Sure Cross® Wireless Q45 Sensor - **Diffuse**

Datasheet

With a diffuse-mode sensor, the object is detected when the object reflects the sensor's transmitted light energy back to the sensor. No reflector or receiver is needed to detect objects.

- Detects objects up to 300 mm (12 in) away
- Includes the diffuse-mode photoelectric sensor, a wireless Node, and an internal battery to make it easy to install
- Counts up to 960 parts per minute

Models	Frequency	Sensing Range	Inputs and Outputs
DX80N2Q45D	2.4 GHz ISM Band	300 mm (12 in)	Photoelectric sensor with event counter
DX80N9Q45D	900 MHz ISM Band		

⚠ **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.

Storage Mode for the Q45

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 button for five seconds. To put any Q45 into storage mode, press and hold the button for five seconds. The Q45 is in storage mode when the LEDs stop blinking.

Configuration Instructions

Button and LEDs
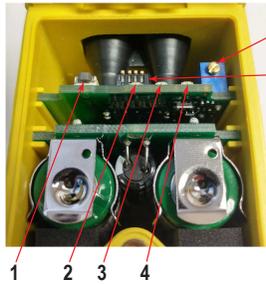
1. Button
2. Red LED (flashing) indicates a radio link error with the Gateway.
3. Green LED (flashing) indicates a good radio link with the Gateway.
4. Amber LED for Alignment or Test Mode. Indicates sensor function (optical sensor models) or when input 1 is active (dry contact models). The amber LED is not used during normal operation.
5. Excess gain potentiometer. Turn clockwise to increase the gain.
6. DIP switches

DIP Switches

Settings	DIP Switch			
	1	2	3	4
900 MHz Transmit Power Level: 1 Watt (30 dBm)	OFF *			
900 MHz Transmit Power Level: 250 mW (24 dBm) (DX80 Compatibility Mode)	ON			
No Counter, 62.5 ms Sample Rate/Change of State Reporting		OFF *	OFF *	OFF *
Counter Enabled, 62.5 ms Sample Rate/1 min Report Rate		OFF	OFF	ON
Counter Enabled, 62.5 ms Sample Rate/User-Defined Report Rate		OFF	ON	OFF
Counter Enabled, 31.25 ms Sample Rate/1 min Report Rate		OFF	ON	ON
Counter Enabled, 31.25 ms Sample Rate/User-Defined Report Rate		ON	OFF	OFF
Reserved		ON	OFF	ON
Reserved		ON	ON	OFF

Settings	DIP Switch			
	1	2	3	4
UCT-Configured (User-Defined)		ON	ON	ON

* Default Configuration

Transmit Power Levels

The 900 MHz radios transmit at 1 Watt (30 dBm) or 250 mW (24 dBm). While the Performance radios operate in 1 Watt mode, they cannot communicate with the older 150 mW radios. To communicate with 150 mW radios, operate this radio in 250 mW mode. 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), making the 2.4 GHz Performance models automatically compatible with older 2.4 GHz models.

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 *Flex*Power® applications, setting the report rate to a slower rate extends the battery life.

Modbus Registers

| I/O #	Modbus Holding Register		I/O Type	I/O Range		Holding Register **Representation**	
	Gateway	Any Node		Min. Value	Max. Value	Min. (Dec.)	Max. (Dec.)
1	1	1 + (Node# × 16)	Sensor IN 1 State	0	1	0	1
2	2	2 + (Node# × 16)	Reserved				
3	3	3 + (Node# × 16)	Counter High Word	0	65535	0	65535
4	4	4 + (Node# × 16)	Counter Low Word	0	65535	0	65535
7	7	7 + (Node# × 16)	Reserved				
8	8	8 + (Node# × 16)	Device Message				
14	14	14 + (Node# × 16)	Clear Counter	0	1	0	1
15	15	15 + (Node# × 16)	Control Message				
16	16	16 + (Node# × 16)	Reserved				

Using the Event Counter

The counter "counts" when the input is on for a minimum of the sample rate. The counter input is off when the input is off for a minimum of the sample rate.

For example, if your sample rate is set to 62.5 ms, the counter input is on, and therefore counts, when the input is on for at least 62.5 ms. If the input is not on for 62.5 ms, the counter does not increment.

To clear the counter when you are using a host-controlled system, send a control message to Node register 15. Control messages on Node register 15 are acknowledged with the same value echoed to Node register 7.

1. Write 5388 (0x150C) to Node register 15.
2. Read Node register 7 until it echoes the Node register 15 value.

Event counts

Event counter does not count

t = 0   1x sample rate   2x sample rate   3x sample rate   4x sample rate
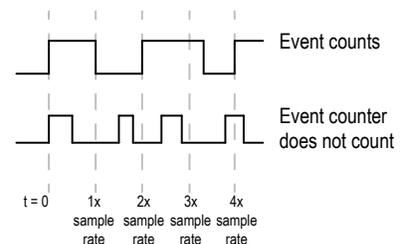
To clear the counter when you are not using a host-controlled system, write a 1 to the Node's output register 14. Clearing the counter requires that this register goes from a 0 to a 1. If there is already a 1 in the register, first write a 0, then write the 1. You can use the Gateway I/O mapping to map an input, such as a button, to clear the counter value.

Installation Instructions

Bind the Q45 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 single-button models, triple-click the button.
   - For two-button models, triple-click button 2.

