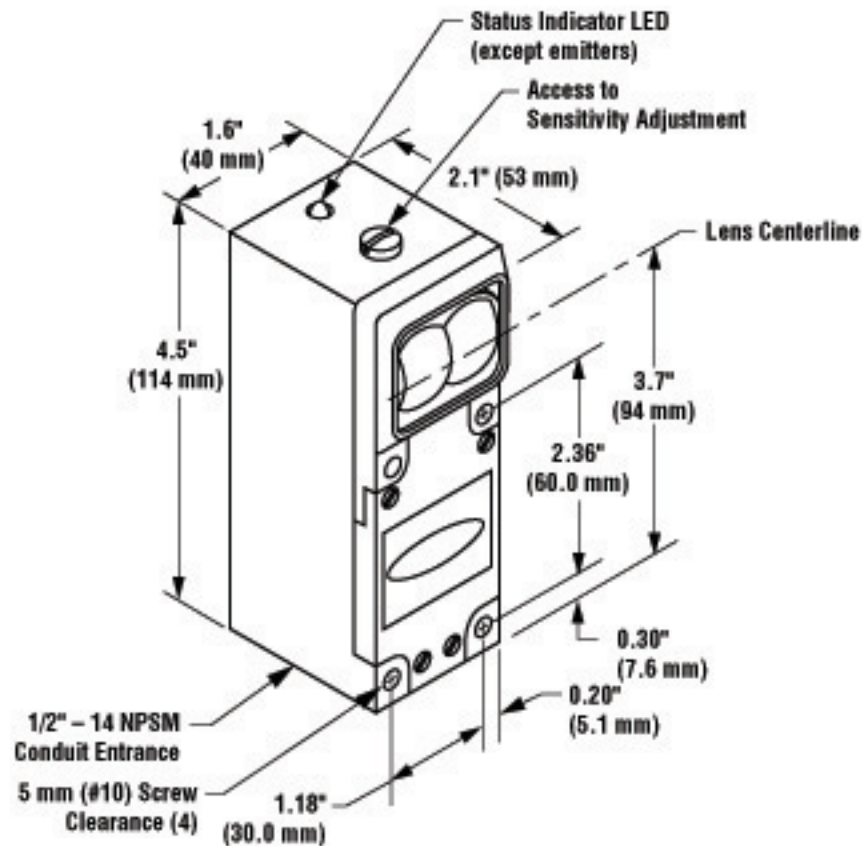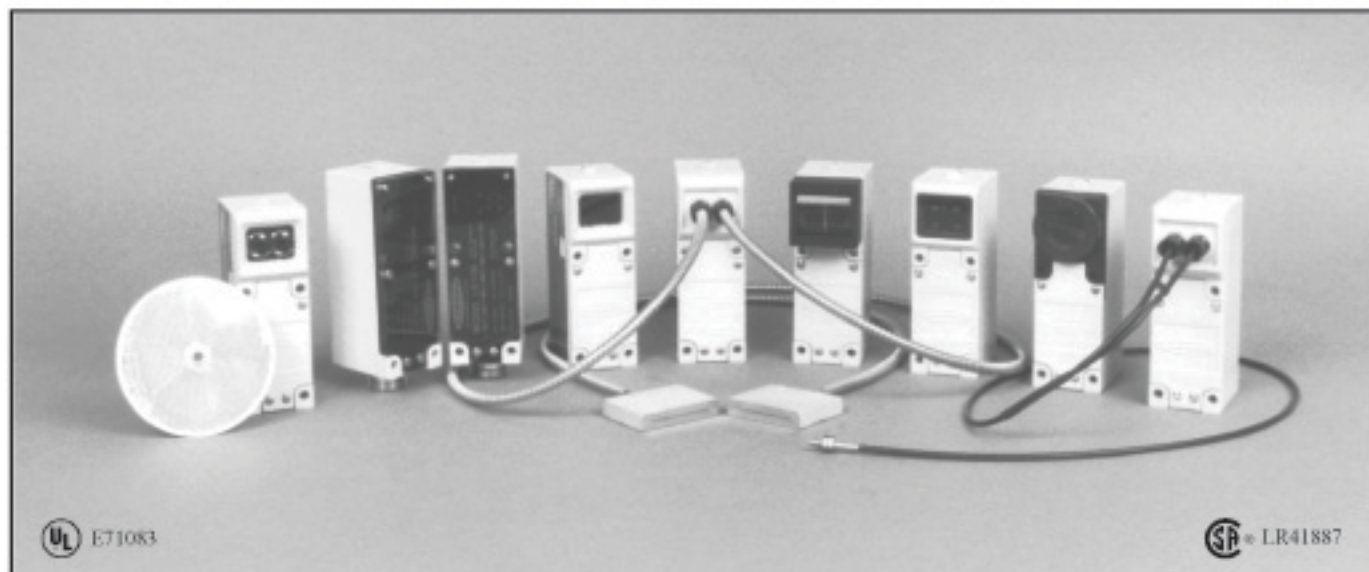**BANNER**®

