SureCross Performance FlexPower Node

BANNER®
more sensors, more solutions

Datasheet

The SureCross® wireless system is a radio frequency network with integrated I/O that can operate in most environments and 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.

- Wireless industrial I/O device with four 3-wire Pt100 RTDs; other types available with configuration
- Selectable transmit power levels of 250 mW or 1 Watt for 900 MHz models and 65 mW for 2.4 GHz models
- *Flex*Power® power options allow for 10 to 30 V dc, solar, and battery power sources for low power applications.
- DIP switches for user configuration
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture ensure reliable data delivery within the unlicensed Industrial, Scientific, and Medical (ISM) band
- Transceivers provide bidirectional communication between the Gateway and Node, including fully acknowledged data transmission
- Lost RF links are detected and relevant outputs set to user-defined conditions

For additional information, updated documentation, and accessories, refer to Banner Engineering's website, *www.bannerengineering.com/surecross*.

Models	Frequency	Power	Housing	I/O
DX80N9X2S-P4	900 MHz ISM Band	10 to 30 V dc or battery supply module	IP67, NEMA 6	Inputs: Four 3-wire RTDs
DX80N9X1S-P4E		10 to 30 V dc or integrated battery	IP54, NEMA 4	
DX80N2X1S-P4E	2.4 GHz ISM Band			

DX80…C (IP20; NEMA 1) models are also available. To order this model with an IP20 housing, add a C to the end of the model number: DX80N9X2S-P4C.

Integrated battery models are also available without batteries. If you purchase a model without the battery, Banner Engineering recommends using the XENO XL-205F battery or equivalent. For DX99 models, only a XENO XL-205F battery is certified.

⚠️ **WARNING: Not To Be Used for Personnel Protection**

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

⚠️ **CAUTION: Never Operate 1 Watt Radios Without Antennas**

To avoid damaging the radio circuitry, never power up SureCross Performance or SureCross MultiHop (1 Watt) radios without an antenna.

0 155864 7

SureCross User Configuration Tool

The User Configuration Tool (UCT) software runs on any Windows machine and uses a converter cable to connect your Gateway to the computer.
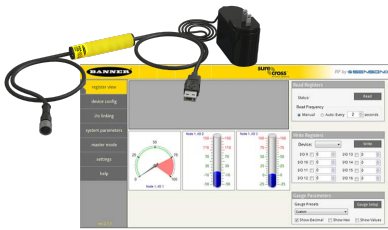
The User Configuration Tool (UCT) offers an easy way to link I/O points in your wireless network, view I/O register values graphically, and set system communication parameters when a host system is not part of the wireless network. Download the most recent revisions of the UCT software from Banner Engineering's website: *http://www.bannerengineering.com/wireless*.

The UCT requires a special USB to RS-485 (model number BWA-UCT-900 for 1 Watt radios, BWA-HW-006 can be used for all other radios) converter cable to pass information between your computer and the Gateway.

Setting Up Your Wireless Network

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

Disconnect the power from your SureCross devices.

1. Configure the DIP switches of all devices.
2. Connect the sensors to the SureCross devices.
3. Apply power to all devices.
   On the Gateway, LED 1 is solid green. On the Node, LED 2 flashes red to indicate there is no radio link to the Gateway.
4. Form the wireless network by binding the Nodes to the Gateway. If the binding instructions are not included in the datasheet, refer to the product manual for binding instructions.
5. Observe the LED behavior to verify the devices are communicating with each other.
   On the Gateway, LED 1 is solid green. On the Node, LED 1 flashes green to indicate it is communicating with the Gateway.
6. Conduct a site survey between the Gateway and Nodes. If the site survey instructions are not included in this datasheet, refer to the product manual for detailed site survey instructions.
7. Install your wireless sensor network components. If installation instructions are not included in this datasheet, refer to the product manual for detailed installation instructions.

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: *128185*
   - SureCross Wireless I/O Network Instruction Manual: *132607*
   - Web Configurator Instruction Manual (used with "Pro" and DX83 models): *134421*
   - Host Controller Systems Instruction Manual: *132114*
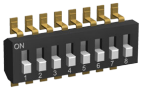
Configure the DIP Switches

Before making any changes to the DIP switch positions, disconnect the power. DIP switch changes will not be recognized if power isn't cycled to the device.

