

Sure Cross® Wireless Q45PS All-in-One Pressure Sensor



Datasheet

Sure Cross® Wireless Q45 Sensors combine the best of Banner's flexible Q45 sensor family with its reliable, field-proven, Sure Cross wireless architecture to solve new classes of applications limited only by the user's imagination. Containing a variety of sensor models, a radio, and internal battery supply, this product line is truly plug and play.

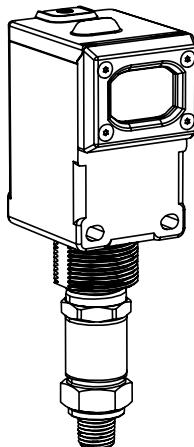
The Q45PS All-in-One Pressure Sensor combines a media isolated pressure sensor with the reliable, field-proven, Sure Cross wireless architecture into one package, eliminating the need for ordering multiple components and reducing the physical size of the device. This solution monitors pressurized systems in remote locations without human intervention. The industrial grade, battery-powered device can be used to wirelessly transmit pressure levels to a wireless controller/gateway for remote monitoring of critical systems.

Benefits

- Provides for the ability to deliver factory automation and IIoT solutions for many applications including, but not limited to monitoring:

- Water pressure
- HVAC systems
- Pneumatic systems
- Cooling systems/compressors/chillers fluid pressure
- Hydraulic system pressure
- Supply tank level via the head pressure

- **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
- Selectable transmit power levels of 250 mW or 1 Watt for 900 MHz models
- DIP switches for user configuration
- Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery within the unlicensed Industrial, Scientific, and Medical (ISM) band
- Transceivers provide bidirectional communication between the Gateway and Node, including fully acknowledged data transmission
- Diagnostics allow user defined output settings in the unlikely event of lost RF signal



Important: Please download the complete Wireless Q45 Sensor 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 Wireless Q45 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 Wireless Q45 Sensor 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.



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.



**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.

Models

Model	Frequency	Inputs and Outputs
DX80N9Q45PS50G	900 MHz ISM Band	Q45 with integrated 0–50 psi gauge pressure sensor
DX80N9Q45PS150G		Q45 with integrated 0–150 psi gauge pressure sensor

To order an integrated battery model without the battery, add a **-NB** to the model number. If you purchase a model without the battery, Banner Engineering recommends battery model **BWA-BATT-006**.

Operating Instructions

Storage Mode

While in **storage mode**, the Q45's radio does not operate. The Q45 ships from the factory in storage mode to conserve the battery. To wake the device, press and hold the binding button (inside the housing on the radio board) for five seconds. To put any Q45 into storage mode, press and hold the binding button for five seconds. The Q45 is in storage mode when the LEDs stop blinking.

Replace or Install the Batteries

To replace the lithium "AA" cell battery, follow these steps. 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.

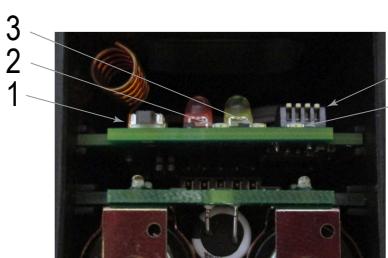


1. Lift the plastic cover.
2. Slide the board containing the batteries out of the Q45 housing.
3. Remove the discharged batteries and replace with new batteries. Use two 3.6 V AA lithium batteries, such as Xeno's XL-60F or equivalent.
4. Verify the battery's positive and negative terminals align to the 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.
5. Slide the board containing the new batteries back into the Q45 housing.

The replacement battery model number is BWA-BATT-006. For pricing and availability, contact Banner Engineering.

Configuration Instructions

Button and LEDs



- | | |
|---|--|
| 1 | 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 Switches

After making any changes to any DIP switch position, reboot the Wireless Q45 Sensor by triple-clicking the button, waiting a second, then double-clicking the button.

