MultiHop H10 Data Radio

Features

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. Wireless MultiHop data radio networks are formed around a MultiHop client and one or more servers and extend the range of a Modbus or other serial communication network.



Range can be extended even further using any server radio as a repeater to create a tree-type network. The MultiHop H10 radios may be powered by either a battery or 10 to 30 V DC power and include Banner's 1-wire serial interface for use with all of Banner's 1-wire serial sensors, such as the QM30VT1 Vibration and Temperature sensor. Up to six sensors may be daisy-chained into a single H10 radio.

Benefits

- Deliver factory automation or IIoT solutions by connecting Banner 1-wire serial sensors for applications such as:
  - Vibration and temperature monitoring for predictive maintenance motor health
  - Ultrasonic distance measurement for tank level monitoring, distance sensing, etc.
  - Temperature and humidity monitoring for energy management, process monitoring, etc.
- MultiHop networks are self-healing, auto-routing RF networks with multiple hops that extend the network's range and improve radio link performance
- Monitor all available 1-wire serial sensor registers previously only available on Modbus sensors
- **Transparency mode**—Global triggers make polling a sensor function identically to a wired Modbus sensor
- **Flexible power options**—10 to 30 V DC or a D-cell battery gives extended battery life
- **Reduced deployment costs**—Allows up to six 1-wire serial sensors to be connected at a time
- **Available solutions**—Integrates with Vibration Monitoring and Predictive Maintenance MultiHop Solutions Kits
- External antenna mounts to the proper location or you can replace it with a higher gain antenna for increased range
- **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**—Simplified 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
- Selectable transmit power levels of 250 mW or 500 mW for 900 MHz models and 65 mW for 2.4 GHz models
- Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery
- Transceivers provide bidirectional communication between the client and server radios, including fully acknowledged data transmission

Models

Models	Frequency	Power	I/O
DX80DR9M-H10	900 MHz ISM Band	Integrated battery or 10 V DC to 30 V DC	**Inputs**: 1-Wire serial interface for one 1-wire serial sensing device
DX80DR2M-H10	2.4 GHz ISM Band		

Configuration Instructions

Set Up Your MultiHop Network

To set up and install your wireless MultiHop network, follow these steps:

1. If your radios have DIP switches, configure the DIP switches of all devices.
2. Connect the sensors to the MultiHop radios if applicable.
3. Apply power to all devices.
4. If your MultiHop radio has rotary dials, set the MultiHop Radio ID. If your MultiHop radio has no rotary dials, continue to the next step.
5. Form the wireless network by binding the server and repeater radios to the client radio. If the binding instructions are not included in this datasheet, refer to the quick start guide or product manual.
6. Observe the LED behavior to verify the devices are communicating with each other.
7. Configure any I/O points to use the sensors connected to the Sure Cross devices.
8. Conduct a site survey between the MultiHop radios. If the site survey instructions are not included in this datasheet, refer to the product manual.
9. Install your wireless sensor network components. If the installation instructions are not included in this datasheet, refer to the product manual.

For additional information, refer to one of the following documents:

Original Instructions
01-Oct-24

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214151
p/n: 214151 Rev. F

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

- MultiHop Data Radio Quick Start Guide: 152653
- MultiHop Data Radio Instruction Manual: 151317
- MultiHop Register Guide: 155289

Configure the DIP Switches

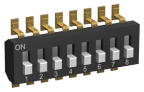
Before changing DIP switch positions, disconnect the power.[1]

Any changes made to the DIP switches are not recognized until after power is cycled to the device. For parameters not set using the DIP switches, use the configuration software to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the configuration software.

Access the Internal DIP Switches

Follow these steps to access the internal DIP switches.

1. Unscrew the four screws that mount the cover to the bottom housing.
2. Remove the cover from the housing without damaging the ribbon cable or the pins the cable plugs into.
3. Gently unplug the ribbon cable from the board mounted into the bottom housing. Skip this step if there is no ribbon cable (integrated battery models) or the ribbon cable is glued down (for C housing models).
4. Remove the black cover plate from the bottom of the device's cover.
   The DIP switches are located behind the rotary dials.
5. Make the necessary changes to the DIP switches.
6. Place the black cover plate back into position and gently push into place.
7. If necessary, plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin.
8. Mount the cover back onto the housing.



