

WORLD-BEAM® Q20 Series Sensors

WORLD-BEAM® Q20 Series Sensors
Compact, Self-Contained Family of Sensors



Features



- Photoelectric sensors in a compact, rugged, sealed, over-molded plastic housing
- Standard 3 mm threaded mounting holes on 25.4 mm (1") spacing
- Advanced electronic design for excellent noise immunity and cross-talk avoidance
- Threaded metal M8 connector on Pico-style quick-disconnect models
- 10 to 30V dc operation with complementary solid-state outputs (1 normally open, 1 normally closed); PNP (sourcing) or NPN (sinking), depending on model
- Complete offering of mounting brackets and apertures available
- Crosstalk prevention filters available for visible red opposed mode pairs
- Exceptional optical performance with easy to align visible red emitters
- Background suppression models provide reliable detection up to 150 mm while ignoring objects in the background
- Background suppression models provide stable detection in the presence of fluorescent lights

Overview

Banner's Q20 family of sensors offers a full complement of sensing modes, with the excellent performance expected of much larger sensors. Their compact plastic housings feature overmolded construction for superior robustness and sealing. Their popular rectangular design is easy to mount into tight spaces; integral threaded mounting holes eliminate the need for separate mounting nuts.

The single-turn Gain potentiometer on most models and bright LEDs (positioned on top of the housing for 360° visibility) provide easy alignment and configuration for reliable sensing (see [Figure 1. Features](#) on page 1).



WARNING: Not To Be Used for Personnel Protection

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product 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.

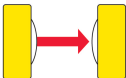
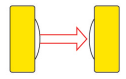
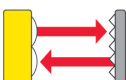
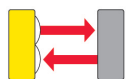
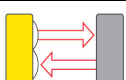
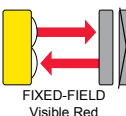


Figure 1. Features

(varies with model, see [Specifications](#) on page 3.)

1. Output LED
2. Power LED
3. Single-Turn Gain Potentiometer (Retro and Diffuse models only)

Models

	Sensing Mode	Model*	Range	Output**
Opposed	624 nm Visible Red	Q20E	12 m (39.4')	N/A
	Effective Beam: 10 mm (0.4") 	Q20PR		PNP
		Q20NR		NPN
	850 nm Infrared	Q20EL	20 m (65.6')	N/A
	Effective Beam: 10 mm (0.4") 	Q20PRL		PNP
		Q20NRL		NPN
Polarized Retro	660 nm Visible Red	Q20PLP	4 m (13')†	PNP
		Q20NLP		NPN
Retro	660 nm Visible Red	Q20PLV	6 m (20')†	PNP
		Q20NLV		NPN
Diffuse – Long-Range	Diffuse-mode and fixed-field performance based on use of 90% reflectance white test card.			
	624 nm Visible Red	Q20PDL	800 mm (32")	PNP
		Q20NDL		NPN
	850 nm Infrared	Q20PDXL	1500 mm (59")	PNP
		Q20NDXL		NPN
Diffuse – Short-Range	624 nm Visible Red	Q20PD	250 mm (10")	PNP
		Q20ND		NPN
Fixed-Field	655 nm Visible Red	Q20PFF50	50 mm (2") cutoff	PNP
		Q20NFF50		NPN
		Q20PFF100	100 mm (4") cutoff	PNP
		Q20NFF100		NPN
		Q20PFF150	150 mm (6") cutoff	PNP
		Q20NFF150		NPN

* Only standard 2 m (6.5') cable models are listed. For 9 m (30') cable, add suffix "W/30" to the model number (e.g., **Q20E W/30**).

QD models:

- For 4-pin Pico-style (threaded) integral QD, add suffix “**Q7**” (e.g., **Q20EQ7**).
- For 4-pin Pico-style (threaded) 150 mm (6") pigtail QD, add suffix “**Q**” (e.g., **Q20EQ**).
- For 4-pin Euro-style 150 mm (6") pigtail QD, add suffix “**Q5**” (e.g., **Q20EQ5**).
- For 150 mm (6") PUR pigtail cable with 4-pin threaded Euro-style QD connector, add “**QPMA**” to model number (e.g., **Q20EQPMA**)

† Range is specified using a model **BRT-84** reflector.

