Signalite
APPLICATION NEWS
from the desk of Ed Bauman, Chief Engineer

Vol. 4, No. 2

Also in this issue . . .
Latched Light Circuit For Signal-Memory
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WRITING WITH LIGHT

By: Jacob G. Rabinowitz
Chief Engineer
Clairex Corporation

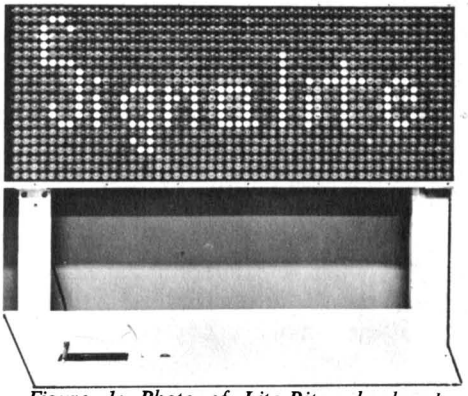
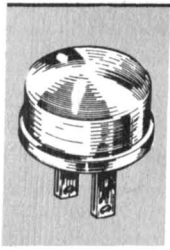


Figure 1: Photo of Lite-Riter developed by Clairex to demonstrate a versatile tool using photo cells with neon glow lamps.

A unique application of the use of solid state photo cells and neon glow lamps was developed by Clairex to demonstrate one of the many uses for cadmium sulfide and cadmium selenide photo cells. The device, which is shown in Figure 1, is an interesting technique for writing a semi-permanent message with nothing more than a flash light.

The unit is based on the principle of changing resistance in individual photo cells with a beam of light so that they, in turn, ignite a corresponding neon glow lamp on a display panel. The lamps on the panel remain lighted until it is desired to change the message. Any



Yours free . . . for telling us how you use or would like to use neon glow lamps

You can get a free Signalite Owl Eye Nite Lite simply by sending us an application for neon glow lamps, a problem or solution on their use. Each reader will receive the Nite Lite whether or not his letter is used in the Application News. In addition we welcome longer articles for feature treatment which we will also place in a leading technical magazine in your name.

message can be written as long as it fits within the physical geometry of the panel.

The system may also be used to project repetitive messages simply by cutting a perforated stencil which is laid over the writing plate. Light from a lamp over the stencil would be projected through the holes to the proper photo cells which again would light the corresponding neon lamps. A moving message could be projected in the same manner with a minor modification in the circuit.

The Lite-Writer was developed by Clairex not as a product, but rather, as a demonstration tool showing the versatility of photo cells and neon lamps. It uses a bank of 1,000 Clairex CL903 cadmium selenide photo cells. These photo cells have a dark resistance in excess of 10^9 ohms and a light resistance of 133K ohms at two foot-candles, maximum voltage rating of 250 volts, and a power rating of 50 mw. They are miniature photo-conductive cells and are supplied in a TO-18 case which is .21 dia. by .15 inches.

Each of these photo cells is individually connected to the trigger element of a three-element neon glow lamp, type LTG-27-2, produced by Signalite Inc. The LTG-27-2 lamp also is a high brightness neon glow lamp which was chosen because once ignited (dc operation) it will stay on until a reset button is pushed.

As opposed to the more conventional two-element lamp, the LTG-27-2 is what is commonly called a "trigger tube". This means that while it has all of the electrical and light characteristics of two-element lamps, it has an auxiliary trigger so it can be turned on by a circuit not necessarily connected to the circuit which supplies power for operating the lamp.

Another reason for the selection of neon glow lamps is their low power requirements. Design current for the LTG-27-2 is only 3.0 ma. A previous model of this demonstrator had used incadescent bulbs, but

Figure 2: Soldering LTG-27-2 lamps and resistors on display board.

the power drain for even a relatively short message was so high that the power line was overloaded, repeatedly tripping the circuit breaker.

For an installation such as the Lite-Writer, lifetime of the neon lamps is an important factor. Since the lamps are soldered in place (Figure 2), replacements would be both time consuming and costly. The rated life for the LTG-27-2 is 5,000 hrs. of continuous operation. Since no one lamp is on all of the time, actual life for any lamp is well in excess of this figure.

