

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.



- 10 to 30 V dc power input
- Modbus serial interface and Ethernet interface
- Frequency Hopping Spread Spectrum (FHSS) technology ensures 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
- Site Survey analyzes the network's signal strength and reliability and displays the results on the Gateway's LCD
- Lost RF links are detected and relevant outputs set to user-defined conditions

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



WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models

Models	Frequency	Descriptions
DX80P2T6S-P-KR	2.4 GHz ISM Band	Modbus/TCP or EtherNet/IP communication protocol

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 housed 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 board-level 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 housed 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 board-level 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.

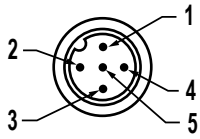
- Sure Cross® Quick Start Guide: [128185](#)
- Sure Cross® Wireless I/O Network Instruction Manual: [132607](#)
- Web Configurator Instruction Manual (used with "Pro" and DX83 models): [134421](#)
- Host Controller Systems Instruction Manual: [132114](#)

Wire Your Sure Cross® Device

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

5-pin M12/Euro-style Wiring for Gateways and DX85s

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

5-pin M12/Euro-style Male Connector	Pin	Wire Color	Description
	1	Brown	10 to 30 V dc
	2	White	RS485 / D1 / B / +
	3	Blue	dc common (GND)
	4	Black	RS485 / D0 / A / -
	5	Gray	Comms Gnd

Industrial Ethernet Wiring

Use the 4-pin industrial Ethernet connection to connect the radio network to an Ethernet-based host system.

4-pin Industrial Ethernet Connector	Pin	Wire Color	Description
	1	White/orange	+ Tx
	2	White/blue	+Rx
	3	Orange	-Tx
	4	Blue	-Rx

Modbus Holding Registers

There are sixteen Modbus holding registers for each device. Calculate the holding register number for each device using the equation: Register number = I/O# + (Node# × 16).

The Gateway is always device 0 and the Gateway's holding registers are registers 1 through 16. Registers for Node 1 are 17 through 32. Although only seven Nodes are listed, the registers continue for as many Nodes as are in the network. For example, the register number for Node 10, I/O point 15, is 175.

Table 1: Modbus Holding Registers

I/O Point	Gateway	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7
1	1	17	33	49	65	81	97	113
2	2	18	34	50	66	82	98	114
3	3	19	35	51	67	83	99	115
4	4	20	36	52	68	84	100	116
5	5	21	37	53	69	85	101	117
6	6	22	38	54	70	86	102	118
7	7	23	39	55	71	87	103	119
8	8	24	40	56	72	88	104	120
9	9	25	41	57	73	89	105	121
10	10	26	42	58	74	90	106	122
11	11	27	43	59	75	91	107	123
12	12	28	44	60	76	92	108	124

I/O Point	Gateway	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7
13	13	29	45	61	77	93	109	125
14	14	30	46	62	78	94	110	126
15	15	31	47	63	79	95	111	127
16	16	32	48	64	80	96	112	128

EtherNet/IP™ Registers

EtherNet/IP™ on ControlLogix PLC Register Map

A ControlLogix PLC may control the DX80 wireless system using EtherNet/IP through assembly objects and the Common Industrial Protocol (CIP). Add the SureCross Gateway to the ControlLogix PLC as a “Generic Ethernet Module.”

There is one input assembly object for all DX80 input points and one output assembly object for all DX80 output points. Each object is 228 elements long, with each element a 16-bit integer.

The SureCross Gateway is configured at the factory to send all inputs and outputs for the first 16 Nodes in the system. To change the factory settings, change the XML configuration file using the SureCross Web Configurator web pages.

Input Assembly Object, DX80 Input, Instance 100 (0x64). Words are not allocated for any specific unit but are used, in device order, for each of the device input registers selected using the EIP checkbox.

Output Assembly Object, DX80 Outputs, Instance 112 (0x70). Words are not allocated for any specific unit but are used, in device order, for each of the device output registers selected using the EIP checkbox.

For proper EtherNet/IP communication, the minimum requested packet interval should be 150 milliseconds or higher.

Instance 100		Instance 112	
Word #	Inputs	Word #	Outputs
0	Input 1	0	Output 1
1	Input 2	1	Output 2
2	Input 3	2	Output 3
3	Input 4	3	Output 4
...
...
226	Input 227	226	Output 227
227	Input 228	227	Output 228

EtherNet/IP™ to PLC5 and SLC5 Register Map

Allen-Bradley’s PLC5 and SLC5 family of devices use PCCC communications over EtherNet/IP. The DX80 wireless system supports these PLCs using input and output register arrays.

There is one input assembly object for all DX80 input points and one output assembly object for all DX80 output points. Each object is 228 elements long, with each element a 16-bit integer. The DX80 wireless data table addresses are N7 for read and N14 for write. The MSG instruction only handles up to 103 words; use multiple MSG instructions if all data is required.

N7 - Read Registers		N14 - Write Registers	
0	Input 1	0	Output 1
1	Input 2	1	Output 2
2	Input 3	2	Output 3
3	Input 4	3	Output 4
...
...
226	Input 227	226	Output 227
227	Input 228	227	Output 228

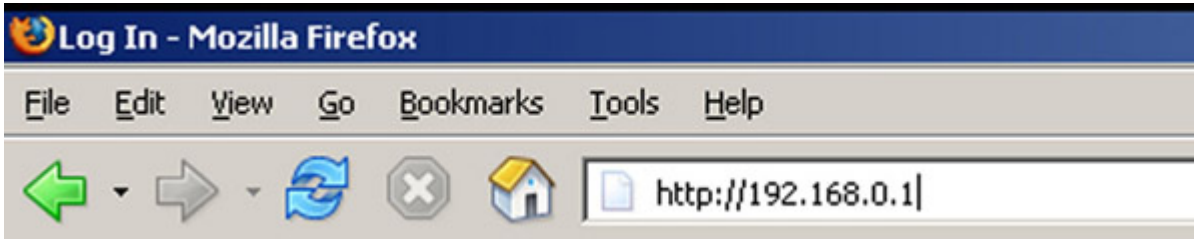
Logging into the Web Configurator

The SureCross® Pro and DX83 Ethernet Bridge devices use an XML file to configure the network. To access the XML file, use any web browser set up for a direct connection to the Internet. If problems occur while connecting, verify the browser is not set to use a proxy server.