H10 DIP Switch Settings

	Switches							
Device Settings	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Serial line baud rate 19200 OR User defined receiver slots	OFF *	OFF *						
Serial line baud rate 38400 OR 32 receiver slots	OFF	ON						
Serial line baud rate 9600 OR 128 receiver slots	ON	OFF						
Serial line baud rate Custom OR 4 receiver slots	ON	ON						
Parity: None			OFF	OFF				
Parity: Even			OFF	ON				
Parity: Odd			ON	OFF				
Disable serial (low power mode) and enable the receiver slots select for switches 1-2			ON *	ON *				
Transmit power 900 MHz radios: 500 mW (27 dBm) 2.4 GHz radios: 65 mW (18 dBm) and 60 ms frame					OFF *			
Transmit power 900 MHz radios: 250 mW (24 dBm) 2.4 GHz radios: 65 mW (18 dBm) and 40 ms frame					ON			
Application mode: Modbus						OFF		
Application mode: Transparency						ON *		
MultiHop radio setting: Repeater							OFF	OFF
MultiHop radio setting: Client							OFF	ON
MultiHop radio setting: Server							ON *	OFF *
MultiHop radio setting: Reserved							ON	ON

* Default configuration

Baud Rate and Parity—The baud rate (bits per second) is the data transmission rate between the device and whatever it is physically wired to. Set the parity to match the parity of the device you are wired to.

Disable Serial—Disable an unused local serial connection to reduce the power consumption of a data radio powered from the solar assembly or from batteries. All radio communications remain operational.

[1] For devices powered by batteries integrated into the housing, triple-click button 2, then double-click button 2 to reset the device without removing the battery.

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Receiver Slots—The number of receiver slots indicates the number of times out of 128 slots/frames the radio can transmit to its parent radio. Setting a server's receiver slots to four reduces the total power consumption by establishing that the server can only transmit to its parent four times per 128 slots.

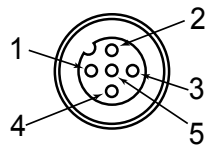
Transmit Power Levels/Frame Size—The 900 MHz data radios can be operated at 500 mW (27 dBm) or 250 mW (24 dBm). For most models, the default transmit power is 500 mW. For 2.4 GHz radios, the transmit power is fixed at 65 mW (18 dBm) and DIP switch 5 is used to set the frame timing. The default position (OFF) sets the frame timing to 60 milliseconds. To increase throughput, set the frame timing to 40 milliseconds. For battery-powered devices, increasing the throughput decreases battery life.

Wire Your Sure Cross Device

Use the following wiring diagrams to first wire the sensors and then apply power to the Sure Cross® devices.

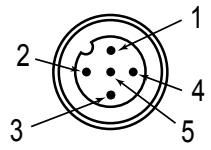
5-Pin M12 Female Quick Disconnect

This female quick disconnect fitting interfaces with a 1-wire serial sensor. The following information defines the wires and the appropriate connection points in the Sure Cross radio.

5-pin M12 Female Quick Disconnect	Pin	Wire Color	Description
	1	Brown (bn)	Power out + (to sensor)
	2	White (wh)	Device select
	3	Blue (bu)	DC common (GND)
	4	Black (bk)	Device output
	5	Gray (gy)	Serial comms

Apply Power to the 10-30 V DC Model

Integral 5-pin M12 male quick-disconnect connectors are wired for 10 V DC to 30 V DC power as shown.

5-pin M12 Male Quick Disconnect Connector	Pin	Wire Color	Description
	1	Brown (bn)	10 V DC to 30 V DC
	2	White (wh)	
	3	Blue (bu)	DC common (GND)
	4	Black (bk)	
	5	Gray (gy)	

Set the Modbus ID on a 1-Wire Serial Sensor

To begin configuring the sensors, each sensor must have a Modbus ID assigned to it. To assign IDs, use either the menu system or the configuration software.

To assign the IDs using the configuration software, download the Sensor Configuration Software (p/n b_3128586) and use the BWA-USB1WIRE-001 cable accessory for the VT1 sensor. Follow the instructions in the Sensor Configuration Software Instruction Manual (p/n 170002) to assign the Sensor Modbus ID.