A schematic diagram of the Lite-Writer system is shown in Figure 3. The light source is turned on when the probe touches the conductively coated glass plate. The beam from the subminiature lamp is passed through an optical lens to a mirror where it is reflected to the bank of CL903 photo cells.

Output from each photo cell is taken through the circuit shown in Figure 4 to the corresponding glow lamp on the display panel. Each neon lamp so activated will remain on until the reset button is pushed which extinguishes all lamps at once. The power source is 140 to 145 volts dc.

The Lite-Writer is but one of many interesting devices which utilize solid state photo cells to perform a variety of tasks. They have been used, as has been described here, to light neon lamps, and have also been used in applications where they are activated by neon lamps. Neon lamps are a good source of light to operate both cadmium sulfide and

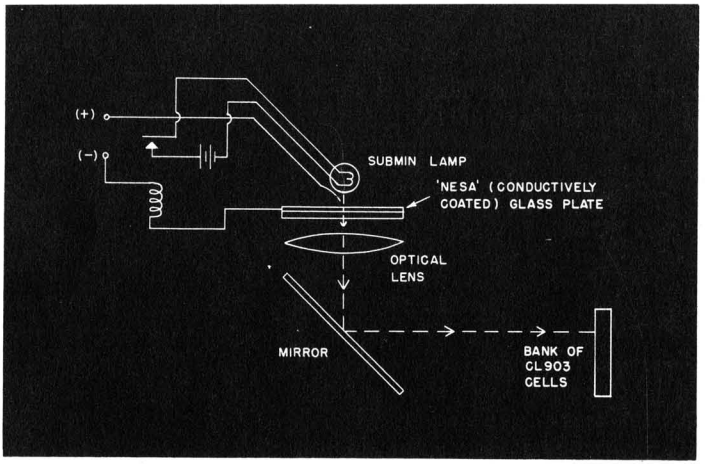


Figure 3: Schematic diagram of Lite-Riter

cadmium selenide photo cells since the spectral response of these materials peaks at between 5150 and 7350 Angstroms. The light from neon glow lamps falls primarily in the spectrum between 5200 and 7500 Angstroms.

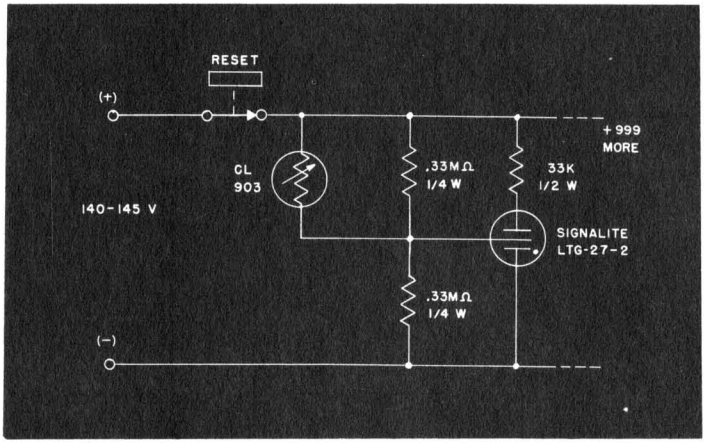


Figure 4: Circuit diagram of Lite-Riter

(Note: Signalite lamps which have been designed specifically to operate cadmium selenide and cadmium sulfide photo cells in photochoppers, photoresistors, and photoswitches are the A083 and the A074.

A second generation of three element trigger lamps has been announced by Signalite (see Vol. 4 No. 1 page 171) which can be used in place of the LTG-27-2 used by Mr. Rabinowitz. These new lamps have lifetimes greater than five times that of the LTG-27-2.)

LATCHED LIGHT CIRCUIT OPERATES SIGNAL-MEMORY DEVICE FOR TWO-WAY RADIO UNITS

By: Gailand Childs
Senior Development Engineer
E. F. Johnson Company

In the development of a device which would permit selective calling of two-way radio units, it was determined that a system based on a resonant reed relay would permit operation of many receivers on the same frequency and eliminate the annoyance of listening to irrelevant transmissions. Such a device could allow operation of the receiver on stand-by 100% of the time, in silence until it was called individually.

