Selection of MULTI-BEAM Components

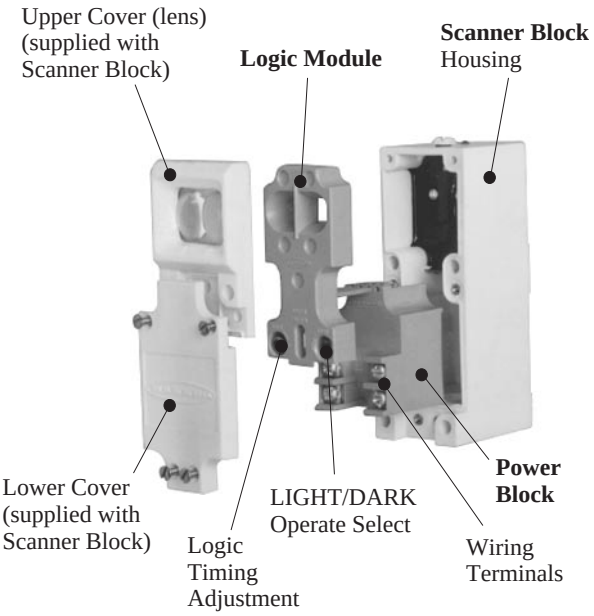
MULTI-BEAM sensors are made up of three components: scanner block, power block, and logic module. This is true for all MULTI-BEAMs with the exception of opposed mode emitter units which require only a power block (no logic module).

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

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

Power Blocks	Model	Input Voltage	Output Configuration	Agency Approvals	Page
	PBT	10 to 30V dc	SPST NPN (sink), 250mA maximum	UL & CSA	p. 15
	PBT2	10 to 30V dc	SPDT NPN (sink), 250mA each output		p. 15
	PBP	10 to 30V dc	SPST PNP (source), 250mA maximum	UL & CSA	p. 15
	PBT-1	10 to 30V dc	No output: for powering emitters	UL & CSA	p. 16
	PBT48	44 to 52V dc	SPST NPN (sink), 250mA maximum		p. 15
	PBP48	44 to 52V dc	SPST PNP (source), 250mA maximum		p. 15
	PBT48-1	44 to 52V dc	No output: for powering emitters		p. 16
	**PBD-2**	11 to 13V ac (50/60Hz)	SPST SCR, 3/4 amp maximum		p. 17
	PBD	22 to 28V ac (50/60Hz)	SPST SCR, 3/4 amp maximum	UL & CSA	p. 17
	PBD-1	22 to 28V ac (50/60Hz)	No output: for powering emitters		p. 19
	PBA	105 to 130V ac (50/60Hz)	SPST SCR, 3/4 amp maximum	UL & CSA	p. 17
	PBAQ	105 to 130V ac (50/60Hz)	SPST SCR, normally closed, 3/4 amp max.	UL & CSA	p. 19
	PBAT	105 to 130V ac (50/60Hz)	SPST isolated transistor, 100mA max. (ac or dc)	UL & CSA	p. 18
	PBO	105 to 130V ac (50/60Hz)	SPST isolated transistor, 50mA max. (dc only)	UL & CSA	p. 18
	PBAM	105 to 130V ac (50/60Hz)	Voltage source: 8V dc at 8ma max.	UL & CSA	p. 18
	PBA-1	105 to 130V ac (50/60Hz)	No output: for powering emitters	UL & CSA	p. 19
	PBB	210 to 250V ac (50/60Hz)	SPST SCR, 3/4 amp maximum	UL & CSA	p. 17
	PBBT	210 to 250V ac (50/60Hz)	SPST isolated transistor, 100mA max. (ac or dc)	UL & CSA	p. 18
	PBOB	210 to 250V ac (50/60Hz)	SPST isolated transistor, 50mA max. (dc only)	UL & CSA	p. 18
	PBB-1	210 to 250V ac (50/60Hz)	No output: for powering emitters	UL & CSA	p. 19

