

Datasheet

Configurable Node with eight discrete inputs and four discrete outputs

The Sure Cross® wireless system is a radio frequency network with integrated I/O that operates in most environments to 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 a list of accessories, refer to Banner Engineering's website, www.bannerengineering.com/wireless.



- Wireless industrial I/O device with eight selectable discrete inputs and four sourcing discrete outputs
- 10 to 30 V 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
- 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)



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.

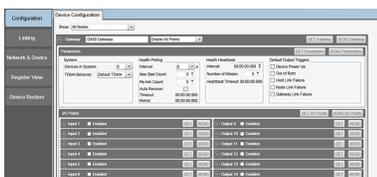
Models

| Models | Frequency | Environmental Rating | I/O |
|---------------|------------------|---|--|
| DX80N9X6S8P4 | 900 MHz ISM Band | IP67, NEMA 6 | Inputs: Eight selectable discrete Outputs: Four sourcing discrete |
| DX80N2X6S8P4 | 2.4 GHz ISM Band | | |
| DX80N9X6S8P4C | 900 MHz ISM Band | IP20, NEMA 1 | (When your wireless network does not include a host system, the eight input/four output Node must be mapped to the four input/eight output Gateway.) |
| DX80N2X6S8P4C | 2.4 GHz ISM Band | Class I, Division 2, Group A, B, C, D Hazardous Locations (see <i>Specifications</i>) | |

Internal antenna models are also available, but are not UL Listed. For more information, contact your local Banner Engineering Corp. representative.

Sure Cross® 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, and set system communication parameters when a host system is not part of the wireless network. The software runs on any computer with the Windows Vista, Windows 7, Windows 8, or Windows 10 operating system.



Use a USB to RS-485 adapter cable to connect a standalone DX80 Gateway to the computer. For DXM Controllers with an internal DX80 radio, connect a computer to the DXM Controller using a USB or Ethernet connection. Download the most recent revisions of the UCT software from Banner Engineering's website: www.bannerengineering.com/wireless.

The USB to RS-485 adapter cable is not required for the DXM Controller. For standalone DX80 Gateway devices use:

- USB to RS-485 adapter cable model BWA-UCT-900 for 1 Watt radios
- USB to RS-485 adapter cable model BWA-HW-006 for all other radios



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. Configure any I/O points to use the sensors connected to the Sure Cross devices.
7. 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.
8. 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 changing DIP switch positions, disconnect the power. DIP switch changes are not recognized until after power is 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 switch address mode | OFF* | | | | | | | |
| Extended address mode | ON | | | | | | | |

| Switches | | | | | | | | |
|---|---|------|------|------|------|---|---|---|
| Device Settings | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 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 | | | |

* 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.

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 Sure Cross® 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 set 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 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

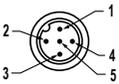
In Modbus/UCT Configured mode, use the User Configuration Tool (UCT) or a Modbus command to change the device parameters. DIP switch positions 3 through 8 are ignored. In DIP Switch Configured mode, use the DIP switches to configure the parameters listed in the table.

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) |

| 5-pin M12/Euro-style (male) | Pin | Wire Color | Powered by 10 to 30 V dc | Powered by Battery or Battery Pack |
|-----------------------------|-----|------------|--------------------------|--|
| | 4 | Black | | |
| | 5 | Gray | | 3.6 to 5.5 V dc |

DX80...C Wiring

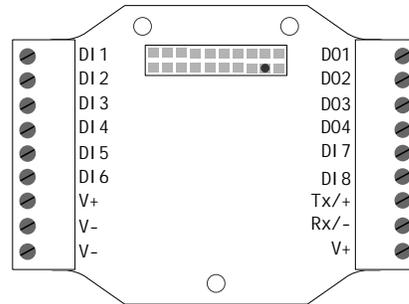
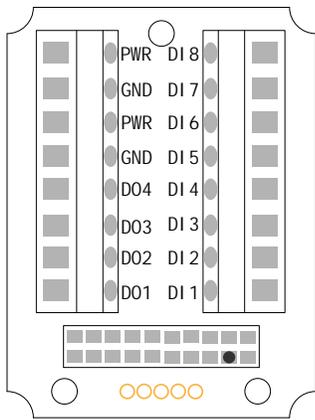
Wiring power to the DX80...C models varies depending the power requirements of the model. Connecting dc power to the communication pins (Tx/Rx) causes permanent damage. For *FlexPower* devices, do not apply more than 5.5 V to the B+ terminal.

| 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

When your wireless network does not include a host system, the eight input/four output Gateway must be mapped to the four input/four output Node. Connecting power to the communication pins will cause permanent damage.

| IP67 Housing | IP20 Housing |
|--------------|--------------|
|--------------|--------------|

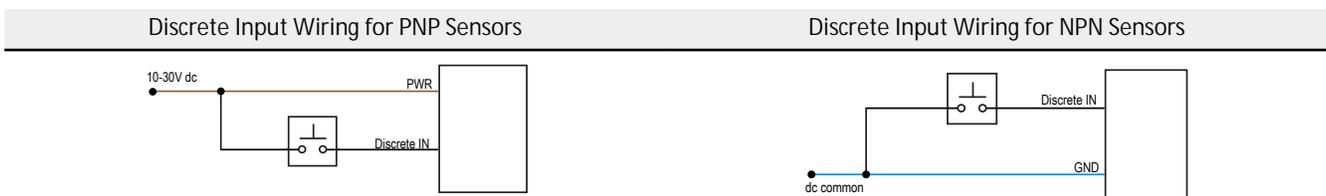


- DIx. Discrete IN x
- DOx. Discrete OUT x
- GND. Ground/dc common connection
- PWR. 10 to 30 V dc power connection

