

Sure Cross® DX80 FlexPower Serial Interface Node



Datasheet

The Sure Cross® 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.

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



- Wireless industrial I/O device with a 1-wire serial interface to handle up to two 1-wire serial sensing devices
- FlexPower® power options allow for 10 to 30 V dc, solar, and battery power sources for low power applications.
- DIP switches for user configuration
- Two switch power outputs provide sensor actuation voltage of 3.6 V dc (battery powered) or 4.3 V dc (10 to 30 V dc powered)
- 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
- The DX80...C models are certified for use in Class I, Division 2, Group A, B, C, D; Zone 2 (Category 3G) Hazardous Locations when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, or applicable local codes/regulations (see Specifications)

| Models | Frequency | Environmental Rating | I/O |
|--------------|------------------|---|--|
| DX80N9X2S2S | 900 MHz ISM Band | IP67, NEMA 6 | I nputs: 1-Wire serial interface for up to two 1-wire serial sensing devices d c Power Outputs: Two |
| DX80N2X2S2S | 2.4 GHz ISM Band | | |
| DX80N9X2S2SC | 900 MHz ISM Band | IP20, NEMA 1 | |
| DX80N2X2S2SC | 2.4 GHz ISM Band | Class I, Division 2, Group A, B, C, D Hazardous Locations (see <i>Specifications</i>) | |

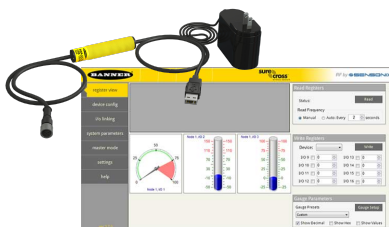


WARNING: Not To Be Used for Personnel Protection

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.

Sure Cross® 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 Sure Cross devices.

1. Configure the DIP switches of all devices.
2. If your device has I/O, connect the sensors to the Sure Cross devices. If your device does not have I/O, skip this step.
3. Refer to the wiring diagrams to 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.

- Sure Cross® Quick Start Guide: [128185](#)
- Sure Cross® 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

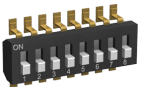
Before making any changes to the DIP switch positions, disconnect the power. DIP switch changes will not be recognized if power isn't cycled to the device.

For 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* | | | | | | | |

| 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 Sure Cross device samples the input. For battery-powered applications, setting a slower rate extends the battery life.

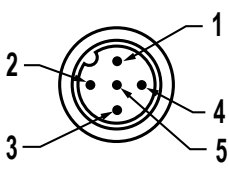
The report rate defines how often the Node communicates the I/O status to the Gateway. Change of state reporting sets the system to report only when the value crosses the threshold setting. For *FlexPower*® applications, setting the report rate to a slower rate extends the battery life.

Wiring Your Sure Cross® Device

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

5-Pin M12/Euro-style Male Quick Disconnect

Integral 5-pin M12/Euro-style male quick disconnect (QD) wiring depends on the model and power requirements of the device. Not all models can be powered by 10 to 30 V dc and not all models can be powered by 3.6 to 5.5 V dc. Refer to *Specifications* to verify the power requirements of your device. For *FlexPower* devices, do not apply more than 5.5 V to the gray wire.

| 5-pin M12/Euro-style (male) | Pin | Wire Color | Powered by 10 to 30 V dc | Powered by Battery or Battery Pack |
|---|-----|------------|--------------------------|------------------------------------|
|  | 1 | Brown | 10 to 30 V dc | |
| | 2 | White | | |
| | 3 | Blue | dc common (GND) | dc common (GND) |
| | 4 | Black | | |
| | 5 | Gray | | 3.6 to 5.5 V dc |

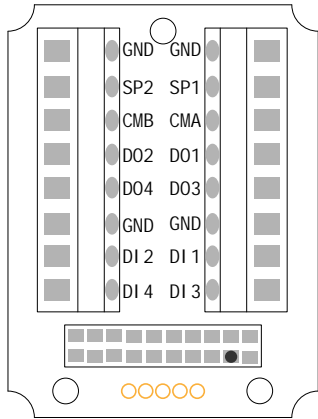
DX80...C Wiring

Wiring power to the DX80...C models varies depending the power requirements of the model. Connecting dc power to the communication pins (Tx/Rx) causes permanent damage. For *FlexPower* devices, do not apply more than 5.5 V to the B+ terminal.

| Terminal Label | Gateway and DX85 | 10 to 30 V dc Powered Nodes | Battery Powered Nodes |
|----------------|--------------------|-----------------------------|-----------------------|
| V+ | 10 to 30 V dc | 10 to 30 V dc | |
| Tx/+ | RS485 / D1 / B / + | | |
| V- | dc common (GND) | dc common (GND) | dc common (GND) |
| Rx/- | RS485 / D0 / A / - | | |
| B+ | | | 3.6 to 5.5 V dc |

Terminal Block (IP67 Housing)

For the IP67 housing models, PWR in the wiring diagram refers to SP1 or SP2 on the wiring board.



