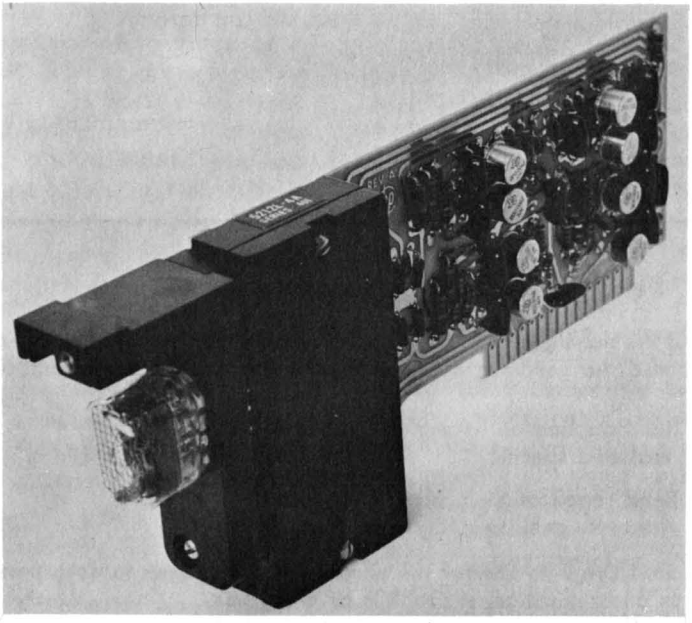
Signalite

APPLICATION NEWS

A General Instrument company

VOL. 3, No. 3

In this issue ...



NEED GLOW LAMPS IN A HURRY?

Customer Service at Signalite is made up of a number of seemingly small things we do, not the least of which is prompt delivery of customers' orders. Normally, our lead time is 3 to 4 weeks, but we pride ourselves on the fact that no reasonable request has ever gone unfilled. (For that matter, reasonable or unreasonable we have been late on delivery of a firm order only once in 14 years.) When we are apprised of a customer's actual need, every effort is made to ensure that delivery is made in accordance with his request.

To cite an example, one of our customers in the New Jersey area called us recently saying that their inventory had become depleted inadvertently and, as a result, one of their production lines was being shut down. Production schedules were immediately changed so that delivery could be made to the customer prior to actual shutdown.

When long range quantity requirements are known, our general practice is to produce the lamps on a schedule which keeps Signalite well ahead of delivery requirements. This puts us in the position of operating as the customer's warehouse and shipping lamps as the customer requires. On a firm order we will maintain some inventory. This service extends to special lamps which are designed and manufactured specifically for only one customer as well as for standard lamps.

This policy of stocking lamps in anticipation of delivery requirements also permits a high degree of flexibility in our own production scheduling. When one customer called recently to place an order for 80,000 lamps, he specified that he needed them at a rate of 10,000 per week beginning in 1 week! His requirement was met without jeopardizing any other delivery requirements.

We would prefer, of course, if you would plan on our normal 3-4 week lead time. However, if you need glow lamps in a hurry, call us. We can deliver.

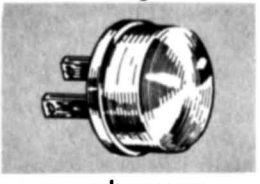
A. Gershon
President
Signalite Inc.

Send Us Your Glow Lamp Application

The use of the neon glow lamp as a reliable circuit component has dramatically increased the need for application information. We are asking that you:

1) **Send application examples—both general and specific**

2) **Send application problems or solutions to problems that we publish**



A Signalite Owl Eye Nite Lite for the home will be sent free to each person who sends us an application, a problem or a solution.

BINARY TO DECIMAL DECODING SYSTEM USING NEON LAMPS AND A PHOTOCONDUCTOR MATRIX

By: Marvin Willrodt
Applications Engineer
Hewlett-Packard Company
Palo Alto, California

Electronic counters are extensively used today to make accurate frequency, period, time interval and ratio measurements. These measurements are made by counting the number of electrical impulses of input signals at rates greater than 100 million per second in some of the more sophisticated counters.

Hewlett-Packard has been designing and manufacturing electronic counters for more than 15 years. The earlier tube models were the fore-runners of today's solid state counters, which provide greater measurement capability in smaller, more portable cases.

Inside the box, counting is accomplished by using a modified binary number system. It is binary in that each counting stage is a binary with four of these binaries interconnected in such a way that the circuit will cycle in 10 counts instead of the 16 counts required by a straight binary system.

Once the counter has accumulated the desired information it must be put in a format acceptable to people; i.e., the binary coded decimal information in which the counter had been operating must be converted to decimal information which will operate a visual display. This is where the neon lamps come into the picture.

