Wireless MultiHop Q45 3-Axis Vibration and Temperature Node

Original Instructions
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Chapter 1 Features

The MultiHop Q45VT3 3-Axis Vibration and Temperature Node connects seamlessly with the compact QM30VT3 Modbus sensor using a cabled quick-disconnect interface. This tethered design allows the compact sensor to be deployed on machinery with small or complex surface geometry while ensuring the wireless node can be mounted within line-of-sight of the receiver.

The MultiHop Q45VA3C 3-Axis Vibration and Temperature Node has the three-axis sensor integrated into an all-in-one design for simple deployments without the need of additional components or cabling.

Both options deliver vibration and temperature data into the MultiHop modbus radio network using industrial battery-powered devices that can be deployed for a variety of machines to analyze data for identifying and predicting failures for rotating machinery.

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
- **Battery-powered** for “peel and stick” functionality with 2+ years of battery life
- **Detects three-axis** (radial, axial, and tangential) vibration characteristics, such as RMS Velocity, High-Frequency Acceleration, Peak Acceleration, Peak Velocity Component Frequency, etc.
- **High-frequency enveloping** mode identifies bearing faults with exceptional accuracy, even in challenging industrial environments
- **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**—Simplifying installation on existing equipment enables deployment in remote and hard-to-access locations where implementing a wired solution would be difficult, impractical, or not cost-effective
- **Adjustable FMax** settings optimize diagnostic capabilities
- Use the DXM Wireless Controller to track and trend vibration and temperature characteristics in real-time to predict the need for maintenance, predict potential component failure, and avoid process downtime
- DIP switches for user configuration of sample time and vibration characteristics
- Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery

Models

Model	Power	Radio Frequency	Inputs and Outputs
DX80DR2MQ45VT3-5QD NB	One D-cell lithium battery	2.4 GHz ISM Band	Pre-configured to monitor QM30VT3 vibration/temperature sensors
DX80DR9MQ45VT3-5QD NB		900 MHz ISM Band	
DX80DR2MQ45VA3C NB	One C-cell lithium battery	2.4 GHz ISM Band	Integrated 3-axis vibration and temperature sensor

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Model	Power	Radio Frequency	Inputs and Outputs
DX80DR9MQ45VA3C NB		900 MHz ISM Band	

Batteries are not included with these models. We recommend ordering D-cell battery model **BWA-BATT-011** and C-cell battery model **BWA-BATT-013**.

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Chapter 2 Configuration Instructions

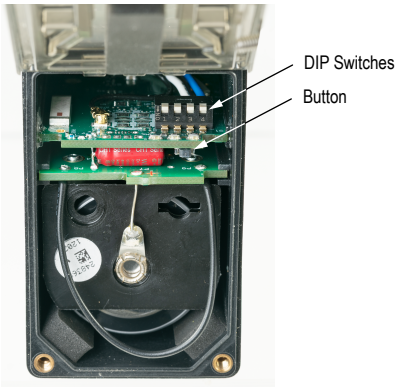
Storage Mode

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

DIP Switches

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

Button and DIP switch location



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

Device Settings	DIP Switches			
	1	2	3	4
Sample/Report Rate: User-defined (5 minutes by default)	OFF			
Sample/Report Rate: 15 minutes	ON			
Fmax setting = User-defined (1 by default); Warmup time: 2.44 s		OFF	OFF	OFF
Fmax setting = 1; Warmup time: 2.44 s		OFF	OFF	ON
Fmax setting = 2; Warmup time: 2.75 s		OFF	ON	OFF
Fmax setting = 3; Warmup time: 3.37 s		OFF	ON	ON
Fmax setting = 4; Warmup time: 4.61 s		ON	OFF	OFF

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Device Settings	DIP Switches			
	1	2	3	4
Fmax setting = 5; Warmup time: 7.09 s		ON	OFF	ON
Reserved		ON	ON	OFF
Reserved		ON	ON	ON

Warmup Time = Sample + Bootloader + Startup Initialization + Radio Frame Buffer Times

Apply Power to the Q45 D-Cell Models

Follow these instructions to install or replace the lithium D-cell batteries.

CAUTION:

- **As with all batteries, these are fire, explosion, and severe burn hazards. There is a risk of explosion if the battery is replaced incorrectly.**
- Do not burn or expose them to high temperatures. Do not recharge, crush, disassemble, or expose the contents to water.
- Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
- Properly dispose of used batteries according to local regulations by taking them to a hazardous waste collection site, an e-waste disposal center, or another facility qualified to accept lithium batteries.

1. Loosen the clamp plate with a small Phillips screwdriver and lift the cover.
2. Use the black pull wire to pull the battery board out of the Q45 housing.
3. If applicable, remove the discharged battery.
4. Install the new battery. Use Banner's **BWA-BATT-011** replacement battery or an equivalent 3.6 V D-cell lithium battery, such as Xeno's XL-205F.
5. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
6. Slide the board containing the new battery back into the Q45 housing.
7. Close the cover and gently tighten the clamp plate with the small Phillips screwdriver.

