

# Sure Cross® DX85 Modbus RTU Remote I/O Device



## Datasheet

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 networks are formed around a Gateway, which acts as the wireless network master device, and one or more Nodes. A remote I/O device with a Modbus interface expands the I/O of the Gateway or the Modbus host.



- Wireless industrial I/O device with four 0 to 20 mA analog inputs and four 0 to 20 mA analog outputs
- 10 V DC to 30 V DC power input
- Selectable Modbus slave address
- Modbus RTU protocol using RS-485
- The DX85...C models are certified for use in Class I, Division 2, Group A, B, C, D; and Zone 2 (Category 3G) Hazardous Locations when properly installed in accordance with the National Electrical Code, the Canadian Electrical Code, or applicable local codes/regulations (see Specifications)

For additional information, updated documentation, and a list of accessories, refer to Banner Engineering's website, [www.bannerengineering.com](http://www.bannerengineering.com).



### 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.

## Models

Models	Environmental Rating	I/O
DX85M0P0M4M4	IP67, NEMA 6	
DX85M0P0M4M4C	IP20, NEMA 1 Class I, Division 2, Group A, B, C, D Hazardous Locations (see Specifications)	<b>Inputs:</b> Four 0 to 20 mA analog <b>Outputs:</b> Four 0 to 20 mA analog

## DX85 Modbus RTU I/O Slaves

Use the DX85 Modbus RTU I/O devices to expand the I/O of a Modbus master device. DX85s are hardwired to Modbus master devices using RS-485 and use Modbus RTU to exchange data. DX85s are available with discrete, analog, or a mix of discrete and analog I/O.

## Setting Up Your DX85 Modbus Remote I/O Devices

To set up and install your DX85 Modbus Remote I/O devices, follow these steps:

1. Configure the DIP switches.
2. Set the Slave ID on the DX85 Modbus Remote I/O devices.
3. Connect the sensors to the DX85 devices.
4. Connect the DX85 to your Gateway, data radio, PLC, or other Modbus host device.
5. Apply power.
6. Observe the LED behavior to verify the devices are communicating with each other.

For additional information, including installation and setup, weatherproofing, device menu maps, troubleshooting, and a list of accessories, refer to one of the following product manuals.

- SureCross Quick Start Guide: Banner part number [128185](#)



- SureCross Wireless I/O Network Manual: [132607](#)
- Web Configurator Manual (used with "Pro" and DX83 models): [134421](#)
- Host Configuration Manual [132114](#)

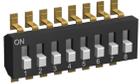
## Configure the DIP Switches

Before changing DIP switch positions, disconnect the power. Any changes made to the DIP switches are not recognized until after power is cycled to the device.

For parameters not set via DIP switches, use the User Configuration Software to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the User 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 (C housing models and Class I, Division 2 certified devices).
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.

## DIP Switch Settings for a DX85

	DIP Switches				
	1	2	3	4	5
Baud Rate: 19200	OFF*	OFF*			
Baud Rate: 38400	OFF	ON			
Baud Rate: 9600	ON	OFF			
Baud Rate: 19200	ON	ON			
Parity: None			OFF*	OFF*	
Parity: Even			OFF	ON	
Parity: Odd			ON	OFF	
Parity: None			ON	ON	
Rotary Dial Decimal Mode					OFF*
Rotary Dial Hex Mode					ON

\* Default configuration

**Baud Rate and Parity.** The baud rate (bits per second) is the data transmission rate between the device and whatever it is physically wired to. Set the parity to match the parity of the device you are wired to.

**Rotary Dial Mode.** By default, the rotary dials are set to decimal mode allowing Slave IDs of 00 through 99. Set the rotary dials to hex mode to be able to set the Slave IDs to 00 through F7.

## Setting the Slave ID on a DX85 Remote I/O Device

On a DX85 Modbus RTU Remote I/O device, use the rotary dials to set the device's Slave ID.



In Rotary Dial Decimal Mode, the left dial acts as the left digit and the right dial acts as the right digit, allowing the Slave ID to be set from 01 through 99.

In Rotary Dial Hex Mode, the left dial acts as the left digit and the right dial acts as the right digit, allowing the Slave ID to be set from 01 through F7 for a total of 247 slaves.

The 12 I/O DX85 models use Rotary Dial Decimal Mode and do not have a DIP switch selection for this option.

To configure the DX85 using the UCT, the DX85's Slave ID must be set to 01.

## Wire Your Sure Cross® Device

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

Refer to the Class I Division 2/Zone 2 control drawings (p/n 143086) for wiring specifications and limitations. Install the device in a suitable enclosure with provision for connection of Division 2 / Zone 2 wiring methods in accordance with local codes, as acceptable to the local inspection authority having jurisdiction.

### 5-pin M12/Euro-style Wiring for Gateways and DX85s

Wiring the 5-pin M12/Euro-style connector depends on the model and power requirements of the device. Connecting power to the communication pins will cause permanent damage.