For parameters not set via DIP switches, use the User Configuration Tool (UCT) to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the User Configuration Tool.

Accessing the Internal DIP Switches

To access the internal DIP switches, follow these steps:

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.
4. Remove the black cover plate from the bottom of the device's cover.
   The DIP switches are located behind the rotary dials.

After making the necessary changes to the DIP switches, place the black cover plate back into position and gently push into place. Plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin. Mount the cover back onto the housing.

DIP Switch Settings (RTD)

Device Settings	Switches							
	1	2	3	4	5	6	7	8
Transmit power level: 1 Watt (30 dBm)	OFF*							
Transmit power level: 250 mW (24 dBm), DX80 compatibility mode	ON							
Modbus or UCT configured (overrides DIP switches)		OFF*						
DIP switch configured		ON						
Temp °Fahrenheit			OFF*					
Temp °Celsius			ON					
High resolution (0.1 degree) **				OFF*				
Low resolution (1 degree)				ON				
Platinum, 100 ohm (European, DIN 43760)					OFF*	OFF*	OFF*	
Unused					OFF	OFF	ON	
Copper, 10 ohm (alpha = 0.00427)					OFF	ON	OFF	
Unused					OFF	ON	ON	
Unused					ON	OFF	OFF	
Unused					ON	OFF	ON	
Unused					ON	ON	OFF	
Unused					ON	ON	ON	

* Default configuration

** In high resolution mode, the temperature = (Modbus register value) ÷ 20. In low resolution mode, the temperature = (Modbus register value) ÷ 2.

Modbus/User Configuration Tool (UCT) or DIP Switch Configured

In Modbus/UCT Configured mode, the device parameters are changed using the User Configuration Tool (UCT) or a Modbus command. All DIP switch positions are ignored. In DIP Switch Configured mode, use the DIP switches to configure the parameters listed in the table.

RTD Type

Use DIP switches 5, 6, and 7 to select the RTD type. The default position is the OFF position for all switches, setting the RTD to a Platinum 100 ohm type.

Temperature Resolution

When set to high resolution, temperature values are stored to the nearest tenth (0.1) of a degree (default position). To measure temperatures above 1600 degrees Fahrenheit or 1600 degrees Celsius, switch the DIP switch to the ON position and use low resolution mode. In high resolution, the device cannot store values larger than 1600.

Temperature Units

Use the DIP switch to specify if the temperature is stored in degrees Fahrenheit or Celsius. The default position is OFF, setting the temperature to Fahrenheit. For Celsius measurements, set this switch to the ON position.

Transmit Power Levels

The 900 MHz radios can be operated at 1 watt (30 dBm) or 250 mW (24 dBm). While the radios operate in 1 Watt mode, they cannot communicate with 150 mW DX80 radio devices. To communicate with the 150 mW radio models, operate this radio in 250 mW mode. For 2.4 GHz radios, this DIP switch is disabled. The transmit power for 2.4 GHz is fixed at about 100 mW EIRP (18 dBm), making the 2.4 GHz Performance models automatically compatible with the DX80 2.4 GHz models.

Mixing Performance and Non-Performance Radios in the Same Network

To comply with federal regulations, the 150 mW radios and 1 Watt radios communicate differently. To mix Performance radios with non-Performance radios:

- Performance radios must operate in 250 mW mode, not 1 Watt mode (DIP switch 1 ON)
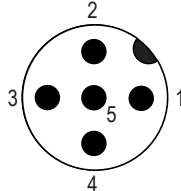- Non-Performance radios must be set to use Extended Address Mode (DIP switch 1 ON)

For more detailed instructions about setting up your wireless network, refer to the Quick Start Guide, Banner document number 128185. For more information about using Performance and non-Performance radios within the same network, refer the technical note titled *Mixing Performance Radios and 150 mW Radios in the Same Network* listed on the FAQ/ Knowledgebase section of Banner's Wireless Sensor Networks website.

