

SureCross DX80 Node with Integrated Battery



more sensors, more solutions

Switch configurable Node with switched power outputs, discrete inputs, discrete NMOS outputs, analog inputs, and an integrated battery



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. Wireless networks are formed around a Gateway, which acts as the wireless network master device, and one or more Nodes.

- Wireless industrial I/O device with two selectable discrete inputs, one NMOS discrete output when configured for discrete mode; two selectable discrete inputs, one NMOS discrete output, and one analog input when configured for analog mode
- FlexPower® technology driven by one lithium primary battery integrated into the housing
- DIP switches for user configuration
- Multiple switched power outputs can be switch configured to provide sensor actuation voltage from the battery supply
- 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

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

Models	Frequency	I/O	
DX80N9X1S2N1M1	900 MHz ISM Band	Discrete Mode Inputs: Two selectable discrete Outputs: One NMOS sinking discrete Switch Power: One, Configurable	Analog Mode Inputs: Two selectable discrete, one 0 to 20 mA analog Outputs: One NMOS sinking discrete Switch Power: One, Configurable
DX80N2X1S2N1M1	2.4 GHz ISM Band		
DX80N9X1S2N1V1	900 MHz ISM Band	Discrete Mode Inputs: Two selectable discrete Outputs: One NMOS sinking discrete Switch Power: One, Configurable	Analog Mode Inputs: Two selectable discrete, one 0 to 10V analog Outputs: One NMOS sinking discrete Switch Power: One, Configurable
DX80N2X1S2N1V1	2.4 GHz ISM Band		



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.

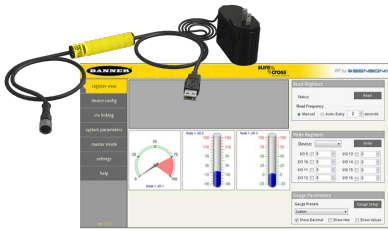
Storage Mode and Sleep Mode

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.



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:

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 Quick Start Guide: Banner part number [128185](#)
- 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

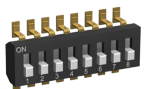
Before making any changes to the DIP switch positions, disconnect the power. DIP switch changes will not be recognized if power isn't cycled to the device. For devices with batteries integrated into the housing, remove the battery for at least one minute.

For parameters not set via DIP switches, use the User Configuration Tool (UCT) to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the User Configuration Tool.

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. For integrated battery models (no ribbon cable) and Class I, Division 2 certified devices (ribbon cable is glued down), skip this step.
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

Device Settings	Switches	
	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)

Select between an analog configuration or a discrete configuration using DIP switch 2.

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 (not available in the integrated battery model) 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					
Booster 10V (Analog IN 1)		OFF*				
Booster 15V (Analog IN 1)		ON				
Warm-up Time 10 milliseconds			OFF*			
Warm-up Time 500 milliseconds			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
Host configured (override switches)				ON	ON	OFF

Analog Configuration, Switch 2 OFF	DIP Switches					
Descriptions	3	4	5	6	7	8
Sample/Report Rate 15 minutes				ON	ON	ON

Analog IN 2 (not available in integrated battery model), Discrete 1, and Discrete 2 are not powered from switched power terminals.

Discrete Configuration (Switch 2 ON)

The discrete configuration matches the switch power output (SP1) with the first discrete input (DI1). 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					
Booster 5V		OFF*				
Booster 10V		ON				
Warm-up Time 4 milliseconds			OFF*			
Warm-up Time 10 milliseconds			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
Host configured (override switches)				ON	ON	OFF
Sample/Report Rate 16 seconds				ON	ON	ON

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

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.

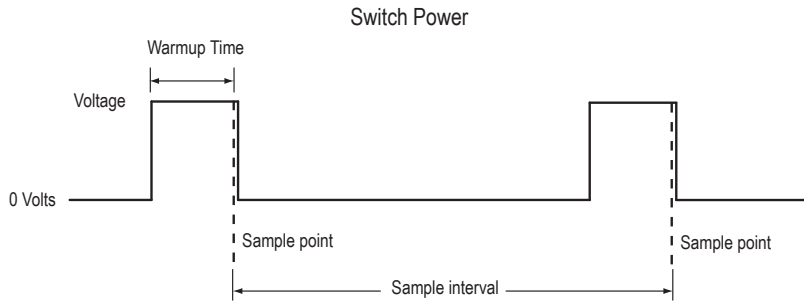
Wiring Your SureCross® Device

Use the following wiring diagrams to first wire the sensors and then apply power to the SureCross devices.

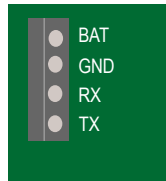
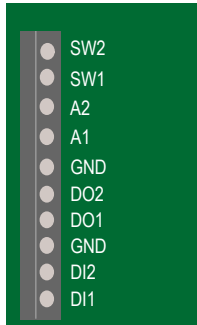
Switch Power (with FlexPower)

Efficient power management technology enables some FlexPower devices to include an internal power supply, called switch power (SP), that briefly steps up to power sensors requiring 5, 10, or 15V power (ideally, 4 to 20 mA loop-powered sensors). When the switch power output cycles on, the voltage is boosted to the voltage needed to power the sensor for a specific warmup time. This warmup time denotes how long the sensor must be powered before a reliable reading can be taken. After the warmup time has passed, the input reads the sensor, then the switch power shuts off to prolong battery life. The switch power voltage, warm-up time, and sample interval are configurable parameters.

- To reduce power consumption and extend battery life, slower sample and reporting rates are used. Faster sample and report rates can be configured, but this will decrease the battery's life. For details, refer to the included table of DIP switch configurable parameters.
- The FlexPower switched power management system can operate a FlexPower Node and a sensing device for up to five years on a single lithium D cell.



