MultiHop DCLATCHE Data Radio

Features

The Sure Cross® wireless system is a radio frequency network with integrated I/O that operates in most environments to eliminate the need for wiring runs. Wireless MultiHop data radio networks are formed around a MultiHop client and one or more servers and extend the range of a Modbus or other serial communication network.



- Wireless industrial I/O device with two selectable discrete inputs that each keep a totalizer event count and one DC latching output
- Selectable transmit power levels of 250 mW or 500 mW for 900 MHz models and 65 mW for 2.4 GHz models
- *Flex*Power® technology is driven by one lithium primary battery integrated into the housing or 10 V DC to 30 V DC
- Self-healing, auto-routing radio frequency network with multiple hops extends the network's range and improves radio link performance
- Message routing improves link performance
- Operates as a slave device when powered by the internal battery; may be configured as a repeater when powered by 10 V DC to 30 V DC; not designed to operate as a master radio
- Built-in site survey mode enables rapid assessment of a location's RF transmission properties
- Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery

Models

Model	Frequency	DC Latch Configuration I/O
DX80DR9M-DCLATCHE	900 MHz ISM Band	**Inputs**: Two selectable discrete **Outputs for DC Latch**: DC Latch
DX80DR2M-DCLATCHE	2.4 GHz ISM Band	

DC Latching Operation

To operate the outputs, write the output register 0503 to 1 to activate the DC Latching output. Write the output register 0503 to 0 to deactivate the outputs. The 0503 operation is not functional when radio communications are lost; the solenoid remains in its last state. The user is responsible for correcting the radio communications problem and regaining control of the external device.

Configuration Instructions

Set Up Your MultiHop Network

To set up and install your wireless MultiHop network, follow these steps:

1. If your radios have DIP switches, configure the DIP switches of all devices.
2. Connect the sensors to the MultiHop radios if applicable.
3. Apply power to all devices.
4. If your MultiHop radio has rotary dials, set the MultiHop Radio ID. If your MultiHop radio has no rotary dials, continue to the next step.
5. Form the wireless network by binding the server and repeater radios to the client radio. If the binding instructions are not included in this datasheet, refer to the quick start guide or product manual.
6. Observe the LED behavior to verify the devices are communicating with each other.
7. Configure any I/O points to use the sensors connected to the Sure Cross devices.
8. Conduct a site survey between the MultiHop radios. If the site survey instructions are not included in this datasheet, refer to the product manual.
9. Install your wireless sensor network components. If the installation instructions are not included in this datasheet, refer to the product manual.

For additional information, refer to one of the following documents:

- MultiHop Data Radio Quick Start Guide: 152653
- MultiHop Data Radio Instruction Manual: 151317
- MultiHop Register Guide: 155289

Configure the DIP Switches

Before changing DIP switch positions, disconnect the power.[1]

[1] For devices powered by batteries integrated into the housing, triple-click button 2, then double-click button 2 to reset the device without removing the battery.

Original Instructions
01-Oct-24

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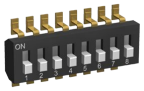
150873
p/n: 150873 Rev. L

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Any changes made to the DIP switches are not recognized until after power is cycled to the device. For parameters not set using the DIP switches, use the configuration software to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the configuration software.

Access the Internal DIP Switches

Follow these steps to access the internal DIP switches.



1. Unscrew the four screws that mount the cover to the bottom housing.
2. Remove the cover from the housing without damaging the ribbon cable or the pins the cable plugs into.
3. Gently unplug the ribbon cable from the board mounted into the bottom housing. Skip this step if there is no ribbon cable (integrated battery models) or the ribbon cable is glued down (for C housing models).
4. Remove the black cover plate from the bottom of the device's cover.
   The DIP switches are located behind the rotary dials.
5. Make the necessary changes to the DIP switches.
6. Place the black cover plate back into position and gently push into place.
7. If necessary, plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin.
8. Mount the cover back onto the housing.

DCLATCHE DIP Switch Settings

The DC Latching MultiHop radio may operate as a server/child radio when powered by the internal battery. To operate this model as a repeater radio, the radio must be powered by 10 to 30 V DC. This model is not designed to operate as a client/parent radio.

