

## 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.

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 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
- 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](http://www.bannerengineering.com).



### 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:

- **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.



### Important:

- **Never operate a 1 Watt radio without connecting an antenna**
- Operating 1 Watt radios without an antenna connected will damage the radio circuitry.
- To avoid damaging the radio circuitry, never apply power to a Sure Cross® Performance or Sure Cross MultiHop (1 Watt) radio without an antenna connected.



**Important:**

- **Electrostatic discharge (ESD) sensitive device**
- ESD can damage the device. Damage from inappropriate handling is not covered by warranty.
- Use proper handling procedures to prevent ESD damage. Proper handling procedures include leaving devices in their anti-static packaging until ready for use; wearing anti-static wrist straps; and assembling units on a grounded, static-dissipative surface.

## 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 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 (p/n [128185](#))
- Sure Cross® Wireless I/O Network Instruction Manual (p/n [132607](#))

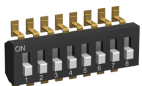
### Configure the DIP Switches

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

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

### Access the Internal DIP Switches

Follow these steps to access the internal DIP switches.



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), C housing models (ribbon cable is glued down), 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.
5. Make the necessary changes to the DIP switches.
6. Place the black cover plate back into position and gently push into place.
7. If necessary, plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin.
8. 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/Software or DIP Switch Configured

In Modbus/Software Configured mode, use the User Configuration Software 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.

### Mixing Performance and Non-Performance (150 mW) Radios in the Same Network

To comply with federal regulations, the 150 mW radios and 1 Watt radios communicate differently. All Performance models offer the ability to select between 250 mW and 1 Watt operation using the DIP switches. To mix Performance radios with non-Performance radios, refer to the product datasheet and:

- Operate Performance radios in 250 mW mode, not 1 Watt mode
- Set non-Performance (150 mW) radios to use Extended Address Mode

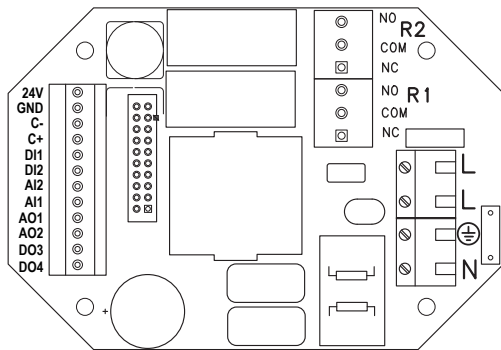
The 150 mW, 250 mW, and 1 Watt networks operate when collocated, but verify the antenna separation distance between a Gateway and Node or between two Gateways is at least 10 feet apart. For more detailed instructions about setting up your wireless network, refer to the following documents:

- DX80 Performance Quick Start Guide (p/n [128185](#))
- DX80 Performance Wireless I/O Network Instruction Manual (p/n [132607](#))

## Wire 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



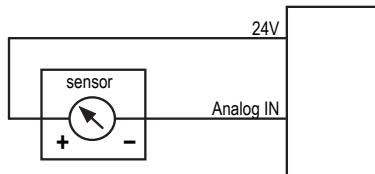
24V. 24 V courtesy power output  
 GND. Gound/dc common connection  
 C+. Serial communication line for the Gateway;  
 no connection for the Nodes  
 C-. Serial communication line for the Gateway;  
 no connection for the Nodes  
 Com. Common

. AC Earth  
 DI1. Discrete IN 1  
 DI2. Discrete IN 2

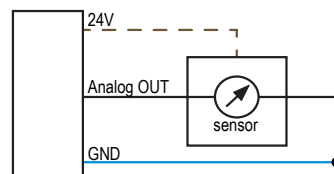
AI1. Analog IN 1  
 AI2. Analog IN 2  
 AO1. Analog OUT 1  
 AO2. Analog OUT 2  
 DO3. Discrete OUT 3  
 DO4. Discrete OUT 4  
 L. AC line  
 N. AC neutral  
 NC. Normally Closed  
 NO. Normally Open  
 R1. Relay 1  
 R2. Relay 2

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)

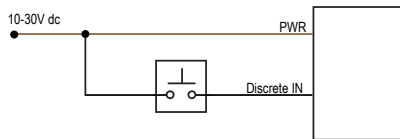


#### Analog Output Wiring (24 V dc Courtesy Power)

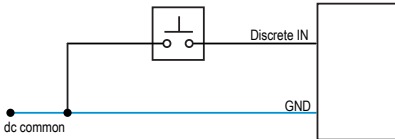


PWR for the discrete sensors may be 10 V dc to 30 V dc, or it may be wired to the 24 V dc (24V) courtesy power supplied by the device.

