

Sure Cross® Wireless Q45 Sensor Node - Vibration/Temperature



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 Sure Cross Vibration and Temperature Sensor works on a variety of machines to provide vibration and temperature measurements to effectively monitor and predict when maintenance of critical equipment is required.

The Wireless Q45 Vibration and Temperature Sensor Node:

- Provides high accuracy vibration and temperature measurements
- Achieves vibration accuracy of $\pm 10\%$ RMS velocity (in/sec) and temperature accuracy of $\pm 3\text{ }^{\circ}\text{C}$
- Houses the sensor element in a robust zinc alloy case
- Includes a red/amber LED that provides local visual indication of a change in machine conditions, similar to a "check engine" light

Available Models

- DX80N2Q45VT - Must be paired with QM42VT1 Vibration and Temperature Sensor (sold separately)



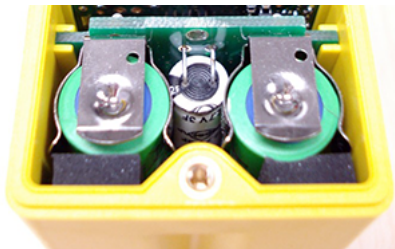
WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

Replacing 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.

Replacement battery model number: BWA-BATT-006. For pricing and availability, contact Banner Engineering.

Storage Mode for the Wireless Q45 Sensors

While in storage mode, the Wireless Q45 Sensor's radio does not operate. All Wireless Q45 Sensors ship from the factory in storage mode to conserve the battery. To wake the device, press and hold the button for five seconds. To put any Wireless Q45 Sensor into storage mode, press and hold the button for five seconds. The Wireless Q45 Sensor is in storage mode when the LEDs stop blinking.



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 (*DIP Switch Settings* on page 3) or using the UCT 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 User Configuration Tool (UCT) 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	good	good	good	good
	0.02	0.45				
	0.03	0.71				
	0.04	1.12	satisfactory	satisfactory	satisfactory	satisfactory
	0.07	1.80				
	0.11	2.80	unsatisfactory	unsatisfactory	unsatisfactory	unsatisfactory
	0.18	4.50				
	0.28	7.10	unacceptable	unacceptable	unacceptable	unacceptable
	0.44	11.2				
	0.70	18.0				
	0.71	28.0	unacceptable	unacceptable	unacceptable	unacceptable
	1.10	45.0				

Figure 1. Vibration Severity per ISO 10816

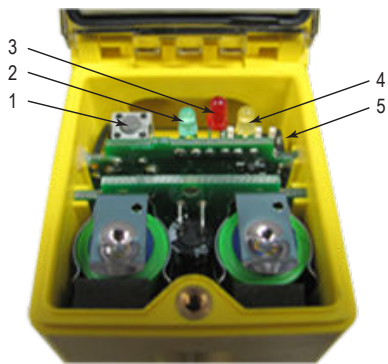
Modbus Register Table

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)	RMS Velocity (in/sec)	0	6.5535	0	65535
2	2	2 + (Node# × 16)	RMS Velocity (mm/sec)	0	65.535	0	65535

I/O #	Modbus Holding Register		I/O Type	I/O Range		Holding Register Representation	
	Gateway	Any Node		Min.	Max.	Min.	Max.
3	3	3 + (Node# × 16)	Temperature (°F)	-1638.4	1638.3	-32768	32767
4	4	4 + (Node# × 16)	Temperature (°C)	-1638.4	1638.3	-32768	32767
5	5	5 + (Node# × 16)	RMS Velocity (in/sec)	0	6.5535	0	65535
6	6	6 + (Node# × 16)	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)	0	1	0	1
10	10	10 + (Node# × 16)	Discrete OUT 2 (Amber Light)	0	1	0	1
		...					
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

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 the Q45s to the Gateway and Assign the Node Address

Before beginning the binding procedure, apply power to all the devices.

1. Enter binding mode on the Gateway.
 - For -B2Q board modules, triple-click the button.
 - For -Q and -QC models, triple-click button 2.

On the board modules, the green and red LED flashes. On the -Q and -QC Gateway models, both LEDs flash red.
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 01, set the left dial to 0 and the right dial to 1. Valid Node addresses are 01 through 47.
3. Loosen the clamp plate on the top of the Wireless Q45 Sensor and lift the cover.
4. Enter binding mode on the Wireless Q45 Sensor by triple-clicking the button. For the opposed mode sensor, the button is on the receiver.

