SureCross DX99 FlexPower Node (Polycarbonate Housing)

Switch configurable Node with two discrete inputs and two analog inputs (powered by external battery module only)

For additional information, updated documentation, and accessories, refer to Banner Engineering's website, *www.bannerengineering.com/surecross*.

The SureCross® 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 two selectable discrete inputs and two analog inputs
- *Flex*Power® power input requires power from the DX81H Battery Supply Module
- 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 Polycarbonate housings are certified for use in Class I, Division 1, Groups A, B, C, D; and Zone 0 (Category 1G) when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, or applicable local codes/regulations

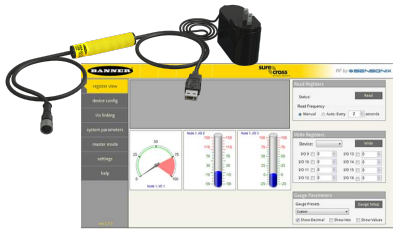
Model (0 to 20 mA)	Frequency	Boost Voltage	Inputs and Outputs	
DX99N9X2S2N0M2X0A2	900 MHz ISM Band	18V	**Discrete Mode** Inputs: Two selectable discrete Switch Power: Two, Configurable	**Analog Mode** Inputs: Two selectable discrete, two 0 to 20 mA analog Switch Power: One, Configurable
DX99N2X2S2N0M2X0A2	2.4 GHz ISM Band			
DX99N9X2S2N0M2X0A1	900 MHz ISM Band	10V		
DX99N2X2S2N0M2X0A1	2.4 GHz ISM Band			

Model (0 to 10V)	Frequency	Boost Voltage	Inputs and Outputs	
DX99N9X2S2N0V2X0A2	900 MHz ISM Band	18V	**Discrete Mode** Inputs: Two selectable discrete Switch Power: Two, Configurable	**Analog Mode** Inputs: Two selectable discrete, two 0 to 10V analog Switch Power: One, Configurable
DX99N2X2S2N0V2X0A2	2.4 GHz ISM Band			
DX99N9X2S2N0V2X0A1	900 MHz ISM Band	10V		
DX99N2X2S2N0V2X0A1	2.4 GHz ISM Band			

Internal antenna models are also available. For more information, contact your local Banner Engineering Corp. representative.

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.

SureCross 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 UCT requires a special USB to RS-485 (model number BWA-UCT-900 for 1 Watt radios, BWA-HW-006 can be used for all other radios) converter cable to pass information between your computer and the Gateway. Download the most recent revisions of the UCT software from Banner Engineering's website: *http://www.bannerengineering.com/wireless*.

Setting Up Your Wireless Network

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

Disconnect the power from your SureCross devices.

1. Configure the DIP switches of all devices.
2. Connect the sensors to the SureCross devices.
3. Apply power to all devices.
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.
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.

- SureCross Wireless I/O Network Manual: *132607*
- Web Configurator Manual (used with "Pro" and DX83 models): *134421*
- Host Configuration Manual *132114*

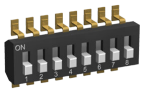
Configuring the DIP Switches

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.

Accessing the Internal DIP Switches

To access the internal DIP switches, follow these steps:

1. Unscrew the four screws that mount the cover to the bottom housing.
2. Remove the cover from the housing without damaging the ribbon cable or the pins the cable plugs into.
3. Gently unplug the ribbon cable from the board mounted into the bottom housing.
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 housing.

DIP Switch Settings

	Switches	
Device Settings	**1**	**2**
Rotary dial address mode	OFF*	
Extended address mode	ON	
Analog Configuration		OFF*
Discrete Configuration		ON

* Default configuration

Address Mode

The SureCross 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 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 to which they are bound. In extended address mode, wireless networks may contain up to 48 radio devices. For more information on extended address mode, refer to the SureCross™ Wireless I/O Network product manual.

The device ships in rotary dial 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.

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.

Analog Configuration - Switch 2 OFF (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.

Analog Configuration, Switch 2 OFF	**DIP Switches**					
Descriptions	**3**	**4**	**5**	**6**	**7**	**8**
Discrete Input Sinking (NPN)	OFF*					
Discrete Input Sourcing (PNP)	ON					
Warm-up Time 10 milliseconds		OFF*	OFF*			
Warm-up Time 62.5 milliseconds		OFF	ON			
Warm-up Time 125 milliseconds		ON	OFF			
Warm-up Time 2 seconds		ON	ON			
Sample/Report Rate 1 second				OFF*	OFF*	OFF*
Sample/Report Rate 2 seconds				OFF	OFF	ON
Sample/Report Rate 4 seconds				OFF	ON	OFF
Sample/Report Rate 16 seconds				OFF	ON	ON
Sample/Report Rate 64 seconds				ON	OFF	OFF
Sample/Report Rate 5 minutes				ON	OFF	ON
Sample/Report Rate 15 minutes				ON	ON	OFF
Modbus or UCT configured (overrides DIP switches)				ON	ON	ON

Analog IN 2, Discrete 1, and Discrete 2 are not powered from switched power terminals. In this configuration, SP2 is disabled. If you need SP2, contact the factory.