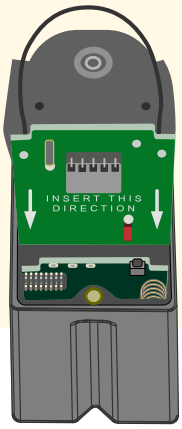
Apply Power to the Q45 C-Cell Models

Follow these instructions to install or replace the lithium C cell batteries.

CAUTION:

- **As with all batteries, these are fire, explosion, and severe burn hazards. There is a risk of explosion if the battery is replaced incorrectly.**
- Do not burn or expose them to high temperatures. Do not recharge, crush, disassemble, or expose the contents to water.
- Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
- Properly dispose of used batteries according to local regulations by taking them to a hazardous waste collection site, an e-waste disposal center, or another facility qualified to accept lithium batteries.

Q45 battery board for C-cell batteries



1. Lift the plastic cover.
2. Slide the board containing the batteries out of the Q45 housing.
3. Remove the discharged battery and replace with a new battery.
   The replacement battery model number is **BWA-BATT-013**. For pricing and availability, contact Banner Engineering.
4. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
5. Slide the board containing the new batteries back into the Q45 housing.

Bind to a DXM and Assign the Node Address

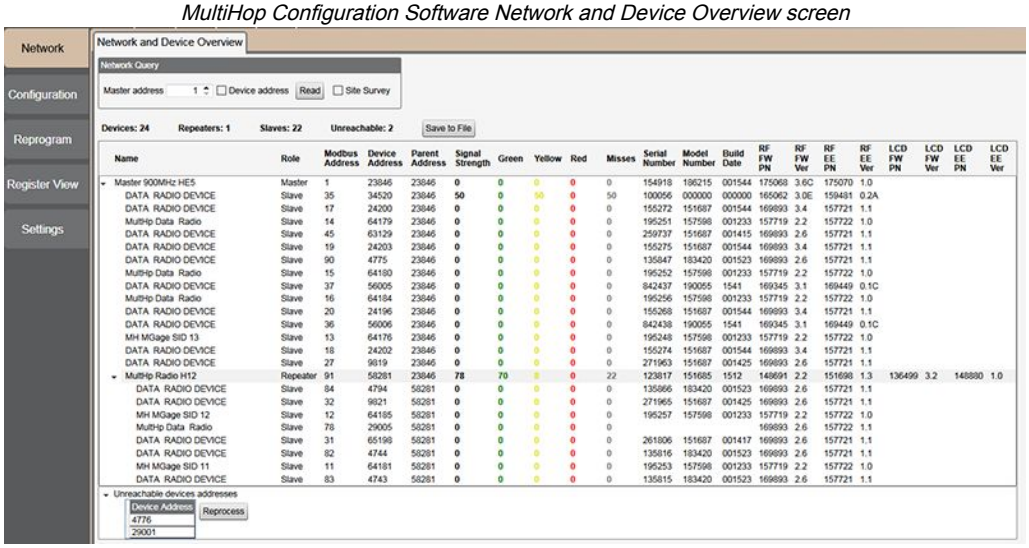
Before beginning the binding procedure, apply power to all the devices. Separate the radios by two meters when running the binding procedure. Put only one DXM into binding mode at a time to prevent the server radio from binding to the wrong client radio.

1. On the DXM: Use the arrow keys to 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 ID to bind to the client radio.
   For MultiHop server radios, use Node IDs (11-60) to assign to the server radio. Modbus Server IDs 01 through 10 are reserved for server devices directly connected to the host (local I/O). Polling messages addressed to these devices are not relayed over the wireless link. Modbus Server IDs 11 through 60 are used for MultiHop client, repeater, and server radios. Up to 50 devices (local servers and remote servers) may be used in this system.
4. On the Q45: Loosen the top clamp plate and lift the cover.
5. Enter binding mode by triple-clicking the binding button.
   The red and green LEDs flash alternately and the sensor searches for a client radio in binding mode. After the Node binds, the LEDs stay solid momentarily, then they flash together four times. The Node exits binding mode.
6. Label the sensor with the Node address number for future reference.
7. On the DXM: Click **BACK** to exit binding for that specific Node address.
8. Repeat steps 3 through 7 and change the Node address for as many Q45s as are needed for your network.
9. On the DXM: After you have finished forming your network, click **BACK** until you reach the main menu.

MultiHop Configuration Software

Use Banner's MultiHop Configuration Software to view your MultiHop radio network and configure the radio and its I/O.

MultiHop Configuration Software Network and Device Overview screen



The software connects to a MultiHop client radio using one of four methods.

- Serial; using a USB to RS-485 (for RS-485 radios) or a USB to RS-232 (for RS-232 radios) converter cable.
- Modbus TCP; using an Ethernet connection to an Ethernet radio client.
- Serial DXM; using a USB cable to a DXM Controller to access a MultiHop client radio.
- TCP DXM: using an Ethernet connection to a DXM Controller to access a MultiHop client radio.

Banner recommends using **BWA-UCT-900**, an RS-485 to USB adapter cable with a wall plug that can power your radio while you configure it. The adapter cable is not required when connecting to a DXM Controller.

