SureCross DX80 Gateway with Analog I/O

Configurable Gateway with four 0-20mA analog inputs and four 0-20mA analog outputs

Features

IP67 Base
2.4 GHz

IP20 Base
900 MHz

The SureCross™ wireless system is a radio frequency network with integrated I/O that can operate in most environments while eliminating the need for wiring runs. Systems are built around a Gateway, which acts as the wireless network master device, and one or more Nodes.

- Wireless industrial I/O device with four 0 to 20 mA analog inputs and four 0 to 20 mA analog 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
- 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) 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 (Group IIC) Hazardous Locations when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, LCIE/ATEX, or applicable local codes/regulations (see Specifications)

For additional information, the most recent version of all documentation, and a complete list of accessories, refer to Banner Engineering's website, *www.bannerengineering.com/surecross*.

Models

Model	Frequency	Environmental Rating	I/O
DX80G9M6S0P0M4M4	900 MHz ISM Band	IP67, NEMA 6	**Inputs**: Four 0 to 20mA analog **Outputs**: Four 0 to 20mA analog
DX80G2M6S0P0M4M4	2.4 GHz ISM Band		
DX80G9M6S0P0M4M4C	900 MHz ISM Band	IP20, NEMA 1 Class I, Division 2, Group A, B, C, D Hazardous Locations (see *Specifications*)	
DX80G2M6S0P0M4M4C	2.4 GHz ISM Band		

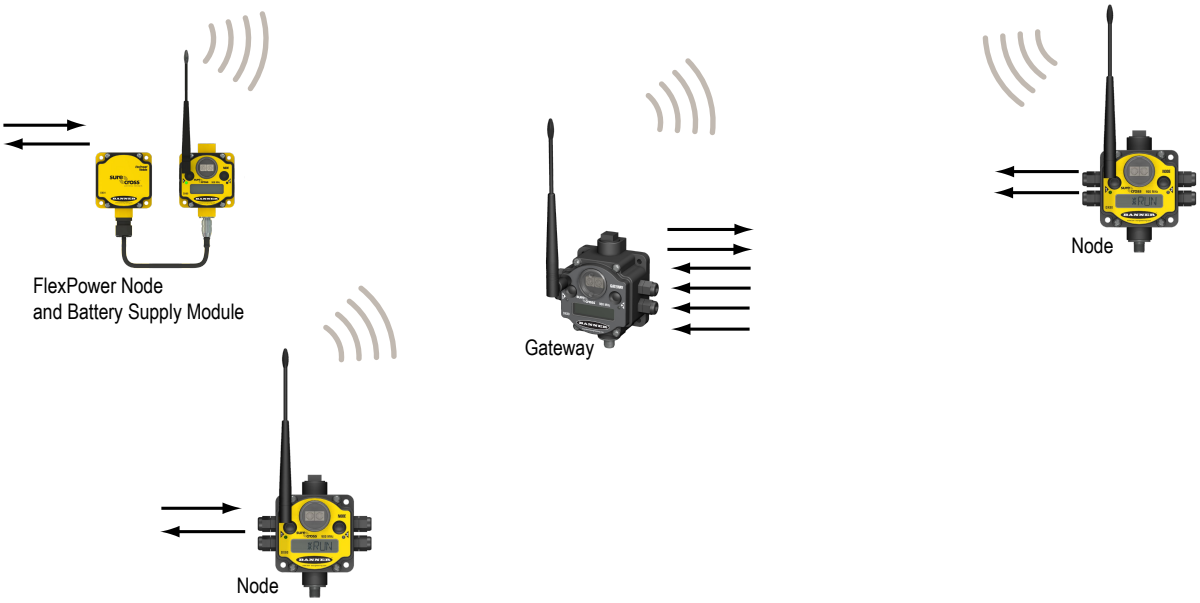
Internal antenna models are also available, but are not UL Listed. For more information, contact your local Banner Engineering Corp. representative.

WARNING: Not To Be Used for Personnel Protection
Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product 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 the burden of wiring or conduit installation. The SureCross wireless network can operate 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 inputs and outputs that may be all discrete, all analog, or a mix of discrete and analog I/O.



The SureCross DX80 network is a deterministic system—the network identifies when the radio signal is lost and drives relevant outputs to user-defined conditions. Once the radio signal is reacquired, the network returns to normal operation.