A counting decade consists of four binary circuits of the kind shown in Fig. 1 together with appropriate interconnections. Each binary has two neon lamps, DS1 and DS2, associated with it. The lamps are Type AO16 manufactured by Signalite Inc., Neptune, N.J. with the following characteristics. Breakdown voltage is selected to within ±1 volt between 64 and 80 volts. Maintaining voltage is held to within ±½ volt for a value selected between 52 and 60 volts. If diodes CR1 and CR2 were not in the circuit, DS1 would light when Q1 conducts, and DS2 would light when Q2 conducts. Since a common load resistor R6 is used, both neons will not light at the same time.

Neon lamps are also connected to the other three binaries of the decade so that four, and only four, of the eight lamps will be on at any one time. These are the INPUT LAMPS shown at the bottom of Figure 2. Light from each of these lamps, when lit can fall on two, or in some cases. three photoconductor elements on the photo cell plate, which is shown both pictorially and schematically on Figure 2. Since this whole assembly is in a light-tight plastic mounting, photoconductor elements are illuminated only when the associated neon lamp is turned on. These photoconductive elements behave electrically as resistors which have a resistance of under 10K when illuminated and above 10 megohms when in the dark. In short, they behave as if they were light activated switches which turn on when illuminated, and are off when dark. By interconnecting 18

of these photoconductive elements as in Figure 2B (physical arrangement shown in Figure 2A) a circuit is produced which always has three photoconductive cells in series. Of the sixteen combinations of four lamps on and four lamps off, the ten that are used permit only one path at a time in order to have each of the three photoconductor elements illuminated. All other

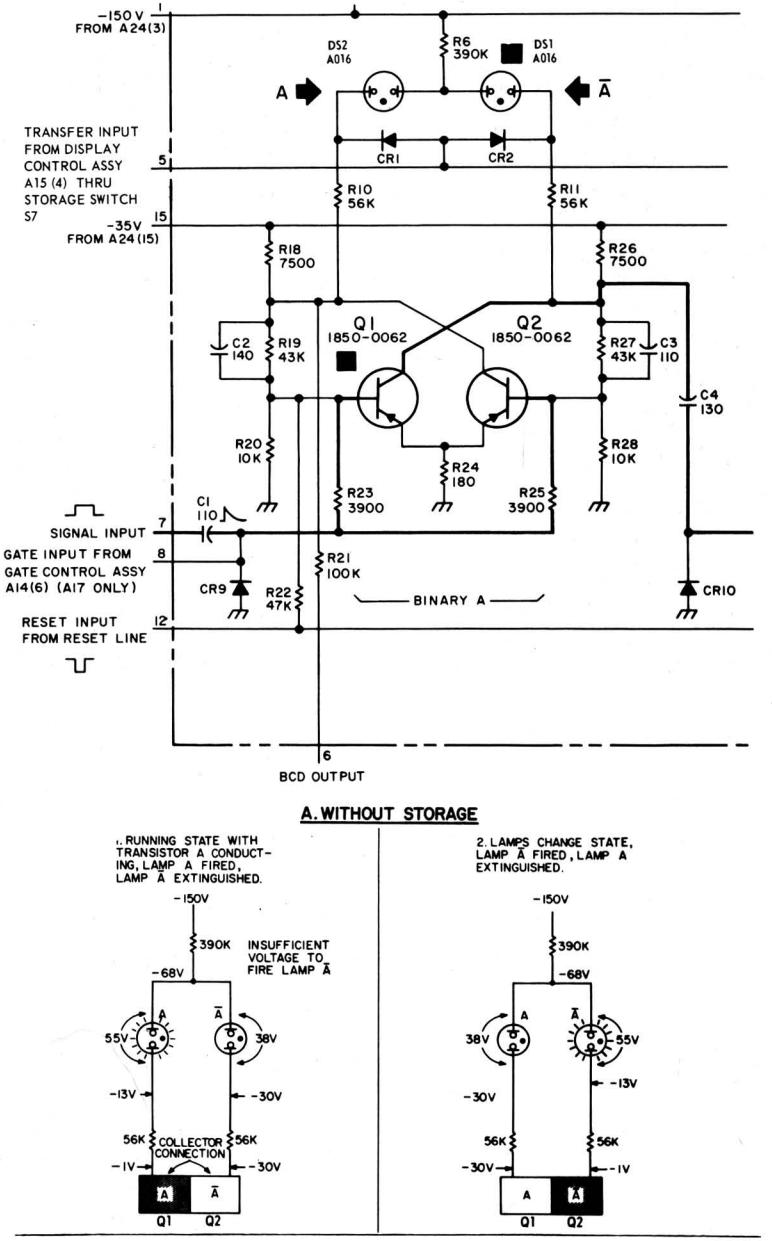


Fig. 1 — Single binary counter circuit with associated Signalite A016 neon lamps.

paths have at least one element that is not illuminated. The illuminated path having low resistance all the way from the common -150 volts can carry current to deflect a meter, light a gas display tube, light another neon lamp or operate some other readout system. In Figure 2 the path to the "6" is the one which is complete.