To use the radio's menu system, follow these steps:

1. Power on the MultiHop radio and only connect one sensor at a time.
2. Push button 1 (left) until ***DVCFG** appears, then click button 2 (right).
3. Push button 1 until **-S ADR** appears and click button 2.
4. Push button 1 and wait for the radio to read the current sensor ID.
   A three-digit value appears with the current sensor ID with a blinking cursor.
5. Use the left button to cycle the value from 0 through 9 and the right button to accept the value and move the cursor to the next digit right.

   Each sensor must be assigned a unique Modbus ID.
6. Push and hold button 2 until SAVING displays on the screen.
7. To repeat for more sensors, unplug the sensor and plug in the next sensor and repeat the steps, using a unique ID.
8. After you have assigned unique IDs to all sensors, double-click button 2 to return to the main menu.
9. Plug in all sensors to be attached to that radio.

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Bind a MultiHop Radio to a DXM and Assign the Device ID

Before beginning the binding procedure, apply power to all the devices. Separate radios by two (2) meters when running the binding procedure. Put only one DXM MultiHop client radio into binding mode at a time to prevent binding the server or repeater radios to the wrong client radio.

Binding MultiHop radios ensures all MultiHop radios within a network communicate only with other radios within the same network. The MultiHop client radio automatically generates a unique binding code when it enters binding mode. This code is transmitted to all radios within range that are also in binding mode. After a repeater/server radio is bound, the repeater/server radio accepts data only from the client radio to which it is bound. The binding code defines the network, and all radios within a network must use the same binding code.

1. Enter binding mode on the DXM radio:
    a. Use the arrow keys select the **ISM Radio** menu on the LCD and press **ENTER**.
    b. Highlight the **Binding** menu and press **ENTER**.
2. Assign the device address to the repeater or server radios. Valid device IDs are 11 through 60.
    - For MultiHop radios without rotary dials: Use the DXM arrow keys to select the device ID to assign to the MultiHop radio about to enter binding mode. The DXM assigns this device ID to the next radio that enters binding mode. Only bind one server radio at a time.
    - For MultiHop radios with rotary dials: Use the MultiHop radio's rotary dials to assign a device ID . The left rotary dial represents the tens digit (1 through 6) and the right dial represents the ones digit (0 through 9) of the device ID. You can leave the DXM "Bind to" address set to 1 because the MultiHop's rotary dials will override that setting.
3. Start binding mode on the DXM radio by pressing **ENTER** on the DXM radio.
4. After entering binding mode on the DXM, put the MultiHop repeater or server radio into binding mode.
    - For housed radios, triple-click button 2.
    - For board-level radios, triple-click the button.
    - For radios without buttons, refer to the radio's datasheet for instructions on entering binding mode.

    After binding is completed, the MultiHop radio automatically exits binding mode and begins operation.
5. Press **BACK** on the DXM to exit binding mode for that specific device address.
    The MultiHop radio's LEDs continue to flash red until the DXM exits binding mode with that MultiHop radio.
6. Label the MultiHop radio with the assigned address number for future reference.
7. Repeat these steps, changing the device address, for as many MultiHop radios as are needed for your network.
8. When you are finished binding, press **BACK** on the DXM until you return to the main menu.
    All radio devices begin to form the network after the client data radio exits binding mode.

H10 Transparent Mode

In a typical MultiHop system, data radios are constantly powered and provide a direct wireless connection to attached Modbus sensors, which can be polled at any time. With the H10 battery-powered data radio, follow these steps to use transparent mode and enhance your battery life.

To create a transparent link to the sensors, set a few global registers in the client radio (ID 1). One register puts all connected radios into a full listening mode called FullMacWhen and the second register enables switch power to all the connected sensors. Using these two registers gives you the benefits of a MultiHop connection to any Banner 1-wire serial sensor without needing to connect 10 to 30 V DC to the radio.

After you first boot the client DXM that this H10 radio will be connecting to, set register 6161 to 1 on the client radio (Modbus ID 1) to enable Global Flags.

- Register 6329—FullMacWhen
- Register 6165—Enable Switch Power

1. Set the registers to a value of 1 and wait a few seconds. All attached H10 radios now act as if they were powered by 10 to 30 V DC.
2. Poll the data from the attached 1-wire serial sensors.
3. After the polling cycle of all sensors is complete, set the two registers back to 0.

