrete Configuration - 10V and 18V Boost Models

The discrete configuration matches the switch power outputs (SP1, SP2) with the discrete inputs. The analog inputs are disabled. The discrete configuration is selected when switch 2 is in the ON position. Two sinking discrete outputs are active for this configuration.

Discrete Configuration, Switch 2 ON	DIP Switches					
Descriptions	3	4	5	6	7	8
Discrete Sinking (NPN)	OFF*					
Discrete Sourcing (PNP)	ON					
Warm-up Time 5 milliseconds		OFF*	OFF*			
Warm-up Time 10 milliseconds		OFF	ON			
Warm-up Time 62.5 milliseconds		ON	OFF			
Warm-up Time 125 milliseconds		ON	ON			
Sample/Report Rate 62.5 milliseconds				OFF	OFF	OFF
Sample/Report Rate 125 milliseconds				OFF	OFF	ON
Sample/Report Rate 250 milliseconds				OFF	ON	OFF
Sample/Report Rate 500 milliseconds				OFF	ON	ON
Sample/Report Rate 1 second				ON	OFF	OFF
Sample/Report Rate 2 seconds				ON	OFF	ON
Sample/Report Rate 16 seconds				ON	ON	OFF
Host Configured (override switches)				ON	ON	ON

SureCross™ DX99 Wireless FlexPower™ Node

Analog Configuration - 18V Boost Models

For analog configuration, DIP switch 2 is in the OFF position (factory default). Analog configuration has analog IN 1 linked to switch power 1 (SP1) and is programmable using switches four through eight. Sample and report rates for analog input 2 are listed in the specifications. Discrete inputs 1 and 2 are also active in this configuration and the input types are defined using switch 3. Two sinking discrete outputs are active for this configuration.

Analog Configuration, Switch 2 OFF	DIP Switches					
Descriptions	3	4	5	6	7	8
Discrete Sinking (NPN)	OFF*					
Discrete Sourcing (PNP)	ON					
Warm-up Time 20 milliseconds		OFF*	OFF*			
Warm-up Time 2 seconds		OFF	ON			
Warm-up Time 4 seconds		ON	OFF			
Warm-up Time 8 seconds		ON	ON			
Sample/Report Rate 4 second				OFF	OFF	OFF
Sample/Report Rate 8 second				OFF	OFF	ON
Sample/Report Rate 16 second				OFF	ON	OFF
Sample/Report Rate 64 second				OFF	ON	ON
Sample/Report Rate 5 minutes				ON	OFF	OFF
Sample/Report Rate 15 minutes				ON	OFF	ON
Sample/Report Rate 30 minutes				ON	ON	OFF
Host Configured (override switches)				ON	ON	ON

Analog IN 2, Discrete IN 1, and Discrete IN 2 are not powered from switched power terminals.

LED Status

Gateway Status	LED 1	LED 2
Power ON	● Green ON	—
Modbus Communication Active	—	☀ Yellow Flash
Modbus Communication Error	—	☀ Red Flash
System Error	☀ Red Flash	☀ Red Flash



Node Status	LED 1	LED 2
RF Link Ok	☀ Green Flash (1 per sec)	—
RF Link Error	—	☀ Red Flash (1 every 3 sec)
System Error	☀ Red Flash	☀ Red Flash (1 per sec)



Metal Enclosure Battery Replacement (DX80...B Housings)



To replace the lithium "D" cell battery in the device,

1. Unscrew the lid on the back side of the metal enclosure.
2. Remove the discharged battery and replace with a new battery. Only use a 3.6V lithium battery from Xeno, model number XL-205F.
3. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case. The negative end is toward the spring. Caution: There is a risk of explosion if the replacement battery is incorrect.
4. Screw on the lid and tighten.
5. After replacing the battery, allow up to 60 seconds for the device to power up.

When removing the battery, press the battery towards the negative terminal to compress the spring. Pry up on the battery's positive end to remove from the battery holder. 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.



Warning: Explosions may result in death or serious injury. Do not remove the instrument cover or open the wiring housing in explosive atmospheres when power and communications are on. Remove the battery-powered device from the hazardous location before opening the cover and replacing the battery.

Warning: 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!

Warning: When replacing the battery, the negative end of the battery holder is the side with the spring terminal. This side is marked with a minus (-) sign.

Warning: 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.

Metal Enclosure Battery Replacement (DX80...D Housings)



To replace the lithium "D" cell battery in the device,

1. Unscrew the lid of the metal enclosure.
2. Remove the discharged battery and replace with a new battery. Only use a 3.6V lithium battery from Xeno, model number XL-205F.
3. 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 replacement battery is incorrect.
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When removing the battery, press the battery towards the negative terminal to compress the spring. Pry up on the battery's positive end to remove from the battery holder. 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.