For this decoding function the neon lamps must fire reliably in total darkness at voltages available from the transistor binary. This is only part of the story, however. By using neon lamps which have stable, carefully controlled firing and maintaining voltages, they can also be used as circuit elements to give the counter a display storage capability. That is, a previous reading can be retained as long as desired, even though the transistor binary might be switching back and forth to accumulate a new count.

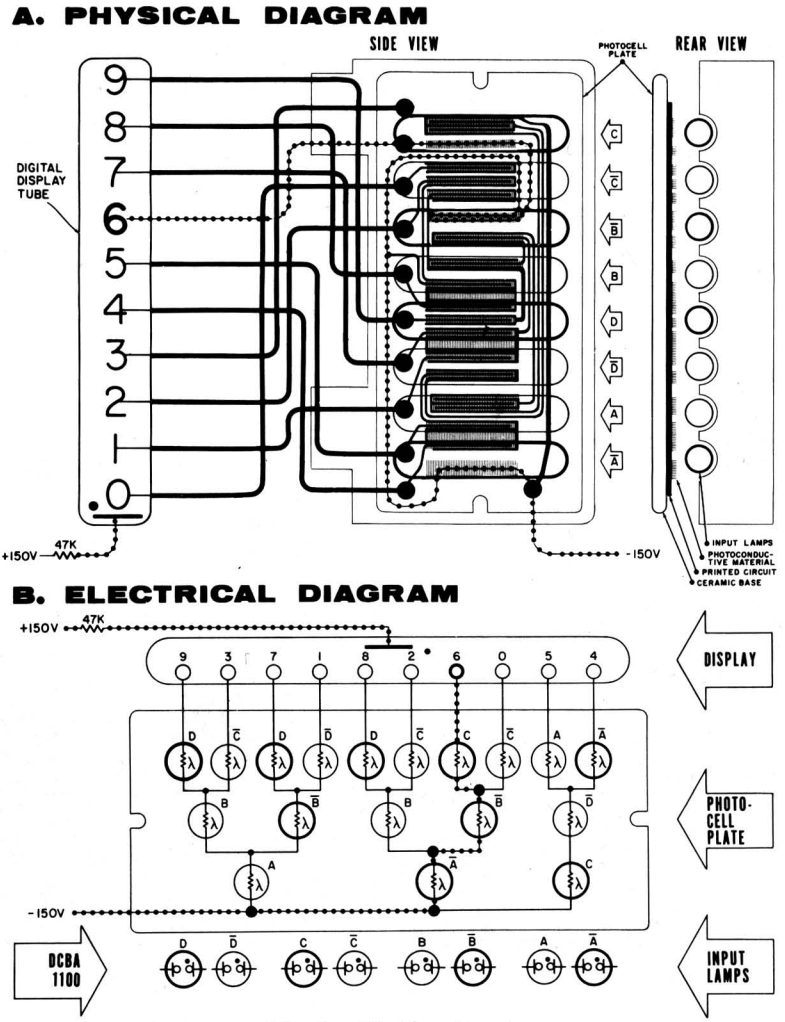


Fig. 2 – Display Matrix.

Storage is achieved by adding diodes CR1 and CR2 to the basic binary. To enter new information into storage, these diodes are back biased by a transfer pulse from the logic section of the counter. When back biased, the diodes look like open circuits; therefore, neon lamp DS1 will light when transistor Q1 conducts, and vice versa as mentioned earlier. To achieve a maximum number of samples in a given time, this transfer pulse should be kept as narrow as possible. Storage is achieved by keeping these diodes in a conducting state. When conducting, these diodes tie one end of DS1 and one end of DS2 effectively to ground, thus the switching of the transistors will not cause the neon lamps to change state. Figure 3 indicates the voltage during the "transfer" and "store" cycle. Requirements which the neon lamps must meet to make this feature reliable are:

1. Rapid firing in complete darkness with a narrow pulse;
2. Carefully controlled firing maintaining voltages, not only initially but throughout the life of the lamp.

Signalite A016 lamps meet this requirement very nicely. The resultant decoding and storage system uses many less components than systems using diode or resistive decoders driving transistorized readout amplifier and storage systems.

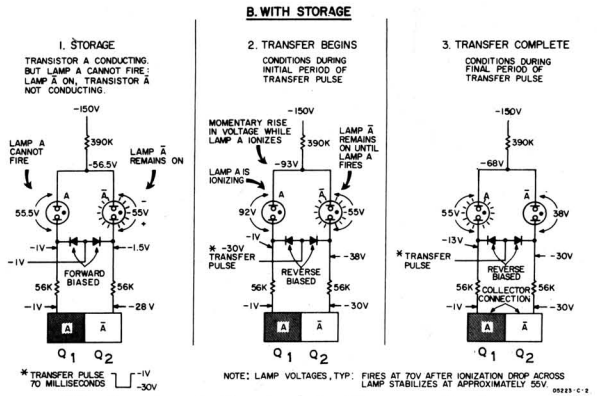


Fig. 3 – Lamp Control in Storage Mode.

