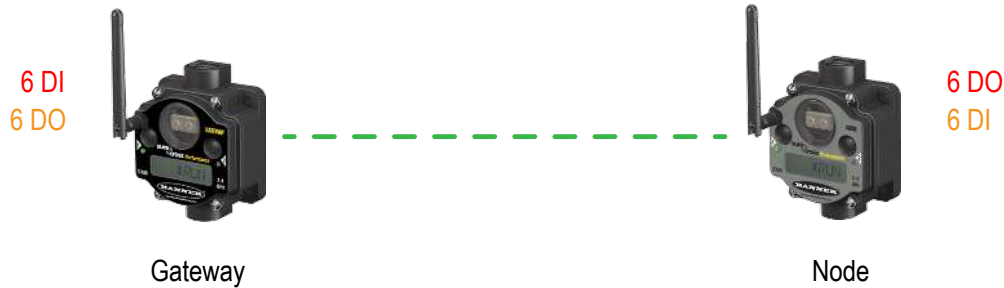


## User Instructions

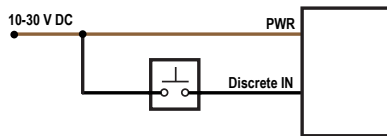


The Sure Cross® Performance Mapping kits include one Gateway, which acts as the wireless network master device, and one Node. I/O mapping between the Gateway and Node are set using the Gateway's DIP switches.

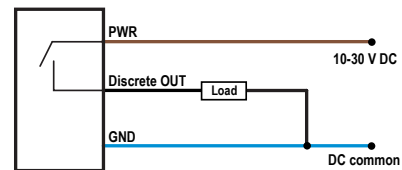
Kit	Gateway and Node in Kit	Frequency	Inputs and Outputs
DX80K9M6-PM8	Gateway: DX80G9M6S-PM8 Node: DX80N9X6S-PM8	900 MHz, ISM Band	Inputs: Six PNP discrete Outputs: Six PNP discrete
DX80K2M6-PM8	Gateway: DX80G2M6S-PM8 Node: DX80N2X6S-PM8	2.4 GHz, ISM Band	I/O is automatically mapped to the PM8 Gateway using the Gateway's menu system

## Connecting the Sensors

### Discrete Input Wiring for PNP Sensors



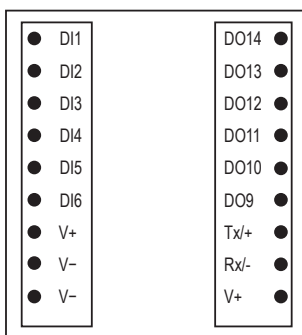
### Discrete Output Wiring (PNP)



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

### Gateway and Node Terminals

### Terminal Labels



- 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 V DC to 30 V DC power connection
- V-. Ground/DC common connection

## LED Behavior for the PMx Kits

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 1 Watt radios: 15 feet
- 2.4 GHz 65 mW radios: 1 foot



### Gateway LEDs

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

The Modbus communication LEDs refer to the communication between the Gateway and its host system (if applicable).

### Node LEDs

Table 2: LED behavior for the Nodes

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

### I/O Mapping for the PM8 Kits

By default, the PM8 kits are set to map between the Gateway and one Node. The rotary dials for the Node must be set to 01 for this mapping to work.

Gateway	Maps to	Node
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

To add additional Nodes to your original kit, download the Performance PM8 Gateway datasheet (p/n [173569](#)) for the I/O mapping options and their respective Node rotary dial settings.

### 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

### Radio Range

900 MHz, 1 Watt: Up to 9.6 km (6 miles) <sup>1</sup>  
 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)

### 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)

Contains FCC ID: UE3RM1809: FCC Part 15, Subpart C, 15.247  
 Contains IC: 7044A-RM1809  
 IFT: RCPBARM13-2283



(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/](http://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

### Supply Voltage

10 V DC to 30 V DC, (Outside the USA: 12 V DC to 24 V DC, ± 10%) <sup>2</sup>

### 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

### Operating Conditions

-40 °C to +85 °C (-40 °F to +185 °F) (Electronics); -20 °C to +80 °C (-4 °F to +176 °F) (LCD) <sup>3</sup>  
 95% maximum relative humidity (non-condensing)  
 Radiated Immunity: 10 V/m (EN 61000-4-3)

### Environmental Ratings

IEC IP67; NEMA 6 <sup>4</sup>

### 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.)

### Antenna Connection

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

### Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

### Wiring Access

Two 1/2-inch NPT ports

### 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

### Certifications



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

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

(CE/UKCA approval only applies to 2.4 GHz models)

### 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  
 ON Condition: Greater than 8 V  
 OFF Condition: Less than 5 V

### 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

## Communication (Gateway only)

### 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

### Communication Protocol

Modbus RTU

## 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 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.

<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> For European applications, power this device from a Limited Power Source as defined in EN 60950-1.

<sup>3</sup> Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

<sup>4</sup> 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.



**Important:** Please download the complete Sure Cross Performance Mapping PM8 Kits technical documentation, available in multiple languages, from [www.bannerengineering.com](http://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](http://www.bannerengineering.com) toda la documentación técnica de los Sure Cross Performance Mapping PM8 Kits, 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 Sure Cross Performance Mapping PM8 Kits sur notre site [www.bannerengineering.com](http://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

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.

**THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.**

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: [www.bannerengineering.com](http://www.bannerengineering.com).

For patent information, see [www.bannerengineering.com/patents](http://www.bannerengineering.com/patents).

## FCC Part 15 Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## Industry Canada

IC: 7044A-DX8024 or 7044A-SX243—This device contains licence-exempt transmitters(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs/récepteurs exemptés de licence conformes à la norme Innovation, Sciences, et Développement économique Canada. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage.
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.