	Switches							
Device Settings	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	ON *	ON *	ON *	ON *		OFF *		
Transmit power 900 MHz radios: 500 mW (27 dBm) 2.4 GHz radios: 65 mW (18 dBm) and 60 ms frame					OFF*			
Transmit power 900 MHz radios: 250 mW (24 dBm) 2.4 GHz radios: 65 mW (18 dBm) and 40 ms frame					ON			
MultiHop radio setting: Repeater							OFF	OFF
MultiHop radio setting: Server							ON *	OFF *

* Default configuration

Transmit Power Levels/Frame Size

The 900 MHz data radios can be operated at 500 mW (27 dBm) or 250 mW (24 dBm). For most models, the default transmit power is 500 mW.

For 2.4 GHz radios, the transmit power is fixed at 65 mW (18 dBm) and DIP switch 5 is used to set the frame timing. The default position (OFF) sets the frame timing to 60 milliseconds. To increase throughput, set the frame timing to 40 milliseconds. For battery-powered devices, increasing the throughput decreases battery life.

Wire Your Sure Cross Device

Use the following wiring diagrams to first wire the sensors and then apply power to the Sure Cross® devices.

Terminal Blocks and Wiring

Power this model by 10 V DC to 30 V DC when it operates as a repeater radio. The power for the sensors can be supplied by the 10 V DC to 30 V DC used to power the radio. Each discrete input is associated with a totalizer event counter.

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Wiring terminals



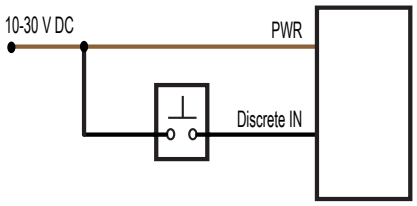
+ and -. DC Latching relay outputs

DI1 and DI2. Discrete inputs, sinking

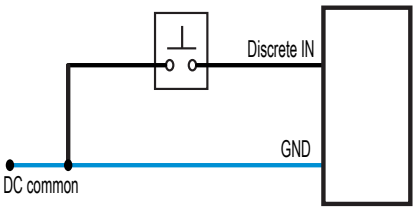
GND. Ground/DC common connection

10-30. 10 V DC to 30 V DC

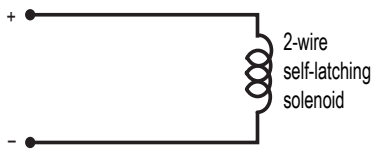
Discrete Input Wiring for PNP Sensors



Discrete Input Wiring for NPN Sensors



DC Latching



Install or Replace the Battery on a DX80E Model

Follow these steps to replace the lithium "D" cell battery or batteries in any DX80E model.

1. Remove the four screws mounting the face plate to the housing and remove the face plate. If there is a radio cover on the faceplate, do not remove the radio cover from the faceplate.
2. If applicable, remove the discharged battery or batteries.
3. Install the new battery or batteries.
4. Verify the positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
5. Allow up to 60 seconds for the device to power up.
6. Properly dispose of used batteries 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.

CAUTION: There is a risk of explosion if the battery is replaced incorrectly.



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

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.

For non-hazardous locations, the replacement battery is model **BWA-BATT-011**. For non-hazardous or hazardous locations, the replacement battery is Xeno model XL-205F, Banner model **BWA-BATT-001**. For pricing and availability, contact Banner Engineering.

Bind a MultiHop Radio (without Rotary Dials)

To create your MultiHop network, bind the MultiHop server radios to the designated client radio and assign a device ID using the client's rotary dials.

1. Apply power to the client radio.
2. Put the MultiHop client radio into binding mode.
   - For client radios with two buttons: triple-click button 2
   - For client radios with one button: trick-click the button

   For the two LED/button models, both LEDs flash red and the LCD shows *BINDNG and *client. For single LED/button models, the LED flashes alternatively red and green.
3. Using the client radio's rotary dials, select the Device ID to assign to the MultiHop server radio. Use the left rotary dial for the left digit and the right rotary dial for the right digit. For example, to assign your server radio to Device ID 10, set the left dial to 1 and the right dial to 0.
4. Put the MultiHop server radio into binding mode.
   - For two-button radios, triple-click button 2.

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- For one-button radios, triple-click the button.

The server radio enters binding mode and searches for any client radio in binding mode. While searching for the client radio, the two red LEDs flash alternately. When the server radio finds the client radio and is bound, both red LEDs are solid for four seconds, then both red LEDs flash simultaneously four times. After the server receives the binding code transmitted by the client, the server radio automatically exits binding mode.

