# Sure Cross® Performance Node with I/O Mapping

## Datasheet

The Sure Cross® 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.

PM8 Node

PM8L Node

⚠ **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.

For additional information, updated documentation, and accessories, refer to Banner Engineering's website, *www.bannerengineering.com/surecross*.

| Models | Frequency | Environmental Rating | I/O |
|---|---|---|---|
| DX80N9X6S-PM8 | 900 MHz ISM Band | IP67, NEMA 6 | Inputs: Six sourcing discrete<br>Outputs: Six sourcing discrete<br>I/O is automatically mapped to the PM8 Gateway using the Gateway's menu system |
| DX80N9X6S-PM8L [1] | | | |
| DX80N2X6S-PM8 | 2.4 GHz ISM Band | | |
| DX80N2X6S-PM8L [1] | | | |

DX80…C (IP20; NEMA 1) models are also available. To order this model with an IP20 housing, add a C to the end of the model number: DX80N9X6S-PM8C.

## Configuration Instructions

### Configure 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.

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[1] The PM8L models have no LCD and, therefore, no accessible menu system. To run a site survey with the PM8L Nodes, refer to the PM8 Gateway datasheet. The PM8L models also have no DIP switches and always operate in 1 Watt mode. If you require a 250 mW Node, order the PM8 model.

## 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.
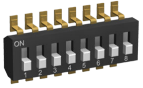
After making the necessary changes to the DIP switches, place the black cover plate back into position and gently push into place. Plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin. Mount the cover back onto the housing.

## DIP Switch Settings

| Device Settings | Switches | |
|---|---|---|
| | 1 | 2 |
| Transmit Power Level: 1 Watt (30 dBm) | OFF (default) | |
| Transmit Power Level: 250 mW (24 dBm), DX80 Compatibility Mode | ON | |

### DIP Switch Settings for the PM8L Nodes

The PM8L Nodes have no DIP switches and always operate in 1 Watt mode with 6 discrete inputs and 6 discrete outputs. If you require 250 mW mode, you must use a PM8 Node instead of the PM8L Node.

### Transmit Power Levels

The 900 MHz radios can be operated 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 the older 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.

## Wiring Your Sure Cross® Device

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

## Terminal Blocks and Wiring (PM8 and PM8C Models)

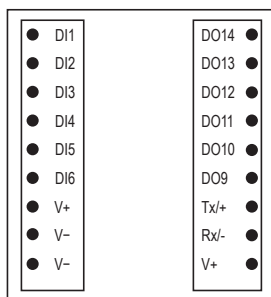Refer to the Class I Division 2/Zone 2 control drawings (p/n *143086*) for wiring specifications or limitations.

DIx. Discrete IN 1 through 6.
DOx. Discrete OUT 9 through 14.
GND. Ground/dc common connection
PWR. 10 to 30 V dc power connection
RX/-. Serial communication line for the Gateway. No connection for Nodes
TX/+. Serial communication line for the Gateway; no connection for Nodes
V+. 10 to 30 V dc power connection
V−. Ground/dc common connection
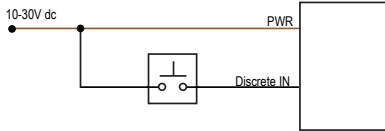
*Figure 1. -PM8 Board*

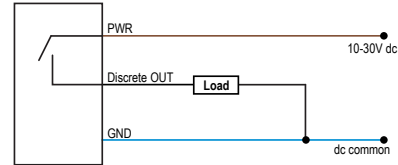Figure 2. Discrete Input Wiring for PNP Sensors



Figure 3. Discrete Output Wiring (PNP)

## Bind Radios to Form Networks

Binding Nodes to a Gateway ensures the Nodes only exchange data with the Gateway they are bound to.

Apply power to the Gateway and the Node you are binding.

1. To enter binding mode on the Gateway, triple-click button 2.
   The red LEDs flash alternately when the Gateway is in binding mode. Any Node entering binding mode will bind to this Gateway.
2. To enter binding mode on the Node, triple-click button 2.

   The Node enters binding mode and locates the Gateway in binding mode. The red LEDs flash alternately. The Node automatically exits binding mode. After the Node is bound, the LEDs are both solid red for a few seconds. The Node cycles its power, then enters Run mode.
3. Use both of the Node's rotary dials to assign the Node Address defined in the Gateway's datasheet.

   The left rotary dial represents the tens digit (0 through 4) and the right dial represents the ones digit (0 through 9) of the Node Address. For the pre-mapped kits, the Node's rotary dials must be set based on the mapping defined by the Gateway. For more information, refer to the mapping tables in the MAPIO Menu section of the Gateway's datasheet.
4. Repeat steps 2 and 3 for all Nodes that need to communicate to this Gateway.
5. Exit binding mode on the Gateway by single-clicking either button 1 or button 2.

