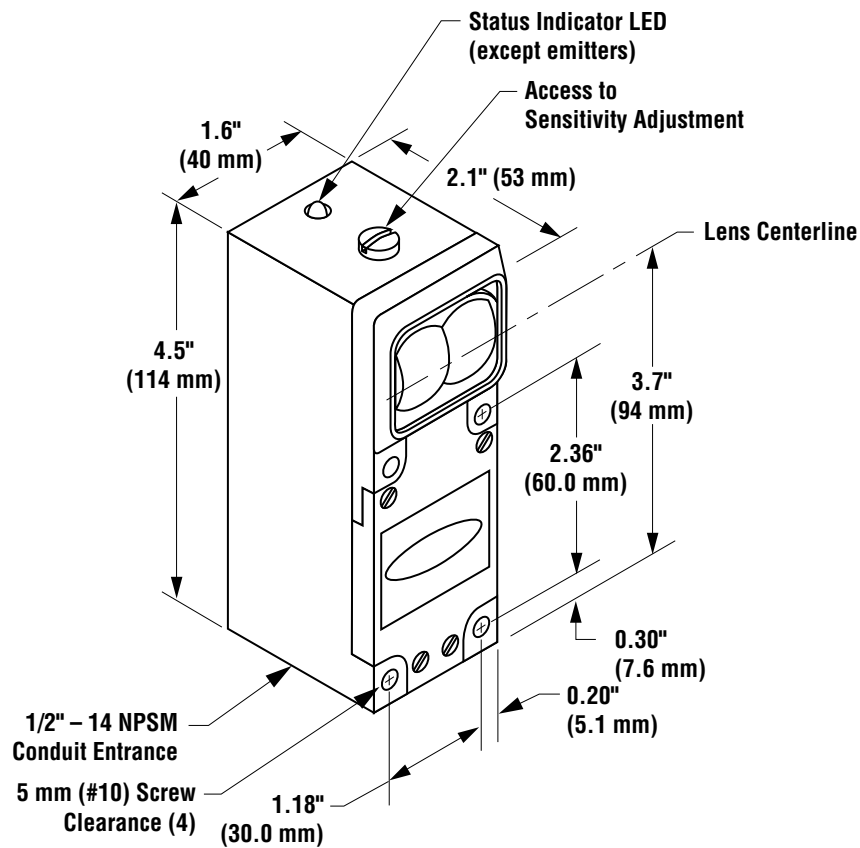




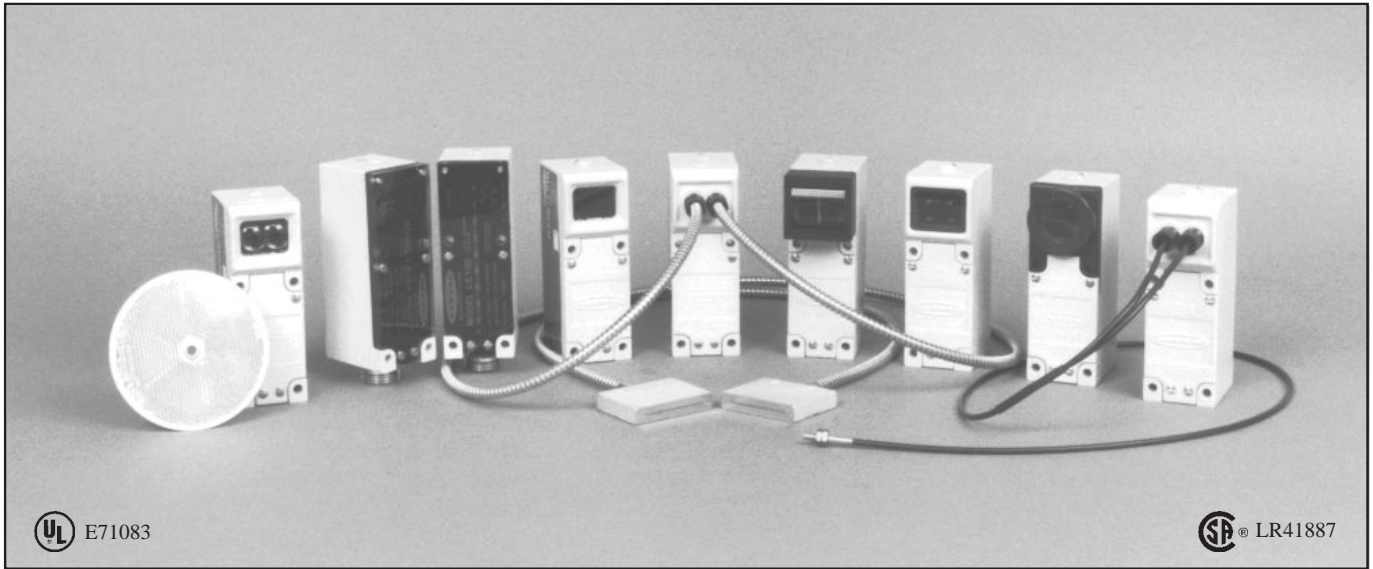
MULTI-BEAM[®] Sensors

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[®] Sensors



UL E71083

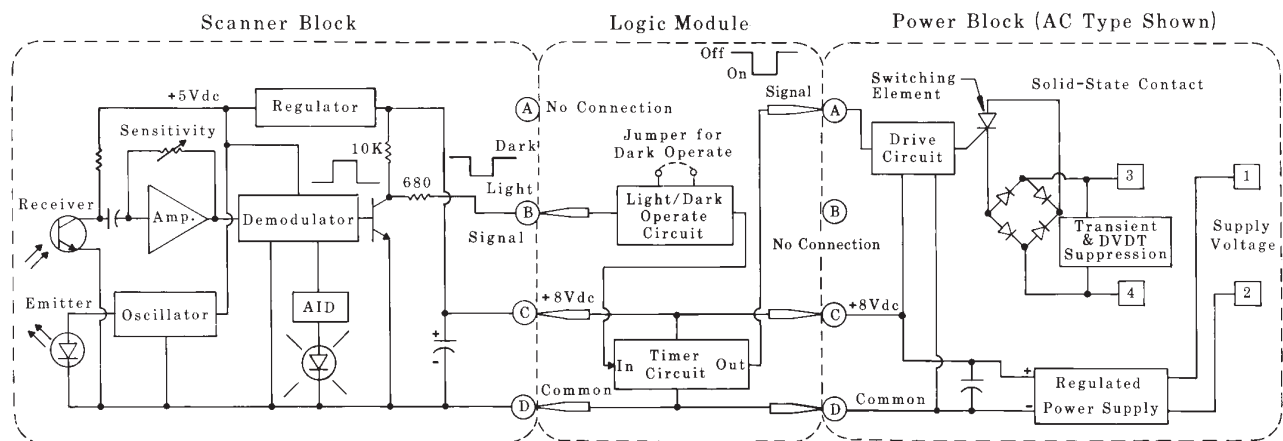
SP[®] LR41887

Banner MULTI-BEAM[®] 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[®] 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[™]) 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




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	<i>NOTE for items below: other time ranges available (p. 23)</i>	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

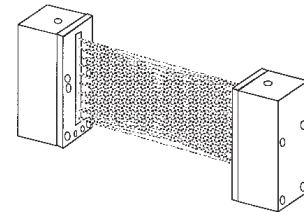
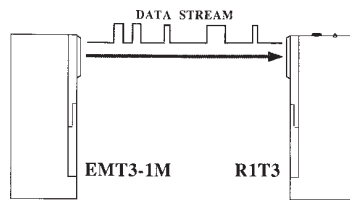
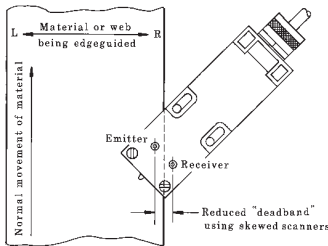
