

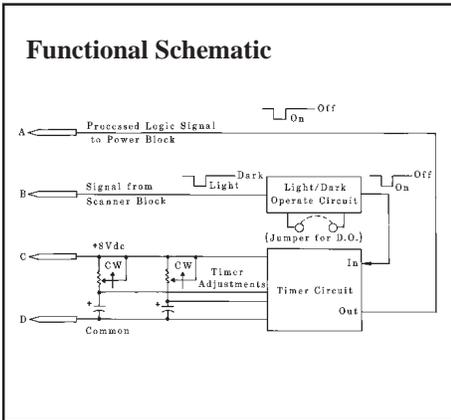
# MULTI-BEAM 3- & 4-wire Logic Modules



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.

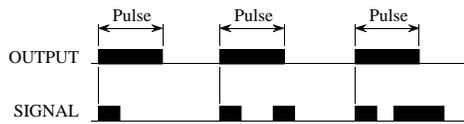
Model and Function	Description of Logic
<p><b>LM1 on-off</b></p> <p>OUTPUT </p> <p>SIGNAL </p>	<p>LM1 is an on-off logic module that causes the power block output to "follow the action" of the scanner block: when the scanner block sees a LIGHT signal, the output is energized; when the scanner block sees 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><b>LM2 alternate action</b></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><b>LM3 on-off</b></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><b>LM4-2 one-shot (retriggerable)</b></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>

# MULTI-BEAM 3- & 4-wire Logic Modules

## Model and Function

## Description of Logic

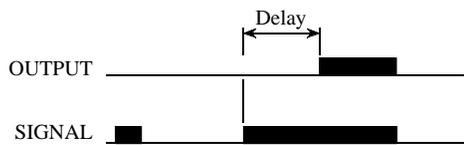
### LM4-2NR one-shot (non-retriggerable)



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.

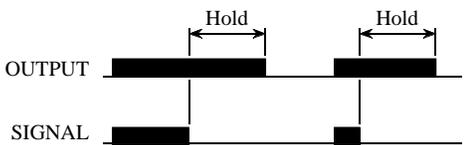
### LM5 on-delay



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.

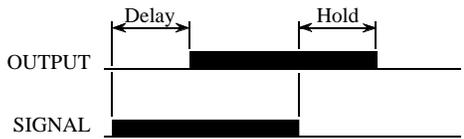
### LM5R off-delay



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.

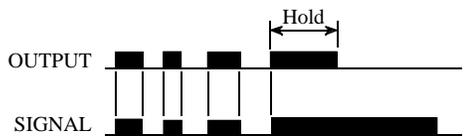
### LM5-14 on- & off-delay



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



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



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.