SureCross DX99 FlexPower RTD Node (Polycarbonate Housing)

Configurable temperature Node with RTD inputs (powered by external battery module only)

BANNER®
more sensors, more solutions

2.4 GHz

900 MHz

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. DX99 wireless networks are formed around a Gateway, which acts as the wireless network master device, and one or more Intrinsically Safe Nodes.

- Wireless industrial I/O device with up to four 3-wire Pt100 RTDs; other types are available with configuration
- *Flex*Power® power input requires power from the DX81H Battery Supply Module
- 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
- DX99 Polycarbonate housings are certified for use in Class I, Division 1, Groups A, B, C, D; and Zone 0 (Category 1G) when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, or applicable local codes/regulations

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

Model	Frequency	I/O
DX99N9X2S0N0R4X0A0	900 MHz ISM Band	**Inputs**: Four 3-wire RTD
DX99N2X2S0N0R4X0A0	2.4 GHz ISM Band	

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

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.

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3. Apply power to all devices.

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.

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 Wireless I/O Network Manual: *132607*
- Web Configurator Manual (used with "Pro" and DX83 models): *134421*
- Host Configuration Manual *132114*

Configuring 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.

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.
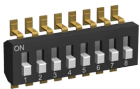
After making the necessary changes to the DIP switches, place the black cover plate back into position and gently push into place. Plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin. Mount the cover back onto the housing.

DIP Switch Settings (RTD)

Device Settings	Switches							
	1	2	3	4	5	6	7	8
Rotary dial address mode	OFF*							
Extended address mode	ON							
Modbus or UCT configured (overrides DIP switches)		OFF*						
DIP switch configured		ON						
Temp °Fahrenheit			OFF*					
Temp °Celsius			ON					
High resolution (0.1 degree) **				OFF*				
Low resolution (1 degree)				ON				
Platinum, 100 ohm (European, DIN 43760)					OFF*	OFF*	OFF*	
Copper, 10 ohm (alpha = 0.00427)					OFF	ON	OFF	

* Default configuration

** In high resolution mode, the temperature = (Modbus register value) ÷ 20. In low resolution mode, the temperature is (Modbus register value) ÷ 2.

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.

RTD Type

Use DIP switches 5, 6, and 7 to select the RTD type. The default position is the OFF position for all switches, setting the RTD to a Platinum 100 ohm type.

Supported RTD Types
The RTD Node supports up to four 3-wire RTD inputs by default. Additional types are available with configuration.

Thermocouple	Range °F	Range °C
Pt100 (DIN 0.00385)	-328 to 900 °F	-200 to 482 °C
Cu 10 Ohm (alpha = 0.00427)	-328 to 500 °F	-200 to 260 °C

* For the copper RTD, the best accuracy is when measuring between −50 to +150 °C (−58 to +302 °F). Below this range, expect errors approaching 3% of reading. Above this range, expect errors approaching 0.5% of reading.

Temperature Resolution

When set to high resolution, temperature values are stored to the nearest tenth (0.1) of a degree (default position). To measure temperatures above 1600 degrees Fahrenheit or 1600 degrees Celsius, switch the DIP switch to the ON position and use low resolution mode. In high resolution, the device cannot store values larger than 1600.

Temperature Units

Use the DIP switch to specify if the temperature is stored in degrees Fahrenheit or Celsius. The default position is OFF, setting the temperature to Fahrenheit. For Celsius measurements, set this switch to the ON position.

Terminal Blocks and Wiring

Wiring Diagrams. For CSA C/US and LCIE/ATEX approved wiring procedures and to check the Entity Parameters (Safety Parameters), refer to the complete control drawing, document *141513* at *www.bannerengineering.com*.

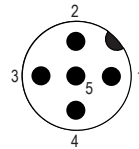**Terminal Block (IP67 Base)**
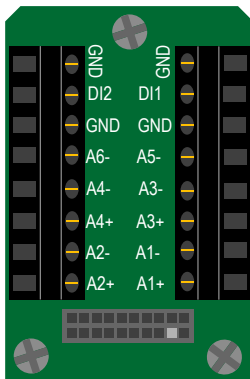
A*x*+ and A*x*-. Analog IN *x*. Analog inputs for devices requiring more than one connection, such as thermocouples or RTDs. When there is no A*x*-, use A*x*+ as an analog input.

