SureCross™ DX99 Intrinsically Safe (IS) *Flex*Power™ Node

Configurable Node with 2 discrete inputs and 2 analog inputs (powered by external battery module only)

2.4 GHz

900 MHz

Features

The SureCross™ DX99 is a radio frequency network system built around a Gateway and one or more Intrinsically Safe Nodes.

- Wireless industrial I/O device with two discrete inputs and two analog inputs
- Certified for use in Class I, Division 1, Groups A, B, C, D and Zone 0 (Group IIC) when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, LCIE/ATEX, or applicable local codes/regulations
- *Flex*Power™ power input requires power from the DX81H Battery Supply Module
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific, and Medical (ISM) bands
- Transceivers provide two-way communication between the Gateway and Node, including fully acknowledged data transmission; lost RF links are detected and relevant outputs set to user-defined conditions
- External or internal antenna

Models

Model	Antenna	Frequency	Boost Voltage	I/O
DX99N9X2S2N0M2X0A2	External	900 MHz ISM Band	18V	Discrete Inputs: Two Selectable Analog Inputs: Two 0–20 mA
DX99N9X2W2N0M2X0A2	Internal			
DX99N2X2S2N0M2X0A2	External	2.4 GHz ISM Band		
DX99N2X2W2N0M2X0A2	Internal			
DX99N9X2S2N0M2X0A1	External	900 MHz ISM Band	10V	
DX99N9X2W2N0M2X0A1	Internal			
DX99N2X2S2N0M2X0A1	External	2.4 GHz ISM Band		
DX99N2X2W2N0M2X0A1	Internal			
DX99N9X2S2N0V2X0A2	External	900 MHz ISM Band	18V	Discrete Inputs: Two Selectable Analog Inputs: Two 0–10V
DX99N9X2W2N0V2X0A2	Internal			
DX99N2X2S2N0V2X0A2	External	2.4 GHz ISM Band		
DX99N2X2W2N0V2X0A2	Internal			
DX99N9X2S2N0V2X0A1	External	900 MHz ISM Band	10V	
DX99N9X2W2N0V2X0A1	Internal			
DX99N2X2S2N0V2X0A1	External	2.4 GHz ISM Band		
DX99N2X2W2N0V2X0A1	Internal			

⚠ WARNING . . . Not To Be Used for Personnel Protection

Never use these products for personnel protection. Doing so could lead to serious injury or death.

These products do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A failure or malfunction can cause either an energized or de-energized output condition. Consult your current Banner Safety Products catalog for safety products that meet OSHA, ANSI, and IEC standards for personnel protection.

Hookup Diagrams

Modbus Register Block (mA Models)

I/O Point*	Modbus Holding Register		I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway	Any Node			Min. Value	Max. Value	Min. (Decimal)	Max. (Decimal)	
1	1	1 + (node# × 16)	Discrete IN 1	-	0	1	0	1	DI1
2	2	2 + (node# × 16)	Discrete IN 2	-	0	1	0	1	DI2
3	3	3 + (node# × 16)	Analog IN 1	mA	0.0	20.0	0	65535	A1+
4	4	4 + (node# × 16)	Analog IN 2	mA	0.0	20.0	0	65535	A2+
5	5	5 + (node# × 16)							
6	6	6 + (node# × 16)							
7	7	7 + (node# × 16)	Reserved						
8	8	8 + (node# × 16)	Device Message						
9	9	9 + (node# × 16)							
10	10	10 + (node# × 16)							
11	11	11 + (node# × 16)							
12	12	12 + (node# × 16)							
13	13	13 + (node# × 16)							
14	14	14 + (node# × 16)							
15	15	15 + (node# × 16)	Control Message						
16	16	16 + (node# × 16)	Reserved						

* These are the I/O points as displayed on the device LCD.

5-pin M12 Euro Hookup

*Flex*Power™

3	Blue	dc common (GND)
5	Gray	3.6V dc

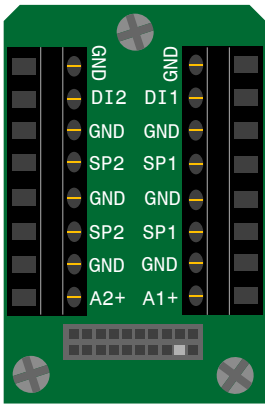
Only use the DX81H Battery Supply Module to power this device.

