

# Sure Cross® Wireless Q45DPSD Differential Pressure Sensor Node



## Datasheet

The Sure Cross® Q45DPSD Differential Pressure Sensor Node combines a differential pressure sensor with the reliable, field-proven, Sure Cross industrial wireless architecture into one package, eliminating the need for ordering multiple components. The industrial grade, battery-powered device can be used to wirelessly transmit differential pressure levels to a wireless DXM Controller/ Gateway for remote monitoring of critical systems.

Figure 1. Q45DPSD Node shown with a QM42-DPS1-1Q differential pressure sensor



### Benefits

- Provides the ability to deliver factory automation and IIoT solutions for many applications including:
  - Filter Monitoring
  - Vacuum Line Monitoring
  - HVAC System/Duct Pressure
  - Dust Collectors
  - Clean Rooms
  - Fume Hoods
  - Air Flow
- Measurement range:  $\pm 1$  inches of water column (wc) with the QM42-DPS1-1Q sensor
- **Eliminate control wires**—The Sure Cross wireless system is a radio frequency network with integrated I/O that removes the need for power and control wires
- **Reduce complexity**—Machine or process reconfiguration made easier; great for retrofit applications
- **Deploy easily**—Simplify installation on existing equipment to enable deployment in remote and hard-to-access locations where implementing a wired solution would be difficult, impractical, or not cost-effective
- **Battery Life**— D-cell battery provides up to five years of battery life with one-minute sampling/reporting
- Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery
- Transceivers provide bidirectional communication between the Gateway and Node, including fully acknowledged data transmission
- Connect with Banner's DXM Series Wireless Controller/Performance Gateway/edge device to process, analyze, and send data to a PLC, HMI, or Cloud platform.

## Models

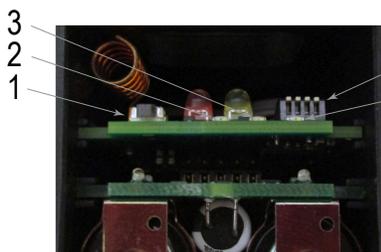
Model	Measurement Range	Frequency	Inputs
DX80N9Q45DPSD	Transmitter Only	900 MHz ISM Band	1-wire serial communications with QM42-DPS pressure sensors
DX80N2Q45DPSD		2.4 GHz ISM Band	
DX80N9Q45DPSD1	$\pm 1$ inch of water column (wc) with the included QM42-DPS1-1Q pressure sensor and supplied tubing	900 MHz ISM Band	
DX80N2Q45DPSD1		2.4 GHz ISM Band	

Replacement Battery: **BWA-BATT-011**.

For the installation instructions for the QM42-DPS1-1Q Differential Pressure Sensor, refer to p/n [220219](#).

## Configuration Instructions

### Button and LEDs



- 1 Binding button
- 2 Red LED (flashing) indicates a radio link error with the Gateway.
- 3 Green LED (flashing) indicates a good radio link with the Gateway.
- 4 Amber LED is not used.
- 5 DIP switches



## DIP Switch Settings

The default settings for sample and report rates are 1 minute, switched power is 12 V, and warm-up time is 125 ms. Only DIP switches 1, 6, 7, or 8 should ever be modified from these settings. Factory default settings are noted by \*.

Descriptions	DIP Switches							
	1	2	3	4	5	6	7	8
Transmit power level: 1 Watt (30 dBm)	OFF*							
Transmit power level: 250 mW (24 dBm), DX80 compatibility mode	ON							
Reserved		OFF*	OFF*	OFF*				
Sample/report rate: user configured					OFF*	OFF*		
Sample/report rate: 16 seconds					OFF	ON		
Sample/report rate: 64 seconds					ON	OFF		
Sample/report rate: sample on demand					ON	ON		
Serial inputs 4-6 disabled							OFF*	
Serial inputs 4-6 enabled							ON	
Reserved								OFF"
Reserved								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).

### Sample and Report Rates

The sample interval, or rate, defines how often the Sure Cross device provides switched power and samples the sensor. For battery-powered applications, setting a slower rate extends the battery life. In the case of this device, if the sample rate is set to 1 minute, the device will provide switched power and sample every 1 minute and immediately report the data if the value is different than the previous sample.

The report rate defines how often the Node communicates the I/O status to the Gateway at a minimum. In the case of this device, if the report rate is set to 2 minutes and the sampled data has not changed by the time it reaches the report rate, the Node automatically reports the latest value.

## Apply Power to the Q45 (D-Cell Models)

Follow these instructions to install or replace the lithium D-cell batteries.

