Sure Cross® Performance PM8 Gateway with I/O Mapping

BANNER
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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.

Models

Models	Frequency	Environmental Rating	I/O
DX80G9M6S-PM8	900 MHz ISM Band	IP67, NEMA 6	**Inputs**: Six sourcing discrete
DX80G2M6S-PM8	2.4 GHz ISM Band		**Outputs**: Six sourcing discrete I/O is automatically mapped to the PM8 Node using the Gateway's menu system

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: For example, DX80G9M6S-PM8C.

Configuration Instructions

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 devices powered by batteries integrated into the housing, triple-click button 2, then double-click button 2 to reset the device without removing the battery.

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

Access the Internal DIP Switches

Follow these steps to access the internal DIP switches.
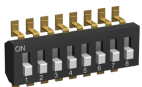
1. Unscrew the four screws that mount the cover to the bottom housing.
2. Remove the cover from the housing without damaging the ribbon cable or the pins the cable plugs into.
3. Gently unplug the ribbon cable from the board mounted into the bottom housing. Skip this step if there is no ribbon cable (integrated battery models) or the ribbon cable is glued down (C housing models).
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
Transmit Power Level: 1 Watt (30 dBm)	OFF (default)	
Transmit Power Level: 250 mW (24 dBm), DX80 Compatibility Mode	ON	

Transmit Power Levels

The 900 MHz radios transmit at 1 Watt (30 dBm) or 250 mW (24 dBm). The 250 mW mode reduces the radio's range but improves the battery life in short range applications. 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).
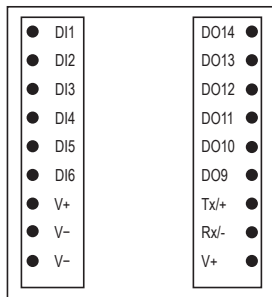
Wire Your Sure Cross® Device

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 and limitations.

Figure 1. -PM8 Board

DIx. Discrete IN 1 through 6.
DOx. Discrete OUT 9 through 14.
GND. Ground/DC common connection
PWR. 10 V DC 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 V DC to 30 V DC power connection
V–. Ground/DC common connection

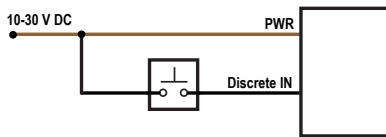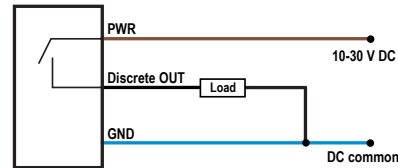*Figure 2. Discrete Input Wiring for PNP Sensors*

Figure 3. Discrete Output Wiring (PNP)

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 (PMx), 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 Gateways

Verify all devices are communicating properly. 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

Table 1: LEC behavior for the Gateway

LED 1	LED 2	Gateway Status
Solid green		Power ON
Flashing red	Flashing red	Device Error
	Flashing amber	Modbus Communication Active
	Flashing red	Modbus Communication Error

For Gateway and Ethernet Bridge systems, active Modbus communication refers to the communication between the Gateway and the Ethernet Bridge. For GatewayPro systems, the Modbus communication LEDs refer to the communication internal to the GatewayPro. For Gateway-only systems, the Modbus communication LEDs refer to the communication between the Gateway and its host system (if applicable).

## Conducting a Site Survey (Gateway and Nodes)

A Site Survey, also known as a Radio Signal Strength Indication (RSSI), analyzes the radio communications link between the Gateway and any Node within the network by analyzing the radio signal strength of received data packets and reporting the number of missed packets that required a retry.

Perform a Site Survey before permanently installing the radio network to ensure reliable communication. Activate Site Survey mode from either the Gateway buttons or the Gateway Modbus holding register 15. Only the Gateway can initiate a Site Survey, and the Site Survey analyzes the radio communications link with one Node at a time.

SITE (Site Survey) Menu

The **SITE** menu displays the results of a Site Survey conducted with this Gateway.

