

Sure Cross® Wireless Q45 Sensor Node - Vibration/Temperature



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



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
DX80N2Q45VT	2.4 GHz 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.

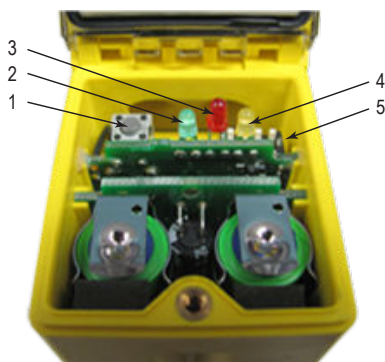
	Machine		Class I Small Machines	Class II Medium Machines	Class III Large Rigid Foundation	Class IV Large Soft Foundation
	in/s	mm/s				
Vibration Velocity Vrms	0.01	0.28				
	0.02	0.45				
	0.03	0.71		good		
	0.04	1.12				
	0.07	1.80				
	0.11	2.80		satisfactory		
	0.18	4.50				
	0.28	7.10		unsatisfactory		
	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 Green LED (flashing) indicates a good radio link with the Gateway.
- 3 Red LED (flashing) indicates a radio link error with the Gateway.
- 4 Amber LED (flashing) indicates fast sample mode.
- 5 DIP Switches

DIP Switch Settings

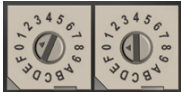
After making any changes to any DIP switch position, reboot the Wireless Q45 Sensor by triple-clicking the button, waiting a second, then double-clicking the button. You may also reboot the device by removing the battery pack, then re-installing it. As shown in the image above, the DIP switches are in 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
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 Disabled (conserves battery)	OFF			
UCT Configurable		ON	ON	OFF

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.

- 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.
- 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.



- Loosen the clamp plate on the top of the Q45 and lift the cover.
- 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.
- Label the sensor with the Q45's Node address number for future reference.
- Repeat steps 2 through 5 for as many Q45s as are needed for your network.
- 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

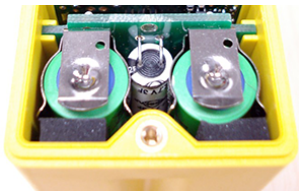
¹ Not available when the vibration/temperature sensor is used with the P6 Node.

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				

* 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.

Specifications

Performance 2.4 GHz Radio Specifications for Internal Antennas

Radio Range²

2.4 GHz, 65 mW (Internal antenna): Up to 1000 m (3280 ft) with line of sight

Antenna Minimum Separation Distance

2.4 GHz, 65 mW: 0.3 m (1 ft)

Radio Transmit Power

2.4 GHz: 65 mW

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

2.4 GHz Compliance

FCC ID UE300DX80-2400: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
IC: 7044A-DX8024

Link Timeout

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

Wireless Q45VT Specifications

Default Sensing Interval

5 minutes

Indicators

Red and green LEDs (radio function)

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.

Typical Battery Life

Up to 3 years, typical
Battery life is reduced to 1.5 years when the sample/report rate is increased to 64 seconds

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

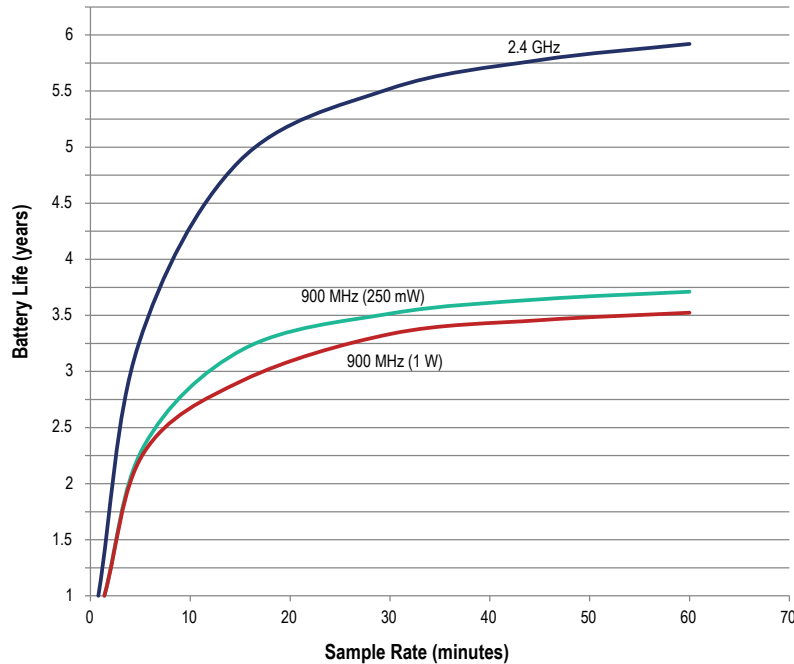
Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

² 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 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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