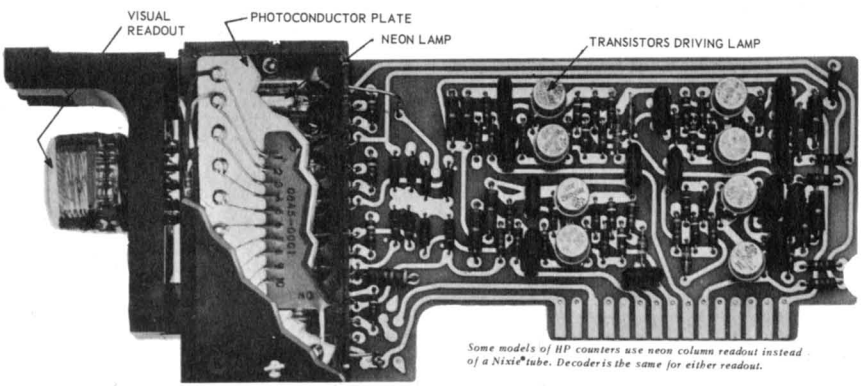


Fig. 4 – Decimal Counting Assembly Photograph showing, Component Location.

We are pleased to announce that Signalite has acquired from Bendix-Red Bank the Gas Discharge Tube Product Line which will be integrated into Signalite's existing product lines. The following news release has been issued describing this event. – A.W. GERSHON

SIGNALITE ACQUIRES BENDIX GAS TUBE OPERATION

NEPTUNE, N.J., – The purchase of the complete Gas Discharge Tube Product Line from the Red Bank Division of Bendix Corp. has been announced by A.W. Gershon, president of Signalite Inc., Neptune, N.J. The entire operation, including a number of the former Bendix engineering, sales and production personnel associated with this product line, will be integrated into the enlarged Signalite plant in Neptune.

This acquisition was undertaken to strengthen Signalite's participation in gaseous discharge devices according to Mr. Gershon. Signalite is a leading supplier of gas discharge glow lamps, voltage regulators and switching devices. The Bendix line adds spark gaps, noise sources, lasers and miscellaneous tubes to Signalite's product inventory.

With the purchase Bendix turned over to Signalite all capital assets, tooling, inventory, customer files and patents pertaining to the Gas Discharge Tube Line. Bendix has handled this product line since 1948. Integration of this operation into the Signalite plant is expected to be completed by October 11, 1965. No interruption in delivery schedules established by Bendix prior to the sale is expected.

The Gas Discharge Tube Product Line will be part of the Special Products Division of Signalite. Keith Olson, formerly chief engineer of Bendix Red Bank gas tube engineering will be manager of this division and Jack Moor, formerly chief sales engineer of Bendix Red Bank Electron Tube Products will be sales manager of this division. The company already has complete sales and marketing organizations for its glow lamp product lines which will be used to promote the further sale of the Gas Discharge Tube products.

Signalite has pioneered the development of high precision gas discharge glow lamps and tubes for use in critical electronic circuitry. Originally considered a simple indicator lamp for appliance uses, the glow lamp is now considered a sophisticated, highly reliable electronic component. This technology in gas discharge devices, augmented by the technical specialists acquired from Bendix, will be directed to providing a predominantly engineering-oriented operation in this field together with the capability of high volumn manufacturing. In the Gas Discharge Tube activity alone, approximately 20% of the average product line shipped each year is composed of items which did not exist the year before.

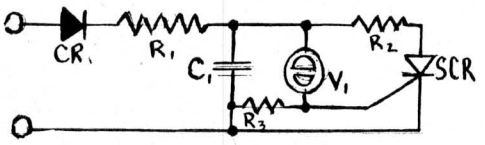
All Gas Discharge Tube products, whether previously developed at Bendix or subsequently at Signalite, will be marketed under the Signalite trade name. During a brief transition period Bendix will assist Signalite in resolving any individual customer problems in order to insure a smooth, continuous operation.

CAN YOU SOLVE THIS? ?????

NEON TUBE ON TIME LIMITER

Dear Mr. Bauman:

One possible solution to Mr. Marston's problem (Ref. Signalite Application News, Vol.3, #2) is to commutate the Neon Tube with an SCR triggered by it. A circuit follows.