When connecting to the Ethernet Bridge, GatewayPro, or MultiHop Pro directly from a host computer, a crossover Ethernet cable is required; when connecting through a switch or Ethernet hub, use a standard Ethernet cable.

- The factory default IP address for the devices is: **192.168.0.1**.

To change the device's default IP address, first set up the host PC with an IP address different from the Ethernet Bridge, GatewayPro, or MultiHop Pro IP addresses. (Please refer to Banner document [133116](#) for instructions on setting up the host computer's network IP address.) After changing the host's IP address, open a web browser and log into the Ethernet Bridge, GatewayPro, or MultiHop Pro by typing the IP address in the browser location window: **http://192.168.0.1**.



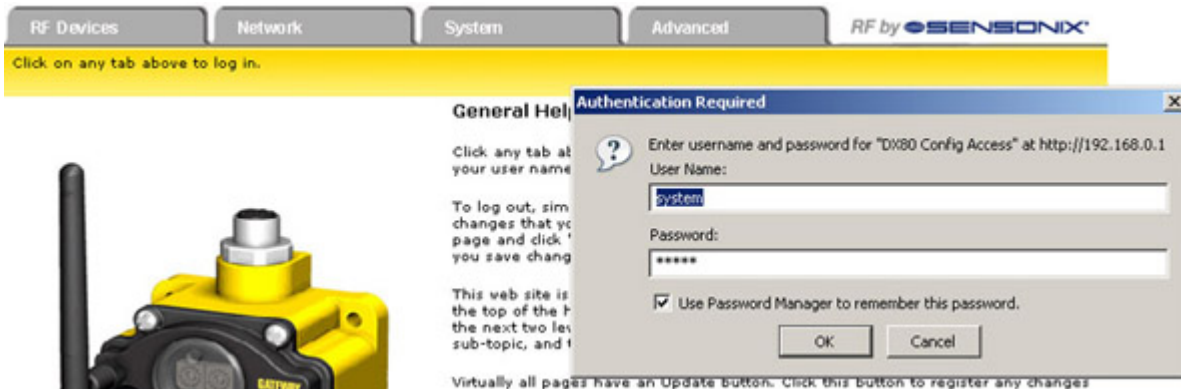
After entering the IP address, the home web page for the SureCross device displays. To log in, click on any tab at the top of the page. To log out, close the browser.

Admin-level access allows administrators to set up system users and their passwords. Admin-level access is also required to change the IP address of the system. For Admin-level access, enter the following as the user name and password:

- **User name: root**
- **Password: sxi**

For user-level access, enter the following as the user name and password.

- **User name: system**
- **Password: admin**



Specifications

Performance 2.4 GHz Korean Radio Specifications

Radio Range¹

2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

Antenna Minimum Separation Distance

2.4 GHz, 65 mW: 0.3 m (1 ft)

Radio Transmit Power

2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

2.4 GHz Compliance for Korean Radio Models

KCC-CRM-BE2-DX

Antenna Connection

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

Link Timeout

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

¹ 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.

RS-485 Communication Specifications

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

GatewayPro Specifications

Supply Voltage

10 V dc to 30 V dc (Outside the USA: 12 V dc to 24 V dc, ± 10%)
Consumption: Less than 4.2 W (175 mA) at 24 V dc

Modbus/TCP and EtherNet/IP

4-wire Industrial Ethernet
10/100 Mbps, full or half duplex, auto sensing

Wiring Access

One 5-pin threaded M12/Euro-style male quick disconnect and One 4-pin female industrial Ethernet connection

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)

Interface

Two bi-color LED indicators, Two buttons, Six character LCD

Certifications



Environmental Specifications

Operating Conditions

-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)

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

Environmental Ratings

IEC IP67; NEMA 6
Refer to the Sure Cross® Wireless I/O Networks Instruction 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.

Accessories


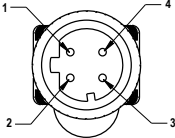
Included with Device ('Pro Models)

The following items ship with the 'Pro radios.

- 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-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-EX2M: Ethernet crossover cable, M12 industrial/RJ45, 2 meter

Ethernet Cables

Use a crossover cable to connect the GatewayPro or DX83 Ethernet Bridge to a host system without using an Ethernet switchbox or hub. When using a switchbox or hub, use a straight cable.

RSCD RJ45 Ethernet to 4-Pin M12/Euro-Style Cordsets				
Model	Length	Style	Dimensions	Pinout
BWA-E2M	2 m (6.6 ft)	Straight RSCD RJ45 440		  <p>1 = White/orange (+Tx) 2 = Orange (-Tx) 3 = White/blue (+Rx) 4 = N/C 5 = N/C 6 = Blue (-Rx) 7 = N/C 8 = N/C</p> <p>1 = White/Orange (+Tx) 2 = White/Blue (+Rx) 3 = Orange (-Tx) 4 = Blue (-Rx)</p>
BWA-E8M	8 m (26.2 ft)			
BWA-EX2M	2 m (6.6 ft)	Crossover RSCD RJ45CR 440		

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.

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.

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 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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

For patent information, see www.bannerengineering.com/patents.