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DRAFT

Features

Data radios may be used to expand a Modbus network or avoid obstacles in the path of the radio signals.

- Wireless industrial device to extend the range of a Modbus network
- +10 to 30V dc power input
- Data routing controlled by Modbus slave IDs
- Radio networks use unique network IDs
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific, and Medical (ISM) bands
- Transceivers provide two-way communication between radios

For additional information and a complete list of accessories, including FCC approved antennas, please refer to Banner Engineering's website, www.bannerengineering.com/surecross.

Models

Model	Power	Frequency	Master/Slave	Serial Type
DX87M9S2	10 to 30V dc	900 MHz ISM Band	Master	RS232
DX87S9S42			Slave	
DX87M9S4			Master	RS485
DX87S9S4			Slave	
DX87M2S2		2.4 GHz ISM Band	Master	RS232
DX87S2S42			Slave	
DX87M2S4			Master	RS485
DX87S2S4			Slave	

⚠ **WARNING… Not to be used for personnel protection**

Never use these products for personnel protection. Doing so could lead to serious injury or death.

These products do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A failure or malfunction can cause either an energized or de-energized product output condition. Consult your current Banner Safety Products catalog for safety products that meet OSHA, ANSI, and IEC standards for personnel protection.

132031

SureCross™ 1 Watt Data Radio

Serial radios connect a Modbus control system to one or more DX80 Gateway devices acting as Modbus slaves. The data radios do not use addressing, error checking, or acknowledgement in the radio packets. Instead, the data stream appearing on the serial input of one radio within the network is reproduced on the serial outputs of all other radios in the same network. Addressing and error connection occur at the application layer. The system operates as it would in a hardwired Modbus multi-drop serial network.

All deterministic properties of the DX80 star networks are preserved. If a data radio linkage drops multiple packets, the target DX80 Gateway reacts as if the serial line was cut, driving all outputs in the local TDMA system to the predefined state. The data radio links are collision free because the master control system uses polling to initiate all data exchanges so all data radio packets originate from the same place.