Download the most recent software revision from the Wireless Reference Library on Banner Engineering's website: www.bannerengineering.com.

Client Radio LED Behavior

All bound radios set to operate as client radios follow this LED behavior after powering up.

Process Steps	Response	LED 1	LED 2
1	Apply power to the client radio	-	Solid amber
2	The client radio enters RUN mode.	Flashes green	-
	Data packets begin transmitting between the client and its children radios.	-	Flashes amber
	In binding mode	Flashes red	Flashes red

Server Radio LED Behavior

All bound radios set to server or repeater modes follow this LED behavior after powering up.

Process Steps	Response	LED 1	LED 2
1	Apply power to the radio	-	Solid amber (briefly)
2	The server/repeater searches for a parent device.	Flashes red	-
3	A parent device is detected. The client/repeater searches for other parent radios within range.	Solid red	-

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Process Steps	Response	LED 1	LED 2
4	The server/repeater selects a suitable parent.	-	Solid amber
5	The server/repeater attempts to synchronize to the selected parent.	-	Solid red
6	The server/repeater is synchronized to the parent.	Flashes green	-
7	The server/repeater enters RUN mode.	Solid green, then flashes green	
	Data packets begin transmitting between the server/repeater and its parent radio.	-	Flashes amber
	In binding mode	Flashes red	Flashes red

High-Performance Third Axis

Banner's 3-axis vibration and temperature monitoring solutions use a digital MEMS sensor for collecting vibration data. The ultra-low noise density on all three axes ensures accurate data no matter the sensor orientation to prevent maintenance decisions from being made because of the bad trending of false data. Most 3-axis MEMS sensors only offer a low noise profile on two axes with the third axis (typically the Z or Vertical Radial Axis) having two to three times the noise density, causing that third axis to have inaccurate data. This inaccurate data leads to maintenance decisions made without a true fault present.

Adjustable FMax Settings (VT3)

The vibration/temperature sensor has optional settings to increase the frequency resolution of the measurement through the adjustable FMax settings.

Adjusting the FMax setting allows users to control the trade-off between frequency resolution, bandwidth, and measurement duration. Lower FMax settings provide finer frequency resolution but reduce the total bandwidth and increase the measurement time, whereas higher FMax settings broaden the frequency range but may sacrifice resolution. FMax is critical in vibration analysis because it determines the sensor's capability to detect and characterize different vibration frequencies, which is essential for diagnosing machinery health, identifying faults, and optimizing maintenance strategies. These options are changed in register 42058.

FMax Options include:

- 1 = 5300 Hz (3.29 Hz resolution, 300 ms sample duration)
- 2 = 2650 Hz (1.65 Hz resolution, 610 ms sample duration)
- 3 = 1300 Hz (0.82 Hz resolution, 1.215 seconds sample duration)
- 4 = 650 Hz (0.41 Hz resolution, 2.43 seconds sample duration)
- 5 = 325 Hz (0.21 Hz resolution, 4.86 seconds sample duration)

Configuring High-Frequency Enveloping (HFE) or Demodulation Mode

High-frequency enveloping (HFE), or demodulation, is a separate measurement type and signal processing technique that is very sensitive to high-frequency impacts and friction.

HFE can be useful for diagnosing bearing defects, lubrication issues, cavitation, and gear faults. These types of faults produce very low energy impacts/forces that can make them difficult to detect in their early stages with standard vibration measurements because they can be drowned out by the machine's fundamental forces. HFE mode trends the values to detect early faults so maintenance can occur before a downtime event occurs. When paired with a lower FMax setting, the sample frequency still remains at maximum but the sensor takes a much longer sample. This data is used to trend early defects on slow-speed assets that would normally require a special ultrasound accelerometer. When using HFE mode, set Fmax to 3 or 4 for the longer 2.4-second or 4.8-second sample times. To enable HFE mode, set register 42059 value to 0 for OFF or 1 for ON.

