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.

- 10 to 30V dc power input
- Modbus serial interface and Ethernet 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

For additional information, updated documentation, and accessories, refer to Banner Engineering’s website, [www.bannerengineering.com/surecross](http://www.bannerengineering.com/surecross).

<table>
<thead>
<tr>
<th>Models</th>
<th>Feature</th>
<th>Frequency</th>
<th>Antenna</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX80P9T6S</td>
<td>Modbus/TCP or EtherNet/IP communication protocol</td>
<td>900 MHz ISM Band</td>
<td>External</td>
</tr>
<tr>
<td>DX80P9T6W</td>
<td>Modbus/TCP or EtherNet/IP communication protocol</td>
<td>900 MHz ISM Band</td>
<td>Internal</td>
</tr>
<tr>
<td>DX80P2T6S</td>
<td></td>
<td>2.4 GHz ISM Band</td>
<td>External</td>
</tr>
<tr>
<td>DX80P2T6W</td>
<td></td>
<td>2.4 GHz ISM Band</td>
<td>Internal</td>
</tr>
<tr>
<td>DX80P9A6S</td>
<td></td>
<td>900 MHz ISM Band</td>
<td>External</td>
</tr>
<tr>
<td>DX80P9A6W</td>
<td>Modbus/TCP protocol, Configuration capability using</td>
<td>900 MHz ISM Band</td>
<td>Internal</td>
</tr>
<tr>
<td>DX80P2A6S</td>
<td>the Web Configurator</td>
<td>2.4 GHz ISM Band</td>
<td>Internal</td>
</tr>
<tr>
<td>DX80P2A6W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 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-
puts to user-defined conditions. After the radio signal is reacquired, the network returns to normal operation.

**SureCross® DX80 Gateways and Nodes**

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.

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.

**SureCross® DX80 GatewayPro**

The SureCross® DX80 GatewayPro combines the function of a SureCross® DX80 Gateway with the ability to interface to Ethernet using Modbus/TCP or EtherNet/IP™ protocols. The GatewayPro has a serial port and an industrial Ethernet port. There are two basic models of the GatewayPro:

- **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 host system to the GatewayPro using its industrial Ethernet connection. To connect the GatewayPro 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](#).

**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
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 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.
6. 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.
7. 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.

- 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. DIP switch changes will not be recognized if power isn't cycled to the device.

For parameters not set via DIP switches, use the User Configuration Tool (UCT) to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the User Configuration Tool.

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.
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

<table>
<thead>
<tr>
<th></th>
<th>Switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Settings</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Rotary dial address mode</td>
<td>OFF*</td>
</tr>
<tr>
<td>Extended address mode</td>
<td>ON</td>
</tr>
</tbody>
</table>

* 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.

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.

<table>
<thead>
<tr>
<th>Wire No.</th>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown</td>
<td>10 to 30V dc</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
<td>RS485 / D1 / B / +</td>
</tr>
<tr>
<td>3</td>
<td>Blue</td>
<td>dc common (GND)</td>
</tr>
<tr>
<td>4</td>
<td>Black</td>
<td>RS485 / D0 / A / –</td>
</tr>
<tr>
<td>5</td>
<td>Gray</td>
<td>Comms Gnd</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Wire No.</th>
<th>Wire Color</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White/Orange</td>
<td>+Tx</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>White/Blue</td>
<td>+Rx</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td>-Tx</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Blue</td>
<td>-Rx</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>LED 1</th>
<th>LED 2</th>
<th>Gateway Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(solid green)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power ON</td>
</tr>
</tbody>
</table>
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).

### Modbus Register Table

<table>
<thead>
<tr>
<th>I/O Point</th>
<th>Gateway</th>
<th>Modbus Holding Register</th>
<th>Any Node</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>6 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>7 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>8 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>9 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>10 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>11 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>13 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>14 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>15 + (Node# × 16)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>16 + (Node# × 16)</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

**Radio and General**

<table>
<thead>
<tr>
<th>Range</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>900 MHz: Up to 4.8 kilometers (3 miles)</td>
<td>Requirements: +10 to 30V dc (Outside the USA: +12 to 24V dc, ±10%). (See UL section below for any applicable UL specifications)</td>
</tr>
<tr>
<td>2.4 GHz: Up to 3.2 kilometers (2 miles)</td>
<td>Consumption: Less than 2.9 W (120 mA) at 24V dc</td>
</tr>
</tbody>
</table>

**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
Radio and General

**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.

**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**
- One 5-pin Euro-style male connector and One 4-pin female industrial Ethernet connection

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

**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

**Modbus/TCP and EtherNet/IP**
- 4-wire Industrial Ethernet
- 10/100 Mbps, full or half duplex, auto sensing

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.

**Rating**
- IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)

**Operating Conditions**
- 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

**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

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>77669</td>
<td>BWA-E2M</td>
<td>Ethernet cable, RSCD RJ45 440, 2M</td>
</tr>
<tr>
<td>78469</td>
<td>BWA-E8M</td>
<td>Ethernet cable, RSCD RJ45 440, 8M</td>
</tr>
<tr>
<td>78467</td>
<td>BWA-EX2M</td>
<td>Ethernet cable, crossover, RSCD RJ45CR 440, 2M</td>
</tr>
</tbody>
</table>

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

**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.

**Violating 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. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or to update documentation at any time. For the most recent version of any documentation, refer to: [www.bannerengineering.com](http://www.bannerengineering.com). © 2006-2013 Banner Engineering Corp. All rights reserved.

### 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.