Each DX80 TDMA cluster is inherently collision free. The only potential collisions occur when hardwired DX80 Gateway devices and data radios are collocated. Fortunately, the application layer (Modbus) retries the packet until it succeeds. Using 2.4 GHz radios in the local TDMA links and 900 MHz in the data radio links (or vice versa) also minimizes data collisions.
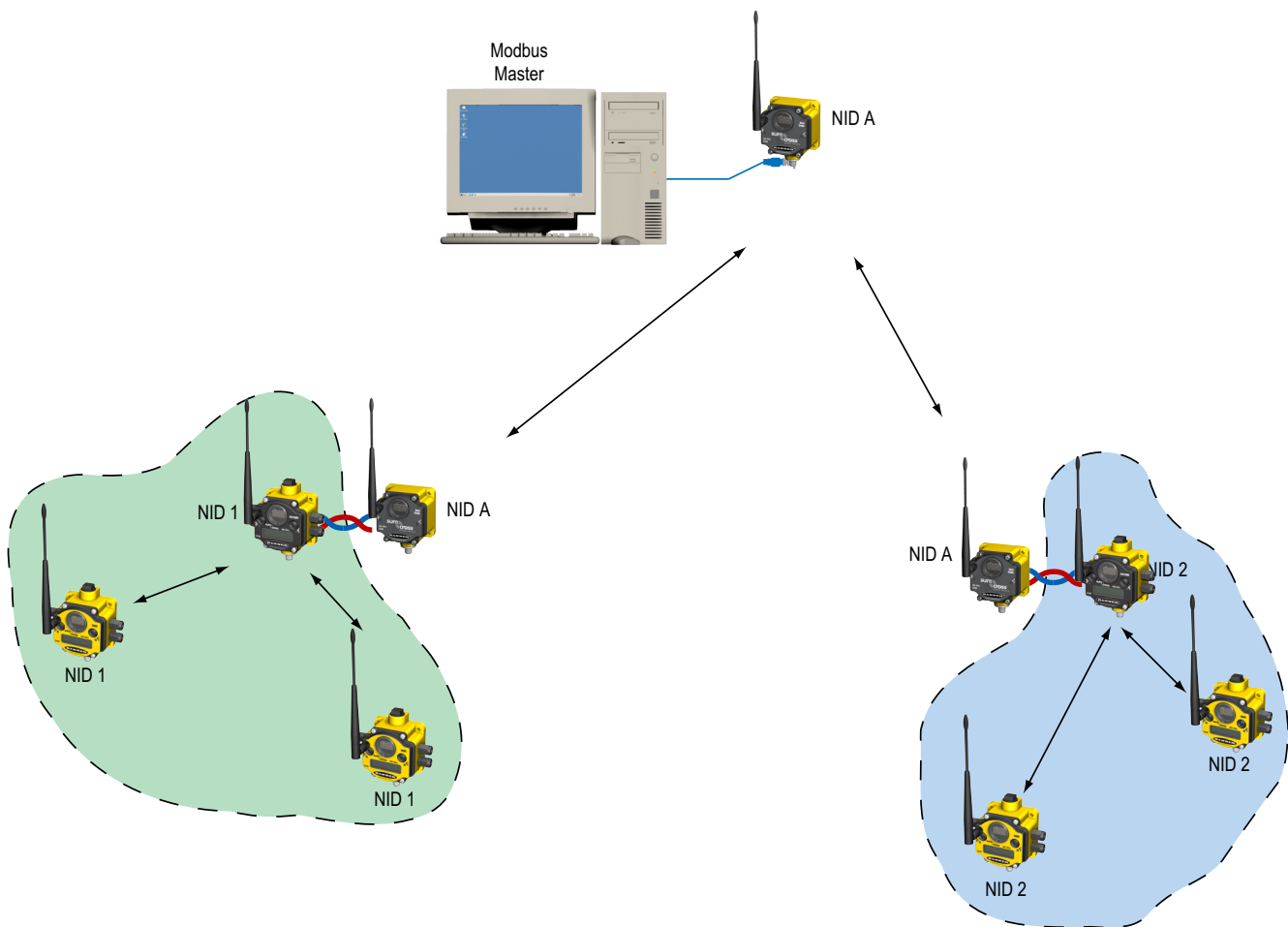
This concept can be expanded indefinitely by chaining independent data radio connections through the serial interface. Very large networks can be created without complex network addressing. Modbus networks can be extended almost without limit while still maintaining the determinism and latency of the underlying TDMA networks.
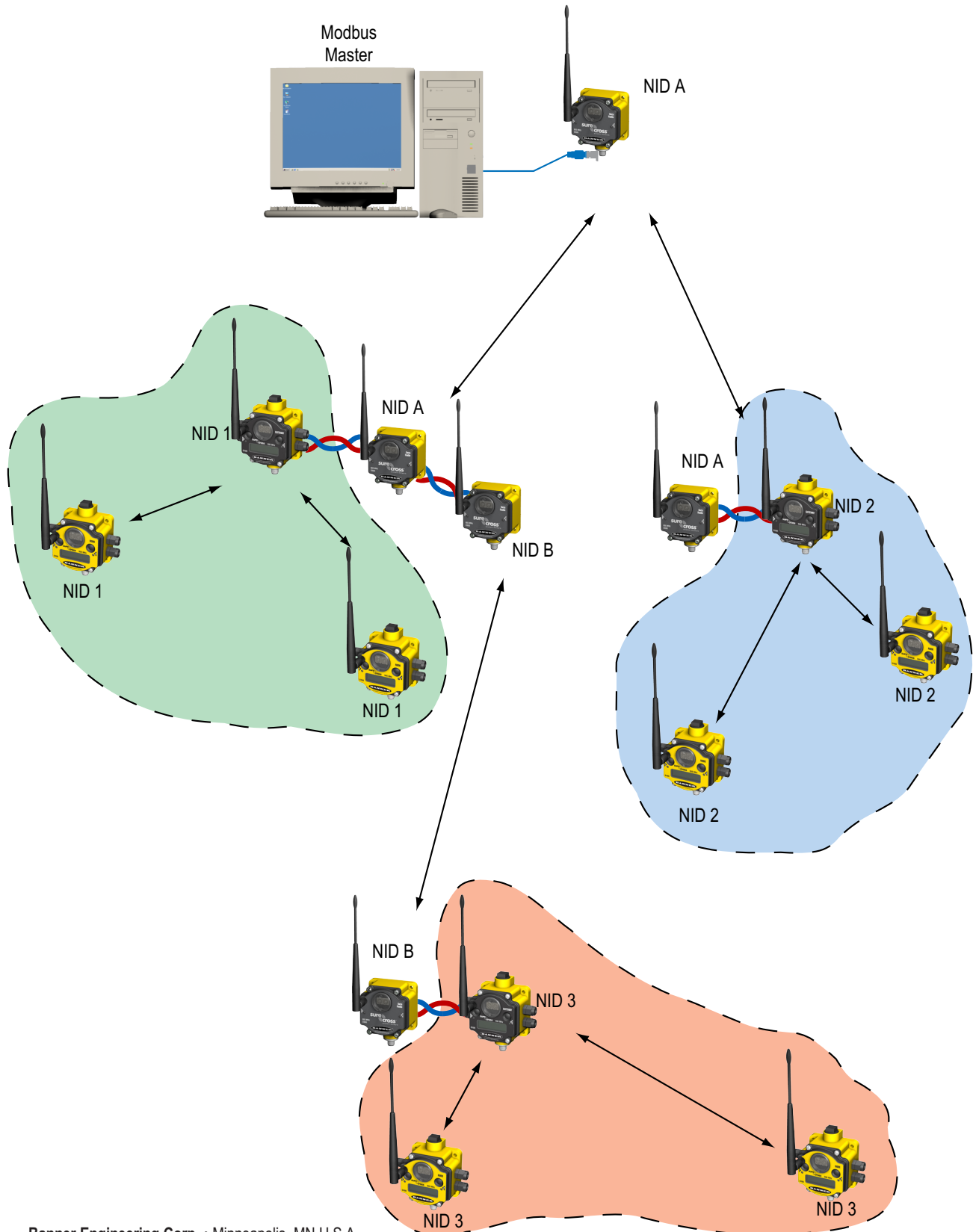
SureCross™ 1 Watt Data Radio