Figure 4. SITE menu
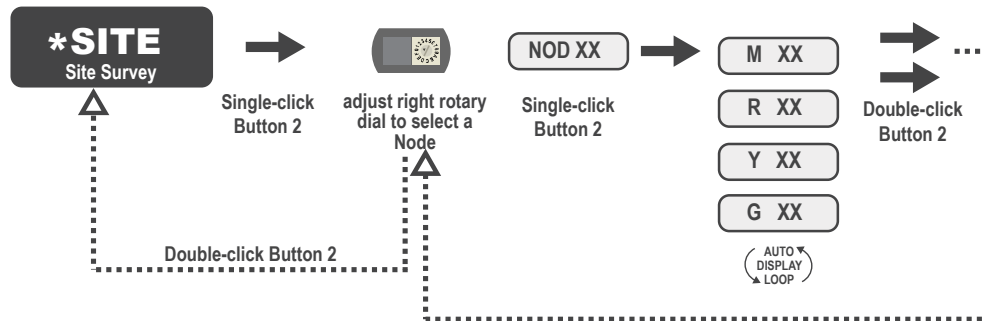
The **SITE** menu displays the device number of the Node the Site Survey was conducted with as well as the missed, green, yellow, and red received packet count. The **SITE** menu is only available on the Gateways. To access the **SITE** menu, single-click button 1 to scroll across the menu levels until reaching the Site Survey (**SITE**) menu.

See Conduct a Site Survey Using the Menu System on page 3.

See Interpreting the Site Survey Results on page 4.

Conduct a Site Survey Using the Menu System

Initiate a Site Survey using the Gateway's buttons and menu system.

1. Remove the Gateway's rotary dial access cover.
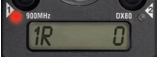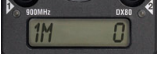2. Set the Gateway's rotary dials to the desired Node number.

   For example, to check the status of Node 1, set the Gateway's left rotary dial to 0 and the right rotary dial to 1. To check the status of Node 32, set the Gateway's left rotary dial to 3 and the right rotary dial to 2.

The Gateway is now enabled to read the status of the selected Node. The display scrolls through the Node's I/O status.

3. Single-click button 1 to scroll across the menu levels until reaching the Site Survey (SITE) menu.
4. Single-click button 2 to enter the Site Survey menu.
5. Single-click button 2 to begin conducting a Site Survey with the Node selected in step 2.
   The Gateway analyzes the quality of the signal from the selected Node by counting the number of data packets it receives from the Node.
6. Examine reception readings (M, R, Y, G) of the Gateway at various locations.

   Site survey results display as a percentage. M represents the percent of missed packets while R, Y, and G represent the percent of received packets at a given signal strength.

   M = Percent of missed packets; R = RED marginal signal; Y = YELLOW good signal; G = GREEN excellent signal. Record the results if you need troubleshooting assistance from the factory.
7. Change the Gateway's rotary dials to conduct a Site Survey with another Node and repeat steps 2 through 6.
8. To end the Site Survey, double-click the Gateway's button 2.
9. Change the Gateway's rotary dials back to 0.
   The LCD displays the device readings for the Gateway.
10. Double-click button 2 to move back to the top level menu.
11. Single-click button 1 to return to RUN mode.
12. Install the rotary dial access cover, referring to the Installation section of the manual to create an IP67 seal.

Interpreting the Site Survey Results

Site Survey results are listed as a percentage of data packets received and indicate the signal strength of the received signal.

Table 2: Site survey results

	Result	Description
	Green	Packets received at a strong signal strength. A strong signal strength is greater than −90 dBm at the receiver.
	Yellow	Packets received at a good signal strength. A good signal is between −90 and −100 dBm at the receiver.
	Red	Packets received at a weak signal strength. A weak signal is less than −100 dBm at the receiver.
	Missed	Packets not received on the first transmission and requiring a retry.

Judging if the reliability of a network's signal meets the needs of the application is not just a matter of green, yellow, and red packets received. In normal operating mode, when data packets are not received, the transmitter re-sends the packet until all data is received.

For slow monitoring applications such as a tank farm, where data is required in terms of seconds or minutes, receiving most of the data in the 'red' range, indicating a weak but reliable signal, transmits enough data for accurate monitoring. Nodes positioned near the outside range of the radio signal may have 90% of the data packets received in the red zone, again indicating a weak, but reliable signal.

We recommend keeping the missed packets average to less than 25%. When the network misses more than 25% of the data packets, the signal is usually too unreliable or obstacles may be interfering with the signal. When Site Survey reports the missed packets are 25% or higher, improve the radio system performance by:

- **Mounting the network's antennas higher** to clear obstacles in the area and improve the line of sight between Sure Cross® devices
- **Using higher gain antennas** to focus the energy of the radio signal in a specific direction and extend the signal's range
- **Adding data radios to the network** to extend the range of a radio network. For more information on data radios, please refer to Banner's white paper on range extension on www.bannerengineering.com/wireless.

