

# SureCross DX80 Node



Configurable Node with 2 discrete inputs, 2 discrete outputs, 2 analog inputs, and 2 analog outputs



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, two sourcing discrete outputs, two 0 to 20 mA analog inputs, and two 0 to 20 mA analog outputs
- 10 to 30V dc power input
- 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

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

Models	Frequency	Antenna	I/O
DX80N9X6S2P2M2M2	900 MHz ISM Band	External	<b>Inputs:</b> Two selectable discrete, two 0 to 20 mA analog <b>Outputs:</b> Two sourcing discrete, two 0 to 20 mA analog
DX80N9X6W2P2M2M2		Internal	



### 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:

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.

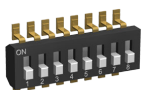
For parameters not set via DIP switches, use the User Configuration Tool (UCT) to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the User Configuration Tool.

## 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.
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	3	4	5	6	7	8
Rotary dial address mode	OFF*							
Extended address mode	ON							
Modbus or UCT configured (overrides DIP switches 3-8)		OFF*						
DIP switch configured		ON						
Inputs sourcing (PNP)			OFF*					
Inputs sinking (NPN)			ON					
Link loss output: zero				OFF*	OFF*			
Link loss output: one				OFF	ON			
Link loss output: hold last state				ON	OFF			
Link loss output: user configuration				ON	ON			
0–20 mA scale (Not used in 0-10V analog models)						OFF*		
4–20 mA scale (Not used in 0-10V analog models)						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 Input and Output Scale**

Use the DIP switch to select which current scale to use for all the device's analog inputs and outputs: 0 to 20 mA or 4 to 20 mA. When using a 4-20 mA sensor with a 0-20 mA input, the sensor uses the 4-20 mA section of the total range. Using a 4-20 mA with a 0-20 mA input allows you to determine when you have an error condition with the sensor. A normal input reading between 4 and 20 mA indicates a functioning sensor whereas a value below 4 mA indicates an error condition, such as a broken wire or loose connection. This DIP switch is used only on the 0 to 20 mA models, not the 0 to 10V models.

**Discrete Input Type**

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

**Link Loss Outputs**

The SureCross DX80 wireless devices use a deterministic radio link time-out method to address RF link interruption or failure. When a radio link fails, all pertinent wired outputs are sent to defined states until the link is recovered, ensuring that disruptions in the communications link result in predictable system behavior.

Following a radio link time-out, all outputs linked to the Node in question are set to de-energize (discrete outputs to zero, analog outputs to 0 mA or 4 mA), energize (discrete outputs to one, analog outputs to 20 mA), or to hold the last stable state/value. Use the DIP switches to select the link loss output state.

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

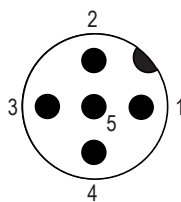
In Modbus/UCT Configured mode, the device parameters are changed using the User Configuration Tool (UCT) or a Modbus command. All DIP switch positions are ignored. In DIP Switch Configured mode, use the DIP switches to configure the parameters listed in the table.

**Wiring Your SureCross® Device**

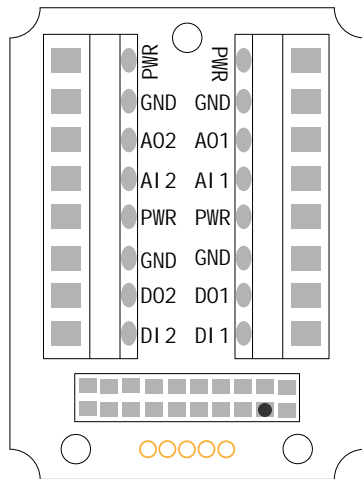
Use the following wiring diagrams to first wire the sensors and then apply power to the SureCross devices.

**5-pin Euro-Style Wiring (Nodes)**

Wiring the 5-pin Euro-style connector depends on the model and power requirements of the device. Connecting dc power to the communication pins will cause permanent damage. For FlexPower devices, do not apply more than 5.5V to the gray wire.

	Wire No.	Wire Color	10 to 30V dc Powered Nodes	Battery Powered Nodes
	1	Brown	10 to 30V dc	
	2	White		
	3	Blue	dc common (GND)	dc common (GND)
	4	Black		
	5	Gray		3.6 to 5.5V dc

## Terminal Block

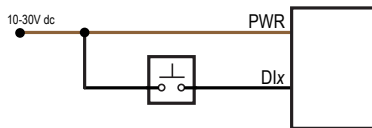


- AIx or Ax. Analog IN x.
- AOx. Analog OUT x.
- DIx. Discrete IN x.
- DOx. Discrete OUT x.
- GND. Ground/dc common connection.
- PWR. Power, 10 to 30V dc power connection.

