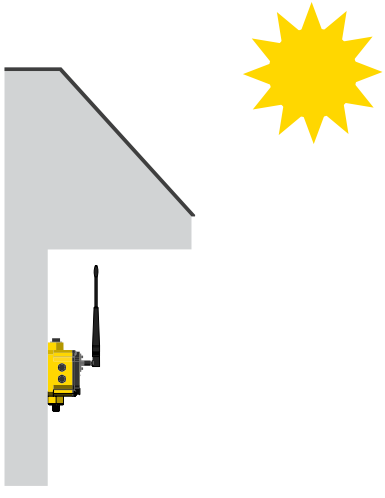
# Installing Your Sure Cross® Radios

Follow these recommendations to install your wireless network components.

## Mounting Sure Cross Devices Outdoors

**Use a Secondary Enclosure**. For most outdoor applications, we recommend installing your Sure Cross devices inside a secondary enclosure. For a list of available enclosures, refer to the Accessories List (p/n b_3147091).

*Point the radio away from direct sunlight*



**Point Away From Direct Sunlight**—When you are not using a secondary enclosure, minimize the damaging effects of ultra-violet radiation by mounting the devices to avoid facing intense direct sunlight.

- Mount under an overhang or other source of shade,
- Install indoors, or
- Face the devices north when installing outside.

For harsh outdoor applications, consider installing your radio inside a secondary enclosure.

**Mount Vertically to Avoid Collecting Rain**—When possible, mount the devices where rain or snow will drain away from the device.

- Mount vertically so that precipitation, dust, and dirt do not accumulate on permeable surfaces.
- Avoid mounting the devices on flat or concave surfaces, especially if the display will be pointing up.

**Remove Moisture and Condensation**—If condensation is present in any device, add a small desiccant packet to the inside of the radio. To help vent the radios, Banner also sells a vented plug (model number **BWA-HW-031**) for the 1/2-inch NPT port of the Sure Cross radios.

## Watertight Glands and NPT Ports

To make glands and plugs watertight, use PTFE tape and follow these steps.

1. Wrap four to eight passes of polytetrafluoroethylene (PTFE) tape around the threads as close as possible to the hexagonal body of the gland.
2. Manually thread the gland into the housing hole. Never apply more than 5 in-lbf of torque to the gland or its cable clamp nut. (1)

*Watertight glands wrapped in PTFE tape*



Seal any unused access holes with one of the supplied plastic plugs. To install a watertight plug:

1. Wrap four to eight passes of PTFE tape around the plug's threads, as close as possible to the flanged surface.
2. Carefully thread the plastic plug into the vacant hole in the housing and tighten using a slotting screwdriver. Never apply more than 10 in-lbf torque to the plastic plug.

If your device has an unused NPT port, install a watertight NPT plug:

1. Wrap 12 to 16 passes of PTFE tape evenly across the length of the threads.
2. Manually thread the plug into the housing port until reaching some resistance.
3. Using a crescent wrench, turn the plug until all the plug's threads are engaged by the housing port or until the resistance doubles. Do not over-tighten as this will damage the device. These threads are tapered and will create a waterproof seal without over-tightening.

## Other Installation Requirements

**Reduce Chemical Exposure**—Before installing any devices in a chemically harsh environment, contact the manufacturer for more information regarding the life-expectancy. Solvents, oxidizing agents, and other chemicals will damage the devices.

**Minimize Mechanical Stress**—Although these radio devices are very durable, they are sophisticated electronic devices that are sensitive to shock and excessive loading.

- Avoid mounting the devices to an object that may be shifting or vibrating excessively. High levels of static force or acceleration may damage the housing or electronic components.
- Do not subject the devices to external loads. Do not step on them or use them as handgrips.
- Do not allow long lengths of cable to hang from the glands on the Gateway or Node. Cabling heavier than 100 grams should be supported instead of allowed to hang from the housing.

(1) This is equivalent to the torque generated without using tools. If a wrench is used, apply only very light pressure. Torquing these fittings excessively damages the device.

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- Do not crack the housing by over-tightening the top screws. Do not exceed the maximum torque of 4 in-lbf.

It is the user's responsibility to install these devices so they will not be subject to over-voltage transients. Always ground the devices in accordance with local, state, or national regulations.

**When Installing 1-Watt Radios**—Notice: This equipment must be professionally installed. The output power must be limited, through the use of firmware or a hardware attenuator, when using high-gain antennas such that the +36 dBm EIRP limit is not exceeded.

