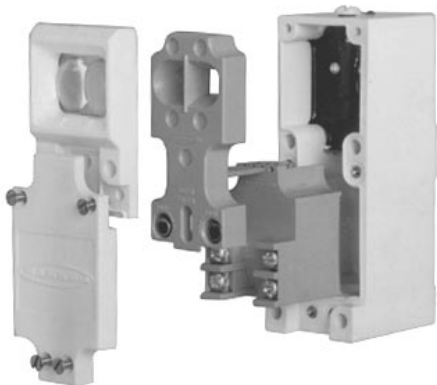
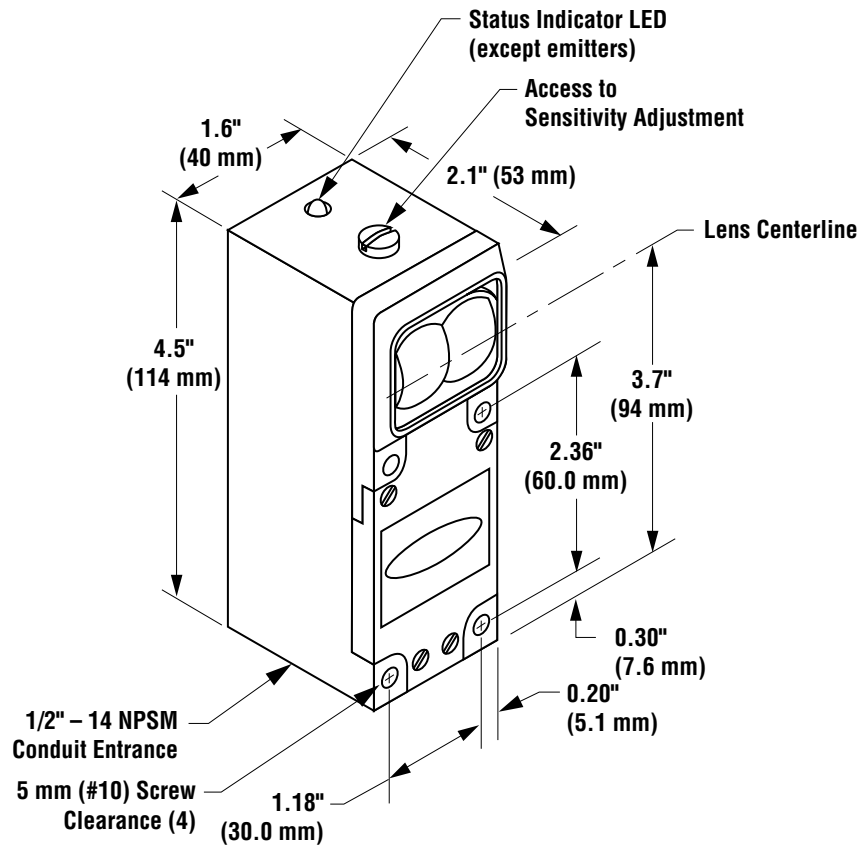




