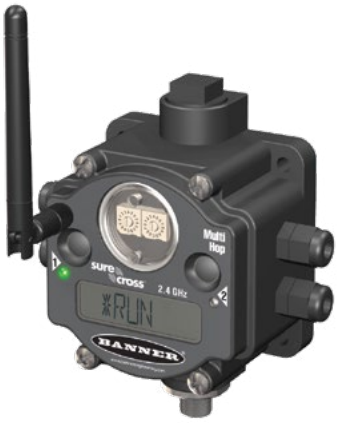
MultiHop Modbus Radios



MultiHop Modbus Data Radios extend the range of Modbus or other Serial communication networks. Each radio may be set to act as either a master, repeater or slave. Models are available with built in discrete and analog I/O, which can be accessed using the Modbus protocol.

Key Features:

- Self-healing, auto routing RF network with multiple hops extends the network's range
- Flexible: DIP switch selectable to be a master, repeater or slave
- User-selectable communication between RS-485 and RS-232

MultiHop Modbus Radios

	Device	ISM Band	Host Comms		I/O
DX80	DR	9	M	–	H
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**H** = No I/O

point-to-point

point-to-multipoint

star

tree

MultiHop Modbus Radios with I/O

	Device	ISM Band	Host Comms		I/O	Housing Options
DX80	DR	9	M	–	H2	
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus			**Blank** = IP67 **C** = IP20 housing (external wiring access) **E** = Environmental housing with internal battery **L** = No LCD, no rotary dials **D** = 10 to 30 V dc power

H1 = FlexPower, 4 Discrete IN, 2 Discrete OUT, 4 Analog IN, 1 thermistor IN, 1 Counter IN
H2 = 4 Discrete IN, 4 Discrete OUT, 2 Analog IN, 2 Analog OUT
H3 = FlexPower, Thermocouple
H4 = FlexPower, RTD
H5 = FlexPower, 4 Discrete IN, 2 Discrete OUT, 4 Analog IN
H6 = Serial interfaceH12 = FlexPower, SDI-12, Bridge, Counter, Discrete, Analog
H12 = FlexPower, SDI-12, Bridge, Counter, Discrete, Analog
H14 = 1 Configurable Discrete IN, 1 Configurable Analog IN, 1 Thermistor, 1 SDI-12, 1 Async Counter, 1 SP
H15 = 2 PNP Discrete IN, 2 0 to 20 mA Analog IN, 2 AC/DC Relay (SPDT), 2 PNP Discrete OUT, 2 0 to10 V Analog OUT
DCLATCH = 2 Discrete IN, 2 Event Counters, 1 DC Latching (H-Bridge) OUT

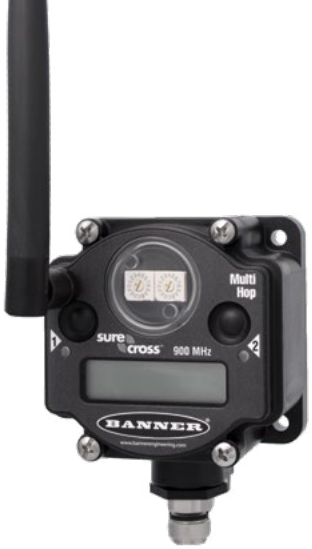
MultiHop Modbus Radios with I/O — Board Models

	Device	ISM Band	Host Comms		I/O
DX80	DR	9	M	–	HB1
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**HB1**= FlexPower board module, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN **HB2** = Board module, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN, 2 Analog OUT

MultiHop Modbus Radios with I/O Specifications*

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Power	*Flex*Power models: 10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%) on the brown wire, or 3.6 to 5.5 V dc low power option on the gray wire 6 Integrated battery models: 3.6 V dc low power option from an internal battery or 10 to 30 V dc Master radio consumption (900 MHz): Maximum current draw is < 100 mA and typical current draw is < 30 mA at 24 V dc (2.4 GHz consumption is less) Repeater/slave radio consumption (900 MHz): Maximum current draw is < 40 mA and typical current draw is < 20 mA at 24 V dc (2.4 GHz consumption is less)	
Compliance	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: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
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 Tool Data format: 8 data bits, no parity, 1 stop bit	
Packet Size (MultiHop)	900 MHz: 175 bytes (85 Modbus registers)	2.4 GHz: 75 bytes (37 Modbus registers)
Intercharacter Timing (MultiHop)	3.5 milliseconds	
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) M-Hx and M-HxC models: Mounting: #10 or M5 (SS M5 hardware included) M-HxE models: Mounting: 1/4-in or M7 (SS M7 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Wiring Access	M-Hx models: Four PG-7, One 1/2-in NPT, One 5-pin threaded M12/Euro-style male quick-disconnect M-HxC models: External terminals M-HxE models: Two 1/2-in NPT ports	
Environmental Rating	M-Hx: IEC IP67; NEMA 6 “C” Housing Models: IEC IP20; NEMA 1 “E” Housing Models: IEC IP65; NEMA 4X	
Operating Conditions	M-Hx and M-HxC models: –40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) M-HxE models: –40 °C to +65 °C (–40 °F to +149 °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	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Certifications	CE	

