

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. Wireless networks are formed around a Gateway, which acts as the wireless network master device, and one or more Nodes.

The Performance Series P15E Node can wirelessly control any AC-powered devices, including lights (including dimming levels), fan speed, and motors. For higher amperage applications, relays can be used to control contactors. By using a current transducer and its analog inputs you can monitor energy/power levels for connected devices.

Benefits

- **Remotely control**—Lights, fans, and motors; use in conjunction with equipment health monitoring sensors to shut down motors remotely when potential issues are detected
- **Eliminate control wires**—The Sure Cross wireless system is a radio frequency network with integrated I/O that removes the need for control wires.
- **Reduce complexity**—Facility or machine reconfiguration made easier; great for retrofit applications
- **Deploy easily**—The relays and wireless radio are housed in a single device, simplifying installation on existing equipment and enabling deployments in remote and hard-to-access locations where implementing a wired solution would be difficult, impractical, or not cost-effective



- Wireless industrial I/O device with two AC/DC relay outputs, two discrete PNP outputs, two 0–10 V dc analog outputs, two discrete NPN or PNP (selectable) inputs, and two 0–10 V dc analog inputs
- Supply voltage of 100–277 V ac at 50/60 Hz
- Courtesy power output of 25 W (24 V dc)
- AC power field wireable through a 1/2-inch NPSM port using 1/2-inch conduit, cable gland, or Mini-style quick disconnect (QD)
- Selectable transmit power levels of 250 mW or 1 Watt for 900 MHz models and 65 mW for 2.4 GHz models
- DIP switches for user configuration
- 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 a list of accessories, refer to Banner Engineering's website, www.bannerengineering.com/wireless.



WARNING:

- **Risk of Electric Shock**
- Disconnect or turn off the power before installing, removing, or servicing the P15E Node.
- Install and connect the P15E Node in accordance with the National Electrical Code (NEC) and any applicable local code requirements and supply the P15E Node with an appropriate fuse box or circuit breaker (see Supply Voltage rating in the Specifications).
- Install the P15E Node at the end of a conduit run.



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.



CAUTION: Never Operate 1 Watt Radios Without Antennas

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



**CAUTION: Electrostatic Discharge (ESD)**

ESD Sensitive Device. This product uses semiconductors that can be damaged by electrostatic discharge (ESD). When performing maintenance, care must be taken so the device is not damaged. Disconnect power from the device when accessing the internal DIP switches. Proper handling procedures include wearing anti-static wrist straps. Damage from inappropriate handling is not covered by warranty.

Models

Models	Frequency	I/O
DX80N9X7S-P15E	900 MHz ISM Band	Inputs: Two selectable discrete, two 0 to 10 V analog
DX80N2X7S-P15E	2.4 GHz ISM Band	Outputs: Two AC/DC relay (SPDT), two PNP discrete, two 0 to 10 V analog

Configuration Instructions

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 two LED 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 one LED 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 two LED 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 one LED 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](#)

Configure the DIP Switches

Before changing DIP switch positions, disconnect the power. DIP switch changes are not recognized until after power is cycled to the device.

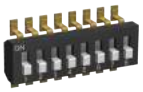
For parameters not set via DIP switches, use the User Configuration Tool (UCT) to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the User Configuration Tool.

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.

- 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
900 MHz transmit power level: 1 Watt (30 dBm)	OFF*				
900 MHz transmit power level: 250 mW (24 dBm), DX80 compatibility mode	ON				
Modbus or UCT configured (overrides DIP switches 3-8)		OFF*			
DIP switch configured		ON			
Inputs sourcing (PNP)			OFF*		
Inputs sinking (NPN)			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

* Default configuration

Discrete Input Type

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

Link Loss Outputs

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

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

Modbus/User Configuration Tool (UCT) or DIP Switch Configured

In Modbus/UCT Configured mode, use the User Configuration Tool (UCT) or a Modbus command to change the device parameters. DIP switch positions 3 through 8 are ignored. In DIP Switch Configured mode, use the DIP switches to configure the parameters listed in the table.

Transmit Power Levels

The 900 MHz radios transmit at 1 Watt (30 dBm) or 250 mW (24 dBm). While the Performance radios operate in 1 Watt mode, they cannot communicate with the older 150 mW radios. To communicate with 150 mW radios, operate this radio in 250 mW mode. For 2.4 GHz models, this DIP switch is disabled. The transmit power for 2.4 GHz is fixed at about 65 mW EIRP (18 dBm), making the 2.4 GHz Performance models automatically compatible with older 2.4 GHz models.

