

SureCross Performance GatewayPro

Performance GatewayPro for protocol conversion or web-based configuration



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.

- Selectable transmit power levels of 250 mW or 1 Watt and license-free operation up to 4 watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- 10 to 30V dc power input
- Modbus serial interface and Ethernet interface
- 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
- 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, the most recent version of all documentation, and a complete list of accessories, refer to Banner Engineering's website, www.bannerengineering.com/surecross.

Models	Power	Frequency	Feature
DX80P9T6S-P	+10 to 30V dc	900 MHz ISM Band	Modbus/TCP or EtherNet/IP communication protocol
DX80P9A6S-P			Modbus/TCP protocol (Configuration capability using the Web Configurator)



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.



Important: Never Operate 1 Watt Radios Without Antennas.

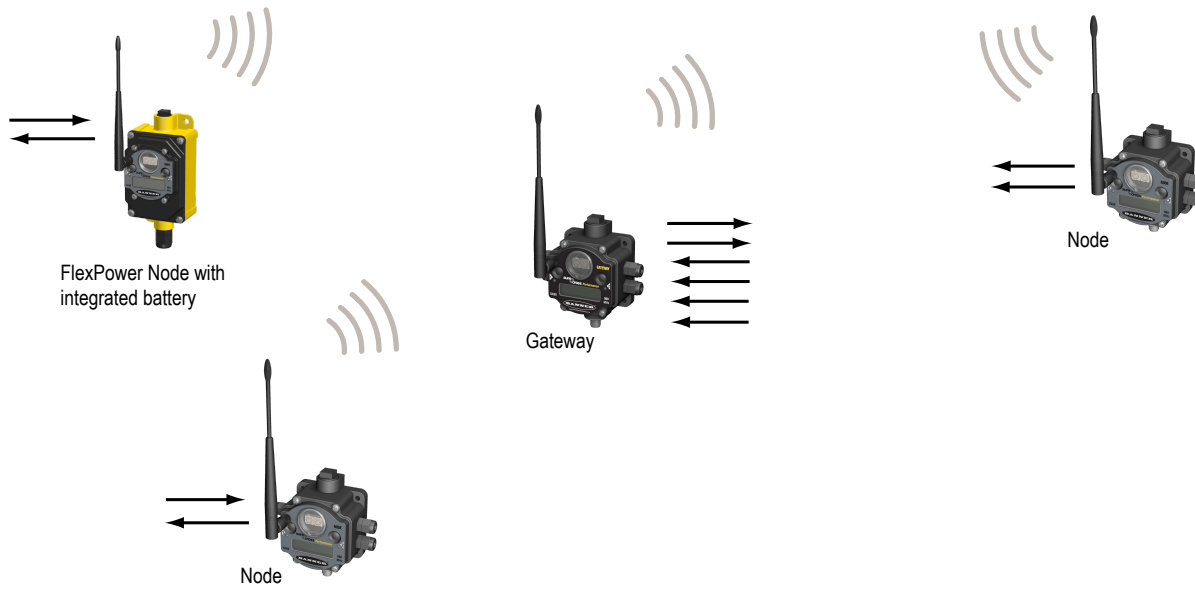
To avoid damaging the radio circuitry, never power up SureCross Performance or SureCross MultiHop (1 Watt) radios without an antenna.

The SureCross® Performance Wireless Network

The SureCross® Performance 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® Performance 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® Performance Gateways and Nodes

A **Gateway** is the master device within each radio 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 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 and the Gateway holds the Modbus registers of all wireless devices within the network.

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® Performance GatewayPro

The SureCross® Performance GatewayPro combines, in one unit, the function of a SureCross® Performance Gateway with the ability to interface to Ethernet using Modbus/TCP or EtherNet/IP™ protocols. The GatewayPro has a serial port as well as an industrial Ethernet port. There are two basic models of the GatewayPro: DX80P*T6* and DX80P*A6*.

- **DX80P*T6***. The 'T6' model acts as a protocol converter only, offering the Modbus/TCP or EtherNet/IP communication protocols.
- **DX80P*A6***. The 'A6' model includes DX80 wireless network configuration, Modbus RTU master, Modbus/TCP client/server, Script Basic, e-mail, data logging, and trending.