the photoelectric specialist

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

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.

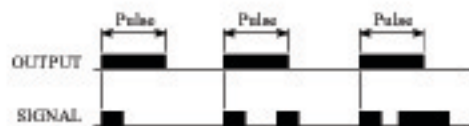## Composite Functional Schematic, 3- and 4-wire Sensors
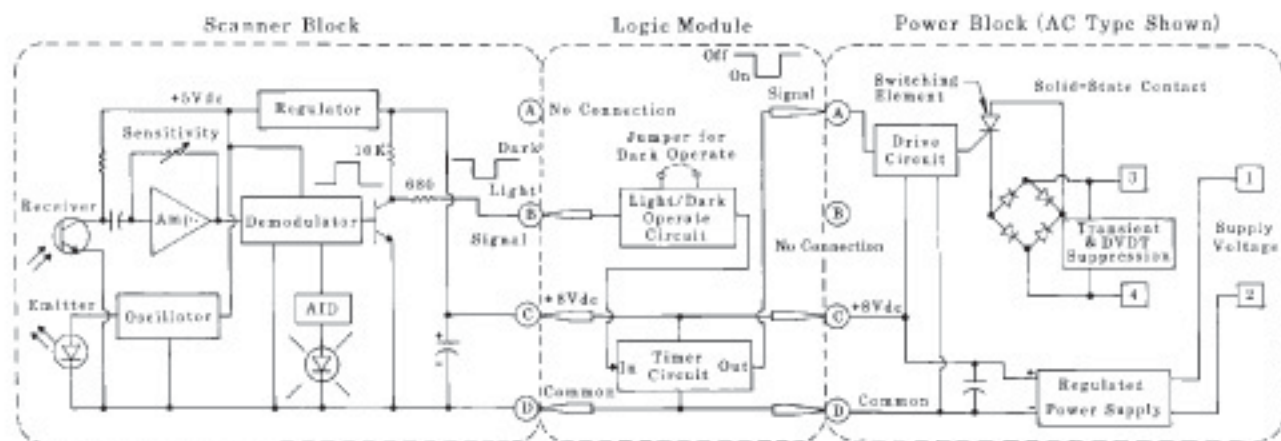
MULTI-BEAM 3- & 4-wire Logic Modules

Model and Function	Description of Logic

LM4-2NR one-shot (non-retriggerable)

OUTPUT

SIGNAL

Setable time range: .1 to 1 second.

The **LM4-2NR** 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 output pulse of the LM4-2NR must complete before it recognizes another input transition. This is called a "non-retriggerable" one shot, which sometimes offers an advantage in indexing or registration control applications where multiple input signals are possible during advance of the product.


LM5 on-delay

OUTPUT

SIGNAL

Setable time range: 1.5 to 15 seconds.