For 129 VRMS, 60 cps input values might be:
CR_1 in 485 R_2 6.8K
R_1 20K V_1 VBO = 72V
C_1 .22 uf SCR1 GE C106 AX11

R_3 is only needed if V_1 leakage is sufficient to trigger SCR_1. A typical value for R_3 might be 100 K_2. R_2 controls the neon "on" time, and also protects SCR_1 from firing into C_1. If a pot is used for R_2 to obtain variable "on" time, it should have a step-off resistance of 50 ohms or more. The circuit as drawn gives one pulse/cycle. If two pulses/cycle are desired, CR_1 may be replaced with a full wave bridge.

Lutron Electronics Co., Inc.
Jonathan Kramer

Ed. Note:
V_1 – Signalite A057B, see Application News, Vol. 2 No. 4

YOUR GLOW LAMP APPLICATION FORUM

It is Signalite's policy to publish letters based on their intrinsic interest only. We do not necessarily agree with all comments and suggested uses and will upon occasion wait for your reaction before taking editorial space for ours.

DECIMAL TO BINARY TRANSLATION

Gentlemen:

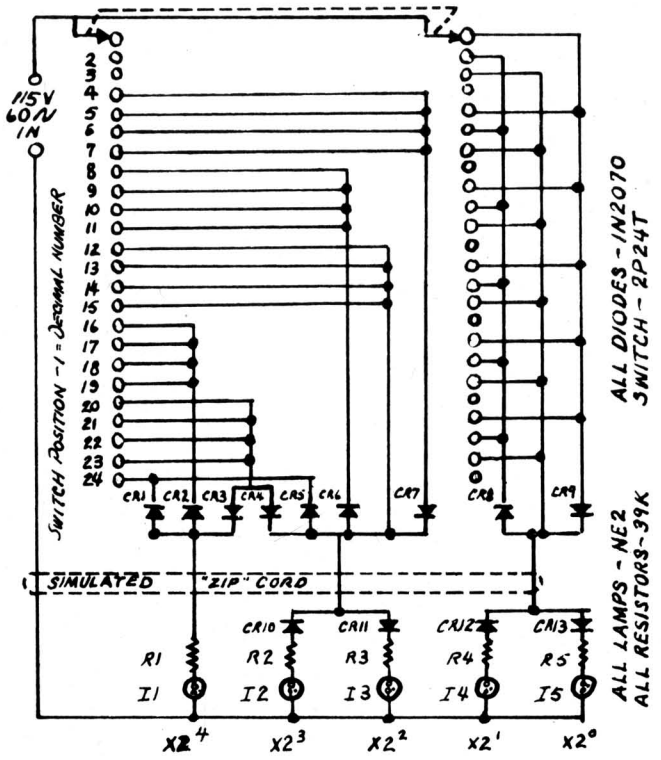
While rummaging through my desk, I came across an old print of my "Decimal to Binary Translator; D2B."

I immediately thumbed back through *Application News* to Mr. Lawson's letter, on page 110, and then Mr. Koenig's letter, on page 99.

I see that they, also, have studied information theory.

In my "translator", I had two black boxes joined by four conductors. (The "simulated 'zip' cord" infers that I made the four look like two; to confuse any more knowledgeable friends.) In the first box was a two-pole, twenty-four-throw rotary switch, some diodes, and the line cord. In the second box was five neons, with resistors, and some more diodes.

While the basic purpose was to introduce some of the neighbor's children to binary arithmetic, this unit is now in the hands of our Electronics Shop foreman; who is taking a course in computors at Adult Night School.



With a quick perusal ot the schematic, I'm sure you can see that, had I had a three-pole, sixty-four position switch in my junk-box, I could have transmitted all sixty-four bits of information over the same four wires.

Claude W. Ashburn
Physics International Co.

Ed Note:

Mr. Ashburn is to be commended on his educational project in binary arithmetic. It might also be noted that there are commercial applications of this basic circuitry. For example, herein lies a simple method of supervisory or remote control. Many types of readout can be attached to the remote end, of course. One that comes to mind readily is to connect photocells in a series shunt arrangement so that the photocells corresponding to lamps that should be "on" are in the series arm of an AND circuit. The neons that should be "off" are shunted across the input to the AND. Hence, when the proper lights are on and/or off, a transistor or relay may be operated. Undoubtedly, some of our readers may have other suggestions. If so, we would like to hear from you.