**Available with Health or Alarm Mode output; contact factory for details.

Specifications**Supply Voltage**

Fixed-Field: 10 to 30V dc (10% maximum ripple within specified limits) at less than 25 mA, exclusive of load

All others: 10 to 30V dc (10% maximum ripple within specified limits) at less than 18 mA, exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configuration

100 mA with short circuit protection

OFF-state leakage current: **NPN:** < 200 μ A sinking (see Application Note 2); **PNP:** < 10 μ A sourcing

ON-state saturation voltage: **NPN:** < 1.6V @ 100 mA; **PNP:** < 3.0V @ 100 mA

Output Response Time

Opposed Mode: 1 millisecond ON/600 microseconds OFF

Fixed-Field: 3 milliseconds ON/1.5 milliseconds OFF

All others: 800 microseconds ON/OFF

Note: 100 millisecond delay on power-up; outputs do not conduct during this time

Indicators

Two LED Indicators: Power (green) and Output (yellow)

Fixed-Field models:

Green ON Steady: Power ON

Yellow ON Steady: Black (LO) wire conducting

All other models:

Green ON Steady: Power ON

Green flashing: Output overloaded (varies with model)

Yellow ON steady: Black (LO) wire conducting

Yellow flashing: Marginal excess gain (1 to 1.5X)

Black (LO) wire conducting

Adjustments

Diffuse, Retroreflective, and Polarized Retroreflective models (only):

Single-turn Sensitivity (Gain) adjustment potentiometer

Repeatability

Opposed Mode: 140 microseconds

Fixed-Field: 182 microseconds

All others: 155 microseconds

Construction

Housing: ABS

Lenses: PMMA

Gain Adjuster: PBT (Retro and Diffuse models only)

Connections

2 m (6.5') or 9 m (30') 4-wire PVC cable, 150 mm (6") pigtail with 4-pin threaded Pico-style (Q) or Euro-style (Q5) connector, or 4-pin integral threaded Pico-style connector (Q7), depending on model

Operating Conditions

Temperature: -20° to +60° C (-4° to +140° F)

Relative Humidity: 95% @ 50° C (non-condensing)

Environmental Rating

IEC IP67 (NEMA 6)

PW12 1200 PSI washdown

Vibration and Mechanical Shock

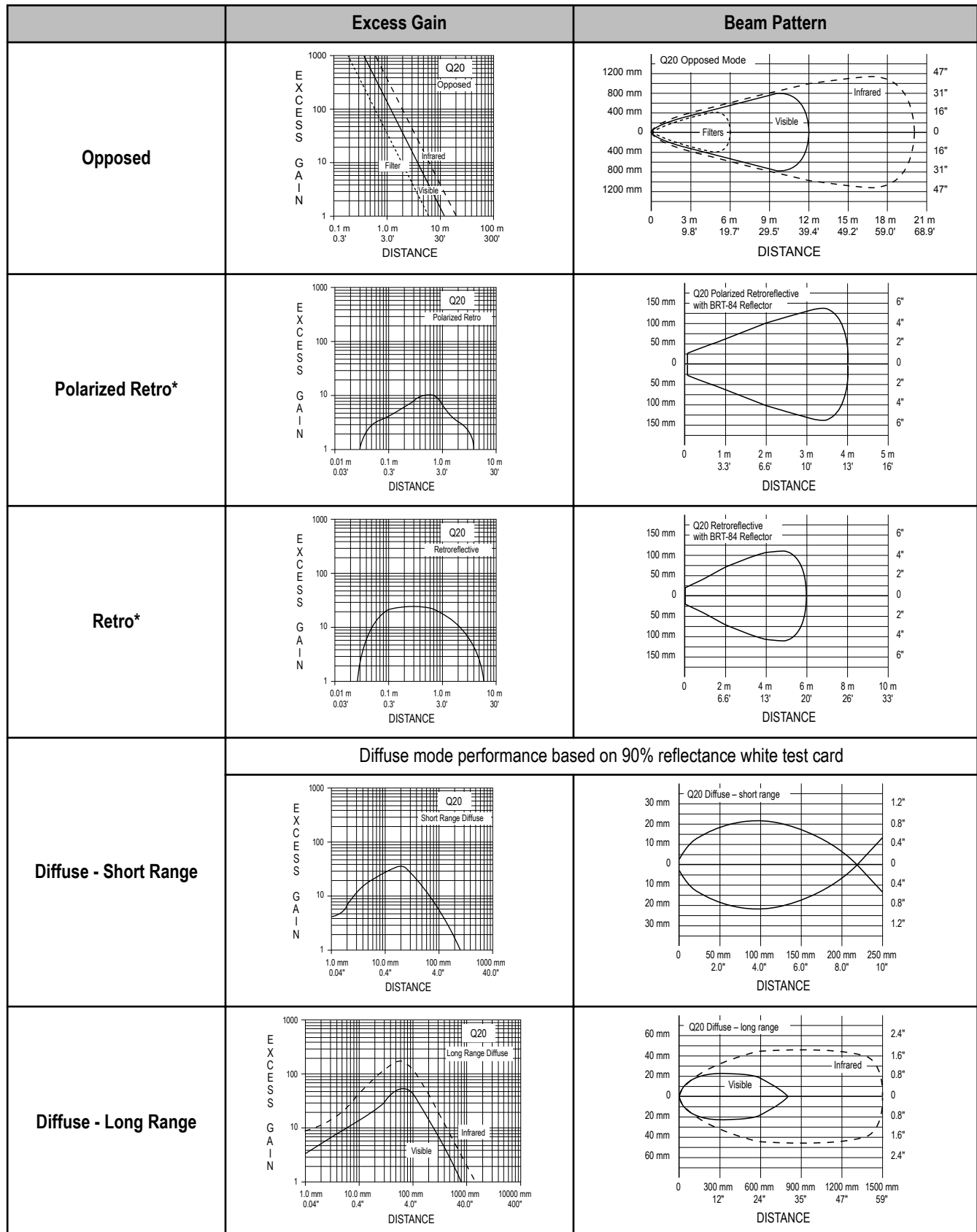
All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave

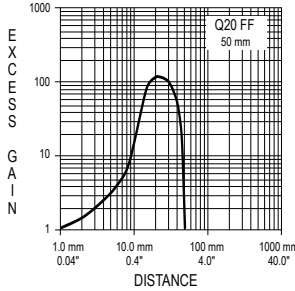
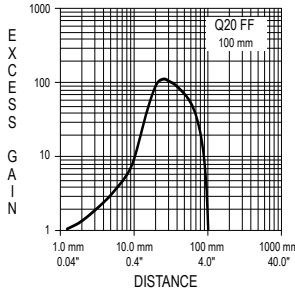
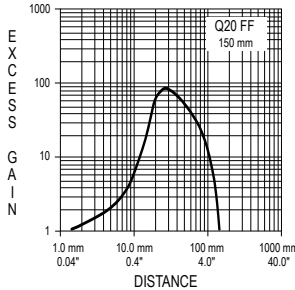
Applications Notes

1. Opposed mode sensor spacing can be reduced by alternating emitters and receivers or by applying cross talk filters (visible red models only)
2. NPN off-state leakage current is <200 μ A for load resistances > 3k Ω or optically isolated loads. For load currents of 100 mA, leakage is <1% of load current.

Certifications

Performance Curves



Excess Gain	
Fixed-Field 50 mm	Fixed-Field mode performance based on 90% reflectance white test card
	 $\varnothing$ 6 mm spot size at 25 mm $\varnothing$ 6 mm spot size at 50 mm cutoff Using 18% gray test card: cutoff distance will be 95% of value shown Using 6% black test card: cutoff distance will be 90% of value shown
Fixed-Field 100 mm	Fixed-Field mode performance based on 90% reflectance white test card
	 $\varnothing$ 6 mm spot size at 50 mm $\varnothing$ 6 mm spot size at 100 mm cutoff Using 18% gray test card: cutoff distance will be 90% of value shown Using 6% black test card: cutoff distance will be 85% of value shown
Fixed-Field 150 mm	Fixed-Field mode performance based on 90% reflectance white test card
	 $\varnothing$ 6 mm spot size at 75 mm $\varnothing$ 9 mm spot size at 150 mm cutoff Using 18% gray test card: cutoff distance will be 80% of value shown Using 6% black test card: cutoff distance will be 70% of value shown

*Performance based on use of a model BRT-84 retroreflector.