## 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 |

## 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*

## Modbus Register Table

| I/O | Modbus Holding Register | | I/O Type | I/O Range | | Holding Register Representation | |
|---|---|---|---|---|---|---|---|
| | Gateway | Any Node | | Min. | Max. | Min. (Dec.) | Max. (Dec.) |
| 1 | 1 | 1 + (Node# × 16) | Discrete IN 1 | 0 | 1 | 0 | 1 |
| 2 | 2 | 2 + (Node# × 16) | Discrete IN 2 | 0 | 1 | 0 | 1 |
| 3 | 3 | 3 + (Node# × 16) | Discrete IN 3 | 0 | 1 | 0 | 1 |
| 4 | 4 | 4 + (Node# × 16) | Discrete IN 4 | 0 | 1 | 0 | 1 |
| 5 | 5 | 5 + (Node# × 16) | Discrete IN 5 | 0 | 1 | 0 | 1 |
| 6 | 6 | 6 + (Node# × 16) | Discrete IN 6 | 0 | 1 | 0 | 1 |

| I/O | Modbus Holding Register | | I/O Type | I/O Range | | Holding Register Representation | |
|---|---|---|---|---|---|---|---|
| | Gateway | Any Node | | Min. | Max. | Min. (Dec.) | Max. (Dec.) |
| 7 | 7 | 7 + (Node# × 16) | Reserved | | | | |
| 8 | 8 | 8 + (Node# × 16) | Device Message | | | | |
| 9 | 9 | 9 + (Node# × 16) | Discrete OUT 9 | 0 | 1 | 0 | 1 |
| 10 | 10 | 10 + (Node# × 16) | Discrete OUT 10 | 0 | 1 | 0 | 1 |
| 11 | 11 | 11 + (Node# × 16) | Discrete OUT 11 | 0 | 1 | 0 | 1 |
| 12 | 12 | 12 + (Node# × 16) | Discrete OUT 12 | 0 | 1 | 0 | 1 |
| 13 | 13 | 13 + (Node# × 16) | Discrete OUT 13 | 0 | 1 | 0 | 1 |
| 14 | 14 | 14 + (Node# × 16) | Discrete OUT 14 | 0 | 1 | 0 | 1 |
| 15 | 15 | 15 + (Node# × 16) | Control Message | | | | |
| 16 | 16 | 16 + (Node# × 16) | Reserved | | | | |

# Specifications

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

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

**Spread Spectrum Technology**
FHSS (Frequency Hopping Spread Spectrum)

**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

**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

**Discrete Inputs**
Six sourcing/PNP
Rating: 3 mA max current at 30 V dc
Sample Rate: 62.5 milliseconds
Report Rate: On change of state
Discrete Input ON Condition: Greater than 4.5 V
Discrete Input OFF Condition: Less than 4 V

**Supply Voltage**
10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%). [3]
900 MHz Consumption: Maximum current draw is < 100 mA and typical current draw is < 50 mA at 24 V dc. (2.4 GHz consumption is less.)

**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**
Two 1/2-in NPT

**Link Timeout**
Gateway: Configurable via User Configuration Tool (UCT) software
Node: Defined by Gateway

**Discrete Outputs**
Six sourcing/PNP
Update Rate: 125 milliseconds
ON Condition: Supply minus 2 V
OFF Condition: Less than 2 V
Output State Following Timeout: OFF

**Discrete Output Rating (PNP)**
100 mA max current at 30 V dc
ON-State Saturation: Less than 3 V at 100 mA
OFF-state Leakage: Less than 10 μA

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[2] 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.
[3] For European applications, power this device from a Limited Power Source as defined in EN 60950-1.

Operating Conditions[4]
  −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)
Environmental Ratings[5]
  PM8 and PM8L Model: IEC IP67; NEMA 6
  PM8C Model: "C" Housing Models/External wiring terminals: IEC IP20; NEMA 1
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

Certifications

CE

Certifications for DX8x...C (External Wiring Terminal) and DX8x...E Models

CSA: Class I Division 2 Groups ABCD, Class I Zone 2 AEx/Ex nA II T4 — Certificate: 1921239

ATEX: II 3 G Ex nA IIC T4 Gc (Group IIC Zone 2) — Certificate LCIE 10 ATEX 1012 X

Refer to the Class I Division 2/Zone 2 control drawings (p/n 143086) for wiring specifications or limitations. All battery-powered devices must only use the lithium battery manufactured by Xeno, model XL-205F.

## Included with Model

The following items ship with the PM2 and PM8 radios.

- One 1/2-inch NPT plug (not included with IP20 "C" models)
- Two 1/2-inch nylon gland fittings (not included with IP20 "C" models)
- 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)
- BWA-HW-011: IP20 Screw Terminal Headers (2 pack) (included only with the IP20 "C" 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.

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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.

[4] Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.
[5] Refer to the Sure Cross® Wireless I/O Networks Instruction Manual (p/n 132607) for installation and waterproofing instructions.