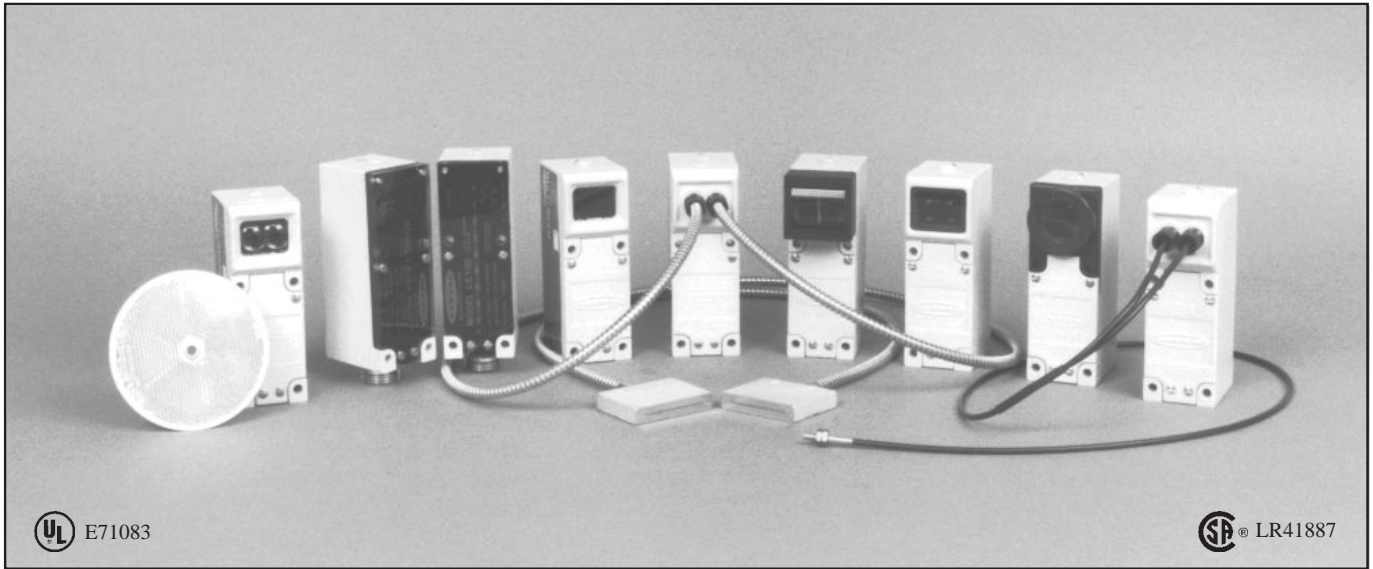
# MULTI-BEAM<sup>®</sup> Sensors

Compact modular self-contained photoelectric sensing controls



- Modular design with interchangeable components (scanner blocks, power blocks, and logic timing modules); over 5,000 sensor configurations possible
- *Scanner blocks* for opposed, retro, diffuse, convergent, and fiber optic sensing modes (including high-gain models)
- *Power blocks* for ac or dc operation, including 2-wire ac operation
- *Logic modules* to support a wide variety of delay, pulse, limit, and rate sensing logic functions
- Most scanner blocks include Banner's exclusive, patented AID™ (Alignment Indicating Device) system, which lights a top-mounted indicator LED whenever the sensor sees its own modulated light source, and pulses the LED at a rate proportional to the strength of the received light signal.