2-wire Systems (pages 24 through 29)

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)

Edgewise 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).

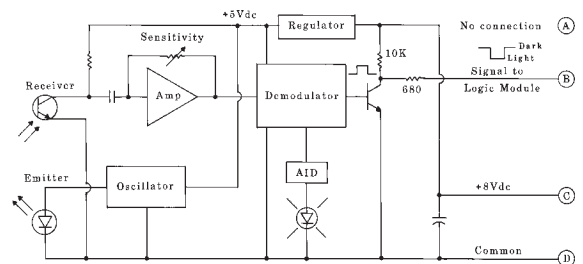
ALIGNMENT INDICATOR: red LED on top of scanner block. Banner's exclusive, patented Alignment Indicating Device (AID™) circuit lights the LED whenever the sensor detects its own modulated light source, and pulses the LED at a rate proportional to the received light level.

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

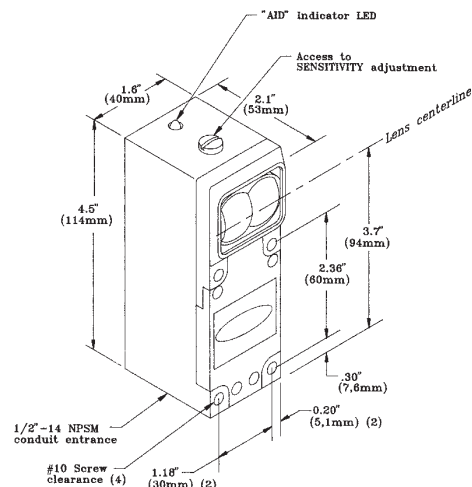
OPERATING TEMPERATURE RANGE: -40 to +70 degrees C (-40 to +158 degrees F).

VALOX® is a registered trademark of General Electric Company.