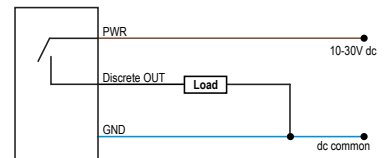
#### Discrete Input Wiring for PNP Sensors



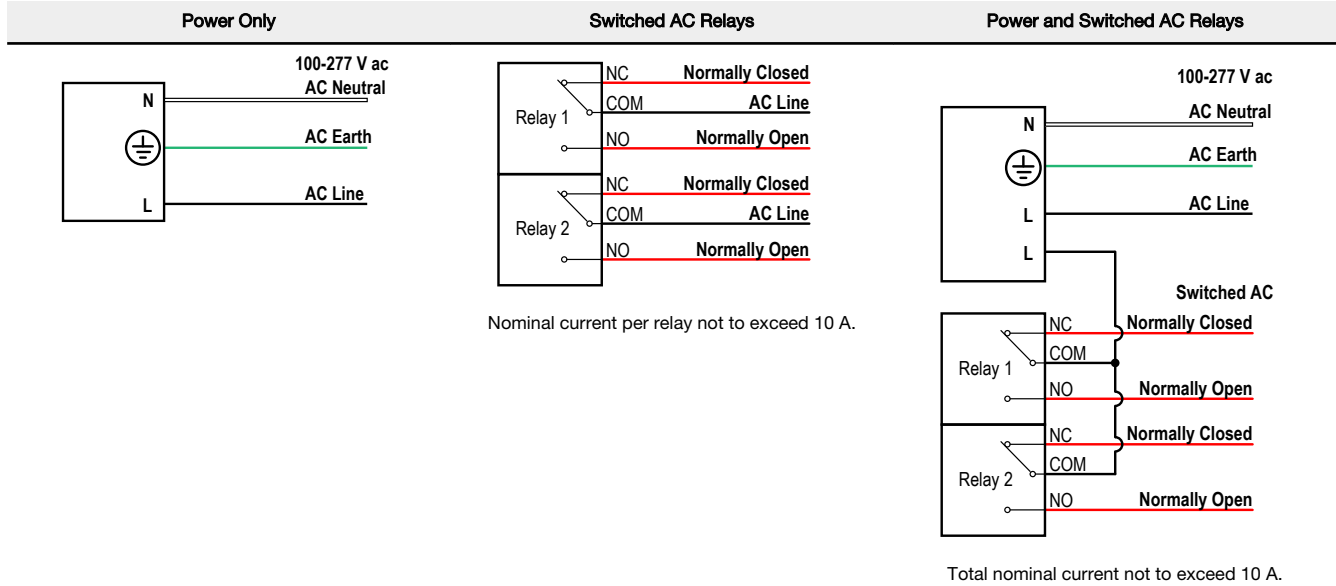
#### Discrete Input Wiring for NPN Sensors