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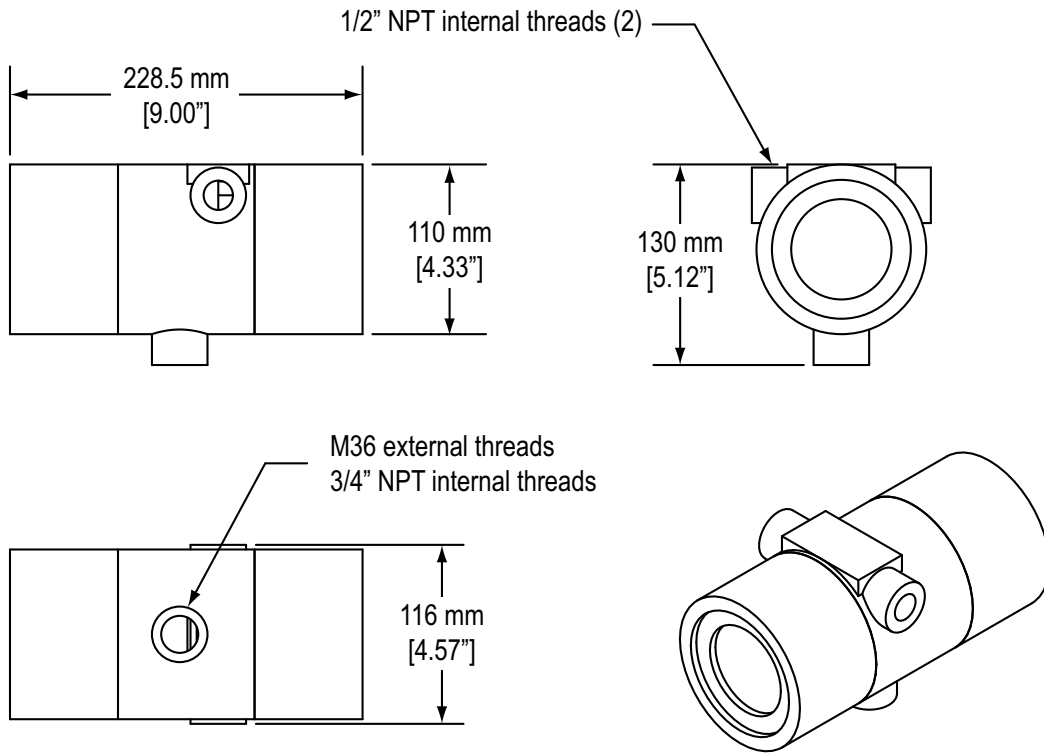
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Dimensions (DX80...B Housings)



Specifications

Many of the parameters are configurable. The values in the tables represent factory defaults unless otherwise noted.

Radio

Range, with standard 2 dB antenna*

- 900 MHz: Up to 4.8 kilometers (3 miles)
- 2.4 GHz: Up to 3.2 kilometers (2 miles)

Transmit Power

- 900 MHz: 21 dBm Conducted
- 2.4 GHz: 18 dBm Conducted, 20 dBm EIRP

Spread Spectrum Technology. FHSS (Frequency Hopping Spread Spectrum)

Antenna

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

Link Timeout. Defined by Gateway

* The range depends on the environment and line of sight. High-gain antennas are available to increase the range.

General

Power. 3.6V dc low power option

Power Consumption. Application dependent

Interface

- Two bi-color LEDs
- Two push buttons
- Six character LCD

Inputs

Discrete Inputs. Sourcing or Sinking (DIP switch selectable)

Discrete Input Rating. See control drawing

Discrete Input Sample Rate. Switch configurable, see tables

Discrete Input Report Rate. Switch configurable, see tables

Discrete Input ON Condition

- Sourcing:** Greater than 8V
- NPN Sinking:** Less than 0.7V

Discrete Input OFF Condition

- Sourcing:** Less than 4.5V
- NPN Sinking:** Greater than 2.2V or open

Analog Inputs. 0 to 20 mA or 0 to 10V (depending on model)

Analog Input 1 Sample / Report Rate. Switch configurable, see tables

Analog Input 2 Sample / Report Rate. 1 second / 16 seconds

Accuracy. 0.1% of full scale +0.01% per °C

Resolution. 12-bit

Environmental

Operating Temperature*. -40 to +70° C

Operating Humidity. 95% max. relative (non-condensing)

Radiated Immunity. 10 V/m, 80-2700 MHz (EN61000-6-2)

Shock and Vibration

IEC 68-2-6 and IEC 68-2-7

Shock: 30g, 11 millisecond half sine wave, 18 shocks

Vibration: 0.5 mm p-p, 10 to 60 Hz

* Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Radio Compliance

900 MHz Models

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

2.4 GHz Models

- FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247
- ETSI/EN: In accordance with EN 300 328: V1.7.1 (2006-05)
- IC: 7044A-DX8024



It is Banner Engineering's 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 that the device is approved in the destination country. A list of approved countries appears in the SureCross DX80 Wireless Product Manual, in the *Agency Certifications* section. The SureCross wireless products were certified for use in these countries using the standard 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 if the destination country is not on this list.

Classified Areas Certifications

(DX99...B, Intrinsically Safe, Metal Housing)

CSA

Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G;

Class III, Division 1; Certificate: 2008243

Ex ia IIC T4 AEx ia IIC T4



LCIE/ATEX

Zone 0 (Group IIC) and Zone 20 (Group II) Certificate: LCIE 08 ATEX 6098 X **

Ex II 1 GD Ex ia IIC T4 Ex iaD 20 Ta +82°C IP68

Special Conditions for Safe Use imposed by Intrinsic Safety Certificate LCIE 08 ATEX 6098 X:

- Ambient temperature range is -40°C to +70°C.
- SureCross™ 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 document 141513.
- The device must only use a lithium battery manufactured by XENO, type XL-205F.

Included with Device	Model	Qty	Item
Antenna Pack	BWA-HW-012	1	Flexible antenna extension cable, three screws
Antenna	BWA-902-C, or BWA-202-C	1	Antenna, 902-928 MHz, 2 dBd Omni, Rubber Swivel RSMA Male, or Antenna, 2.4 GHz, 2 dBd Omni, Rubber Swivel RSMA Male
SureCross Literature CD	79685	1	SureCross Literature CD