To properly trigger the global registers, take the necessary data from each sensor, and then shut off the global registers quickly, use a ScriptBasic file. With a ScriptBasic file, the timing of turning on the global registers and collecting the data from the sensors, as well as knowing when the last sensor's data has been read ensures that the FullMacWhen and Enable Switch Power are not left on longer than necessary.

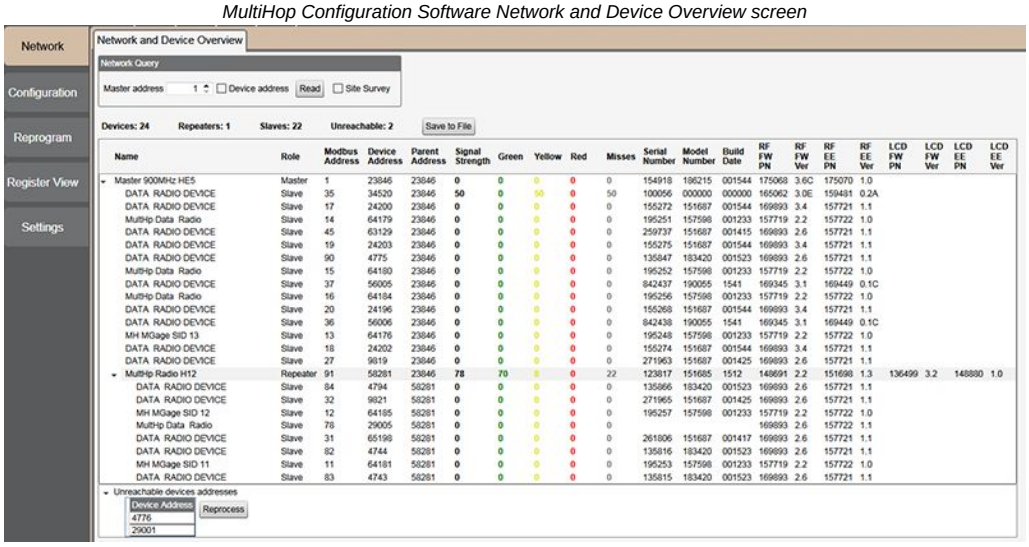
Do not leave the global registers on (1) because it will drain the H10 battery.

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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.

Installing Your Sure Cross® Radios

Please refer to one of these instruction manuals to install your wireless network components.

- DX80 Performance Wireless I/O Network Instruction Manual: 132607
- MultiHop Data Radio Instruction Manual: 151317

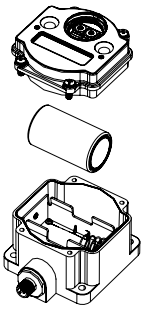
Modbus Addressing Convention

All Modbus addresses refer to Modbus holding registers. When writing your own Modbus scripts, use the appropriate commands for interfacing to holding registers. Parameter description headings refer to addresses in the range of 40000 as is customary with Modbus convention.

Install or Replace the Battery for a DX80 Integrated Battery Model

To install or replace the 3.6 V lithium "D" cell battery in any model with a battery integrated into the housing, follow these steps.

1. Remove the four screws mounting the face plate to the housing and remove the face plate.
2. Remove the discharged battery.
3. Install the new battery, verifying the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
4. After installing the battery, allow up to 60 seconds for the device to power up.
5. Properly dispose of used batteries according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or another facility qualified to accept lithium 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.

For non-hazardous locations, the replacement battery is model **BWA-BATT-011**. For non-hazardous or hazardous locations, the replacement battery is Xeno model XL-205F, Banner model **BWA-BATT-001**. For pricing and availability, contact Banner Engineering.

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CAUTION: There is a risk of explosion if the battery is replaced incorrectly.

Specifications

Radio Specifications for MultiHop

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)

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)

Antenna Minimum Separation Distance

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

Antenna Connection

Ext. Reverse Polarity SMA, 50 Ohms

Max Tightening Torque: 0.45 N·m (4 lbf·in)

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

Radio Packet Size (MultiHop)

900 MHz: 175 bytes (85 Modbus registers)

2.4 GHz: 75 bytes (37 Modbus registers)

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

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.

