Sure Cross® DXM150-B2 Wireless Controller

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more sensors, more solutions

Datasheet

The DXM150-B2 Wireless Controller is a communications gateway that interfaces local serial ports, local I/O ports, and local ISM radio devices to the Internet using either a cellular connection or a wired network connection.

- Powered by 12 to 30 V dc, 12 V dc solar panel, or battery backup
- Master RS-485/Slave RS-485, Ethernet, and USB communication ports
- Local I/O options: isolated discrete inputs, universal inputs, PNP/NPN outputs, and analog outputs
- Display options include an interactive LCD display for I/O information and user programmable LED functions
- ISM radios available in either a 900 MHz band or 2.4 GHz band for local wireless networks
- Internal cellular radio

⚠️ **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.
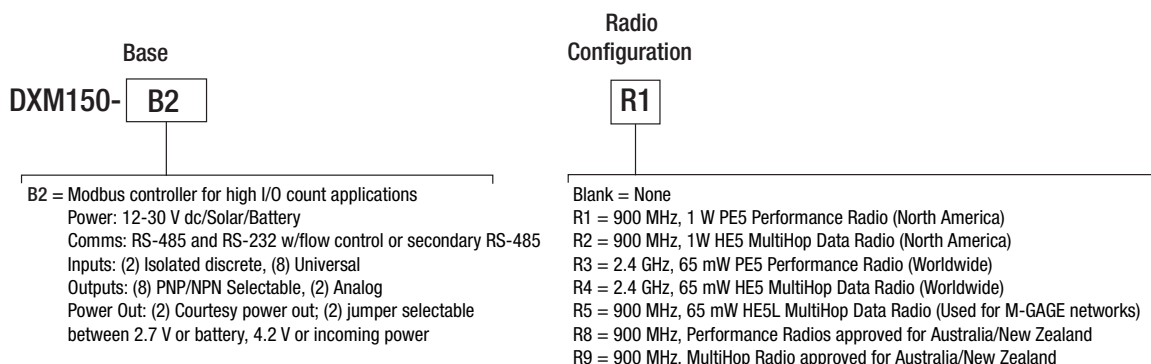
👉 **Important:**
- **Never operate a 1 Watt radio without connecting an antenna**
- Operating 1 Watt radios without an antenna connected will damage the radio circuitry.
- To avoid damaging the radio circuitry, never apply power to a Sure Cross® Performance or Sure Cross MultiHop (1 Watt) radio without 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.

Model Key for the DXM150-B2 Models

Base

DXM150- | B2

Radio Configuration

R1

B2 = Modbus controller for high I/O count applications
  Power: 12-30 V dc/Solar/Battery
  Comms: RS-485 and RS-232 w/flow control or secondary RS-485
  Inputs: (2) Isolated discrete, (8) Universal
  Outputs: (8) PNP/NPN Selectable, (2) Analog
  Power Out: (2) Courtesy power out; (2) jumper selectable
  between 2.7 V or battery, 4.2 V or incoming power

Blank = None
R1 = 900 MHz, 1 W PE5 Performance Radio (North America)
R2 = 900 MHz, 1W HE5 MultiHop Data Radio (North America)
R3 = 2.4 GHz, 65 mW PE5 Performance Radio (Worldwide)
R4 = 2.4 GHz, 65 mW HE5 MultiHop Data Radio (Worldwide)
R5 = 900 MHz, 65 mW HE5L MultiHop Data Radio (Used for M-GAGE networks)
R8 = 900 MHz, Performance Radios approved for Australia/New Zealand
R9 = 900 MHz, MultiHop Radio approved for Australia/New Zealand

Some example models include, but are not limited to, the following:

Models	Description
DXM150-B2R1	DXM150-B2 Wireless Controller with DX80 ISM 900 MHz radio
DXM150-B2R2	DXM150-B2 Wireless Controller with Data Radio ISM 900 MHz radio

Cellular Communication—Controllers accept Banner GSM and LTE modems only. Cellular modems are ordered separately as accessories under the following part numbers:

- GSM/3G (HSPA): **SXI-GSM-001**
- LTE-Verizon: **SXI-LTE-001**
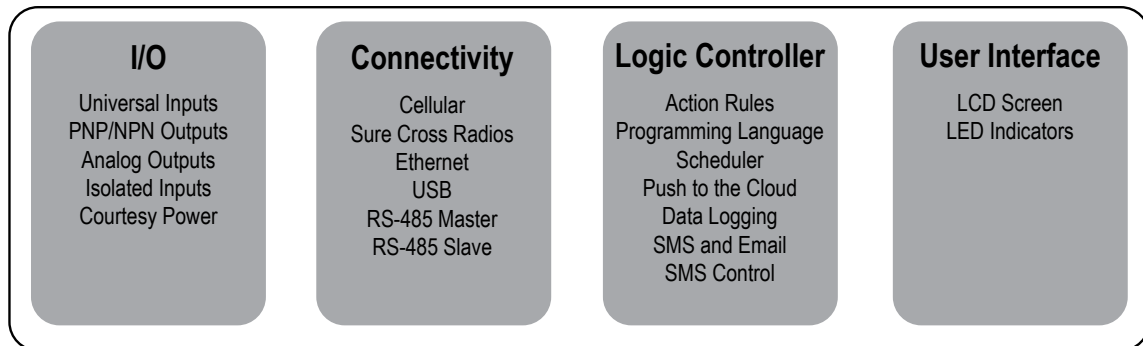
DXM150 Documentation List

For more information about the DXM Wireless Controller family of products, please see additional documentation and videos on the Banner website: *www.bannerengineering.com/wireless*.

- DXM Wireless Controller Sell Sheet, p/n *194063*
- DXM150-B1 Wireless Controller Datasheet, p/n *178136*
- DXM150-B2 Wireless Controller Datasheet, p/n *195952*
- DXM150-Bx Wireless Controller Instruction Manual, p/n *190038*
- DXM150-S1 Modbus Slave Datasheet, p/n *160171*
- DXM150-S2 Modbus Slave Datasheet, p/n *200634*
- DXM150-Sx Modbus Slave Instruction Manual, p/n *195455*
- DXM ScriptBasic Instruction Manual, p/n *191745*
- DXM Controller Configuration Quick Start, p/n *191247*
- DXM Configuration Tool software (p/n *b_4447978*)
- DXM Configuration Tool Instruction Manual, p/n *158447*
- DXM EDS *Configuration file* for Allen-Bradley PLCs
- EIP Configuration File for DXM 1xx-BxR1 and R3 models (p/n *194730*)
- Activating a Cellular Modem (p/n *b_4419353*)
- Additional technical notes and videos

Technical notes, configuration examples, and ScriptBasic program examples are available at *http://www.bannerengineering.com*.

DXM150-B2 System Overview

Banner's DXM Logic Controller integrates Banner's wireless radio, cellular connectivity, and local I/O to provide a platform for the Industrial Internet of Things (IIoT).

I/O	**Connectivity**	**Logic Controller**	**User Interface**
Universal Inputs	Cellular	Action Rules	LCD Screen
PNP/NPN Outputs	Sure Cross Radios	Programming Language	LED Indicators
Analog Outputs	Ethernet	Scheduler	
Isolated Inputs	USB	Push to the Cloud	
Courtesy Power	RS-485 Master	Data Logging	
	RS-485 Slave	SMS and Email	
		SMS Control	

Inputs/Outputs—On-board universal and programmable I/O ports connect to local sensors, indicators, and control equipment.

- Universal Inputs
- Analog outputs
- PNP/NPN outputs
- Isolated inputs
- Courtesy power
- Battery backup
- Solar controller

Connectivity—The DXM Wireless Controller's wired and wireless connectivity options make it easy to share data between local and remote equipment. The cellular modem option eliminates the need for IT infrastructures to connect remote equipment for sensing and control. The integrated Sure Cross® wireless radio enables Modbus connectivity to remote sensors, indicators, and control equipment.

Wired Connectivity

Ethernet: Modbus TCP or Ethernet/IP

Field Bus: Modbus RS-485 Master/Slave or CAN

Wireless Connectivity

Sure Cross Wireless Radio: DX80 900 MHz, DX80 2.4 GHz, MultiHop 900 MHz, or MultiHop 2.4 GHz

Cellular modem: CDMA (Verizon), GSM 3G, LTE (Verizon)

Logic Controller—Program the DXM Wireless Controller's logic controller using action rules and/or ScriptBasic language, which can execute concurrently. The control functions allow freedom when creating custom sensing and control sequences. The logic controller supports the Modbus protocol standards for data management, ensuring seamless integration with existing automation systems.