Logic Modules	Model	Timing Logic Function	Time Range(s)	Page
	LM1	ON/OFF (no timing function), light operate only	*NOTE for items below:* other time ranges available (p. 23)	p. 21
	LM3	ON/OFF (no timing function), light or dark operate		p. 21
	LM5	ON-delay	.15 to 15 seconds	p. 22
	LM5R	OFF-delay	.15 to 15 seconds	p. 22
	LM5-14	ON & OFF delay	.15 to 15 seconds (both delays)	p. 22
	LM5T	Limit timer (time-limited ON/OFF)	.15 to 15 seconds	p. 22
	**LM4-2**	One-shot, retriggerable	.01 to 1 second	p. 21
	LM4-2NR	One-shot, non-retriggerable	.01 to 1 second	p. 22
	LM8-1	Delayed one-shot	.15 to 15 seconds (both times)	p. 23
	LM8A	ON-delay one-shot	.15 to 15 seconds (both times)	p. 23
	LM6-1	Rate sensor	60 to 1200 pulses per minute	p. 22
	LM8	Repeat cycle timer	.15 to 15 seconds (both times)	p. 23
	LM2	Alternate action, divide by 2		p. 21
	LM10	Alternate action, divide by 10		p. 23
	LMT	Test module		p. 23

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

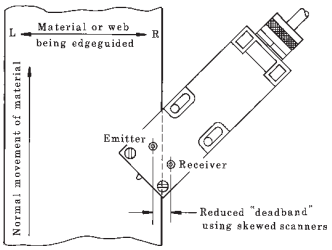
2-wire Systems (pages 24 through 29)

Power Blocks	Model	Input Voltage	Output Configuration	Agency Approvals	Page
	**2PBD**	22 to 28V ac (50/60Hz)	2-wire, SPST SCR, 3/4 amp max.	UL & CSA	p. 27
	2PBA	105 to 130V ac (50/60 Hz)	2-wire, SPST SCR, 3/4 amp max.	UL & CSA	p. 27
	2PBB	210 to 250V ac (50/60Hz)	2-wire, SPST SCR, 3/4 amp max.	UL & CSA	p. 27
	2PBR	105 to 130V ac (50/60Hz)	4-wire, SPST E/M relay, 5 amps max.		p. 27
	2PBR2	105 to 130V ac (50/60Hz)	4-wire, SPDT E/M relay, 5 amps max.		p. 27

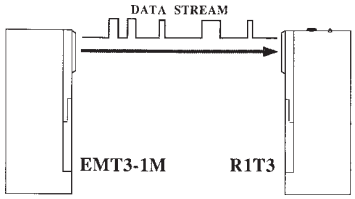
Logic Modules	Model	Timing Logic Function	Time Range(s)	Page
	**2LM3**	ON/OFF (no timing)		p. 29
	2LM5	ON-delay	.15 to 15 seconds	p. 29
	2LM5R	OFF-delay	.15 to 15 seconds	p. 29
	2LM5-14	ON & OFF delay	.15 to 15 seconds (both delays)	p. 29
	2LM5T	Limit timer (time limited ON/OFF)	.15 to 15 seconds (both delays	p. 29
	2LM4-2	One-shot, retriggerable	.01 to 1 second	p. 29
	LMT	Test module		p. 23

Other MULTI-BEAM Systems (described in Banner product catalog or in the data sheets noted below)

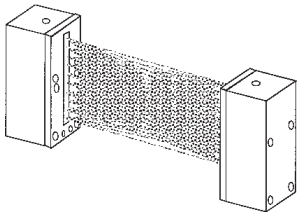
Edgeguide Systems (data sheet 03506)



Optical Data Transmitter (data sheet 03321)



Light Screen System (data sheet 03557)



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).

