Sure Cross® Vibration and Temperature Sensor

BANNER®
more sensors, more solutions

Datasheet

The Sure Cross Vibration and Temperature Sensor works in a variety of machines to identify and predict failures in rotating machinery.

- Provides high accuracy vibration (velocity RMS) and temperature measurements
- Manufactured with a robust zinc alloy housing
- Connects via a 1-wire serial interface
- Designed to work with FlexPower 1-Wire Serial Interface Node models DX80N9X1S-P6 and DX80N2X1S-P6, MultiHop M-H6 radios, and the Wireless Q45 Sensor Node DX80N2Q45VT

⚠️ 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.

For additional information, updated documentation, and accessories, refer to Banner Engineering's website, *www.bannerengineering.com/surecross*.

Model	Power Requirements	I/O
QM42VT1	3.6 to 5.5 V dc	Vibration and temperature using a 1-wire serial interface

Configure this sensor using the Sure Cross User Configuration Tool (UCT) or by using the pre-configured settings of the Wireless Q45 Sensor Node for Vibration and Temperature (DX80N2Q45VT).

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			
	0.02	0.45				
	0.03	0.71				
	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

Sure Cross® User Configuration Tool

The User Configuration Tool (UCT) software runs on any Windows machine and uses a converter cable to connect your Gateway to the computer.
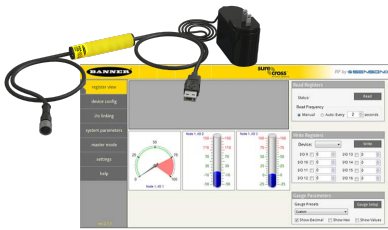
The User Configuration Tool (UCT) offers an easy way to link I/O points in your wireless network, view I/O register values graphically, and set system communication parameters when a host system is not part of the wireless network. Download the most recent revisions of the UCT software from Banner Engineering's website: *http://www.bannerengineering.com/wireless*.

The UCT requires a special USB to RS-485 (model number BWA-UCT-900 for 1 Watt radios, BWA-HW-006 can be used for all other radios) converter cable to pass information between your computer and the Gateway.

Connecting the Vibration/Temperature Sensor

To install the sensor to a device with a 5-pin M12 female connector:

1. Align the notch in the female connector with the key in the sensor's male connector.
2. Gently slide the sensor end into the connector.
3. Rotate the threaded nut to tighten the sensor down.

Vibration sensitivity
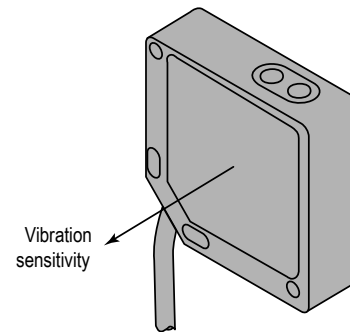
Wiring

5-pin M12 Connector (Male)	Pin	Wire Color	Sensor Connection
	1	Brown	Power IN (+), 3.6 to 5.5 V dc
	2	White	1-Wire serial device select (sinking input to sensing device)
	3	Blue	Ground (-)
	4	Black	Not used/reserved
	5	Gray	1-Wire serial communications

This sensor is designed to be plugged directly into compatible Nodes. The Node powers the sensor and periodically requests data using the 1-wire serial interface.

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)	Reserved				
6	6	6 + (Node# × 16)	Reserved				
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 (Amber Light) [1]	0	1	0	1
		…					
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

Specifications

Supply Voltage
  3.6 to 5.5 V dc
Current
  Active comms: 11.9 mA at 5.5 V dc
Communication Hardware
  Interface: 1-wire serial interface
  Baud rates: 9.6k, 19.2k (default), or 38.4k
  Data format: 8 data bits, no parity (default), 1 stop bit (even or odd parity available)

Communication Protocol
  Sure Cross DX80 Sensor Node 1-Wire Serial Interface
Communications Line
  Level Receive ON: Greater than 2 V
  Level Receive OFF: Less than 0.7 V
  Level Transmit ON: 2.7 to 3 V
  Level Transmit OFF: 0 V (pulldown resistor of 10 kOhm
Compatible Nodes
  DX80N9X1S-P6
  DX80N2X1S-P6
  DX80DR9M-H6
  DX80DR2M-H6
  DX80N2Q45VT
Certifications