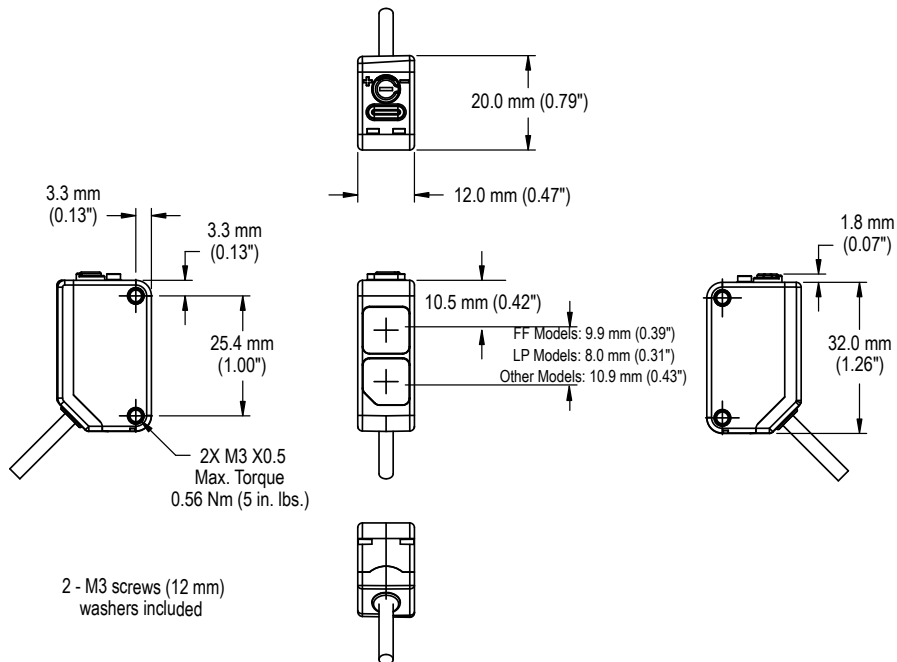
See [Accessories](#) on page 7-9. Additionally, see the Accessories section of the current Banner catalog, or www.bannerengineering.com for complete information.



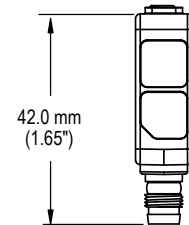
NOTE: Polarized sensors require corner cube type retroreflective targets only.

Dimensions

Cabled and Pigtail QD Models

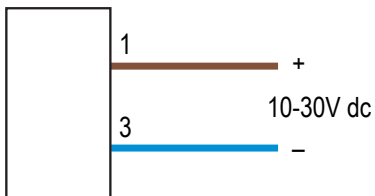


Integral QD Models



Hookups

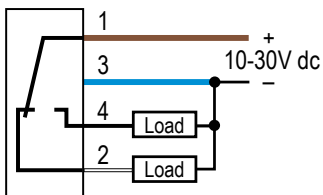
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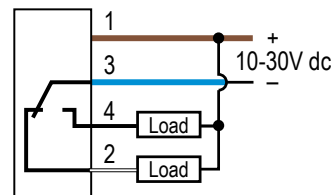
Wiring Key:

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black

PNP (Sourcing) Outputs



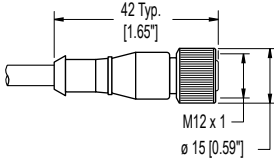
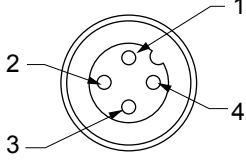
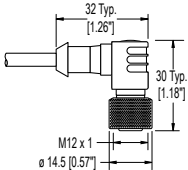
NPN (Sinking) Outputs

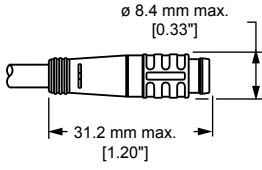
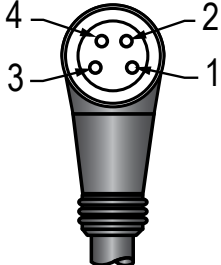
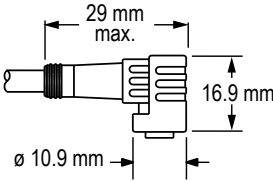


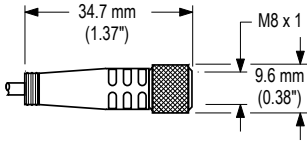
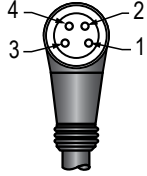
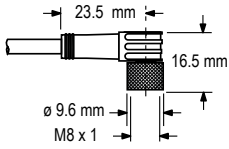
Cabled hookups only are shown. Hookups for QD models are functionally identical.