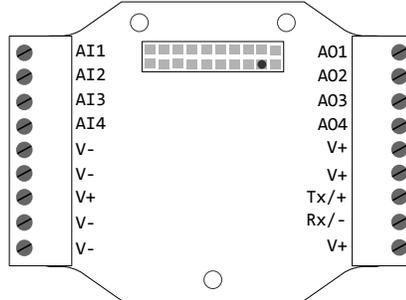
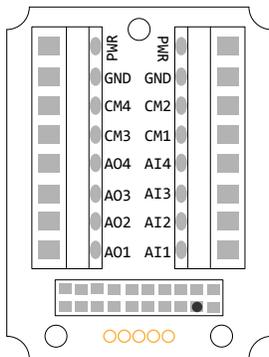
5-pin M12/Euro-style Connector (male)	Pin	Wire Color	Description
	1	Brown (bn)	10 to 30 V DC
	2	White (wh)	RS485 / D1 / B / +
	3	Blue (bu)	DC common (GND)
	4	Black (bk)	RS485 / D0 / A / -
	5	Gray (gy)	Comms Gnd

## Terminal Blocks

Connecting power to the communication pins will cause permanent damage. Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.

### IP67 Housings

### IP20 Housings



- AIx or Ax. Analog IN x
- AOx. Analog OUT x
- CMx. Serial interface connection; for non-serial interface models, do not make any wiring connections to these terminals
- GND. Ground/DC common connection
- PWR. 10 to 30 V DC power connection
- Rx/-. Serial communication line for the Gateway. No connection for Nodes
- Tx/+. Serial communication line for the Gateway; no connection for Nodes
- V+. 10 to 30 V DC power connection
- V-. Ground/DC common connection

## DX80...C Wiring

Wiring power to the DX80...C models varies depending the power requirements of the model. Connecting DC power to the communication pins (Tx/Rx) causes permanent damage. For FlexPower devices, do not apply more than 5.5 V to the B+ terminal.

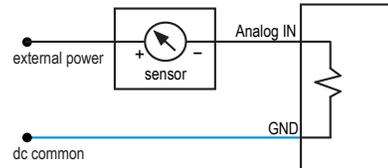
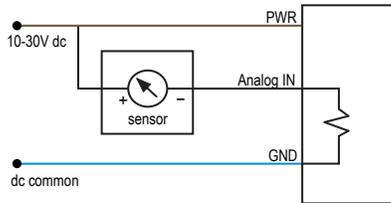
Terminal Label	Gateway and DX85	10 to 30 V DC Powered Nodes	Battery Powered Nodes
V+	10 V DC to 30 V DC	10 V DC to 30 V DC	
Tx/+	RS485 / D1 / B / +		

Terminal Label	Gateway and DX85	10 to 30 V DC Powered Nodes	Battery Powered Nodes
V-	DC common (GND)	DC common (GND)	DC common (GND)
Rx/-	RS485 / D0 / A / -		
B+			3.6 to 5.5 V DC

### Wiring Diagrams for Analog Inputs

Connecting power to the communication pins will cause permanent damage. Do not exceed analog input ratings for analog inputs. Only connect sensor outputs to analog inputs.

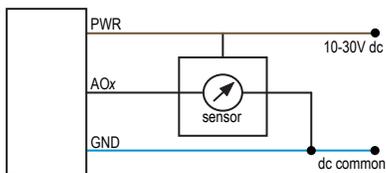
#### Analog Input Wiring (10–30 V DC Power)      Analog Input Wiring (4–20 mA, 2-Wire, Externally-Powered Sensors)



### Wiring Diagrams for Analog Outputs

Connecting power to the communication pins will cause permanent damage.

#### Analog Output Wiring



### LED Behavior of the DX85 Modbus RTU Remote I/O

After powering up, verify the DX85 is communicating properly. LED 1 should be on and green. The Modbus communication LEDs refer to the communication between the DX85 and what it is connected to (host system, Gateway, Data Radio, etc).

LED 1	LED 2	Status
Green	-	Power on
Flashing red	Flashing red	Device error, contact factory
-	Flashing amber	Modbus communication active
-	Flashing red	Modbus communication error

### Modbus Registers

I/O	Modbus Holding Register	I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway /DX85			Min.	Max.	Min. (Dec.)	Max. (Dec.)	
1	1	Analog IN 1	mA / V	0.0	20.0 / 10.0	0	65535	AI1
2	2	Analog IN 2	mA / V	0.0	20.0 / 10.0	0	65535	AI2
3	3	Analog IN 3	mA / V	0.0	20.0 / 10.0	0	65535	AI3
4	4	Analog IN 4	mA / V	0.0	20.0 / 10.0	0	65535	AI4
7	7	Reserved						
8	8	Device Message						
9	9	Analog OUT 1	mA / V	0.0	20.0 / 10.0	0	65535	AO1

