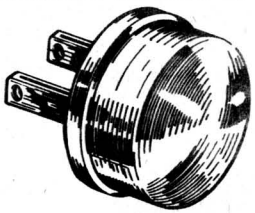
Signalite
APPLICATION NEWS
A General Instrument company

VOL. 1, NO. 3

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.

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STROMBERG-CARLSON TELEPHONE TOLL TICKETING SYSTEM USES NEON GLOW LAMPS IN NUMBER IDENTIFICATION MATRIX

The rapid increase in direct station-to-station dialing for long distance telephone service is its own testimonial to the value of this service to telephone communications. With the benefits that have accrued to the subscribers, however, has also arisen the problem of accurately and economically determining the calling line number. This problem has been a major obstacle to the extention of direct distance dialing to the smaller independent telephone systems.

Most automatic number identification systems are relatively complex and have been designed primarily to serve larger exchanges. Recently, Stromberg-Carlson, a division of General Dynamics, introduced a Toll Ticketing System to meet the needs of the independent telephone industry for an economical method for number identification, timing, recording, routing and bill preparation.

The identification process developed for this system by T. R. Redington and A. A. Jorgensen of Stromberg-Carlson involves the application of an identifying signal to the third wire or sleeve lead in a form having digital significance with respect to the originating terminal number and the transmission of the digital information to a recording medium.

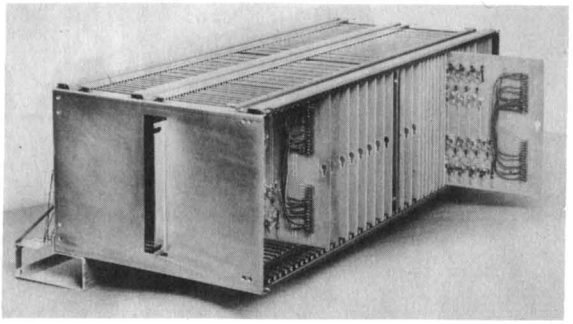

Figure 1

The identification principle employed is based upon a matrix, (Figure 1) in which standard neon glow lamps are used as gating elements. A pulse of positive potential is applied via the originating switch train sleeve to the originating line circuit and connector terminal, and thence to an associated cluster of neon diodes in a matrix. The diodes transfer the pulse to appropriate digital busses which are interrogated by a detector under the control of a synchronous scanning and pulsing circuit.

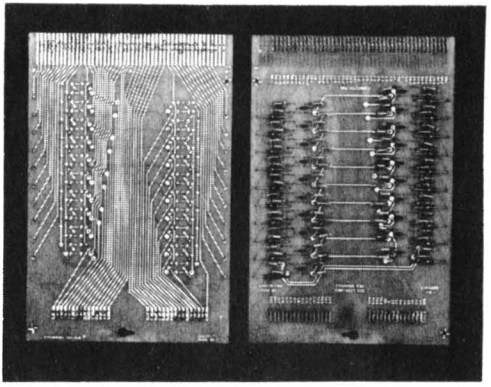

Figure 2

Figure 2, a plug-in printed circuit card, consists of 20 matrices. Each matrix consists of a cluster of four neon glow lamps produced by Signalite Inc., and a resistor per connector terminal. For those connector terminals assigned to multi-party lines in terminal-per-station groups, a silicon diode is added for party gating purposes. With connector terminals assigned to multi-party lines in terminal-per-line groups, clusters of three neon glow lamps and a resistor are used.