Modbus Registers

Vibration Characteristics

Modbus Address	Description	IO Range Min	IO Range Max	Holding Register Min	Holding Register Max	Default Value	Scale (exp)
40111	X-Axis RMS Velocity (in/sec) (6-1000Hz)	0	6.5535	0	65535		-4
40112	X-Axis High-Frequency RMS Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40113	Y-Axis RMS Velocity (in/sec)(6-1000Hz)	0	6.5535	0	65535		-4
40114	Y-Axis High-Frequency RMS Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40115	Z-Axis RMS Velocity (in/sec) (6-1000Hz)	0	6.5535	0	65535		-4
40116	Z-Axis High-Frequency RMS Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40117	Temperature (°F)	-327.68	327.67	-32768	32767		-2
40118	X-Axis Full Band Pk to Pk Acceleration (G) (6-5300 Hz)	0	65.535	0	65535		-3
40119	Y-Axis Full Band Pk to Pk Acceleration (G) (6-5300 Hz)	0	65.535	0	65535		-3
40120	Z-Axis Full Band Pk to Pk Acceleration (G) (6-5300 Hz)	0	65.535	0	65535		-3
40121	X-Axis High-Frequency Pk Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40122	Y-Axis High-Frequency Pk Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40123	Z-Axis High-Frequency Pk Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40124	X-Axis High-Frequency Crest Factor (1000-5300 Hz)	0	65.535	0	65535		-3
40125	Y-Axis High-Frequency Crest Factor (1000-5300 Hz)	0	65.535	0	65535		-3
40126	Z-Axis High-Frequency Crest Factor (1000-5300 Hz)	0	65.535	0	65535		-3
40127	X-Axis High-Frequency Kurtosis (1000-5300 Hz)	0	65.535	0	65535		-3
40128	Y-Axis High-Frequency Kurtosis (1000-5300 Hz)	0	65.535	0	65535		-3
40129	Z-Axis High-Frequency Kurtosis (1000-5300 Hz)	0	65.535	0	65535		-3
40130	X-Axis Full Band Crest Factor (6-5300 Hz)	0	65.535	0	65535		-3
40131	Y-Axis Full Band Crest Factor (6-5300 Hz)	0	65.535	0	65535		-3
40132	Z-Axis Full Band Crest Factor (6-5300 Hz)	0	65.535	0	65535		-3
40133	X-Axis Full Band Kurtosis (6-5300 Hz)	0	65.535	0	65535		-3
40134	Y-Axis Full Band Kurtosis (6-5300 Hz)	0	65.535	0	65535		-3
40135	Z-Axis Full Band Kurtosis (6-5300 Hz)	0	65.535	0	65535		-3
40136	X-Axis Peak Velocity Component Frequency (Hz) (6-1000 Hz)	0	6553.5	0	65535		-1
40137	Y-Axis Peak Velocity Component Frequency (Hz) (6-1000 Hz)	0	6553.5	0	65535		-1
40138	Z-Axis Peak Velocity Component Frequency (Hz) (6-1000 Hz)	0	6553.5	0	65535		-1
40139	Motor Run Flag	0	1	0	1		
40140	X-Axis Full Band Peak Acceleration Frequency (Hz) (6-5300 Hz)	0	6553.5	0	65535		-1
40141	Y-Axis Full Band Peak Acceleration Frequency (Hz) (6-5300 Hz)	0	6553.5	0	65535		-1
40142	Z-Axis Full Band Peak Acceleration Frequency (Hz) (6-5300 Hz)	0	6553.5	0	65535		-1

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Modbus Address	Description	IO Range Min	IO Range Max	Holding Register Min	Holding Register Max	Default Value	Scale (exp)
40143	Magnitude (XYZ) High-Frequency RMS Acceleration* (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40144	X-Axis Full Band RMS Acceleration (G) (6-5300 Hz)	0	65.535	0	65535		-3
40145	Y-Axis Full Band RMS Acceleration (G) (6-5300 Hz)	0	65.535	0	65535		-3
40146	Z-Axis Full Band RMS Acceleration (G)(6-5300 Hz)	0	65.535	0	65535		-3
40147	X-Axis RMS Velocity (mm/sec)(6-1000 Hz)	0	65.535	0	65535		-3
40148	X-Axis High-Frequency RMS Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40149	Y-Axis RMS Velocity (mm/sec) (6-1000 Hz)	0	65.535	0	65535		-3
40150	Y-Axis High-Frequency RMS Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40151	Z-Axis RMS Velocity (mm/sec) (6-1000 Hz)	0	65.535	0	65535		-3
40152	Z-Axis High-Frequency RMS Acceleration (G) (1000-5300 Hz)	0	65.535	0	65535		-3
40153	Temperature (°C)	-327.68	327.67	-32768	32767		-2

FMax Settings

Modbus Address	Description	IO Range Min	IO Range Max	Holding Register Min	Holding Register Max	Default Value	Scale (exp)
40157	FMax Setting (1 = 5300 Hz, 2 = 2650 Hz, 3 = 1300 Hz, 4 = 650 Hz, 5 = 325 Hz)	0	5	0	5	1	

Scalar Data Glossary

The following list defines many of the available parameters on the Banner QM30VT3 Vibration and Temperature Sensor.

Velocity

Measures a moving or vibrating mass's speed.

Velocity is used in the lower frequency part of the vibration measurement to indicate many types of vibration faults, such as unbalance, misalignment, soft foot, looseness, eccentricity, etc. Trending velocity over time with continuous monitoring can indicate these faults early.

High-Frequency Acceleration

Useful metric for early high-frequency fault detection when trended for bearing faults, cavitation, gear mesh, rotor rubs, lubrication issues, etc.

Crest Factor

Peak Acceleration / RMS Acceleration. This unitless ratio defines how a signal peaks and is used to predict an impact. Increasing crest factor tends to be an early indicator of bearing faults.

Kurtosis

Unitless statistical measure of the tailedness of a normal distribution of the data.

Kurtosis represents the probability or frequency of values that are extremely high or low compared to the mean. Values around three (3) indicate moderate outlier frequency (normal distribution); less than three (3) indicates lower outlier frequency, and above three (3) indicates higher outlier frequency.