Figure 2. Battery pack and board



As with all batteries, these are a fire, explosion, and severe burn hazard. Do not burn or expose them to high temperatures. Do not recharge, crush, disassemble, or expose the contents to water. Properly dispose of used batteries according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or other facility qualified to accept lithium batteries.

1. Loosen the clamp plate with a small Phillips screwdriver and lift the cover.
2. Use the black pull wire to pull the battery board out of the Q45 housing.
3. If applicable, remove the discharged battery.
4. Install the new battery. Use Banner's **BWA-BATT-011** replacement battery or an equivalent 3.6 V D-cell lithium battery, such as Xeno's XL-205F.
5. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case. Caution: There is a risk of explosion if the battery is replaced incorrectly.
6. Slide the board containing the new battery back into the Q45 housing.
7. Close the cover and gently tighten the clamp plate with the small Phillips screwdriver.

## Bind to the Gateway and Assign the Node Address

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

1. On the Gateway: Enter binding mode.
  - For housed DX80 Gateways, triple-click button 2 on the Gateway. Both LEDs flash red.
  - For Gateway board modules, triple-click the button. The green and red LED flashes.
2. Assign the Q45 a Node address using the Gateway's rotary dials. Use the left rotary dial for the left digit and the right rotary dial for the right digit. For example, to assign your Q45 to Node 10, set the Gateway's left dial to 1 and the right dial to 0. Valid Node addresses are 01 through 47.



3. On the Q45: Loosen the clamp plate on the top of the Q45 and lift the cover.
4. Enter binding mode on the Q45 by triple-clicking the Q45's button. The red and green LEDs flash alternately and the sensor searches for a Gateway in binding mode. After the Q45 is bound, the LEDs stay solid momentarily, then they flash together four times. The Q45 exits binding mode.
5. Label the sensor with the Q45's Node address number for future reference.
6. Repeat steps 2 through 5 for as many Q45s as are needed for your network.
7. On the Gateway: After binding all Q45s, exit binding mode.
  - For housed DX80 Gateways, double-click button 2.
  - For board-level DX80 Gateways, double-click the button.

For Gateways with single-line LCDs: After binding your Q45 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 Q45s if your Gateway is ever replaced.

## Bind to a DXM and Assign the Node Address

Before beginning the binding procedure, apply power to all the devices. Separate the radios by two meters when running the binding procedure. Put only one DXM into binding mode at a time to prevent the Q45 from binding to the wrong Gateway.

1. On the DXM: Use the arrow keys to select the **ISM Radio** menu on the LCD and click **ENTER**.
2. Highlight the **Binding** menu and click **ENTER**.
3. Use the arrow keys to select the Node address to bind the Q45 to.
4. On the Q45: Loosen the top clamp plate and lift the cover.
5. Enter binding mode by triple-clicking the binding button. The red and green LEDs flash alternately and the sensor searches for a Gateway in binding mode. After the Node binds, the LEDs stay solid momentarily, then they flash together four times. The Node exits binding mode.
6. Label the sensor with the Node address number for future reference.
7. On the DXM: Click **BACK** to exit binding for that specific Node address.
8. Repeat steps 3 through 7 and change the Node address for as many Q45s as are needed for your network.
9. On the DXM: After you have finished forming your network, click **BACK** until you reach the main menu.

## 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

Table 1: 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

## Holding Registers

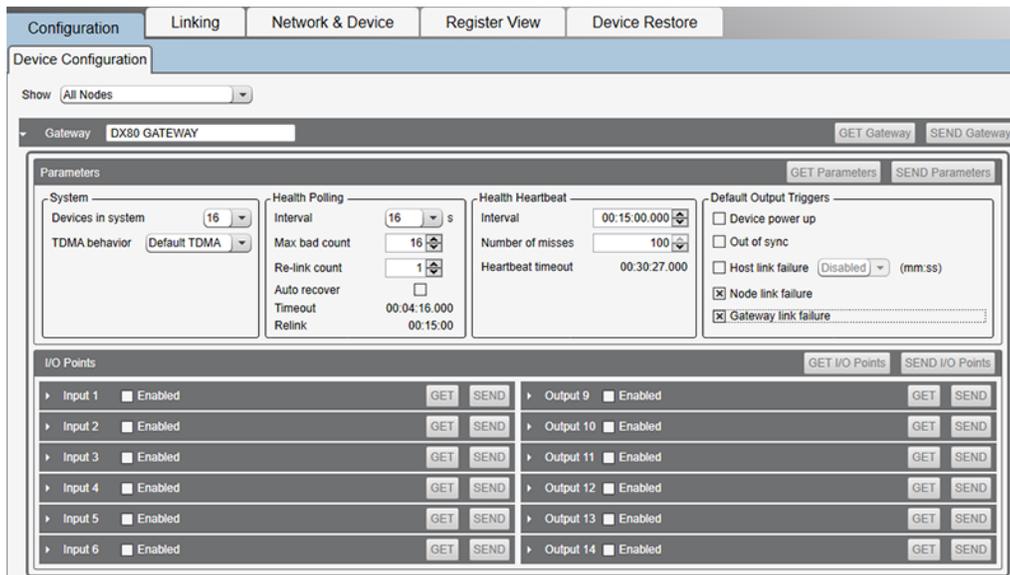
Table 2: Modbus holding registers for model QM42-DP1-1Q