# Installation Quick Tips

The following are some quick tips for improving the installation of wireless network components.

## Create a Clear Communication Path

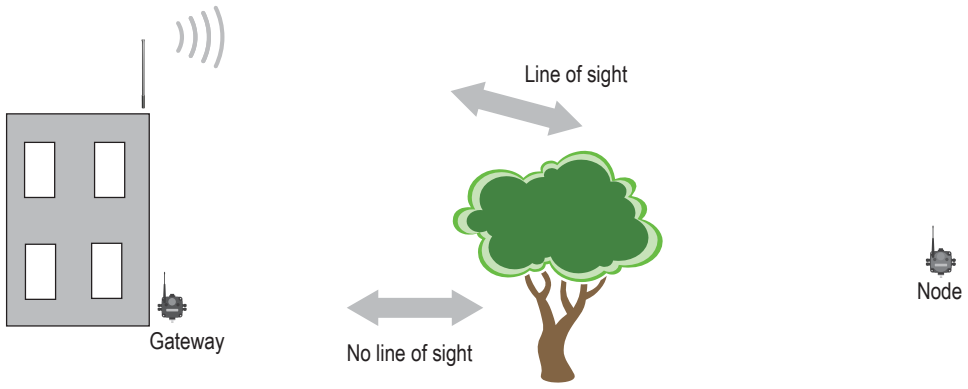
Wireless communication is hindered by radio interference and obstructions in the path between the transmitter and receiver. To achieve the best radio performance, carefully consider the installation locations for the Gateways and Nodes and select locations without obstructions in the path.

For more information about antennas, please refer to the Antenna Basics reference guide, Banner document p/n 132113.

## Increase the Height of the Antennas

Position the external antenna vertically for optimal radio communication. If necessary, consider changing the height of the Sure Cross radio, or its antenna, to improve reception. For outdoor applications, mounting the antenna on top of a building or pole may help achieve a line-of-sight radio link with the other radios in the network.

*Move the antenna higher*




## Collocated Radios

When the radio network's client/parent radio is too close to another radio device, communication between all devices is interrupted. For this reason, always assign a unique Network ID to your wireless networks.

The Network ID (NID) is a unique identifier you assign to each wireless network to minimize the chances of two collocated networks interfering with each other. Assigning different NIDs to different networks improves collocation performance in dense installations.

Do not install antennas within the minimum separation distance.