* See datasheet for model specific details



MultiHop Modbus–H6

The -H6 MultiHop Modbus Data Radio has a 1-wire Serial Interface that is designed to transmit data from 1-wire Serial sensors, such as the Banner Temperature and Humidity (M12FTH4Q), Vibration and Temperature (QM42VT1), or Ultrasonic (K50UX1RA) sensors.

Key Features:

- 1-wire Serial Interface
- Battery-powered models for a completely wireless solution
- Tree topology allows for multiple hops to cover longer distances and circumvent obstacles

point-to-point

point-to-multipoint

star

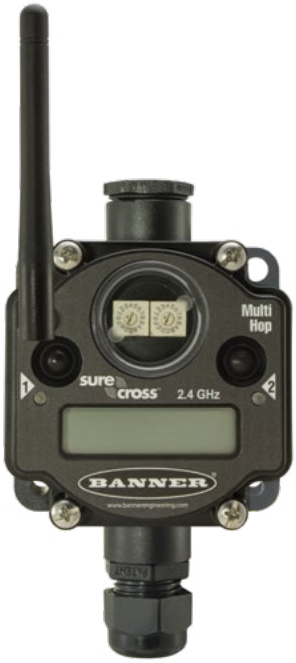
tree

	Device	ISM Band	Host Comms		I/O
DX80	N	9	X	–	H6
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**H6** = Serial interface

Used with		
M12FTH4Q	Temperature and relative humidity via a 1-wire Serial Interface	see page 6
M12FT4Q	Temperature via a 1-wire Serial Interface	
QM42VT1	Vibration and temperature via a 1-wire Serial Interface	see page 10
K50UX1RA	Ultrasonic sensor with a 1-wire Serial Interface	see page 12

MultiHop -H6 Modbus Radio Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Supply Voltage	3.6 V dc low power option from an internal battery	
Compliance	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: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
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 Tool Data format: 8 data bits, no parity, 1 stop bit	
Packet Size (MultiHop)	900 MHz: 175 bytes (85 Modbus registers)	2.4 GHz: 75 bytes (37 Modbus registers)
Intercharacter Timing (MultiHop)	3.5 milliseconds	
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)	
Wiring Access	One 5-pin threaded M12/Euro-style male quick-disconnect	
Environmental Rating	IEC IP67; NEMA 6	
Operating Conditions	–40 °C to +65 °C (–40 °F to +149 °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	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Certifications	CE	



MultiHop Modbus–H14

The -H14 MultiHop Modbus Data Radio makes it easy to add a remote monitoring point to a wireless network. Simply select one I/O from multiple options, then wire a sensor into the easily accessible wiring terminals inside the Node. The integrated D-cell lithium battery makes it easy to deploy, even where power is not readily available.

Key Features:

- Inputs include: One configurable discrete, one configurable analog, one thermistor, one asynchronous counter, and one SDI-12
- Battery-powered models for a completely wireless solution
- Tree topology allows for multiple hops to cover longer distances and circumvent obstacles
- Field-wireable terminal for wiring I/O

Applications:

- Door monitoring
- Tank level monitoring
- High speed counting
- Flow monitoring
- RPM monitoring
- Non-contact temperature monitoring
- Pressure monitoring

point-to-point

point-to-multipoint

star

tree

DX80	DR	9	M	–	H14
	Device	ISM Band	Host Comms		I/O

DR = Modbus

9 = 900 MHz
2 = 2.4 GHz

M = Modbus

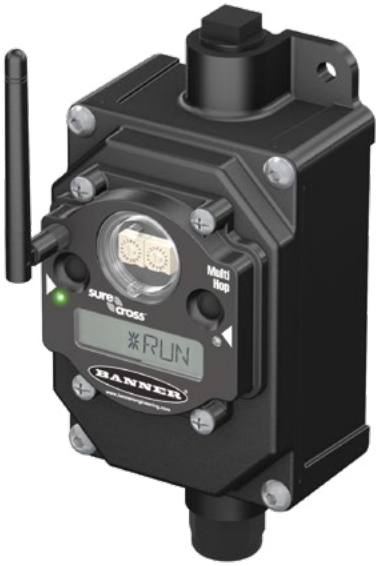
H14 = 1 Configurable Discrete IN, Configurable Analog IN, 1 Thermistor, 1 SDI-12, 1 Async Counter, 1 SP