   On the board modules, the green and red LED flashes. On the housed 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 Q45 and lift the cover.
4. Enter binding mode on the Q45 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 Q45.
6. Repeat steps 2 through 5 for as many Q45 as are needed for your network.
7. After binding all Q45, exit binding mode on the Gateway.

   - For single-button models, double-click the button.
   - For two-button models, double-click button 2.

For Gateways with 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.

Optical Alignment Mode (Diffuse)

In diffuse-mode sensing, light emitted from the sensor strikes the surface of the object to be detected and is diffused back, sending some light back to the receiver, which is usually housed with the emitter. With a diffuse-mode sensor, the object is detected when it "makes" the beam, that is, the object reflects the sensor's transmitted light energy back to the sensor.

The Wireless Q45 Sensor enters and remains in optical alignment mode for 15 minutes after the button is pushed, after the Wireless Q45 Sensor exits binding mode, or after the Q45 is powered up (battery replaced).

During optical alignment mode, the sensor's yellow LED lights up whenever the sensor detects the reflected beam.

After 15 minutes, the Wireless Q45 Sensor automatically exits optical alignment mode and begins normal operation. After the sensor begins normal operation, the amber/yellow sensor state LED is inactive. To exit alignment mode earlier, click the button five times.

DIFFUSE

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.

Specifications

Radio Range[1]
   900 MHz, 1 Watt (Internal antenna): Up to 3.2 km (2 miles)
   2.4 GHz, 65 mW (Internal antenna): Up to 1000 m (3280 ft) with line of sight

Transmit Power
   900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)
   2.4 GHz: 65 mW EIRP

Report Rate
   On Change of State

900 MHz Compliance (1 Watt)
   FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247
   IC: 7044A-RM1809

2.4 GHz Compliance
   FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247
   ETSI EN 300 328 V1.8.1 (2012-06)
   IC: 7044A-DX8024

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.

Adjustments
   Multi-turn sensitivity control (allows precise sensitivity setting - turn clockwise to increase gain.

Minimum Separation Distance
   900 MHz, 1 Watt: 4.57 m (15 ft)
   2.4 GHz, 65 mW: 0.3 m (1 ft)

Sensing Range
   101 mm to 300 mm (4 in to 12 in)

Default Sample Rate
   62.5 milliseconds

Battery Life (Typical)
   With no counter and change-of-state reporting of greater than 5 minutes: Up to 2 years
   With no counter and change-of-state reporting of about 30 s: 1.5 years
   With a counter set to 62.5 ms sample rate and 60 s report rate: 1.5 years
   With a counter set to 31.25 ms sample rate and 60 s report rate: 1 year

Spread Spectrum Technology
   FHSS (Frequency Hopping Spread Spectrum)

Indicators
   Red and green LEDs (radio function); amber LED (only for alignment mode)

Environmental Rating
   NEMA 6P, IEC IP67

Operating Conditions
   –40 °C to 70 °C (–40 °F to 158 °F); 90% relative humidity at 50 °C (non-condensing)

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[1] Range depends on the environment and decreases significantly without line of sight. Always verify your wireless network's range by performing a Site Survey.

Performance Curves

Performance curves are based on a 90% **reflectance** white test card.	
Excess Gain	Beam **Pattern**
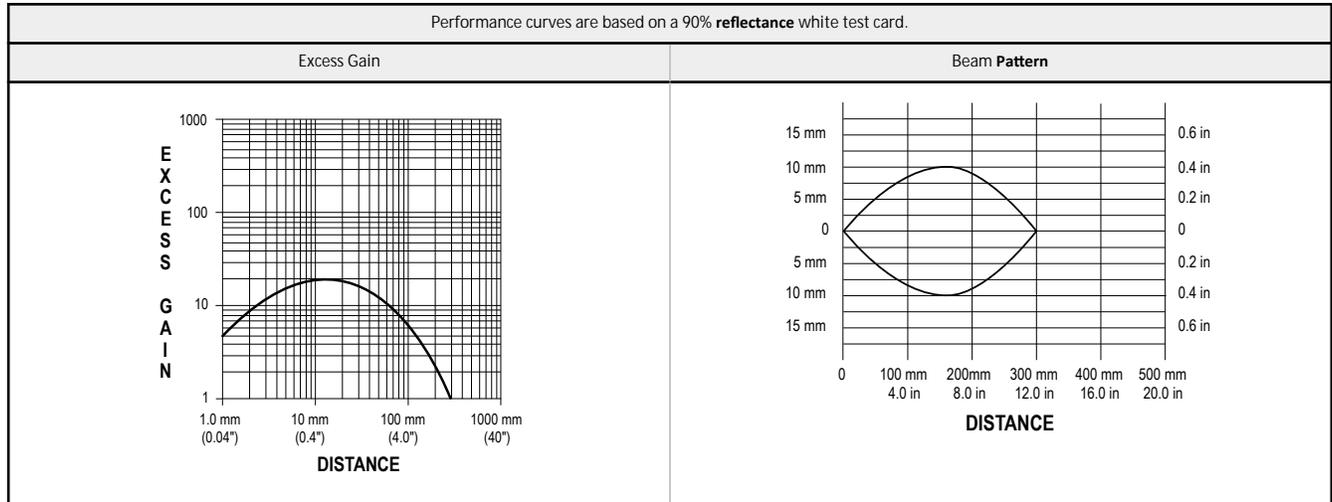
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Exporting Sure Cross® Radios

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