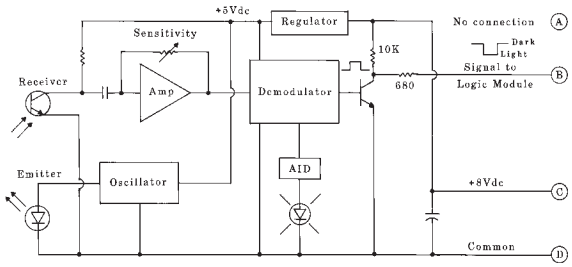
ALIGNMENT INDICATOR: red LED on top of scanner block. Banner's exclusive, patented Alignment Indicating Device (AID™) circuit lights the LED whenever the sensor detects its own modulated light source, and pulses the LED at a rate proportional to the received light level.

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

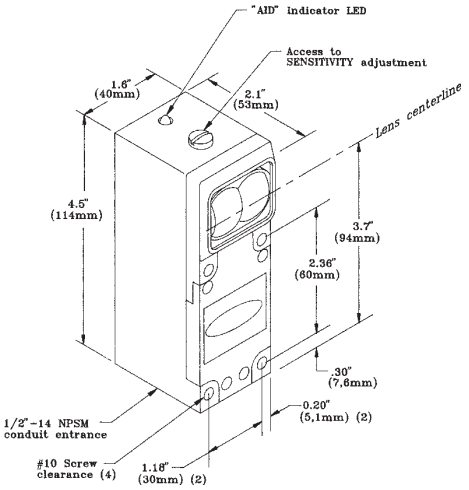
OPERATING TEMPERATURE RANGE: -40 to +70 degrees C (-40 to +158 degrees F).

VALOX® is a registered trademark of General Electric Company.

Functional Schematic, 3- and 4-wire Scanner Block

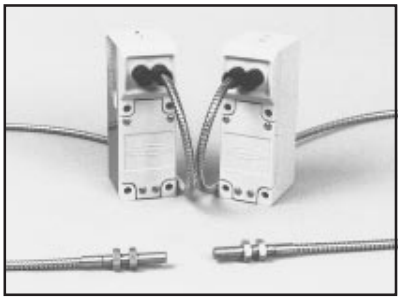


Dimensions, 3- and 4-wire Scanner Block

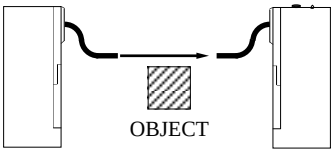


MULTI-BEAM 3- & 4-wire Scanner Blocks

Sensing Mode *Models* *Excess Gain* *Beam Pattern*



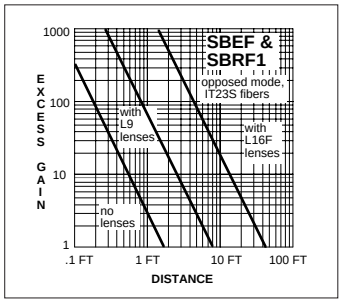
OPPOSED FIBER OPTIC Mode (glass fiber optics)

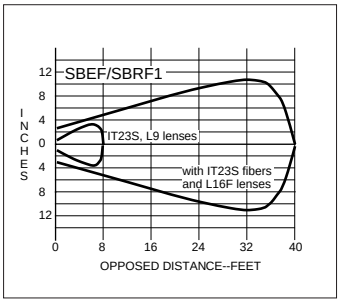


SBEF & SBRF1

Range: see excess gain curve
Response: 1ms on/off
Repeatability: 0.03ms
Beam: infrared, 880nm

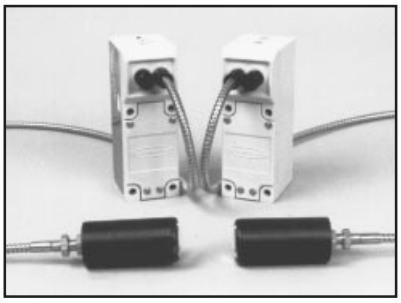
NOTE: fiber optic gain curves apply to 3-foot fiber lengths. Gain decreases by approximately 10% for each additional foot of fiberoptic cable.





