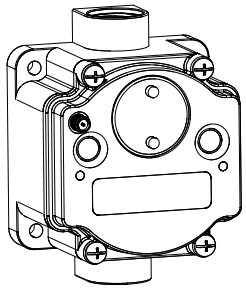
MultiHop H14 Data Radio

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.



- Wireless industrial I/O device with one configurable discrete input, one configurable analog input, one thermistor input, one SDI-12 input, one asynchronous counter input, and one switch power output
- Selectable transmit power levels of 250 mW or 500 mW for 900 MHz models and 65 mW for 2.4 GHz models
- Self-healing, auto-routing radio frequency network with multiple hops extends the network's range and improves radio link performance
- Serial and I/O communication on a Modbus platform
- Message routing improves link performance
- DIP switches select operational modes: client, repeater, or server
- Built-in site survey mode enables rapid assessment of a location's RF transmission properties
- Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery
- Field-wireable terminals for wiring I/O

Models

Models	Frequency	I/O
DX80DR9M-H14	900 MHz ISM Band	**Inputs**: One configurable discrete, one configurable analog , one thermistor, one SDI-12, and one asynchronous counter **Switch Power**: One
DX80DR2M-H14	2.4 GHz ISM Band	

To order an integrated battery model without the battery, add a **-NB** to the model number. If you purchase a model without the battery, Banner Engineering recommends lithium D cell battery **BWA-BATT-001**.

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:

- 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.

[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.

Original Instructions
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p/n: 194836 Rev. H

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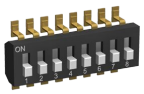
Access the Internal DIP Switches

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.

H14 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: Transparent						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

Application Mode

The MultiHop radio operates in either Modbus mode or transparent mode. Use the internal DIP switches to select the mode of operation. All MultiHop radios within a wireless network must be in the same mode.

Modbus mode uses the Modbus protocol for routing packets. In Modbus mode, a routing table is stored in each parent device to optimize the radio traffic. This allows for point-to-point communication in a multiple data radio network and acknowledgment/retry of radio packets. To access a radio's I/O, the radios must be running in Modbus mode.

In **transparent** application mode, all incoming packets are stored, then broadcast to all connected data radios. The data communication is packet-based and not specific to any protocol. The application layer is responsible for data integrity. For one-to-one data radios it is possible to enable broadcast acknowledgment of the data packets to provide better throughput. In transparent mode, there is no access to the radio's I/O.

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.

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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.

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.

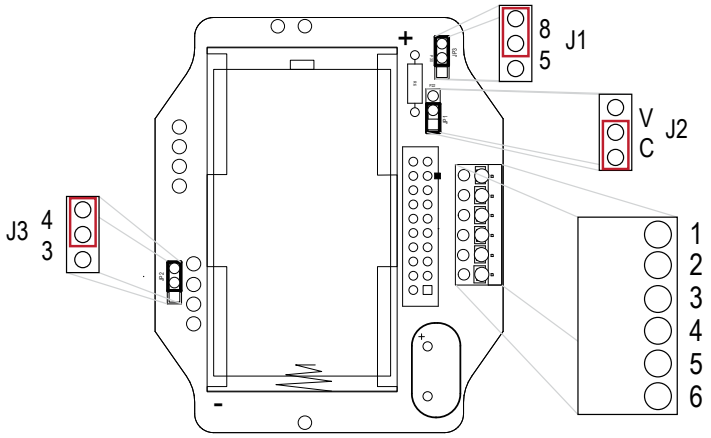
For 2.4 GHz radios, the transmit power is fixed at 65 mW (18 dBm) and DIP switch 5 is used to set the frame timing. The default position (OFF) sets the frame timing to 60 milliseconds. To increase throughput, set the frame timing to 40 milliseconds. For battery-powered devices, increasing the throughput decreases battery life.

Wire for Power and I/O

Follow these instructions to wire your device for power, ground, inputs, and outputs. The jumper settings determine which inputs and outputs are active.