5. Repeat this sequence (steps 3 and 4) for as many MultiHop server radios as you need to bind.
   If two MultiHop server radios are accidentally assigned the same Device ID, rerun the binding procedure on one of the radios to reassign the ID. The binding sequence may be run as many times as necessary.
6. To exit binding mode on the MultiHop client radio, double-click button 2 on the MultiHop client radio. The client radio restarts and enters RUN mode.

Child Radios Synchronize to the Parent Radios

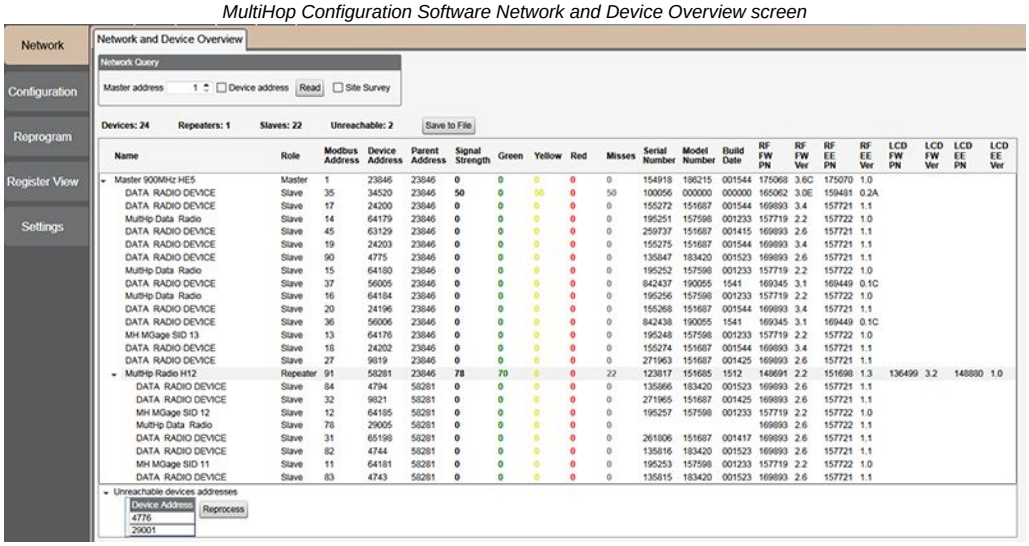
The synchronization process enables a Sure Cross® radio to join a wireless network formed by a client radio. After power-up, synchronization may take a few minutes to complete. First, all radios within range of the client data radio wirelessly synchronize to the client radio. These radios may be server radios or repeater radios.

After repeater radios are synchronized to the client radio, any radios that are not in sync with the client but can "hear" the repeater radio will synchronize to the repeater radios. Each repeater “family” that forms a wireless network path creates another layer of synchronization process. The table below details the process of synchronization with a parent. When testing the devices before installation, verify the radio devices are at least two meters apart or the communications may fail.

MultiHop Configuration Software

Use Banner’s MultiHop Configuration Software to view your MultiHop radio network and configure the radio and its I/O.

MultiHop Configuration Software Network and Device Overview screen



The software connects to a MultiHop client radio using one of four methods.

- Serial; using a USB to RS-485 (for RS-485 radios) or a USB to RS-232 (for RS-232 radios) converter cable.
- Modbus TCP; using an Ethernet connection to an Ethernet radio client.
- Serial DXM; using a USB cable to a DXM Controller to access a MultiHop client radio.
- TCP DXM: using an Ethernet connection to a DXM Controller to access a MultiHop client radio.

Banner recommends using **BWA-UCT-900**, an RS-485 to USB adapter cable with a wall plug that can power your radio while you configure it. The adapter cable is not required when connecting to a DXM Controller.

Download the most recent software revision from the Wireless Reference Library on Banner Engineering's website: www.bannerengineering.com.

Installing Your Sure Cross® Radios

Please refer to one of these instruction manuals to install your wireless network components.

- DX80 Performance Wireless I/O Network Instruction Manual: 132607
- MultiHop Data Radio Instruction Manual: 151317

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Modbus Registers

Register (4xxxx)	Input #	Inputs	I/O Range		Holding Register Representation		Terminal Block Labels
			Min. Value	Max. Value	Min. (Dec.)	Max. (Dec.)	
1	1	Discrete IN 1	0	1	0	1	DI1
2	2	Discrete IN 2	0	1	0	1	DI2
3015	1	Counter IN 1 (High Word)	0	65535	0	65535	DI1
3016	1	Counter IN 1 (Low Word)	0	65535	0	65535	DI1
3035	2	Counter IN 2 (High Word)	0	65535	0	65535	DI2
3036	2	Counter IN 2 (Low Word)	0	65535	0	65535	DI2

Register (4xxxx)	Output #	Outputs	I/O Range		Holding Register Representation		Terminal Block Labels
			Min. Value	Max. Value	Min. (Dec.)	Max. (Dec.)	
503	3 *	DC Latch OUT	0	1	0	1	+ and –

* Output 1 and 2 are reserved for the DL Latch Output functions.