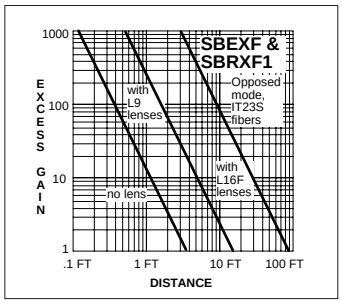
SBEF & SBRF1: use with individual glass fiber optic assemblies in lieu of model SBF1 where it is inconvenient to run fibers from a single scanner block.

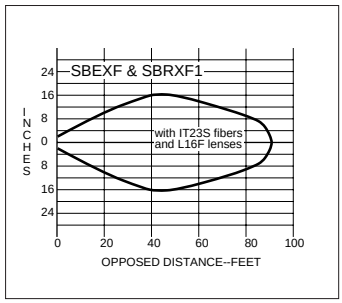
SBEXF & SBRXF1: use in place of model SBFX1 (shown below) for long-range opposed fiber optic sensing. Or use where high excess gain is required and it is difficult to run the fibers to both sides of the process from a single scanner block. Lenses for fiber optics are shown in the Banner product catalog.

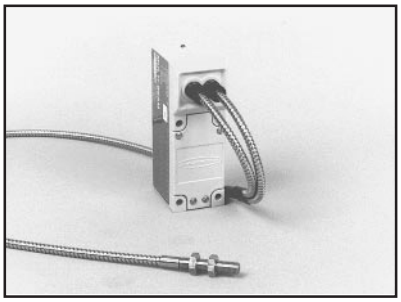


SBEXF & SBRXF1

Range: see excess gain curve
Response: 10ms on/off
Repeatability: 0.7ms
Beam: infrared, 880nm



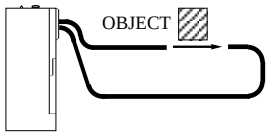




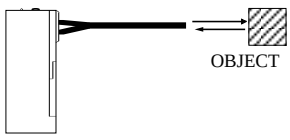
FIBER OPTIC Mode (glass fiber optics)

HIGH-POWER SCANNER BLOCK

OPPOSED MODE



DIFFUSE MODE



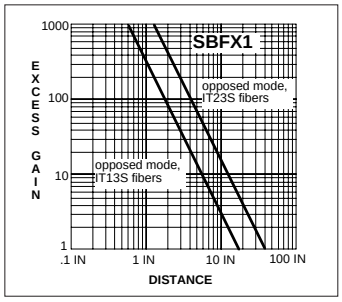
For complete information on glass fiber optic assemblies and accessories, see product catalog.

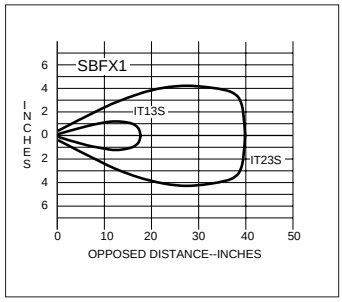
SBFX1

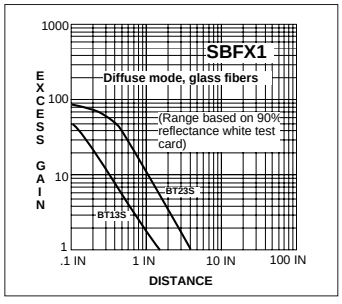
Range: see excess gain curves
Response: 10ms on/off
Repeatability: 1.5ms
Beam: infrared, 880nm