# MULTI-BEAM<sup>®</sup> Sensors



UL E71083

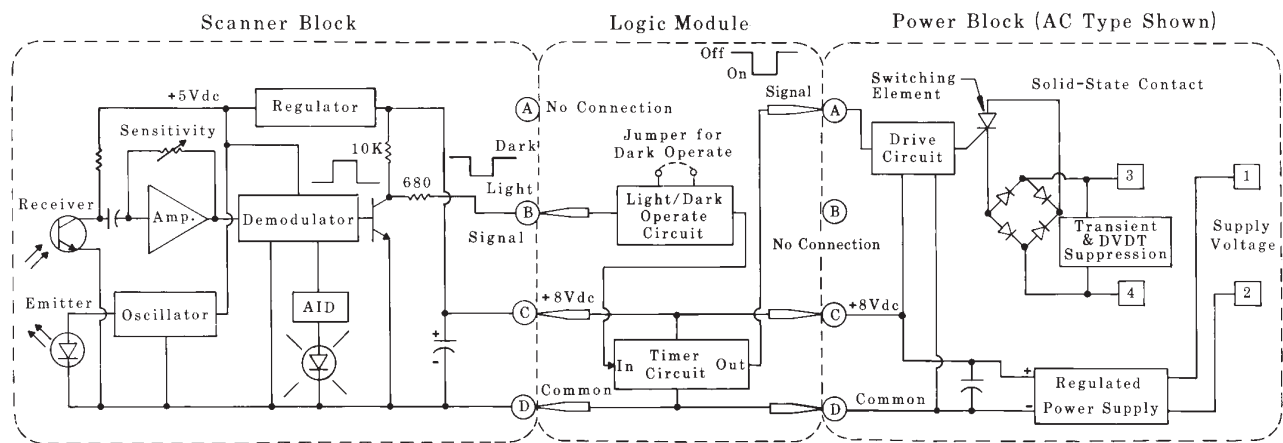
SP<sup>®</sup> LR41887

Banner MULTI-BEAM<sup>®</sup> sensors are compact *modular* self contained photoelectric switches. Each MULTI-BEAM consists of three components: scanner block, power block, and logic module. The *scanner block* contains the complete modulated photoelectric amplifier as well as the emitter and receiver optoelements. It also contains the sensing optics and the housing for the other two modules. The *power block* provides the interface between the scanner block and the external circuit. It contains a power supply for the MULTI-BEAM plus a switching device to interface the circuit to be controlled. The *logic module* interconnects the power block and scanner block both electrically and mechanically. It provides the desired timing logic function (if any), plus the ability to program the output for either light- or dark-operate. The emitters of MULTI-BEAM emitter-receiver pairs do not require a logic module. Emitter scanner blocks are supplied with a blade-pin to interconnect the scanner block and power block. This modular design, with field-replaceable power block and logic module, permits over 5,000 sensor configurations, resulting in exactly the right sensor for any photoelectric application.

There are two families of MULTI-BEAM sensors: 3- and 4-wire, and 2-wire. Three- and four-wire MULTI-BEAMS offer the greatest selection of sensor configurations. They permit either ac or dc operation and offer the fastest response times and the greatest sensing ranges. Two-wire MULTI-BEAMS are used in ac-powered applications where simplicity and convenience of wiring are important. They are physically *and* electrically interchangeable with heavy-duty limit switches.

The circuitry of all MULTI-BEAM components is encapsulated within rugged, corrosion-resistant VALOX<sup>®</sup> housings, which meet or exceed NEMA 1, 3, 12, and 13 ratings. Most MULTI-BEAM scanner blocks include Banner's patented Alignment Indicating Device (AID<sup>™</sup>) which lights a top-mounted LED when the sensor sees its own modulated light source and pulses the LED at a rate proportional to the received light signal. Most MULTI-BEAM sensor assemblies are UL listed and certified by CSA (see power block listings). All MULTI-BEAM components (except power block models 2PBR and 2PBR2) are totally solid-state for unlimited life.

## Composite Functional Schematic, 3- and 4-wire Sensors



## Selection of MULTI-BEAM Components

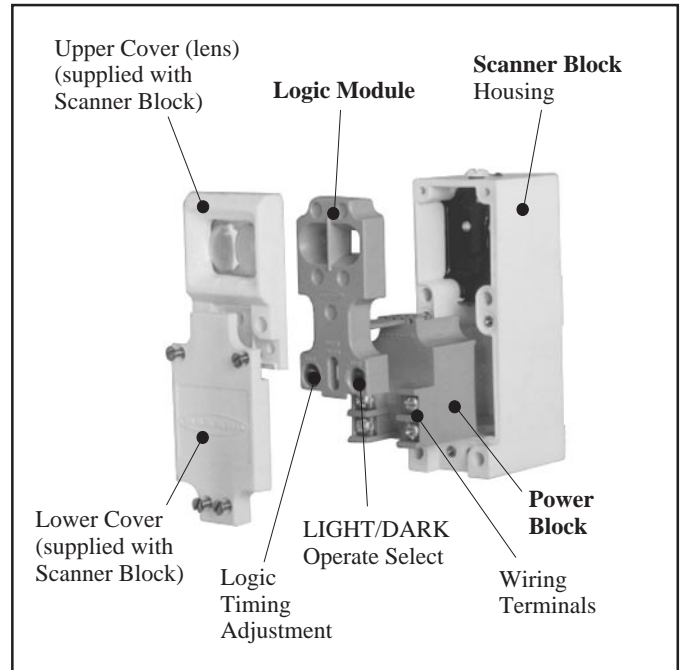
MULTI-BEAM sensors are made up of three components: scanner block, power block, and logic module. This is true for all MULTI-BEAMs with the exception of opposed mode emitter units which require only a power block (no logic module).