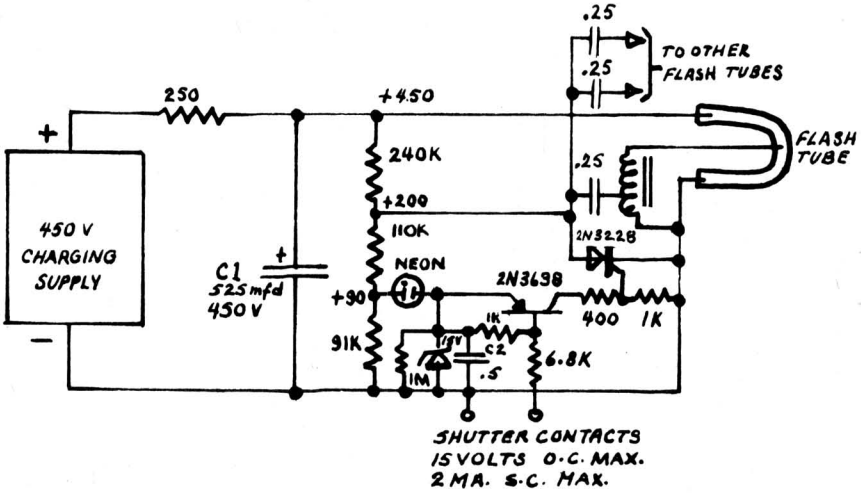
FLASH PULSING CIRCUIT

Dear Mr. Bauman:

The attached flash pulsing circuit was developed to meed the requirements of a photographic firm specializing in portraits of school children. It meets the following customer requirements:

1. Withstands physical abuse.
2. Has no moving parts (relays).
3. Subjects shutter contacts to harmless potentials and currents.
4. Visually shows full capacitor charge.
5. Inhibits flashing until full capacitor charge.

Requirements 1, 2 and 3 are readily met by the solid-state devices used, but requirements 4 and 5 are met through a novel application of the neon lamp.



When C1 capacitor is nearly charged, the neon ionizes, visually showing the capacitor condition and applying current to the R-C zener diode parallel combination. C2 capacitor, which prevents a voltage surge across the combination, as the neon ionizes, charges to the 15V threshold of the zener thus enabling the 2N3638 circuitsso that it can trigger the 2N3228 SCR flash tube pulser upon shutter command. The flash-tubes are always pulsed with 400 to 450 volts applied (they formally could be triggered at 250 to 300V), thereby maintaining the proper lumen output and color temperature for color photography.

Elbert S. Kennedy, P.E.
Leawood, Kansas

Ed. Note:
For best performance we suggest using our A079 which has a maximum breakdown voltage in light of 70 VDC and a maintain ing voltage of 58 VDC. Design current is 0.3 ma.

PULSED TIMER

Dear Mr. Bauman:

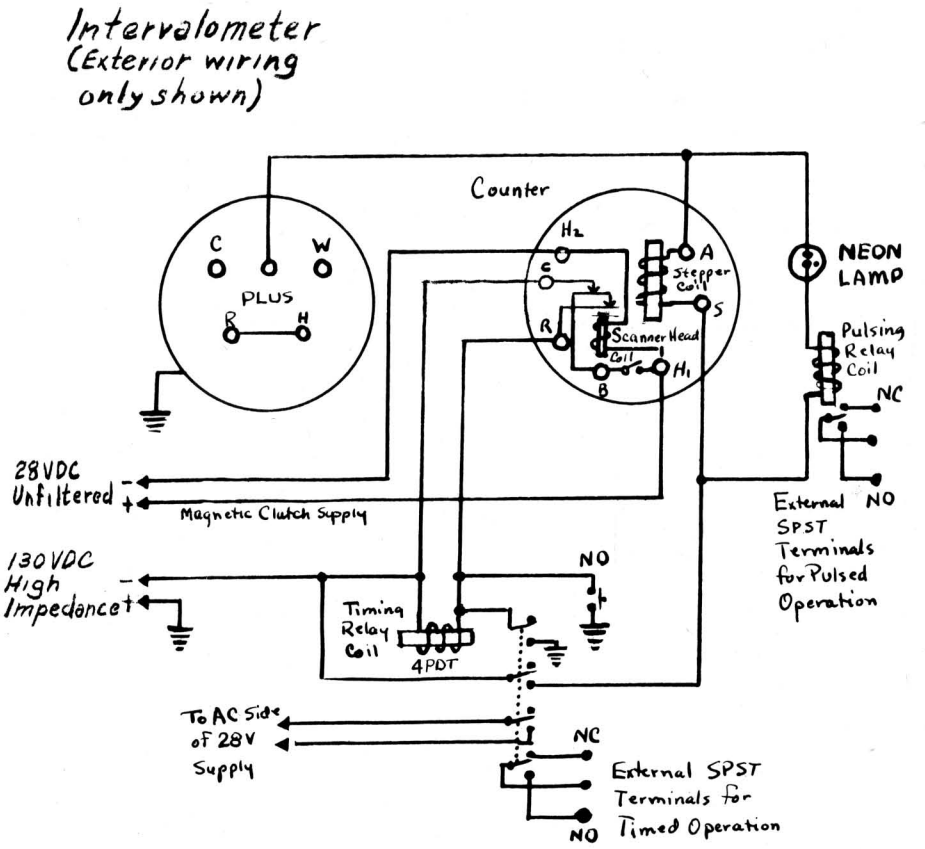
A pulsed timer is shown here which can be electrically triggered and will then operate two SPST relay switches in different modes:

- One relay will operate at the start of the cycle, remain closed until the timed cycle is over, then will de-activate.
- The second relay will operate for half-second intervals while the pulse timer is in operation, then cease at the end of the timing cycle.

