SureCross MultiHop Data Radio

**FlexPower MultiHop Radio with discrete, analog, thermistor, and counter I/O**

### Features

SureCross MultiHop data radios are wireless industrial communication devices used to extend the range of a Modbus or other serial communication network.

- Wireless industrial I/O device with four sinking discrete inputs, two NMOS discrete outputs, two analog (0–20 mA) inputs, one thermistor input, one counter input, and two switch power outputs
- Selectable transmit power levels of 250 mW or 1 Watt and license-free operation up to 4 watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- **FlexPower™** power options allows for +10 to 30 V dc, solar, and battery power sources for low power applications.
- Self-healing, auto-routing RF network with multiple hops extended the network’s range
- Serial and I/O communication on a Modbus platform
- Message routing improves link performance
- DIP switches select operational modes: master, repeater, or slave
- Built-in site survey mode enables rapid assessment of a location’s RF transmission properties
- FHSS radios operate and synchronize automatically; selectable network IDs reduce interference from collocated networks

For additional information, the most recent version of all documentation, and a complete list of accessories, refer to Banner Engineering’s website, [www.bannerengineering.com/surecross](http://www.bannerengineering.com/surecross).

### Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency</th>
<th>Power</th>
<th>Housing</th>
<th>Transmit Power</th>
<th>I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX80DR9M-H1</td>
<td>900 MHz ISM Band</td>
<td>10 to 30 V dc or battery supply module</td>
<td>IP67, NEMA 6</td>
<td>250 mW or 1 Watt (DIP switch selectable)</td>
<td>Inputs: Four sinking discrete, two 0 to 20 mA analog, one thermistor, one sinking counter</td>
</tr>
<tr>
<td>DX80DR9M-H1E</td>
<td>900 MHz ISM Band</td>
<td>10 to 30 V dc or integrated battery</td>
<td>IP54, NEMA 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DX80DR2M-H1</td>
<td>2.4 GHz ISM Band</td>
<td>10 to 30 V dc or battery supply module</td>
<td>IP67, NEMA 6</td>
<td>63 mW (100 mW EIRP)</td>
<td>Outputs: Two NMOS discrete, two switch power</td>
</tr>
<tr>
<td>DX80DR2M-H1E</td>
<td>2.4 GHz ISM Band</td>
<td>10 to 30 V dc or integrated battery</td>
<td>IP54, NEMA 4</td>
<td></td>
<td>Serial interface: RS-485</td>
</tr>
</tbody>
</table>

DX80...C (IP20; NEMA 1) models are also available. To order this model with an IP20 housing, add a C to the end of the model number: DX80DR9M-H1C.

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**WARNING: Not To Be Used for Personnel Protection**

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.
Integrated Battery Replacement (DX80...E Models)

For outside or high humidity environments, conductive grease may be applied to the battery terminals to prevent moisture and corrosion buildup.

To replace the lithium "D" cell battery in any integrated housing model, follow these steps.

1. Remove the four screws mounting the face plate to the housing and remove the face plate. Do not remove the radio cover from the face plate.
2. Remove the discharged battery and replace with a new battery. Only use a 3.6V lithium battery from Xeno, model number XL-205F.
3. Verify the battery’s positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case. Caution: There is a risk of explosion if the battery is replaced incorrectly.
4. After replacing the battery, allow up to 60 seconds for the device to power up.

Properly dispose of your used battery according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or other facility qualified to accept lithium batteries. 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.

Replacement battery model number: BWA-BATT-001. For pricing and availability, contact Banner Engineering.

Specifications

Radio

<table>
<thead>
<tr>
<th>Range</th>
<th>900 MHz: Up to 9.6 kilometers (6 miles) *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.4 GHz: Up to 3.2 kilometers (2 miles) *</td>
</tr>
</tbody>
</table>

Transmit Power

<table>
<thead>
<tr>
<th>900 MHz</th>
<th>30 dBm conducted (up to 36 dBm EIRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 GHz</td>
<td>18 dBm conducted, less than or equal to 20 dBm EIRP</td>
</tr>
</tbody>
</table>

900 MHz Compliance (1 Watt Radios)

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: V1.7.1 (2006-05)
IC: 7044A-DX8024

Notice: This equipment must be professionally installed. The output power must be limited, through the use of firmware or a hardware attenuator, when using high-gain antennas such that the +36 dBm EIRP limit is not exceeded.