Hookup Diagrams

5-pin M12 Euro Hookup

5=Center pin

| Color	No.	Description
Brown	1	10 to 30V dc Input
White	2	RS485 / D1 / B /+
Blue	3	dc common
Black	4	RS485 / D0 / A / -
Gray	5	Comms Gnd

Note: Terminal block GND = dc common

Configuration

Network and Device ID

Since the data stream appearing on the serial input of one radio within the network is reproduced on the serial outputs of all other radios in the same network, the only configuration necessary is to set up the network ID and device ID.

To setup the data radio:

1. Set each radio in the same network to the same network ID (NID).

2. Set the device ID of one radio in each NID network to zero. This radio acts as the time keeper for the radio network and can be any radio in the network.

3. Set the device IDs for the other radios within the same network to any device number other than zero. Except for the one radio set to device ID zero, the other device ID settings are ignored by the radio network.
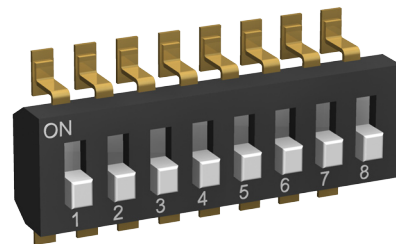
Network ID

Device ID
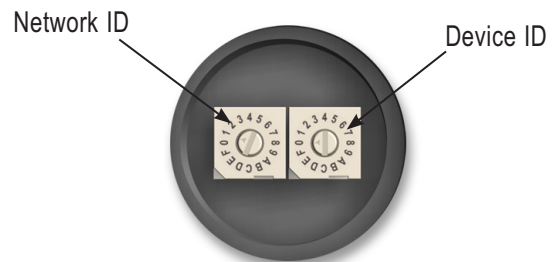
Switches

Use the switches on the board to set the baud rate and parity.

Baud Rate Switches			Parity Switches		
1	2		3	4	
Off	Off	19200 (default)*	Off	Off	None (default)*
On	Off	9600	On	Off	Odd
Off	On	38400	Off	On	Even
On	On	19200	On	On	None

* Default position shown

SureCross™ 1 Watt Data Radio

FCC Certification
The DX80 Module complies with Part 15 of the FCC rules and regulations.

