

Datasheet

The Sure Cross® Wireless Q45VT Node is a compact, industrial, battery-powered device that wirelessly communicates vibration and temperature data collected from Banner's 1-wire serial VT1 vibration sensor to any Sure Cross Performance Gateway. Banner's VT1 vibration sensors work on a variety of machines to provide vibration and temperature measurements to effectively monitor and predict when maintenance of critical equipment is needed.

Benefits

- Delivers pre-processed high accuracy vibration values for monitoring rotating equipment such as:
 - Motors
 - Pumps
 - Rotary compressors
 - Exhaust or HVAC fan motors
 - Spindles
- Easy-to-use rugged device that can be easily mounted to equipment
- Use with the DXM Wireless Controller to track and trend vibration characteristics in real time to predict the need for maintenance, potential component failure, and to avoid unplanned downtime
- **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 powered for "peel and stick" functionality with 2+ years of battery life
- Selectable transmit power levels of 250 mW or 1 Watt for 900 MHz models and 65 mW for 2.4 GHz models
- DIP switches for user configuration of alarm levels
- 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.



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	Radio Frequency	Description
DX80N9Q45VT	900 MHz ISM Band	Must be paired with QM30VT1 Vibration and Temperature Sensor (sold separately)

General Operation

For the first 15 minutes after power up, the Node samples the sensor every two seconds (fast sample mode). After 15 minutes, the Node defaults to 5 minute sample intervals. **Activate fast sample mode by single clicking the button (the amber LED is solid).**

- The amber LED on the front of the Q45 Node flashes when the vibration threshold limit set in I/O 1 is met. To minimize false vibration triggering, two consecutive samples must be above the threshold before the output condition is satisfied.
- The red LED on the front of the Q45 Node flashes when the temperature threshold limit set in I/O 4 is met. Only one reading above the established threshold is required to trigger this alert.

Set the vibration thresholds using the DIP switches or using the User Configuration Software to define the Threshold parameter. The DIP switch vibration thresholds were determined using the guidance of Vibration Severity per ISO 10816.

The default setting for the temperature threshold is 80 °C. Change the temperature threshold using the software and defining the Threshold parameter.

- Class I: Small (up to 15 kW) machines and subassemblies of larger machines.
- Class II: Medium size (15 kW to 75 kW) machines without special foundations, or machines up to 300 kW rigidly mounted on special foundations.
- Class III: Large rotating machines rigidly mounted on foundations which are stiff in the direction of vibration measurement.
- Class IV: Large rotating machines mounted on foundations which are flexible in the direction of vibration measurement.

ISO 10816 provides guidance for evaluating vibration velocity severity motors, pumps, fans, compressors, gear boxes, blowers, dryers, presses, and other machines that operate in the 10 to 1000 Hz frequency range.

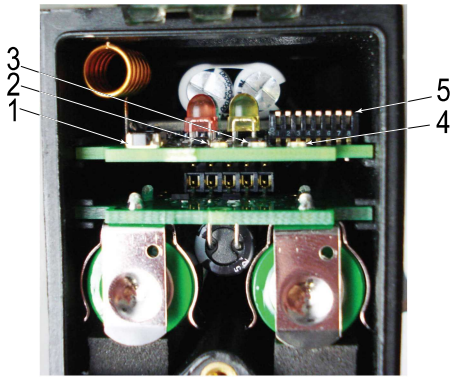
	Machine		Class I	Class II	Class III	Class IV
	in/s	mm/s	Small Machines	Medium Machines	Large Rigid Foundation	Large Soft Foundation
Vibration Velocity Vrms	0.01	0.28				
	0.02	0.45				
	0.03	0.71		good		
	0.04	1.12				
	0.07	1.80				
	0.11	2.80		satisfactory		
	0.18	4.50				
	0.28	7.10		unsatisfactory		
	0.44	11.2				
	0.70	18.0				
	1.10	28.0		unacceptable		
	1.77	45.9				

Figure 1. Vibration Severity per ISO 10816

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.

Button, LEDs, and DIP Switches



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 (flashing) indicates fast sample mode.
5. DIP Switches

DIP Switch Settings

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. As shown in the image above, 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.

Description	DIP Switches							
	1	2	3	4	5	6	7	8
Transmit power: 1 Watt (30 dBm)	OFF *							
Transmit power: 250 mW (24 dBm) (DX80 compatibility mode)	ON							
RESERVED		OFF *	OFF *	OFF *				
Vibration alarm at 0.15 in/sec (default setting)					ON	OFF	OFF	OFF
Vibration alarm at 0.25 in/sec					ON	OFF	OFF	ON
Vibration alarm at 0.35 in/sec					ON	OFF	ON	OFF
Vibration alarm at 0.55 in/sec					ON	OFF	ON	ON
Local light mapping disabled					OFF *			
UCT configurable						ON	ON	OFF

* default setting

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.