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

Antenna Connection

Ext. Reverse Polarity SMA, 50 Ohms
Max Tightening Torque: 0.45 N·m (4 in·lbf)

* With the standard 2 dB antenna. High-gain antennas are available, but the range depends on the environment and line of sight. To determine the range of your wireless network, perform a Site Survey.

General

Power*

FlexPower models: Requirements: +10 to 30V dc (For European applications: +10 to 24V dc, ± 10%) on the brown wire, or 3.6 to 5.5V on the gray wire

Interface

Indicators: Two bi-color LEDs
Buttons: Two
Display: Six character LCD
Integrated battery models: Requirements: 3.6V dc low power option from an internal battery or 10 to 30V dc Master radio consumption (900 MHz): Maximum current draw is <100 mA and typical current draw is <30 mA at 24V 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 24V dc. (2.4 GHz consumption is less.)

**Housing**
- Polycarbonate
- Weight: 0.26 kg (0.57 lbs)
- M-Hx and M-HxC models: Mounting: #10 or M5 (M5 hardware included)
- M-HxE models: Mounting: 1/4-inch or M7 (M7 hardware included)
- Max. Tightening Torque: 0.56 N·m (5 in·lbf)

**Inputs**

**Discrete Inputs**
- Rating: 3 mA max current at 30V dc
- Sample Rate: 40 milliseconds
- ON Condition (NPN): Less than 0.7V
- OFF Condition (NPN): Greater than 2V or open

**Counter Inputs**
- 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 25 kHz

**Analog Inputs**
- Rating: 24 mA
- Sample Rate: 1 second
- Accuracy: 0.1% of full scale +0.01% per °C
- Resolution: 12-bit

**Thermistor (MultiHop)**
- Model: Omega’s 44006 or 44031 families of 10 kOhm
- Sample: 1 second
- Accuracy: 0.4° C (10 to 50° C); Up to 0.8° C (−40 to +85° C)

**Outputs**

**Discrete Output Rating (MultiHop NMOS)**
- Less than 1 A max current at 30V dc
- ON-State Saturation: Less than 0.7V at 20 mA

**Discrete Output ON Condition**
- Less than 0.7V

**Discrete Output OFF Condition**
- Open

**Communication**

**Hardware (RS-485)**
- Interface: 2-wire half-duplex RS-485
- Baud Rates: 9.6k, 19.2k (default), or 38.4k
- Data Format: 8 data bits, no parity, 1 stop bit

Note, the MultiHop models also support 2400 baud communication via Modbus register parameters.

**Packet Size (MultiHop)**
- 900 MHz: 175 bytes
- 2.4 GHz: 125 bytes

**Intercharacter Timing (MultiHop)**
- 3.5 milliseconds

**Environmental**

**Rating**
- M-Hx Models: IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)
- M-HxC Models: IEC IP20; NEMA 1
- M-HxE Models: IEC IP54; NEMA 4

**Shock and Vibration**
- IEC 68-2-6 and IEC 68-2-7
- Shock: 30g, 11 millisecond half sine wave, 18 shocks
- Vibration: 0.5 mm p-p, 10 to 60 Hz
**Operating Temperature**
-40 to +85° C (Electronics); -20 to +80° C (LCD)

**Operating Humidity**
95% max. relative (non-condensing)

**Radiated Immunity**
10 V/m, 80-2700 MHz (EN61000-6-2)

Refer to the SureCross™ MultiHop product manual, Banner p/n 151317, for installation and waterproofing instructions. Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