Used with

T30UX	Long-range ultrasonic sensor	see bannerengineering.com
QT50ULB	Long-range ultrasonic sensor	see bannerengineering.com
M18T	Non-contact temperature sensor	see bannerengineering.com
TL70	Wireless modular tower light	see page 22

DX80 Performance H14 Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	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: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Supply Voltage	3.6 V dc low power option from an 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	
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 Tool Data format: 8 data bits, no parity, 1 stop bit	
Packet Size (MultiHop)	900 MHz: 175 bytes (85 Modbus registers) 2.4 GHz: 75 bytes (37 Modbus registers)	
Intercharacter Timing (MultiHop)	3.5 milliseconds	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Integrated battery models: Weight: 0.30 kg (0.65 lbs) Non-battery models: 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	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Wiring Access	Two 1/2-inch NPT	
Operating Conditions	–40 to +85 °C (–40 to +185 °F) (Electronics); –20 to +80 °C (–4 to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
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 Sample Rate: 1 second Accuracy: 0.1% of full scale +0.01% per °C Resolution: 12-bit	
Thermistor Input	Model: 44006 or 44031 Series of 10 kOhm thermistors Sample Rate: 1 second Report Rate: 64 seconds Accuracy: 0.4 °C (10 °C to 50 °C); Up to 0.8 °C (–40 °C to 85 °C)	
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	
Environmental Rating	IEC IP67; NEMA 6	
Certifications	CE	



MultiHop Modbus–H15E

The H15E MultiHop Modbus Data Radio enables users to wirelessly power and control any connected devices and easily monitor device status and performance. It is easy to deploy and a simple way to remotely control lights, fans, motors, and other AC powered devices without the trouble or expense of running cable.

Key Features:

- Switch AC loads up to 10 amps
- AC power field wireable
- No separate power supply required
- Supply voltage of 100 – 277 V AC at 50/60 Hz

Applications:

- Remotely control lights, dimming levels, fans, and motors
- Provide power and control connectivity to remote I/O devices
- Use as an AC powered repeater to extend the range of the wireless network

point-to-point

point-to-multipoint

star

tree

MultiHop Modbus Radio

Models	I/O	Frequency
DX80DR9M-H15E	Inputs: Two selectable discrete, two 0 to 10 V analog Outputs: Two AC/DC relay (SPDT), two PNP discrete, two 0 to 10 V analog	900 MHz
DX80DR2M-H15E		2.4 GHz

Used with		
WLB92ZC1100ACT	Large, ultra-bright LED work light	
WLB32ZC1130QM	Adjustable LED workstation light	see bannerengineering.com
K50LGRYA120Q	50 mm colored domed indicator	

MultiHop -H15E Modbus Radio Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 150 mW and 250 mW: 2 m (6 ft) 900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	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: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Radio Packet Size	900 MHz: 175 bytes (85 Modbus registers)	2.4 GHz: 75 bytes (37 Modbus registers)
Communication Hardware (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 Tool Data format: 8 data bits, no parity, 1 stop bit	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway	
Supply Voltage	Nominal voltage: 120–277 V ac at 60 Hz in North America Nominal voltage: 100–277 V ac at 50/60 Hz outside North America Maximum supply current: 0.37 A Maximum power consumption: 25 W	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.51 kg (1.13 lbs) Mounting: 1/4-inch or M7 Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Wiring Access	Two 1/2-inch NPSM ports, 14 threads/inch (1/2-14 NPSM)	
Analog Input	0 to 20 mA Input Rating: 24 mA Impedance: Approximately 100 Ohms Sample Rate: 1 second Accuracy: 0.1% of full scale +0.01% per degree C Resolution: 12-bit	
Output State Following Timeout	De-energized (OFF)	
Relay Outputs	SPDT (Form C) relay 277 V ac, 10 A Minimum Mechanical Life: 10,000,000 Surge breakdown voltage (Between contacts and coil) (Initial): 10,000 V	
Analog Output	0 to 10 V Update Rate: 125 milliseconds Accuracy: 1.0% of full scale +0. 01% per °C Resolution: 12-bit	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
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)	
Environmental Rating	IEC IP65	
Certifications	CE c UL us LISTED	