Modbus Registers		Type	Notes	I/O Type	I/O Range		Holding Register Representation (Dec)	
Gateway	Node				Minimum	Maximum	Minimum	Maximum
1	1 + (Node# × 16)	Int 16 Read Only	Pressure = Register Value ÷ 1000	Pressure (milli-in of water)	1	-1000	-1000	1000
2	2 + (Node# × 16)		Pressure = Register Value ÷ 1000	Pressure (milli-PSI)	-0.036	0.036	-36	36
3	3 + (Node# × 16)		Pressure = Register Value	Pressure (Pascal)	-248	248	-248	248
4	4 + (Node# × 16)		Temperature = Register Value ÷ 100	Temperature (°C)	-40	105	-4000	10 500
5	5 + (Node# × 16)		Temperature = Register Value ÷ 100	Temperature (°F)	-40	221	-4000	22 100
6	6 + (Node# × 16)							
7	7 + (Node# × 16)			Reserved				
8	8 + (Node# × 16)			Device Message				
9	9 + (Node# × 16)							
	...							
15	15 + (Node# × 16)			Control Message				
16	16 + (Node# × 16)			Reserved				

## Sure Cross® DX80 Performance Configuration Software

The configuration software offers an easy way to link I/O points in your wireless network, view I/O register values, and set system communication parameters when a host system is not part of the wireless network. The software runs on any computer with the Windows Vista, Windows 7, Windows 8, or Windows 10 operating system.

Figure 3. Device Configuration screen



Use a USB to RS-485 adapter cable to connect a standalone DX80 Gateway to the computer. For DXM Controllers with an internal DX80 radio, connect a computer to the DXM Controller using the supplied USB or Ethernet connection. Download the most recent revisions of the configuration software from Banner Engineering's website: <https://www.bannerengineering.com/us/en/products/wireless-sensor-networks/reference-library/software.html>.

The USB to RS-485 adapter cable is not required for the DXM Controller. For standalone DX80 Gateway devices use:

- USB to RS-485 adapter cable model **BWA-UCT-900** for 1 Watt radios
- USB to RS-485 adapter cable model **BWA-HW-006** for all other radios

## Installing the Pressure Sensor

The pressure sensor can be mounted to any surface using fasteners sized for the 1/8-inch (3.2 mm) diameter through-holes on the base of the unit. The optional **BWA-BK-001** bracket may be used for mounting to a magnetic surface.

The supplied tubing has an 1/8 inch inner diameter and is intended to fit the barbed fittings on the high (+) and low (-) pressure ports. Cut the tubing to the length required, but for the best results, keep the tubing as short as possible. Install the high (+) side to the upstream or high-line pressure and install the low (-) side to downstream or low-line pressure.

## Storage and Sleep Modes

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**Storage Mode** (applies to battery-powered models only)—While in **storage mode**, the radio does not operate. To put any integrated battery Sure Cross radio into storage mode, press and hold button 1 for five seconds. To wake the device, press and hold button 1 for five seconds. The radio is in storage mode when the LEDs stop blinking, but in some models, the LCD remains on for an additional minute after the radio enters storage mode. After a device has entered storage mode, you must wait one minute before waking it.

**Sleep Mode** (applies to both battery and 10–30 V DC powered models)—During normal operation, the Sure Cross radio devices enter **sleep mode** after 15 minutes of operation. The radio continues to function, but the LCD goes blank. To wake the device, press any button.

