

SureCross DX80 Serial Node with Integrated Battery



Configurable *FlexPower* Node with an integrated battery and serial interface for one serial sensing device

Features



The SureCross™ wireless system is a radio frequency network with integrated I/O that can operate in most environments while eliminating the need for wiring runs. Systems are built around a Gateway, which acts as the wireless network master device, and one or more Nodes.

- Wireless industrial I/O device with a serial interface to handle one serial sensing device
- *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 combine to 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, the most recent version of all documentation, and a complete list of accessories, refer to Banner Engineering's website, www.bannerengineering.com/surecross.

Models

Model	Frequency	Environmental Rating	I/O
DX80N9X1S1S	900 MHz ISM Band	IP67, NEMA 6	Inputs: Serial interface for one serial sensing device
DX80N2X1S1S	2.4 GHz ISM Band		

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



WARNING: Not To Be Used for Personnel Protection

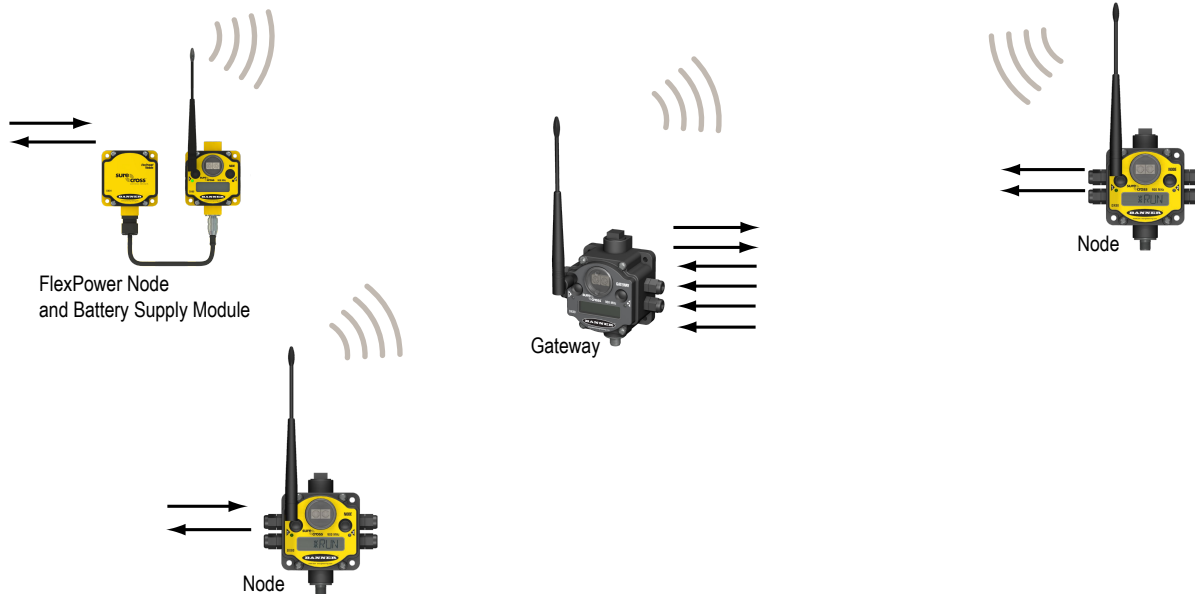
Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized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



The SureCross DX80 Wireless Network

The SureCross DX80 wireless I/O network provides reliable monitoring without the burden of wiring or conduit installation. The SureCross wireless network can operate independently or in conjunction with a host system, PLC, and/or PC software.

Each wireless network system consists of one Gateway and one or more Nodes. Devices ship with factory defined inputs and outputs that may be all discrete, all analog, or a mix of discrete and analog I/O.



The SureCross DX80 network is a deterministic system—the network identifies when the radio signal is lost and drives relevant outputs to user-defined conditions. Once the radio signal is reacquired, the network returns to normal operation.

