

SureCross DX80 Gateway for M-GAGEs



Configurable Gateway with discrete inputs and outputs for use with the M-GAGE™ Node



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. 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 six selectable discrete inputs and six sourcing discrete outputs
- Gateway's discrete inputs are mapped to baseline up to six M-GAGE™ Nodes; MGAGE inputs are mapped to the Gateway's outputs
- 10 to 30V dc power input
- DIP switches for user configuration
- Modbus serial interface
- Site Survey analyzes the network's signal strength and reliability and displays the results on the Gateway's LCD
- 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

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

Models	Frequency	Environmental Rating	I/O
DX80G9M6S6P6Z	900 MHz ISM Band	IP67, NEMA 6	Inputs: Six selectable discrete Outputs: Six sourcing discrete
DX80G2M6S6P6Z	2.4 GHz ISM Band		
DX80G9M6S6P6ZC	900 MHz ISM Band	IP20, NEMA 1	
DX80G2M6S6P6ZC	2.4 GHz ISM Band		

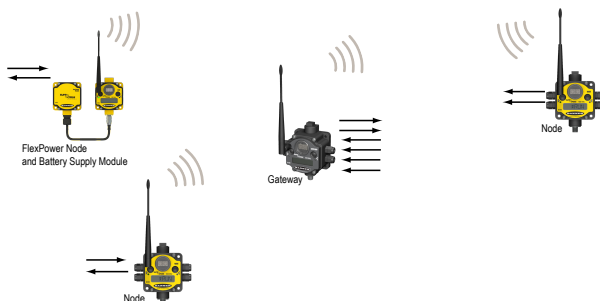
Internal antenna models are also available, but are not UL Listed. For more information, contact your local Banner Engineering Corp. representative.



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.

The SureCross® DX80 Wireless Network



The SureCross® DX80 wireless I/O network provides reliable monitoring without wiring or conduit installation. The SureCross wireless network operates independently or in conjunction with a host system, PLC, and/or PC software.

Each wireless network system consists of one Gateway and one or more Nodes. Devices ship with factory-defined discrete, analog, or a mix of discrete and analog inputs and outputs.

The SureCross® DX80 network is a deterministic system—the network identifies when the radio signal is lost and drives relevant out-



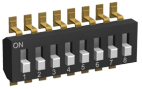
A **Gateway** is the master device within each radio network. Every wireless network must have one Gateway, which schedules communication traffic and controls the I/O configuration for the network, and one or more Nodes. Similar to how a gateway device on a wired network acts as a “portal” between networks, the SureCross Gateway acts as the portal between the wireless network and the host controller. When the Gateway, using its Modbus RTU RS-485 connection, is a Modbus slave to a Modbus RTU host controller, the wireless network may contain up to 47 Nodes in a single wireless network. The Gateway holds the Modbus registers of all wireless devices within the 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>.

- SureCross Quick Start Guide: Banner part number [128185](#)
- SureCross Wireless I/O Network Manual: [132607](#)
- Web Configurator Manual (used with "Pro" and DX83 models): [134421](#)
- Host Configuration Manual [132114](#)

P/N 134303 Rev. H

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

Device Settings	Switches							
	1	2	3	4	5	6	7	8
Rotary dial address mode	OFF*							
Extended address mode	ON							
Inputs sourcing (PNP)		OFF*						
Inputs sinking (NPN)		ON						
Node 1 baseline filter OFF			OFF*					
Node 1 baseline filter ON			ON					
Node 1: threshold = 100, hysteresis = 30				OFF*	OFF*			
Node 1: threshold = 150, hysteresis = 30				OFF	ON			
Node 1: threshold = 200, hysteresis = 30				ON	OFF			
Node 1: threshold = 50, hysteresis = 15				ON	ON			
Node 2 baseline filter OFF						OFF*		
Node 2 baseline filter ON						ON		
Node 2: threshold = 100, hysteresis = 30							OFF*	OFF*
Node 2: threshold = 150, hysteresis = 30							OFF	ON
Node 2: threshold = 200, hysteresis = 30							ON	OFF
Node 2: threshold = 50, hysteresis = 15							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.

Baseline Threshold/Filter (M-GAGE)

Under normal conditions, the ambient magnetic field fluctuates. When the magnetic field readings drift below a threshold setting, the baseline or drift filter uses an algorithm to slowly match the radio device's baseline to the ambient magnetic field.

Discrete Input Type

Select the type of discrete input sensors to use with this device: sourcing (PNP) sensors or sinking (NPN) sensors.

