Sure Cross® Performance Node

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more sensors, more solutions

Datasheet

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.

- Wireless industrial I/O device with a 1-wire serial interface
- Selectable transmit power levels of 250 mW or 1 Watt for 900 MHz models and 65 mW for 2.4 GHz models
- 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

Integrated battery model   10 to 30 V dc power model

For additional information, updated documentation, and a list of accessories, refer to Banner Engineering's website, *www.bannerengineering.com/wireless*.

⚠️ 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.

⚠️ CAUTION: Never Operate 1 Watt Radios Without Antennas

To avoid damaging the radio circuitry, never power up Sure Cross® Performance or Sure Cross MultiHop (1 Watt) radios without an antenna.

⚠️ CAUTION: Electrostatic Discharge (ESD)

ESD Sensitive Device. This product uses semiconductors that can be damaged by electrostatic discharge (ESD). When performing maintenance, care must be taken so the device is not damaged. Disconnect power from the device when accessing the internal DIP switches. Proper handling procedures include wearing anti-static wrist straps. Damage from inappropriate handling is not covered by warranty.

Models

Models	Frequency	Power	I/O
DX80N9X1S-P6	900 MHz ISM Band	Battery integrated into the housing	Inputs: 1-Wire serial interface for one serial sensing device
DX80N2X1S-P6	2.4 GHz ISM Band		
DX80N9X6S-P6	900 MHz ISM Band	10 to 30 V dc	
DX80N2X6S-P6	2.4 GHz ISM Band		

General Operation

For the first five minutes after powering up, the Node operates in fast sample mode, sampling and sending data every two seconds. After five minutes, the Node defaults to five minute sample intervals and the LCD turns off to save power, which is ideal for the battery-powered models.

Use the DIP switches or the User Configuration Tool (UCT) software to set the sample rate. The recommended sample/report rate for 10 to 30 V dc powered devices is 5 seconds.

To activate fast sample mode, single-click button 1. LED 2 is on (amber) during the fast sample mode. To exit fast sample mode and turn off the LCD, click button 2 five times. This behavior is available with radio firmware versions 5.3 and higher.

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, ±2% Accuracy, 1-wire serial interface (Requires a 5-pin threaded M12/Euro-style double-ended cordset less than 3 meters long, such as model DEE2R-5xD.)	162669	
M12FT4Q	Temperature Sensor with 1-wire serial interface (Requires a 5-pin threaded M12/Euro-style double-ended cordset less than 3 meters long, such as model DEE2R-5xD.)		
QS30WEQ	WORLD-BEAM Photoelectric Emitter, QS30 (Max Range: 100 feet, 10x excess gain at 50 feet), 1-wire serial interface	140987	
QS30WRQ	WORLD-BEAM Photoelectric Receiver, QS30 (Max Range: 100 feet, 10x excess gain at 50 feet), 1-wire serial interface		
QM42VT1	Vibration and Temperature Sensor with 1-wire serial interface	186209	
K50UX1RA	U-GAGE Ultrasonic Sensor with 1-wire serial interface	191599	

Configuration Instructions

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*
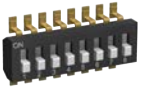
Configure the DIP Switches

Before 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

These DIP switch settings are available with radio firmware versions 5.3 and higher.

Device Settings	Switches							
	1	2	3	4	5	6	7	8
Transmit power level: 1 Watt (30 dBm) (default)	OFF							
Transmit power level: 250 mW (24 dBm), DX80 compatibility mode	ON							
Modbus or UCT configured (overrides DIP switches 3-8) (default)		OFF						
DIP switch configured		ON						
Sensor 1: 6 registers (default)			OFF	OFF	OFF			
Sensor 1: 3 registers			OFF	OFF	ON			
Sample/Report Rates: 5 minutes (default)						OFF	OFF	OFF
Sample/Report Rates: 2 minutes						OFF	OFF	ON
Sample/Report Rates: 1 minute						OFF	ON	OFF
Sample/Report Rates: 30 seconds						OFF	ON	ON
Sample/Report Rates: 10 seconds						ON	OFF	OFF

Device Settings	Switches							
	1	2	3	4	5	6	7	8
Sample/Report Rates: 5 seconds [1]						ON	OFF	ON
Sample/Report Rates: sample on demand						ON	ON	OFF

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.

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 *Flex*Power® applications, setting the report rate to a slower rate extends the battery life.