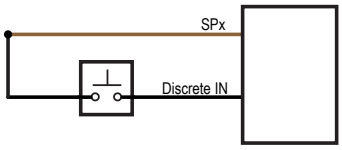
Input Configuration	Jumper Setting	Wiring Terminals	Wiring Diagram Label	Description
Discrete Input	J1 set to 5	1	Discrete IN	Discrete Input
SDI-12 Input	J1 set to 8	1	SDI-12 Data	SDI-12 Data (default)
		2	GND	Ground
		3	SPx	Switch Power 1 (3.6 to 24 V DC)
Analog Current Input	J2 set to C	4	Analog IN	Analog Input (0-20 mA) (default)
Analog Voltage Input	J2 set to V	4	Analog IN	Analog Input (0-10 V DC)
		5	GND	Ground
Counter Input	J3 set to 3	6	Counter IN	Counter Input
Thermistor Input	J3 set to 4	6	Thermistor IN	Thermistor Input (default)

Wiring terminals and jumper locations

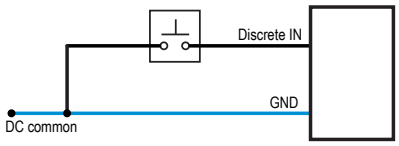


Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.

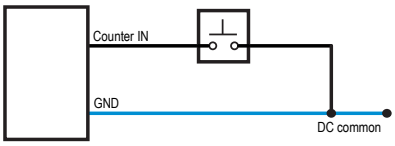
Discrete Input Wiring for PNP Sensors



Discrete Input Wiring for NPN Sensors



Counter Input Wiring



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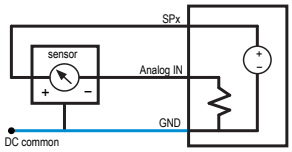
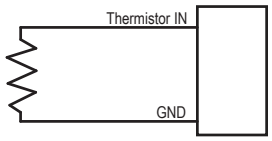
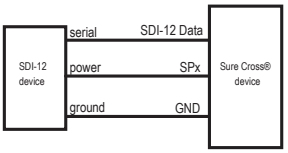
Analog Input Wiring



Thermistor Input Wiring



Input Wiring for SDI-12 Sensors



Set the MultiHop Radio ID

The Modbus ID is an identifying number used for devices within a Modbus system. When using more than one Modbus peripheral, assign each peripheral device a unique ID number.

For MultiHop radios with rotary dials, use the rotary dials to set the device's MultiHop Radio ID. The left dial sets the left digit and the right dial sets the right digit.

- Modbus IDs 01 through 10—Reserved for servers directly connected to the host (local I/O). Polling messages addressed to these devices are not relayed over the wireless link.
- Modbus IDs 11 through 60—Use for MultiHop client, repeater, and server radios. Up to 50 devices (local servers and remote servers) may be used in this system.

If your MultiHop radio does not have rotary dials, you must use the client radio to set the Modbus ID during the binding process.

Configure the H14 Discrete IO

By default, the J1 jumper is set for SDI-12 inputs. To select discrete inputs instead, move the J1 jumper to the '5' position.

After the jumper is moved, the discrete inputs default to NPN. Use the MultiHop Configuration Tool to change the discrete input type to PNP.

1. With the MultiHop master radio connected to your computer, launch the MultiHop Configuration Tool software.
2. From the **Device › Configuration Settings** menu, select **Comm Port** and click **Connect**.
3. Go to the **Configuration › Configure Device** screen.
4. Select the device address in the **Device Address** box.
5. Select H14 in the **Device Type** drop-down list.
6. Click **GET All Parameters**.
7. In the Input Type drop-down list for Discrete Input 1, select PNP.
8. Click **SEND I/O Points**.

Configure the H14 Counter Input

By default, jumper J3 is set to use the thermistor input.

To use the counter input instead, change the J3 jumper to the '3' position and disable the SDI-12 inputs. The counter and SDI-12 inputs cannot be enabled at the same time.

By default, the counter is an event (rising edge) counter. Use the MultiHop Configuration Tool if you need to change your counter input to a frequency (1 to 10 kHz) counter.