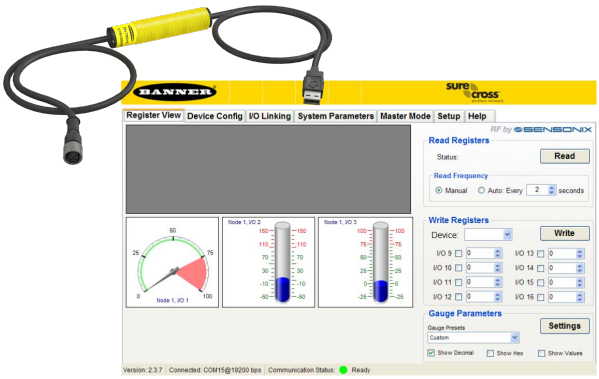
SureCross DX80 Gateways and Nodes

A **Gateway** acts as the master device within each radio network, initiates communication and reporting with the Nodes, and controls the timing for the entire network.

The Gateway also holds the configuration for the network. Every wireless network must have one Gateway that schedules communication traffic and controls the I/O configuration for the network. A radio network contains only one Gateway, but can contain many 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 central control process.

A **Node** is a wireless network end-point device used to provide sensing capability in a remote area or factory. The Node collects data from sensors and communicates the data back to the Gateway. Nodes are available in a wide variety of power or input/output options. Each Node device can be connected to sensors or output devices and reports I/O status to the Gateway.

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-HW-006) 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*.

Wiring Diagrams

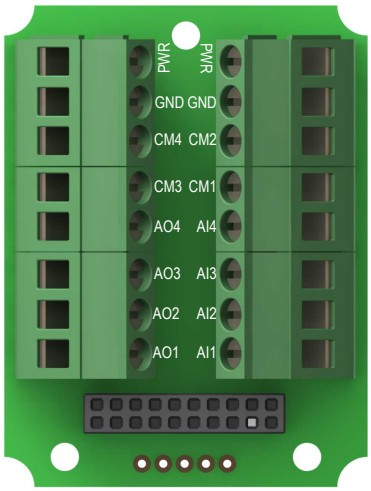
5-pin Euro-Style Hookup

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

Terminal Block (IP67 Housing)

Connecting dc power to the communication pins will cause permanent damage. Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.



AI*x* or A*x*. Analog IN *x*.

AO*x*. Analog OUT *x*.

CM*x*. Not used. Do not make any wiring connections to these terminals.

GND. Ground/dc common connection.

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

DX80...C Wiring

Wiring power to the DX80...C models varies depending the power requirements of the model.

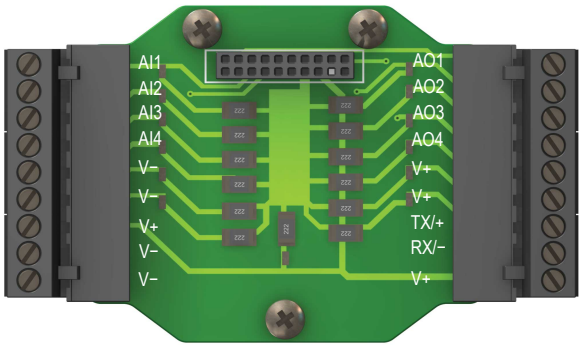
Terminal Label	Gateway, DX85 *	10 to 30V dc Powered Nodes	Battery Powered Nodes **
V+	10 to 30V dc	10 to 30V dc	
Tx/+	RS485 / D1 / B / +		
V-	dc common (GND)	dc common (GND)	dc common (GND)
Rx/-	RS485 / D0 / A / -		
B+			3.6 to 5.5V dc

* Connecting dc power to the communication pins will cause permanent damage.

** For FlexPower devices, do not apply more than 5.5V to the gray wire.

Terminal Block (IP20 Housing)

Connecting dc power to the communication pins will cause permanent damage. Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.



AI*x* or A*x*. Analog IN *x*.

AO*x*. Analog OUT *x*.

CM*x*. Not used. Do not make any wiring connections to these terminals.

RX/-. Serial comms line

TX/+. Serial comms line

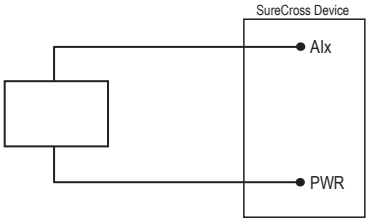
V+. Power, 10 to 30V dc power connection.

