

Sure Cross® DXM150-B1 Wireless Controller



Datasheet

The DXM150-B1 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
- RS-232, RS-485, Ethernet, and USB communication ports
- Local I/O options: isolated discrete inputs, universal inputs, SPDT (Form C) relay outputs, NMOS outputs, and Analog outputs (0 to 10 V)
- 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

Model Key for the DXM150-B1 Models

Base	Radio Configuration
DXM 150-B1	R1
B1 = Modbus controller designed for applications with high I/O count, isolated inputs or integrated relays Power: 12/30 V DC /Solar/Battery Comms: RS-485 and RS-232 /CAN or secondary RS-485 Inputs: Two isolated discrete, eight universal Outputs: Two relay, four NMOS, two Analog Power Out: Two jms per selectable between 2.7 V or battery, 4.2 V or incoming power	Blank = None R1 = 900 MHz, 1W PE5 Performance Radio (North America) R2 = 900 MHz, 1W HES MultiHop Data Radio (North America) R3 = 2.4 GHz, 65 mW PE5 Performance Radio (Worldwide) R4 = 2.4 GHz, 65 mW HES MultiHop Data Radio (Worldwide) R5 = 900 MHz, 65 mW HES 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-B1C1	DXM150-B1 Wireless Controller with CDMA cellular radio
DXM150-B1R1	DXM150-B1 Wireless Controller with DX80 ISM 900 MHz radio
DXM150-B1R2	DXM150-B1 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

- 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 API Protocol, p/n [186221](#)
- DXM Controller Configuration Quick Start, p/n [191247](#)
- DXM Configuration Software v4 (p/n [b_4496867](#))
- DXM Configuration Software v4 Instruction Manual, p/n [209933](#)
- DXM EDS Configuration file for Allen-Bradley PLCs (p/n [b_4205242](#))
- EIP Configuration File for DXM 1xx-BxR1 and R3 models (p/n [194730](#))
- Activating a Cellular Modem (p/n [b_4419353](#))



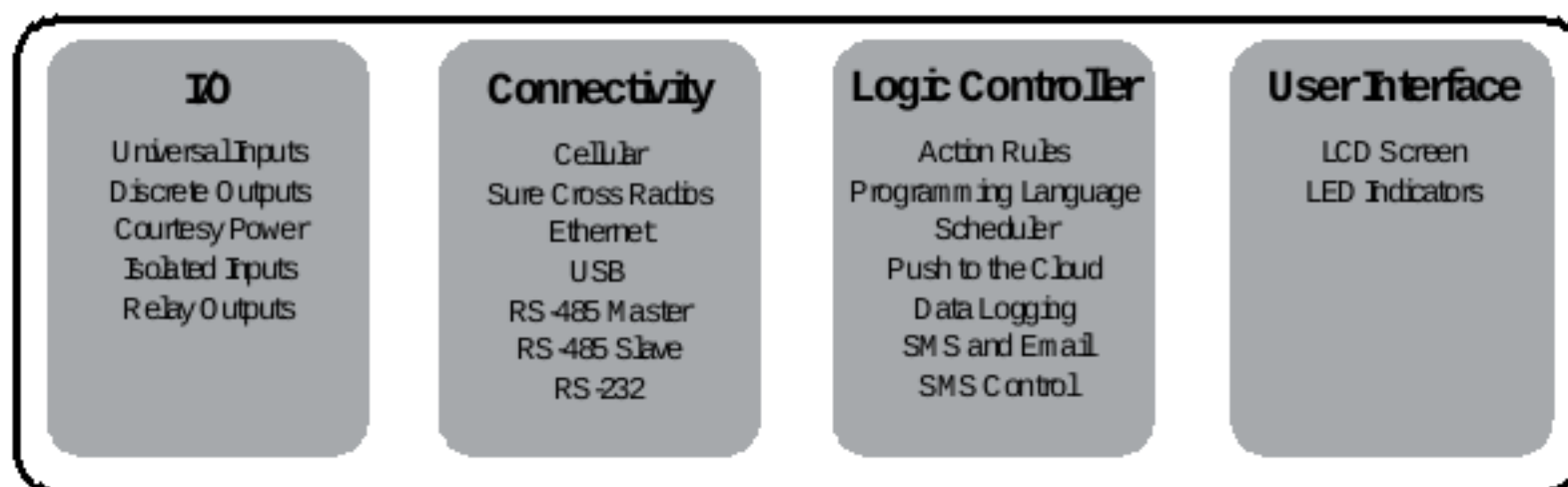
- Additional technical notes and videos

For more information about the DXM150 family of products, including technical notes, configuration examples, and ScriptBasic programs, please visit www.bannerengineering.com/wireless.