The first decision in the component selection process is to determine which family of MULTI-BEAM sensors is appropriate for the application: 3- and 4-wire, or 2-wire.


Next, decide which scanner block (within the selected family) is best for the application. The guidelines in the catalog introduction will help you to determine the best sensing mode. Then narrow the choice by comparing the specifications listed in the following charts and on the pages referenced in the charts.

Finally, choose a power block and logic module to complete the MULTI-BEAM assembly. Components snap together without inter-wiring to form a complete photoelectric sensing system that meets your exact requirements while maintaining the simplicity of a self-contained sensor.


If you have any questions about selecting MULTI-BEAM components, please contact your Banner sales engineer or call Banner's Applications Department at (612) 544-3164 during normal business hours.



## 3- and 4-wire Systems (pages 6 through 23)

Scanner Blocks	Model	Sensing Mode	Range	Response	Page
	<b>SBE &amp; SBR1</b>	Opposed: high speed	150 feet	1 millisecond	p. 7
	<b>SBED &amp; SBRD1</b>	Opposed: high speed, narrow beam	10 feet	1 millisecond	p. 7
	<b>SBEX &amp; SBRX1</b>	Opposed: high power, long range	700 feet	10 milliseconds	p. 7
	<b>SBEV &amp; SBRV1</b>	Opposed: visible beam	100 feet	10 milliseconds	p. 7
	<b>SBEXD &amp; SBRXD1</b>	Opposed: high power, wide beam angle	30 feet	10 milliseconds	p. 7
	<b>SBLV1</b>	Retroreflective: high speed, visible beam	30 feet	1 millisecond	p. 8
	<b>SBLVAG1</b>	Retroreflective: polarized beam (anti-glare)	15 feet	1 millisecond	p. 8
	<b>SBL1</b>	Retroreflective: high speed, infrared beam	30 feet	1 millisecond	p. 8
	<b>SBLX1</b>	Retroreflective: high power, long range	100 feet	10 milliseconds	p. 8
	<b>SBD1</b>	Diffuse (proximity): high speed	12 inches	1 millisecond	p. 9
<b>SBDL1</b>	Diffuse (proximity): medium range	24 inches	1 millisecond	p. 9	
<b>SBDX1</b>	Diffuse (proximity): high power, long range	6 feet	10 milliseconds	p. 9	
<b>SBDX1MD</b>	Diffuse (proximity): wide beam angle	24 inches	10 milliseconds	p. 9	
<b>SBCV1</b>	Convergent beam: high speed, visible red	1.5-inch focus	1 millisecond	p. 10	
<b>SBCVG1</b>	Convergent beam: high speed, visible green	1.5-inch focus	1 millisecond	p. 10	
<b>SBC1</b>	Convergent beam: high speed, infrared	1.5-inch focus	1 millisecond	p. 10	
<b>SBC1-4</b>	Convergent beam: high speed, infrared	4-inch focus	1 millisecond	p. 10	
<b>SBC1-6</b>	Convergent beam: high speed, infrared	6-inch focus	1 millisecond	p. 10	
<b>SBCX1</b>	Convergent beam: high power, infrared	1.5-inch focus	10 milliseconds	p. 10	
<b>SBCX1-4</b>	Convergent beam: high power, infrared	4-inch focus	10 milliseconds	p. 10	
<b>SBCX1-6</b>	Convergent beam: high power, infrared	6-inch focus	10 milliseconds	p. 10	
<b>SBEF &amp; SBRF1</b>	Opposed fiber optic (glass fibers): high speed	see specs	1 millisecond	p. 11	
<b>SBEXF &amp; SBRXF1</b>	Opposed fiber optic (glass fibers): high power	see specs	10 milliseconds	p. 11	
<b>SBFX1</b>	Fiber optic (glass fibers): high power, infrared	see specs	10 milliseconds	p. 11	
<b>SBF1</b>	Fiber optic (glass fibers): high speed, infrared	see specs	1 millisecond	p. 12	
<b>SBF1MHS</b>	Fiber optic (glass fibers): very high speed	see specs	0.3 millisecond	p. 12	
<b>SBFV1</b>	Fiber optic (glass fibers): visible red	see specs	1 millisecond	p. 13	
<b>SBFVG1</b>	Fiber optic (glass fibers): visible green	see specs	1 millisecond	p. 13	
<b>SBAR1</b>	Ambient light receiver	see specs	10 milliseconds	p. 14	
<b>SBAR1GH</b>	Ambient light receiver: high gain	see specs	10 milliseconds	p. 14	
<b>SBAR1GHF</b>	Ambient light receiver: for glass fiber optics	see specs	10 milliseconds	p. 14	