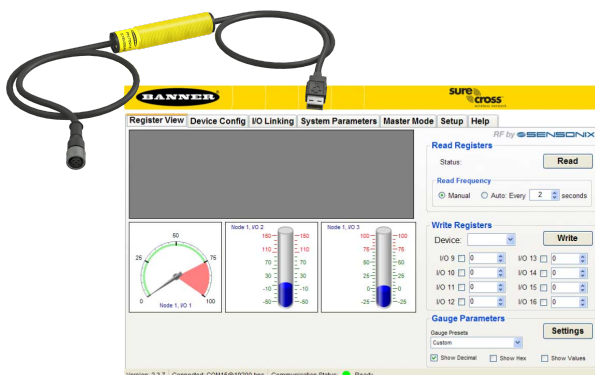
SureCross DX80 Gateways and Nodes

A **Gateway** acts as the master device within each radio network, initiates communication and reporting with the Nodes, and controls the timing for the entire network.

The Gateway also holds the configuration for the network. Every wireless network must have one Gateway that schedules communication traffic and controls the I/O configuration for the network. A radio network contains only one Gateway, but can contain many Nodes. Similar to how a gateway device on a wired network acts as a “portal” between networks, the SureCross Gateway acts as the portal between the wireless network and the central control process.

A **Node** is a wireless network end-point device used to provide sensing capability in a remote area or factory. The Node collects data from sensors and communicates the data back to the Gateway. Nodes are available in a wide variety of power or input/output options. Each Node device can be connected to sensors or output devices and reports I/O status to the Gateway.

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-HW-006) 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.banner-engineering.com/wireless>.

Wiring Diagrams

5-Pin Euro-Style Female Pinout

The connections are completed using the 5-pin M12 Euro-style connector. The following table defines the wires and the appropriate connection points in the SureCross radio.

	No.	Wire Color	Description
	1	brown	power +
	2	white	device select
	3	blue	dc common (GND)
	4	black	device output
	5	gray	serial comms

Additional Information

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](#)

Modbus Register Table

I/O Point	Modbus Holding Register		I/O Type	
	Gateway	Any Node		
1	1	1 + (Node# × 16)	Serial device 1, primary input 1	0h00
2	2	2 + (Node# × 16)	Serial device 1, primary input 2; OR Discrete IN 3	0h01
3	3	3 + (Node# × 16)	Serial device 1, primary input 3; OR Discrete IN 1	0h02
4	4	4 + (Node# × 16)	Serial device 1, secondary input 1; OR Serial device 2, primary input 1	0h03* 0h00
5	5	5 + (Node# × 16)	Serial device 1, secondary input 2; OR Serial device 2, primary input 2; OR Discrete IN 4	0h04* 0h01
6	6	6 + (Node# × 16)	Serial device 1, secondary input 3; OR Serial device 2, primary input 3; OR Discrete IN 2	0h05* 0h02
7	7	7 + (Node# × 16)	Reserved	
8	8	8 + (Node# × 16)	Device Message	
9	9	9 + (Node# × 16)	Serial device 1, primary output 1	0h00
10	10	10 + (Node# × 16)	Serial device 1, primary output 2	0h01
11	11	11 + (Node# × 16)	Serial device 1, primary output 3	0h02
12	12	12 + (Node# × 16)	Serial device 1, secondary output 1; OR Serial device 2, primary output 1	0h03* 0h00
13	13	13 + (Node# × 16)	Serial device 1, secondary output 2; OR Serial device 2, primary output 2	0h04* 0h01

I/O Point	Modbus Holding Register		I/O Type	
	Gateway	Any Node		
14	14	$14 + (\text{Node\#} \times 16)$	Serial device 1, secondary output 3; OR Serial device 2, primary output 3	0h05* 0h02
15	15	$15 + (\text{Node\#} \times 16)$	Control Message	
16	16	$16 + (\text{Node\#} \times 16)$	Reserved	

* Based on DIP switch settings.

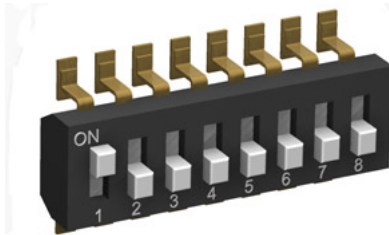
Device Configuration

Hibernation Mode and Sleep Mode

While in hibernation mode, the radio does not operate. All SureCross devices powered from an integrated battery ship from the factory in hibernation 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 **hibernation mode**, press and hold button 1 for five seconds. The radio is in hibernation mode when the LEDs stop blinking, but in some models, the LCD remains on for an additional minute after the radio enters hibernation mode. After a device has entered hibernation 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.