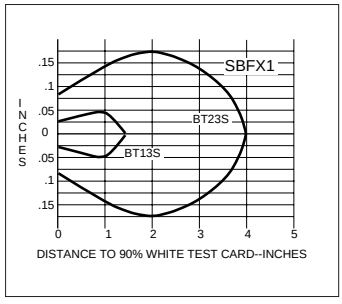
Fiber optic information:
IT13S: individual assembly .06 in (1,5mm) dia. bundle
IT23S: individual assembly .12 in. (3mm) dia. bundle
BT13S: bifurcated assembly, .06 in. (1.5mm) dia. bundle
BT23S: bifurcated assembly, .12 in. (3mm) dia. bundle

L9: .5in. (12mm) dia. lens
L16F: 1.0 in. (25mm) dia. lens





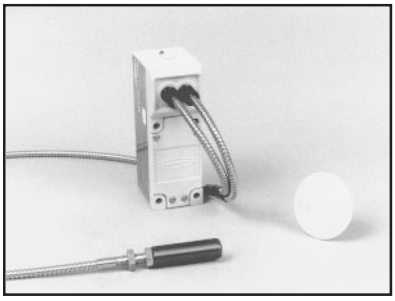




Model SBFX1 is the first choice for glass fiber optic applications, except in fiber optic retroreflective applications or where faster response speed or visible light are a requirement. Model SBFX1 contains both emitter and receiver and thus accepts either one bifurcated fiberoptic assembly or two individual fiber optic cables. The excess gain of model SBFX1 is the highest available in the photoelectric industry. As a result, opposed individual fibers operate reliably in many very hostile environments. Also, special miniature bifurcated fiber optic assemblies with bundle sizes as small as .020 inch (.5mm) in diameter may be used successfully with model SBFX1 for diffuse mode sensing. The excess gain curves and beam patterns illustrate response with standard .060 inch (1.5mm) diameter and .12 inch (3mm) diameter bundles. Response for smaller or larger bundle sizes may be interpolated. NOTE: opposed ranges shown are meant to illustrate excess gain only, and are limited by fiber length. Use scanner block models SBEXF and SBRXF1 (above) for long range opposed fiber optic sensing.

MULTI-BEAM 3- & 4-wire Scanner Blocks

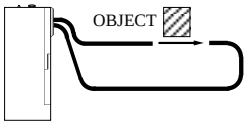
Sensing Mode *Models* *Excess Gain* *Beam Pattern*



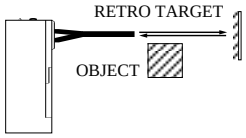
FIBER OPTIC Mode (glass fiber optics)

HIGH-SPEED SCANNER BLOCK

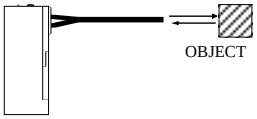
OPPOSED MODE



RETROREFLECTIVE MODE



DIFFUSE MODE



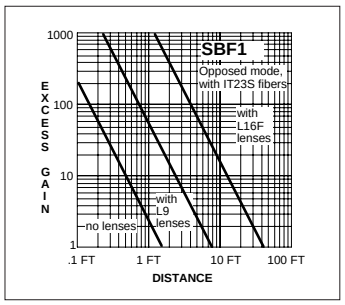
SBF1

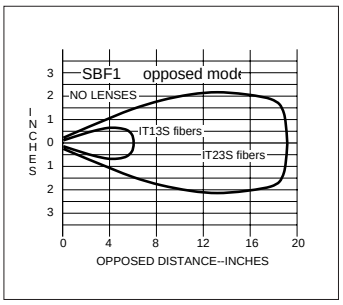
Range: see excess gain curves
Response: 1ms on/off
Repeatability: 0.3ms
Beam: infrared, 940nm