Connect a GatewayPro to a host system using the industrial Ethernet connection on the DX80 GatewayPro. To connect the GatewayPro directly to the host system without using an Ethernet switchbox/hub, some host systems may require a crossover cable.

By default, the GatewayPro is configured to use Modbus/TCP server. To use EtherNet/IP, connect the GatewayPro to a managed switch. For more information, see [SureCross Wireless I/O Product Manual](#) or [Host Configuration Manual](#).

Setting Up Your Wireless Network

To set up and install your wireless network, follow these steps:

1. Configure the DIP switches of all devices.
2. Connect the sensors to the SureCross devices.
3. Apply power to all devices.
4. Form the wireless network. For binding instructions, refer to the product manual.
5. Observe the LED behavior to verify the devices are communicating with each other.
6. Conduct a site survey between the Gateway and Nodes. For site survey instructions, refer to the product manual.

7. Install your wireless sensor network components. For installation instructions, refer to the product manual.

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](#)
- Host Configuration Manual [132114](#)

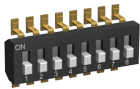
Configuring the DIP Switches

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
Transmit Power Level: 1 Watt (30 dBm)	OFF*			
Transmit Power Level: 250 mW (24 dBm), DX80 Compatibility Mode	ON			

* Default configuration

Transmit Power Levels

The 900 MHz radios can be operated at 1 watt (30 dBm) or 250 mW (24 dBm). While the radios operate in 1 Watt mode, they cannot communicate with 150 mW DX80 radio devices. To communicate with the 150 mW radio models, operate this radio in 250 mW mode. For 2.4 GHz radios, this DIP switch is disabled. The transmit power for 2.4 GHz is fixed at about 100 mW EIRP (18 dBm), making the 2.4 GHz Performance models automatically compatible with the DX80 2.4 GHz models.

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

Industrial Ethernet Wiring

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

	Wire No.	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 SureCross™ device. Calculate the holding register number for each device using the equation: Register number = I/O# + (Node# × 16).

Because the Gateway is always device 0, the Gateway's holding registers are registers 1 through 16. Registers for Node 1 are 17 through 32, as shown in the Modbus Holding Register table below. Though only ten Nodes are shown, the table can continue for as many Nodes as are used in a given network.

Using the equation or the Modbus Holding Registers table, the register number for I/O point 15 for Node 7 is 127.

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
13	13	29	45	61	77	93	109	125
14	14	30	46	62	78	94	110	126

Modbus Holding Registers								
I/O Point	Gateway	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7
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

The DX80 wireless system is controlled by a ControlLogix PLC 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
...

N7 - Read Registers		N14 - Write Registers	
...
226	Input 227	226	Output 227
227	Input 228	227	Output 228

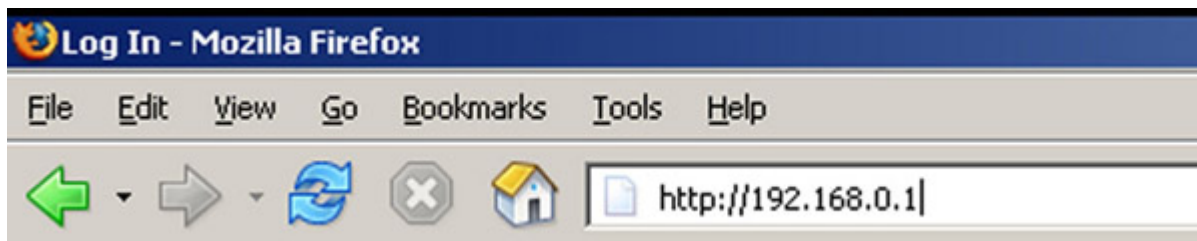
Logging into the Web Configurator

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 detailed 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**.