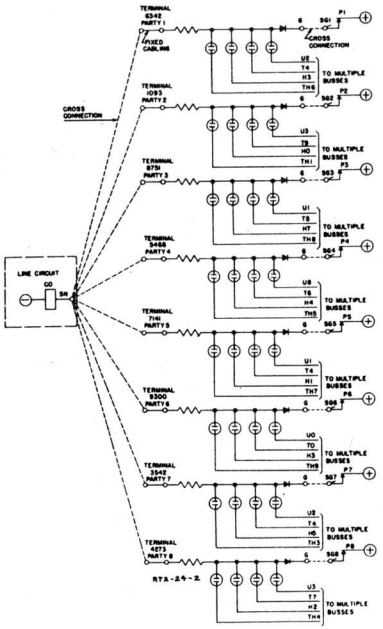

Figure 3 Terminal-per-station gating arrangement

In operation. (Figure 3) each matrix cluster transfers the identification signal to four of a possible forty multiple busses having digital significance with respect to the terminal number. The anodes of all of the glow lamps in the cluster are connected in parallel through the resistor to the sleeve lead of the associated connector terminal. Thus, a voltage appearing on the sleeve also appears on the anodes of the glow lamps. The identification signal ionizes the glow lamp whose cathode is connected to one of the multiple busses in accordance with the thousands, hundreds, tens or units digits of the connector terminal number. This, in turn, causes a positive voltage to appear on the multiple bus to which the diode is connected.

The Signalite type RT2-24-2 neon glow lamps exhibit excellent characteristics for use as a gating element in the identification matrix. The DC resistance drops from greater than 500 megohms in the deionized or non-conducting state to about 8000 ohms when ionized. For all practical purposes this characteristic completely eliminates the marginal signals on matrix busses which are characteristic of resistor matrices. Consequently, signal detection becomes a non-marginal "go" or "no go" process readily accomplished by simple detection circuitry.

Minimum maintenance requirements and operational simplicity were two objectives of the design of the identifier. The nature of the service for which the identifier was intended, often installed in unattended offices which are visited at less than weekly intervals, precludes reliance on daily routine testing. The glow lamps are consistent with these objectives. Rated life for RT 2-24-2 is 25,000 hours, or about 3 years of continuous use. Based on a more realistic duty cycle of 3% in the Stromberg-Carlson identifier matrix, the glow lamps could

last almost 100 years without replacement. Visual trouble shooting techniques are practical since there is a visual indication of the firing of the glow lamps in the matrix, and bring the maintenance requirements of the identifier within the grasp of personnel who do not possess a depth of electronic knowledge or training.

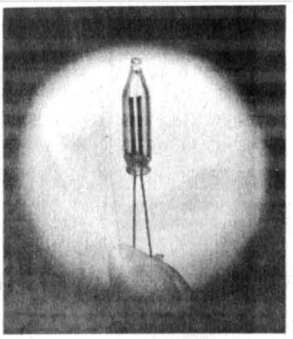

Figure 4

Signalite Type RT2-24-2 neon glow lamps exhibit excellent characteristics for use as gating elements in identification matrix. D-C resistance drops from greater than 500 in the deionized or non-conducting state to about 8k ohms when ionized. For all practical purposes this characteristic completely eliminates marginal signals on matrix busses which are characteristic of resistor matrices. Consequently, signal detection becomes non-marginal "go or no-go" process readily accomplished by simple detection circuitry.

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A condensation of the Stromberg-Carlson story appeared in the October, 1963 issue of EDN magazine.

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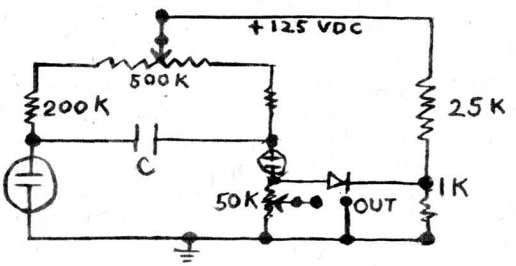
Your Glow Lamp Application Forum

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.

Dear Ed:

I would like to use the circuit below for a low frequency (1-10 cps) oscillator. What type lamps do you suggest for best stability?

D. K. Fraedrich
Alexandria, Va.



My suggestion would be our AO16 lamp. This lamp has an extremely close tolerance on breakdown and maintaining voltages. We are presently supplying it to a test equipment manufacturer and also to a computer company. This lamp can be supplied in a choice of ±1 volts on breakdown within a range of 64 to 80 volts and ±.5 volt on maintaining voltage within a range of 52 to 60 volts.