V-. Ground/dc common connection.

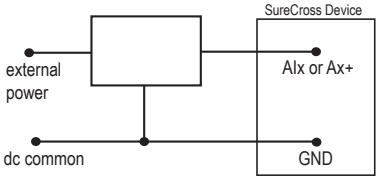
Wiring Diagrams for Analog Inputs

Connecting dc power to the communication pins will cause permanent damage. Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.

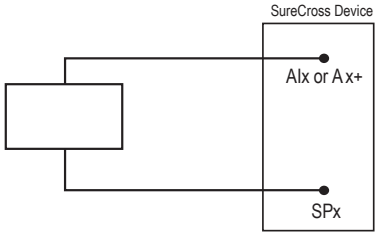
Analog Input Wiring (10 to 30V dc Power)



Analog Input Wiring (Externally Powered Sensors)



Analog Input Wiring (Switch Powered Sensors)

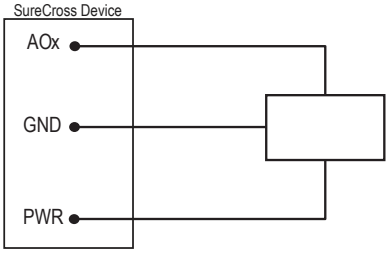


(Only possible in models with switch power (SPx) outputs)

Wiring Diagrams for Analog Outputs

Connecting dc power to the communication pins will cause permanent damage. Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.

Analog Output Wiring



Additional Information

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

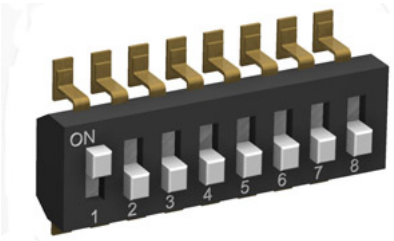
- SureCross Quick Start Guide: Banner part number *128185*
- SureCross Wireless I/O Network Manual: *132607*
- Web Configurator Manual (used with "Pro" and DX83 models): *134421*

Modbus Register Table

I/O	Modbus Holding Register		I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway or DX85	Any Node			Min. Value	Max. Value	Min. (Dec.)	Max. (Dec.)	
1	1	1 + (Node# × 16)	Analog IN 1	mA / V	0.0	20.0 / 10.0	0	65535	AI1
2	2	2 + (Node# × 16)	Analog IN 2	mA / V	0.0	20.0 / 10.0	0	65535	AI2
3	3	3 + (Node# × 16)	Analog IN 3	mA / V	0.0	20.0 / 10.0	0	65535	AI3
4	4	4 + (Node# × 16)	Analog IN 4	mA / V	0.0	20.0 / 10.0	0	65535	AI4
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)	Analog OUT 1	mA / V	0.0	20.0 / 10.0	0	65535	AO1
10	10	10 + (Node# × 16)	Analog OUT 2	mA / V	0.0	20.0 / 10.0	0	65535	AO2
11	11	11 + (Node# × 16)	Analog OUT 3	mA / V	0.0	20.0 / 10.0	0	65535	AO3
12	12	12 + (Node# × 16)	Analog OUT 4	mA / V	0.0	20.0 / 10.0	0	65535	AO4
13	13	13 + (Node# × 16)							
14	14	14 + (Node# × 16)							
15	15	15 + (Node# × 16)	Control Message						
16	16	16 + (Node# × 16)	Reserved						

Device Configuration

DIP Switch Changes



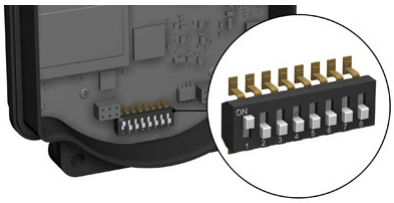
Before making any changes to the DIP switch positions, disconnect the power. For devices with batteries integrated into the housing, remove the battery for at least one minute.

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. 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

	Switches							
Device Settings	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Rotary switch address mode	OFF*							
Extended address mode	ON							
Host configured (overrides switches 3-8)		OFF*						
Use switch settings		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			
0–20 mA scale **						OFF*		
4–20 mA scale **						ON		

* Default configuration

** Not used on 0–10V I/O models.

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.

Analog Input and Output Scale

Use the DIP switch to select which current scale to use for all the device's analog inputs and outputs: 0 to 20 mA or 4 to 20 mA.