Wiring Your SureCross® Device

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

5-pin Euro-Style Wiring for Nodes

Wiring the 5-pin Euro-style connector depends on the model and power requirements of the device. Not all models can be powered by 10 to 30 V dc and not all models can be powered by 3.6 to 5.5 V dc. Refer to the Specifications to verify the power requirements of your device. For FlexPower devices, do not apply more than 5.5 V to the gray wire.

|	Wire No.	Wire Color	10 to 30 V dc Powered	Battery Powered
	1	Brown	10 to 30 V dc	
	2	White		
	3	Blue	dc common (GND)	dc common (GND)
	4	Black		
	5	Gray		3.6 to 5.5 V dc

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, DX85	10 to 30 V dc Powered Nodes	Battery Powered Nodes
V+	10 to 30 V dc	10 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 to 5.5 V dc

Terminal Block (IP67 and IP20)

For the DX8*x*…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.
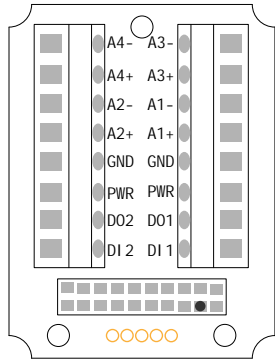
IP67 Housing	IP20 Housing
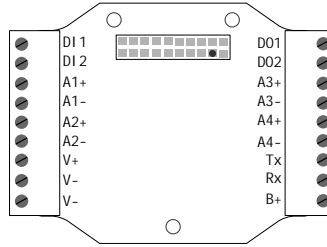
A*x*+ and A*x*–. Analog IN *x*. Analog inputs for devices requiring more than one connection, such as thermocouples or RTDs. When there is no A*x*–, use A*x*+ as an analog input.

DI*x*. Discrete IN *x*.

DO*x*. Discrete OUT *x*.

GND. Ground/dc common connection.

PWR. Power, 10 to 30 V dc power connection.

B+. 3.6 to 5.5 V dc (for battery powered models only).

RX/-. Serial comms line for Gateways and DX85s only. No connection for Nodes.

TX/+. Serial comms line for Gateways and DX85s only. No connection for Nodes

V+. Power, 10 to 30 V dc power connection.

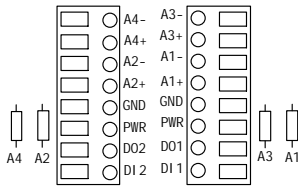V–. Ground/dc common connection.

Wiring for DX80...E Radios

Connecting dc power to the communication pins will cause permanent damage. The integrated battery DX80...E radios may also be powered by 10 to 30V dc. The power for the sensors can be supplied by the radio's SPx terminals or from the 10 to 30V dc used to power the radio.

The BAT connection is a low voltage connection to the internal battery. Remove the internal battery if a low voltage source is connected to the BAT terminal. When powering the device from the integrated battery, the BAT connection must remain open.

		Integrated battery (RS-485) (P1E, M-H1E Models)	Integrated battery (RS-232) (P3E, P4E, M-H3E, M-H4E Models)
	1	10 to 30V dc (optional)	10 to 30V dc (optional)
	2	RS-485 / D1 / B / +	RS-232 Tx
	3	dc common (GND)	dc common (GND)
	4	RS-485 / D0 / A / -	RS-232 Rx
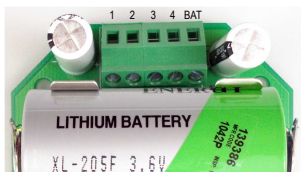
Terminal Block (IP54)

A*x*+ and A*x*−. Analog IN *x*. Analog inputs for devices requiring more than one connection, such as thermocouples or RTDs. When there is no A*x*−, use A*x*+ as an analog input.
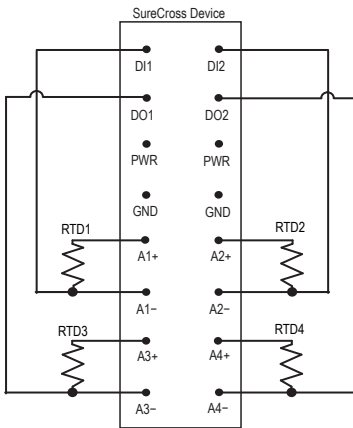
DI*x*. Discrete IN *x*.

DO*x*. Discrete OUT *x*.

GND. Ground/dc common connection.

PWR. Power, 10 to 30 V dc power connection.

Wiring Diagram for RTD Inputs

Supported RTD Types

The RTD Node supports up to four 3-wire RTD inputs by default. Additional types are available with configuration.

