

# LX Series Part-Sensing Light Screen



## Datasheet

For Sensing Small or Flat Parts at High Speeds



- Emitter and receiver pair produce a strobed web of modulated light beams, in 8 lengths, 2 sensing ranges
- Simple, economical and highly reliable means of sensing small parts or flat items which pass anywhere through the light screen
- Fast response, output includes a 5-millisecond pulse stretcher for interfacing reliability
- Simple wiring configuration; emitter and receiver do not need a synchronization wire
- Rugged, self-contained and compact construction; rated IEC IP65
- Bipolar design offers both NPN (current sinking) and PNP (current sourcing) solid-state outputs



### 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.

## Models

Short-Range Models <sup>1</sup> 75 mm to 200 mm (3 in to 8 in) 5.6 mm dia. Minimum Object Detection Size	Standard-Range Models 150 mm to 2 m (6 in to 6.5 ft) 9.5 mm dia. Minimum Object Detection Size	Sensing Array Length	Cable <sup>2</sup>	Supply Voltage	Output Type
LX3ESR Emitter LX3RSR Receiver	LX3E Emitter LX3R Receiver	67 mm (2.6 in)	2 m (6.5 ft) 5- wire Integral cable	10 to 30 V dc	Bipolar NPN/PNP
LX6ESR Emitter LX6RSR Receiver	LX6E Emitter LX6R Receiver	143 mm (5.6 in)			
—	LX9E Emitter LX9R Receiver	218 mm (8.6 in)			
LX12ESR Emitter LX12RSR Receiver	LX12E Emitter LX12R Receiver	295 mm (11.6 in)			
—	LX15E Emitter LX15R Receiver	371 mm (14.6 in)			
—	LX18E Emitter LX18R Receiver	447 mm (17.6 in)			
—	LX21E Emitter LX21R Receiver	523 mm (20.6 in)			
—	LX24E Emitter LX24R Receiver	599 mm (23.6 in)			

<sup>1</sup> Additional sizes available on request; contact Banner Engineering.

<sup>2</sup> Integral cable models are listed.

- To order the 5-pin M12/Euro-style 150 mm (6 in) cable model, add suffix "Q" to model number (for example, LX3EQ).
- Models with a quick disconnect require a mating cordset.



## Theory of Operation

The LX Series light screen sensing system consists of two self-contained units: an emitter and a receiver of equal size and sensing range. The emitter has multiple infrared LEDs spaced at 9.5 mm (0.38 in) increments, and the receiver has corresponding photodiodes. The emitter sequentially fires each infrared LED. Multiple photodiodes in the receiver recognize each of the emitted pulses; the result is a “cross-hatched” optical pattern. Optical synchronization enables the receiver to recognize light from each of the emitter LEDs.

The optical crosshatch pattern enables the LX system to detect targets of very small diameter, and extremely thin, flat objects—as thin as a piece of paper or an envelope. For small diameter objects, the sensing resolution is less effective at the exact center (see the minimum object detection size specification) of the sensing range and at the extreme edges of the pattern (close to the emitter and receiver faces); sensing should take place within the center 80 percent of the range, as shown.

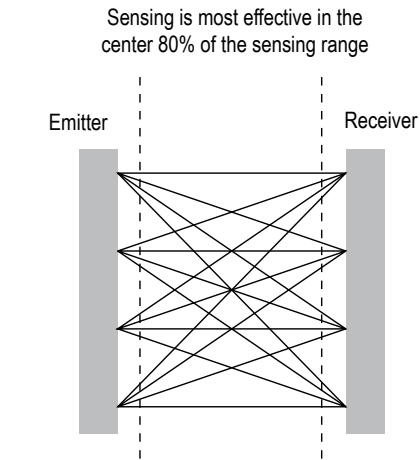


Figure 1. LX Series optical crosshatch pattern

LX Series sensors are available in two ranges: short and standard. Short-range emitters and receivers may be located as close together as 75 mm (3 in), with a maximum separation of 200 mm (8 in). Standard-range sensors may be separated 150 mm to 2 m (6 in to 6.5 ft) apart. Both emitter and receiver must be either short-range or standard models, of the same length. Detection sensitivity varies somewhat, depending on the distance between the sensors and the position of the target object.

For closer-range applications, the working range of any sensor pair can be reduced by connecting the sensor’s Select wire to 0 to 2 V dc (see the sensing range specification).

The receiver output interfaces directly with dc loads or circuits up to 30V dc, and offers both sinking (NPN) and sourcing (PNP) output transistors. Outputs conduct whenever a beam is broken. A 5 millisecond pulse stretcher (OFF-delay) is included to improve interfacing reliability.