Installing Your Sure Cross® Radios

Please refer to one of these instruction manuals to install your wireless network components.

- Performance Wireless I/O Network Instruction Manual: 132607
- MultiHop Data Radio Instruction Manual: 151317

MAPIO Menu for the PM8 Gateway

The PM8 Gateway and Node use the LCD menu system to automatically map I/O. The Node's rotary dials need to be set properly for the I/O mapping to work.

The first map in the list is the factory default setting. In addition to the MAPIO menu, an entry was added to the bottom of the DVCFG menu to display the currently selected I/O map.
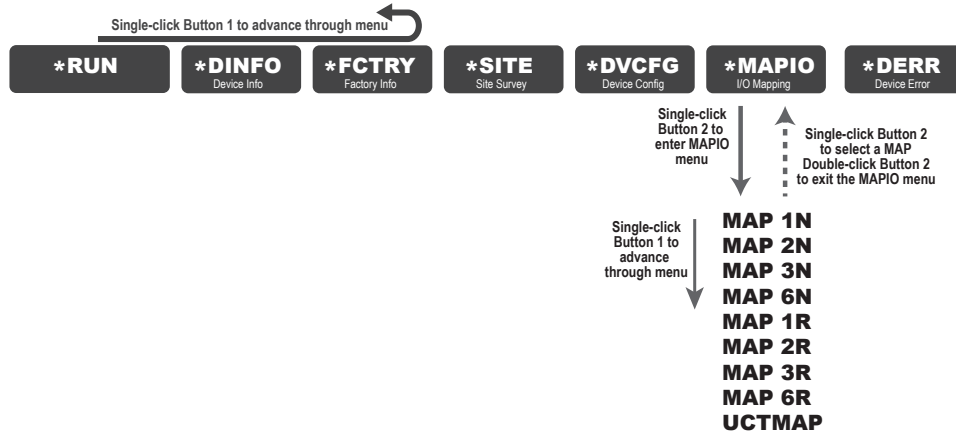
MAP 1N

MAP 1N maps the I/O between the PM8 Gateway and one PM8 Node. Verify Node 1's rotary dials are set to 01.

Gateway	Maps to	Node 1
Discrete IN 1	→	Discrete OUT 9
Discrete IN 2	→	Discrete OUT 10
Discrete IN 3	→	Discrete OUT 11
Discrete IN 4	→	Discrete OUT 12
Discrete IN 5	→	Discrete OUT 13
Discrete IN 6	→	Discrete OUT 14
Discrete OUT 9	←	Discrete IN 1
Discrete OUT 10	←	Discrete IN 2
Discrete OUT 11	←	Discrete IN 3
Discrete OUT 12	←	Discrete IN 4
Discrete OUT 13	←	Discrete IN 5
Discrete OUT 14	←	Discrete IN 6

MAP 2N

MAP 2N maps the I/O between the PM8 Gateway and two PM8 Nodes. Verify Node 1's rotary dials are set to 01 and Node 2's rotary dials are set to 02.

Gateway	Maps to	Node 1	Node 2
Discrete IN 1	→	Discrete OUT 9	
Discrete IN 2	→	Discrete OUT 10	
Discrete IN 3	→	Discrete OUT 11	
Discrete IN 4	→		Discrete OUT 9
Discrete IN 5	→		Discrete OUT 10
Discrete IN 6	→		Discrete OUT 11
Discrete OUT 9	←	Discrete IN 1	
Discrete OUT 10	←	Discrete IN 2	
Discrete OUT 11	←	Discrete IN 3	

Gateway	Maps to	Node 1	Node 2
Discrete OUT 12	←		Discrete IN 1
Discrete OUT 13	←		Discrete IN 2
Discrete OUT 14	←		Discrete IN 3

MAP 3N

MAP 3N maps the I/O between the PM8 Gateway and three PM8 Nodes. Verify Node 1's rotary dials are set to 01, Node 2's rotary dials are set to 02, and Node 3's rotary dials are set to 03.

Gateway	Maps to	Node 1	Node 2	Node 3
Discrete IN 1	→	Discrete OUT 9		
Discrete IN 2	→	Discrete OUT 10		
Discrete IN 3	→		Discrete OUT 9	
Discrete IN 4	→		Discrete OUT 10	
Discrete IN 5	→			Discrete OUT 9
Discrete IN 6	→			Discrete OUT 10
Discrete OUT 9	←	Discrete IN 1		
Discrete OUT 10	←	Discrete IN 2		
Discrete OUT 11	←		Discrete IN 1	
Discrete OUT 12	←		Discrete IN 2	
Discrete OUT 13	←			Discrete IN 1
Discrete OUT 14	←			Discrete IN 2

MAP 6N

MAP 6N maps the I/O between the PM8 Gateway and six PM8 Nodes. Verify Node 1's rotary dials are set to 01, Node 2's rotary dials are set to 02, through Node 6's rotary dials set to 06.