Wiring Diagrams

For CSA C/US and LCIE/ATEX approved wiring procedures and to check the Entity Parameters (Safety Parameters), refer to the complete

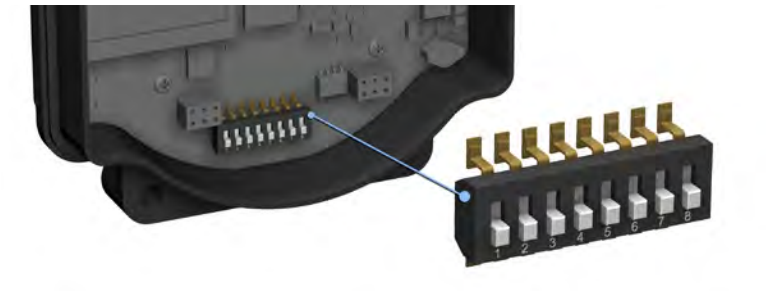
Additional Information

For additional information, including installation and setup, weatherproofing, device menu maps, troubleshooting, and a list of accessories, please refer to the SureCross™ Wireless I/O Network



Label	Function
GND	Ground.
DIx	Discrete IN x.
SPx	Switch Power. Provides variable power sources for external devices.
Ax+ Ax–	Analog IN. Analog inputs for devices requiring more than one connection, such as thermocouples and RTDs.

Device Configuration



Turn the Power Off

Before making any changes to the DIP switch positions, disconnect the power. For devices with batteries integrated into the housing, remove the battery.

	Switches	
Device Settings	1	2
Rotary Switch Address Mode	OFF	
DX80 Extended Address Mode	ON	
Analog Configuration		OFF
Discrete Configuration		ON

Address Mode

The SureCross wireless devices may use one of two types of addressing modes: rotary switch addressing or extended addressing. In rotary switch 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 they are bound to. In extended address mode, wireless networks may contain up to 56 radio devices. For more information on extended address mode, refer to the SureCross™ Wireless I/O Network product manual.

The device ships in rotary switch 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.

Host Configured

Selecting "Host Configured (override switches)" uses the factory's default configuration for this device or allows a host system to set parameters. If the host configured option is not selected, use the DIP switches to configure the device parameters.

Warm-Up Time

The warm-up time defines how long the device must power up the sensor before a stable sensor reading is taken.

Accessing the DIP Switches

To access the DIP switches, follow these steps:

Unscrew the four screws that mount the cover to the bottom housing.

1. Remove the cover from the housing without damaging the ribbon cable or the pins the cable plugs into.
2. Gently unplug the ribbon cable from the board mounted into the bottom housing.
3. 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.

Analog or Discrete Configuration

Select between an analog configuration or a discrete configuration using the DIP switch specified in the table. The default switch settings for this device are all in the OFF position.

Discrete Input Type

Select the discrete input type: sourcing (PNP) or sinking (NPN).

Sample and Report Rates

The sample rate defines how often the Node samples the sensor. The report rate defines how often the Node communicates the I/O status to the Gateway. For FlexPower™ applications, setting the sample and/or report rates to slower rates extends the battery life.

Change of state reporting sets the system to report only when the value crosses the threshold setting.

Analog Configuration - 10V Boost Models

For analog configuration, DIP switch 2 is in the OFF position (factory default). Analog configuration has analog IN 1 linked to switch power 1 (SP1) and is programmable using switches four through eight. Sample and report rates for analog input 2 are listed in the specifications. Discrete inputs 1 and 2 are also active in this configuration and the input types are defined using switch 3. Two sinking discrete outputs are active for this configuration.

Analog Configuration, Switch 2 OFF	DIP Switches					
Descriptions	3	4	5	6	7	8
Discrete Sinking (NPN)	OFF*					
Discrete Sourcing (PNP)	ON					
Warm-up Time 10 ms		OFF*	OFF*			
Warm-up Time 62.5 ms		OFF	ON			
Warm-up Time 125 ms		ON	OFF			
Warm-up Time 2 seconds		ON	ON			
Sample/Report Rate 1 second				OFF	OFF	OFF
Sample/Report Rate 2 second				OFF	OFF	ON
Sample/Report Rate 4 second				OFF	ON	OFF
Sample/Report Rate 16 second				OFF	ON	ON
Sample/Report Rate 64 second				ON	OFF	OFF
Sample/Report Rate 5 minutes				ON	OFF	ON
Sample/Report Rate 15 minutes				ON	ON	OFF
Host Configured (override switches)				ON	ON	ON

Analog IN 2, Discrete IN 1, and Discrete IN 2 are not powered from switched power terminals.

