

SureCross DX80 Serial Node with Integrated Battery



Datasheet

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 a 1-wire serial interface to handle one 1-wire 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 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 | Environmental Rating | I/O |
|-------------|------------------|----------------------|--|
| DX80N9X1S1S | 900 MHz ISM Band | IP67, NEMA 6 | Inputs: 1-Wire serial interface for one 1-wire 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.

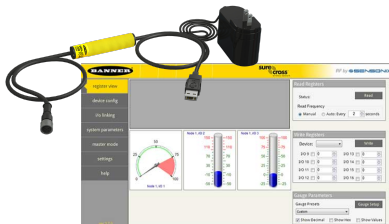


WARNING: Not To Be Used for Personnel Protection

Never use this 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) software runs on any Windows machine and uses a converter cable to connect your Gateway to the computer.



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. Download the most recent revisions of the UCT software from Banner Engineering's website: <http://www.bannerengineering.com/wireless>.

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.



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.
 - For two LED models, the Gateway's LED 1 is solid green and the Node's LED 2 flashes red to indicate there is no radio link to the Gateway.
 - For one LED models, the Gateway's LED is solid green and the Node's LED flashes red to indicate there is no radio link to the Gateway.
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.
 - For two LED models, the Gateway's LED 1 is solid green and the Node's LED 1 flashes green to indicate it is communicating with the Gateway.
 - For one LED models, the Gateway's LED is solid green and the Node's LED flashes green to indicate it is communicating with the Gateway.
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: [128185](#)
- SureCross Wireless I/O Network Instruction Manual: [132607](#)
- Web Configurator Instruction Manual (used with "Pro" and DX83 models): [134421](#)
- Host Controller Systems Instruction Manual: [132114](#)

Configure the DIP Switches

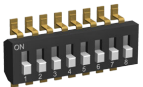
Before making any changes to the DIP switch positions, disconnect the power. DIP switch changes will not be recognized if power isn't cycled to the device. For devices with batteries integrated into the housing, remove the battery for at least one minute.

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

| | Switches | | | | | | | |
|--------------------------|----------|---|---|---|---|---|---|---|
| Device Settings | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Rotary dial address mode | OFF* | | | | | | | |

| Switches | | | | | | | | |
|---|----|------|------|------|------|------|------|------|
| Device Settings | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Extended address mode | ON | | | | | | | |
| Modbus or UCT configured (overrides DIP switches 3-8) | | OFF* | | | | | | |
| DIP switch configured | | 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.

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.

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.

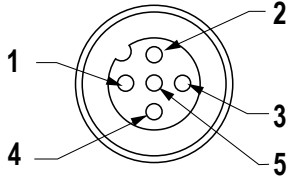
Sample and Report Rates

The sample 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.

5-Pin M12/Euro-style Connector (Female)

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.

| 5-pin M12/Euro-style Connector (female) | Pin | Wire Color | Description |
|---|-----|------------|-----------------|
|  | 1 | Brown | Power + |
| | 2 | White | Device select |
| | 3 | Blue | dc common (GND) |
| | 4 | Black | Device output |
| | 5 | Gray | Serial comms |

LED Behavior for the Nodes

Nodes do not sample inputs until they are communicating with the Gateway. The radios and antennas must be a minimum distance apart to function properly. Recommended minimum distances are:

- 2.4 GHz 65 mW radios: 1 foot
- 900 MHz 150 mW radios: 6 feet
- 900 MHz 1 Watt radios: 15 feet

| 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 |

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 5 seconds. To put any *FlexPower*® or integrated battery SureCross radio into storage mode, press and hold button 1 for 5 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 1 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.

Modbus Register Table

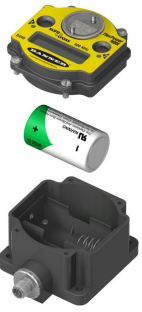
| I/O Point | Modbus Holding Register | | I/O Type | |
|-----------|-------------------------|-------------------|--|---------------|
| | Gateway | Any Node | | |
| 1 | 1 | 1 + (Node# × 16) | Serial device 1, primary input 1 | 0h00 |
| 2 | 2 | 2 + (Node# × 16) | Serial device 1, primary input 2; OR Discrete 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 |
| 14 | 14 | 14 + (Node# × 16) | Serial device 1, secondary output 3; OR Serial device 2, primary output 3 | 0h05* 0h02 |
| 15 | 15 | 15 + (Node# × 16) | Control Message | |
| 16 | 16 | 16 + (Node# × 16) | Reserved | |

* Based on DIP switch settings.

Replacing the Integrated Battery (DX80 Models)

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 by pressing the battery toward the negative terminal to compress the spring. Pry up on the battery's positive end to remove from the battery holder.
3. Replace with a new battery. Only use a 3.6 V lithium battery from Xeno, model number XL-205F.
4. 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.
5. After replacing the battery, allow up to 60 seconds for the device to power up.
6. 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.

Specifications

Radio Range

900 MHz: Up to 4.8 km (3 miles) ¹
2.4 GHz: Up to 3.2 km (2 miles)

Radio 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)

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 via User Configuration Tool (UCT) software
Node: Defined by Gateway

Antenna Connection

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

Supply Voltage

3.6 V dc low power option from an internal battery ²
Consumption: As low as 1 mW (250 μ A) at 3.6 V dc (depending on configuration)

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)

Interface

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

Wiring Access

One 5-pin M12 Euro-style female connector

Environmental Ratings

IEC IP67; NEMA 6 ³

Operating Conditions

-40 °C to +85 °C (-40 °F to +185 °F) (Electronics); -20 °C to +80 °C (-4 °F to +176 °F) (LCD) ⁴
95% maximum relative humidity (non-condensing)
Radiated Immunity: 10 V/m, 80-2700 MHz (EN61000-6-2)

Shock and Vibration

IEC 68-2-6 and IEC 68-2-27
Shock: 30g, 11 millisecond half sine wave, 18 shocks
Vibration: 0.5 mm p-p, 10 to 60 Hz

Certifications



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)

Sensors with a Serial Interface


The following sensors are designed to be used with any of the 1-Wire Serial Interface FlexPower Nodes.

¹ 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.

² For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.

³ Refer to the *SureCross Wireless I/O Networks Instruction Manual* (p/n 132607) for installation and waterproofing instructions.

⁴ Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

| Models | Description | Datasheet | List Price | Sensors |
|----------|--|------------------------|------------|---|
| M12FTH4Q | Temperature and Humidity Sensor, ±2% Accuracy, 1-wire serial interface | 162669 | \$175 |  |
| M12FT4Q | Temperature Sensor with 1-wire serial interface | | \$115 | |

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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