Action Rules
- Supports simple logic, arithmetic and thresholding
- Low complexity solutions
- SMS text message Notifications
- E-mail Notifications
- Push data on conditions

Text Programming Language
- ScriptBasic
- Medium complexity solutions

Scheduler
- Time/calendar-based events
- Astronomical clock

Data Logging
- Cyclic Data/Event logging
- E-mail log files

SMS Commanding
- Read/Write Local Registers
- Force a push to the cloud
- Reboot controller

User Interface—A simple user interface consists of an LCD screen and four LED indicators. Use the LCD to access system status and setup, view user selectable events or data, and to bind and perform site surveys for Sure Cross radios. Configure the user programmable LEDs to indicate the status of the DXM Wireless Controller, processes, or equipment.

User programmable LCD
- Bind Sure Cross Radios
- Site Survey
- View Sensor Information
- System Status

User Defined LED indicators

Applications Overview

The DXM150-B2 Wireless Controller is ideal for smart factory and facilities applications, including:
- Productivity solutions, such as
  - Call for parts, service, or maintenance
  - Pick-to-light
  - Tank level monitoring
- Predictive maintenance and continuous monitoring using
  - Vibration and temperature monitoring
  - Non-contact temperature monitoring
- Environmental monitoring and control, such as
  - Temperature and humidity monitoring

The DXM150-B2 Wireless Controller can provide visual indication using indicator lights, send text or email alerts, collect data, and interface with automation systems.

Specifications

MultiHop Radio Specifications

Radio Range[1]
900 MHz, 1 Watt: Up to 9.6 km (6 miles)
2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

Antenna 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

Spread Spectrum Technology
FHSS (Frequency Hopping Spread Spectrum)

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

2.4 GHz Compliance (MultiHop)
FCC ID UE300DX80-2400: FCC Part 15, Subpart C, 15.247
RED Directive 2014/53/EU
IC: 7044A-DX8024

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

Radio Packet Size (MultiHop)
900 MHz: 175 bytes (85 Modbus registers)
2.4 GHz: 75 bytes (37 Modbus registers)

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[1] Radio range is with the 2 dB antenna that ships with the product. High-gain antennas are available, but the range depends on the environment and line of sight. Always verify your wireless network's range by performing a Site Survey.

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

RS-232 Communication Specifications

Communication Hardware (MultiHop RS-232)
Interface: 2-wire RS-232
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

Power and I/O Specifications

Supply Voltage
12 to 30 V dc (use only with a suitable Class 2 power supply (UL) or a SELV (CE) power supply) or
12 V dc solar panel and 12 V sealed lead acid battery

Power Consumption
35 mA average at 12 Volts

Solar Power Battery Charging
1 A maximum with 20 Watt solar panel

Solar Power
12 V sealed lead acid battery
2 A maximum charge current
12 V, 20 W maximum solar panel

Courtesy Power Out
Two incoming power or battery power
100 mA maximum

Universal Inputs
Sinking/Sourcing discrete, 4–20 mA analog, 0–10 V analog, counter, and temperature 10 kOhm thermistor

Counters, Synchronous
32-bits unsigned
10 ms clock rate minimum

Discrete Inputs
Optically isolated AC input type
Input to output isolation: 2.5 kV

Analog Outputs (DAC)
0 to 20 mA or 0 to 10 V dc output
Accuracy: 0.1% of full scale +0.01% per °C
Resolution: 12-bit

Selectable (Jumper) Power Out
Output on pin 45, jumper selects 2.7 V or battery
Output on pin 35, jumper selects 4.2 V or incoming power
100 mA maximum

Logging
8 GB maximum; removable Micro SD card format

Security Protocols
VPN, SSL, and HTTPS

Communication Protocols
Modbus RTU Master/Slave, Modbus/TCP, and Ethernet/IP

Construction
Polycarbonate; DIN rail mount option

Indicators
Four LEDs, four control buttons, one LCD

Discrete Outputs
Eight sourcing/PNP, sinking/NPN
ON Condition: Supply minus 2 V
OFF Condition: Less than 2 V

Discrete Output Rating (PNP)
100 mA max current at 30 V dc
ON-State Saturation: Less than 3 V at 100 mA
OFF-state Leakage: Less than 10 µA

Discrete Output Rating (NPN)
100 mA max current at 30 V dc
ON-State Saturation: Less than 1.6 V at 100 mA
OFF-state Leakage: Less than 200 µA for loads greater than 3 kΩ. For load current of 100 mA, leakage is less than 1% of load current.