I suggest, in your circuit, you place a 1,000 ohm resistor in the cathode of the left lamp to limit the peak discharge current of capacitor "C". Your right lamp is adequately protected via the 50K and the clamping diode and the 1K resistor.

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Sharpening Relay Voltage Operation Threshold

Gentlemen:

Where it is desired for a relay to operate within a narrower current or voltage range than is available from the standard characteristics of the relay itself, it is possible to use a zener diode in series with the relay.

If sufficient voltage is available and the relay current required is not high, a glow lamp is a much less expensive control element.

In a circuit which we had designed the day before the "News" arrived, an RT2-32-1A is used in series with a P&B, KCP5, 2500 ohm ohm, 18V, 7.2 ma relay to operate when an increasing applied voltage reaches about 70 to 90 V.

When the circuit voltage reaches the firing voltage, the lamp will conduct and the 12-25V difference of the firing and maintaining voltages will appear across the relay causing operation.

This scheme can be applied with other combinations of relay and lamp types and numbers.

Gerhard A. Liedholz, Staff Engineer
CORDIS CORPORATION

Your suggestion for the application of our circuit component neon lamps is an extremely good one. You have obviously recognized the fact that we can get small differentials between breakdown and extinguishing voltages.

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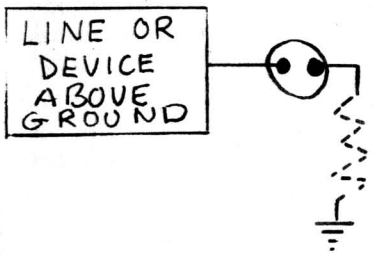
Static Electricity Discharger

Gentlemen:

Enclosed is my GLOW LAMP application.

Application GLOW LAMP—Static Electricity Discharger



Glow Lamp firing voltage to be chosen above system voltage maximum. If system is subject to voltage transients, a resistor should be seriesed with Glow Lamp.

T. Wiseman
HARTMAN ELECTRICAL
MANUFACTURING CO.

Glow lamp devices have been used for many years for static electricity discharging networks for telephone lines and many other similar type applications. We recently had an inquiry for a lamp to be used in an Electronic Fence Controller which required U.L. approval. Purpose of this lamp was not to pass primary line voltage in case of transformer failure, but to pass the high shock voltage to the fence.

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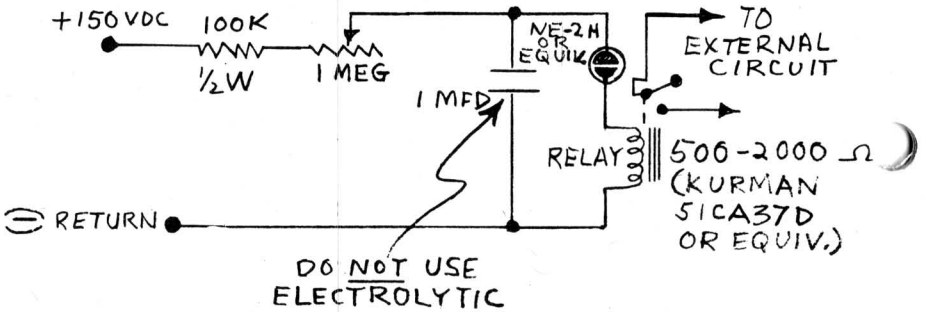
Variable-Speed Timing Circuit

Dear Ed:

For the interest of your readers, I found several years ago that a simple variable-speed timing circuit could be made from an RC circuit driving a relay in series with a neon lamp. Using an NE-2H which is the high-brightness version of the NE-2, a sensitive relay will pull in whenever the RC circuit discharges through the NE-2H. Ambient light must be kept out of the glow lamp, however, or the timing becomes erratic due to the premature ionization of the neon in the presence of light. I believe you have high capacity glow lamps containing some radioactive isotopes that control this