#### Discrete Output Wiring (PNP)

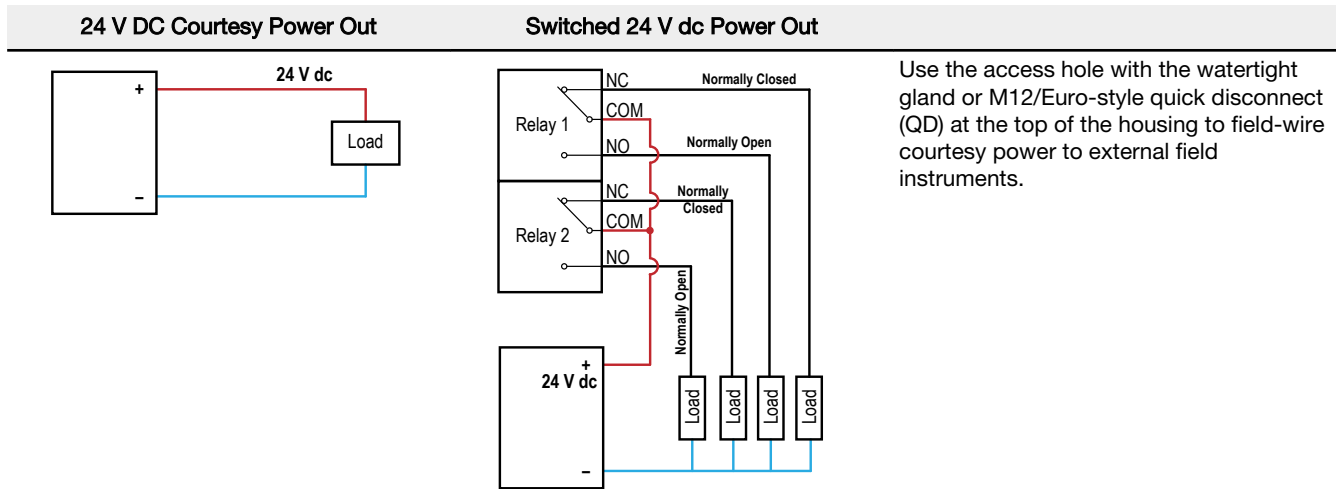


### Wiring Diagrams for AC Power



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

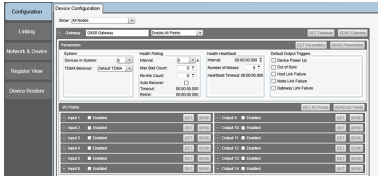
Nodes do not sample inputs until they are communicating with the Gateway. The radios and antennas must be a minimum distance apart to function properly. Recommended minimum distances are:

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

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 Software

The User Configuration Software 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 configuration software from Banner Engineering's website:

[www.bannerengineering.com/wireless](http://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	65535
4	4 + (Node# × 16)	3 + (Node# × 8)		Analog IN 2 (V)	0.0	10.0	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.

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

## Specifications

### Performance Radio Specifications

#### Radio Range<sup>1</sup>

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: FCC Part 15, Subpart C, 15.247  
IC: 7044A-RM1809  
IFT: RCPBARM13-2283

#### 2.4 GHz Compliance

FCC ID UE300DX80-2400: FCC Part 15, Subpart C, 15.247  
Radio Equipment Directive (RED) 2014/53/EU  
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 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



#### 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)

#### 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](http://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

#### Relay Outputs

SPDT (Form C) relay  
277 V AC, 10 A  
Minimum Mechanical Life: 10,000,000  
Surge breakdown voltage<sup>2</sup> (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

#### 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

All models meet IEC 60068-2-6 and IEC 60068-2-27 testing criteria  
Shock: 30G 11 ms duration, half sine wave per IEC 60068-2-27  
Vibration: 10 Hz to 55 Hz, 0.5 mm peak-to-peak amplitude per IEC 60068-2-6

#### Environmental Ratings

IEC IP65  
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.

<sup>1</sup> 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.

<sup>2</sup> Wave is standard shock voltage of  $\pm 1.2 \times 50 \mu\text{s}$  according to JEC-212-1981

## Accessories

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### Included with Model

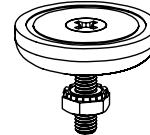
The following items ship with the DX80 radios.

- 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-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)

### Mounting Brackets

#### BWA-BK-020

- Includes two 80-lb pull rare-earth magnet mounts and two #10-32 x 1 inch screw mounts
- Used on multiple mounting brackets
- 31.75 mm (1.25 inch) diameter



## Warnings

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**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.** 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. This device has been designed to operate with the antennas listed on Banner Engineering's website and having a maximum gain of 9 dBm. Antennas not included in this list or having a gain greater than 9 dBm are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen such that the equivalent isotropically radiated power (EIRP) is not more than that permitted for successful communication. 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.

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