DI*x*. Discrete IN *x*.

GND. Ground/dc common connection.

5-Pin M12 Euro-style Hookup

***Flex*Power™**
3) blue, dc common (GND)

5) gray, 3.6V dc (Only use the DX81H Battery Supply Module to power this device)

LED Behavior for the Nodes

After powering up and binding the Gateway and its Nodes, verify all devices are communicating properly. A Node will not sample its inputs until it is communicating with its Gateway. When testing communication between the Gateway and Node, all radios and antennas should be at least two meters apart or the communications may fail.

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 (RTD High Resolution Mode)

I/O	Modbus Holding Register		I/O Type	Units	I/O Range		Holding Register Representation (Dec)		Terminal Block Labels
	Gateway	Any Node			Min.	Max.	Min.	Max.	
1	1	1 + (Node# × 16)							
2	2	2 + (Node# × 16)							
3	3	3 + (Node# × 16)	RTD 1	°F/°C	-1638.3	+1638.4	-32768	32767	A1+/A1–/A5–
4	4	4 + (Node# × 16)	RTD 2	°F/°C	-1638.3	+1638.4	-32768	32767	A2+/A2–/A6–
5	5	5 + (Node# × 16)	RTD 3	°F/°C	-1638.3	+1638.4	-32768	32767	A3+/A3–/DI1
6	6	6 + (Node# × 16)	RTD 4	°F/°C	-1638.3	+1638.4	-32768	32767	A4+/A4–/DI2
7	7	7 + (Node# × 16)	Reserved						
8	8	8 + (Node# × 16)	Device Message						
		...							
15	15	15 + (Node# × 16)	Control Message						
16	16	16 + (Node# × 16)	Reserved						

In high resolution mode, the temperature = (Modbus register value) ÷ 20. In low resolution mode, the temperature is (Modbus register value) ÷ 2.

Temperature values are stored as signed values in the Modbus register. A 0 in the register is interpreted as 0°; and 65535 in the register (0xFFFF) is interpreted as −1 ÷ 20 = −0.05° in high resolution mode and –1 ÷ 2 = –0.5° in low resolution mode.

Specifications

Radio	General

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 (150 mW) conducted
  2.4 GHz: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
	Power
	  Requirements: 3.6V dc low power option (from the DX81H Battery Supply Module)
	  Consumption: Application dependant

Radio	General

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)

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

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.

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 Euro-style male connector

Inputs	Environmental

RTD Inputs
Sample Rate: 1 second
Report Rate: 16 seconds
Accuracy: 0.1% of full scale
Resolution: 0.1 °C, 15-bit

Refer to the *SureCross DX80 Wireless I/O Network Product Manual* (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.

Rating
IEC IP67, NEMA 4x

Operating Conditions
Operating Temperature: −40 to +70 °C
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

Certifications

DX99 Polycarbonate Housings

CSA: Class I, Division 1, Groups A, B, C, D (Ex ia IIC / AEx ia IIC T4) Certificate: CSA 2008243

LCIE/ATEX: Zone 0 (Category 1G), Temperature Class T4 (II 1 G / Ex ia IIC T4) Certificate: LCIE 08 ATEX 6098 X
Notes: Special Conditions for Safe Use imposed by Intrinsic Safety Certificate LCIE 08 ATEX 6098 X: Ambient temperature range is -40°C to +70°C. SureCross® DX99 FlexPower devices can only be connected to Intrinsically Safe certified equipment or simple apparatus as defined by EN 60079-11. All connected equipment must comply with the Entity Parameters (Safety Parameters) listed in the *Control Drawings* (p/n 141513). The device must only use a lithium battery manufactured by XENO, type XL-205F.

CE

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-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)
- 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)

FlexPower Supplies and Replacement Batteries (DX99 Polycarbonate Housing Models)

	Part No.	Model No.	Description
	82864	DX81H	Battery Supply Module with mounting hardware, for DX99 polycarbonate housing devices
	78261	BWA-BATT-001	Lithium "D" cell, single, for DX81 and DX81H Battery Supply Module

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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