* Default positions

Analog Configuration - Switch 2 OFF (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.

Analog Configuration, Switch 2 OFF	**DIP Switches**					
Descriptions	**3**	**4**	**5**	**6**	**7**	**8**
Discrete Inputs Sinking (NPN)	OFF*					
Discrete Inputs 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 seconds				OFF	OFF	ON
Sample/Report Rate 16 seconds				OFF	ON	OFF
Sample/Report Rate 64 seconds				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
Modbus or UCT configured (overrides DIP switches)				ON	ON	ON

Analog IN 2, Discrete 1, and Discrete 2 are not powered from switched power terminals. In this configuration, SP2 is disabled. If you need SP2, contact the factory.

* Default positions

Discrete Configuration - Switch 2 ON (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.

Discrete Configuration, Switch 2 ON	**DIP Switches**					
Descriptions	**3**	**4**	**5**	**6**	**7**	**8**
Discrete Inputs Sinking (NPN)	OFF*					
Discrete Inputs 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

Discrete Configuration, Switch 2 ON	DIP Switches					
Descriptions	**3**	**4**	**5**	**6**	**7**	**8**
Sample/Report Rate 1 second				ON	OFF	OFF
Sample/Report Rate 2 seconds				ON	OFF	ON
Sample/Report Rate 16 seconds				ON	ON	OFF
Modbus or UCT configured (overrides DIP switches)				ON	ON	ON

Discrete IN 1 uses switched power 1 (SP1). Discrete IN 2 uses switched power 2 (SP2). Analog inputs 1 and 2 are disabled.

* Default positions

Discrete Input Type

Select the type of discrete input sensors to use with this device: sourcing (PNP) sensors or sinking (NPN) sensors.

Modbus/User Configuration Tool (UCT) or DIP Switch Configured

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.

Sample and Report Rates

The sample interval, or rate, defines how often the SureCross device samples the input. For battery-powered applications, setting a slower rate extends the battery life.

The report rate defines how often the Node communicates the I/O status to the Gateway. Change of state reporting sets the system to report only when the value crosses the threshold setting. For FlexPower™ applications, setting the report rate to a slower rate extends the battery life.

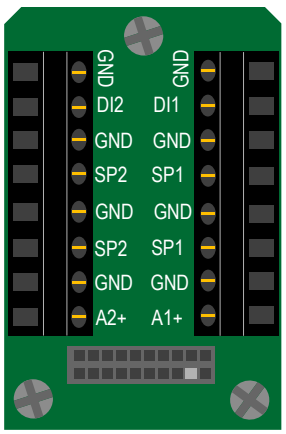
Warm-Up Time

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

Terminal Blocks and Wiring

Wiring Diagrams. For CSA C/US and LCIE/ATEX approved wiring procedures and to check the Entity Parameters (Safety Parameters), refer to the complete control drawing, document *141513* at *www.bannerengineering.com*.

Wiring Base



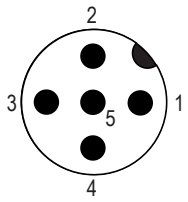
A*x*+ and A*x*-. Analog IN *x*. Analog inputs for devices requiring more than one connection, such as thermocouples or RTDs. When there is no A*x*-, use A*x*+ as an analog input.

DI*x*. Discrete IN *x*.

GND. Ground/dc common connection.

SP*x*. Switch Power. Provides variable power sources for external devices.

5-Pin M12 Euro-style Hookup



***Flex*Power™**

3) blue, dc common (GND)

5) gray, 3.6V dc (Only use the DX81H Battery Supply Module to power this device)

LED Behavior for the Nodes

After powering up and binding the Gateway and its Nodes, verify all devices are communicating properly. A Node will not sample its inputs until it is communicating with its Gateway. When testing communication between the Gateway and Node, all radios and antennas should be at least two meters apart or the communications may fail.