C E

Vibration Sensor
  Mounted base resonance: 5.5 kHz nominal
  Measuring Range: 0–65 mm/sec or 0–6.5 in/sec RMS
  Frequency Range: 10–1000 Hz
  Accuracy: ±10% at 25 °C
Connector
  3 meter cable with 5-pin M12 fitting
Indicators
  Green flashing: Power ON
  Amber flicker: Serial Tx
Temperature Sensor
  Measuring Range: −40 °C to +105 °C (−40 °F to +221 °F)
  Resolution: 1 °C
  Accuracy: ± 3 °C
Environmental Rating
  NEMA 6P, IEC IP67
Operating Temperature
  −40 °C to +85 °C (−40 °F to +185 °F) [2]
Shock
  400G
Mounting Options
  The VT1 sensor can be mounted using a variety of methods, including 1/4"-28 hex screw, epoxy, thermal tape, or magnetic mount.

---

[1] Not available when the vibration/temperature sensor is used with the P6 Node.
[2] Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.
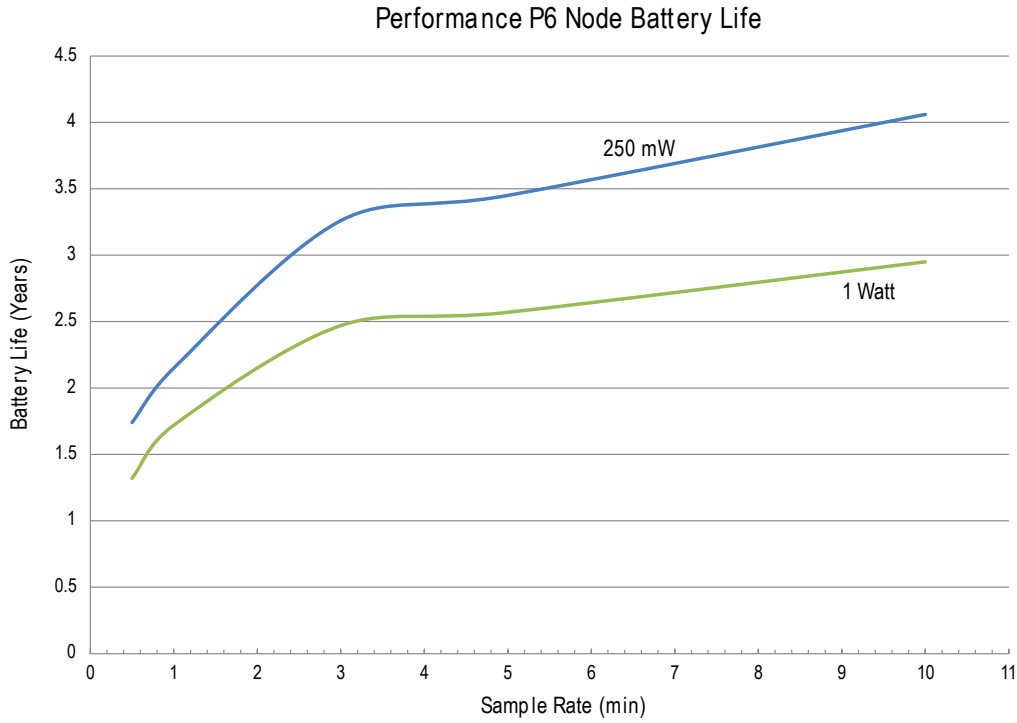
Performance P6 Node Battery Life

