Sure Cross® DXM100-B1 Wireless Controller

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more sensors, more solutions

Datasheet

The DXM100-B1 Wireless Controller is an industrial wireless controller that facilitates Industrial Internet of Things (IIoT) applications. As a communications gateway, it interfaces local serial ports, local I/O ports, and local ISM radio devices to the Internet using either a cellular connection or a wired Ethernet network connection.

- Sure Cross® DX80 Gateway or MultiHop 900 MHz or 2.4 GHz radio models available
- Logic controller with action rules and ScriptBasic programming
- Cellular modem Internet connectivity
- Automation protocols include Modbus® TCP, Modbus RTU, and EtherNet/IP™ [1]
- Secure email and text Internet messaging for alarms, alerts, and data log files
- Data logging with removable SD card
- Interactive programmable user interface with LCD and LED indicators
- Universal, on-board I/O with analog and discrete I/O
- Industry standard RS-485, Ethernet, and USB communication ports
- Multiple managed power options with battery backup

Model Key for the DXM100-B1 Models

Base

DXM100- [B1]

B1 = Modbus controller for data aggregation of sensors
and wireless networks
Power: 12−30 V DC/Solar/Battery
Comms: RS-485, CAN, RS-232 w/flow or secondary RS-485
Inputs: (4) universal IN
Outputs: (4) NMOS OUT, (2) analog OUT (0–10 V or 4–20 mA)
Power Out: (2) Selected 5 V or 16 V switched power,
(1) 5 V courtesy power

Radio Configuration

[R1]

Blank = None
R1 = 900 MHz, 1 W PE5 Performance Radio (North America)
R2 = 900 MHz, 1 W 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
DXM100-B1R1	DXM100-B1 Wireless Controller with DX80 ISM 900 MHz radio
DXM100-B1R2	DXM100-B1 Wireless Controller with DX80 ISM 900 MHz MultiHop radio
DXM100-B1R3	DXM100-B1 Wireless Controller with DX80 ISM 2.4 GHz radio
DXM100-B1R4	DXM100-B1 Wireless Controller with DX80 ISM 2.4 GHz MultiHop 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**

DXM100 Documentation

- DXM Wireless Controller Sell Sheet, p/n 194063
- DXM100-B1 Wireless Controller Datasheet, p/n 186724
- DXM100-B2 Wireless Controller Datasheet, p/n 195232
- DXM100-Bx Wireless Controller Instruction Manual, p/n 190037
- DXM100-S1 Modbus Slave Datasheet, p/n 195454
- DXM100-S2 Modbus Slave Datasheet, p/n 195231
- DXM100-Sx Modbus Slave Instruction Manual, p/n 188231
- DXM ScriptBasic Instruction Manual, p/n 191745
- DXM Controller API Protocol, p/n 186221
- DXM Controller Configuration Quick Start, p/n 191247
- SolutionsKit-AG1 Quick Start Guide, p/n 212028
- DXM Configuration Software v4 (p/n b_4496867)

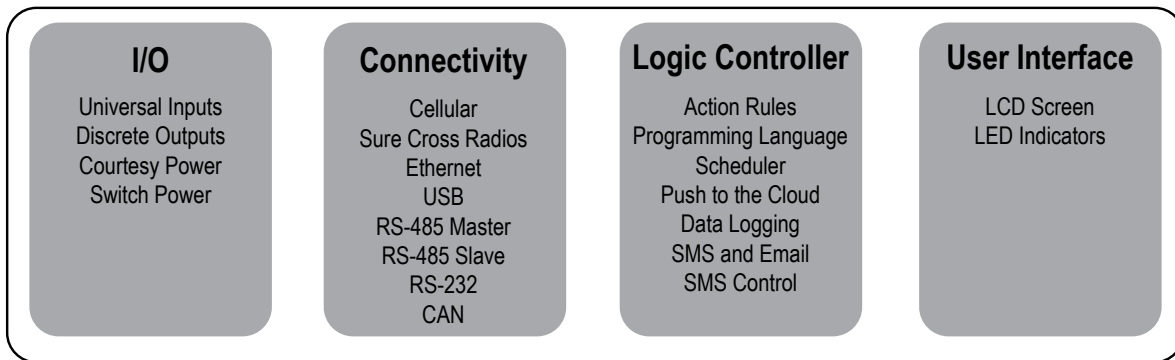[1] EtherNet/IP™ is a trademark of ODVA, Inc. Modbus® is a registered trademark of Schneider Electric USA, Inc.