1. With the MultiHop master radio connected to your computer, launch the MultiHop Configuration Tool software.
2. From the **Device › Configuration Settings** menu, select **Comm Port** and click **Connect**.
3. Go to the **Configuration › Configure Device** screen.
4. Select the device address in the **Device Address** box.
5. Select H14 in the **Device Type** drop-down list.
6. Click **GET All Parameters**.
7. Disable the SDI-12 Input 1.
8. Click **SEND I/O Points**.
9. To use the event counter (default), enable Counter Input 1. To use the frequency counter, enable Counter Input 1 and select Frequency Counter from the **Counter Type** drop-down list.
10. Click **SEND I/O Points**.

Configure the H14 Thermistor Input

By default, jumper J3 is set to use the thermistor input.

The thermistor input requires a 10 kOhm 44006, 44016, or 44031 type thermistor. By default, the thermistor is a type 44006 or 44031. To use a 44016 type, use the MultiHop Configuration Tool to change the thermistor type definition.

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1. With the MultiHop master radio connected to your computer, launch the MultiHop Configuration Tool software.
2. From the **Device › Configuration Settings** menu, select **Comm Port** and click **Connect**.
3. Go to the **Register View › Register View** screen.
4. In the Write Registers section, select register 4973.
5. Write a 1 to select thermistor type 44016. (Write a 0 to select 44006 or 44031 thermistor types.)
6. Click **Write Registers**.

Configure the H14 Analog Input

By default, jumper J2 is set to use a current (0 to 20 mA) analog input.

To use the voltage (0 to 10 V) analog input, change the J2 jumper to the 'V' position and follow these steps.

1. With the MultiHop master radio connected to your computer, launch the MultiHop Configuration Tool software.
2. From the **Device › Configuration Settings** menu, select **Comm Port** and click **Connect**.
3. Go to the **Configuration › Configure Device** screen.
4. Select the device address in the **Device Address** box.
5. Select H14 in the **Device Type** drop-down list.
6. Click **GET All Parameters**.
7. Change the **Maximum Value** of Analog Input 1 from 14418 to 10000.
8. Click **SEND I/O Points**.

Configure the SDI-12 Inputs

The SDI-12 interface on the MultiHop radio can support up to five devices with (12) 32-bit register values each. The radio's SDI-12 interface can be configured to increase the number of registers per device address for devices with large register sets. The factory default enables one SDI-12 device using device address 1 with up to nine registers with a SDI-12 command of "M!".

Configure the MultiHop device by writing to non-volatile Modbus registers with configuration parameters. Read or write the device configuration parameters using standard Modbus commands. For more information about manually configuring the SDI-12 interface, refer to the MultiHop Register Parameter document, p/n 155289.

Basic SDI-12 Interface Parameters

Up to five devices/commands can be accessed using the SDI-12 interface. There are three parameters for each device/command: Enable, Device Address, Device Command. For more information, refer to the SDI-12 Technical Notes.

Enable. Instructs the H14 device to activate or deactivate the SDI-12 device. Write a 1 to enable, and write a 0 to disable. The factory default for device 1 is enabled; devices 2 through 5 are disabled.

Device Address. Each SDI-12 device must have a unique device address. This parameter is the ASCII code for the device address. Valid device addresses are `0–9` and `a–z` that map to ASCII codes `48–57` and `97–122`, respectively. The factory default addresses are:

- SDI-12 Device 0 uses ASCII code 48
- SDI-12 Device 1 uses ASCII code 49
- SDI-12 Device 2 uses ASCII code 50
- SDI-12 Device 3 uses ASCII code 51
- SDI-12 Device 4 uses ASCII code 52

Device Command The SDI-12 interface supports "M!" or "C!" commands. Use the Device Command parameter to define which command to use for this device. The factory default is "M!" commands for all devices (value of 10 in the Modbus register).

Supported M! commands

SDI-12 Command	Register Value	SDI-12 Command	Register Value
xM!	0 or 10	xM5!	15
xM1!	11	xM6!	16
xM2!	12	xM7!	17
xM3!	13	xM8!	18
xM4!	14	xM9!	19

Supported C! commands

SDI-12 Command	Register Value	SDI-12 Command	Register Value
xC!	1 or 20	xC5!	25
xC1!	21	xC6!	26
xC2!	22	xC7!	27

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SDI-12 Command	Register Value	SDI-12 Command	Register Value
xC3!	23	xC8!	28
xC4!	24	xC9!	29

The Modbus configuration registers are listed. All registers are defined as Modbus holding registers. The factory default values are shown in parentheses. All values are in decimal unless noted otherwise.