The unit, designed by E. F. Johnson Co., Waseca, Minn., uses a very high "Q", frequency selective, resonant reed relay which will respond only to its specific frequency from a relay in the calling unit. There are thirty-seven different calling tones available for the Viking Tone Alert thus permitting thirty-seven different systems to operate on the same channel without "stand-by" annoyance.

The reeds are of the plug-in type and may be changed easily if two systems in the same locality find they are using the same calling tone and are on the same frequency. The tone generator in the transmitter consists of a resonant reed controlled transistor oscillator. The selective calling tone unit in the receiver consists of a dual vacuum tube driver, the resonant reed relay, the neon lamp memory, and the reset switch.

In operation, the resonant reed relay is activated when a tone of the correct frequency is received, causing the relay contacts to make intermittent contact. This intermittent contact converts the dc current into pulsating dc at the signalling frequency. The tone is passed into the audio amplifier and is heard through the speaker of the receiver, signifying that this station is being called.

In addition to the audible tone, it was decided that a memory device should be incorporated so that the operator would know his station had been called if he left the unit unattended. For this, a simple and economical "latched light" circuit was included in the Tone Alert. (Figure 1).

Two standard neon glow lamps produced by Signalite were used. The characteristics of these lamps allow reliable operation over a $\pm$ 15% variation of line voltage. The first of these neon lamps (I-2) has a starting potential of 100 to 120 volts. It breaks down and ignites as soon as the unit is turned on. The second neon lamp (I-1) has a starting potential of 155 to 210 volts. Because the glow lamp with the lower breakdown potential always starts first, and the sum of its maintaining voltage plus the drop across the three resistors is less than the starting potential of the second lamp, I-1 will not ignite.

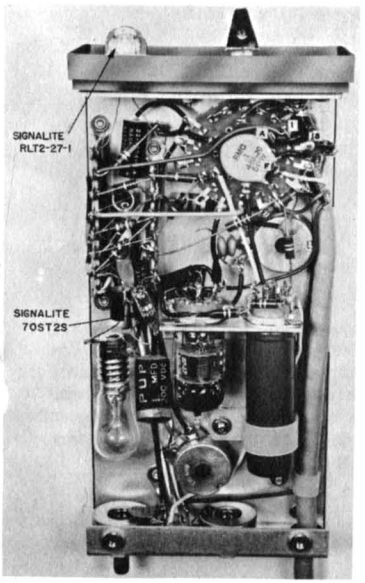


Figure 1

Internal view of the Tone Alert showing the relative position of the two Signalite neon glow lamps in the "latched light" circuit.

When the station is called, the resonant reed relay causes a voltage to be applied to the first glow lamp which is nearly equal to the voltage on the other side of the lamp. This drops the potential across the lamp below the lamp's maintaining voltage, and the first lamp goes out. The total circuit voltage is then applied to the second glow lamp, the "call" indicator, which breaks down and ignites. Since the maintaining voltage of the second lamp is lower than the breakdown voltage of the first, the circuit is locked, or latched, until the operator, noting the call signal, resets the circuit by switching the unit to "Operate". This returns the circuit to its original condition, and the call indicator light goes out.

Neon glow lamps lend themselves well to this type of application. They are economical, rugged, reliable and have very long operating life. Lamps with different starting potentials are readily available, and the characteristic difference between breakdown and maintaining voltage provides a simple "latched light" switch and indicator.