## Specifications

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### Environmental Specifications

#### Operating Conditions

–40 °C to +70 °C (–40 °F to +158 °F); 90% at +50 °C maximum relative humidity (non-condensing)  
Radiated Immunity: 10 V/m (EN 61000-4-3)

#### Environmental Rating

NEMA 6P, IP67

Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

### Performance Radio with Internal Antenna Specifications

#### Radio Range<sup>1</sup>

900 MHz, 1 Watt: Up to 3.2 km (2 miles) with line of sight (internal antenna)  
2.4 GHz, 65 mW: Up to 1000 m (3280 ft) with line of sight (internal antenna)

#### 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)

#### 900 MHz Compliance (1 Watt)

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

#### 2.4 GHz Compliance

FCC ID UE3SX243: FCC Part 15, Subpart C, 15.247  
Radio Equipment Directive (RED) 2014/53/EU  
IC: 7044A-SX243

#### Link Timeout (Performance)

Gateway: Configurable via User Configuration Software  
Node: Defined by Gateway

### Q45DPSD Sensor Node Specifications

#### Supply Voltage

3.6 V DC (internal battery)

#### Current Draw at 3.6 V DC

900 MHz, 1 Watt: Approximately 1 mA  
900 MHz, 250 mW: Approximately 0.5 mA

#### Housing

Molded reinforced thermoplastic polyester housing, o-ring sealed transparent Lexan® cover, molded acrylic lenses, stainless steel hardware.  
Designed to withstand 1200 psi washdown.

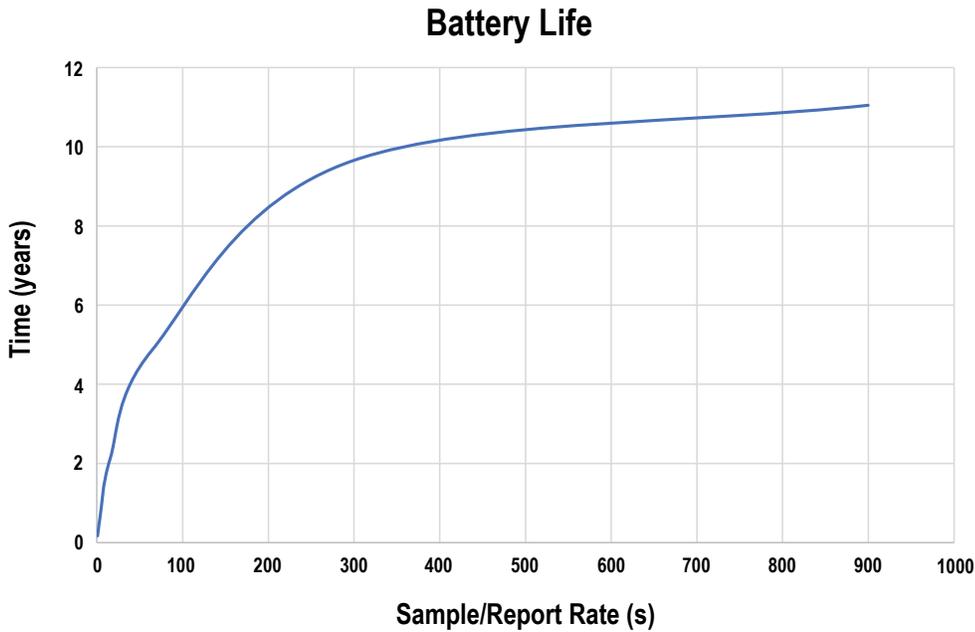
#### Interface

Two bi-color LED indicators; Two buttons

<sup>1</sup> Range depends on the environment and decreases significantly without line of sight. Always verify your wireless network's range by performing a Site Survey.

## Battery Performance Curve

Figure 4. Battery life by sample/report rate (s)



Sample/Report Rate (seconds)	Battery Life (years)
1	0.17
2	0.33
4	0.64
16	2.13
64	4.84
300	9.65
900	11.04

## Accessories

### Replacement Batteries

**BWA-BATT-011**

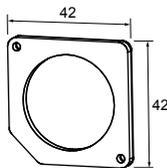
- 3.6 V Lithium D cell for non-hazardous locations only
- 19000 mAh
- One battery



### Brackets

**BWA-BK-001**

- Includes magnetic mounting bracket **SMB42FLM12** and 2 mounting screws



**SMB42T**

- Stainless steel 2-axis side-mounting bracket
- Nut strap included for replacing two M3 mounting nuts

**Hole center spacing:** A = 20.3, B to C = 24.1

**Hole size:** A =  $\varnothing$  4.3  $\times$  20°, B =  $\varnothing$  3.0, C =  $\varnothing$  3.0  $\times$  30°



## 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.



**Important:** Please download the complete Q45DPSD Differential Pressure Sensor Node 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 Q45DPSD Differential Pressure Sensor 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 Q45DPSD Differential Pressure Sensor Node 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.

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

## Notas Adicionales

Información México: La operación de este equipo está sujeta a las siguientes dos condiciones: 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."