Device/CMD Configuration	Registers (Default Value)		
	Enable	Device Address	Device Command
SDI-12 Device/CMD 1	1751 (1)	11001 (48) [1]	11002 (10)
SDI-12 Device/CMD 2	1701 (0)	11201 (49)	11202 (10)
SDI-12 Device/CMD 3	1651 (0)	11401 (50)	11402 (10)
SDI-12 Device/CMD 4	1601 (0)	11601 (51)	11602 (10)
SDI-12 Device/CMD 5	1551 (0)	11801 (52)	11802 (10)

SDI-12 Device Result Registers

The result registers store all information received from the SDI-12 devices.

The registers are 16-bit registers and require two registers to store a 32-bit value. The factory default configuration defines the result registers as 32-bit registers, floating point format, and the first nine result registers are enabled for use. A host system reads the SDI-12 device data from these registers.

Result Registers	Register 1	Register 2	Register 3	Register 4	Register 5	Register 6
SDI-12 Device/CMD 1 Result Upper	11101	11103	11105	11107	11109	11111
SDI-12 Device/CMD 1 Result Lower	11102	11104	11106	11108	11110	11112
SDI-12 Device/CMD 2 Result Upper	11301	11303	11305	11307	11309	11311
SDI-12 Device/CMD 2 Result Lower	11302	11304	11306	11308	11310	11312
SDI-12 Device/CMD 3 Result Upper	11501	11503	11505	11507	11509	11511
SDI-12 Device/CMD 3 Result Lower	11502	11504	11506	11508	11510	11512
SDI-12 Device/CMD 4 Result Upper	11701	11703	11705	11707	11709	11711
SDI-12 Device/CMD 4 Result Lower	11702	11704	11706	11708	11710	11712
SDI-12 Device/CMD 5 Result Upper	11901	11903	11905	11907	11909	11911
SDI-12 Device/CMD 5 Result Lower	11902	11904	11906	11908	11910	11912

Result Registers	Register 7	Register 8	Register 9	Register 10	Register 11	Register 12
SDI-12 Device/CMD 1 Result Upper	11113	11115	11117	11119	11121	11123
SDI-12 Device/CMD 1 Result Lower	11114	11116	11118	11120	11122	11124
SDI-12 Device/CMD 2 Result Upper	11313	11315	11317	11319	11321	11323
SDI-12 Device/CMD 2 Result Lower	11314	11316	11318	11320	11322	11324
SDI-12 Device/CMD 3 Result Upper	11513	11515	11517	11519	11521	11523
SDI-12 Device/CMD 3 Result Lower	11514	11516	11518	11520	11522	11524
SDI-12 Device/CMD 4 Result Upper	11713	11715	11717	11719	11721	11723
SDI-12 Device/CMD 4 Result Lower	11714	11716	11718	11720	11722	11724
SDI-12 Device/CMD 5 Result Upper	11913	11915	11917	11919	11921	11923
SDI-12 Device/CMD 5 Result Lower	11914	11916	11918	11920	11922	11924

[1] The default device addresses 48 through 52 are in ASCII.

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SDI-12 Device Settings

	Registers (Default Value)							
Device / Cmd Configuration	Enable	Device Address	Switch Power Enable	Device Command	Sample Hi	Sample Low	Warmup Time	Voltage
SDI-12 Device/CMD 1	1751 (1)	11001 (48) [1]	1754 (4)	11002 (10)	1752 (1)	1753 (24464)	1755 (200)	1756 (148)
SDI-12 Device/CMD 2	1701 (0)	11201 (49)	1704 (4)	11202 (10)	1702 (1)	1703 (24464)	1705 (200)	1706 (148)
SDI-12 Device/CMD 3	1651 (0)	11401 (50)	1654 (4)	11402 (10)	1652 (1)	1653 (24464)	1655 (200)	1656 (148)
SDI-12 Device/CMD 4	1601 (0)	11601 (51)	1604 (4)	11602 (10)	1602 (1)	1603 (24464)	1605 (200)	1606 (148)
SDI-12 Device/CMD 5	1551 (0)	11801 (52)	1554 (4)	11802 (10)	1552 (1)	1553 (24464)	1555 (200)	1556 (148)