**Antenna Minimum Separation Distance**

900 MHz radios transmitting at ≤ 250 mW: 2 m (6 ft) with the supplied antenna

900 MHz (1 Watt): 4.57 m (15 ft) with the supplied antenna

900 MHz radios transmitting at ≥ 500 mW: 4.57 m (15 ft) with the supplied antenna

2.4 GHz radios transmitting at 65 mW: 0.3 m (1 ft) with the supplied antenna

## Be Aware of Seasonal Changes

When conducting the initial Site Survey, the fewest possible missed packets for a given link is better. However, seasonal changes may affect the signal strength and the total signal quality. Radios installed outside with 50% missed packets in the winter months may have 80% or more missed packets in the summer when leaves and trees interfere with radio reception.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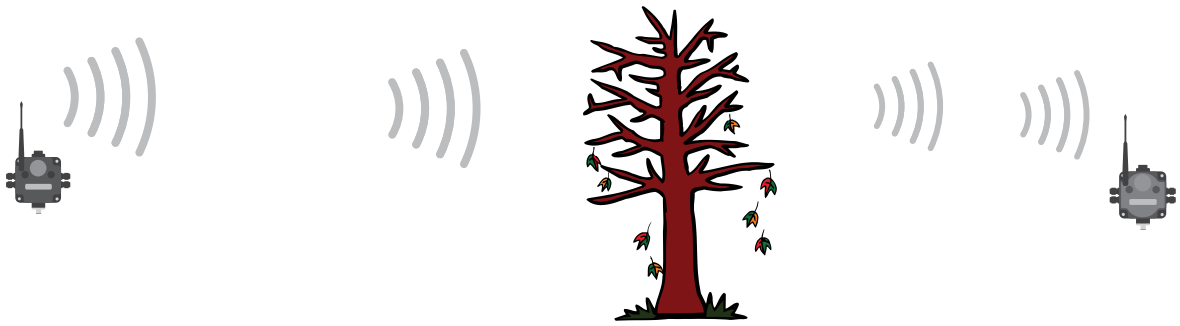
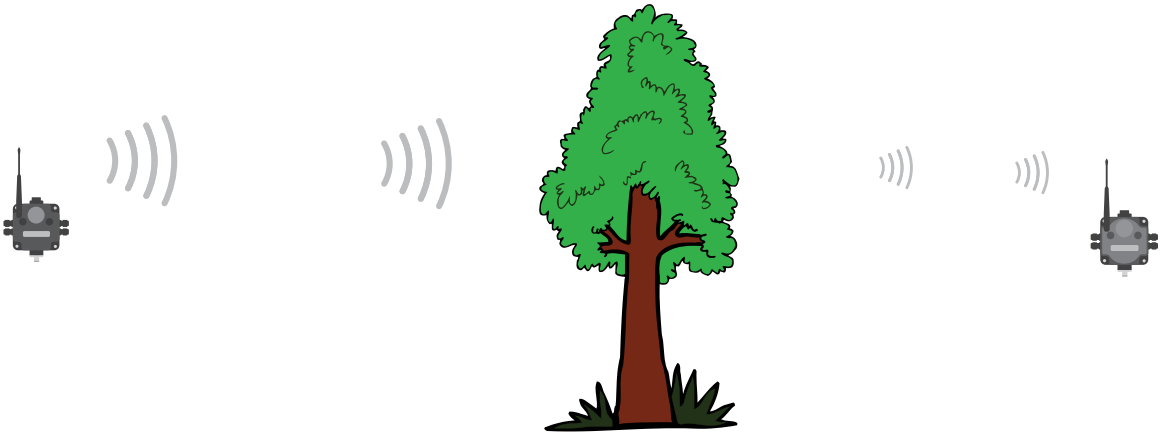
*A good signal in winter doesn't always mean you will get the same signal strength the rest of the year.*



*During spring and summer, leaves may block more of the radio signal.*



## Installing a Basic Remote Antenna

A remote antenna system is any antenna system where the antenna is not connected directly to the radio; coaxial cable connects the antenna to the radio.

When installing a remote antenna system, always include a lightning arrestor or coaxial surge suppressor in the system. Remote antenna systems installed without surge protection invalidate the warranty of the radio devices.

Surge suppressors should be properly grounded and mounted at ground level near where the cabling enters a building. Install the surge suppressor indoors or inside a weatherproof enclosure to minimize corrosion or component deterioration. For best results, mount the surge suppressor as close to the ground as possible to minimize the length of the ground connection and use a single-point ground system to avoid creating ground loops.

For more detailed information about how antennas work and how to install them, refer to Antenna Basics (p/n 132113.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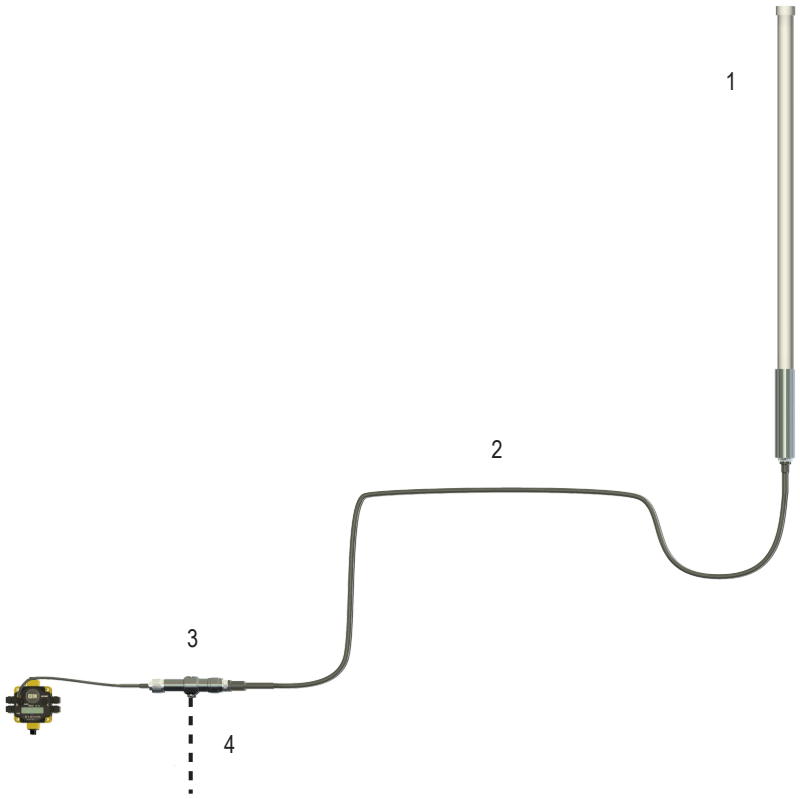
*Basic remote antenna components*