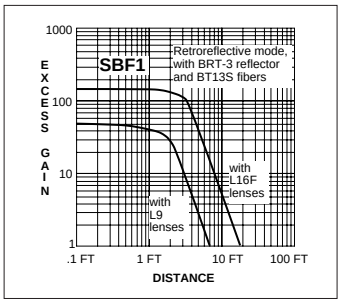
Fiber optic information:
IT13S: individual assembly .06in (1,5mm) dia. bundle
IT23S: individual assembly .12 in. (3mm) dia. bundle
BT13S: bifurcated assembly, .06 in. (1,5mm) dia. bundle
BT23S: bifurcated assembly, .12 in. (3mm) dia. bundle

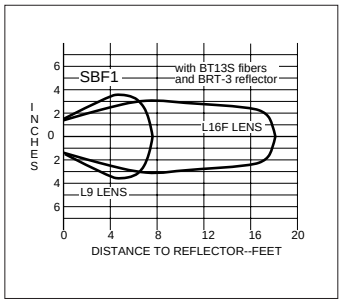
L9: .5in. (12mm) dia. lens
L16F: 1.0 in. (25mm) dia. lens

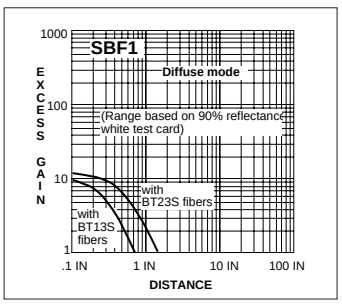
For information on the complete line of glass fiber optics, see Banner product catalog.

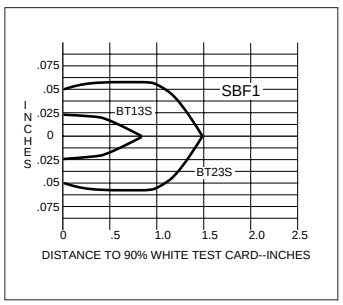










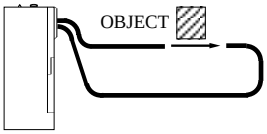


Fiber optics are often used to sense small parts. Small parts or narrow profiles which move at a high rate of speed can require sensors with fast response times for reliable detection. High speed fiber optic sensors are ideal for sensing gear or sprocket teeth or other targets in applications involving counters or shift registers for position control. Selection of the fiber optic sensing tip should involve matching the effective beam of the fiber to the profile of the part to be sensed to maximize the time that the part is sensed and/or the time between adjacent parts. Combining the best selection of fiber tip geometry with a high speed sensor will result in a highly repeatable position sensing system. The model BT13S fiber optic assembly used with a model L9 or L16F lens and a high speed scanner block is an excellent system for retroreflective code reading or for almost any short range retroreflective sensing application. Response time of a MULTI-BEAM sensor is also a function of the power block. For this reason, only power blocks which switch dc (e.g. PBT, PBP, PBO, PBAT, etc) should be used if the fast response time of the scanner block is to be utilized.

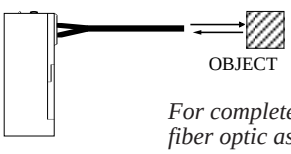
FIBER OPTIC Mode (glass fiber optics)

VERY HIGH-SPEED SCANNER BLOCK

OPPOSED MODE



DIFFUSE MODE

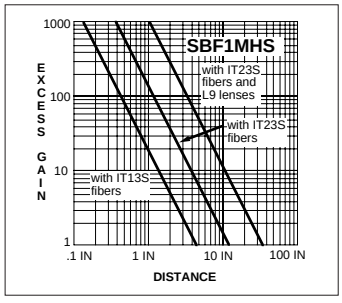


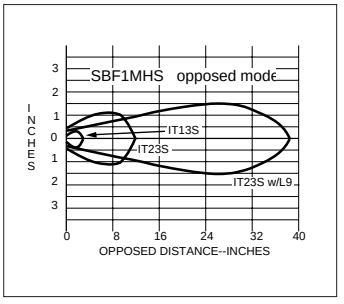
SBF1MHS

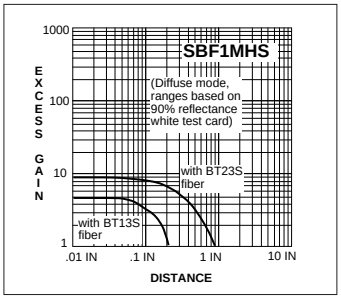
Range: see excess gain curves
Response: 300 microseconds on/off
Repeatability: 100 microseconds
Beam: infrared, 940nm