DIP Switch Changes



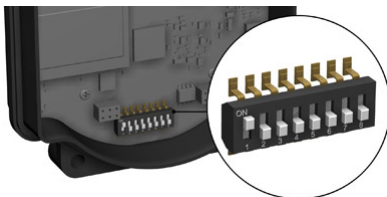
Before making any changes to the DIP switch positions, disconnect the power. For devices with batteries integrated into the housing, remove the battery for at least one minute.

DIP switch changes will not be recognized if power isn't cycled to the device.

Accessing the DIP Switches

To access the 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

Switches								
Device Settings	1	2	3	4	5	6	7	8
Rotary dial address mode	OFF*							
Extended address mode	ON							
Host configured (overrides switches 3-8)		OFF*						
Use switch settings		ON						
Sensor 1: 3 inputs, 0 outputs (Primary inputs 1-3)			OFF*	OFF*	OFF*			
Sensor 1: 1 input, 0 outputs (Primary input 1), Discrete IN 1, and Discrete IN 3**			OFF	OFF	ON			
Sensor 1: 2 inputs, 0 outputs (Primary inputs 1-2), and Discrete IN 1**			OFF	ON	OFF			
Sensor 1: 6 inputs, 6 outputs (Primary and secondary I/O 1-3)			OFF	ON	ON			
Sensor 1 & 2: 3 inputs, 0 outputs (Primary inputs 1-3)			ON	OFF	OFF			
Sensors 1 & 2: 1 input, 0 outputs (Primary input 1), and Discrete IN 1 through 4**			ON	OFF	ON			
Sensors 1 & 2: 2 inputs, 0 outputs (Primary inputs 1-2), Discrete IN 1, and Discrete IN 2**			ON	ON	OFF			
Sensors 1 & 2: 3 inputs, 3 outputs (Primary I/O 1-3)			ON	ON	ON			
Sample/Report Rates: 16 seconds						OFF*	OFF*	OFF*
Sample/Report Rates: 64 seconds						OFF	OFF	ON
Sample/Report Rates: Sample on Demand						OFF	ON	OFF
Sample/Report Rates: 125 milliseconds						OFF	ON	ON
Sample/Report Rates: 500 milliseconds						ON	OFF	OFF
Sample/Report Rates: 1 seconds						ON	OFF	ON
Sample/Report Rates: 4 seconds						ON	ON	OFF
Sample/Report Rates: 8 seconds						ON	ON	ON

* Default configuration

** All discrete inputs are sinking inputs with sample rates of 62.5 milliseconds and change of state reporting.

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.

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.

Register Configuration

The Node’s Modbus registers can be configured using DIP switches 3 through 5, allowing for some custom configurations. Each *FlexPower* Serial Sensor has a defined set of template registers listed in the device’s data sheet. For example, the *FlexPower* Temperature/Humidity sensor has three defined primary registers a user can access: register 1 for relative humidity, register 2 for the temperature in degrees C, and register 3 for the temperature in degrees F.

When using the default switch settings (OFF, OFF, OFF), the Node reads all three registers and places the contents in the first three Modbus registers associated with the Node. With the switch settings set to “001” (OFF, OFF, ON), only the relative humidity information is read and placed into Modbus register 1.

Integrated battery devices support only one serial sensor device per Node. *FlexPower* Serial Nodes with internal wiring terminals support up to two serial sensor devices per Node. Use the DIP switches to define the Modbus register use for both serial sensor devices.

Some *FlexPower* Serial Sensor devices have more than three primary inputs; these inputs are referred to as secondary inputs or outputs. The DIP switch configurations allow for up to six inputs and six outputs for a single device.

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.

DX80 Integrated Battery Replacement

To replace the lithium “D” cell battery in any integrated housing model, follow these steps.