Functional Schematic, 3- and 4-wire Scanner Block



Dimensions, 3- and 4-wire Scanner Block



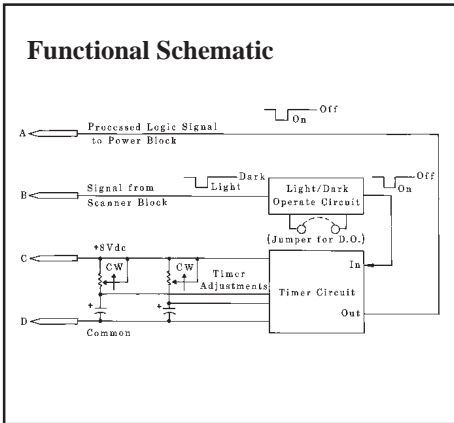
MULTI-BEAM 3- & 4-wire Logic Modules



The logic module interconnects the power block and scanner block both electrically and mechanically using a unique blade-and-socket connector concept. It also provides the LIGHT/DARK operate function (except in the LM1) and the timing functions, all of which are fully adjustable.

In the diagrams below, the "signal" represents the light condition (in LIGHT operate) or the DARK condition (in DARK operate), and the "output" represents the energized condition of the solid-state output switch (power block). "Delay" refers to the time delay before the output operates, and "hold" refers to the time that the output remains "on" after the event has occurred.

The photo (left) shows a typical logic module for 3- or 4-wire operation. Note that all 3- & 4-wire logic modules are color-coded red. The time ranges listed for the logic modules in the table below are standard time ranges. Other time ranges are available; see page 23 for information.



Specifications, 3- and 4-wire Logic Modules

CONSTRUCTION: molded VALOX® housing; electronic components epoxy encapsulated. Gold plated blade connectors.







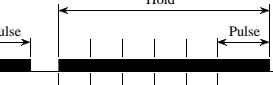

OPERATING TEMPERATURE: -40 to +70 degrees C (-40 to +158 degrees F).

TIMING ADJUSTMENT(S): one or two single turn potentiometers with slot for blade-type screwdriver adjustment. NOTE: when turning time adjustments fully clockwise or counterclockwise, avoid excessive torque to prevent damage to potentiometers.

TIMING REPEATABILITY: plus or minus 2% of maximum range under constant power supply and temperature conditions; plus or minus 5% of maximum range under all conditions of supply voltage and temperature.

RESPONSE TIME: response time will be that for the scanner block (plus power block) plus the programmed delay (if the logic includes a delay function).

TIMING RANGE: useful range is from maximum time down to 10% of maximum (e.g.- from 1 to 0.1 seconds, or from 15 to 1.5 seconds). When timing potentiometer is set fully counterclockwise, time will be approximately 1% of maximum.

Model and Function	Description of Logic
<p>LM1 on-off</p> <p>OUTPUT </p> <p>SIGNAL </p>	<p>LM1 is an on-off logic module that causes the power block output to "follow the action" of the scanner block: when the scanner block sees a LIGHT signal, the output is energized; when the scanner block sees a DARK signal, the output is de-energized. This is referred to as the LIGHT operate mode. If the application calls for DARK operate mode, the LM1 may be used with normally-closed type power blocks such as PBAQ or PBT2.</p>
<p>LM2 alternate action</p> <p>OUTPUT </p> <p>SIGNAL </p>	<p>The LM2 provides "flip-flop" or toggling action of the power block output, such that each time the scanner block changes from a DARK state to a LIGHT state, the output changes state. The output remains in the last state until another change occurs. The LM2 is frequently used to operate a diverter gate that splits a production line into two lines. It may also be used to operate room lighting by breaking a photoelectric beam: if the lights are OFF, breaking the beam turns them ON; if the lights are ON, breaking the beam turns them OFF.</p>
<p>LM3 on-off</p> <p>OUTPUT </p> <p>SIGNAL </p>	<p>The LM3 is an on-off logic module that has the ability to be programmed for either LIGHT operate or DARK operate. It comes with a jumper wire installed: with the jumper in place, the output is DARK operated; with the jumper removed, the output is LIGHT operated. The LM3 is the most commonly used logic module when no timing function is desired, particularly if it is not known at the time of ordering which mode (LIGHT or DARK operate) will be needed.</p>
<p>LM4-2 one-shot (retriggerable)</p> <p>OUTPUT </p> <p>SIGNAL </p> <p>Setable time range: .1 to 1 second.</p>	<p>The LM4-2 provides a one-shot ("single shot") output pulse each time there is a transition from LIGHT to DARK (jumper installed) or from DARK to LIGHT (jumper removed). The output pulse time range is adjustable from 0.1 to 1 second. The duration of the pulse is independent of the duration of the input signal. The timing of the LM4-2 is restarted each time the input signal is removed and then recurs. This is referred to as a "retriggerable" one shot, and this feature may be applied to some rate sensing applications (use LM6-1 for true rate sensing).</p>