I/O	Modbus Holding Register	I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway /DX85			Min.	Max.	Min. (Dec.)	Max. (Dec.)	
10	10	Analog OUT 2	mA / V	0.0	20.0 / 10.0	0	65535	AO2
11	11	Analog OUT 3	mA / V	0.0	20.0 / 10.0	0	65535	AO3
12	12	Analog OUT 4	mA / V	0.0	20.0 / 10.0	0	65535	AO4
15	15	Control Message						
16	16	Reserved						

## Specifications

### Specifications

#### Supply Voltage

10 V DC to 30 V DC (Outside the USA: 12 V DC to 24 V DC, ± 10%)<sup>1</sup>  
 Consumption: Less than 1.4 W (60 mA) at 24 V DC  
 (See UL section below for any applicable UL specifications)

#### Housing

Polycarbonate housing  
 Weight: 0.26 kg (0.57 lbs)  
 Mounting: #10 or M5 (SS M5 hardware included)  
 Max. Tightening Torque: 0.56 N·m (5 lbf·in)

#### Interface

Two bi-color LED indicators

#### Wiring Access

Non-C models: Four PG-7, One 1/2-inch NPT, One 5-pin threaded M12/  
 Euro-style male quick disconnect  
 C models: External terminals

#### Analog Inputs and Outputs

Rating: 24 mA  
 Input Impedance: Approximately 100 Ohms<sup>2</sup>  
 Accuracy: 0.1% of full scale +0.01% per °C  
 Resolution: 12-bit

#### Certifications for DX8x...C (External Wiring Terminal) and DX8x...E Models



CSA: Class I Division 2 Groups ABCD, Class I Zone 2 AEx/Ex nA II T4 – Certificate: 1921239



ATEX: II 3 G Ex nA IIC T4 Gc (Group IIC Zone 2) – Certificate LCIE 10 ATEX 1012 X

Refer to the Class I Division 2/Zone 2 control drawings (p/n [143086](#)) for wiring specifications and limitations. Install the device in a suitable enclosure with provision for connection of Division 2 / Zone 2 wiring methods in accordance with local codes, as acceptable to the local inspection authority having jurisdiction. All battery-powered devices must only use the lithium battery manufactured by Xeno, model XL-205F (Banner model number **BWA-BATT-001**).

#### Certifications



IND. CONT. EQ.  
447Y

#### UL Listing

Maximum ambient temperature: 70 °C  
 Mounting instructions: See document 132607  
 Power rating: 10 to 30 V dc, UL Class 2  
 Enclosure environmental rating: UL Type 1

## RS-485 Communication Specifications

#### Communication Hardware (RS-485)

Interface: 2-wire half-duplex RS-485  
 Baud rates: 9.6k, 19.2k (default), or 38.4k  
 Data format: 8 data bits, no parity, 1 stop bit

## Environmental Specifications

#### Operating Conditions

-40 °C to +85 °C (-40 °F to +185 °F) (Electronics); -20 °C to +80 °C (-4 °F to +176 °F) (LCD)  
 -40 °C to +80 °C (-40 °F to +176 °F) ambient temperature for Class I Division 2 / Zone 2  
 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

IEC IP67; NEMA 6  
 Refer to the Sure Cross® Wireless I/O Networks Instruction Manual (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.

<sup>1</sup> For European applications, power this device from a Limited Power Source as defined in EN 60950-1.

<sup>2</sup> To verify the analog input's impedance, use an Ohm meter to measure the resistance between the analog input terminal (Alx) and the ground (GND) terminal.

## Environmental Specifications for the C Housings

### 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

"C" Housing Models/External wiring terminals: IEC IP20; NEMA 1  
 Refer to the Sure Cross® Wireless I/O Networks Instruction Manual (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.

## Included with Device (DX85 and DX85...C Models)

The following items ship with the DX85 models.

- BWA-HW-002: DX80 Access Hardware Kit \*, containing four PG-7 plastic threaded plugs, four PG-7 nylon gland fittings, four PG-7 hex nuts, one 1/2-inch NPT plug, and one 1/2-inch nylon gland fitting
- BWA-HW-001: Mounting Hardware Kit, containing four M5-0.8 x 25mm SS screws, four M5-0.8 x 16mm SS screws, four M5-0.8mm SS hex nuts, and four #8-32 x 3/4" SS bolts
- BWA-HW-003: PTFE tape
- Quick Start Guide (128185 for DX80 Gateways or 152653 for MultiHop models)
- MQDC1-506: 5-Euro (single ended) straight cable, 2m
- BWA-HW-011: IP20 Screw Terminal Headers (2 pack), not included with the IP67 DX80 models; ships with the IP20 DX80...C models only

\* Not included with DX85...C models.

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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](http://www.bannerengineering.com/patents).



more sensors, more solutions