

## DX85 (4422) 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 networks are formed around a Gateway, which acts as the wireless network client 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 sourcing discrete inputs, four sourcing discrete outputs, two 0 to 20 mA analog inputs, and 0 to 20 mA two analog outputs
- 10 V DC to 30 V DC power input
- Selectable Modbus server 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.

## DX85 (4422) Models

Models	Environmental Rating	I/O
DX85M4P4M2M2	IP67, NEMA 6	<b>Inputs:</b> Four sourcing discrete, two 0 to 20 mA analog <b>Outputs:</b> Four sourcing discrete, two 0 to 20 mA analog
DX85M4P4M2M2C	IP20, NEMA 1 Class I, Division 2, Group A, B, C, D Hazardous Locations (see <i>Specifications</i> )	

## DX85 Modbus RTU I/O Server Overview

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.

## Set Up Your DX85 Modbus Remote IO 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.

- Sure Cross® Quick Start Guide (p/n [128185](#))
- Sure Cross® Wireless I/O Network Manual (p/n [132607](#))
- Host Configuration Manual (p/n [132114](#))

## Configure the DIP Switches

Before changing DIP switch positions, disconnect the power.<sup>(1)</sup>

<sup>(1)</sup> 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.

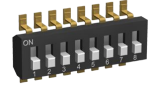


Any changes made to the DIP switches are not recognized until after power is cycled to the device. For parameters not set using the DIP switches, use the configuration software to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made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



## 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 ID on a DX85 Remote IO Device

On a DX85 Modbus RTU Remote I/O device, use the rotary dials to set the device's 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 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 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 DX80 Performance Configuration Software, set the DX85's ID to 01.

## Wire Your Sure Cross Device

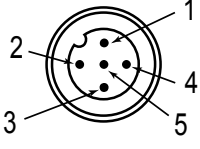
Use the following wiring diagrams to first wire the sensors and then apply power to the Sure Cross® devices.

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 Wiring

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

5-pin M12 male connector wiring

5-pin M12 Male Connector	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 Ground

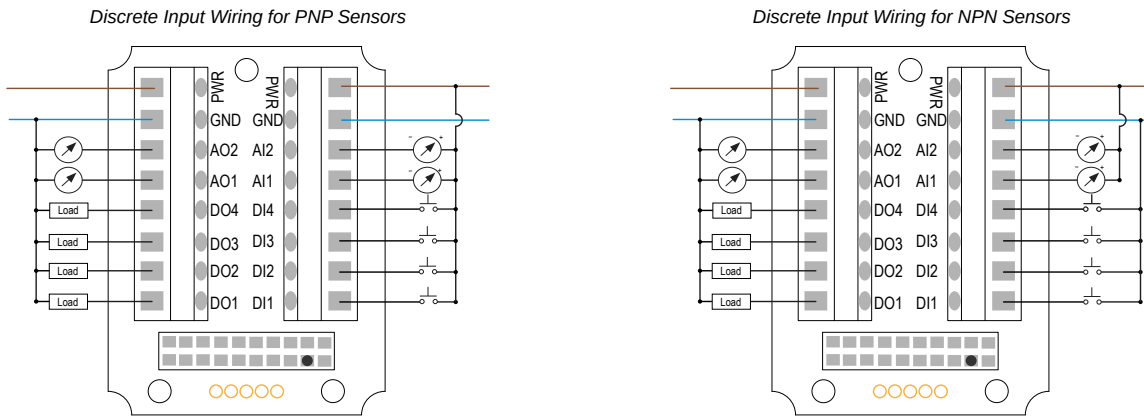
## Apply Power to the DX80C Nodes

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.

Wiring for the C housing models

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

## Wiring Diagrams (IP67 Models)

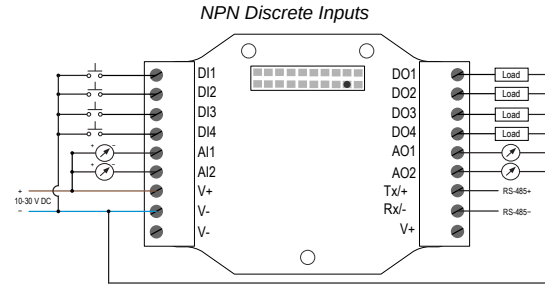
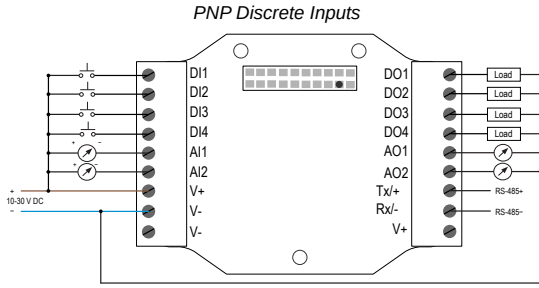


AIx or Ax. Analog IN x  
 AOx. Analog OUT x  
 DIx. Discrete IN x

DOx. Discrete OUT x  
 GND. Ground/DC common connection  
 PWR. 10 V DC to 30 V DC power connection

## Wiring Diagrams (IP20 Models)

Connecting power to the communication pins will cause permanent damage. Refer to the Class I Division 2/Zone 2 control drawings (p/n 143086) for wiring specifications and limitations.

