DX85 Modbus RTU Remote IO (0044) Device

DX85 (0044) 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 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.

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	**Inputs**: Four 0 to 20 mA analog **Outputs**: Four 0 to 20 mA analog
DX85M0P0M4M4C	IP20, NEMA 1 Class I, Division 2, Group A, B, C, D Hazardous Locations (see *Specifications*)	

DX85 Modbus RTU I/O Slaves 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.

Setting 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)

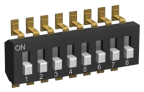
p/n: 138371 Rev. E

Configure the DIP Switches

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

[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.

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 DX80 Performance Configuration Software, set the DX85's Slave ID to 01.

Wire Your Sure Cross® Device

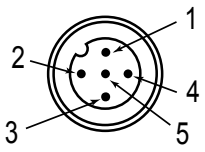
Use the following wiring diagrams to first wire the sensors and then apply power to the Sure Cross devices.

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

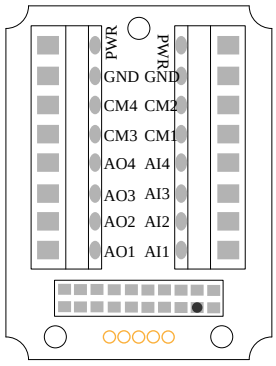
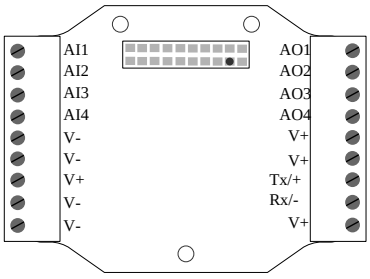
Wiring the 5-pin M12 connector depends on the model and power requirements of the device. Connecting power to the communication pins will cause permanent damage.

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

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	
		AI*x* or A*x*. Analog IN *x* AO*x*. Analog OUT *x* CM*x*. Serial interface connection; for non-serial interface models, do not make any wiring connections to these terminals 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

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 *Flex*Power 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 / -		

Continued on page 4

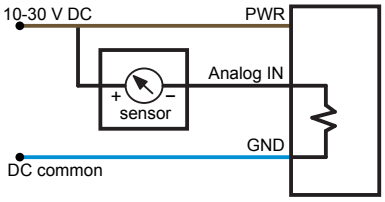
Continued from page 3

Terminal Label	Gateway and DX85	10 V DC to 30 V DC Powered Nodes	Battery-Powered Nodes
B+			3.6 V DC to 5.5 V DC

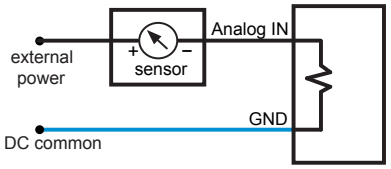
Wiring Diagrams for Analog Inputs

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)



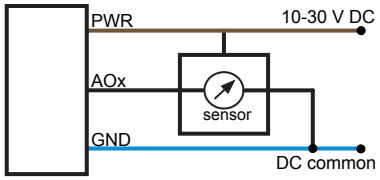
Analog Input Wiring (4–20 mA, 2-Wire, Externally-Powered Sensors)



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
10	10	Analog OUT 2	mA / V	0.0	20.0 / 10.0	0	65535	AO2

Continued on page 5

Continued from page 4

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.)	
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

DX85 (0044) Specifications

Supply Voltage

10 V DC to 30 V DC (Outside the USA: 12 V DC to 24 V DC, ± 10%)(1)

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

Analog Inputs and Outputs

Rating: 24 mA

Input Impedance: Approximately 100 Ohms(2)

Accuracy: 0.1% of full scale +0.01% per °C

Resolution: 12-bit

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

(2) To verify the analog input's impedance, use an Ohm meter to measure the resistance between the analog input terminal (AI*x*) and the ground (GND) terminal.

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

C SP US	CSA: Class I Division 2 Groups ABCD, Class I Zone 2 AEx/Ex nA II T4 — Certificate: 1921239
Ex	ATEX: II 3 G Ex nA IIC T4 Gc (Group IIC Zone 2) — Certificate LCIE 10 ATEX 1012 X

Certifications

c UL us LISTED IND. CONT. EQ. 447Y

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

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

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.

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 and search for the complete instruction manual (p/n 132607)

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)

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® 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-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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For patent information, see www.bannerengineering.com/patents.

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Part number: 138371
Revision: E