

Datasheet

The Sure Cross® wireless system is a radio frequency network with integrated I/O that operates in most environments to eliminate the need for wiring runs. The Wireless Q45CT Current Transformer Node combines a pre-wired M12 connector for use with any Banner 1-wire serial VT1 vibration sensor (sold separately) and a pre-wired one-meter twisted pair cable for use with a supplied current transformer with the reliable, field-proven Sure Cross wireless architecture into one, easy-to-deploy package.

This proven wireless solution makes condition monitoring simple by measuring vibration and current with a single device. All configuration is done using the internal DIP switches or customized with Banner's DX80 User Configuration Software.



Benefits

- Deliver factory automation and IIoT solutions for a range of applications requiring vibration and current monitoring including:
 - Motor brushes
 - Motor windings
 - Motor load
 - Compressor failure
 - Energy use
 - Remote lighting use
 - On/off state
 - **Eliminate control wires**—The Sure Cross wireless system is a radio frequency network with integrated I/O and internal battery 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
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- The current transformer input takes a high voltage current input and produces a proportional low voltage, low current signal for measuring and monitoring.
 - 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
 - Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery
 - 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 radio signal

Models

Model	Frequency	Inputs and Outputs
DX80N9Q45CT	900 MHz ISM Band	Pre-wired Euro Connector for use with any 1-wire serial vibration sensor (sold separately).
DX80N9Q45CT NB		Pre-wired one meter twisted pair cable reports true RMS Current (20 A and 150 A current transformers included with Node; model and frequency are DIP switch selectable)

If you order the **NB** (without battery) model, Banner Engineering recommends battery **BWA-BATT-006** (see [Accessories](#) on p. 5).

Operating 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.

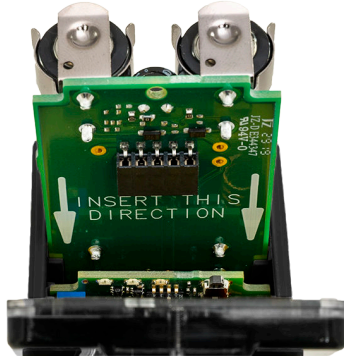
Apply Power to the Q45

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

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.



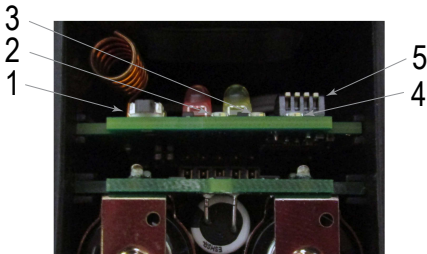
Figure 1. Q45 battery board



1. Loosen the clamp plate with a small Phillips screwdriver and lift the cover.
2. Slide the battery board out of the Q45 housing.
3. If applicable, remove the discharged batteries.
4. Install the new batteries. Use Banner's **BWA-BATT-006** replacement batteries or an equivalent 3.6 V AA lithium batteries, such as Xeno's XL-60F.
5. 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.
6. Slide the board containing the new batteries back into the Q45 housing.
7. Close the cover and gently tighten the clamp plate with the small Phillips screwdriver.

Configuration Instructions

Button and LEDs



- 1 Binding 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 is not used.
- 5 DIP switches

DIP Switches

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

The DIP switches are in the OFF position, by default. To turn a DIP switch on, push the switch toward the battery pack.

Table 1: DIP switches for the Q45CT

Description	DIP Switches							
	1	2	3	4	5	6	7	8
900 MHz transmit power level: 1 Watt (30 dBm)	OFF*							
900 MHz transmit power level: 250 mW (24 dBm), DX80 compatibility mode	ON							
Mains frequency (for CT) 60 Hz		OFF*						
Mains frequency (for CT) 50 Hz		ON						
AC current transformer is 20 A model			OFF*					
AC current transformer is 150 A model			ON					
Reserved				OFF*				
Reserved					OFF*			
Sample/report rate modbus or software configured						OFF*	OFF*	OFF*
Sample/report rate of 15 minutes						OFF	OFF	ON
Sample/report rate of 5 minutes						OFF	ON	OFF
Sample/report rate of 64 seconds						OFF	ON	ON
Sample/report rate of 32 seconds**						ON	OFF	OFF
Sample/report rate of 16 seconds**						ON	OFF	ON
Sample/report rate of 4 seconds**						ON	ON	OFF

Description	DIP Switches							
	1	2	3	4	5	6	7	8
Modbus or software configured (overrides DIP switches)						ON	ON	ON

Refer to the [Configuring for Sample on Demand](#) technical note for details on sampling on demand and using a host system.