Peak Velocity/Acceleration Frequency Component

Provides the frequency where the highest peak of either velocity or acceleration occurred within the specified bandwidth. Can be useful for detecting motor fundamental frequencies or fault frequencies as they appear.

Asset Run Flag

Uses the measured acceleration data to determine if the asset is running or is offline.

Magnitude

$\sqrt{(X^2 + Y^2 + Z^2)}$; Provides the magnitude of all three vectors and is specifically used for high-frequency acceleration measurement where the direction is less important and the trend of the overall value of the data can be used in a single point.

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Chapter 3 Installation Instructions

Installing the QM30VT3 Sensor

The vibration sensors have an X, Y, and Z axis indicated on the face of the sensor. Typically, in vibration analysis, the three axes are referred to as Axial (in line with the shaft of the asset), Horizontal Radial (parallel to the ground), Vertical Radial (perpendicular to the ground).

Not every application is identical so not every orientation will be the same. It is important to document the direction in which each axis is installed for labeling and diagnostic purposes.

An example install is to mount the sensor at the top center of a horizontally mounted motor with the X axis (parallel with the sensor cable) in line with the motor shaft or to mount the sensor with the Y axis (perpendicular to the sensor cable) perpendicular to the shaft in the horizontal radial axis and the Z axis (through plane of the sensor) going into or through the motor in the vertical radial axis.

For the best results, install the sensor as close to the motor bearing as possible. If this is not possible, install the sensor on a surface that is in rigid connection with the vibration characteristics of the motor.

Using a cover shroud or other flexible mounting location may result in a reduced accuracy or reduced ability to detect certain vibration characteristics. After determining the sensor direction and location, mount the sensor for the best possible vibration sensing accuracy.

Mounting Options	QM30 Housing Type	Description
BWA-QM30-FTAL (included with the aluminum housing model)	Aluminum	When available, directly mounting the bracket to the motor using an 1/4-28 × 1/2-inch screw provides a rigid surface with the highest sensor accuracy and frequency response. This mounting option offers flexibility for future sensor and bracket movement.
BWA-QM30-FTSS (included with the stainless steel housing model)	Stainless steel	Another mounting option is to use an epoxy to adhere the bracket to the motor. Banner recommends using an epoxy designed for accelerometer mounting, such as Loctite Depend 330 and 7388 activator. Epoxying a bracket to a motor provides a permanent installation of the bracket to which the sensor can be attached. This more rigid mounting solution ensures some of the best sensor accuracy and frequency response, but is not flexible for future adjustments. A third option is to use the included thermally conductive adhesive tape. This often provides a more than sufficient mounting type but does introduce some additional flex that reduces accuracy.
BWA-QM30-CEAL (curved bracket epoxied to the motor)	Aluminum	This lightweight aluminum bracket provides a close connection to the motor with ridges to sit on curved surfaces and ensure a tight fit. The bracket is epoxied to the motor and the sensor is screwed into the bracket.
BWA-QM30-FMSS (flat magnet bracket)	Aluminum and stainless steel	Gives a solid, strong, and adjustable mount to a motor, but with a motor's curved surface it may not provide the best connection if the motor is too small for the magnet to get a full connection with the motor housing. Magnet mounts are susceptible to accident rotation or a change in the sensor location if an outside force bumps or moves the sensor. This can lead to a change in sensor information that differs from the time-trended data from the previous location. The bracket is stainless steel and the magnet insert is neodymium.
BWA-QM30-CMAL (curved surface magnet bracket)	Aluminum and stainless steel	Gives a solid, strong, and adjustable mount to a motor, intended for use when the flat magnetic bracket does not make a good connection with the motor's surface. Magnet mounts are susceptible to accidental rotation or change in the sensor location if an outside force bumps or moves the sensor. This can lead to a change in the sensor information that differs from the time-trended data from the previous location. The bracket is aluminum and the magnet insert is samarium-cobalt.

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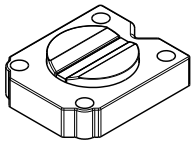
Mounting Options	QM30 Housing Type	Description
BWA-QM30-FSALR (robust quick-release bracket)	Aluminum	This larger aluminum bracket mounts to the motor with a 1/4-28 × 1/2-inch screw to provide a rigid connection to the motor. On the right or left side, a setscrew is hand-tightened to secure the sensor to the bracket, allowing for rapid release and installation of a sensor compared to other mounting options.
BWA-QM30-FSSSR (robust quick-release bracket)	Stainless steel	This larger stainless steel bracket mounts to the motor with a 1/4-28 × 1/2-inch screw to provide a rigid connection to the motor. A set-screw is hand-tightened to secure the sensor to the bracket, allowing for rapid release and installation of a sensor compared to other mounting options.

Installing the Q45 3-Axis Vibration and Temperature Node

These brackets may also be used for mounting the Wireless MultiHop Q45 3-Axis Vibration and Temperature Node.