Using 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:

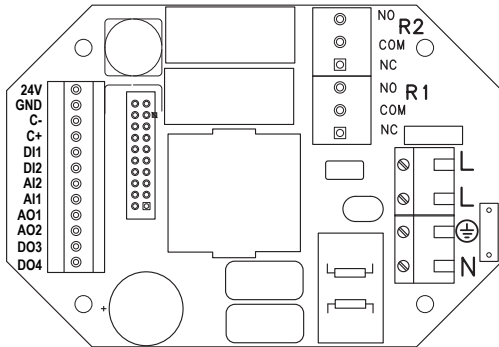
- Operate Performance radios in 250 mW mode to communicate with non-Performance radios (DIP switch 1 ON)
- Set non-Performance radios to use Extended Address Mode to communicate with Performance radios (DIP switch 1 ON)


For more detailed instructions about setting up your wireless network, refer to the Quick Start Guide (p/n [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 Wireless Support - FAQs section of Banner's [Wireless website](#).

Wiring Your Sure Cross® Device

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

Wiring for Power and I/O

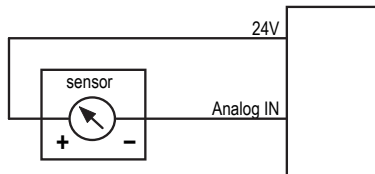


24V. 24 V courtesy power output
 GND. Ground/dc common connection
 C+. Serial communication line for the Gateway;
 no connection for the Nodes
 C-. Serial communication line for the Gateway;
 no connection for the Nodes
 Com. Common
 . AC Earth
 DI1. Discrete IN 1
 DI2. Discrete IN 2

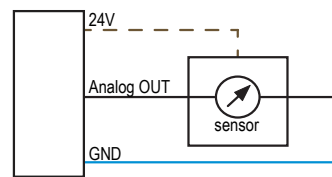
AI1. Analog IN 1
 AI2. Analog IN 2
 AO1. Analog OUT 1
 AO2. Analog OUT 2
 DO3. Discrete OUT 3
 DO4. Discrete OUT 4
 L. AC line
 N. AC neutral
 NC. Normally Closed
 NO. Normally Open
 R1. Relay 1
 R2. Relay 2

Connecting 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 (24 V dc Courtesy Power)

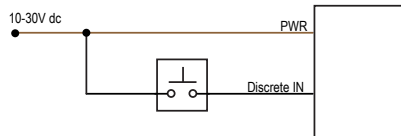


Analog Output Wiring (24 V dc Courtesy Power)

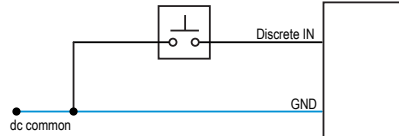


PWR for the discrete sensors may be 10 V dc to 30 V dc, or it may be wired to the 24 V dc (24V) courtesy power supplied by the device.