**Certifications**

**Included with Device**
The following items ship with the DX80 radios.

<table>
<thead>
<tr>
<th>Included with Device</th>
<th>Model</th>
<th>Qty</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX80 Access Hardware Kit *</td>
<td>BWA-HW-002</td>
<td>4</td>
<td>Plastic threaded plugs, PG-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nylon gland fittings, PG-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hex nuts, PG-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Plug, 1/2&quot; NPT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nylon gland fitting, 1/2&quot; NPT</td>
</tr>
<tr>
<td>Mounting Hardware Kit</td>
<td>BWA-HW-001</td>
<td>4</td>
<td>Screw, M5-0.8 x 25mm, SS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Screw, M5-0.8 x 16mm, SS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hex nut, M5-0.8mm, SS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bolt, #8-32 x 3/4&quot;, SS</td>
</tr>
<tr>
<td>PTFE Tape</td>
<td>BWA-HW-003</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Antenna **</td>
<td>BWA-9O2-C, or</td>
<td>1</td>
<td>Antenna, 902-928 MHz, 2 dBd Omni, Rubber Swivel RP-SMA Male</td>
</tr>
<tr>
<td></td>
<td>BWA-2O2-C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SureCross Literature CD</td>
<td>79685</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SureCross Quick Start Guide</td>
<td>128185</td>
<td>1</td>
<td>(Ships with Gateways)</td>
</tr>
<tr>
<td>Cable *</td>
<td>MQDC1-506</td>
<td>1</td>
<td>Cable, 5-Euro (single ended), Straight, 2m</td>
</tr>
<tr>
<td>IP20 Screw Terminal Headers (2 pack)</td>
<td>BWA-HW-011</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

* Not included with IP20 DX80...C models.
** Internal antenna devices do not ship with this antenna.
*** Not included with IP67 DX80 models.

**Included with Device (DX80...E Models)**
The following items ship with the DX80...E (NEMA 4) models.

<table>
<thead>
<tr>
<th>Included with Device</th>
<th>Model</th>
<th>Qty</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting Hardware Kit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTFE Tape</td>
<td>BWA-HW-003</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
SureCross MultiHop Radio with RTD I/O

Configurable FlexPower MultiHop radio with RTD inputs

Features

SureCross MultiHop data radios are wireless industrial communication devices used to extend the range of a Modbus or other serial communication network.

- Wireless industrial I/O device with four Pt100 RTD inputs
- Selectable transmit power levels of 250 mW or 1 Watt and license-free operation up to 4 watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- FlexPower™ power options allows for +10 to 30V dc, solar, and battery power sources for low power applications.
- Self-healing, auto-routing RF network with multiple hops extended the network’s range
- Serial and I/O communication on a Modbus platform
- Message routing improves link performance
- DIP switches select operational modes: master, repeater, or slave
- Built-in site survey mode enables rapid assessment of a location’s RF transmission properties
- FHSS radios operate and synchronize automatically; selectable network IDs reduce interference from collocated networks

For additional information, the most recent version of all documentation, and a complete list of accessories, refer to Banner Engineering’s website, www.bannerengineering.com/surecross.

Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency</th>
<th>Power</th>
<th>Housing</th>
<th>Transmit Power</th>
<th>I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX80DR9M-H4</td>
<td>900 MHz ISM Band</td>
<td>10 to 30V dc or battery supply</td>
<td>IP67, NEMA 6</td>
<td>250 mW or 1 Watt (DIP switch selectable)</td>
<td>Inputs: Four 3-wire Pt100 RTDs</td>
</tr>
<tr>
<td>DX80DR9M-H4E</td>
<td>10 to 30V dc or integrated battery</td>
<td></td>
<td>IP54, NEMA 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DX80DR2M-H4</td>
<td>2.4 GHz ISM Band</td>
<td>10 to 30V dc or battery supply</td>
<td>IP67, NEMA 6</td>
<td>63 mW (100 mW EIRP)</td>
<td>Serial interface: RS-232</td>
</tr>
<tr>
<td>DX80DR2M-H4E</td>
<td>10 to 30V dc or integrated battery</td>
<td></td>
<td>IP54, NEMA 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DX80...C (IP20; NEMA 1) models are also available. To order this model with an IP20 housing, add a C to the end of the model number: DX80DR9M-H4C.

WARNING: Not To Be Used for Personnel Protection

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.
Setting the MultiHop Radio (Slave) ID

On a MultiHop radio, use the rotary dials to set the device’s MultiHop Radio ID. By factory default, Modbus Slave IDs 01 through 10 are reserved for slaves directly connected to the host (local I/O). Polling messages addressed to these devices are not relayed over the wireless link.