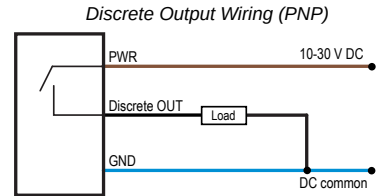


AIx or Ax. Analog IN x  
 AOx. Analog OUT x  
 DIx. Discrete IN x  
 DIx. Discrete IN x  
 DOx. Discrete OUT x  
 GND. Ground/DC common connection

PWR. 10 V DC 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 V DC to 30 V DC power connection  
 V-. Ground/DC common connection

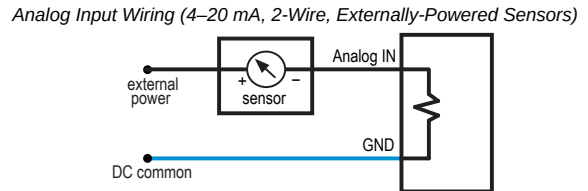
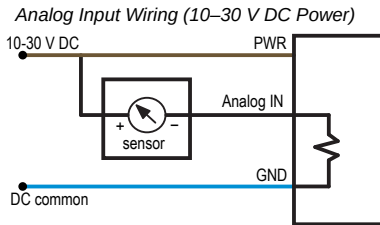
### Wiring Diagrams for Discrete PNP Outputs

Connecting power to the communication pins will cause permanent damage. For the DX8x...C models, PWR in the wiring diagram refers to V+ on the wiring board and GND in the wiring diagram refers to V- on the wiring board. To power the sensor using the switch power output (SPx), replace the PWR with SPx in these wiring diagrams.



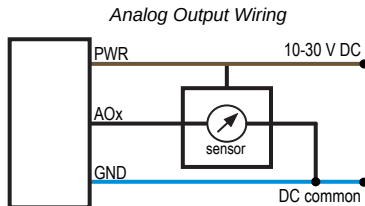
### Wiring Diagrams for Analog Inputs

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.



### Wiring Diagrams for Analog Outputs

Connecting power to the communication pins will cause permanent damage.



## LED Behavior of the DX85 Devices

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

## DX85 (4422) Modbus Registers

I/O	Modbus Holding Register	I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway or DX85			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
3	3	Discrete IN 3	-	0	1	0	1	DI3
4	4	Discrete IN 4	-	0	1	0	1	DI4
5	5	Analog IN 1	mA V	0.0 0.0	20.0 10.0	0	65535	AI1
6	6	Analog IN 2	mA V	0.0 0.0	20.0 10.0	0	65535	AI2
7	7	Reserved						
8	8	Device Message						
9	9	Discrete OUT 1	-	0	1	0	1	DO1
10	10	Discrete OUT 2	-	0	1	0	1	DO2
11	11	Discrete OUT 3	-	0	1	0	1	DO3
12	12	Discrete OUT 4	-	0	1	0	1	DO4
13	13	Analog OUT 1	mA V	0.0 0.0	20.0 10.0	0	65535	AO1
14	14	Analog OUT 2	mA V	0.0 0.0	20.0 10.0	0	65535	AO2
15	15	Control Message						
16	16	Reserved						

Some analog I/O models may use milliamps or voltage, depending on the model. Check the models table of your product's datasheet to determine which model you have.

## Specifications

### DX85 (4422) Specifications

#### Supply Voltage

10 V DC to 30 V DC (Outside the USA: 12 V DC to 24 V DC,  $\pm 10\%$ )<sup>(1)</sup>

Consumption: Less than 1.4 W (60 mA) at 24 V DC

(See UL section below for any applicable UL specifications)

#### Interface

Two bi-color LED indicators

#### Discrete Inputs

Rating: 3 mA max current at 30 V DC

Sample Rate: Up to 62.5 milliseconds

Report Rate: On change of state

ON Condition (PNP): Greater than 8 V

OFF Condition (PNP): Less than 5 V

#### 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

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

**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)



**Wiring Access**

Non-C models: Four PG-7, one 1/2-inch NPT, one 5-pin M12 male quick-disconnect connector  
 C models: External terminals

**Discrete Outputs**

ON Condition: Supply minus 2 V  
 OFF Condition: Less than 2 V  
 Output State Following Timeout: OFF

**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 <b>BWA-BATT-001</b> ).	

**Certifications**



**Discrete Output Rating (PNP)**


100 mA max current at 30 V DC  
 ON-State Saturation: Less than 3 V at 100 mA  
 OFF-state Leakage: Less than 10 µA

**Analog Inputs and Outputs**

Rating: 24 mA  
 Input Impedance: Approximately 100 Ohms<sup>(1)</sup>  
 Accuracy: 0.1% of full scale +0.01% per °C  
 Resolution: 12-bit

<sup>(1)</sup> To verify the analog input's impedance, use an Ohm meter to measure the resistance between the analog input terminal (AIx) and the ground (GND) terminal.

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

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

**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 (IP67 Housing Models)**

**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  
 For installation and waterproofing instructions, go to [www.bannerengineering.com](http://www.bannerengineering.com) and search for the complete instruction manual (p/n Key definition for "MANUAL\_PART\_NUMBER" not found in the DITA map.)

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

**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)  
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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® 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.

**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-pin M12 (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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