Accessories

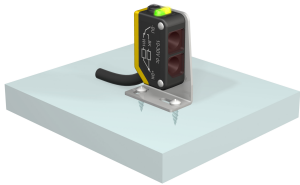
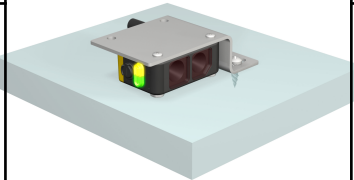
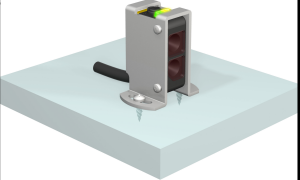
Quick-Disconnect (QD) Cordsets

4-Pin Euro-Style -- Single-Ended				
Model	Length	Description	Dimensions	Pinout
MQDC-406	2 m (6.5')	4-pin Euro-style, straight		
MQDC-415	5 m (15')			
MQDC-430	9 m (30')			
MQDC-406RA	2 m (6.5')	4-pin Euro-style right-angle		1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-415RA	5 m (15')			
MQDC-430RA	9 m (30')			

4-Pin Pico-Style Snap-On Connectors				
Style	Model	Length	Dimensions	Pinout
4-pin Pico-style straight, Snap-on Connector	PKG4-2	2 m (6.5')		
4-pin Pico-style Right-angle, Snap-on Connector	PKW4Z-2	2 m (6.5')		Wiring Key: 1 = Brown 2 = White 3 = Blue 4 = Black

4-Pin Pico-Style Connector with M8 Threads				
Style	Model	Length	Dimensions	Pinout
4-pin Pico-style straight with M8 threads	PKG4M-2 PKG4M-9	2 m (6.5') 9 m (30')		 Wiring Key: 1 = Brown 2 = White 3 = Blue 4 = Black
4-pin Pico-style Right-angle with M8 threads	PKW4M-2 PKW4M-9	2 m (6.5') 9 m (30')		

Accessory Mounting Brackets

SMBQ20L		SMBQ20LV	
• Sensor vertical base mount • +/- 5° tip, +/- 7° swivel • Stainless steel		• Sensor vertical back mount • +/- 10° tip • Stainless steel	
SMBQ20H		SMBQ20U	
• Sensor horizontal flange mount • +/- 10° swivel • Stainless steel		• Sensor vertical base mount with protection • +/- 22.5° swivel • Stainless steel	

Cross Talk Prevention Filters

(Visible Red Models Only)

Model*	Description			Reduced Sensor Range E/R (two apertures used)
PFQ20-H		Stainless steel (natural color)	7.5 mm (0.3") dia.	6.0 m (21.3")
PFQ20-V		Stainless steel (colorized black)		

* The "H" and "V" in the model numbers refer to the polarization of the filter material. Since they are visually identical, the "H" models have been left the natural stainless steel and the "V" models have been colored black.

Apertures

Model	Description		Reduced Sensor Range E/R (two apertures used)	Reduced Sensor Range EL/RL (two apertures used)
APQ20-0.5	 Circular Hole	0.5 mm (0.02") dia.	0.10 m (0.33')	0.18 m (0.6')
APQ20-1		1 mm (0.04") dia.	0.35 m (1.14')	0.66 m (2.1')
APQ20-2		2 mm (0.08") dia.	1.5 m (4.9')	2.9 m (9.5')
APQ20-0.5V	 Vertical Slot	0.5 mm (0.02") dia.	1.4 m (4.6')	2.3 m (7.5')
APQ20-1V		1 mm (0.04") dia.	2.8 m (9.2')	4.8 m (15.7')
APQ20-2V		2 mm (0.08") dia.	5.8 m (19.0')	8.6 m (28.2')
APK-Q20	Kit	Includes two of each type		

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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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