Use Modbus Slave IDs 11 through 61 for MultiHop master, repeater, and slave radios. Up to 50 devices (local slaves and remote slaves) may be used in this system.

With the left dial acting as the left digit and the right dial acting as the right digit, the MultiHop Radio ID can be set from 01 through 61.

Modbus Register Configuration

The factory default settings for the inputs, outputs, and device operations can be changed by the user through the device Modbus registers. To change parameters, the data radio network must be set to Modbus mode and the data radio must be assigned a valid Modbus slave ID.

Generic input or output parameters are grouped together based on the device input or output number: input 1, input 2, output 1 etc. Operation type specific parameters (discrete, counter, analog 4 to 20 mA) are grouped together based on the I/O type number: analog 1, analog 2, counter 1, etc.

Not all inputs or outputs may be available for all models. To determine which specific I/O is available on your model, refer to the Modbus Input/Output Register Maps listed in the device’s data sheet.

For more information about registers, refer to the MultiHop Product Manual, Banner part number 151317.

Integrated Battery Replacement (DX80...E Models)

For outside or high humidity environments, conductive grease may be applied to the battery terminals to prevent moisture and corrosion buildup.

To replace the lithium "D" cell battery in any integrated housing model, follow these steps.

1. Remove the four screws mounting the face plate to the housing and remove the face plate. Do not remove the radio cover from the face plate.
2. Remove the discharged battery and replace with a new battery. Only use a 3.6V lithium battery from Xeno, model number XL-205F.
3. Verify the battery’s positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case. Caution: There is a risk of explosion if the battery is replaced incorrectly.
4. After replacing the battery, allow up to 60 seconds for the device to power up.

Properly dispose of your used battery according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or other facility qualified to accept lithium batteries. 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.

Replacement battery model number: BWA-BATT-001. For pricing and availability, contact Banner Engineering.

Specifications

Radio

<table>
<thead>
<tr>
<th>Range</th>
<th>Spread Spectrum Technology</th>
<th>Antenna Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>900 MHz: Up to 9.6 kilometers (6 miles) *</td>
<td>FHSS (Frequency Hopping Spread Spectrum)</td>
<td>Ext. Reverse Polarity SMA, 50 Ohms</td>
</tr>
<tr>
<td>2.4 GHz: Up to 3.2 kilometers (2 miles) *</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transmit Power

www.bannerengineering.com - tel: 763-544-3164
900 MHz: 30 dBm conducted (up to 36 dBm EIRP)
2.4 GHz: 18 dBm conducted, less than or equal to 20 dBm EIRP

**900 MHz Compliance (1 Watt Radios)**

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: V1.7.1 (2006-05)
IC: 7044A-DX8024

Notice: This equipment must be professionally installed. The output power must be limited, through the use of firmware or a hardware attenuator, when using high-gain antennas such that the +36 dBm EIRP limit is not exceeded.

**General**

**Power**

M-Hx Requirements: +10 to 30V dc (For European applications: +10 to 24V dc, ± 10%) on the brown wire, or 3.6 to 5.5V on the gray wire
M-HxE Requirements: 3.6V dc low power option from an internal battery or 10 to 30V dc
Master radio consumption (900 MHz): Maximum current draw is <100 mA and typical current draw is <30 mA at 24V 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 24V dc. (2.4 GHz consumption is less.)

**Housing**

Polycarbonate
Weight: 0.26 kg (0.57 lbs)
M-Hx and M-HxC: Mounting: #10 or M5 (M5 hardware included)
M-HxE Mounting: 1/4-inch or M7 (M7 hardware included)
Max. Tightening Torque: 0.45 N·m (4 in·lbf)

**Inputs**

**RTD Inputs (MultiHop)**
Sample Rate: 1 second
Accuracy: 0.1% of full scale
Resolution: 0.1° C, 24-bit A/D converter

**Communication**

**Hardware (RS-232)**
Interface: 2-wire RS-232
Baud Rates: 9.6k, 19.2k (default), or 38.4k
Data Format: 8 data bits, no parity, 1 stop bit

**Packet Size (MultiHop)**
900 MHz: 175 bytes
2.4 GHz: 125 bytes

**Intercharacter Timing (MultiHop)**

* With the standard 2 dB antenna. High-gain antennas are available, but the range depends on the environment and line of sight. To determine the range of your wireless network, perform a Site Survey.