### Typical Applications

Typical applications for the LX Series include parts ejection verification and package detection on a conveyor.

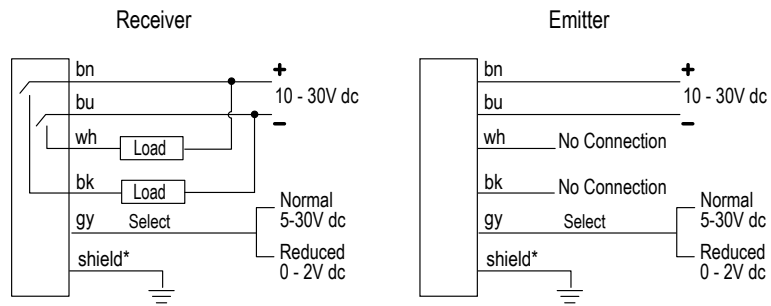
## Installation and Alignment

Reliable performance of the LX series light screen systems requires a simple alignment process. Mount the sensor in a location as free from vibration as possible.

Sensors may be mounted using the accessory brackets (available separately) or using the T-slots in the sensor housings. After mechanical alignment is completed, the sensors can be wired and power applied.

1. Loosely mount the emitter and receiver at their operating locations with their front panels opposite each other, and at approximately the same level.
2. Adjust the emitter position until the receiver detects alignment (the yellow LED turns OFF). For best alignment, position the emitter in the middle of the positions that cause a clear receiver condition.
3. Tighten the bracket hardware.
4. Position a pencil or similar object within the sensing area to verify that it can be reliably detected throughout the sensing area.

## Wiring Diagrams



\*It is recommended that the shield wire be connected to earth ground or DC common.



**NOTE:** Wiring for cabled and quick disconnect (QD) models is functionally identical.

## Specifications

### Supply Voltage and Power

10 to 30 V dc (10% maximum ripple) at less than 1 watt each for emitter and receiver (exclusive of load)

### Supply Protection Circuitry

Protected against reverse polarity and transient voltages

### Sensing Range

	Normal (see hookups)	Reduced
Short-Range Models	100 to 200 mm (4 in to 8 in)	75 to 150 mm (3 in to 6 in)
Standard-Range Models	300 mm to 2 m (1 ft to 6.5 ft)	150 mm to 600 mm (6 ft to 24 ft)

### Output Configuration

Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor

### Output Rating

125 mA maximum each output  
 Off-state leakage current: less than 5 microamps  
 Output saturation voltage (PNP output): < 1 volt at 10 mA and < 1.5 volts at 100 mA  
 Output saturation voltage (NPN output): < 0.5 volts at 10 mA and < 0.6 volts at 100 mA

### Output Protection Circuitry

Protected against false pulse on power-up and continuous overload or short circuit of outputs

### Output Response Time

LX3: 0.8 ms ON-time; 6 ms OFF-time (5 ms OFF-delay)  
 LX6: 1.6 ms ON-time; 7 ms OFF-time (5 ms OFF-delay)  
 LX9: 2.4 ms ON-time; 7.5 ms OFF-time (5 ms OFF-delay)  
 LX12: 3.2 ms ON-time; 8.5 ms OFF-time (5 ms OFF-delay)  
 LX15: 4.0 ms ON-time; 9 ms OFF-time (5 ms OFF-delay)  
 LX18: 4.8 ms ON-time; 10 ms OFF-time (5 ms OFF-delay)  
 LX21: 5.6 ms ON-time; 11 ms OFF-time (5 ms OFF-delay)  
 LX24: 6.4 ms ON-time; 11.5 ms OFF-time (5 ms OFF-delay)

### 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 (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

### Minimum Object Detection Size (M.O.D.S.)

Smallest diameter rod that can be detected in sensing range:

Short-Range: 5.6 mm (0.22 in)

Standard-Range: 9.5 mm (0.38 in)

### Indicators

#### Emitter:

- LED1 (green)
  - ON: Power ON, good sensor
  - OFF: Reduced Range
  - ON: Power ON, good sensor
- LED2 (red)
  - ON: Reduced range
  - OFF: Normal range
  - Flashing: Emitter hardware failure

#### Receiver

- LED1 (yellow)
  - ON: Output conducting
  - OFF: Output not conducting
- LED2 (bicolor green/red)
  - Green: Normal range
  - Red: Reduced range
  - Flashing Red: Receiver hardware failure

### Construction

Aluminum housing, die cast zinc with black e-coat painted endcaps, acrylic lens window