System Overview for the DXM150-B1

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). Various combinations of I/O and connectivity are available based on the different models.

Figure 1. DXM150-B1 system overview



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

- | | |
|--|--|
| <ul style="list-style-type: none"> • Universal inputs • Discrete outputs • Courtesy power • Switch power | <ul style="list-style-type: none"> • Isolated inputs • Relay outputs • Battery backup • Solar controller |
|--|--|

Connectivity—The DXM'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

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'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 cannot 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 DXM, 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 DXM150-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 DXM150-B1 Wireless Controller can provide visual indication using indicator lights, send text or email alerts, collect data, and interface with automation systems.

ptions

Radio options

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)

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)

Contains FCC ID: UE3RM1809; FCC Part 15, Subpart C, 15.247
Contains IC: 7044A-RM1809
IFT: RCPBARM13-2283



(NOM approval only applies to 900 MHz models)

2.4 GHz Compliance (DX80-2400 Radio Module)

Radio module is indicated by the product label marking
Contains FCC ID: UE300DX80-2400; FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
Contains 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/pr-br/

2.4 GHz Compliance (SX243 Radio Module)

Radio module is indicated by the product label marking
Contains FCC ID: UE3SX243; FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
Contains IC: 7044A-SX243

RS-485 Communication options

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 options

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

¹ Radio range is with the 2 dBi 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 ptions

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

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

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

Discrete Inputs

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

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

Power Consumption

35 mA average at 12 Volts (exclusive of load)

Indicators

Four LEDs, four control buttons, one LCD

Security Protocols

VPN, SSL, and HTTPS

Communication Protocols

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

Logging

8 GB maximum; removable Micro SD card format

Construction

Polycarbonate; DIN rail mount option

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

Relay Outputs

SPDT (Form C) relay
250 V ac, 16 A

Environmental ptions

Operating Conditions²

–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



Banner Engineering
Europe Park Lane,
Culliganlaan 2F bus 3, 1831
Degen, BELGIUM

(CE/UKCA approval
only applies to 2.4
GHz models)

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

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

Short-Range Omni Antennas

BWA-202-D—Antenna, Dome, 2.4 GHz, 2 dBi, RP-SMA Box Mount
BWA-902-D—Antenna, Dome, 900 MHz, 2 dBi, RP-SMA Box Mount
BWA-902-RA—Antenna, Rubber Fixed Right Angle, 900 MHz, 2 dBi, RP-SMA Male Connector

Medium-Range Omni Antennas

BWA-905-C—Antenna, Rubber Swivel, 900 MHz 5 dBi, RP-SMA Male Connector
BWA-205-C—Antenna, Rubber Swivel, 2.4 GHz 5 dBi, RP-SMA Male Connector

Misc Accessories

BWA-CG-5-3X5.6-10—Cable Gland Pack: 1/2-inch NPT, Cord grip 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-1MR5MN05—LMR200 RP-SMA to N-Type Male, 0.5 m
BWC-2MRSFR56—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-908-A5—Antenna, Fiberglass, 3/4 Wave, 900 MHz, 8 dBi, N-Type Female Connector
BWA-208-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](#)

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

Enclosures and DIN Rail Kits

BWA-AH864—Enclosure, Polycarbonate, with Opaque Cover, 8 x 6 x 4
BWA-AH1084—Enclosure, Polycarbonate, with Opaque Cover, 10 x 8 x 4
BWA-AH12106—Enclosure, Polycarbonate, with Opaque Cover, 12 x 10 x 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

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)
PSDNP-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
PSDNP-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, Monocrystalline, 573 x 357 x 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 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: Please download the complete DXM150-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 DXM150-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 DXM150-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.

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.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.

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For general information, see www.bannerengineering.com/globals.

FCC Part 15 Class A

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.

Industry Canada

IC: 7044A-DX8024 or 7044A-SX243—This device contains licence-exempt transmitter(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.

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.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera exclusiva para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 8 dBi y Yagi para una ganancia máxima de antena 10 dBi que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 8 dBi. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 8 dBi en tipo Omnidireccional y 10 dBi en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

Antenas SMA	Modelo	Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 2 dBi, junta de caucho, RP SMA Macho	BWA-902-C	Antena, Omni 902-928 MHz, 8 dBi, fija de vidrio, 1800mm, N Hembra	BWA-906-A
Antena, Omni 902-928 MHz, 5 dBi, junta de caucho, RP SMA Macho	BWA-905-C	Antena, Yagi, 900 MHz, 10 dBi, N Hembra	BWA-9Y10-A

Mexican Importer

Banner Engineering de México, S. de R.L. de C.V.
David Alfaro Siqueiros 103 Piso 2 Valle Oriente
San Pedro Garza García Nuevo León, C. P. 66269
91 9363.2714

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