* For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.
Note, the MultiHop models also support 2400 baud communication via Modbus register parameters.

3.5 milliseconds

Environmental

Environmental
Rating for M-Hx models: IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)
Rating for M-HxC models: IEC IP20; NEMA 1
Rating for M-HxE models: IEC IP54; NEMA 4
Operating Temperature: −40 to +85° C (Electronics); −20 to +80° C (LCD)
Operating Humidity: 95% max. relative (non-condensing)
Radiated Immunity: 10 V/m, 80-2700 MHz (EN61000-6-2)

Shock and Vibration
IEC 68-2-6 and IEC 68-2-7
Shock: 30g, 11 millisecond half sine wave, 18 shocks
Vibration: 0.5 mm p-p, 10 to 60 Hz

Refer to the SureCross™ MultiHop product manual, Banner p/n 151317, for installation and waterproofing instructions. Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Certifications

Included with Device
The following items ship with the DX80 radios.

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<td>Nylon gland fittings, PG-7</td>
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<td></td>
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<td></td>
<td>Plug, 1/2&quot; NPT</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Nylon gland fitting, 1/2&quot; NPT</td>
</tr>
<tr>
<td>Mounting Hardware Kit</td>
<td>BWA-HW-001</td>
<td>4</td>
<td>Screw, M5-0.8 x 25mm, SS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Screw, M5-0.8 x 16mm, SS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hex nut, M5-0.8mm, SS</td>
</tr>
<tr>
<td>PTFE Tape</td>
<td>BWA-HW-003</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Antenna **</td>
<td>BWA-9O2-C, or</td>
<td>1</td>
<td>Antenna, 902-928 MHz, 2 dBD Omni, Rubber Swivel RP-SMA Male, or Antenna, 2.4 GHz, 2 dBD Omni, Rubber Swivel RP-SMA Male</td>
</tr>
<tr>
<td></td>
<td>BWA-2O2-C</td>
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<tr>
<td>SureCross Literature CD</td>
<td>79685</td>
<td>1</td>
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<tr>
<td>SureCross Quick Start Guide</td>
<td>128185</td>
<td>1</td>
<td>(Ships with Gateways)</td>
</tr>
<tr>
<td>Cable *</td>
<td>MQDC1-506</td>
<td>1</td>
<td>Cable, 5-Euro (single ended), Straight, 2m</td>
</tr>
<tr>
<td>IP20 Screw Terminal Headers (2 pack) ***</td>
<td>BWA-HW-011</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

* Not included with IP20 DX80...C models.
** Internal antenna devices do not ship with this antenna.
SureCross MultiHop Radio with Thermocouple I/O

Configurable FlexPower MultiHop Radio with Thermocouple and Discrete I/O

Features

SureCross MultiHop data radios are wireless industrial communication devices used to extend the range of a Modbus or other serial communication network.

- Wireless industrial I/O device with four thermocouple inputs, two sinking discrete inputs, one thermistor input, and two NMOS discrete outputs
- Selectable transmit power levels of 250 mW or 1 Watt and license-free operation up to 4 watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- FlexPower™ power options allows for +10 to 30V dc, solar, and battery power sources for low power applications.
- Self-healing, auto-routing RF network with multiple hops extended the network’s range
- Serial and I/O communication on a Modbus platform
- Message routing improves link performance
- DIP switches select operational modes: master, repeater, or slave
- Built-in site survey mode enables rapid assessment of a location’s RF transmission properties
- FHSS radios operate and synchronize automatically; selectable network IDs reduce interference from collocated networks

For additional information, the most recent version of all documentation, and a complete list of accessories, refer to Banner Engineering's website, www.bannerengineering.com/surecross.

Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency</th>
<th>Power</th>
<th>Housing</th>
<th>Transmit Power</th>
<th>I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX80DR9M-H3</td>
<td>900 MHz</td>
<td>10 to 30V dc or battery</td>
<td>IP67, NEMA 6</td>
<td>250 mW or 1 Watt (DIP switch selectable)</td>
<td>Inputs: Two sinking discrete, four thermocouple, one thermistor (internal)</td>
</tr>
<tr>
<td></td>
<td>ISM Band</td>
<td>supply module</td>
<td></td>
<td></td>
<td>Outputs: Two NMOS discrete</td>
</tr>
<tr>
<td>DX80DR9M-H3E</td>
<td></td>
<td>10 to 30V dc or integrated</td>
<td>IP54, NEMA 4</td>
<td></td>
<td>Serial interface: RS-232</td>
</tr>
<tr>
<td></td>
<td></td>
<td>battery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DX80DR2M-H3</td>
<td>2.4 MHz</td>
<td>10 to 30V dc or battery</td>
<td>IP67, NEMA 6</td>
<td>63 mW (100 mW EIRP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISM Band</td>
<td>supply module</td>
<td>IP54, NEMA 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DX80DR2M-H3E</td>
<td></td>
<td>10 to 30V dc or integrated</td>
<td>IP54, NEMA 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>battery</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DX80...C (IP20; NEMA 1) models are also available. To order this model with an IP20 housing, add a C to the end of the model number: DX80DR9M-H3C.

WARNING: Not To Be Used for Personnel Protection

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.
**Integrated Battery Replacement (DX80...E Models)**

For outside or high humidity environments, conductive grease may be applied to the battery terminals to prevent moisture and corrosion buildup.

To replace the lithium "D" cell battery in any integrated housing model, follow these steps.

1. Remove the four screws mounting the face plate to the housing and remove the face plate. Do not remove the radio cover from the face plate.
2. Remove the discharged battery and replace with a new battery. Only use a 3.6V lithium battery from Xeno, model number XL-205F.
3. Verify the battery’s positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case. Caution: There is a risk of explosion if the battery is replaced incorrectly.
4. After replacing the battery, allow up to 60 seconds for the device to power up.

Properly dispose of your used battery according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or other facility qualified to accept lithium batteries. 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.

Replacement battery model number: BWA-BATT-001. For pricing and availability, contact Banner Engineering.

**Specifications**

**Radio**

- **Range**
  - 900 MHz: Up to 9.6 kilometers (6 miles) *
  - 2.4 GHz: Up to 3.2 kilometers (2 miles) *

- **Transmit Power**
  - 900 MHz: 30 dBm conducted (up to 36 dBm EIRP)
  - 2.4 GHz: 18 dBm conducted, less than or equal to 20 dBm EIRP

- **900 MHz Compliance (1 Watt Radios)**
  - 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: V1.7.1 (2006-05)
  - 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 in·lbf)

*With the standard 2 dB antenna. High-gain antennas are available, but the range depends on the environment and line of sight. To determine the range of your wireless network, perform a Site Survey.

**General**

**Power**

- FlexPower models: Requirements: +10 to 30V dc (For European applications: +10 to 24V dc, ± 10%) on the brown wire, or 3.6 to 5.5V on the gray wire

**Interface**

- Indicators: Two bi-color LEDs
- Buttons: Two
- Display: Six character LCD
Integrated battery models: Requirements: 3.6V dc low power option from an internal battery or 10 to 30V dc Master radio consumption (900 MHz): Maximum current draw is <100 mA and typical current draw is <30 mA at 24V 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 24V dc. (2.4 GHz consumption is less.)

Housing
Polycarbonate
Weight: 0.26 kg (0.57 lbs)
M-Hx and M-HxC models: Mounting: #10 or M5 (M5 hardware included)
M-HxE models: Mounting: 1/4-inch or M7 (M7 hardware included)
Max. Tightening Torque: 0.56 N·m (5 in·lbf)

Wiring Access
M-Hx models: Four PG-7, One 1/2-inch NPT, One 5-pin Euro-style male connector
M-HxC models: External terminals
M-HxE models: Two 1/2-inch NPT
* For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.