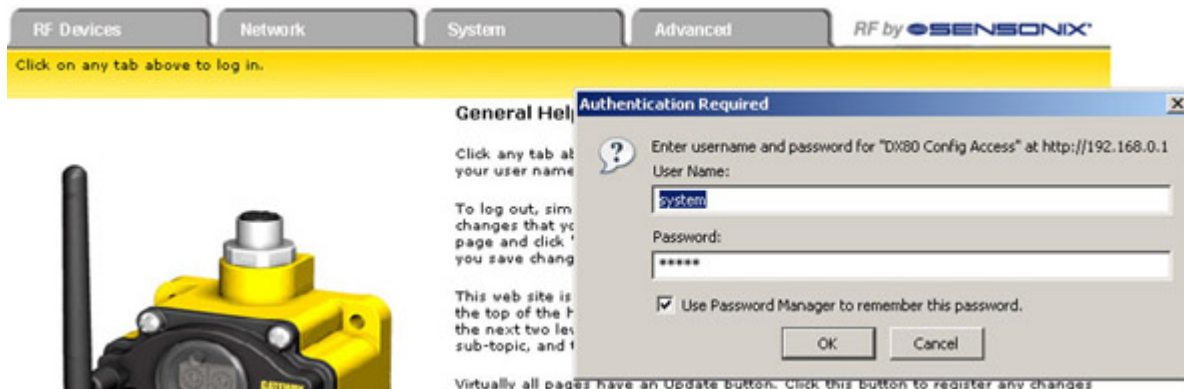
After entering the IP address, the home web page for the SureCross device displays. To log in, click on any tab at the top of the page. To log out, close the browser.

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**



Mixing Performance and Non-Performance Radios in the Same Network

To comply with federal regulations, the 150 mW radios and 1 Watt radios communicate differently. To mix Performance radios with non-Performance radios:

- Performance radios must operate in 250 mW mode, **not** 1 Watt mode (DIP switch 1 ON)
- Non-Performance radios must be set to use Extended Address Mode (DIP switch 1 ON)

For more detailed instructions about setting up your wireless network, refer to the Quick Start Guide, Banner document number 128185. For more information about using Performance and non-Performance radios within the same network, refer the technical note titled *Mixing Performance Radios and 150 mW Radios in the Same Network* listed on the FAQ/Knowledgebase section of Banner's Wireless Sensor Networks website.

Specifications

Radio	General
<p>Radio Range 900 MHz (1 Watt): Up to 9.6 kilometers (6 miles) *</p> <p>Radio Transmit Power 900 MHz (1 Watt): 30 dBm conducted (up to 36 dBm EIRP)</p> <p>900 MHz Compliance (1 Watt Radios) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809</p> <p>Spread Spectrum Technology FHSS (Frequency Hopping Spread Spectrum)</p> <p>Link Timeout Gateway: Configurable Node: Defined by Gateway</p> <p>* 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.</p>	<p>Power* Requirements: +10 to 30V dc (For European applications: +10 to 24V dc, \pm 10%). (See UL section below for any applicable UL specifications) Consumption: Less than 4.2 W (175 mA) at 24V dc</p> <p>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 in·lbf)</p> <p>Antenna Connection Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 in·lbf)</p> <p>Interface Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD</p> <p>Wiring Access One 5-pin Euro-style male connector and One 4-pin female industrial Ethernet connection</p> <p>* For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.</p>
Communication	Environmental
<p>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</p> <p>Protocol Modbus RTU</p> <p>Modbus/TCP and EtherNet/IP 4-wire Industrial Ethernet 10/100 Mbps, full or half duplex, auto sensing</p>	<p>Environmental Rating: IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications) Operating Temperature: -40 to +85° C (Electronics); -20 to +80° C (LCD) Operating Humidity: 95% max. relative (non-condensing) Radiated Immunity: 10 V/m, 80-2700 MHz (EN61000-6-2)</p> <p>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</p> <p>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.</p>

Certifications



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

Part No.	Model No.	Description
77669	BWA-E2M	Ethernet cable, RSCD RJ45 440, 2M
78469	BWA-E8M	Ethernet cable, RSCD RJ45 440, 8M
78467	BWA-EX2M	Ethernet cable, crossover, RSCD RJ45CR 440, 2M

Use a crossover cable to connect the DX80 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.

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.

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