## 2-wire Systems (pages 24 through 29)

Scanner Blocks	Model	Sensing Mode	Range	Response	Page
	SBE & 2SBR	Opposed	150 feet	10 milliseconds	p. 25
	2SBL1	Retroreflective	30 feet	10 milliseconds	p. 25
	2SBD1	Diffuse (proximity): short range	12 inches	10 milliseconds	p. 26
	2SBDX1	Diffuse (proximity): long range	30 inches	10 milliseconds	p. 26
	2SBC1	Convergent beam	1.5-inch focus	10 milliseconds	p. 25
	2SBC1-4	Convergent beam	4-inch focus	10 milliseconds	p. 25
	2SBF1	Fiberoptic	see specs	10 milliseconds	p. 26

## MULTI-BEAM 3- & 4-WIRE SCANNER BLOCKS

### DESCRIPTION

MULTI-BEAM 3- & 4-wire scanner blocks offer a complete complement of sensing modes. There are 3 or more models for each sensing mode, resulting in a choice of exactly the right sensor for any application. The high power models (10 millisecond response time) offer greater optical sensing power than any other industrial sensors.

### SPECIFICATIONS

**SUPPLY VOLTAGE:** input power and output connections are made via a 3- or 4-wire power block (see pages 15 to 20).

**RESPONSE TIME:** 1 millisecond ON and OFF, except high gain models with "X" suffix and ambient light receivers which are 10 milliseconds ON and OFF.

**REPEATABILITY OF RESPONSE:** see individual sensor specs.

**SENSITIVITY ADJUSTMENT:** easily accessible, located on top of scanner block beneath o-ring gasketed screw cover. 15-turn clutched control (rotate clockwise to increase gain).

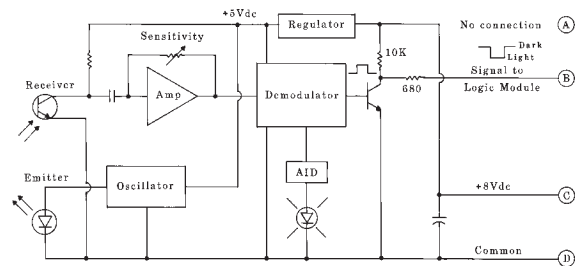
**ALIGNMENT INDICATOR:** red LED on top of scanner block. Banner's exclusive, patented Alignment Indicating Device (AID™) circuit lights the LED whenever the sensor detects its own modulated light source, and pulses the LED at a rate proportional to the received light level.

**CONSTRUCTION:** reinforced VALOX® housing with components totally encapsulated. Stainless steel hardware. Meets NEMA standards 1, 3, 12, and 13.

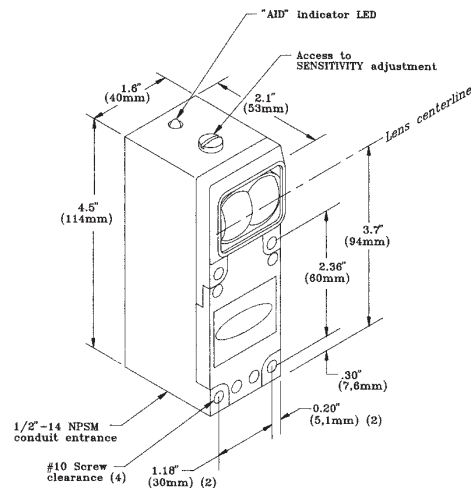
**OPERATING TEMPERATURE RANGE:** -40 to +70 degrees C (-40 to +158 degrees F).