Terminal Block



Alx or Ax. Analog IN x.

BAT. 3.6 to 5.5V dc power connection when powered by DX81 or DX81P6 Battery Supply Modules.

DIx. Discrete IN x.

DOx. Discrete OUT x.

GND. Ground/dc common connection.

RX/-. Serial comms line

SWx or SPx. Switch Power. Provides variable power sources for external devices.

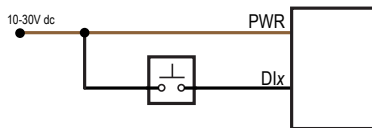
TX/+. Serial comms line

For FlexPower devices, do not apply more than 5.5V to the gray wire. Do not apply power to the Ax+ connection.

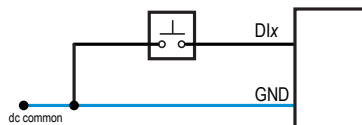
Wiring Diagrams for Discrete Inputs

Connecting dc power to the communication pins will cause permanent damage. For the DX8x...C models, PWR in the wiring diagram refers to V+ on the wiring board and GND in the wiring diagram refers to V- on the wiring board.

Discrete Input Wiring for PNP Sensors



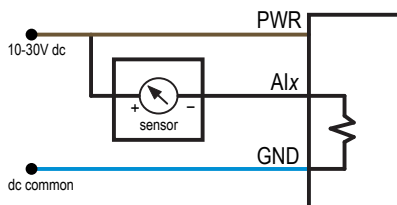
Discrete Input Wiring for NPN Sensors



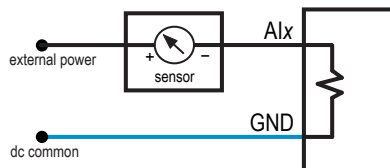
Wiring Diagrams for Analog Inputs

Connecting dc power to the communication pins will cause permanent damage. Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.

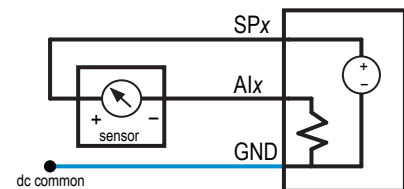
Analog Input Wiring (10 to 30V dc Power)



Analog Input Wiring (4-20mA, 2-Wire, Externally Powered Sensors)



Analog Input Wiring (4-20mA, 2-Wire, Switch Powered Sensors)



Analog Input Wiring (10 to 30V dc Power)

Analog Input Wiring (4–20mA, 2-Wire, Externally Powered Sensors)

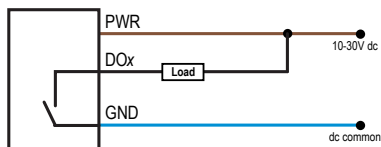
Analog Input Wiring (4–20mA, 2-Wire, Switch Powered Sensors)

(Only possible in models with switch power (SPx) outputs)

Wiring Diagrams for Discrete Outputs

Connecting dc power to the communication pins will cause permanent damage. For the DX8x...C models, PWR in the wiring diagram refers to V+ on the wiring board and GND in the wiring diagram refers to V- on the wiring board.

Discrete Output Wiring (NPN or NMOS)



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 Point	Modbus Holding Register		I/O Type	Units	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	D11
2	2	2 + (Node# × 16)	Discrete IN 2	-	0	1	0	1	D12
3	3	3 + (Node# × 16)	Analog IN 1+	mA or V	0.0	20.0	0	65535	A1+
		...							
7	7	7 + (Node# × 16)	Reserved						
8	8	8 + (Node# × 16)	Device Message						
9	9	9 + (Node# × 16)	Discrete OUT 1	-	0	1	0	1	DO1
		...							
15	15	15 + (Node# × 16)	Control Message						
16	16	16 + (Node# × 16)	Reserved						

Specifications

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.

Radio and General

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 conducted
 2.4 GHz: 18 dBm conducted, less than or equal to 20 dBm EIRP

900 MHz Compliance (150 mW Radios)

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: 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
 Node: Defined by Gateway

Power

Requirements: 3.6V dc low power option from an internal battery
 Consumption: Less than 1.4 W (60 mA) at 24V dc

Housing

Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers
 Weight: 0.30 kg (0.65 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)

Interface

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

Wiring Access

One 1/2-inch NPT

For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.

Inputs and Outputs

Discrete Inputs

Rating: 3 mA max current at 30V dc
 Sample/Report Rates: DIP switch configurable (see tables)

Discrete Input ON Condition

PNP: Greater than 8V
 NPN: Less than 0.7V

Discrete Input OFF Condition

PNP: Less than 5V
 NPN: Greater than 2V or open

Analog Input

Rating for 0 to 20 mA models: 24 mA
 Rating for 0 to 10V models: 10V
 Impedance: 100 Ohms
 Sample/Report Rates: DIP switch configurable (see tables)
 Accuracy: 0.1% of full scale +0.01% per °C
 Resolution: 12-bit

Discrete Output Rating (NMOS)

Less than 10 mA max current at 30V dc
 ON-State Saturation: Less than 0.7V at 20 mA

Discrete Output

Update Rate: 1 second
 ON Condition: Less than 0.7V
 OFF Condition: Open

Output State Following Timeout

De-energized (OFF)

Switch Power Outputs

Analog configuration: one
 Discrete configuration: one

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

Environmental and Certifications

Rating

IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)

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

Environmental and Certifications

Operating Conditions

Temperature: -40 to +65 °C
 Humidity: 95% max. relative (non-condensing)
 Radiated Immunity: 10 V/m, 80-2700 MHz
 (EN61000-6-2)



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.

Included with Device (Integrated Battery)

- 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-902-C (900 MHz) or BWA-202-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)

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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more sensors, more solutions

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