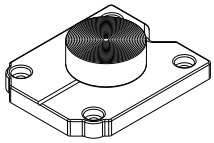
BWA-Q45VAC-CMSS

- Includes a magnetic mounting bracket and four mounting screws
- For use on flat or curved surfaces
- SmCo magnet with a 40 lb pull strength
- 44.5 mm × 54 mm; 15.6 mm thick



BWA-Q45VAC-FESS

- Includes a base plate, two screw retainers, four mounting screws, a set screw, and a mounting disc
- Mounts the device to a surface using two-part epoxy
- Alignment mark indicates the front of device
- 44.5 mm × 54 mm



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Chapter 4 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 five-minute sample intervals. Activate fast sample mode by single-clicking the button (the amber LED is solid).

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Chapter 5 Specifications

Radio Transmit Power (900 MHz, 500 mW radios)

Conducted: 27 dBm (500 mW)

EIRP with the supplied antenna: < 36 dBm

Radio Transmit Power (2.4 GHz radios)

Conducted: < 18 dBm (65 mW)

EIRP with the supplied antenna: < 20 dBm (100 mW)

Antenna Minimum Separation Distance

900 MHz radios transmitting at ≤ 250 mW: 2 m (6 ft) with the supplied antenna

900 MHz radios transmitting at ≥ 500 mW: 4.57 m (15 ft) with the supplied antenna

2.4 GHz radios transmitting at 65 mW: 0.3 m (1 ft) with the supplied antenna

Radio Range

A 2 dB antenna ships with this device.

Transmit power and range are subject to many factors, including antenna gain, installation methods, characteristics of the application, and environmental conditions.

Please refer to the following documents for installation instructions and high-gain antenna options.

Installing Your Sure Cross® Radios (151514)
Conducting a Site Survey (133602)
Sure Cross® Antenna Basics (132113)

900 MHz Compliance (SX7023EXT Radio Module)

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX7023EXT

Contains IC: 7044A-SX7023EXT

2.4 GHz Compliance (SX243 Radio Module)

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX243

Radio Equipment Directive (RED) 2014/53/EU

Contains IC: 7044A-SX243

Default Sensing Interval

5 minutes

Indicators

Red and green LEDs (radio function)

Construction

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

Shock

30G

Environmental Rating

NEMA 6P, IP67

Typical Battery Life

See chart

Vibration Sensor

Sensor Type: Ultralow noise Digital MEMS

Measuring Range: ±16g, 0 to 65.5 mm/sec or 0 to 6.5 in/sec RMS

Frequency Range: 6 Hz to 5.3 kHz

Accuracy: ±10% at 25 °C

Sampling Frequency: 26.80 kHz (default)

Time Waveform Record Length: 4096 points

FFT Lines of Resolution: 1600

FMax Settings (sample duration): 5300 Hz (default 300 ms), 2650 Hz (610 ms), 1300 Hz (1.215 s), 650 Hz (2.43 s), or 325 Hz (4.865 s)

Temperature Sensor

Measuring Range: –40 °C to +105 °C (–40 °F to +221 °F)

Operating Conditions

Ambient temperature: –40 °C to +70 °C (–40 °F to +158 °F)

Contact temperature: –40 °C to +105 °C (–40 °F to +221 °F)

90% at +50 °C maximum relative humidity (non-condensing)

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

FCC Part 15 Class A for Intentional Radiators

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Industry Canada Statement for Intentional Radiators

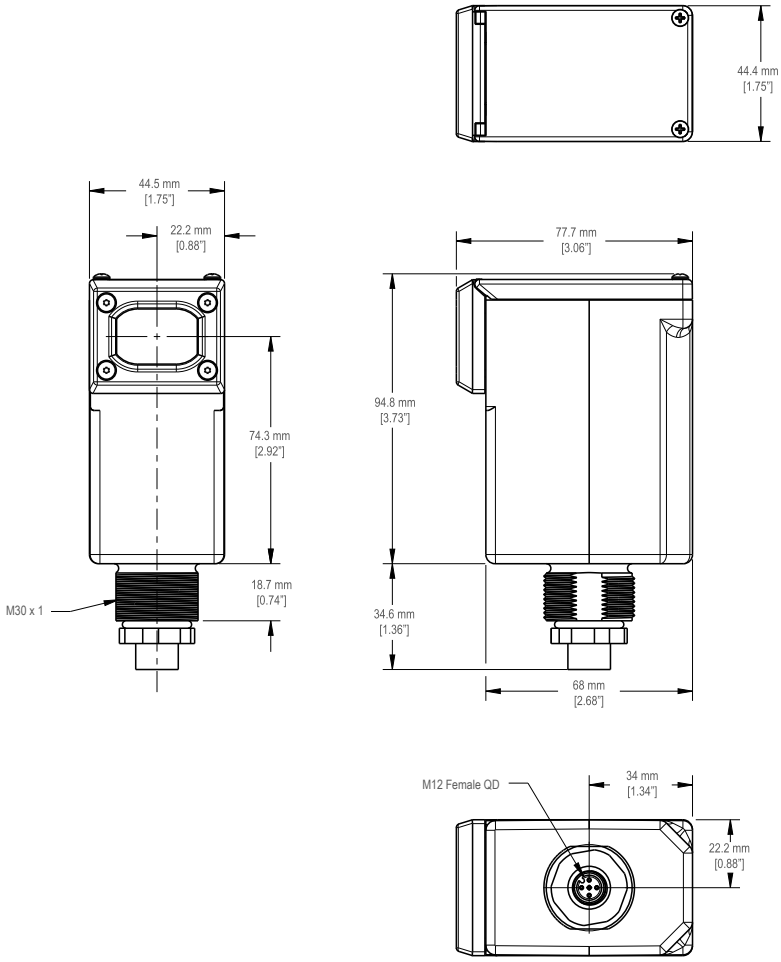
This device contains licence-exempt transmitters(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs/récepteurs exemptés de licence conformes à la norme Innovation, Sciences, et Développement économique Canada. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage.
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