- DXM Configuration Software v4 Instruction Manual, p/n 209933
- DXM EDS Configuration filefor Allen-Bradley PLCs, p/n b_4205242
- EIP Configuration File for DXM 1xx-BxR1 and R3 models, p/n 194730
- Banner CDS Web Service Quick Start Guide, p/n 201126
- Banner CDS Web Service Instruction Manual, p/n 178337
- Activating a Cellular Modem, p/n b_4419353
- Additional technical notes and videos

For more information about the DXM100 family of products, including technical notes, configuration examples, and ScriptBasic programs, please visit www.bannerengineering.com.

System Overview for the B1 Models

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 Discrete Outputs Courtesy Power Switch Power	Cellular Sure Cross Radios Ethernet USB RS-485 Master RS-485 Slave RS-232 CAN	Action Rules Programming Language Scheduler Push to the Cloud Data Logging SMS and Email SMS Control	LCD Screen LED Indicators

Inputs/Outputs—On-board universal and programmable I/O ports connect to local sensors, indicators, and control equipment.
- Universal Inputs
- Discrete outputs
- Courtesy power
- Switch power
- Battery backup
- Solar controller

Connectivity—The DXM100'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, RS-232, or Controller Area Network (CAN)

Wireless Connectivity
Sure Cross Wireless Radio: DX80 900 MHz, DX80 2.4 GHz, MultiHop 900 MHz, or MultiHop 2.4 GHz
Cellular modem: LTE (United States) or GSM (outside the United States)

Logic Controller—Program the DXM100'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
Use for low complexity solutions
SMS text message Notifications
E-mail Notifications
Push data on conditions

Text Programming Language
ScriptBasic
Use when Action Rules can't supply a solution

Scheduler
Time/calendar-based events
Astronomical clock

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

SMS Commanding
Read/Write Local Registers
Upload data to the cloud-based data service
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 DXM100, processes, or equipment.

User programmable LCD

    Binding Sure Cross radios

    Conducting a Site Survey

    Viewing sensor information

    Viewing the system's status

User Defined LED indicators

Applications Overview

The DXM100-B1 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 DXM100-B1 Wireless Controller can provide visual indication using indicator lights, send text or email alerts, collect data, and interface with automation systems.

Specifications

Radio Specifications

Radio Range [2]
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)

Link Timeout (Performance)
Gateway: Configurable via User Configuration Software
Node: Defined by Gateway

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)

900 MHz Compliance (1 Watt)
FCC ID UE3RM1809: FCC Part 15, Subpart C, 15.247
IC: 7044A-RM1809
IFT: RCPBARM13-2283

(NOM approval only applies to 900 MHz models)

2.4 GHz Compliance
FCC ID UE300DX80-2400: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
IC: 7044A-DX8024
ANATEL: 15966-21-04042 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/

2.4 GHz Compliance (MultiHop)
FCC ID UE300DX80-2400: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
IC: 7044A-DX8024
ANATEL: 15966-21-04042 Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados. Para maiores informações, consulte o site da ANATEL www.gov.br/anatel/pt-br/

RS-485 Communication Specifications

Communication Hardware (MultiHop RS-485)
Interface: 2-wire half-duplex RS-485
Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Software
Data format: 8 data bits, no parity, 1 stop bit

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

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[2] 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.

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

Courtesy Power Out
One output at 5 Volts, 500 mA maximum
No short circuit protection

Power Consumption
35 mA average at 12 Volts (exclusive of load)

Construction
Polycarbonate; DIN rail mount option

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

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

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

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

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

Switched Power Out
Two selectable 5 V or 16 V outputs
5 V: 400 mA maximum
16 V: 125 mA maximum

Security Protocols
VPN, SSL, and HTTPS

Logging
8 GB maximum; removable Micro SD card format

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

Discrete Output Rating (NMOS)
Less than 1 A max current at 30 V DC
ON-State Saturation: Less than 0.7 V at 20 mA
ON Condition: Less than 0.7 V
OFF Condition: Open

Environmental Specifications

Operating Conditions [3]
–20 °C to +60 °C (–4 °F to +140 °F)
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: 15G 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 Rating
IP20

Certifications

CE

cULus LISTED

(CE approval only applies to 2.4 GHz models)

Required Overcurrent Protection

⚠️ **WARNING:** Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

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

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

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, 10 pack
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, one each

Antenna Cables
BWC-1MRSMN05—LMR200 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

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

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

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

Cellular Antenna

BWA-CELLA-002—Cellular multiband, 2 dBi, RP-SMA male connection, 6.3 inch blade style. Datasheet: b_4475176

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.** 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 that 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:** Please download the complete DXM100-B1 Wireless Controller 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 DXM100-B1 Wireless Controller, 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 DXM100-B1 Wireless Controller sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

> **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.

Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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

Notas Adicionales

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.

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

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

81 8363.2714

ANATEL

Modelo (Model): DX80-2400—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/

ANATEL
Agência Nacional de Telecomunicações

ANATEL: 15966-21-04042

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more sensors, more solutions