Modbus Addressing Convention

All Modbus addresses refer to Modbus holding registers. When writing your own Modbus scripts, use the appropriate commands for interfacing to holding registers. Parameter description headings refer to addresses in the range of 40000 as is customary with Modbus convention.

Specifications

Radio Specifications for MultiHop

Radio Transmit Power (900 MHz, 500 mW radios)

Conducted: 27 dBm (500 mW)

EIRP with the supplied antenna: < 36 dBm

Radio Transmit Power (2.4 GHz radios)

Conducted: < 18 dBm (65 mW)

EIRP with the supplied antenna: < 20 dBm (100 mW)

Radio Range

A 2 dB antenna ships with this device.

Transmit power and range are subject to many factors, including antenna gain, installation methods, characteristics of the application, and environmental conditions.

Please refer to the following documents for installation instructions and high-gain antenna options.

Installing Your Sure Cross® Radios (151514)
Conducting a Site Survey (133602)
Sure Cross® Antenna Basics (132113)

Antenna Minimum Separation Distance

900 MHz radios transmitting at ≥ 500 mW: 4.57 m (15 ft) with the supplied antenna

2.4 GHz radios transmitting at 65 mW: 0.3 m (1 ft) with the supplied antenna

Antenna Connection

Ext. Reverse Polarity SMA, 50 Ohms

Max Tightening Torque: 0.45 N·m (4 lbf·in)

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

Radio Packet Size (MultiHop)

900 MHz: 175 bytes (85 Modbus registers)

2.4 GHz: 75 bytes (37 Modbus registers)

900 MHz Compliance (SX7023EXT Radio Module)

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX7023EXT

Contains IC: 7044A-SX7023EXT

2.4 GHz Compliance (SX243 Radio Module)

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX243

Radio Equipment Directive (RED) 2014/53/EU

Contains IC: 7044A-SX243

FCC Part 15 Class A for Intentional Radiators

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.

(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Industry Canada Statement for Intentional Radiators

This device contains licence-exempt transmitters(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:

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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.

Environmental Specifications for the E Housing

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)

Shock and Vibration

All models meet IEC 60068-2-6 and IEC 60068-2-27 testing criteria

Shock: 30G 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 Ratings

IP65

Refer to the Sure Cross® DX80 Performance (p/n 132607) or the Sure Cross® MultiHop (p/n 151317) instruction manual for installation and waterproofing instructions.

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

DCLATCHE Specifications

Supply Voltage

3.6 V DC (internal battery) or 10 V DC to 30 V DC

Discrete Inputs

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

DC Latch Outputs

Capacitance Fed at 12 V DC (configurable)

Switch Time: 40 ms (configurable)

Wiring Access

Two 1/2-inch NPT

Interface

Two bi-color LED indicators

Two buttons

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: 1/4-inch or M7 (SS M7 hardware included)

Max. Tightening Torque: 0.56 N·m (5 lbf·in)

Certifications

CE/UKCA approval only applies to 2.4 GHz models

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1831 Diegem, BELGIUM

ANATEL
Agência Nacional de Telecomunicações
03737-22-04042

Included with Device

The following items ship with this model:

- **BWA-9O2-C** (900 MHz) or **BWA-2O2-C** (2.4 GHz): Antenna, 2 dBd Omni, Rubber Swivel RP-SMA Male.
- **BWA-BATT-001**: Replacement battery, 3.6 Volt, D Lithium Cell
- **BWA-HW-032**: Access Hardware for "E" Housing (One each of 1/2-inch plug, 1/2-inch gland)

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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/

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Warnings

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: Please download the complete MultiHop Data Radio technical documentation, available in multiple languages, from www.bannerengineering.com for details on the proper use, applications, Warnings, and installation instructions of this device.

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IMPORTANT: Por favor descargue desde www.bannerengineering.com toda la documentación técnica de los MultiHop Data Radio, 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 MultiHop Data Radio sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

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:

- **Never operate a radio without connecting an antenna**
- Operating 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 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 (con Antena)

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Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

Approved Antennas

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

Mexican Importer

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