

# Sure Cross® Performance Mapping PM2-KR Node



## 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.



### 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:

- **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.

For additional information, updated documentation, and a list of accessories, refer to Banner Engineering's website, [www.bannerengineering.com/wireless](http://www.bannerengineering.com/wireless).

## Models

| Models            | Frequency        | Environmental Rating | I/O   |
|-------------------|------------------|----------------------|---|
| DX80N2X6S-PM2-KR  | 2.4 GHz ISM Band | IP67, NEMA 6         | <b>Inputs:</b> Four selectable discrete, two 0–20 mA  |
| DX80N2X6S-PM2C-KR |                  | IP20, NEMA 1         | <b>Outputs:</b> Four PNP discrete, two 0–20 mA analog<br>I/O is automatically mapped to the PM2 Gateway using the Gateway's menu system |

## Configuration Instructions

### Configure the DIP Switches

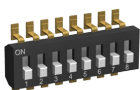
Before changing DIP switch positions, disconnect the power. DIP switch changes are not recognized until after power is cycled to the device.

### 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    | 3    | 4    | 5    | 6 <sup>1</sup> |
| 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   |                |
| 0 to 20 mA scale   |          |      |      |      |      | OFF*           |
| 4 to 20 mA scale   |          |      |      |      |      | ON             |

\* Default configuration

## Analog Input and Output Scale

Use the DIP switch to select which current scale to use for all the device's analog inputs and outputs: 0 to 20 mA or 4 to 20 mA. When using a 4-20 mA sensor with a 0-20 mA input, the sensor uses the 4-20 mA section of the total range. Using a 4-20 mA with a 0-20 mA input allows you to determine when you have an error condition with the sensor. A normal input reading between 4 and 20 mA indicates a functioning sensor whereas a value below 4 mA indicates an error condition, such as a broken wire or loose connection. This DIP switch is used only on the 0 to 20 mA models, not the 0 to 10V models.

## 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

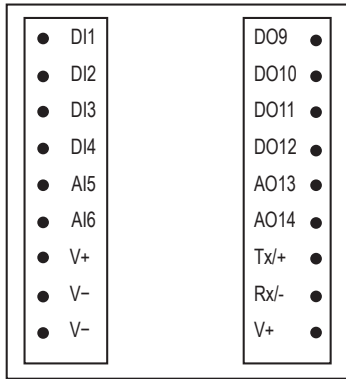
In Modbus/Software Configured mode, use the User Configuration Software or a Modbus command to change the device parameters. DIP switch positions 3 through 8 are ignored. In DIP Switch Configured mode, use the DIP switches to configure the parameters listed in the table.

## Wire Your Sure Cross® Device

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

<sup>1</sup> Not used when configured for 0-10 V I/O.

## Terminal Blocks (PM2 and PM2C Models)



- AIx. Analog IN x.
- AOx. Analog OUT x.
- DIx. Discrete IN x.
- DOx. Discrete OUT x.
- 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

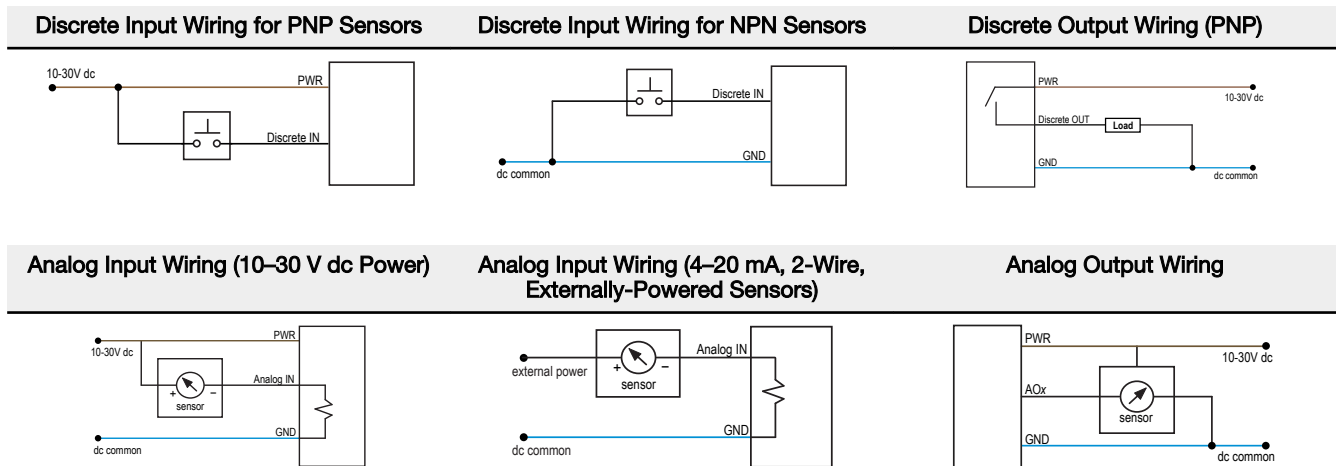
(-PM2 board shown)

Connecting power to the communication pins will cause permanent damage. For the DX8x..C models, PWR in the wiring diagram refers to V+ on the wiring board and GND in the wiring diagram refers to V- on the wiring board.

Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.

To power the sensor using the switch power output (SPx), replace the PWR with SPx in these wiring diagrams.

Refer to the Class I Division 2/Zone 2 control drawings (p/n [143086](#)) for wiring specifications and limitations.



## Bind the DX80 Nodes to the DX80 Gateway and Assign the Node Address

Before beginning the binding procedure, apply power to all the devices. Separate radios by 2 meters when running binding procedure. Put only one Gateway into binding at a time to prevent binding to the wrong Gateway.

1. Enter binding mode on the Gateway.
  - For housed DX80 Gateways, triple-click the right-hand button. LEDs alternatively flash red.
  - For board level DX80 Gateways, triple-click the binding button. LED flashes green and red.
2. 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.
3. 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. 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. Label the Node with the assigned address for future references.
5. Repeat steps 2 through 4 for all Nodes that need to communicate to this Gateway.

6. Exit binding mode on the Gateway by single-clicking either button 1 or button 2.

For Gateways with single line LCDs, after binding your Nodes to the Gateway, make note of the binding code displayed under the Gateway's \*DVCFG menu, XADR submenu on the LCD. Knowing the binding code prevents having to re-bind all Nodes if your Gateway is ever replaced.

## 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 |

## 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 Registers

| I/O | Modbus Holding Register |                   | I/O Type           | I/O Range  |            | Holding Register Representation |             |
|-----|-------------------------|-------------------|--------------------|------------|------------|---------------------------------|-------------|
|     | Gateway                 | Any Node          |                    | Min. Value | Max. Value | 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)  | Analog IN 5 (mA)   | 0.0        | 20.0       | 0                               | 65535       |
| 6   | 6                       | 6 + (Node# × 16)  | Analog IN 6 (mA)   | 0.0        | 20.0       | 0                               | 65535       |
| 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) | Analog OUT 13 (mA) | 0.0        | 20.0       | 0                               | 65535       |
| 14  | 14                      | 14 + (Node# × 16) | Analog OUT 14 (mA) | 0.0        | 20.0       | 0                               | 65535       |
| 15  | 15                      | 15 + (Node# × 16) | Control Message    |            |            |                                 |             |
| 16  | 16                      | 16 + (Node# × 16) | Reserved           |            |            |                                 |             |

## Specifications

### Performance 2.4 GHz Korean Radio Specifications

**Radio Range<sup>2</sup>**

2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

**Antenna Minimum Separation Distance**

2.4 GHz, 65 mW: 0.3 m (1 ft)

**Radio Transmit Power**

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)

**2.4 GHz Compliance for Korean Radio Models**

KCC-CRM-BE2-DX

**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

### PM2-KR Specifications

**Supply Voltage**

10 V dc to 30 V dc (Outside the USA: 12 V dc to 24 V dc, ± 10%)

**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)

**Discrete Inputs**

Four, DIP switch selectable between PNP and NPN  
Rating: 3 mA max current at 30 V dc  
Sample Rate: 62.5 milliseconds  
Report Rate: On change of state

**Discrete Input ON Condition**

PNP: Greater than 8 V  
NPN: Less than 0.7 V

**Discrete Input OFF Condition**

PNP: Less than 5 V  
NPN: Greater than 2 V or open

**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

**Certification**



**Power Consumption**

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.)

**Wiring Access**

Two 1/2-inch NPT ports

**Interface**

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

**Discrete Outputs**

Four PNP  
Update Rate: 125 milliseconds  
ON Condition: Supply minus 2 V  
OFF Condition: Less than 2 V  
Output State Following Timeout: OFF

**Analog Inputs**

Two, 0 to 20mA  
Rating: 24 mA  
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

**Analog Outputs**

Two, 0 to 20 mA  
Update Rate: 125 milliseconds  
Accuracy: 0.1% of full scale +0.01% per °C  
Resolution: 12-bit

### Environmental Specifications

**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**

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

**Environmental Ratings**

IEC IP67; NEMA 6  
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.

### Environmental Specifications for the C Housings

**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**

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

**Environmental Ratings**

"C" Housing Models/External wiring terminals: IEC IP20; NEMA 1  
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>2</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.

## 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-902-C** (900 MHz) or **BWA-202-C** (2.4 GHz) Antenna, 2 dBd Omni, Rubber Swivel RP-SMA Male
- **BWA-HW-011** IP20 Screw Terminal Headers (2 pack) (IP20 "C" models only)

## 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.** 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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