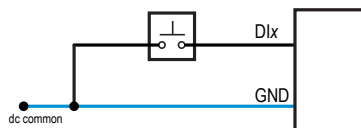
## Wiring Diagrams for Discrete Inputs

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



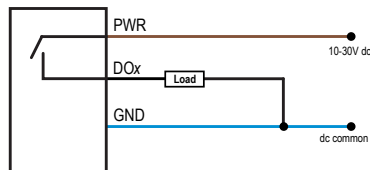
### Discrete Input Wiring for NPN Sensors



## Wiring Diagrams for 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.

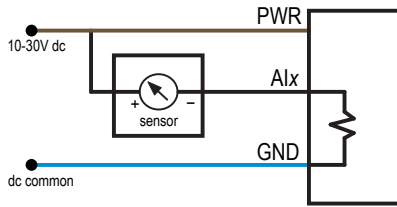
### Discrete Output Wiring (PNP)



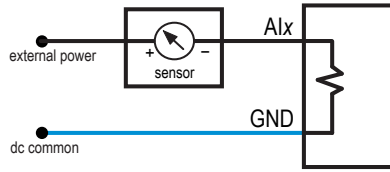
## Wiring Diagrams for Analog Inputs

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.

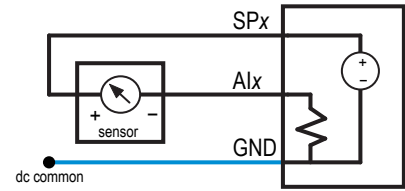
**Analog Input Wiring (10 to 30V dc Power)**



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



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

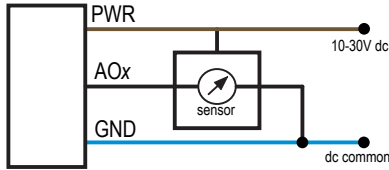


(Only possible in models with switch power (SPx) outputs)

**Wiring Diagrams for Analog Outputs**

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 Output Wiring**



**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	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway	Any Node			Min. Value	Max. Value	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)							
4	4	4 + (Node# × 16)							
5	5	5 + (Node# × 16)	Analog IN 1	mA	0.0	20.0	0	65535	AI1
6	6	6 + (Node# × 16)	Analog IN 2	mA	0.0	20.0	0	65535	AI2

I/O #	Modbus Holding Register		I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway	Any Node			Min. Value	Max. Value	Min. (Dec.)	Max. (Dec.)	
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
10	10	10 + (Node# × 16)	Discrete OUT 2	-	0	1	0	1	DO2
11	11	11 + (Node# × 16)							
12	12	12 + (Node# × 16)							
13	13	13 + (Node# × 16)	Analog OUT 1	mA	0.0	20.0	0	65535	AO1
14	14	14 + (Node# × 16)	Analog OUT 2	mA	0.0	20.0	0	65535	AO2
15	15	15 + (Node# × 16)	Control Message						
16	16	16 + (Node# × 16)	Reserved						

## Specifications

### Radio and General

#### Range

900 MHz: Up to 4.8 kilometers (3 miles)

#### Transmit Power

900 MHz: 21 dBm conducted

#### 900 MHz Compliance (150 mW Radios)

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

#### Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

#### Link Timeout

Gateway: Configurable  
Node: Defined by Gateway

#### Wiring Access

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

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.

#### Power

Requirements: +10 to 30V dc (Outside the USA: +12 to 24V dc, ±10%). (See UL section below for any applicable UL specifications)

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: 0.26 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)

#### Interface

Indicators: Two bi-color LEDs

Buttons: Two

Display: Six character LCD

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 Rate: 62.5 milliseconds

Report Rate: On change of state

#### Discrete Outputs

Update Rate: 125 milliseconds

ON Condition: Supply minus 2V

OFF Condition: Less than 2V

Output State Following Timeout: De-energized (OFF)

## Inputs and Outputs

### 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 Inputs

Rating: 24 mA  
Impedance: 100 Ohms  
Sample Rate: 62.5 milliseconds  
Report Rate: 1 second or On Change of State (1% change in value)  
Accuracy: 0.1% of full scale +0.01% per °C  
Resolution: 12-bit

### Discrete Output Rating (PNP)

100 mA max current at 30V dc  
ON-State Saturation: Less than 3V at 100 mA  
OFF-state Leakage: Less than 10 µA

### Analog Outputs

Update Rate: 125 milliseconds  
Accuracy: 0.1% of full scale +0.01% per °C  
Resolution: 12-bit

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

### Ratings

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

### Operating Conditions

Temperature: -40 to +85 °C (Electronics); -20 to +80 °C (LCD)  
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



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 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-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)
- 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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