Transmit Power Levels

The 900 MHz radios transmit at 1 Watt (30 dBm) or 250 mW (24 dBm). The 250 mW mode reduces the radio's range but improves the battery life in short range applications. For 2.4 GHz models, this DIP switch is disabled. The transmit power for 2.4 GHz is fixed at about 65 mW EIRP (18 dBm).

Sample and Report Rates

The sample interval, or rate, defines how often the Sure Cross device samples the input. For battery-powered applications, setting a slower rate extends the battery life.

The report rate defines how often the Node communicates the I/O status to the Gateway. For *FlexPower*® applications, setting the report rate to a slower rate extends the battery life.

What is Sampling on Demand?

Sample on demand allows a host system to send a Modbus command to any register and require the inputs to immediately sample the sensor and report readings back to the host system. Sampling on demand can be used between the normal periodic reporting.

To use the Sample on Demand feature requires using a host-controlled system capable of sending Modbus commands to the master radio.

Sample an Input Using a Host System

To sample the input, have the Host System write to the Node's register 15. To calculate which register this is for your Node, use this equation: 15 + (Node # × 16).

- From the host system, write 0x13xx to the Node's register 15, where xx defines the input you want to sample.

For Input	Write Value (in hex)	Write Value (in decimal)
1	0x1301	4865
2	0x1302	4866
3	0x1304	4868
4	0x1308	4872
5	0x1310	4880
6	0x1320	4896
All Inputs	0x133F	4927

- To send the Sample on Demand command to more than one input, add together the binary representation values. For example, to demand a sampling of inputs 1, 2, and 3, the Hex command is 0x1307.

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.

- On the Gateway: Enter binding mode.
 - For housed DX80 Gateways, triple-click button 2 on the Gateway. Both LEDs flash red.
 - For Gateway board modules, triple-click the button. The green and red LED flashes.
- Assign the Q45CT 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 Q45CT to Node 10, set the Gateway's left dial to 1 and the right dial to 0. Valid Node addresses are 01 through 47.



- On the Q45: Loosen the clamp plate on the top of the Q45CT and lift the cover.
- Enter binding mode on the Q45CT by triple-clicking the Q45CT's button. The red and green LEDs flash alternately and the sensor searches for a Gateway in binding mode. After the Q45CT is bound, the LEDs stay solid momentarily, then they flash together four times. The Q45CT exits binding mode.
- Label the sensor with the Q45CT's Node address number for future reference.

6. Repeat steps 2 through 5 for as many Q45CTs as are needed for your network.
7. On the Gateway: After binding all Q45CTs, exit binding mode.
 - For housed DX80 Gateways, double-click button 2.
 - For board-level DX80 Gateways, double-click the button.

For Gateways with single-line LCDs: After binding your Q45CT 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 Q45CTs if your Gateway is ever replaced.

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 Q45CT from binding to the wrong Gateway.

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 address to bind the Q45CT to.
4. On the Q45CT: 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 Gateway 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 Q45CTs 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.

Holding Registers

Table 2: Holding registers for the Q45CT Sensor Node

Modbus Registers		EIP Registers		I/O Type	I/O Range		Holding Register Representation (Dec)	
Gateway	Node	Node			Min.	Max.	Min.	Max.
1	1 + (Node# × 16)	0 + (Node# × 8)	Instance 100 / N7	Current Transformer Input Register				
...						
7	7 + (Node# × 16)	6 + (Node# × 8)		Reserved				
8	8 + (Node# × 16)	7 + (Node# × 8)		Device Message				
	...							
15	15 + (Node# × 16)	6 + (Node# × 8)	Instance 112 / N14	Control Message				
16	16 + (Node# × 16)	7 + (Node# × 8)		Reserved				

To interpret the holding register representation of the current transformer (CT) in amperes, divide the register value by 100.

To use a current transformer other than those provided, ensure the CT matches the 333 mV output characteristics of the CTs provided with the Condition Monitoring Node. For more information, see [Specifications](#) on p. 4.

If the custom CT exceeds the 150 A CT, set DIP switch 8 to ON and use a DXM Controller or PLC to multiply the typical 150 A output value in the input by the ratio of the custom CT to 150 A. For example: For a 300 A CT, divide the register data by 100 as you would for the 150 A CT, then multiply that value by 2 to scale it to 300 A.