1. Remove the four screws mounting the face plate to the housing and remove the face plate.
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 battery is replaced incorrectly.
4. 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.

Replacement battery model number: BWA-BATT-001. For pricing and availability, contact Banner Engineering.

Verify Communications

After powering up and binding the Gateway and its Nodes, verify all devices are communicating properly. Verify LED 1 is green. Until communication is established with the Gateway, the Node's LED 2 flashes red. When communication is established, the Node's LED 1 flashes green.

A Node will not sample its inputs until it is communicating with the Gateway to which it is bound.

LED 1	LED 2	Gateway Status	Node Status
 (green on)		Power ON	
 (green flashing)			RF Link OK
 (red flashing)	 (red flashing)	Device Error	Device Error
	 (yellow flashing)	Modbus Communication Active	
	 (red flashing)	Modbus Communication Error	No radio link (when flashing once every three seconds)

For Gateway and Ethernet Bridge systems, active Modbus communication refers to the communication between the Gateway and the Ethernet Bridge. For GatewayPro systems, the Modbus communication LEDs refer to the communication internal to the Gateway Pro. For Gateway only systems, the Modbus communication LEDs refer to the communication between the Gateway and its host system (if applicable).

When testing the Gateway and Node, verify all radios and antennas are at least two meters apart or the communications may fail.

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 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)

Antenna Connection

Ext. Reverse Polarity SMA, 50 Ohms

Max Tightening Torque: 0.45 N·m (4 in·lbf)

Link Timeout

Gateway: Configurable

Node: Defined by Gateway

* 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

Power*

Requirements: 3.6V dc low power option from an internal battery

Interface

Indicators: Two bi-color LEDs

Buttons: Two

Display: Six character LCD

Consumption: As low as 1 mW (250 μ A) at 3.6V dc (depending on configuration)

Housing

Polycarbonate

Weight: 0.30 kg (0.65 lbs)

Mounting: #10 or M5 (M5 hardware included)

Max. Tightening Torque: 0.56 N·m (5 in·lbf)

Wiring Access

One 5-pin Euro-style female connector

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

Environmental

Environmental

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

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

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

Refer to the SureCross™ DX80 Wireless I/O Network product manual, Banner 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




Included with Device (Integrated Battery)



Included with Device	Model	Qty	Item
Mounting Hardware Kit	BWA-HW-001	4	Screw, M5-0.8 x 25mm, SS
		4	Screw, M5-0.8 x 16mm, SS
		4	Hex nut, M5-0.8mm, SS
		4	Bolt, #8-32 x 3/4", SS
Antenna*	BWA-902-C, or BWA-202-C	1	Antenna, 902-928 MHz, 2 dBd Omni, Rubber Swivel RP-SMA Male, or Antenna, 2.4 GHz, 2 dBd Omni, Rubber Swivel RP-SMA Male
SureCross Literature CD	79685	1	SureCross Literature CD

* Internal antenna devices do not ship with this antenna.

Sensors with a Serial Interface

	Part No.	Model No.	Description	Data Sheet
	79610	M12FTH1Q	Temperature and Humidity Sensor, $\pm 2\%$ Accuracy 1-wire serial interface	137303
	81050	M12FTH2Q	Temperature and Humidity Sensor, $\pm 3.5\%$ Accuracy 1-wire serial interface	

The following filters may be used with the M12FTH*Q Temperature and Humidity Sensors.

	Part No.	Model No.	Description
	81930	FTH-FIL-001	Temperature and Humidity Sensor Filter, Aluminum Grill Filter Cap (default filter cap)
	81931	FTH-FIL-002	Temperature and Humidity Sensor Filter, Stainless Steel Sintered Filter, 10 micrometer porosity

Warnings

The manufacturer does not take responsibility for the violation of any warning listed in this document.

Make no modifications to this product. Any modifications to this product not expressly approved by Banner Engineering could void the user's authority to operate the product. Contact the Factory for more information.

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Antenna Installation

Always 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.

Always 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 *Agency 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 if the destination country is not on this list.

Limited Warranty

Banner 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 of the Banner product.

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This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.

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