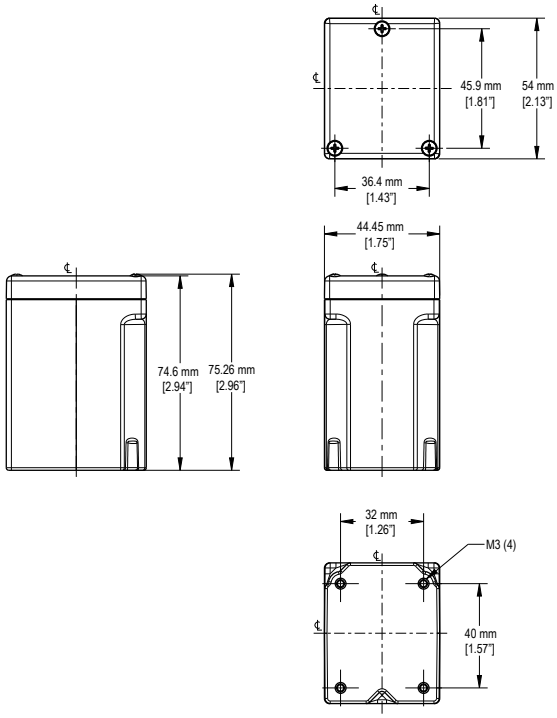
Q45VT3 Dimensions



Q45VA3C Dimensions

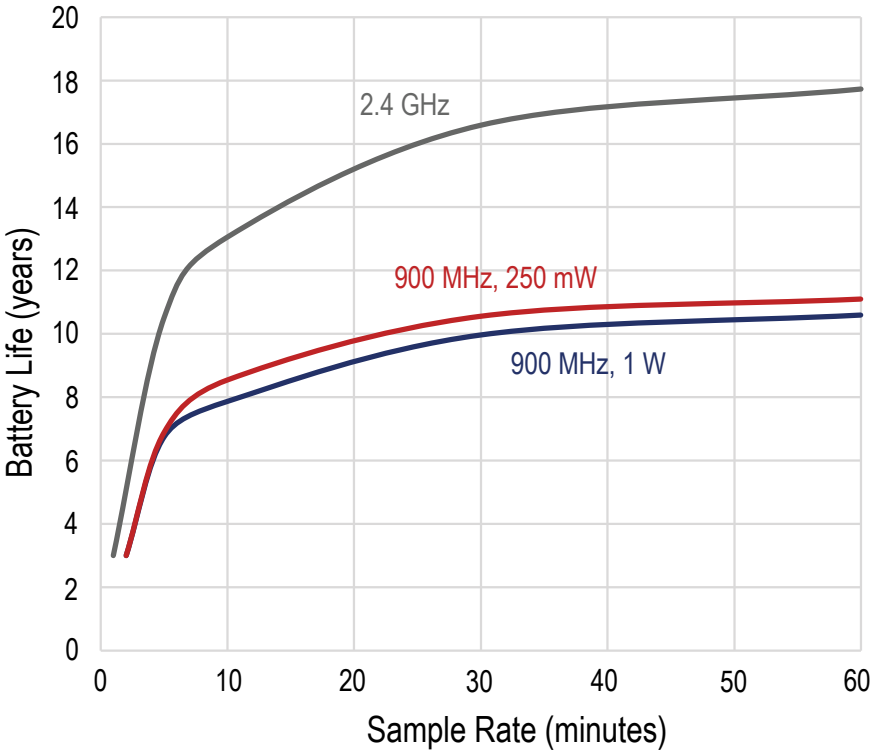
All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.