Gateway	Maps to	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6
Disc IN 1	→	Disc OUT 9					
Disc IN 2	→		Disc OUT 9				
Disc IN 3	→			Disc OUT 9			
Disc IN 4	→				Disc OUT 9		
Disc IN 5	→					Disc OUT 9	
Disc IN 6	→						Disc OUT 9
Disc OUT 9	←	Disc IN 1					
Disc OUT 10	←		Disc IN 1				
Disc OUT 11	←			Disc IN 1			
Disc OUT 12	←				Disc IN 1		
Disc OUT 13	←					Disc IN 1	
Disc OUT 14	←						Disc IN 1

MAP 1R

MAP 1R maps the I/O from Node 1 to Node 7, using the Gateway as a repeater. Verify Node 1's rotary dials are set to 01 and Node 7's rotary dials set to 07.

Node 1	Maps to	Node 7
Discrete IN 1	→	Discrete OUT 9
Discrete IN 2	→	Discrete OUT 10
Discrete IN 3	→	Discrete OUT 11
Discrete IN 4	→	Discrete OUT 12
Discrete IN 5	→	Discrete OUT 13
Discrete IN 6	→	Discrete OUT 14
Discrete OUT 9	←	Discrete IN 1
Discrete OUT 10	←	Discrete IN 2

Node 1	Maps to	Node 7
Discrete OUT 11	←	Discrete IN 3
Discrete OUT 12	←	Discrete IN 4
Discrete OUT 13	←	Discrete IN 5
Discrete OUT 14	←	Discrete IN 6

MAP 2R

Map 2R maps the I/O from Node 1 and Node 2 to Node 7, using the Gateway as a repeater. Verify Node 1's rotary dials are set to 01, Node 2's rotary dials are set to 02, and Node 7's rotary dials set to 07.

Node 7	Maps to	Node 1	Node 2
Discrete IN 1	→	Discrete OUT 9	
Discrete IN 2	→	Discrete OUT 10	
Discrete IN 3	→	Discrete OUT 11	
Discrete IN 4	→		Discrete OUT 9
Discrete IN 5	→		Discrete OUT 10
Discrete IN 6	→		Discrete OUT 11
Discrete OUT 9	←	Discrete IN 1	
Discrete OUT 10	←	Discrete IN 2	
Discrete OUT 11	←	Discrete IN 3	
Discrete OUT 12	←		Discrete IN 1
Discrete OUT 13	←		Discrete IN 2
Discrete OUT 14	←		Discrete IN 3

MAP 3R

MAP 3R maps the I/O from Nodes 1 through 3 to Node 7, using the Gateway as a repeater. Verify Node 1's rotary dials are set to 01, Node 2's rotary dials are set to 02, Node 3's rotary dials are set to 03, and Node 7's rotary dials set to 07.

Node 7	Maps to	Node 1	Node 2	Node 3
Discrete IN 1	→	Discrete OUT 9		
Discrete IN 2	→	Discrete OUT 10		
Discrete IN 3	→		Discrete OUT 9	
Discrete IN 4	→		Discrete OUT 10	
Discrete IN 5	→			Discrete OUT 9
Discrete IN 6	→			Discrete OUT 10
Discrete OUT 9	←	Discrete IN 1		
Discrete OUT 10	←	Discrete IN 2		
Discrete OUT 11	←		Discrete IN 1	
Discrete OUT 12	←		Discrete IN 2	
Discrete OUT 13	←			Discrete IN 1
Discrete OUT 14	←			Discrete IN 2

MAP 6R

MAP 6R maps the I/O from Nodes 1 through 6 to Node 7, using the Gateway as a repeater. Verify Node 1's rotary dials are set to 01, Node 2's rotary dials are set to 02, through Node 7's rotary dials set to 07.