VALOX® is a registered trademark of General Electric Company.

Functional Schematic, 3- and 4-wire Scanner Block



Dimensions, 3- and 4-wire Scanner Block



# MULTI-BEAM 3- & 4-wire Scanner Blocks

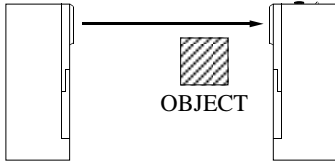
*Sensing Mode*

*Models*

*Excess Gain*

*Beam Pattern*

## OPPOSED Mode



**SBE/SBR1:** this opposed pair has the highest gain available at 1 ms response.

**SBED/SBRD1:** fast response and small effective beam; will detect objects as small as .14 inch in crosssection moving at up to 10 feet per second. Best choice for repeatability of position sensing.

**SBEX/SBRX1:** best choice for opposed sensing in extremely dirty environments. Use for outdoor applications and all applications requiring opposed range of 100 feet or more. Also useable side-by-side for long-distance mechanical convergent sensing. Alignment difficult beyond 400 feet.

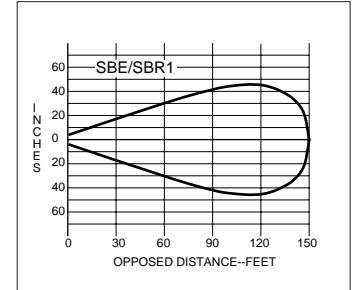
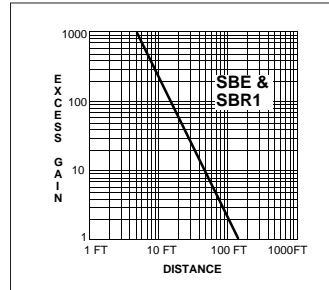
**SBEV/SBRX1:** SBEV has visible red beam for easiest alignment and system monitoring.

**SBEXD/SBRXD1:** wide beam angle and high gain for the most forgiving emitter-receiver alignment.



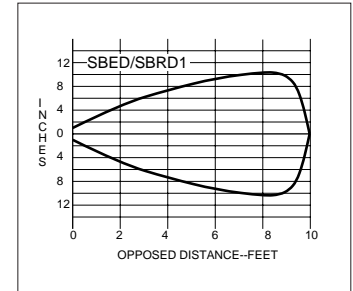
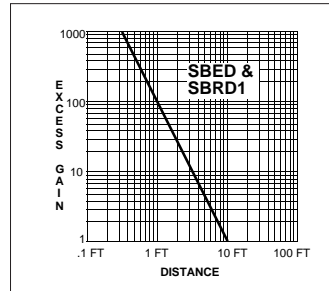
### SBE & SBR1

**Range:** 150 feet (45m)  
**Response:** 1ms on/off  
**Repeatability:** 0.03ms  
**Beam:** infrared, 940nm  
**Effective beam:** 1" dia.



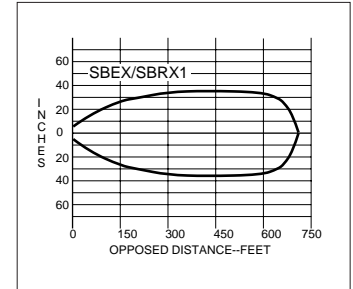
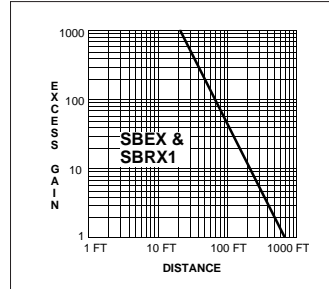
### SBED & SBRD1

**Range:** 10 feet (3m)  
**Response:** 1ms on/off  
**Repeatability:** 0.03ms  
**Beam:** infrared, 880nm  
**Effective beam:** .14" dia.