When using a 4-20 mA sensor with a 0-20 mA input, the sensor uses the 4-20 mA section of the total range. Using a 4-20 mA with a 0-20 mA input allows you to determine when you have an error condition with the sensor. A normal input reading between 4 and 20 mA indicates a functioning sensor whereas a value below 4 mA indicates an error condition, such as a broken wire or loose connection.

This DIP switch is used only on the 0 to 20 mA models, not the 0 to 10V models.

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.

Link Loss Outputs

The SureCross™ DX80 wireless devices use a deterministic link time-out method to address RF link interruption or failure. When a radio link fails, all pertinent wired outputs are sent to defined states until the link is recovered, ensuring that disruptions in the communications link result in predictable system behavior.

Following a 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 to hold the last stable state/value. Use the DIP switches to select the link loss output state.

Verify Communications

After powering up and binding the Gateway and its Nodes, verify all devices are communicating properly. Verify LED 1 is green. Until communication is established with the Gateway, the Node’s LED 2 flashes red. When communication is established, the Node’s LED 1 flashes green.

A Node will not sample its inputs until it is communicating with the Gateway to which it is bound.

LED 1	LED 2	Gateway Status	Node Status
(green on)		Power ON	
(green flashing)			RF Link OK
(red flashing)	(red flashing)	Device Error	Device Error
	(yellow flashing)	Modbus Communication Active	
	(red flashing)	Modbus Communication Error	No radio link (when flashing once every three seconds)

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

When testing the Gateway and Node, verify all radios and antennas are at least two meters apart or the communications may fail.

Specifications

Radio

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 conducted
2.4 GHz: 18 dBm conducted, less than or equal to 20 dBm 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)

Antenna Connection
Ext. Reverse Polarity SMA, 50 Ohms
Max Tightening Torque: 0.45 N·m (4 in·lbf)

Link Timeout
Gateway: Configurable
Node: Defined by Gateway

* 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.

General

Power*
Requirements: +10 to 30V dc (For European applications: +10 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
Weight: 0.26 kg (0.57 lbs)
Mounting: #10 or M5 (M5 hardware included)
Max. Tightening Torque: 0.56 N·m (5 in·lbf)

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

Analog Inputs
Rating: 24 mA
Impedance: 100 Ohms
Sample Rate: 62.5 milliseconds
Report Rate: 1 second or On Change of State (1% change in value)
Accuracy: 0.1% of full scale +0.01% per °C
Resolution: 12-bit

To verify the analog input's impedance, use an Ohm meter to measure the resistance between the analog input terminal (AI*x*) and the ground (GND) terminal.

Analog Outputs
Update Rate: 125 milliseconds
Accuracy: 0.1% of full scale +0.01% per °C
Resolution: 12-bit

Communication

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

Environmental

Rating

DX80 Models:IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)
DX80...C Models: IEC IP20; NEMA 1 (In a suitable enclosure: Class I, Division 2, Group A, B, C, D; T4 −40 to 80° C)

Operating Environmental

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)

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

Refer to the SureCross™ DX80 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

DX8x...C (External Wiring Terminal Models)

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

Included with Device

The following items ship with the DX80 radios.

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	BWA-HW-003	1	

Antenna **	BWA-9O2-C, or BWA-2O2-C	1	Antenna, 902-928 MHz, 2 dBd Omni, Rubber Swivel RP-SMA Male, or Antenna, 2.4 GHz, 2 dBd Omni, Rubber Swivel RP-SMA Male
SureCross Literature CD	79685	1	
SureCross Quick Start Guide	128185	1	(Ships with Gateways)
Cable *	MQDC1-506	1	Cable, 5-Euro (single ended), Straight, 2m
IP20 Screw Terminal Headers (2 pack) ***	BWA-HW-011	1	

* Not included with IP20 DX80...C models.

** Internal antenna devices do not ship with this antenna.

*** Not included with IP67 DX80 models.

Warnings

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

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.

All specifications published in this document are subject to change. Banner reserves the right to modify the specifications of products without notice. Banner Engineering reserves the right to update or change documentation at any time. For the most recent version of any documentation, refer to our website: *www.bannerengineering.com*. © 2006-2010 Banner Engineering Corp. All rights reserved.

Antenna Installation

Always 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.

Always 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 *Agency 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 if the destination country is not on this list.

Limited Warranty

Banner 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 of the Banner product. **THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.** This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Limited Warranty
Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.

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