The pulsed-timer consists of three basic units, a pair of DC power supplies, an **intervalometer,** and a **counter,** the relays operating off these. The **intervalometer** is DC operated and consists of a constant speed motor which drives a scanning arm via a magnetic clutch. The scanning arm closes a contact at the end of its travel, the actual angle of travel being set by a calibrated knob at the end of the unit. As it is used in this circuit, the scanning arm contact closes after the adjustable interval from 1 sec to two minutes upon closing the magnetic clutch. As the scanning arm contact is closed it shorts out both the motor drive and the magnetic clutch coil. However, the intervalometer is connected to the line through a counter stepper coil. The **Counter** is similar in construction to the intervalometer, in that it has a scanning-arm-with-contact driven thru a magnetic clutch. However, the drive is not a motor, but a rachet stepper driven by a low impedance solenoid coil. It is this coil which is connected in series with the intervalometer, and when the intervalometer scanning arm contact shorts the input line the current surge is sufficient to operate the rachet one step. The counter will close a switch upon completion of from 5 to 110 counts.

The relay used for timing has a four pole double throw contact arrangement, and is wired for electrical latching of its coil. The coil is shorted through a protective resistor by the scanning arm contact on the counter, thus opening the relay and ending the timing cycle. The contacts of this relay are used in the following way:

1. Electrical latching
2. External circuits
3. Magnetic clutch power supply
4. Intervalometer power supply



The relay used for pulsing is connected across the counter stepper coil and normally would operate wherever the intervalometer was drawing the current ($\sim$130mA). However, since the voltage rises greatly across the stepper coil when the intervalometer is shorted by its own scanning-arm contact, a neon lamp connected in series with the relay coil insures operation only at this time, the lamp extinguishes and the relay de-activates when the intervalometer returns to its normal timing mode.

Clifford L. Miles
Department of Physics
The University of Connecticut

FUSE INDICATION

Dear Mr. Bauman:

When indication of a blown fuse is desired, the use of a glow lamp across the fuse is practical when the circuit is 85 volts or greater.

If the fuse(s) are not located on the control panel, remote indication for a number of fuses is possible by:

A. Bringing lamps themselves to the front panel.

B. Using an optical link – with the attendant advantages of low voltage:

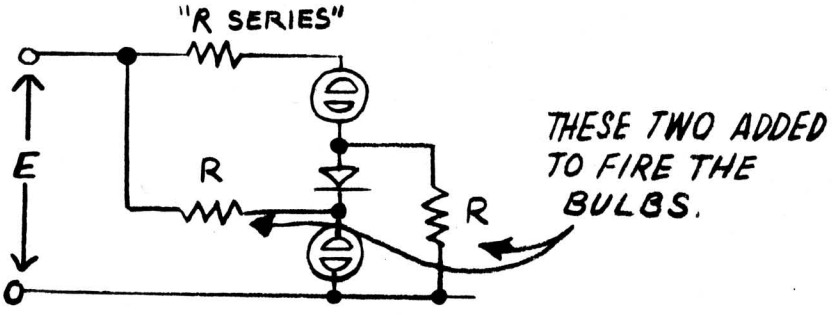
1. Individual links may be used when identification of the open circuit is desired.
2. Where just the indication of open circuit is desired, the photo cells may be paralleled if the fuses are at different locations.
3. When the fuses are in the same general location, one photo cell may be used with several lamps.

Robert C. Hale
Research & Development Dept.
Samuel Moore & Company

Ed. Note:
Signalite's LT2-27-1 lamp with a 30K resistor is a good choice for 115V A-C fuses. For 230 VA-C fuses, the same lamp is used with a 150K resistor For D-C fuses from 70V up, use our A079 and select the resistor so that current is .3 milliamp when lamp is on.