H10 Specifications

Supply Voltage

Integrated battery: 3.6 V DC (internal battery) (1)

Non-battery: 10 V DC to 30 V DC (Outside the USA: 12 V DC to 24 V DC, ± 10%)

Interface

Two bi-color LED indicators

Two buttons

Six character LCD

Wiring Access

One 5-pin M12 female quick-disconnect connector and One 5-pin M12 male quick-disconnect connector

(1) For European applications, power this device from a Limited Power Source as defined in EN 60950-1.

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Housing

Polycarbonate housing; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur-cured button covers

Weight: 0.26 kg (0.57 lbs)

Mounting: #10 or M5 (SS M5 hardware included)

Max. Tightening Torque: 0.56 N·m (5 lbf·in)

Certifications

CE/UKCA approval only applies to 2.4 GHz models

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1831 Diegem, BELGIUM

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Blenheim Court
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GREAT BRITAIN

03737-22-04042

ANATEL

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados. Para maiores informações, consulte o site da ANATEL www.gov.br/anatel/pt-br/

RS-485 Communication Specifications

Communication Hardware (MultiHop RS-485)

Interface: 2-wire half-duplex RS-485

Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Software

Data format: 8 data bits, no parity, 1 stop bit

Environmental Specifications (IP67 Housing Models)

Operating Conditions

–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD)

95% maximum relative humidity (non-condensing)

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

Shock and Vibration

All models meet IEC 60068-2-6 and IEC 60068-2-27 testing criteria

Shock: 30G 11 ms duration, half sine wave per IEC 60068-2-27

Vibration: 10 Hz to 55 Hz, 0.5 mm peak-to-peak amplitude per IEC 60068-2-6

Environmental Ratings

IEC IP67; NEMA 6

For installation and waterproofing instructions, go to www.bannerengineering.com and search for the complete instruction manual (p/n 151317)

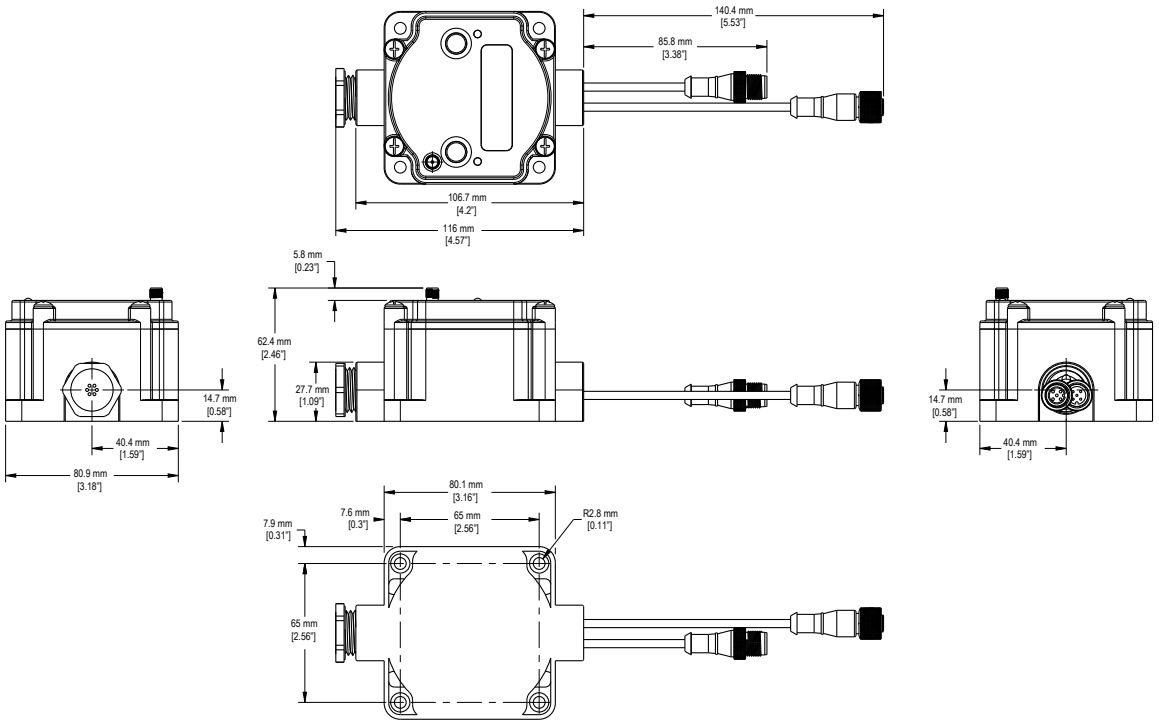
Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