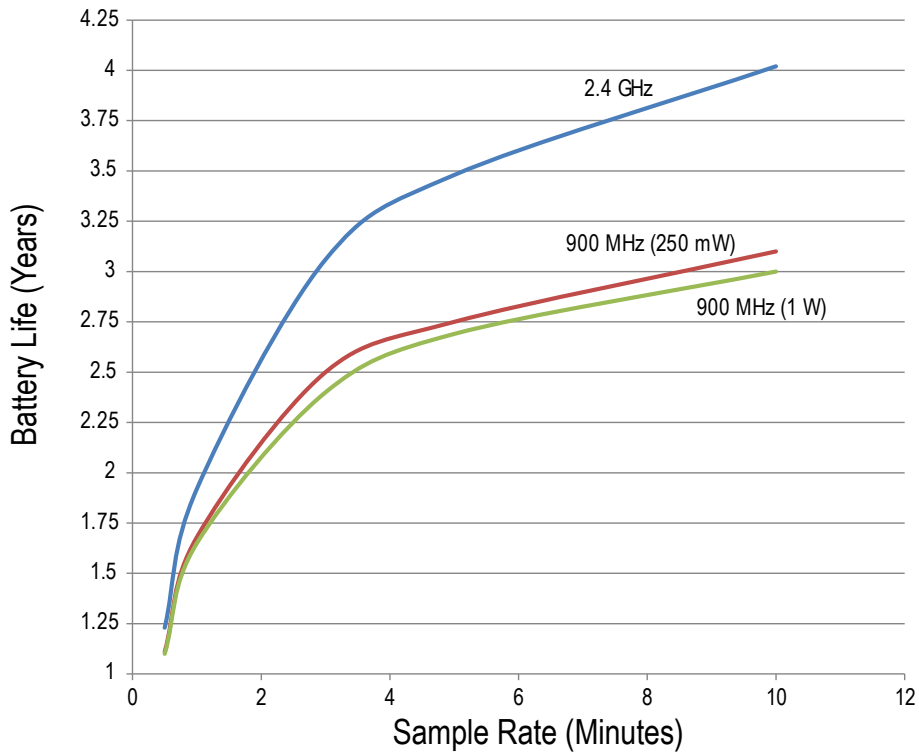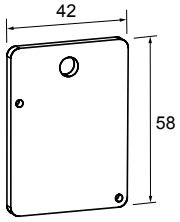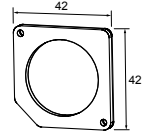*Figure 2. Battery Life of a P6 Performance Node Connected to a QM42VT1 Sensor*

Figure 3. Battery Life of a Wireless Q45VT Node Connected to a QM42VT1 Sensor

Dimensions

12.7 mm
(0.50 in)

Green LED

Amber LED

ø 3.2 mm
(0.125 in)
(4 Holes)

42.0 mm
(1.65 in)

23.9 mm (2)
(0.94 in)

27.1 mm (2)
(1.07 in)

42.0 mm
(1.65 in)

10.0 mm (0.39 in)

12.3 mm (0.48 in)

Threaded M4 x 0.7
Mounting Holes
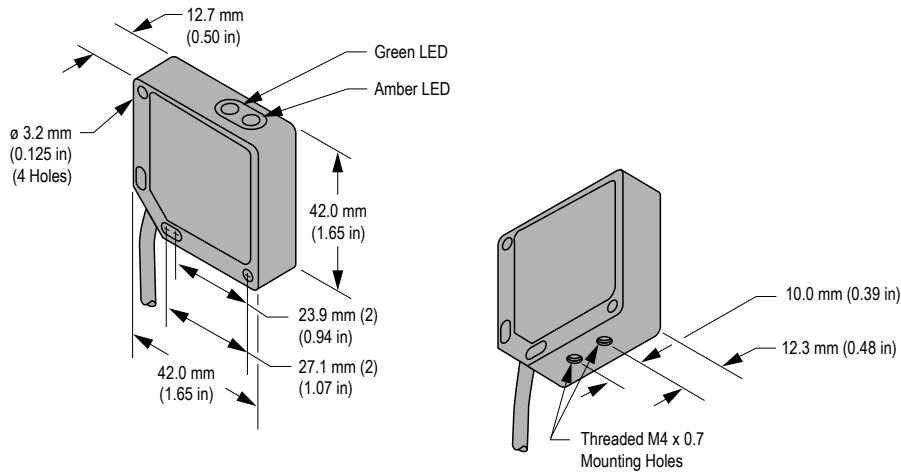
Vibration and Temperature Sensor Accessories

Included with Sensor	Available for Order
BWA-BK-002 • Includes SMB42FL stainless steel bracket, 1/4"-28 screw mount, and 1 piece of 3M™ thermally conductive adhesive transfer tape 42 58	**BWA-BK-001** • Includes magnetic mounting bracket SMB42FLM12 and 2 mounting screws 42 42
BWA-HW-057 • 3M™ Thermally Conductive Adhesive Transfer Tape 8820 • Provides a heat-transfer path between heat-generating components and heat sinks or other cooling devices • 3 pieces per pack • Tape is 20 mils (0.50 mm) thick; liner is 1.5-2 mil (37.5-50 µm) thick • Thermally conductive ceramic filler • Dual liner using silicone-treated polyester: easy-release PET liner is clear, tight side PET liner is blue	

Warnings

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.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.