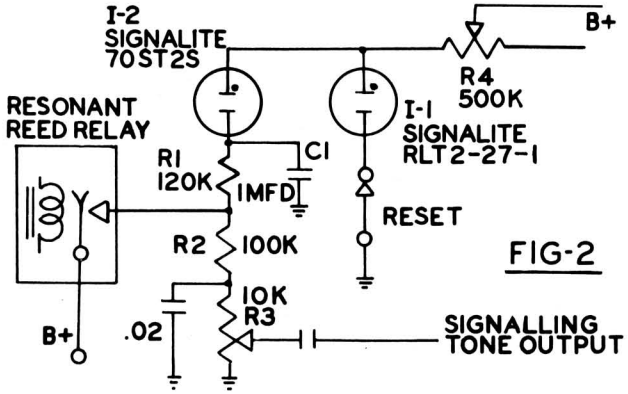


Figure 2

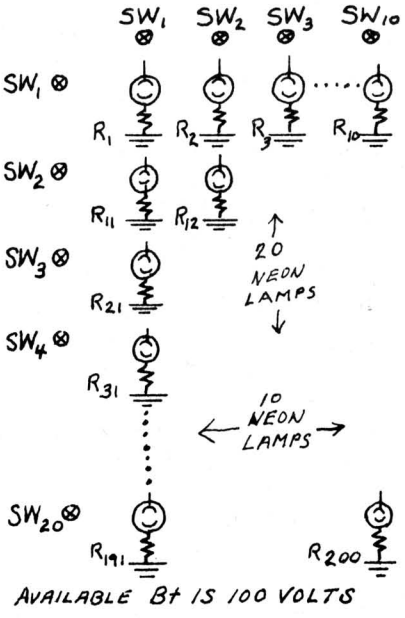
Operation of the circuit is straightforward. Signalite neon glow lamp I-2 with a starting potential of 100 to 120 volts ignites when the set is turned on. When the proper tone is received, the resonant reed relay applies B+ voltage to Signalite lamp I-2 causing this lamp to turn off. This action applies circuit voltage to call indicator lamp I-1 causing it to ignite. When the system is reset by switching to "Operate", I-1 is turned off causing I-2 to become operative again, returning the circuit to its original condition.

Mr. Rabinowitz' article originally appeared in ELECTRONICS WORLD November 1965 issue, and Mr. Childs' article appeared in ELECTRONICS WORLD, July 1965.

CAN YOU SOLVE THIS ? ?????

Dear Sir:

I wish to construct a 20 x 10 matrix of neon lamps with the cathode of each connected to ground through a suitable resistor providing a 10 volt drop across the resistor upon ignition of the lamp. Each of the 200 lamps must be turned on with no effect on the remaining 199 lamps, whether any of them are on or off. Available B+ is 100 volts. This device is to be used as a memory board indicating any and all combinations of the rows and colums in the matrix.



My problem is finding a suitable means of turning on any lamp in the matrix using only 30 switches; 20 for the rows and 10 for the columns. Does someone have a solution?

Richard R. Valent
McDonald's Research and
Development Laboratory

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.

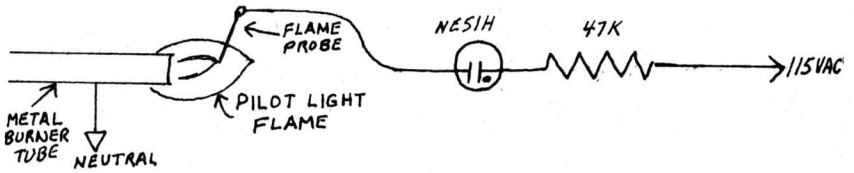
MORE ON FLAME OUT INDICATOR

Ed. Note: Here are three more interesting solutions to Mr. Ludtke's question about a fail-safe indicator for gas pilot lights in furnaces (Vol. 3, No.4).

USE IONIZED GAS IN FLAME

Dear Mr. Bauman:

Here is another way that Mr. Ludtke (Vol. 3 No. 4 and Vol. 4 No. 1) can tell if his pilot light is on in his furnace.



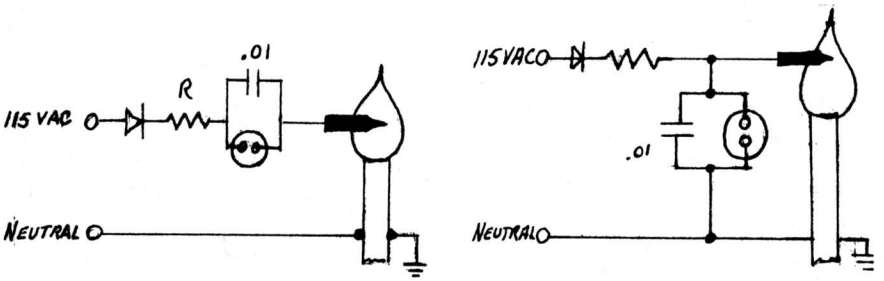
By putting a metal probe into the flame and connecting it as shown to an NE51H and resistor, the neon bulb will glow when the flame is on due to the conductivity of the ionized gas. I tried this with an NE51H but a different neon bulb might be better.