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H10 Dimensions

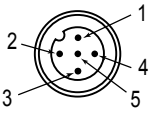
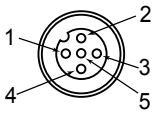
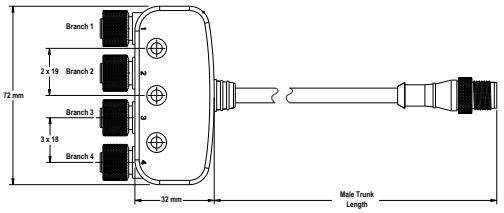
All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.

Dimensions for the MultiHop H10 model

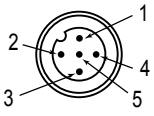
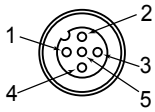


Accessories

Splitter Cordsets

5-Pin Double-Ended M12 Female to M12 Male Flat Junction Splitter Cordsets			
Model	**Description**	**Pinout (Male)**	**Pinout (Female)**
CSB4-M1251M1250	Four (no cable) 5-pin M12 female quick-disconnect connectors One 0.3 m (0.98 ft) cable with a 5-pin M12 male quick-disconnect connector Parallel wiring		
		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray

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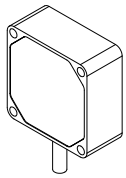
5-Pin M12 Female to M12 Male Splitter Tee			
Model		**Pinout (Male)**	**Pinout (Female)**
CSB-M1250M1250-T • Two 5-pin M12 female quick-disconnect connectors • One 5-pin M12 male quick-disconnect connector • Parallel wiring		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray

1-Wire Serial Sensors

QM30VT1 Vibration and Temperature Sensor
- Aluminum housing
- 2.09 m (6.85 ft) cable with a 5-pin M12 male quick disconnect (QD)
- Datasheet: 212568

QM30VT1-QP Vibration and Temperature Sensor
- Aluminum housing
- 150 mm (6 in) cable with a 5-pin M12 male quick disconnect (QD)
- Datasheet: 212568

QM30VT1-SS Vibration and Temperature Sensor
- Stainless steel housing
- 2.09 m (6.85 ft) cable with a 5-pin M12 male quick disconnect (QD)
- Datasheet: 212568



K50UX1ARA U-GAGE Ultrasonic Sensor
- 1-wire serial interface
- Range: 100 mm to 1 m (3.94 in to 39.4 in)
- Datasheet: 191599

K50UX1CRA U-GAGE Ultrasonic Sensor
- 1-wire serial interface
- Range: 300 mm to 3 m (11.8 in to 118 in)
- Datasheet: 191599



M12FTH4Q Temperature and Humidity Sensor
- ±2% Accuracy, 1-wire serial interface
- (Requires a 5-pin threaded M12 double-ended cordset less than 3 meters long, such as model DEE2R-5*x*D.)
- Datasheet: 162669

M12FT4Q Temperature Sensor
- 1-wire serial interface
- (Requires a 5-pin threaded M12 double-ended cordset less than 3 meters long, such as model DEE2R-5*x*D.)
- Datasheet: 162669



Included with Integrated Battery Devices

- BWA-HW-001: Mounting Hardware Kit, containing four M5-0.8 x 25mm SS screws, four M5-0.8 x 16mm SS screws, four M5-0.8mm SS hex nuts, and four #8-32 x 3/4" SS bolts
- BWA-9O2-C (900 MHz) or BWA-2O2-C (2.4 GHz): Antenna, 2 dBd Omni, Rubber Swivel RP-SMA Male. (Not included with Internal antenna models)
- Quick Start Guide (128185 for DX80 Gateways or 152653 for MultiHop models)

Warnings

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.

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IMPORTANT: Please download the complete MultiHop H10 Data Radio 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 MultiHop H10 Data Radio, 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 MultiHop H10 Data Radio sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

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:

- **Never operate a radio without connecting an antenna**
- Operating 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 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.

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 (con Antena)

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."

Approved Antennas

BWA-9O2-C--Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho
BWA-9O5-C--Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho
BWA-9O6-A--Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra
BWA-9Y10-A--Antena, Yagi, 900 MHz, 10 dBd, N Hembra

Mexican Importer

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