Q45VAC Dimensions

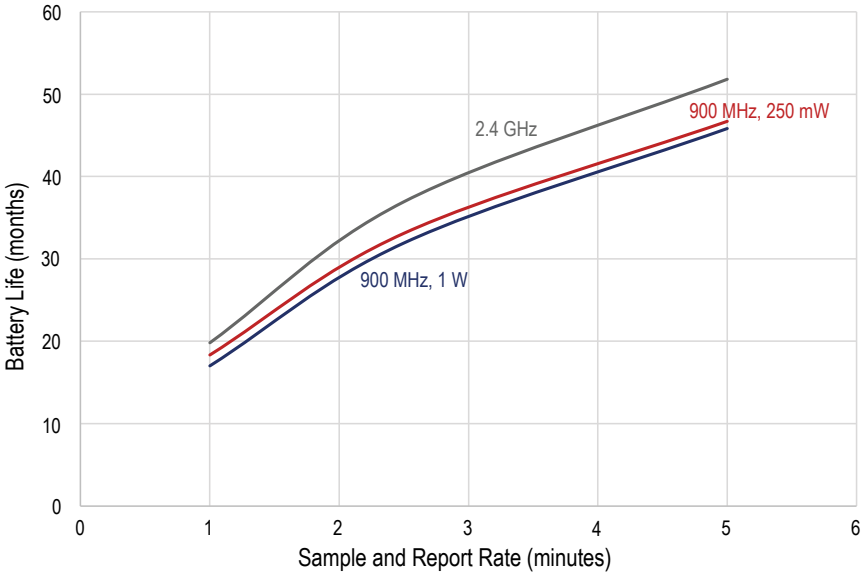


Battery Life for the Q45VT3 and Q45VA3C Models

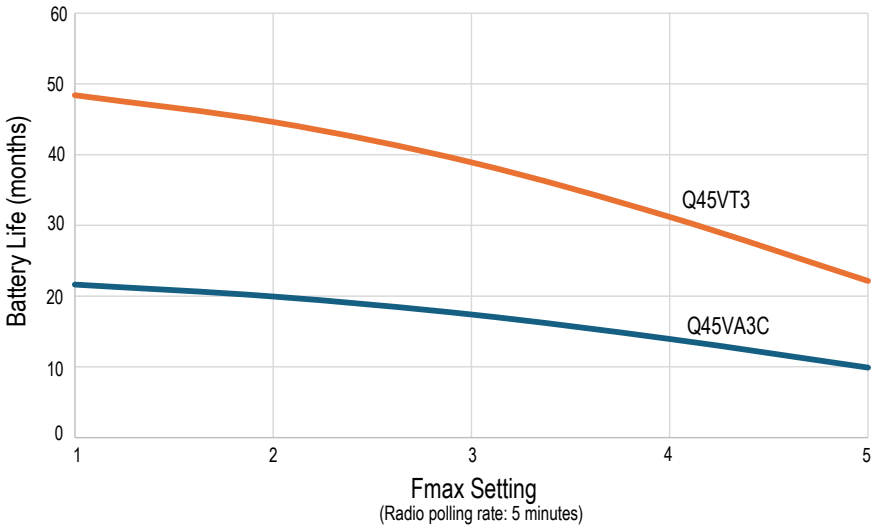
Battery life for the Q45VT3 models



Battery Life for the Q45VA3C models



Battery Life for FMax Settings



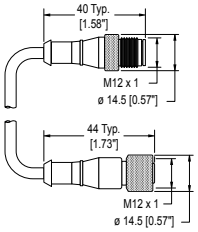
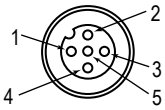
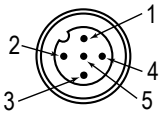
Chapter Contents

Chapter 6 Accessories

QM30VT3-SS-MQP
- Vibration and temperature sensor, RS-485 Modbus interface
- Three-axis vibration detection
- 316L stainless steel housing
- 150 mm (6 in) cable with 5-pin M12 male quick disconnect
- Datasheet: 244688

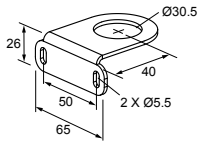
QM30VT3-MQP
- Vibration and temperature sensor, RS-485 Modbus interface
- Three-axis vibration detection
- Aluminum housing
- 150 mm (6 in) cable with 5-pin M12 male quick disconnect
- Datasheet: 244688

5-pin A-Code Double-Ended M12 Female to M12 Male Cordsets (datasheet p/n 236183)

Model	Length	Dimensions (mm)	Pinouts	
BC-M12F5-M12M5-22-1	1 m (3.28 ft)		Female  Male 	1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
BC-M12F5-M12M5-22-2	2 m (6.56 ft)			
BC-M12F5-M12M5-22-5	5 m (16.4 ft)			
BC-M12F5-M12M5-22-8	8 m (26.25 ft)			
BC-M12F5-M12M5-22-10	10 m (30.81 ft)			
BC-M12F5-M12M5-22-15	15 m (49.2 ft)			

Brackets

LMB30LP
- Low profile
- 30 mm mounting hole
- 300 series stainless steel



Replacement Batteries

BWA-BATT-011
- 3.6 V Lithium D cell for non-hazardous locations only
- 19000 mAH
- One battery

Chapter Contents

Chapter 7 Warnings (Internal Antenna Models)

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.** Consult with Banner Engineering Corp. if the destination country is not on this list.

IMPORTANT: Please download the complete Wireless MultiHop Q45 3-Axis Vibration and Temperature 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 MultiHop Q45 3-Axis Vibration and Temperature 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 MultiHop Q45 3-Axis Vibration and Temperature 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.

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.

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.

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."

Mexican Importer

Banner Engineering de Mèxico, S. de R.L. de C.V. | David Alfaro Siqueiros 103 Piso 2 Valle oriente | San Pedro Garza Garcia Nuevo Leòn, C. P. 66269

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