Threshold and Hysteresis (M-GAGE)

Threshold and hysteresis work together to establish the ON and OFF points of an analog input. The threshold defines a trigger point or reporting threshold (ON point) for a sensor input. Setting a threshold establishes an ON point. Hysteresis defines how far below the threshold the analog input is required to be before the input is considered OFF. A typical hysteresis value is 10% to 20% of the unit's range.

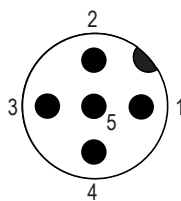
The M-GAGE Node's threshold and hysteresis ranges are 0 to 65,535. The factory default threshold setting is 100 and default hysteresis is 30 (the sensor detects an OFF condition at threshold minus hysteresis, or $100 - 30 = 70$). With the default settings, once the magnetic field reading is above 100, an ON or "1" is stored in the lowest significant bit (LSB) in the Modbus register. When the M-GAGE reading drops below the OFF point (threshold minus hysteresis), the LSB of the Modbus register is set to "0." To determine your threshold, take M-GAGE readings of the test objects at the distance they are likely to be from the sensor. For example, if a car reads 100, a bicycle 15, and a truck reads 200, setting the threshold to 150 will detect only trucks of a specific size. Magnetic field fluctuations vary based on the amount of ferrous metal present and the distance from the sensor.

Wiring Your SureCross® Device

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

5-pin Euro-Style Hookup

Wiring the 5-pin Euro-style connector depends on the model and power requirements of the device. Connecting dc power to the communication pins will cause permanent damage.

	Wire No.	Wire Color	Description
	1	Brown	10 to 30V dc
	2	White	RS485 / D1 / B / +
	3	Blue	dc common (GND)
	4	Black	RS485 / D0 / A / -
	5	Gray	Comms Gnd

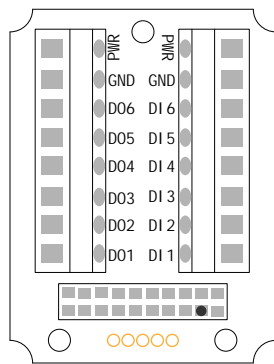
DX80...C Wiring

Wiring power to the DX80...C models varies depending the power requirements of the model. Connecting dc power to the communication pins (Tx/Rx) will cause permanent damage. For FlexPower devices, do not apply more than 5.5V to the gray wire.

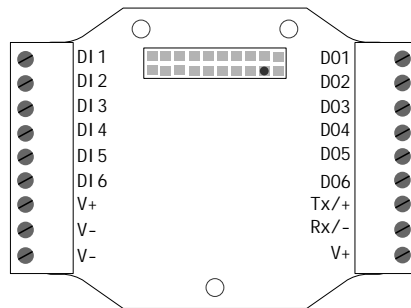
Terminal Label	Gateway, DX85	10 to 30V dc Powered Nodes	Battery Powered Nodes
V+	10 to 30V dc	10 to 30V dc	
Tx/+	RS485 / D1 / B / +		
V-	dc common (GND)	dc common (GND)	dc common (GND)
Rx/-	RS485 / D0 / A / -		
B+			3.6 to 5.5V dc

Terminal Blocks

IP67 Housing



IP20 Housing



DIx. Discrete IN x.

DOx. Discrete OUT x.

GND. Ground/dc common connection.

PWR. Power, 10 to 30V dc power connection.

RX/-. Serial comms line

TX/+. Serial comms line

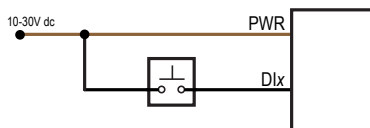
V+. Power, 10 to 30V dc power connection.

V-. Ground/dc common connection.

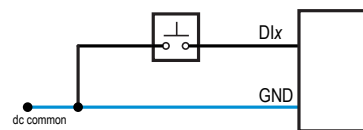
Wiring Diagrams for Discrete Inputs

Connecting dc 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.

Discrete Input Wiring for PNP Sensors



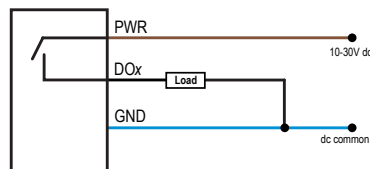
Discrete Input Wiring for NPN Sensors



Wiring Diagrams for Discrete Outputs

Connecting dc 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.