The DIP switches are in the OFF position. To turn a DIP switch on, push the switch toward the battery pack. DIP switches one through four are numbered from left to right.

	DIP Switches							
	1	2	3	4	5	6	7	8
900 MHz transmit power level: 1 Watt (30 dBm)	OFF *							
900 MHz transmit power level: 250 mW (24 dBm), DX80 compatibility mode	ON							
Temperature in Fahrenheit		OFF *						
Temperature in Celsius		ON						
Reserved			OFF *					
Reserved				OFF *				
Reserved					OFF *			
Modbus or software configured (overrides DIP switches)						OFF *	OFF *	OFF *
Sample/report rate of 15 minutes						OFF	OFF	ON
Sample/report rate of 5 minutes						OFF	ON	OFF
Sample/report rate of 64 seconds						OFF	ON	ON
Sample/report rate of 16 seconds						ON	OFF	OFF
Sample/report rate of 4 seconds						ON	OFF	ON
Sample/report rate of 2 seconds						ON	ON	OFF
Sample/report rate of 1 seconds						ON	ON	ON

The factory default sample and report rate is 5 minutes.

Transmit Power Levels

The 900 MHz radios transmit 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 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.

Sample and Report Rates

The sample interval, or rate, defines how often the Sure Cross device samples the input. For battery-powered applications, setting a slower rate extends the battery life.

The report rate defines how often the Node communicates the I/O status to the Gateway. For *FlexPower*® applications, setting the report rate to a slower rate extends the battery life.

What is Sampling on Demand?

Sample on demand allows a host system to send a Modbus command to any register and require the inputs to immediately sample the sensor and report readings back to the host system. Sampling on demand can be used between the normal periodic reporting.

To use the Sample on Demand feature requires using a host-controlled system capable of sending Modbus commands to the master radio.

Sample an Input Using a Host System

To sample the input, have the Host System write to the Node's register 15. To calculate which register this is for your Node, use this equation: $15 + (\text{Node \#} \times 16)$.

- From the host system, write 0x13xx to the Node's register 15, where xx defines the input you want to sample.

For Input	Write Value (in hex)	Write Value (in decimal)
1	0x1301	4865
2	0x1302	4866
3	0x1304	4868
4	0x1308	4872
5	0x1310	4880

For Input	Write Value (in hex)	Write Value (in decimal)
6	0x1320	4896
All Inputs	0x133F	4927

2. To send the Sample on Demand command to more than one input, add together the binary representation values.

For example, to demand a sampling of inputs 1, 2, and 3, the Hex command is 0x1307.

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. Enter binding mode on the Gateway.
 - For housed DX80 Gateways, triple-click button 2 on the Gateway. Both LEDs flash red.
 - For Gateway board modules, triple-click the binding 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. 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 binding 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. After binding all Q45s, exit binding mode on the Gateway.
 - For housed DX80 Gateways, double-click button 2 on the Gateway.
 - For board-level DX80 Gateways, double-click the binding button on the Gateway.

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 Gateway and Assign the Node Address

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

1. On the DXM radio using the arrow keys 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. Loosen the clamp plate on the top of the Q45 and lift the cover.
5. Enter binding mode on the Q45 by triple-clicking the power/binding button. The red and green LEDs flash alternately and the sensor searches for a Gateway in binding mode. After the Q45 binds, the LEDs stay solid momentarily, then they flash together four times. The Q45 exits binding mode.
6. Label the sensor with the Q45's Node address number for future reference.
7. Click **BACK** on DXM to exit binding for that specific Node address.
8. Repeat steps 3 through 7 changing the Node address for as many Q45s as are needed for your network.
9. Click **BACK** on DXM until back to the main menu when finished binding.