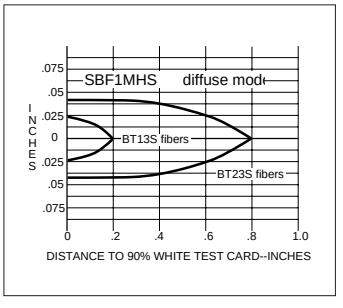
NOTE: gain curves illustrate that faster response comes at the expense of lower gain.

For complete information on glass fiber optic assemblies and accessories, see Banner product catalog.



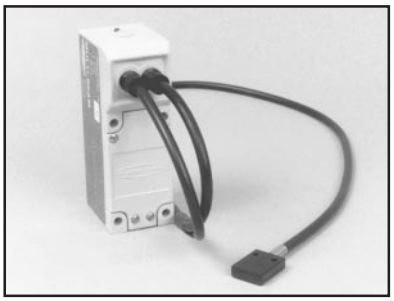






MULTI-BEAM 3- & 4-wire Scanner Blocks

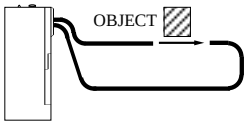
Sensing Mode *Models* *Excess Gain* *Beam Pattern*



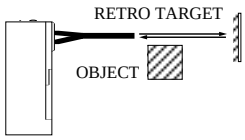
FIBER OPTIC Mode (glass fiber optics)

VISIBLE RED LIGHT SOURCE

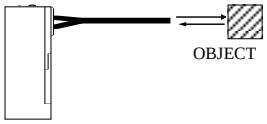
OPPOSED MODE



RETROREFLECTIVE MODE



DIFFUSE MODE



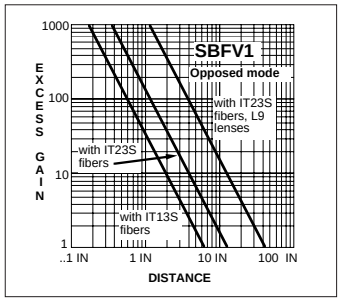
SBFV1

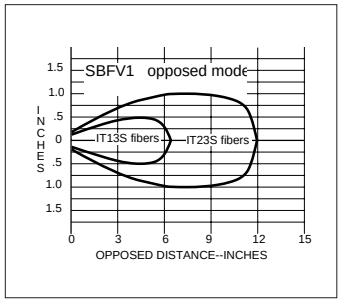
Range: see excess gain curves
Response: 1ms on/off
Repeatability: 0.3ms
Beam: visible red, 650nm

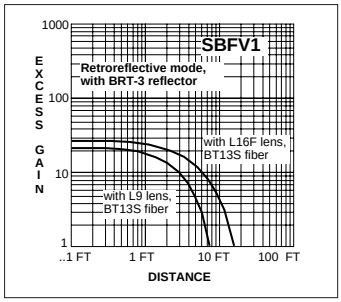
Fiber optic information:
IT13S: individual assembly .06in (1,5mm) dia. bundle
IT23S: individual assembly .12 in. (3mm) dia. bundle
BT13S: bifurcated assembly, .06 in. (1,5mm) dia. bundle
BT23S: bifurcated assembly, .12 in. (3mm) dia. bundle

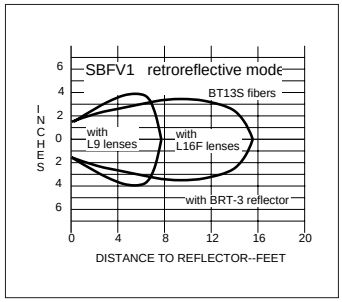
L9: .5in. (12mm) dia. lens
L16F: 1.0 in. (25mm) dia. lens