Discrete Output Wiring (PNP)



LED Behavior for the Gateways

After powering up and binding the Gateway and its Nodes, verify all devices are communicating properly. 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	Gateway Status
• (solid green)		Power ON
✱ (flashing red)	✱ (flashing red)	Device Error
	☀ (flashing yellow)	Modbus Communication Active
	✱ (flashing red)	Modbus Communication Error

For Gateway and Ethernet Bridge systems, active Modbus communication refers to the communication between the Gateway and the Ethernet Bridge. For GatewayPro systems, the Modbus communication LEDs refer to the communication internal to the GatewayPro. For

Gateway only systems, the Modbus communication LEDs refer to the communication between the Gateway and its host system (if applicable).

M-GAGE™ Gateway I/O Mapping

The M-GAGE Gateways are pre-programmed to allow the Gateway's inputs to set the baseline of up to six M-GAGE FlexPower Nodes. For example, Discrete IN 1 on the Gateway triggers a baseline reading for M-GAGE FlexPower Node 1 (Device ID 1). The Gateway's inputs 1 through 6 are mapped to Node Device IDs 1 through 6.

The M-GAGE inputs for each FlexPower Node are likewise mapped to the Gateway's discrete outputs by Device ID. M-GAGE Node Device ID 2 is mapped to the Gateway's Discrete OUT 2. The Gateway's outputs are activated when the M-GAGE sensor is above the established threshold value.

Use the DX80 User Configuration Tool (UCT) to adjust the M-GAGE sensor parameters.

I/O	Terminal Label	M-GAGE Gateway		M-GAGE Node	I/O
1	DI1	Discrete IN 1	to	M-GAGE Node 1 Baseline	14
2	DI2	Discrete IN 2	to	M-GAGE Node 2 Baseline	14
3	DI3	Discrete IN 3	to	M-GAGE Node 3 Baseline	14
4	DI4	Discrete IN 4	to	M-GAGE Node 4 Baseline	14
5	DI5	Discrete IN 5	to	M-GAGE Node 5 Baseline	14
6	DI5	Discrete IN 6	to	M-GAGE Node 6 Baseline	14
9	DO1	Discrete OUT 1	from	M-GAGE Node 1 M-GAGE Input	1
10	DO2	Discrete OUT 2	from	M-GAGE Node 2 M-GAGE Input	1
11	DO3	Discrete OUT 3	from	M-GAGE Node 3 M-GAGE Input	1
12	DO4	Discrete OUT 4	from	M-GAGE Node 4 M-GAGE Input	1
13	DO5	Discrete OUT 5	from	M-GAGE Node 5 M-GAGE Input	1
14	DO6	Discrete OUT 6	from	M-GAGE Node 6 M-GAGE Input	1

Modbus Register Table

I/O	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	0	1	0	1	DI1
2	2	2 + (Node# × 16)	Discrete IN 2	0	1	0	1	DI2
3	3	3 + (Node# × 16)	Discrete IN 3	0	1	0	1	DI3
4	4	4 + (Node# × 16)	Discrete IN 4	0	1	0	1	DI4
5	5	5 + (Node# × 16)	Discrete IN 5	0	1	0	1	DI5
6	6	6 + (Node# × 16)	Discrete IN 6	0	1	0	1	DI6
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

I/O	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.)	
13	13	13 + (Node# × 16)	Discrete OUT 5	0	1	0	1	DO5
14	14	14 + (Node# × 16)	Discrete OUT 6	0	1	0	1	DO6
15	15	15 + (Node# × 16)	Control Message					
16	16	16 + (Node# × 16)	Reserved					

Specifications

Radio and 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

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
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.

Power

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

Consumption: Less than 1.4 W (60 mA) at 24V 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 Euro-style male connector

For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.

Inputs and Outputs

Discrete Inputs

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

Discrete Input ON Condition

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

Discrete Input OFF Condition

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

Discrete Outputs

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

Discrete Output Rating (PNP)

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

Communication and Environmental

Hardware (RS-485)

Interface: 2-wire half-duplex RS-485
 Baud rates: 9.6k, 19.2k (default), or 38.4k
 Data format: 8 data bits, no parity, 1 stop bit

Protocol

Modbus RTU

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

Rating

DX80 Models: IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)
 DX80...C Models: IEC IP20; NEMA 1

Operating Environment

Temperature: -40 to +85 °C (Electronics); -20 to +80 °C (LCD)
 Humidity: 95% max. relative (non-condensing)
 Radiated Immunity: 10 V/m, 80-2700 MHz (EN61000-6-2)

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.

Certifications

DX80...C (External Wiring Terminal Models)



UL 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



UL Listing

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



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)

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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