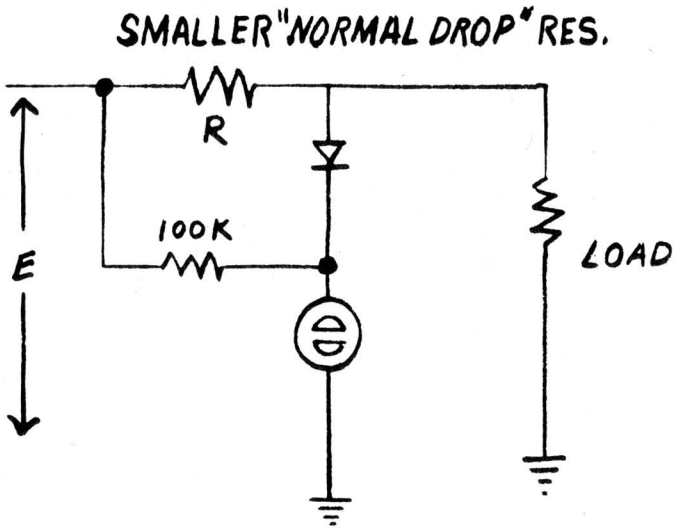
FIRING IN PARALLEL – OPERATE IN SERIES

Gentlemen:



This circuit "well-known" for voltage regulators. The diode can be a third VR to get three to fire at below "normal" voltage also.

Smaller "Normal drop" res.



Diode opens R effectively until the VR is fired.

Will Herzog
Cedar Rapids, Iowa

*

GLOW LAMPS AT WORK

If your product is using neon glow lamps, send us a photograph together with some information about the product and where the glow lamp is used. It is not necessary that the lamp used be a Signalite lamp.

* * * * *

Limit Switches With Neon Indicating Lights

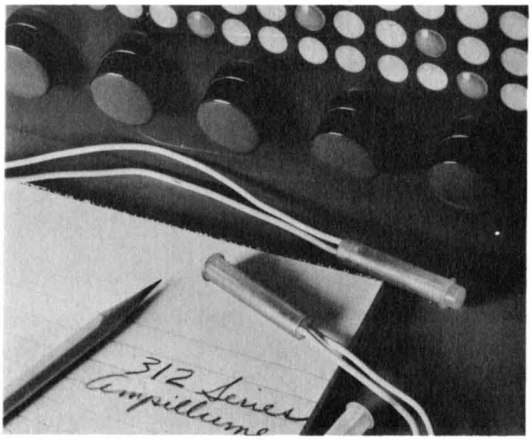
"LS501" Series, compact and plug-in limit switches, have an integral neon lamp which indicates whether or not the switch is functioning. The lamp goes off when the switch is actuated. The lamp may be installed to provide contact with the normally-open or normally-closed contacts of the contact block.

"LS501" Limit Switches have a two-circuit double-break contact arrangement. *Micro Switch, Freeport, Illinois.*

One Piece Indicator Light is Front Panel Removable

HARRISBURG, PA. – A new nylon encased pilot light has been designed by AMP Incorporated for installation and removal from the front of panels. Measuring only 3/8" wide (lens) by 1½" in length, the AMPILLUME (TM) indicator light is available with either flush-mount or raised lens in five standard neon colors: natural, red, yellow, amber and orange. The unique wedge-type construction of the housing permits the AMPILLUME indicator light to be snapped into a .312" diameter mounting hold on the panel without the need for mounting hardware or tools.

The one-piece panel indicator light is designed with integral 125V or 250V AC neon lamps rated for 25,000 hours at nominal voltage. (Incandescent models are available on special order.) Six-inch leads, stripped on the free ends, are supplied with each unit. The smaller-than-standard size of the 312 Series AMPILLUME and the ease of installation make it ideal for use in electrical appliances, test equipment and other applications where space is a restricting factor.



If you have a circuit design problem involving the use of glow lamps, or have developed a circuit in which glow lamps are important for design and/or economic reasons, we would like to discuss your application in a future issue of this newsletter.

Applications which in the opinion of Signalite have significant interest will also be brought to the attention of the editors of leading technical publications for consideration as articles and featurettes. Your by-line and company credit will be given with your permission.

* * * * *

For immediate technical application or circuit design assistance, you may contact Ed Bauman directly at:

TWX: 201-775-2255 *TEL: 201-775-2490*

* * * * *

For information about Signalite Neon Glow Lamps for circuit component and/or indicator applications, for specifications on lamps, for general information about Signalite and its products, call us at any of the following telephone numbers:

Phoenix, Arizona	(602) 254-8889	Detroit, Michigan	(313) 862-2225
Los Altos, Calif.	(415) 967-8998	Neptune, New Jersey	(201) 775-2490
Los Angeles, Calif.	(213) 466-4464	Albuquerque, N. Mex.	(505) 256-0884
Central City, Colorado	(303) 582-2671	Cincinnati, Ohio	(513) 521-2290
No. Miami, Florida	(305)PL1-5566	Cleveland, Ohio	(216) 333-2585
Chicago, Illinois	(312) 763-2131	Columbus, Ohio	(614) 488-9731
Indianapolis, Indiana	(317)FL9-5374	Dayton, Ohio	(513) 298-9546
Fort Wayne, Indiana	(219) 743-4411	Portland, Oregon	(503)CA2-7337
Louisville, Kentucky	(502) 893-7303	Seattle, Washington	(206)MU2-7337

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