LED 1	LED 2	Node Status
(flashing green)		Radio Link Ok
(flashing red)	(flashing red)	Device Error
	(flashing red, 1 per 3 sec)	No Radio Link

Modbus Register Table

I/O	Modbus Holding Register		I/O Type	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway	Any Node		Min.	Max.	Min. (Dec.)	Max. (Dec.)	
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 or V)	0.0	20.0 or 10.0	0	65535	A1+
4	4	4 + (Node# × 16)	Analog IN 2 (mA or V)	0.0	20.0 or 10.0	0	65535	A2+
		...						
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					

Storage Mode and Sleep Mode

While in **storage mode**, the radio does not operate. All SureCross® 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 five seconds. To put any FlexPower® or integrated battery SureCross radio into storage mode, press and hold button 1 for five 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 one minute before waking it.

During normal operation, the SureCross 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.

Specifications

Radio

Range

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

900 MHz Compliance (150 mW Radios)

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

General

Power

Requirements: 3.6V dc low power option (from the DX81H Battery Supply Module)
Consumption: Application dependant

Housing

Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers
Weight: 0.26 kg (0.57 lbs)
Mounting: #10 or M5 (SS M5 hardware included)
Max. Tightening Torque: 0.56 N·m (5 lbf·in)

Antenna Connection

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

Radio

2.4 GHz Compliance

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

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

Link Timeout

Gateway: Configurable via User Configuration Tool (UCT) software

Node: Defined by Gateway

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. To determine the range of your wireless network, perform a Site Survey.

General

Interface

Indicators: Two bi-color LEDs

Buttons: Two

Display: Six character LCD

Wiring Access

Four PG-7, One 1/2-inch NPT, One 5-pin Euro-style male connector

Inputs

Discrete Inputs

Rating: See control drawing

Sample/Report Rates: DIP switch configurable

Discrete Input ON Condition

PNP: Greater than 8V

NPN: Less than 0.7V

Discrete Input OFF Condition (DX99 Models)

PNP: Less than 4.5V

NPN: Greater than 2.2V or open

Analog Input Rating (mA Models)

Rating for 4 to 20 mA models: 24 mA

Impedance: 20 Ohms

Analog Input 1 Sample/Report Rates: DIP switch configurable

Analog Input 2 Sample/Report Rates: 1 second / 16 seconds

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

Resolution: 12-bit

Analog Input Rating (V Models)

Rating for 0 to 10V models: 10V

Impedance: 20 Ohms

Analog Input 1 Sample/Report Rates: DIP switch configurable

Analog Input 2 Sample/Report Rates: 1 second / 16 seconds

Accuracy: 0.25% of full scale +0.01% per °C

Resolution: 12-bit

Environmental

Ratings

IEC IP67, NEMA 4x

Operating Conditions

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

To verify the analog input's impedance, use an Ohm meter to measure the resistance between the analog input terminal (AI*x*) and the ground (GND) terminal.

Refer to the *SureCross DX80 Wireless I/O Network Product Manual* (p/n 132607) for installation and waterproofing instructions. Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Certifications

DX99 Polycarbonate Housings

c SP us CSA: Class I, Division 1, Groups A, B, C, D (Ex ia IIC / AEx ia IIC T4) Certificate: CSA 2008243

Ex LCIE/ATEX: Zone 0 (Category 1G), Temperature Class T4 (II 1 G / Ex ia IIC T4) Certificate: LCIE 08 ATEX 6098 X

Notes: 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* (p/n 141513). The device must only use a lithium battery manufactured by XENO, type XL-205F.

Certifications

CE

Included with Model

The following items ship with the DX80 radios.

- BWA-HW-002: DX80 Access Hardware Kit, containing four PG-7 plastic threaded plugs, four PG-7 nylon gland fittings, four PG-7 hex nuts, one 1/2-inch NPT plug, and one 1/2-inch nylon gland fitting. (Not included with IP20 DX80...C models)
- BWA-HW-001: Mounting Hardware Kit, containing four M5-0.8 x 25mm SS screws, four M5-0.8 x 16mm SS screws, four M5-0.8mm SS hex nuts, and four #8-32 x 3/4" SS bolts
- BWA-HW-003: PTFE tape
- BWA-9O2-C (900 MHz) or BWA-2O2-C (2.4 GHz): Antenna, 2 dBd Omni, Rubber Swivel RP-SMA Male. (Not included with Internal antenna models)
- Quick Start Guide (128185 for DX80 Gateways or 152653 for MultiHop models)
- MQDC1-506: 5-Euro (single ended) straight cable, 2m (Not included with FlexPower devices)
- BWA-HW-011: IP20 Screw Terminal Headers (2 pack) (Included only with the IP20 DX80...C models)

Warnings

Antenna Installations. 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 SureCross® device or any equipment connected to the SureCross device during a thunderstorm.

Exporting SureCross 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 SureCross 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.

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