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 and place the sticker on the Wireless Q45 Sensor.
6. Repeat steps 2 through 5 for as many Wireless Q45 Sensors as are needed for your network.
7. After binding all Wireless Q45 Sensors, exit binding mode on the Gateway.
 - For -B2Q board modules, double-click the button.
 - For -Q and -QC models, double-click button 2.

For Gateways with LCDs, after binding your Wireless Q45 Sensors 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.

Specifications

Radio Range Up to 1000 m (3280 ft) with line of sight ¹	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.7.1 (2006-05) IC: 7044A-DX8024
Minimum Separation Distance 2.4 GHz (65 mW): 0.3 m (1 ft)	Spread Spectrum Technology FHSS (Frequency Hopping Spread Spectrum)
Transmit Power 2.4 GHz: 65 mW	
Default Sensing Interval 5 minutes	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
Indicators Red and green LEDs (radio function)	Environmental Rating NEMA 6P, IEC IP67
Connection One 5-pin M12 Euro-style female connector	Operating Conditions -40 °C to 70 °C (-40 °F to 158 °F); 90% relative humidity at 50 °C (non-condensing)
Construction Molded reinforced thermoplastic polyester housing, oring-sealed transparent Lexan® cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown.	

¹ The actual radio range significantly decreases without line of sight. Always verify your wireless network's range by running a site survey.

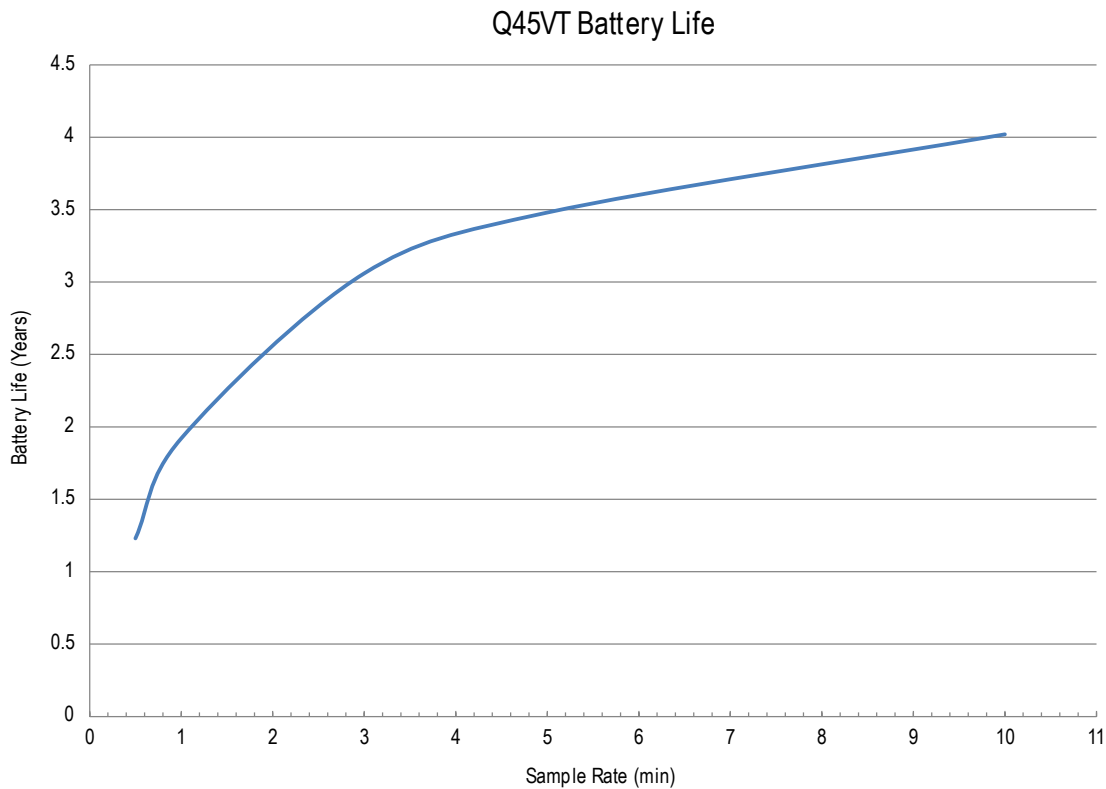


Figure 2. Battery Life of a Wireless Q45VT Node Connected to a QM42VT1 Sensor

Warnings

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