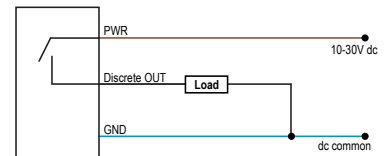
Discrete Input Wiring for PNP Sensors



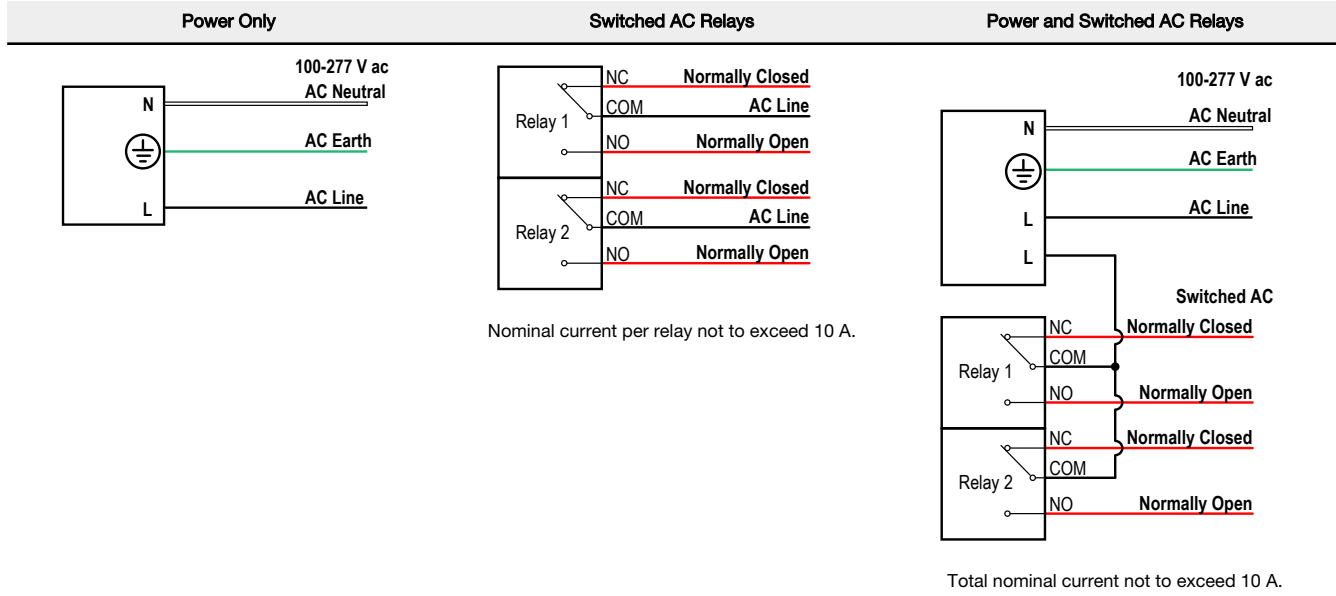
Discrete Input Wiring for NPN Sensors



Discrete Output Wiring (PNP)

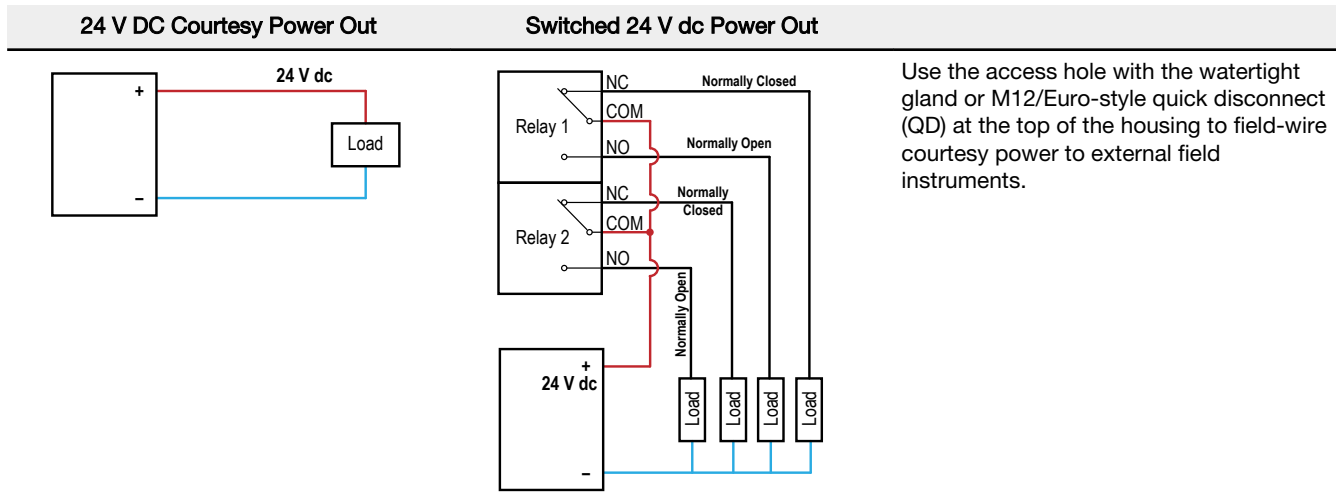


Wiring Diagrams for AC Power



Connecting ac or dc power to the communication pins will cause permanent damage. Use the access hole with a 1/2-inch conduit fitting, cable gland, or Mini-style quick disconnect (QD) at the bottom of the housing to field-wire ac power and ac circuits.

Wiring Diagrams for 24 DC Courtesy Power Out



LED Behavior for the Nodes

Nodes do not sample inputs until they are communicating with the Gateway. The radios and antennas must be a minimum distance apart to function properly. Recommended minimum distances are:

- 2.4 GHz 65 mW radios: 1 foot
- 900 MHz 150 mW and 250 mW radios: 6 feet
- 900 MHz 1 Watt radios: 15 feet

LED 1	LED 2	Node Status
Flashing green		Radio Link Ok
Flashing red	Flashing red	Device Error
	Flashing red, 1 per 3 sec	No Radio Link

Sure Cross® 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, and set system communication parameters when a host system is not part of the wireless network. The software runs on any computer with the Windows Vista, Windows 7, Windows 8, or Windows 10 operating system.



Use a USB to RS-485 adapter cable to connect a standalone DX80 Gateway to the computer. For DXM Controllers with an internal DX80 radio, connect a computer to the DXM Controller using a USB or Ethernet connection. Download the most recent revisions of the UCT software from Banner Engineering's website: www.bannerengineering.com/wireless.