Modbus Registers

I/O #	Modbus Holding Register		I/O Type	I/O Range		Holding Register Representation	
	Gateway	Any Node		Min.	Max.	Min.	Max.
1	1	1 + (Node# × 16)	Temperature	-1638.3	1638.4	-32768	32767
2	2	2 + (Node# × 16)	Pressure (unscaled)	0	65535	0	65535
		...					
7	7	7 + (Node# × 16)	Reserved				
8	8	8 + (Node# × 16)	Device Message				

I/O #	Modbus Holding Register		I/O Type	I/O Range		Holding Register Representation	
	Gateway	Any Node		Min.	Max.	Min.	Max.
		...					
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

The temperature = (Modbus register value) ÷ 20.

Examples

The Q45PS is equipped with a 0–5 V DC pressure sensor. The Node's register 2 reports this output as a raw value. Use the following equations to interpret the raw value in PSIG or PSIS.

- When using the 0–50 PSIG model, divide the value in register 2 by 655.35. For example: PSI = 13265 (holding register 2 in decimal) ÷ 655.35 = 20.2 PSIG
- When using the 0–150 PSIG model, divide the value in register 2 by 218.45. For example: PSI = 13265 (holding register 2 in decimal) ÷ 218.45 = 60.7 PSIG

Specifications

Performance 900 MHz Radio Specifications for Internal Antennas

Radio Range

900 MHz, 1 Watt (Internal antenna): Up to 3.2 km (2 miles) with line of sight

Antenna Minimum Separation Distance

900 MHz, 1 Watt: 4.57 m (15 ft)

Radio Transmit Power

900 MHz, 1 Watt (Internal antenna): 25 dBm Conducted

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

Link Timeout

Gateway: Configurable via User Configuration Software

Node: Defined by Gateway

Wireless Q45PS Sensor Node Specifications

Performance

Construction

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

Indicators

Red and green LEDs (radio function)

Default Sensing Interval

5 minutes

Typical Battery Life

See chart

Certifications



(NOM approval only applies to 900 MHz models)

Environmental Specifications

Operating Conditions

-40 °C to +70 °C (-40 °F to +158 °F); 90% at +50 °C maximum relative humidity (non-condensing)

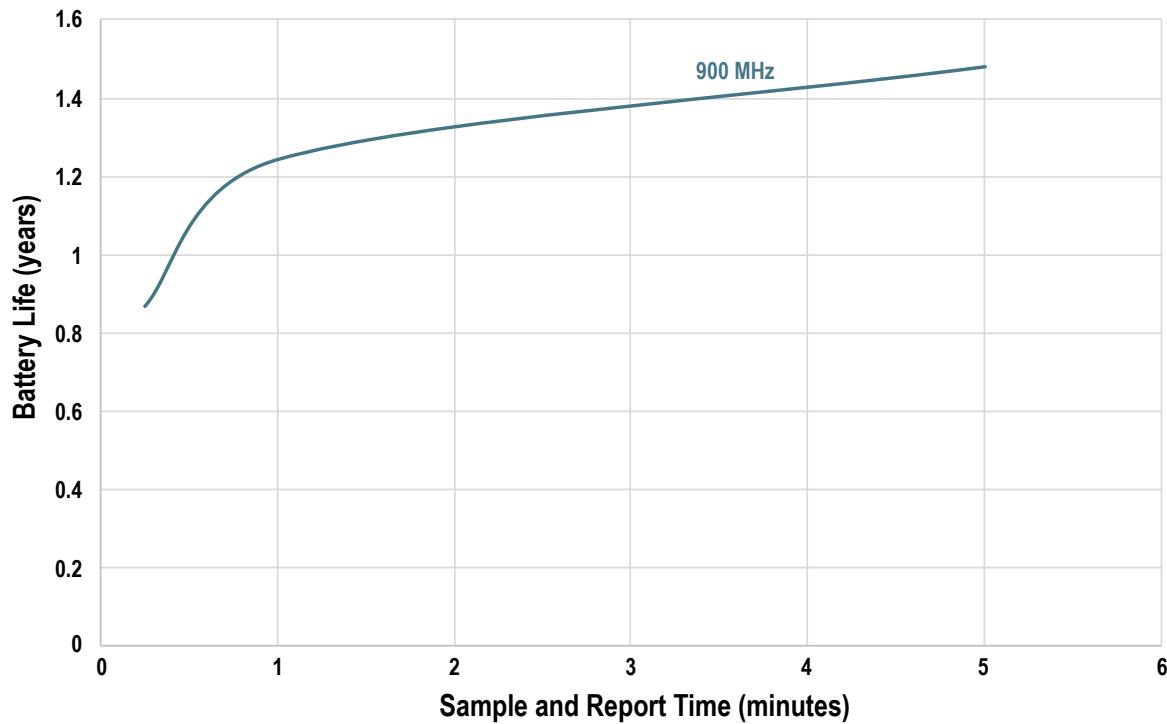
Radiated Immunity: 10 V/m (EN 61000-4-3)