Environmental Specifications

Operating Conditions[2]
–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD)
Micro CD Card (if applicable): –25 °C to +85 °C (–13 °F to +185 °F)
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

Environmental Rating
IEC IP20

Certifications

(CE approval only applies to 2.4 GHz models)

Accessories

For a complete list of all the accessories for the Sure Cross wireless product line, please download the *Accessories List* (p/n b_3147091)

Cordsets
MQDC1-506—5-pin M12/Euro-style, straight, single ended, 6 ft
MQDC1-530—5-pin M12/Euro-style, straight, single ended, 30 ft
MQDC1-506RA—5-pin M12/Euro-style, right-angle, single ended, 6 ft
MQDC1-530RA—5-pin M12/Euro-style, right-angle, single ended, 30 ft

Misc Accessories
BWA-CG.5-3X5.6-10—Cable Gland Pack: 1/2-inch NPT, Cordgrip for 3 holes of 2.8 to 5.6 mm diam, qty 10
BWA-HW-052— Cable Gland and Vent Plug Pack: includes 1/2-inch NPT gland, 1/2-inch NPT multi-cable gland, and 1/2-inch NPT vent plug, qty 1 each

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

Static and Surge Suppressor

BWC-LFNBMN-DC—Surge Suppressor, bulkhead, N-Type, dc Blocking, N-Type Female, N-Type Male

Short-Range Omni Antennas

BWA-2O2-D—Antenna, Dome, 2.4 GHz, 2 dBi, RP-SMA Box Mount

BWA-9O2-D—Antenna, Dome, 900 MHz, 2 dBi, RP-SMA Box Mount

BWA-9O2-RA—Antenna, Rubber Fixed Right Angle, 900 MHz, 2 dBi, RP-SMA Male Connector

Medium-Range Omni Antennas

BWA-9O5-C—Antenna, Rubber Swivel, 900 MHz 5 dBi, RP-SMA Male Connector

BWA-2O5-C—Antenna, Rubber Swivel, 2.4 GHz 5 dBi, RP-SMA Male Connector

Enclosures and DIN Rail Kits

BWA-AH864—Enclosure, Polycarbonate, with Opaque Cover, 8 × 6 × 4

BWA-AH1084—Enclosure, Polycarbonate, with Opaque Cover, 10 × 8 × 4

BWA-AH12106—Enclosure, Polycarbonate, with Opaque Cover, 12 × 10 × 6

BWA-AH8DR—DIN Rail Kit, 8", 2 trilobular/self-threading screws

BWA-AH10DR—DIN Rail Kit, 10", 2 trilobular/self-threading screws

BWA-AH12DR—DIN Rail Kit, 12", 2 trilobular/self-threading screws

Antenna Cables

BWC-1MRSMN05—LMR100 RP-SMA to N-Type Male, 0.5 m

BWC-2MRSFRS6—LMR200, RP-SMA Male to RP-SMA Female Bulkhead, 6 m

BWC-4MNFN6—LMR400 N-Type Male to N-Type Female, 6 m

Long-Range Omni Antennas

BWA-9O8-AS—Antenna, Fiberglass, 3/4 Wave, 900 MHz, 8 dBi, N-Type Female Connector

BWA-2O8-A—Antenna, Fiberglass, 2.4 GHz, 8 dBi, N-Type Female Connector

Long-Range Yagi Antennas

BWA-9Y10-A—Antenna, 900 MHz, 10 dBd, N-Type Female Connector

Power Supplies

PSD-24-4—DC Power Supply, Desktop style, 3.9 A, 24 V dc, Class 2, 4-pin M12/Euro-style quick disconnect (QD)

PSDINP-24-13 —DC Power Supply, 1.3 Amps, 24 V dc, with DIN Rail Mount, Class I Division 2 (Groups A, B, C, D) Rated

PSDINP-24-25 — DC Power Supply, 2.5 Amps, 24 V dc, with DIN Rail Mount, Class I Division 2 (Groups A, B, C, D) Rated

BWA-SOLAR PANEL 20W—Solar Panel, 12 V, 20 W, Multicrystalline, 573 × 357 × 30, "L" style mounting bracket included (does not include controller)

Warnings

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.** A list of approved countries appears in the *Radio Certifications* section of the product manual. 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. Consult with Banner Engineering Corp. if the destination country is not on this list.

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