Specifications

Performance 900 MHz Radio Specifications for Internal Antennas

Radio Range

900 MHz, 1 Watt: Up to 3.2 km (2 miles) with line of sight (internal antenna)

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 (Performance)

Gateway: Configurable via User Configuration Software

Node: Defined by Gateway

Wireless Q45CT Current Transformer Node Specifications

Supply Voltage

3.6 V DC (internal battery)

Current Draw at 3.6 V dc

900 MHz, 1 Watt: Approximately 1 mA
 900 MHz, 250 mW: Approximately 0.5 mA
 2.4 GHz, 65 mW: Approximately 0.3 mA

CT20A and CT150A Current Transformer

Electrical:

Rated input: 0–20 A (CT20A) or 0–150 A (CT150A)
 Rated Output: 0.333 V (AC)
 Ratio: $\leq \pm 1.0\%$
 Phase angle: $\leq \pm 60$ min
 Dielectric Strength: 2.5 kV/1 mA/1 min
 Insulation Resistance: DC500 V/100 MOhm min

Mechanical:

Case: PA / UL94-V0
 Bobbin: PBT
 Core: Silicon Steel
 –25 °C to +75 °C (–13 °F to +167 °F)
 $\leq 85\%$ maximum relative humidity (non-condensing)

For more information, refer to the [Split Core Current Transformer](#) datasheet (p/n 212463)

Indicators

Red and green LEDs (radio function)

Typical Battery Life

See chart

Default Sensing Interval

5 minutes

Construction

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

Certifications

Environmental Specifications

Operating Conditions

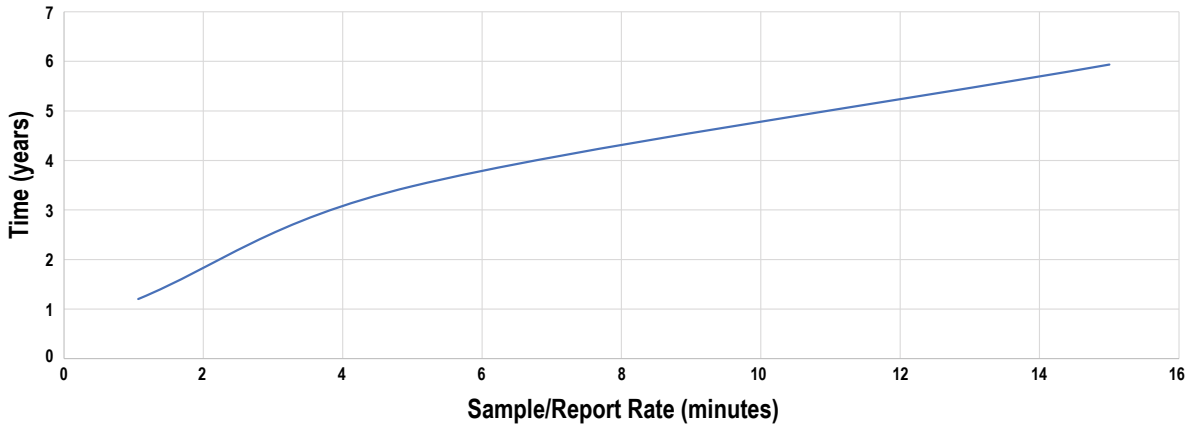
–40 °C to +70 °C (–40 °F to +158 °F); 90% at +50 °C maximum relative humidity (non-condensing)
 Radiated Immunity: 10 V/m (EN 61000-4-3)

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 Performance Curve

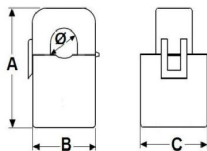


Accessories

BWA-CURRENT-TRANSFORMER-20A

- Split-Core Current Transformer
- 5–20 A Input
- 0.333 V Output
- Datasheet p/n [212463](#)

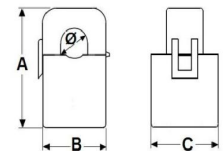
A = 41 mm; B = 24 mm; C = 26.5 mm



BWA-CURRENT-TRANSFORMER-150A

- Split-Core Current Transformer
- 5–150 A Input
- 0.333 V Output
- Datasheet p/n [212463](#)

A = 45.5 mm; B = 29 mm; C = 31.5 mm



BWA-BATT-006

- 3.6 V Lithium AA cell
- Two batteries



Warnings

Install and properly ground a qualified surge suppressor when installing a remote antenna system. Remote antenna configurations installed without surge suppressors invalidate the manufacturer's warranty. Keep the ground wire as short as possible and make all ground connections to a single-point ground system to ensure no ground loops are created. No surge suppressor can absorb all lightning strikes; do not touch the Sure Cross® device or any equipment connected to the Sure Cross device during a thunderstorm.

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.



Important: Please download the complete Wireless Q45CT Current Transformer 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 Q45CT Current Transformer 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 Q45CT Current Transformer 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:**

- **Never operate a 1 Watt radio without connecting an antenna**
- Operating 1 Watt radios without an antenna connected will damage the radio circuitry.
- To avoid damaging the radio circuitry, never apply power to a Sure Cross® Performance or Sure Cross MultiHop (1 Watt) radio without an antenna connected.

**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.

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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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