Thermocouple	Range °F	Range °C
Pt100 (DIN 0.00385)	-328 to 900 °F	-200 to 482 °C
Cu 10 Ohm (alpha = 0.00427)	-328 to 500 °F	-200 to 260 °C

* For the copper RTD, the best accuracy is when measuring between −50 to +150 °C (−58 to +302 °F). Below this range, expect errors approaching 3% of reading. Above this range, expect errors approaching 0.5% of reading.

LED Behavior for the Nodes

After binding the Gateway and Nodes, verify all devices are communicating properly. A Node will not sample its inputs until it is communicating with its Gateway. The radios and antennas must be a minimum distance apart to function properly. Recommended minimum distances are:

    2.4 GHz 65 mW radios: 1 foot
    900 MHz 150 mW radios: 6 feet
    900 MHz 1 Watt radios: 15 feet

LED 1	LED 2	Node Status
☀ (flashing green)		Radio Link Ok

LED 1	LED 2	Node Status
☀ (flashing red)	☀ (flashing red)	Device Error
	☀ (flashing red, 1 per 3 sec)	No Radio Link

Modbus Register Table (High Resolution Mode)

I/O	Modbus Holding Register		I/O Type	Units	I/O Range		Holding Register Representation		Terminal Block Labels
	Gateway	Any Node			Min.	Max.	Min. (Dec.)	Max. (Dec.)	
1	1	1 + (Node# × 16)							
2	2	2 + (Node# × 16)							
3	3	3 + (Node# × 16)	RTD 1						A1+/A1-/DI1
4	4	4 + (Node# × 16)	RTD 2	°F/°C	-1638.3	+1638.4	-32768	32767	A2+/A2-/DI2
5	5	5 + (Node# × 16)	RTD 3						A3+/A3-/DO1
6	6	6 + (Node# × 16)	RTD 4						A4+/A4-/DO2
7	7	7 + (Node# × 16)	Reserved						
8	8	8 + (Node# × 16)	Device Message						
		…							
15	15	15 + (Node# × 16)	Control Message						
16	16	16 + (Node# × 16)	Reserved						

In high resolution mode, the temperature = (Modbus register value) ÷ 20. In low resolution mode, the temperature is (Modbus register value) ÷ 2.

Temperature values are stored as signed values in the Modbus register. A 0 in the register is interpreted as 0°; and -32767 (65535 unsigned) in the register (0xFFFF) is interpreted as −1 ÷ 20 = −0.05° in high resolution mode and −1 ÷ 2 = −0.5° in low resolution mode.

Storage Mode and Sleep Mode

While in storage mode, the radio does not operate. All SureCross® radios powered from an integrated battery ship from the factory in storage mode to conserve the battery. To wake the device, press and hold button 1 for 5 seconds. To put any FlexPower® or integrated battery SureCross radio into storage mode, press and hold button 1 for 5 seconds. The radio is in storage mode when the LEDs stop blinking, but in some models, the LCD remains on for an additional minute after the radio enters storage mode. After a device has entered storage mode, you must wait 1 minute before waking it.

During normal operation, the SureCross radio devices enter sleep mode after 15 minutes of operation. The radio continues to function, but the LCD goes blank. To wake the device, press any button.

Replacing the Integrated Battery (DX80...E Models)

To replace the lithium "D" cell battery in any integrated housing model, follow these steps.
1. Remove the four screws mounting the face plate to the housing and remove the face plate. Do not remove the radio cover from the face plate.
2. Remove the discharged battery and replace with a new battery.
   Only use a 3.6V lithium battery from Xeno, model number XL-205F.
3. Verify the battery's positive and negative terminals align to the positive and negative terminals of the battery holder mounted within the case.
   Caution: There is a risk of explosion if the battery is replaced incorrectly.
4. After replacing the battery, allow up to 60 seconds for the device to power up.

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

Properly dispose of your used battery 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. 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.

Replacement battery model number: BWA-BATT-001. For pricing and availability, contact Banner Engineering.