Transmit Power Levels

The 900 MHz radios can be operated at 1 watt (30 dBm) or 250 mW (24 dBm). While the Performance radios operate in 1 Watt mode, they cannot communicate with the older 150 mW radios. To communicate with the older 150 mW radios, operate this radio in 250 mW mode. For 2.4 GHz models, this DIP switch is disabled. The transmit power for 2.4 GHz is fixed at about 65 mW EIRP (18 dBm), making the 2.4 GHz Performance models automatically compatible with older 2.4 GHz models.
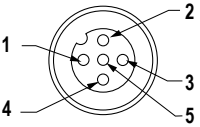
Wiring Your Sure Cross® Device

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

Control Drawings

Refer to the Class I Division 2/Zone 2 control drawings (p/n *143086*) for wiring specifications or limitations.
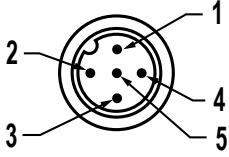
5-Pin M12/Euro-style Female Quick Disconnect

This female quick disconnect fitting interfaces with a 1-wire serial sensor. The following information defines the wires and the appropriate connection points in the Sure Cross radio.

5-pin M12/Euro-style Female Quick Disconnect	Pin	Wire Color	Description
	1	Brown	Power out + (to sensor)
	2	White	Device select
	3	Blue	dc common (GND)
	4	Black	Device output
	5	Gray	Serial comms

5-Pin M12/Euro-Style Male Quick Disconnect

Integral 5-pin M12/Euro-style male quick disconnect (QD)s are wired for 10 to 30 V dc power as shown.

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[1] Recommended setting for 10–30 V dc powered devices.

5-pin M12/Euro-style (male)	Pin	Wire Color	Description
	1	Brown	10 to 30 V dc
	2	White	
	3	Blue	dc common (GND)
	4	Black	
	5	Gray	

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

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 User Configuration Tool (UCT) 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: *http://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

Installing Your Sure Cross® Radios

Please refer to one of the following instruction manuals for details about successfully installing your wireless network components.
- DX80 and Performance Wireless I/O Network Instruction Manual: *132607*

Holding Registers

I/O Point	Modbus Registers		EIP Registers		I/O Type
	Gateway	Any Node			
1	1	1 + (Node# × 16)	0 + (Node# × 8)		Input 1
2	2	2 + (Node# × 16)	1 + (Node# × 8)		Input 2
3	3	3 + (Node# × 16)	2 + (Node# × 8)	Instance 100 / N7	Input 3
4	4	4 + (Node# × 16)	3 + (Node# × 8)		Input 4
5	5	5 + (Node# × 16)	4 + (Node# × 8)		Input 5
6	6	6 + (Node# × 16)	5 + (Node# × 8)		Input 6

I/O Point	Modbus Registers		EIP Registers		I/O Type
	Gateway	Any Node			
7	7	7 + (Node# × 16)	6 + (Node# × 8)		Reserved
8	8	8 + (Node# × 16)	7 + (Node# × 8)		Device Message
		...		Instance 112 / N14	
15	15	15 + (Node# × 16)	6 + (Node# × 8)		Control Message
16	16	16 + (Node# × 16)	7 + (Node# × 8)		Reserved

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.

Storage and Sleep Modes

Storage Mode (applies to battery-powered models only)—While in storage mode, the radio does not operate. All Sure Cross® 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 *Flex*Power® or integrated battery Sure Cross 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.

Sleep Mode (applies to both battery and 10–30 V dc powered models)—During normal operation, the Sure Cross 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.

Specifications

Radio Range[2]
    900 MHz, 1 Watt: Up to 9.6 km (6 miles)
    2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

Minimum Separation Distance
    900 MHz, 1 Watt: 4.57 m (15 ft)
    2.4 GHz, 65 mW: 0.3 m (1 ft)

Radio Transmit Power
    900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)
    2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

900 MHz Compliance (1 Watt)
    FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247
    IC: 7044A-RM1809

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)

Sample/Report Rates
    5 minutes[3]

Operating Environment[4]
    −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)

Environmental Rating[5]
    IEC IP67; NEMA 6

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 Voltage
    Integrated battery models: 3.6 V dc low power option from an internal battery
    Non-battery models: 10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%).

Housing
    Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers
    Integrated battery models: Weight: 0.30 kg (0.65 lbs)
    Non-battery models: 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)

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)

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

Wiring Access
    Integrated battery models: One 5-pin threaded M12/Euro-style female quick disconnect
    Non-battery models: One 5-pin threaded M12/Euro-style female quick disconnect and One 5-pin threaded M12/Euro-style male quick disconnect

Certifications

CE

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.

Included with Device

- 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-9O2-C (900 MHz) or BWA-2O2-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)

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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[2] 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. Always verify your wireless network's range by performing a Site Survey.
[3] For the 10–30 V dc models, Banner recommends setting your sample/report rate to 5 seconds.
[4] Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.
[5] Refer to the *Sure Cross® Wireless I/O Networks Instruction Manual* (p/n 132607) for installation and waterproofing instructions.

Banner Engineering Corp. 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 or installation of the Banner product.

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