The USB to RS-485 adapter cable is not required for the DXM Controller. For standalone DX80 Gateway devices use:

- USB to RS-485 adapter cable model BWA-UCT-900 for 1 Watt radios
- USB to RS-485 adapter cable model BWA-HW-006 for all other radios

Holding Registers

Modbus Holding Register		EIP Registers		I/O Type	I/O Range		Holding Register Representation (Dec)	
Gateway	Node	Node			Min.	Max.	Min.	Max.
1	1 + (Node# × 16)	0 + (Node# × 8)	Instance 100 / N7	Discrete IN 1	0	1	0	1
2	2 + (Node# × 16)	1 + (Node# × 8)		Discrete IN 2	0	1	0	1
3	3 + (Node# × 16)	2 + (Node# × 8)		Analog IN 1 (V)	0.0	10.0	0.0	65535
4	4 + (Node# × 16)	3 + (Node# × 8)		Analog IN 2 (V)	0.0	10.0	0.0	65535
5	5 + (Node# × 16)	4 + (Node# × 8)						
6	6 + (Node# × 16)	5 + (Node# × 8)						
7	7 + (Node# × 16)	6 + (Node# × 8)		Reserved				
8	8 + (Node# × 16)	7 + (Node# × 8)		Device Message				
9	9 + (Node# × 16)	0 + (Node# × 8)	Instance 112 / N14	Relay OUT 1	0 *	1 *	0	1
10	10 + (Node# × 16)	1 + (Node# × 8)		Relay OUT 2	0 *	1 *	0	1
11	11 + (Node# × 16)	2 + (Node# × 8)		Discrete OUT 3	0	1	0	1
12	12 + (Node# × 16)	3 + (Node# × 8)		Discrete OUT 4	0	1	0	1
13	13 + (Node# × 16)	4 + (Node# × 8)		Analog OUT 1 (V)	0.0	10.0	0	65535
14	14 + (Node# × 16)	5 + (Node# × 8)		Analog OUT 2 (V)	0.0	10.0	0	65535
15	15 + (Node# × 16)	6 + (Node# × 8)		Control Message				
16	16 + (Node# × 16)	7 + (Node# × 8)		Reserved				

* Relay Output Truth Table		
Relay Connection	I/O Value	
	0 (OFF)	1 (ON)
Normally Closed	Closed	Open
Normally Open	Open	Closed

Installing Your Sure Cross® Radios

Please refer to one of the following instruction manuals for details about successfully installing your wireless network components.

- DX80 and Performance Wireless I/O Network Instruction Manual: [132607](#)

Specifications

Performance Radio Specifications

Radio Range¹

900 MHz, 1 Watt: Up to 9.6 km (6 miles)
2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

Antenna Minimum Separation Distance

900 MHz, 1 Watt: 4.57 m (15 ft)
2.4 GHz, 65 mW: 0.3 m (1 ft)

Radio Transmit Power

900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)
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)

900 MHz Compliance (1 Watt)

FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247
IC: 7044A-RM1809

2.4 GHz Compliance

FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247
ETSI EN 300 328 V1.8.1 (2012-06)
IC: 7044A-DX8024

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

P15E Model Specifications

Supply Voltage and Current

Nominal voltage: 120–277 V ac at 60 Hz in North America
Nominal voltage: 100–277 V ac at 50/60 Hz outside North America
Maximum supply current: 0.37 A
Maximum power consumption: 25 W

Interface

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

Housing

Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers
Weight: 0.51 kg (1.13 lbs)
Mounting: 1/4-inch or M7
Max. Tightening Torque: 0.56 N·m (5 lbf·in)

Wiring Access

Two 1/2-inch NPSM ports, 14 threads/inch (1/2-14 NPSM)

Certifications



Required Overcurrent Protection



WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Analog Input

0 to 10 V
Input Rating: 10 V
Impedance: Approximately 220 Ohms
Sample Rate: 62.5 milliseconds
Report Rate: 1 second or On Change of State (1% change in value)
Accuracy: 0.2% of full scale +0.01% per °C
Resolution: 12-bit

Output State Following Timeout

De-energized (OFF)

Relay Outputs

SPDT (Form C) relay
277 V ac, 10 A
Minimum Mechanical Life: 10,000,000
Surge breakdown voltage² (Between contacts and coil) (Initial): 10,000 V

Analog Output

0 to 10 V
Update Rate: 125 milliseconds
Accuracy: 1.0% of full scale +0.01% per °C
Resolution: 12-bit

Environmental Specifications for the E Housing

Environmental Ratings³

IEC IP65

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

Operating Conditions⁴

–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)

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.

² Wave is standard shock voltage of ±1.2 × 50 µs according to JEC-212-1981

³ Refer to the Sure Cross® Wireless I/O Networks Instruction Manual (p/n [132607](#)) for installation and waterproofing instructions.

⁴ Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Included with Model

The following items ship with the DX80 radios.

- BWA-HW-059: Access Hardware Kit for "E" Housing Models, containing one 1/2-inch vented plug and one 1/2-inch gland
- BWA-HW-003: PTFE tape
- BWA-9O2-C (900 MHz) or BWA-2O2-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)

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

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