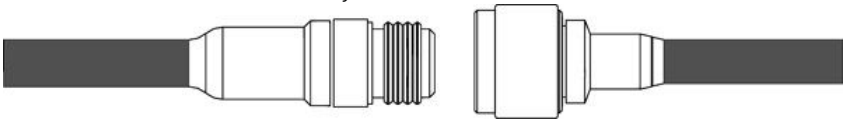

1. The antenna is mounted remotely from the radio device.
2. Coaxial cable
3. Surge suppressor
4. Ground wire to a single-point ground system

**I/O Isolation**—When connecting analog and discrete I/O to external equipment such as VFDs (Variable Frequency Drives), it may be appropriate to install interposing relays and/or loop isolation devices to protect the DX80 unit from transients, noise, and ground plane interference originating from devices or the environment. Contact Banner Engineering Corp. for more information.

# Weatherproof Remote Antenna Installations

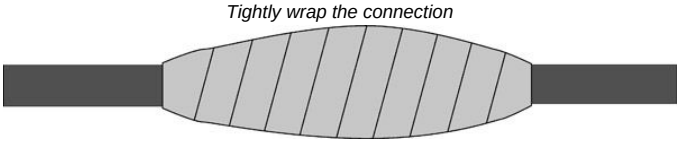
Seal the connections with rubber splicing tape and electrical tape to prevent water damage to the cable and connections.

*Verify connections are clean*



Step 1: Verify both connections are clean and dry before connecting the antenna cable to the antenna or other cable. Hand-tighten the cable connections.

*Tightly wrap the connection*



Step 2: Tightly wrap the entire connection with rubber splicing tape. Begin wrapping the rubber splicing tape one inch away from the connection and continue wrapping until you are one inch past the other end of the connection. Each new round of tape should overlap about half the previous round.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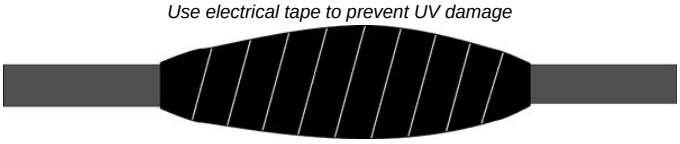
*Use electrical tape to prevent UV damage*



Step 3: Protect the rubber splicing tape from UV damage by tightly wrapping electrical tape on top of the rubber splicing tape. The electrical tape should completely cover the rubber splicing tape and overlap the rubber tape by one inch on each side of the connection.

# Installing Remote Antennas

**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.

# Mount a Dome Antenna to the Enclosure

Use a -D dome antenna when mounting an antenna directly to the outside of the enclosure.

*Components to mount a dome antenna to an enclosure*




1. Dome antenna
2. DIN rail and DIN rail bracket
3. Enclosure

The -D dome antennas include an 18-inch RP-SMA extension cable connected to the antenna. Use this extension cable to connect the antenna directly to the radio.

To mount, drill a hole in the enclosure and insert the antenna.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*Omni-directional dome antenna with RP-SMA male connection*