J.P. Mathews
Port Credit, Ont. Canada

FLASHING LIGHTS

Mr. Bauman:

Since neon tubes are high impedance and gas flame is also high resistance should be able to make pilot-off detectors as follows: (Tried propane torc seemed to work ok.)



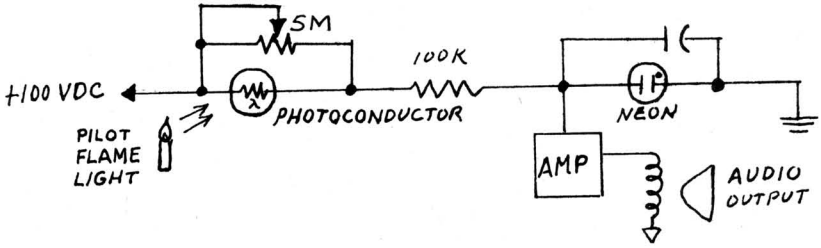
J.K. Green
General Development Laboratory

Ed. Note: R is selected for preferred flashing rate.

AUDIO ALARM

Dear Sirs:

There are a number of solutions to the problem of the gas furnace pilot light alarm, (Vol. 3 No. 4).



Kenneth Putkovich
Derwood, Maryland

Ed. Note: In Mr. Putkovich's solution the neon light will be on continuously as long as the flame is on. The light will blink when the flame goes out, and an audio alarm will be produced through the amplifier and loudspeaker.

MUSIC MAKER

Dear Ed:

My interest lies in building Electronic Organs using Neon Lamps. In the Signalite News mention was given to Leakage Resistance. Would you please define this term, and if possible cite method of determining Leakage Resistance . . .

Ed. Note: Leakage resistance is measured by applying a voltage lower than breakdown and measuring the amount of current that will flow across the surface of the lamp.

Those AO78's worked out beautifully in my Electronic Organ, just as you said they would. Organs of this circuitry (using Neons) have a special appeal as they are inexpensive, simple, take less room than tube organs, and now with matched Neon Lamps available, can be built with more confidence. Thanks for taking the pain out of using Neons.

I am enclosing . . . slides and books . . .

Robert Greco
New York Telephone Co.
Bronx, New York

Ed. Note: The basic circuitry Mr. Greco refers to was covered in Vol.2, No.3, "Neon Glow Lamps as Oscillators and Stable Frequency Dividers." His accomplishment was briefly described in Telephone Review, published by the New York Telephone Company where he is employed as communications serviceman.

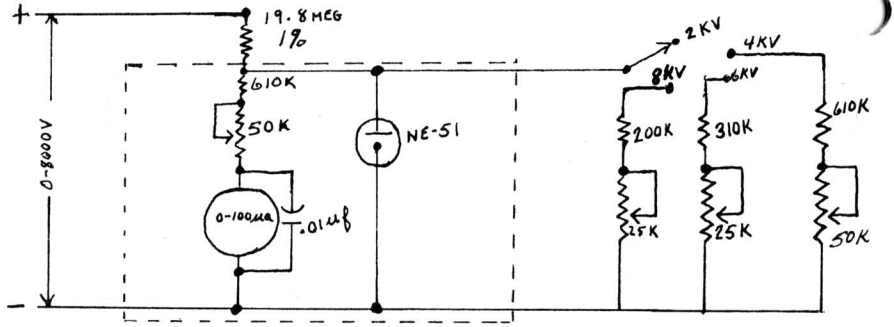
COMBINATION INDICATOR-PROTECTOR

Dear Mr. Bauman:

Here is an application for neon glow lamps:

A simple, inexpensive neon-lamp(NE-51) circuit was chosen, instead of an SCR circuit, to protect a O-100 μa, taunt-band suspension, D'Arsonval meter in a multi-range high voltage monitoring circuit (O-2KV, 4KV, 6KV, and 8KV).

The neon lamp is ideally suited for this high-voltage/ low-current application. Before firing, the neon shunts an insignificant amount of current around the meter. In the case of an accidental over-range condition, the neon strikes at about 105% of meter full scale and instantly limits meter current to approximately 80%, remaining relatively fixed at this point. This gives both a neon light and meter indication of an over-range condition.