### Environmental Rating

Meets IEC IP65

### Connections

2 meter (6.5 ft) 5-conductor (with drain) pvc-jacketed attached cable or 5-pin Euro-style 150 mm (6 in) QD pigtail, depending on model

### Operating Conditions

Temperature: -20 °C to +70 °C (-4 °F to +158 °F)  
 90% at +50 °C maximum relative humidity (non-condensing)

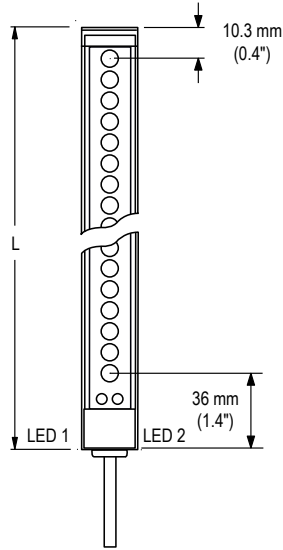
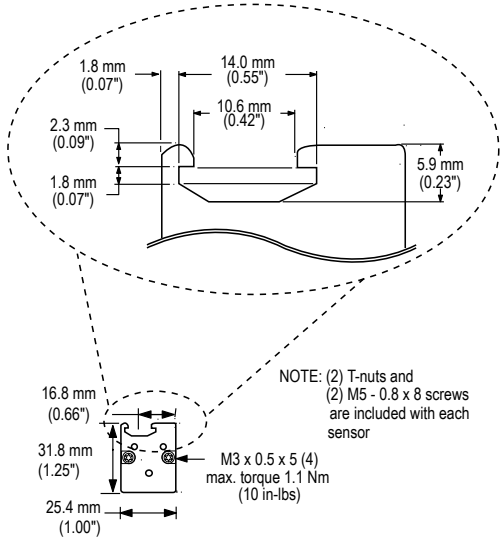
### Application Notes

1. The best sensing resolution occurs within the center 80% of the sensing range (*Figure 1* on page 2).
2. Low-profile packages can be reliably detected.
3. Outputs are active while the light screen is interrupted.
4. For reliable detection, successive parts must be spaced up to the total of ON-time plus OFF-time apart. (that is, 12 milliseconds for the LX12)

### Certifications



## Dimensions



Model	Length (L)
LX3	113.4 mm (4.46 in)
LX6	189.6 mm (7.46 in)
LX9	265.8 mm (10.46 in)
LX12	342.0 mm (13.46 in)
LX15	418.2 mm (16.46 in)
LX18	494.4 mm (19.46 in)
LX21	570.6 mm (22.46 in)
LX24	646.8 mm (25.46 in)

## Accessories

### Quick-Disconnect (QD) Cables

5-Pin Threaded M12/Euro-Style Cordsets—with Shield				
Model	Length	Style	Dimensions	Pinout (Female)
MQDEC2-506	1.83 m (6 ft)	Straight		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
MQDEC2-515	4.57 m (15 ft)			
MQDEC2-530	9.14 m (30 ft)			
MQDEC2-550	15.2 m (50 ft)			
MQDEC2-506RA	1.83 m (6 ft)	Right-Angle		
MQDEC2-515RA	4.57 m (15 ft)			
MQDEC2-530RA	9.14 m (30 ft)			
MQDEC2-550RA	15.2 m (50 ft)			

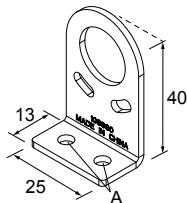
## Mounting Brackets

### SMBLX

- End-cap brackets; set of 2
- Zinc-plated cold rolled steel
- Hardware included for mounting brackets to sensor

Hole center spacing: A = 12.7

Hole size: A = ø 4.3

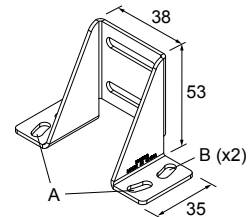


### SMBLXR

- Back-mount bracket for secure one-end mounting
- Zinc-plated cold rolled steel
- Hardware included for mounting bracket to sensor

Hole center spacing: A, B = 63.5, A to B = 10.2

Hole size: A, B = 5.2 x 11.6



## LX Series Lens Shields

Lens Shield Model Number	Fits LX Series Sensor Model	
LXS3	LX3	Self-adhesive polycarbonate lens shields protect sensor lens window from impact or weld flash. When shields are installed on both emitter and receiver, excess gain is reduced by 36% (maximum operating range reduces by 20%).
LXS6	LX6	
LXS9	LX9	
LXS12	LX12	
LXS15	LX15	
LXS18	LX18	
LXS21	LX21	
LXS24	LX24	

## 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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: [www.bannerengineering.com](http://www.bannerengineering.com).