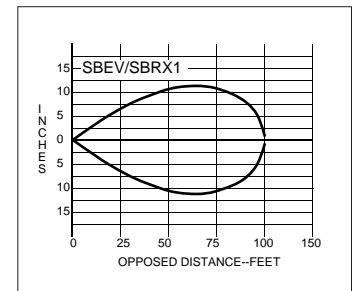
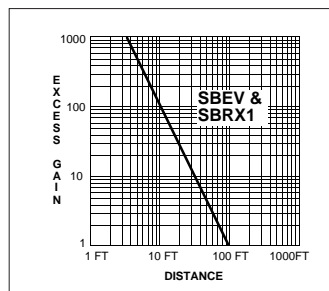
### SBEX & SBRX1

**Range:** 700 feet (200m)  
**Response:** 10ms on/off  
**Repeatability:** 0.7ms  
**Beam:** infrared, 940nm  
**Effective beam:** 1" dia.



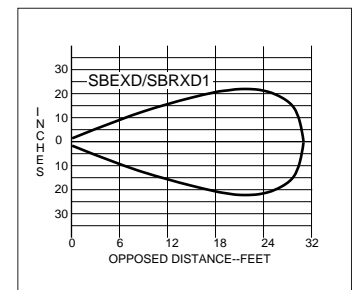
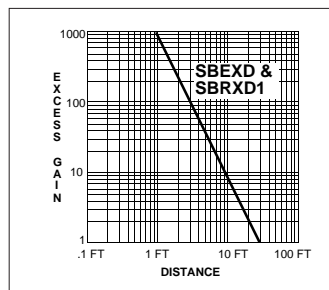
### SBEV & SBRX1

**Range:** 100 feet (30m)  
**Response:** 10ms on/off  
**Repeatability:** 0.1ms  
**Beam:** visible red, 650nm  
**Effective beam:** 1" dia.



### SBEXD & SBRXD1

**Range:** 30 feet (9m)  
**Response:** 10ms on/off  
**Repeatability:** 0.7ms  
**Beam:** infrared, 880nm  
**Effective beam:** .14" dia.



# MULTI-BEAM 2-wire Scanner Blocks

## Sensing Mode

## Models

## Excess Gain

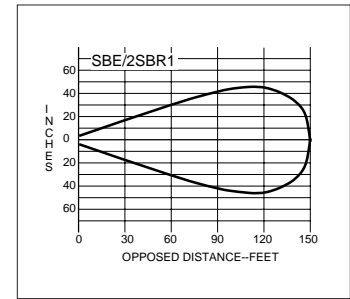
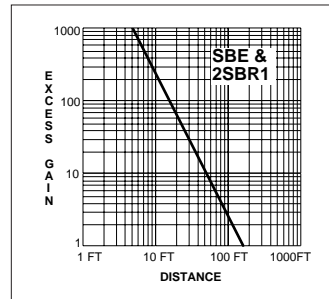
## Beam Pattern

### OPPOSED Mode



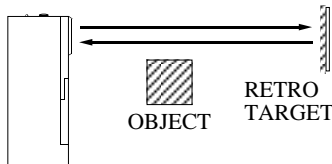
#### SBE & 2SBR1

**Range:** 150 feet (45m)  
**Response:** 10ms on/off  
**Repeatability:** 0.03ms  
**Beam:** infrared, 940nm  
**Effective beam:** 1" dia.



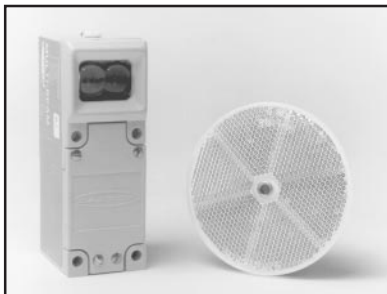
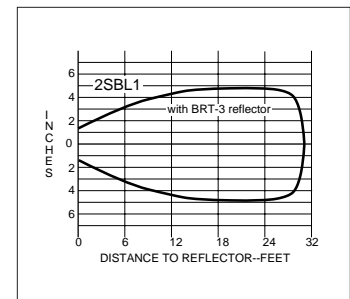
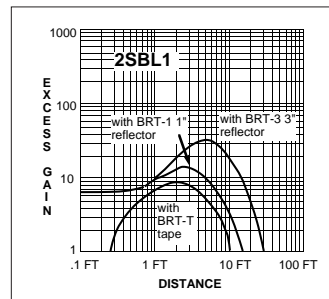
Model 2SBR1 receiver is used with the SBE emitter, which is the same emitter used with the 1 millisecond 3- & 4-wire receiver model SBR1. The response time, however, is determined by the receiver, and is 10 milliseconds. This pair will work reliably in slightly dirty (average manufacturing plant) conditions up to 60 feet opposed, and outdoors up to 20 feet. When more distance (or excess gain) is required, use 3- & 4-wire receiver model SBRX1 with the SBEX emitter. The 2SBR1 will not work with the visible emitter SBEV. Use opposed mode sensors as a first choice in any application, except where the material to be sensed is translucent to light or so small that it will not break the effective beam diameter. The SBE emitter uses a 3 & 4 wire power block. Powerblocks for use with SBE include models PBA-1, PBB-1, PBD-1, PBT-1, and PBT48-1 (see pages 16 and 19 for information on these powerblocks).