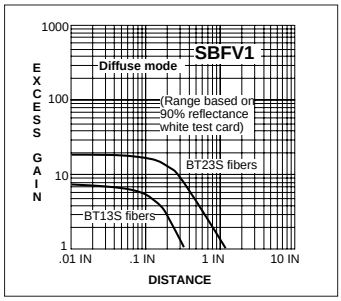
For information on the complete line of glass fiber optics, see Banner product catalog.

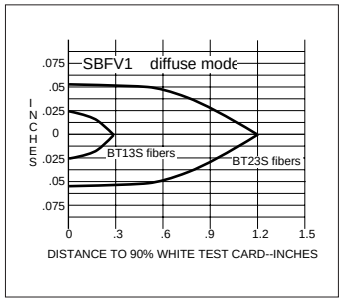








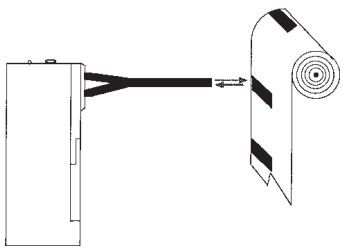




Scanner block model SBFV1 supplies visible red light to the emitter half of a glass fiber optic photoelectric system. Visible light sensors have less optical energy as compared to infrared systems. There are, however, some sensing situations which require visible light wavelengths in order to realize adequate optical contrast. Opposed fibers using visible red light are used to reliably sense translucent materials (e.g. plastic bottles) which appear transparent to infrared opposed sensors. Fiber assembly model BT13S used with a the model L9 or L16F lens makes an excellent visible light sensing system for retroreflective code reading as well as many short-range retroreflective applications (e.g. retro scanning across a narrow conveyor). When combined with a bifurcated fiber, model SBFV1 may be used for color registration sensing for applications where there is a large difference between the two colors (e.g. black-on-white). For combinations of red-on-white, however, the visible-green light source of model SBFVG1 (below) is needed. Visible light emitters are also helpful for visual system alignment and maintenance.

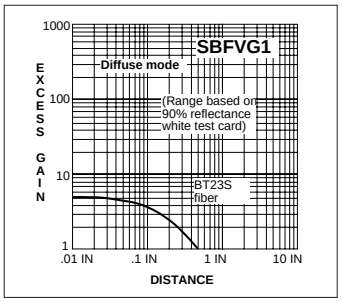
FIBER OPTIC Mode (glass fiber optics)

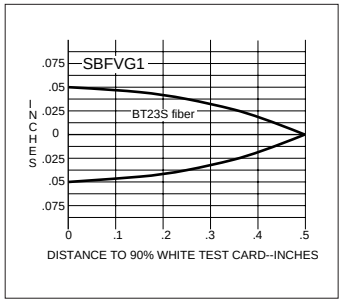
VISIBLE GREEN LIGHT SOURCE for COLOR SENSING (REGISTRATION CONTROL)



SBFVG1

Range: see excess gain curve
Response: 1 ms on/off
Repeatability: 0.3ms
Beam: visible green, 560nm





Convergent beam sensors like model SBCVG1 are often used for color registration sensing. However, there are some registration applications where the use of bifurcated fiber optics is beneficial. Fiber optics are able to fit into tight locations which are too small for a convergent sensor. Fibers also allow a choice of image size. It is important to create an image size which is smaller than the registration mark in order to maximize optical contrast and to ease sensor response requirements. Fibers allow a match of the light image to the geometry of the registration mark. Scanner block model SBFVG1 will sense most bold color differences, including red-on-white. Use only power blocks which switch dc (e.g. PBT, PBP, PBO, PBAT, etc.) for fast response.