Inputs

Discrete Inputs
Rating: 3 mA max current at 30V dc
Sample Rate: 40 milliseconds
ON Condition (NPN): Less than 0.7V
OFF Condition (NPN): Greater than 2V or open

Thermocouple Inputs (MultiHop)
Sample Rate: 8 seconds
Accuracy: 0.1% of full scale reading + 0.8°C
0.1°C, 24-bit A/D converter

Thermistor (MultiHop)
Model: Omega’s 44006 or 44031 families of 10 kOhm
Sample: 1 second
Accuracy: 0.4°C (10 to 50°C); Up to 0.8°C (−40 to +85°C)

Outputs

Discrete Outputs
ON Condition: Less than 0.7V
OFF Condition: Open

Discrete Output Rating (MultiHop NMOS)
Less than 1 A max current at 30V dc
ON-State Saturation: Less than 0.7V at 20 mA

Communication

Hardware (RS-232)
Interface: 2-wire RS-232
Baud Rates: 9.6k, 19.2k (default), or 38.4k
Data Format: 8 data bits, no parity, 1 stop bit
Note, the MultiHop models also support 2400 baud communication via Modbus register parameters.

Packet Size (MultiHop)
900 MHz: 175 bytes
2.4 GHz: 125 bytes

Intercharacter Timing (MultiHop)
3.5 milliseconds

Environmental

Rating
Rating for M-Hx models: IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)
Rating for M-HxC models: IEC IP20; NEMA 1

Shock and Vibration
IEC 68-2-6 and IEC 68-2-7
Shock: 30g, 11 millisecond half sine wave, 18 shocks
Vibration: 0.5 mm p-p, 10 to 60 Hz
Rating for M-HxE models: IEC IP54; NEMA 4
Operating Temperature: −40 to +85° C (Electronics);
−20 to +80° C (LCD)
Operating Humidity: 95% max. relative (non-condensing)
Radiated Immunity: 10 V/m, 80-2700 MHz
(EN61000-6-2)

Refer to the SureCross™ MultiHop product manual, Banner p/n 151317, for installation and waterproofing instructions. Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Certifications

Included with Device

The following items ship with the DX80 radios.

<table>
<thead>
<tr>
<th>Included with Device</th>
<th>Model</th>
<th>Qty</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX80 Access Hardware Kit *</td>
<td>BWA-HW-002</td>
<td>4</td>
<td>Plastic threaded plugs, PG-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nylon gland fittings, PG-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hex nuts, PG-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Plug, 1/2” NPT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Nylon gland fitting, 1/2” NPT</td>
</tr>
<tr>
<td>Mounting Hardware Kit</td>
<td>BWA-HW-001</td>
<td>4</td>
<td>Screw, M5-0.8 x 25mm, SS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Screw, M5-0.8 x 16mm, SS</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Hex nut, M5-0.8mm, SS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Bolt, #8-32 x 3/4&quot;, SS</td>
</tr>
<tr>
<td>PTFE Tape</td>
<td>BWA-HW-003</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Antenna **</td>
<td>BWA-902-C, or BWA-202-C</td>
<td>1</td>
<td>Antenna, 902-928 MHz, 2 dBD Omni, Rubber Swivel RP-SMA Male, or Antenna, 2.4 GHz, 2 dBD Omni, Rubber Swivel RP-SMA Male</td>
</tr>
<tr>
<td>SureCross Literature CD</td>
<td>79685</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SureCross Quick Start Guide</td>
<td>128185</td>
<td>1</td>
<td>(Ships with Gateways)</td>
</tr>
<tr>
<td>Cable *</td>
<td>MQDC1-506</td>
<td>1</td>
<td>Cable, 5-Euro (single ended), Straight, 2m</td>
</tr>
<tr>
<td>IP20 Screw Terminal Headers (2 pack) ***</td>
<td>BWA-HW-011</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

* Not included with IP20 DX80...C models.
** Internal antenna devices do not ship with this antenna.
*** Not included with IP67 DX80 models.

Included with Device (DX80...E Models)

The following items ship with the DX80...E (NEMA 4) models.

<table>
<thead>
<tr>
<th>Included with Device</th>
<th>Model</th>
<th>Qty</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting Hardware Kit</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>