Discrete Configuration - 10V and 18V Boost Models

The discrete configuration matches the switch power outputs (SP1, SP2) with the discrete inputs. The analog inputs are disabled. The discrete configuration is selected when switch 2 is in the ON position. Two sinking discrete outputs are active for this configuration.

Discrete Configuration, Switch 2 ON	DIP Switches					
Descriptions	3	4	5	6	7	8
Discrete Sinking (NPN)	OFF*					
Discrete Sourcing (PNP)	ON					
Warm-up Time 5 milliseconds		OFF*	OFF*			
Warm-up Time 10 milliseconds		OFF	ON			
Warm-up Time 62.5 milliseconds		ON	OFF			
Warm-up Time 125 milliseconds		ON	ON			
Sample/Report Rate 62.5 milliseconds				OFF	OFF	OFF
Sample/Report Rate 125 milliseconds				OFF	OFF	ON
Sample/Report Rate 250 milliseconds				OFF	ON	OFF
Sample/Report Rate 500 milliseconds				OFF	ON	ON
Sample/Report Rate 1 second				ON	OFF	OFF
Sample/Report Rate 2 seconds				ON	OFF	ON
Sample/Report Rate 16 seconds				ON	ON	OFF
Host Configured (override switches)				ON	ON	ON

Analog Configuration - 18V Boost Models

For analog configuration, DIP switch 2 is in the OFF position (factory default). Analog configuration has analog IN 1 linked to switch power 1 (SP1) and is programmable using switches four through eight. Sample and report rates for analog input 2 are listed in the specifications. Discrete inputs 1 and 2 are also active in this configuration and the input types are defined using switch 3. Two sinking discrete outputs are active for this configuration.

Analog Configuration, Switch 2 OFF	DIP Switches					
Descriptions	3	4	5	6	7	8
Discrete Sinking (NPN)	OFF*					
Discrete Sourcing (PNP)	ON					
Warm-up Time 20 milliseconds		OFF*	OFF*			
Warm-up Time 2 seconds		OFF	ON			
Warm-up Time 4 seconds		ON	OFF			
Warm-up Time 8 seconds		ON	ON			
Sample/Report Rate 4 second				OFF	OFF	OFF
Sample/Report Rate 8 second				OFF	OFF	ON
Sample/Report Rate 16 second				OFF	ON	OFF
Sample/Report Rate 64 second				OFF	ON	ON
Sample/Report Rate 5 minutes				ON	OFF	OFF
Sample/Report Rate 15 minutes				ON	OFF	ON
Sample/Report Rate 30 minutes				ON	ON	OFF
Host Configured (override switches)				ON	ON	ON

Analog IN 2, Discrete IN 1, and Discrete IN 2 are not powered from switched power terminals.

LED Status

Gateway Status	LED 1	LED 2
Power ON	Green ON	—
Modbus Communication Active	—	Yellow Flash
Modbus Communication Error	—	Red Flash
System Error	Red Flash	Red Flash

Node Status	LED 1	LED 2
RF Link Ok	Green Flash (1 per sec)	—
RF Link Error	—	Red Flash (1 every 3 sec)
System Error	Red Flash	Red Flash (1 per sec)

Specifications

Many of the parameters are configurable. The values in the tables represent factory defaults unless otherwise noted.

Radio	
Range, with standard 2 dB antenna*	900 MHz: Up to 4.8 kilometers (3 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles)
Frequency	900 MHz: 902 to 928 MHz ISM band 2.4 GHz: 2.4 to 2.4835 GHz ISM Band
Transmit Power	900 MHz: 21 dBm Conducted 2.4 GHz: 18 dBm Conducted, ≤ 20 dBm EIRP
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)
Antenna Connector	Ext. Reverse Polarity SMA, 50 Ohms
Antenna Max. Tightening Torque	0.45 N•m (4 in•lbf)
Link Timeout	Gateway: Configurable Node: Defined by Gateway

* The range depends on the environment and line of sight. High-gain antennas are available to increase the range.