The **LM5** is a true "on-delay" type logic module. The input signal must be present for a predetermined length of time before the output is energized. The output then remains energized until the input signal is removed. If the input signal is not present for the predetermined time period, no output occurs. If the input signal is removed momentarily and then reestablished, the timing function starts over again from the beginning. A LIGHT/DARK operation selection jumper is included. The standard time range is adjustable from 1.5 to 15 seconds (field adjustable), and other ranges are available. The LM5 is often used to detect jams on a conveyor line, where a beam broken for longer than a preset period of time implies a product jammed in the light beam.

LM5R off-delay
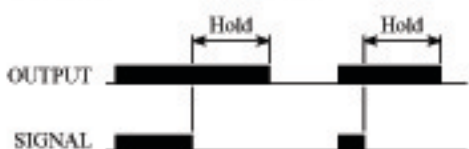
OUTPUT

SIGNAL

Setable time range: 1.5 to 15 seconds.

The **LM5R** is an "off-delay" logic module, similar to the LM5, except that timing begins on the trailing edge of the input signal. When the input occurs, the output is immediately energized; if the input is then removed, the output remains energized for the adjustable pre-determined time period, then de-energizes. If the input is removed but then re-established while the timing holds the output energized, a new output cycle is begun. The LM5R might typically be used to tell when no products have broken a beam for a predetermined length of time, therefore indicating a jam or an empty reservoir upstream. The LIGHT/DARK operate jumper wire is included. Timing range is adjustable from 1.5 to 15 seconds, and optional ranges are available.


LM5-14 on- & off-delay

OUTPUT

SIGNAL

Setable time range: 1.5 to 15 seconds.

The **LM5-14** combines the function of an "on-delay" and an "off-delay" into one logic module. When the signal is present for more than the on-delay time, the output energizes. The off-delay circuit is now active, and holds the output on even if the input signal disappears for short periods of time. If the input signal is gone for longer than the off-delay time, the output finally drops out. The most common use for the LM5-14 is to control fill level, for example in a bin: when the bin is full, a beam is broken, and a predetermined time later, the flow is stopped. After the level has fallen below the beam for a time, the flow is restarted. The time delays control the high and low levels. Each delay is independently adjustable for 1.5 to 15 seconds.

LM5T limit timer
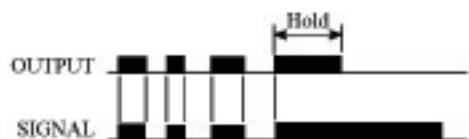
OUTPUT

SIGNAL

Setable time range: 1.5 to 15 seconds.

The **LM5T** "limit" timer combines the function of on-off logic and on-delay logic. As long as the signal is present for only short periods of time, the output "follows the action" of the input signal. If the input signal is present for longer than the predetermined time, the output deenergizes. The output only reenergizes when the input signal is removed and then reestablished. Interval timers are used to operate loads which must not run continuously for long periods of time, such as intermittent duty solenoids and conveyor motors. The LM5T may be used to run a supermarket checkout conveyor, always bringing the product up to the sensor beam and then stopping the motor. When the last item is removed, the motor times out and stops. Timing range is .15 to 15 seconds.

LM6-1 rate sensor

OUTPUT

SIGNAL

Setable rate: 60 to 1200 pulses per minute.

The **LM6-1** is a true overspeed or underspeed sensing logic module that monitors signals from a scanner block and continuously calculates the time between input signals, and compares that time with the reference set by the "HOLD" potentiometer. A jumper allows the mode to be changed from *overspeed* (jumper installed) to *underspeed* (jumper removed). In the overspeed mode, the output will drop if the preset rate is exceeded. In the underspeed mode, the output remains energized until the input rate drops below the preset. The output will not "pulse" at low speeds as retriggerable one-shots do. A "DELAY" adjustment allows the LM6-1 to ignore data for the first several seconds after power is applied, to permit the rate to accelerate to operating speed without false underspeed outputs. The sensing rate may be adjusted from 60 to 1200 pulses per minute (.05 to 1.0 second per pulse), and the power-up inhibit from 1 to 15 seconds.