Node 7	Maps to	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6
Disc IN 1	→	Disc OUT 9					
Disc IN 2	→		Disc OUT 9				
Disc IN 3	→			Disc OUT 9			
Disc IN 4	→				Disc OUT 9		
Disc IN 5	→					Disc OUT 9	
Disc IN 6	→						Disc OUT 9
Disc OUT 9	←	Disc IN 1					

Node 7	Maps to	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6
Disc OUT 10	←		Disc IN 1				
Disc OUT 11	←			Disc IN 1			
Disc OUT 12	←				Disc IN 1		
Disc OUT 13	←					Disc IN 1	
Disc OUT 14	←						Disc IN 1

UCTMAP

Select UCTMAP to use the User Configuration Tool (UCT) software to map I/O between the Gateway and its Nodes.

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
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

Performance Radio Specifications

Radio Range [1]
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)

Link Timeout (Performance)
Gateway: Configurable via User Configuration Software
Node: Defined by Gateway

Antenna Connection
Ext. Reverse Polarity SMA, 50 Ohms
Max Tightening Torque: 0.45 N·m (4 lbf·in)

900 MHz Compliance (1 Watt)
Contains FCC ID: UE3RM1809: FCC Part 15, Subpart C, 15.247
Contains IC: 7044A-RM1809
IFT: RCPBARM13-2283

NOM NYCE

(NOM approval only applies to 900 MHz models)

2.4 GHz Compliance (DX80-2400 Radio Module)
Radio module is indicated by the product label marking
Contains FCC ID: UE300DX80-2400: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
Contains IC: 7044A-DX8024
ANATEL: 15966-21-04042 Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados. Para maiores informações, consulte o site da ANATEL www.gov.br/anatel/pt-br/

2.4 GHz Compliance (SX243 Radio Module)
Radio module is indicated by the product label marking
Contains FCC ID: UE3SX243: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
Contains IC: 7044A-SX243

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[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.

RS-485 Communication Specifications

Communication Hardware (RS-485)
Interface: 2-wire half-duplex RS-485
Baud rates: 9.6k, 19.2k (default), or 38.4k
Data format: 8 data bits, no parity, 1 stop bit

PM8 Gateway Specifications

Supply Voltage
10 V DC to 30 V DC (Outside the USA: 12 V DC to 24 V DC, ± 10%)
For European applications, power this device from a Limited Power Source as defined in EN 60950-1.

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.)

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)

Interface
Two bi-color LED indicators; Two buttons; Six character LCD

Wiring Access
Two 1/2-inch NPT ports

Certifications

Banner Engineering **Europe** Park Lane, Culliganlaan 2F bus 3, 1831 Diegem, BELGIUM

(CE approval only applies to 2.4 GHz models)

Turck Banner LTD
Blenheim House, Blenheim Court, Wickford, Essex SS11 8YT, Great Britain

Discrete Inputs
Six PNP
Rating: 3 mA max current at 30 V DC
Sample Rate: 62.5 milliseconds
Report Rate: On change of state
ON Condition (PNP): Greater than 4.5 V
OFF Condition (PNP): Less than 4 V

Discrete Outputs
Six PNP
Update Rate: 125 milliseconds
ON Condition (PNP): Supply minus 2 V
OFF Condition (PNP): 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

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 and limitations. Install the device in a suitable enclosure with provision for connection of Division 2 / Zone 2 wiring methods in accordance with local codes, as acceptable to the local inspection authority having jurisdiction. All battery-powered devices must only use the lithium battery manufactured by Xeno, model XL-205F (Banner model number **BWA-BATT-001**).

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
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 IP67; NEMA 6
For installation and waterproofing instructions, go to www.bannerengineering.com and search for the complete instruction manual (p/n 132607)

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
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
"C" Housing Models/External wiring terminals: IEC IP20; NEMA 1
Refer to the Sure Cross® DX80 Performance (p/n 132607) or the Sure Cross® MultiHop (p/n 151317) instruction manual for installation and waterproofing instructions.

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 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
- **BWA-HW-011** IP20 Screw Terminal Headers (2 pack) (IP20 "C" models only)

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.** 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 that 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.

Important: Please download the complete Performance Gateway or Node technical documentation, available in multiple languages, from www.bannerengineering.com for details on the proper use, applications, Warnings, and installation instructions of this device.

Important: Por favor descargue desde www.bannerengineering.com toda la documentación técnica de los Performance Gateway or Node, disponibles en múltiples idiomas, para detalles del uso adecuado, aplicaciones, advertencias, y las instrucciones de instalación de estos dispositivos.

Important: Veuillez télécharger la documentation technique complète des Performance Gateway or Node sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

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.

Banner Engineering Corp. Limited Warranty