- RX/-. Serial communication line for the Gateway. No connection for Nodes
- 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 Diagrams for Discrete Inputs

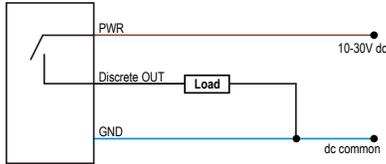
Connecting power to the communication pins will cause permanent damage. For the DX8x...C models, PWR in the wiring diagram refers to V+ on the wiring board and GND in the wiring diagram refers to V- on the wiring board. To power the sensor using the switch power output (SPx), replace the PWR with SPx in these wiring diagrams.



Wiring Diagrams for Discrete Outputs

Connecting 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. To power the sensor using the switch power output (SPx), replace the PWR with SPx in these wiring diagrams.

Discrete Output Wiring (PNP)



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 and 250 mW radios: 6 feet
- 900 MHz 1 Watt radios: 15 feet

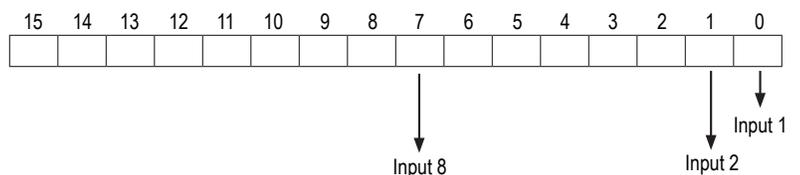
| LED 1 | LED 2 | Node Status |
|----------------|---------------------------|---------------|
| Flashing green | | Radio Link Ok |
| Flashing red | Flashing red | Device Error |
| | Flashing red, 1 per 3 sec | No Radio Link |

Modbus Registers

When your wireless network does not include a host system, the eight input/four output Node must be mapped to the four input/eight output Gateway.

| I/O Point | Modbus Holding Register | | I/O Type | I/O Range | | Holding Register Representation | | Terminal Block Labels |
|-----------|-------------------------|-------------------|-----------------|-----------|------|---------------------------------|-------------|-----------------------|
| | Gateway/ DX85 | Any Node | | Min. | Max. | Min. (Dec.) | Max. (Dec.) | |
| 1 | 1 | 1 + (Node# × 16) | Discrete IN 1–8 | 0 | ** | 0 | 255 | DI1 |
| | | ... | | | | | | |
| 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) | Discrete OUT 3 | 0 | 1 | 0 | 1 | DO3 |
| 12 | 12 | 12 + (Node# × 16) | Discrete OUT 4 | 0 | 1 | 0 | 1 | DO4 |
| | | ... | | | | | | |
| 15 | 15 | 15 + (Node# × 16) | Control Message | | | | | |
| 16 | 16 | 16 + (Node# × 16) | Reserved | | | | | |

The lower eight bits of the 16-bit unsigned register represent each of the eight digital inputs. Therefore, if all inputs are OFF (0) the register contains 0x0000; if all inputs are ON (1) the register contains 0x00FF (255).



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

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)

Link Timeout

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

Discrete Inputs

Rating: 3 mA max current at 30 V dc
Sample Rate: 62.5 milliseconds
Report Rate: On change of state

Discrete Input ON Condition

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

Discrete Input OFF Condition

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

Environmental Rating³

DX80 models: IEC IP67; NEMA 6 (See UL section below for any applicable UL specifications)
"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 Conditions⁴

-40 °C to +85 °C (-40 °F to +185 °F) (Electronics); -20 °C to +80 °C (-4 °F to +176 °F) (LCD)
95% maximum relative humidity (non-condensing)
Radiated Immunity: 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

UL Listing

Maximum ambient temperature: 70 °C
Mounting instructions: See document 132607
Power rating: 10 to 30 V dc, UL Class 2
Enclosure environmental rating: UL Type 1

Supply Voltage²

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

Discrete Outputs

Update Rate: 125 milliseconds
ON Condition: Supply minus 2 V
OFF Condition: Less than 2 V
Output State Following Timeout: OFF

Discrete Output Rating (PNP)

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

Certifications for DX8x...C (External Wiring Terminal) and DX8x...E Models



CSA: Class I Division 2 Groups ABCD, Class I Zone 2 AEx/Ex nA II T4 —
Certificate: 1921239



ATEX: II 3 G Ex nA IIC T4 Gc (Group IIC Zone 2) — Certificate LCIE 10 ATEX 1012 X

Refer to the Class I Division 2/Zone 2 control drawings (p/n 143086) for wiring specifications or limitations. All battery-powered devices must only use the lithium battery manufactured by Xeno, model XL-205F.

Certifications



IND. CONT. EQ.
447Y



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)

¹ Radio range is with the 2 dB antenna that ships with the product. Radio range depends on the environment and line of sight and is lower when buried. Always verify your wireless network's range by performing a Site Survey.

² For European applications, power this device 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.

- 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

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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