FCC ID: UE3RM1809 This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Notices
IMPORTANT: The DX80 Modules have been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

IMPORTANT: The DX80 Modules have been certified for fixed base station and mobile applications. If modules will be used for portable applications, the device must undergo SAR testing.

IMPORTANT: If integrated into another product, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door, or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: **Contains FCC ID: UE3RM1809**.

Note
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna,
- Increase the separation between the equipment and receiving module,
- Connect the equipment into an outlet on a circuit different from that to which the receiving module is connected, and/or
- Consult the dealer or an experienced radio/TV technician for help.

Antenna WARNING: This device has been tested with Reverse Polarity SMA connectors with the antennas listed in Table 1 Appendix A. When integrated into OEM products, fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Antennas not listed in the tables must be tested to comply with FCC Section 15.203 (unique antenna connectors) and Section 15.247 (emissions).

FCC-Approved Antennas
WARNING: This equipment is approved only for mobile and base station transmitting devices. Antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter.

DX80 Module may be used only with Approved Antennas that have been tested with this module.

Part Number	Antenna Type	Maximum Gain	Maximum Power Setting
—	Integral antenna	Unity gain	+30 dBm
BWA-9O1-x	Omni, 1/4 wave dipole	≤2 dBi	+30 dBm
BWA-9O2-C	Omni, 1/2 wave dipole, Swivel	≤2 dBi	+30 dBm
BWA-9O6-A	Omni Wideband, Fiberglass Radome	≤8.2 dBi	+27.8 dBm
BWA-9O5-B	Omni Base Whip	≤7.2 dBi	+28.8 dBm
BWA-9Y10-A	Yagi	≤10 dBi	+26 dBm

Table 1. Type certified Antenna

Specifications

Many of the DX80 parameters are configurable. The values in the tables represent factory defaults unless otherwise noted.

General

Power*	+10 to 30V dc (For European applications: +10 to 24V dc, ±10%)
Power Consumption	
Mounting	#10 or M5 (M5 hardware included)
M5 fasteners – Max. Tightening Torque	0.56 N•m (5 in•lbf)
Case Material	Polycarbonate
Weight	0.26 kg (0.57 lb.)
Indicators	Two LED, bi-color
External Cable Glands	One 1/2 NPT type
Cable Glands, Max Tightening Torque	0.56 N•m (5 in•lbf)

*   For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.

Radio

Range, with standard 2 dB antenna*	
Frequency	902 to 928 MHz ISM band
Transmit Power	+30 dBm Conducted
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)
Antenna Connector	Ext. Reverse Polarity SMA - 50 Ohms
Antenna - Max Tightening Torque	0.45 N•m (4 in•lbf)
Link Timeout	Configurable, up to 2 minutes

*   The range depends upon the environment and line of sight. High-gain antennas are available to increase the range.

Communications

Interface	2-wire RS-485
Baud Rates	9.6k, 19.2k (default), or 38.4k
Data Format	8 data bits, no parity, 1 stop bit
Protocol	Modbus RTU

Environmental

Environmental Rating*	IEC IP67; NEMA 6
Operating Temperature**	-40 to +85° C
Operating Humidity	95% max. relative (non-condensing)
Radiated Immunity	10 V/m, 80-2700 MHz (EN61000-6-2)
Shock & 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, 10-60 Hz

*   Please refer to the SureCross™ DX80 Wireless I/O Network product manual, Banner p/n 132607, for installation and waterproofing instructions.

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

Specifications, continued

Compliance

900 MHz Models	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809

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.

The manufacturer does not take responsibility for the violation of any warning listed in this document.

⚠ **CAUTION . . .**
Make no modifications to this product.

Any modifications to this product not expressly approved by Banner Engineering could void the user's authority to operate the product. Contact the Factory for more information.

Always use lightning arrestors/surge protection with all remote antenna systems to avoid invalidating the Banner Engineering Corp. warranty. No surge protector can absorb all lightning strikes. Do not touch Banner's SureCross™ wireless devices or any equipment connected to Banner's SureCross wireless devices during a thunderstorm.

WARRANTY: Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

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