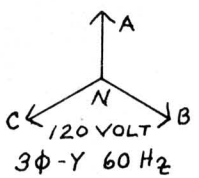
The circuit shown uses a standard voltage dividing, multi-range technique-the current shunting method being used to limit the voltage across the range selector switch. The meter protection circuit, shown within the dotted lines has about 630K ohms resistance in series with the meter in order to fire the neon lamp at 105% of meter full scale. The .01 μf capacitor across the meter terminals protects against electrical transients. All fixed resistors are carbon composition ± 5% tolerance except the 19.8 megohm ± 1%. It consists of several carbon film resistors in series in order to obtain greater voltage capability and higher wattage rating.

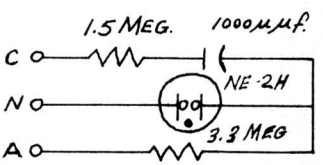
N.C. Vogle
Physical Chemistry Division
U.S. Naval Ord. Laboratory

PHASE SEQUENCE INDICATOR

Dear Mr. Bauman:

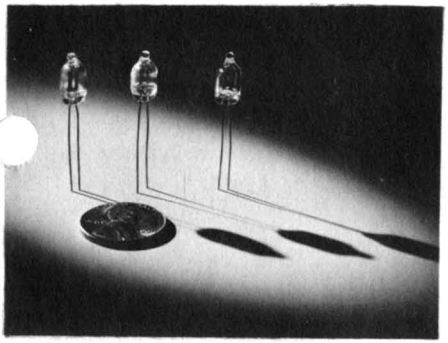
Thank you for the back issues of Signalite Application News. In glancing over the glow lamp applications, I do not believe that the following circuit has appeared.





We have used this circuit for several years as a phase sequence indicator for an induction type watthour meter. The NE-2H glow lamp will not light if the phase voltage E_{AN} lags the phase voltage E_{CN} by 120° (correct phase sequence for proper operation of meter). The glow lamp will light if the phase voltage E_{AN} leads the phase voltage E_{CN} by 120° (incorrect phase sequence).

E.W. Schwarz
Consultant to
Manager of Engineering
Sangamo Electric Company



(The majority of the applications for neon glow lamps discussed in the Application News are concerned with the use of lamps as circuit components, or a combination use as circuit component and indicator. The lamps designed for circuit component use are an outgrowth of Signalite's original development and production of standard indicator lamps. We would like to mention here that Signalite is still a leading producer of standard indicator lamps in addition to the many circuit component lamps we developed. The following new product announcement concerns the most recent indicator we have introduced.-Ed.)

SUBMINIATURE INDICATOR NEON LAMPS

Two new subminiature neon glow lamps, the A1B and the A1C, have been introduced by Signalite Inc. for use as indicators in appliances and other devices. The A1B is a standard brightness lamp and the A1C is a high brightness lamp. Light output of the high brightness lamps generally runs approximately ten times that of the standard brightness lamps and can be readily observed under normal room lighting conditions. Standard brightness lamps are used where normal lighting conditions are low and a lower light level is desired, such as on electric blankets.

Both lamps are supplied in a clear glass tube which is .244" max. in diameter and .5" max. in length. Leads are 1" copper. The lamps may be provided with or without a current limiting resistor in accordance with customer specifications.

The A1B and A1C subminiature lamps are available from stock.

LAMP #	MAX. BREAKDOWN VOLTAGE AC	DC	BULB LENGTH MAX.	WIRE LEAD LENGTH	MAX. BULB DIAM.
A1B	65	90	.5"	1"	.244"
A1C	95	135	.5"	1"	.244"

LAMP #	A.C. CIRCUIT VOLTAGE	LIFE (HOURS)	SERIES RES.	NOM. CURRENT
A1B	105 - 125	Avg. 25,000	220K	.3 ma
A1B	105 - 125	Min. 5,000	150K	.5 ma
A1B	210 - 250	Avg. 25,000	600K	.3 ma
A1B	210 - 250	Min. 5,000	330K	.5 ma
A1C	105 - 125	Avg. 25,000	68K	.8 ma
A1C	105 - 125	Min. 5,000	47K	1.2 ma
A1C	210 - 250	Avg. 25,000	220K	.8 ma
A1C	210 - 250	Min. 5,000	150K	1.2 ma

All Resistors are ¼ Watt

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*

* * * * *

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