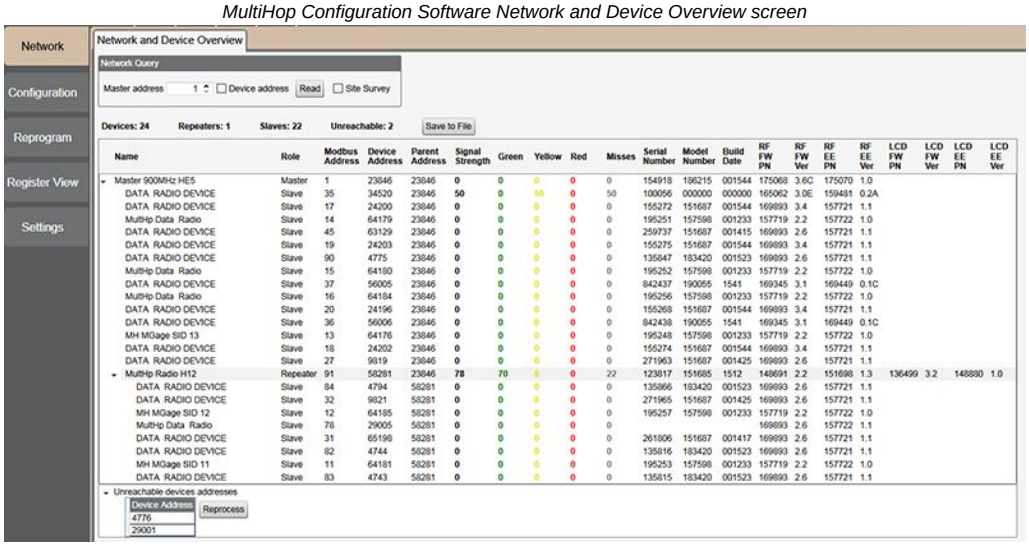
These SDI-12 probes have been tested and are functional with the factory default settings.

MFG	Models	Technical Note
Acclima	SEN-SDI (TDT SDI-12 Soil Moisture Sensor)	SDI-12 and the Acclima TDT SDI-12 Soil Moisture Probe (p/n b_4182040)
Adcon Telemetry	HydraProbeII	
AquaCheck	Sub-surface Probe	SDI-12 and the AquaCheck Sub-Surface Soil Moisture Probe (p/n b_4182041)
Decagon	MPS-2, MPS-6, 5TE, TS1, T8	SDI-12 and the Decagon 5TE Soil Moisture Probe (p/n b_4182042) SDI-12 and the Decagon GS3 Soil Moisture Probe (p/n b_4182043) SDI-12 and the Decagon MPS-2 Soil Moisture Probe (p/n b_4182044)
HSTI	HydraScout	SDI-12 and the HydraScout HSTI Probe (p/n b_4182045)
Sentek	EnviroSCAN	SDI-12 and the Sentek EnviroScan Soil Moisture Probe (p/n b_4182046)

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.

[1] The default device addresses 48 through 52 are in ASCII.

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H14 Modbus Registers

Register (4xxxx)	Input #	Inputs	I/O Range		Holding Register Representation	
			Min. Value	Max. Value	Min. (Dec.)	Max. (Dec.)
1	1	Discrete IN 1	0	1	0	1
	...					
5	5	Analog IN 1 (mA)	0.0	20.0	0	65535
	...					
8	8	Thermistor (°C)	–3276.8	3276.7	–32768	32767
9	9	Counter High Word *	0	65535	0	65535
10	10	Counter Low Word *	0	65535	0	65535
11	11					
12	12	SDI-12 Device/CMD 5 *				
13	13	SDI-12 Device/CMD 4 *				
14	14	SDI-12 Device/CMD 3 *				
15	15	SDI-12 Device/CMD 2 *				
16	16	SDI-12 Device/CMD 1				

* The factory default setting for SDI-12 devices 2 through 5 and the counter input is disabled. The counter and SDI-12 inputs cannot be enabled at the same time.

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.