Specifications

Radio [1]

Radio Range
900 MHz (1 Watt): Up to 9.6 km (6 miles)
2.4 GHz: Up to 3.2 km (2 miles)

Minimum Separation Distance
900 MHz (1Watt): 4.57 m (15 ft)
2.4 GHz (65 mW): 0.3 m (1 ft)

Radio Transmit Power
900 MHz (1 Watt): 30 dBm (1 W) conducted (up to 36 dBm EIRP)
2.4 GHz: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

900 MHz Compliance (1 Watt)
FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247
IC: 7044A-RM1809

2.4 GHz Compliance
FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247
ETSI/EN: In accordance with EN 300 328: V1.7.1 (2006-05)
IC: 7044A-DX8024

Spread Spectrum Technology
FHSS (Frequency Hopping Spread Spectrum)

Link Timeout
Gateway: Configurable via User Configuration Tool (UCT) software
Node: Defined by Gateway

General

Power
DX80 and DX80...C Model10 to 30 V dc or 3.6 to 5.5 V dc low power option (Outside the USA: 12 to 24 V dc, ±10% or 3.6 to 5.5 V dc low power option) [2]
DX80...E Model 3.6 V dc low power option from an internal battery or 10 to 30 V dc
900 MHz Consumption: Maximum current draw is < 40 mA and typical current draw is < 30 mA at 24 V dc. (2.4 GHz consumption is less.)

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)
DX80 and DX80...C Mounting: #10 or M5 (SS M5 hardware included)
DX80... E Mounting: 1/4-inch or M7 (SS M7 hardware included)
Max. Tightening Torque: 0.56 N·m (5 lbf·in)

Antenna Connection
Ext. Reverse Polarity SMA, 50 Ohms
Max Tightening Torque: 0.45 N·m (4 lbf·in)

Interface
Indicators: Two bi-color LEDs
Buttons: Two
Display: Six character LCD

Wiring Access
DX80: Four PG-7, One 1/2-inch NPT, One 5-pin Euro-style male connector
DX80...C: External terminals
DX80...E: Two 1/2-inch NPT

Inputs

RTD Inputs
Sample Rate: 1 second
Report Rate: 16 seconds
Accuracy: 0.1% of full scale
Resolution: 0.1 °C, 15-bit

Certifications

CE

---

[1] Radio range is with the 2 dB antenna that ships with the product. High-gain antennas are available, but the range depends on the environment and line of sight. To determine the range of your wireless network, perform a Site Survey.
[2] For European applications, power the DX80 from a Limited Power Source as defined in EN 60950-1.

Environmental

Rating
　Rating for DX80 models:IEC IP67; NEMA 6; (See UL section below for any applicable UL specifications)
　Rating for DX80…C models: IEC IP20; NEMA 1
　Rating for DX80…E models: IEC IP54; NEMA 4

Operating Conditions
　Operating Temperature for P4 and P4C models: −40 to 85 °C (Electronics); −20 to 80 °C (LCD)
　Operating Temperature for P4E models: −40 to 65 °C
　Operating Humidity: 95% max. relative (non-condensing)
　Radiated Immunity: 10 V/m, 80-2700 MHz (EN61000-6-2)

Shock and 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 to 60 Hz

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

Included with Model

The following items ship with the DX80 radios.

- 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. (Not included with IP20 DX80…C models)
- 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
- BWA-9O2-C (900 MHz) or BWA-2O2-C (2.4 GHz): Antenna, 2 dBd Omni, Rubber Swivel RP-SMA Male. (Not included with Internal antenna models)
- Quick Start Guide (128185 for DX80 Gateways or 152653 for MultiHop models)
- MQDC1-506: 5-Euro (single ended) straight cable, 2m (Not included with FlexPower devices)
- BWA-HW-011: IP20 Screw Terminal Headers (2 pack) (Included only with the IP20 DX80…C models)

Included with Device (DX80…E Models)

The following items ship with the DX80…E (NEMA 4) models.

- Mounting hardware kit
- BWA-HW-003: PTFE tape
- BWA-9O2-C (900 MHz) or BWA-2O2-C (2.4 GHz): Antenna, 2 dBd Omni, Rubber Swivel RP-SMA Male. (Not included with Internal antenna models)
- Quick Start Guide (128185 for DX80 Gateways or 152653 for MultiHop models)

Warnings

Antenna Installations. 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 SureCross® device or any equipment connected to the SureCross device during a thunderstorm.

Exporting SureCross 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. A list of approved countries appears in the *Radio Certifications* section of the product manual. The SureCross 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. Consult with Banner Engineering Corp. if the destination country is not on this list.

Violating Warnings. The manufacturer does not take responsibility for the violation of any warning listed in this document. 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. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. For the most recent version of any documentation, refer to: *www.bannerengineering.com*. © 2006-2013 Banner Engineering Corp. All rights reserved.

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.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.