Modbus Register Table

The temperature = (Holding register value) ÷ 20.

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)	Input 1: Z-Axis RMS Velocity (in/sec)	0	6,5535	0	65535
2	2	2 + (Node# × 16)	Input 2: Z-Axis RMS Velocity (mm/sec)	0	65,535	0	65535
3	3	3 + (Node# × 16)	Input 3: Temperature (°F)	-1638,4	1638,3	-32768	32767
4	4	4 + (Node# × 16)	Input 4: Temperature (°C)	-1638,4	1638,3	-32768	32767
5	5	5 + (Node# × 16)	Input 5: X-Axis RMS Velocity (in/sec)	0	6,5535	0	65535
6	6	6 + (Node# × 16)	Input 6: X-Axis RMS Velocity (mm/sec)	0	65,535	0	65535
7	7	7 + (Node# × 16)	Reserved				
8	8	8 + (Node# × 16)	Device Message				
9	9	9 + (Node# × 16)	Discrete OUT 1: Red Light ¹	0	1	0	1
10	10	10 + (Node# × 16)	Discrete OUT 2: Yellow Light ¹	0	1	0	1
11	11	11 + (Node# × 16)	Discrete OUT 3: Green Light ¹	0	1	0	1
12	12	12 + (Node# × 16)	Discrete OUT 4: Blue Light ¹	0	1	0	1
		...					
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

* These are the default data types that output from the QM30VT1 serial sensor, corresponding to inputs 1 through 6 of the Q45 Node. If necessary, configure the QM30VT1 output data types using the Sensor Configuration Software and adapter cable **BWA-USB1WIRE-001** (datasheet [170020](#)). Refer to the QM30VT1 datasheet (p/n [212568](#)) for optional output data types with their corresponding I/O ranges and holding register representations.

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.

¹ Not available when the vibration/temperature sensor is used with the P6 Node.

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 Q45VT Specifications

Typical Battery Life

See chart

Default Sensing Interval

5 minutes

Connection

One 5-pin threaded M12/Euro-style female quick disconnect

Construction

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

Indicators

Red and green LEDs (radio function)

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

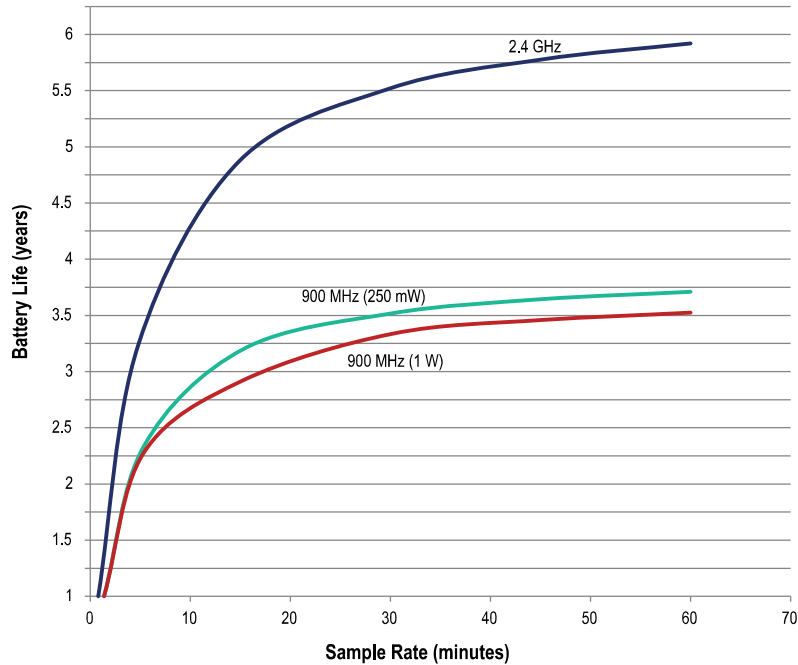
NEMA 6P, IEC IP67

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

Battery Life for a Q45VA or Q45VT/Q45U Node with 1-Wire Serial Sensor

This is the battery life curve for the following models:

- Q45VT or Q45U 1-Wire Serial Interface Node connected to a 1-wire serial sensor (such as a VT1 Vibration/Temperature sensor)
- Q45VTP Node



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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-902-C	Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	BWA-906-A
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	BWA-905-C	Antena, Yagi, 900 MHz, 10 dBd, N Hembra	BWA-9Y10-A

Mexican Importer

Banner Engineering de México, S. de R.L. de C.V.
David Alfaro Siqueiros 103 Piso 2 Valle oriente
San Pedro Garza Garcia Nuevo León, C. P. 66269
81 8363.2714