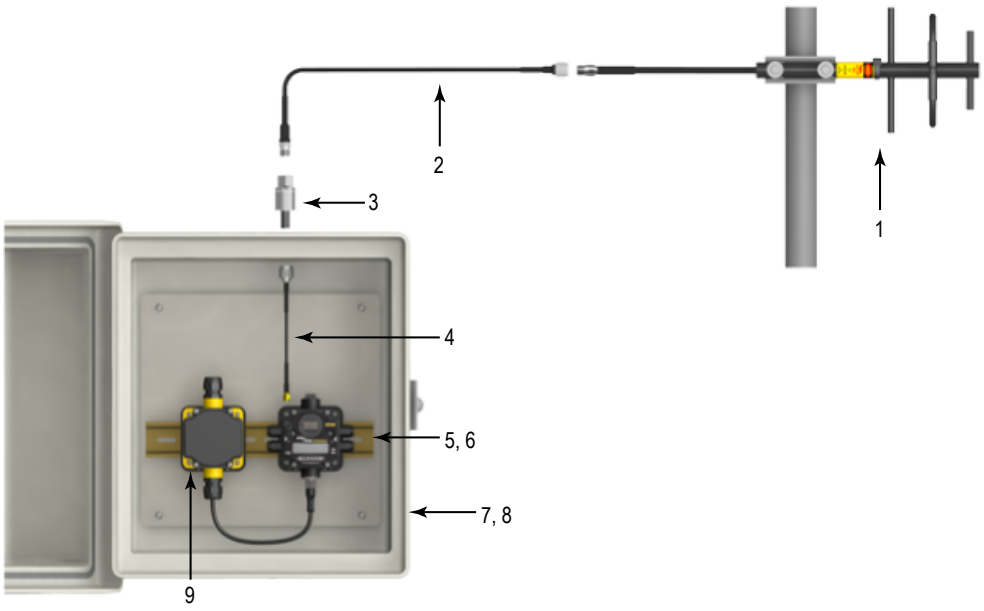
| Model | Description | |
|---|---|---|
| **BWA-9O2-D** | Dome antenna, 2 dBi, 18-inch cable,<br>900 MHz, RP-SMA Box Mount<br>Datasheet: b_3145121 |  |
| **BWA-2O2-D** | Dome antenna, 2 dBi, 18-inch cable, 2.4 GHz<br>RP-SMA Box Mount<br>Datasheet: b_3145115 | |

# Use an N-Type, Pole-Mounted Antenna

This antenna mounts remotely from the box, with the Sure Cross® device mounted inside the box.

Ground the surge suppressor and antenna. 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.

*Components to mount an antenna on a pole*




1. N-type Yagi antenna
2. N-Type to N-Type antenna cable
3. Surge suppressor
4. RP-SMA to N-Type male antenna cable

5 and 6. DIN rail and DIN rail bracket

7and 8. Enclosure and enclosure cover/plate, etc

9. Power supply

*Directional (Yagi) antennas with an N-type female connection*

| Model | Description | |
|---|---|---|
| **BWA-9Y6-A** | 6.5 dBd, 6.8 × 13 inches Outdoor, 900 MHz<br>Datasheet: b_3145127 |  |
| **BWA-9Y10-A** | 10 dBd, 6.8 × 24 inches Outdoor, 900 MHz<br>Datasheet: b_3145130 | |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*Omni-directional fiberglass antennas with N-type female connections*

| Model | Description | |
|---|---|---|
| **BWA-9O6-A** | 6 dBd, Fiberglass, Full wave, 71.5 inches, 900 MHz<br>Datasheet: b_3145124 |  |
| **BWA-2O8-A** | 8.5 dBi, Fiberglass, 24 inches, 2.4 GHz<br>Datasheet: b_3145131 | |
| **BWA-2O6-A** | 6 dBi, Fiberglass, 16 inches (shown), 2.4 GHz<br>Datasheet: b_3145117 | |
| **BWA-9O6-AS** | 6 dBi, Fiberglass, 1/4 Wave, 23.6 inches (1.3-inch dia.), 900 MHz<br>Datasheet: b_3145125 | |
| **BWA-9O8-AS** | 8 dBi, Fiberglass, 3/4 Wave, 63 inches (1.5-inch dia.), 900 MHz<br>Datasheet: b_3145126 | |

Use the LMR400 cables to connect the surge suppressor to the antenna.

*N-type to N-type cables—LMR400 type*

| Model | Length (m) | Description | |
|---|---|---|---|
| **BWC-4MNFN3** | 3 | LMR400 N-Type Male to N-Type Female |  |
| **BWC-4MNFN6** | 6 | | |
| **BWC-4MNFN15** | 15 | | |
| **BWC-4MNFN30** | 30 | | |

*Surge suppressors*

| Model | Description | |
|---|---|---|
| **BWC-LMRSFRPB** | Surge Suppressor, Bulkhead, RP-SMA Type, RP-SMA to RP-SMA |  |
| **BWC-PRC827-DC** | Surge Suppressor, bulkhead, DC Blocking, N-Type Female, N-Type Male | |

Use the RP-SMA to N-Type male cables to connect the radio to the surge suppressor.

*RP-SMA to N-type cables—LMR200 type*

| Model | Length (m) | Description | |
|---|---|---|---|
| **BWC-1MRSMN05** | 0.5 | LMR200 RP-SMA to N-Type Male |  |
| **BWC-1MRSMN2** | 2 | | |


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