Environmental Rating

NEMA 6P, IEC IP67

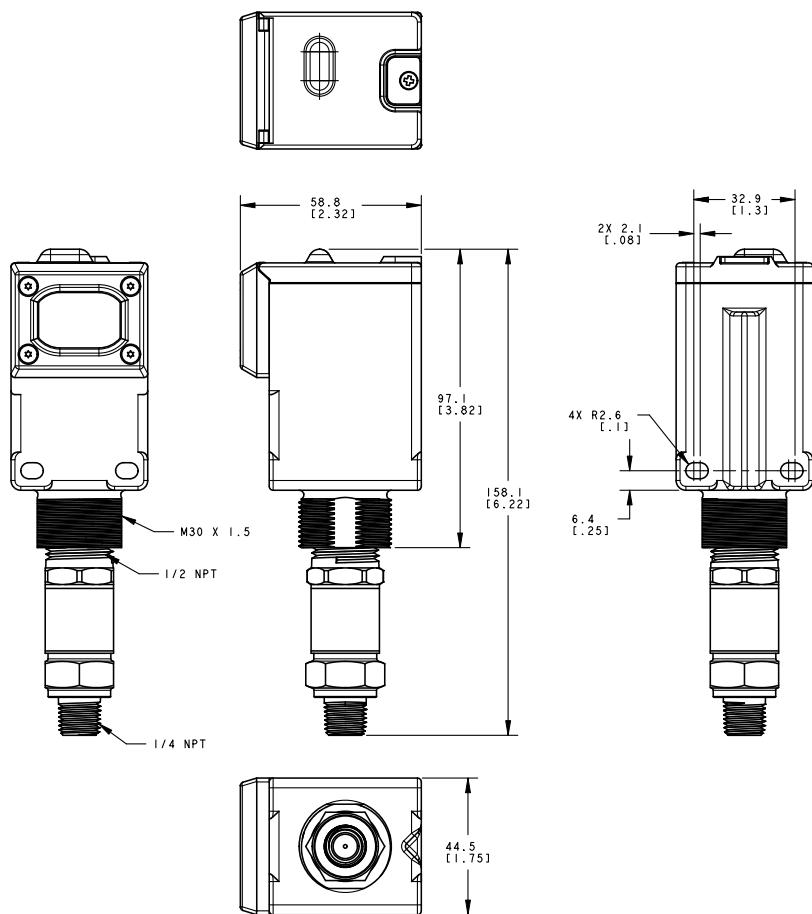
Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Battery Life Performance Curve



Dimensions

All measurements are listed in millimeters, unless noted otherwise.



Accessories

BWA-BATT-006—3.6 V Lithium AA cell for Wireless Q45 Sensors, 2 batteries

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.

Exporting Sure Cross® Radios

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.

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."

Antenas SMA	Modelo	Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho	BWA-9O2-C	Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	BWA-9O6-A
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	BWA-9O5-C	Antena, Yagi, 900 MHz, 10 dBd, N Hembra	BWA-9Y10-A

Mexican Importer

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