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

Storage and Sleep Modes

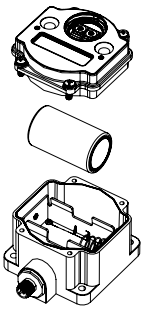
Storage Mode (applies to battery-powered models only)—While in **storage mode**, the radio does not operate. To put any integrated battery Sure Cross® radio into storage mode, press and hold button 1 for five seconds. To wake the device, press and hold button 1 for five seconds. The radio is in storage mode when the LEDs stop blinking, but in some models, the LCD remains on for an additional minute after the radio enters storage mode. After a device has entered storage mode, you must wait one minute before waking it.

Sleep Mode (applies to both battery and 10–30 V DC powered models)—During normal operation, the Sure Cross radio devices enter **sleep mode** after 15 minutes of operation. The radio continues to function, but the LCD goes blank. To wake the device, press any button.

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.

Specifications for the M-H14 Models

Supply Voltage

3.6 V DC (internal battery)

Current Draw at 3.6 V dc

900 MHz, 500 mW: Approximately 1 mA

900 MHz, 250 mW: Approximately 0.5 mA

2.4 GHz, 65 mW: Approximately 0.3 mA

Discrete Input

Rating: 3 mA max current at 30 V DC

Sample Rate: 40 milliseconds

ON Condition (NPN): Less than 0.7 V

OFF Condition (NPN): Greater than 2 V or open

Analog Input

Rating: 24 mA

Impedance: Approximately 220 Ohms(1)

Sample Rate: 1 second

Accuracy: 0.1% of full scale +0.01% per °C

Resolution: 12-bit

Counter Input

Event counter: Input rating 1 Hz to 10 kHz (For battery-powered devices, the recommended input rating is less than 1 kHz)

Rate (frequency) counter: 1 Hz to 10 kHz

Threshold: 1.7 V

(1) To verify the analog input's impedance, use an Ohm meter to measure the resistance between the analog input terminal (AI*x*) and the ground (GND) terminal.

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Housing

Polycarbonate housing and rotary dial cover; 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)

Interface

Two bi-color LED indicators, Two buttons, Six character LCD

Wiring Access

Two 1/2-inch NPT

Thermistor Input

Model: Omega's 44006 or 44031 family of 10 kOhm thermistors

Sample Rate: 1 second

Accuracy: 0.4 °C (10 °C to 50 °C); Up to 0.8 °C (−40 °C to 85 °C)

Certifications

CE/UKCA approval only applies to 2.4 GHz models

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
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/

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)

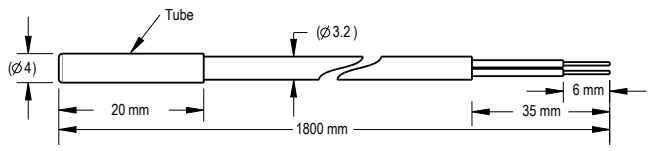
Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Accessories

Thermistor Probes

BWA-THERMISTOR-PROBE-003

- Temperature sensor with thermistor **PS103G2**
- Beta Value(K) 0–50°C: 3575
- Base thermistor accuracy of 0.2%
- Operating Temperature Range: –20 °C to +105 °C (–4 °F to +221 °F)
- Maximum Power Rating: 30 mW at 25 °C; derated to 1 mW at 125 °C
- Dissipation Constant: 1 mW/°C
- 316 stainless steel finish; PVC insulation



Included with the M-H14 and P14 Models

The following items ship with the M-H14 and P14 radios.

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- BWA-HW-059: DX80 Access Hardware Kit, containing one 1/2-inch NPT strain relief fitting with o-ring, and one 1/2-inch NPT plastic vent plug.
- 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-HW-003: PTFE tape
- BWA-9O2-C (900 MHz) or BWA-2O2-C (2.4 GHz): Antenna, 2 dBd Omni, Rubber Swivel RP-SMA Male.
- Quick Start Guide (128185 for DX80 Gateways or 152653 for MultiHop models)
- BWA-BATT-001: Replacement battery, 3.6 V lithium "D" cell

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.

IMPORTANT: Please download the complete MultiHop H14 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 H14 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 H14 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.

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

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For patent information, see www.bannerengineering.com/patents.

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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

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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