### RETROREFLECTIVE



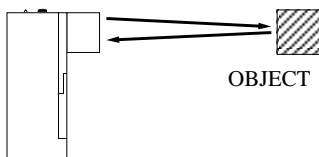
#### 2SBL1

**Range:** 1 in. to 30 feet  
 (2.5cm to 9m)  
**Response:** 10ms on/off  
**Repeatability:** 2.5ms  
**Beam:** infrared, 940nm



Model 2SBL1 is the retroreflective mode scanner block in the 2-wire MULTI-BEAM family. It has the same excellent optical performance as model SBL1 in the 3- & 4-wire family. If the application calls for breaking a retroreflective beam with shiny objects such as metal cans or cellophane-wrapped packages, mount the 2SBL1 and its retroreflector at an angle of 10 degrees or more to the shiny surface to eliminate any direct reflections from the object itself, or consider using 3- & 4-wire scanner block model SBLVAG1 (page 8). Alternatively, the MAXI-BEAM, VALU-BEAM, and MINI-BEAM families offer 2-wire ac visible and polarized retroreflective models. Notice from the excess gain curve that the gain falls off at very close sensing ranges, so much so that retroreflectors cannot be used reliably closer than one inch from the sensor.

### CONVERGENT Mode

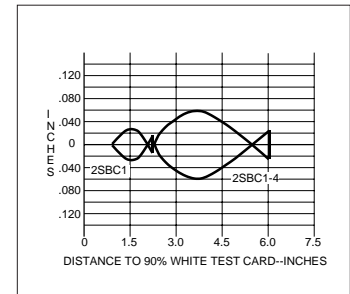
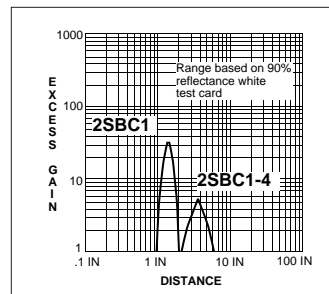


#### 2SBC1

**Focus at:** 1.5inches  
 (38mm)

#### 2SBC1-4

**Focus at:** 4 inches  
 (10cm)  
**Response:** 10ms on/off  
**Repeatability:** 2.5ms  
**Beam:** infrared, 940nm



These convergent mode 2-wire scanner blocks are identical in performance to their 3- & 4-wire equivalents, except for the 10 millisecond response time. They are designed for 2-wire applications where background objects might be seen by proximity mode sensors, or where the precision of a small focused image is important (e.g. - edge-guiding or position control). Model 2SBC1 provides much more excess gain at its focus point as compared to the diffuse mode sensors. Convergent mode sensors are preferable to diffuse mode sensors if the distance from the sensor to the object to be detected can be kept constant. Models 2SBC1 and 2SBC1-4 may be derived from retro model 2SBL1 by exchange of the upper cover assembly. Model 2SBC1 uses upper cover UC-C, and model 2SBC1-4 uses upper cover model UC-C4. These may be interchanged. A 6-inch convergent model may be created from either model by substituting upper cover UC-C6. See the Upper Cover Interchangeability Chart in the Banner product catalog for more information.