General	
Power	3.6V dc low power option (from the DX81H Battery Supply Module)
Power Consumption	Application dependant
Mounting	#10 or M5 (M5 hardware included)
M5 Fasteners Max. Tightening Torque	0.56 N•m (5 in•lbf)
Case Material	Polycarbonate
Weight	0.26 kg (0.57 lb.)
Indicators	Two LED, bi-color
Switches	Two Push Buttons
Display	Six Character LCD
External Cable Glands	Four PG-7 type, One 1/2 NPT type
Cable Glands Max. Tightening Torque	0.56 N•m (5 in•lbf)

Discrete Inputs	Sourcing or Sinking
Discrete Input Rating	See control drawing
Discrete Input Sample Rate	Switch configurable, see tables
Discrete Input Report Rate	Switch configurable, see tables
Discrete Input ON Condition	Sourcing: Greater than 8V NPN Sinking: Less than 0.7V
Discrete Input OFF Condition	Sourcing: Less than 4.5V NPN Sinking: Greater than 2.2V or open

Analog Inputs	0 to 20 mA or 0 to 10V (depending on model)
Analog Input 1 Sample / Report Rates	Switch configurable, see tables
Analog Input 2 Sample / Report Rates	1 second / 16 seconds
Accuracy	0.1% of full scale +0.01% per °C
Resolution	12-bit

Environmental	
Environmental Rating*	IEC IP67; NEMA 4x
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

* Please refer to the SureCross™ Wireless I/O Network product manual, Banner 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.

Certifications, Radio	
900 MHz Models	FCC ID TGUDX80: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-DX8009
2.4 GHz Models	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

Certifications (DX99, Intrinsically Safe, Polycarbonate Housing)	
	Class I, Division 1, Groups A, B, C, D Certificate: CSA 2008243 Ex ia IIC AEx ia IIC T4
	LCIE/ATEX Zone 0 (Group IIC), Temperature Class T4 Certificate: LCIE 08 ATEX 6098 X *** II 1 G Ex ia IIC T4

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 *Flex*Power 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 document 141513.
- The DX81H Battery Supply module must only use a lithium battery manufactured by XENO, type XL-205F.

Included with Device	Model	Qty	Item
DX80 Access Hardware Kit	BWA-HW-002	4	Plastic threaded plugs, PG-7
		4	Nylon gland fittings, PG-7
		4	Hex nuts, PG-7
		1	Plug, 1/2" NPT
		1	Nylon gland fitting, 1/2" NPT
Mounting Hardware Kit	BWA-HW-001	4	Screw, M5-0.8 x 25mm, SS
		4	Screw, M5-0.8 x 16mm, SS
		4	Hex nut, M5-0.8mm, SS
		4	Bolt, #8-32 x 3/4", SS
PTFE Tape	HWA-HW-003	1	PTFE tape
Antenna*	BWA-9O2-C, or BWA-2O2-C	1	Antenna, 902-928 MHz, 2 dBd Omni, Rubber Swivel RSMA Male, or Antenna, 2.4 GHz, 2 dBd Omni, Rubber Swivel RSMA Male
SureCross Literature CD	79685	1	SureCross Literature CD

* Internal antenna devices do not ship with this antenna

It is Banner Engineering's 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 that the device is approved in the destination country. A list of approved countries appears in the SureCross DX80 Wireless Product Manual, in the *Agency Certifications* section. The SureCross wireless products were certified for use in these countries using the standard 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 if the destination country is not on this list.

*Flex*Power™ Supplies and Replacement Batteries

Part No: 82864
Model No: DX81H
Description: Battery Supply Module with mounting hardware, for DX99 polycarbonate housing devices

Part: 78261
Model: BWA-BATT-001
Description: Lithium “D” cell, single

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The manufacturer does not take responsibility for the violation of any warning listed in this document.

CAUTION. Make no modifications to this product. Any modifications to this product not expressly approved by Banner Engineering could void the user’s authority to operate the product. Contact the Factory for more information.

Lightning Arrestors/Surge Protection. Always use lightning arrestors/surge protection with all remote antenna systems to avoid invalidating the Banner Engineering Corp. warranty. No surge protector can absorb all lightning strikes. Do not touch the SureCross device or any equipment connected to the SureCross device during a thunderstorm.

WARRANTY. Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

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