CMx. Serial interface connection; for non-serial interface models, do not make any wiring connections to these terminals

DIx. Discrete IN x

DOx. Discrete OUT x

GND. Ground/dc common connection

SPx. Switch Power; provides variable power sources for external devices

Ignore alternate labeling referring to other models that use this board.

Terminal Block (IP20 Housing)

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. Ignore alternate labeling referring to other models that use this board.

| All Models | FlexPower Serial Interface Models Only | FlexPower Counter Models Only |
|--|--|-------------------------------|
| B+. 3.6 to 5.5 V dc (use for battery powered models only) | CMx. Serial interface connection; for non-serial interface models, do not make any wiring connections to these terminals | CIx. Counter IN x |
| DIx. Discrete IN x | | |
| DOx. Discrete OUT x | | |
| RX/-. Serial communication line for the Gateway. No connection for Nodes | | |
| SPx. Switch Power; provides variable power sources for external devices | | |
| TX/+. Serial communication line for the Gateway; no connection for Nodes | | |
| V+. 10 to 30 V dc power connection | | |
| V-. Ground/dc common connection | | |

Wiring for Serial Inputs

To connect serial interface sensors to the FlexPower Node with Serial Interface, use the I/O terminal block. The following table defines the wires and the appropriate connection points in the Node.

| Connection | Serial Device Wire | DX80 Node Wiring PCB |
|---------------|--------------------|--------------------------------|
| Power + | Brown | SP1 (device 1), SP2 (device 2) |
| Ground - | Blue | GND |
| Serial Comms | Gray | CMA (device 1), CMB (device 2) |
| Device Select | White | DO1 (device 1), DO2 (device 2) |

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 |

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.

Specifications

Radio Range¹

900 MHz, 150 mW: Up to 4.8 km (3 miles)
2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

Transmit Power

900 MHz, 150 mW: 21 dBm (150 mW) conducted
2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

Minimum Separation Distance

900 MHz (150 mW): 2 m (6 ft)
2.4 GHz (65 mW): 0.3 m (1 ft)

900 MHz Compliance

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 300 328 V1.8.1 (2012-06)
IC: 7044A-DX8024

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

Discrete Inputs (NPN)

Rating: 3 mA max current at 30 V dc
Sample Rate: 125 milliseconds
Report Rate: On change of state
ON Condition: Less than 0.7 V
OFF Condition: Greater than 2 V or open

Environmental Rating

DX80 Models: IEC IP67; NEMA 6 ³
"C" Housing Models/External wiring terminals: IEC IP20; NEMA 1 (In a suitable enclosure: Class I, Division 2, Group A, B, C, D; T4 -40 to 80 °C)

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 HF

10 V/m (EN 61000-4-3)

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

Supply Voltage²

10 to 30 V dc or 3.6 to 5.5 V dc low power option (Outside the USA: 12 to 24 V dc, ±10% or 3.6 to 5.5 V dc low power option)
Consumption: Less than 1.4 W (60 mA) at 24 V 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

Wiring Access

Four PG-7, One 1/2-inch NPT, One 5-pin threaded M12/Euro-style male quick disconnect

Link Timeout

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

Discrete Outputs (NMOS)

Update Rate: 1 second
ON Condition: Less than 0.7 V
OFF Condition: Open
Output State Following Timeout: OFF

Discrete Output Rating (NMOS)

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

Certification



DX8x...C (External Wiring Terminal Models)



CSA: Class I, Division 2, Groups A, B, C, D (Ex/A Ex nA II T4); Certificate: 1921239



LCIE/ATEX: Zone 2 (II 3G / Ex nA IIC); Certificate: LCIE 10 ATEX 1012 X

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)

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 [Sure Cross® 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.

Sensors with a Serial Interface

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

| Models | Description | Datasheet | |
|----------|--|-----------|---|
| M12FTH4Q | Temperature and Humidity Sensor, $\pm 2\%$ Accuracy, 1-wire serial interface | 162669 |  |
| M12FT4Q | Temperature Sensor with 1-wire serial interface | | |
| QM42VT1 | Vibration and Temperature Sensor with 1-wire serial interface | 186209 |  |

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 Sure Cross® device or any equipment connected to the Sure Cross device during a thunderstorm.

Exporting Sure Cross® 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 Sure Cross 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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