SIMPLE GLOW-LAMP TIMING CIRCUIT

effect. Anyhow, this circuit is very simple and direct for non-critical timing applications, such as sport-car rally timers, metronomes, etc. . . . The relay contacts can be used to trigger a digital counter. Also, the light flashes with each discharge as a visual indicator. All sorts of variations are possible in the circuit constants; with the values shown, the pulse repetition rate is about 2 to 10 pulses per second, adjusted by the setting of the potentiometer. Actually, a regular NE-2 will work, but not nearly as well as the NE-2H. The relay is not critical, but it should be a unit that energizes at about 4 mils with a 500 ohm coil, or less with a higher resistance coil. The higher the relay resistance, the slower the pulse rate. The clicking of most relays is loud enough that it can be used as a metronome with nothing at all connected to the relay contacts!

There's nothing new about glow lamp neon relaxation oscillators, of course; the "gimmick" here is the use of the relay coil directly in series with the glow lamp.

Fred Blechman, Canoga Park, Calif.

I would suggest that where you wish to operate a relay directly from a relaxation oscillator timer that you choose a lamp that has a larger ratio of breakdown to maintaining voltage, and that the breakdown voltage is controlled to a narrower limit for stability and timing. The T2-27-1WR250 has essentially no difference in breakdown in dark or light eliminating the light problem you discussed. I chose the T2-27-1WR250 because its breakdown voltage falls closest to 63% of the 150V so that the circuit would be operating in the linear portion of the RC time constant. The specifications on these lamps are such that you will have a minimum of 30 volts to a maximum of 60 volts to operate this relay. Life of this lamp at 6 milliamps continuous operation is 7,500 hours. Therefore there is no concern about using it with your relay.

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Lamps Solve Counter EMF Problem

Dear Sir:

Approximately a year ago I built a switching circuit which involved a few hundred reed relays and many diodes. One of the problems in the circuit was that occasionally the coil counter emf would damage a diode, and hence a service problem. At that time I installed some miniature neon lamps across the coils and had no further problems.

Because your article mentioned the use of neons to suppressed counter emfs, I thought I would mention the fact that we had previously done this, and it had worked out very, very well. For relays having a higher coil voltage than the initial breakdown of a given neon, we placed two neon bulbs in series.

Franklin D. Wood, Development Engr.
ALLEN-BRADLEY COMPANY

Signalite manufactures glow lamps with breakdown voltages as high as 300 volts. With these it may not be necessary to use lamps in series.

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Simple Annunciator Circuit

Dear Sir:

In your No. 2 issue you discuss the time delay relay idea and this should have many applications. This type of application also brings to mind the need for a simple annunciator circuit. Such an annunciator circuit could use a neon lamp for indication and high reliability; and in addition a memory circuit is required.

Have you considered the use of your device as an annunciator. Possibly the use of a cold cathode triode might be useful as a memory element. We will appreciate your comments on this.

J. L. Michaelis
PITTSBURGH PLATE GLASS CO.

Annunciators cover a wide range of signalling devices. Our lamps have been used in several types. Perhaps some of our readers would like to suggest some annunciator circuits for Mr. Michaelis . . .

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Harness Tester

Gentlemen:

We are using the same circuit as in Mr. Fisher's Harness Tester letter, except that B+ is 150 Volts DC. All resistances are 120K 1W, and the tubes used are NE 51's. We are experiencing difficulty in that the firing voltages for the NE 51's do not remain constant over a given period of time. The NE 51's are aged before installation, which helps somewhat.

Can you suggest one of your tubes that will give us a relatively long service life — somewhat in the neighborhood of 10,000 hours or better?

R. P. Scott, Field Engineer
HUGHES AIRCRAFT CO. (F.S.)

The NE 51 lamp is not a circuit element, but rather has been designed as a bayonet-based indicator. Occasionally, indicator lamps may be used as circuit elements under certain conditions as we indicated in our correspondence with you. Neon lamps designed as circuit components are kept within very close tolerances during manufacture to ensure an unusually high degree of reliability.

Our T2-32-1 lamp when used with any of the resistors indicated in the suggestion to Mr. Fisher will give you more than 10,000 hrs.

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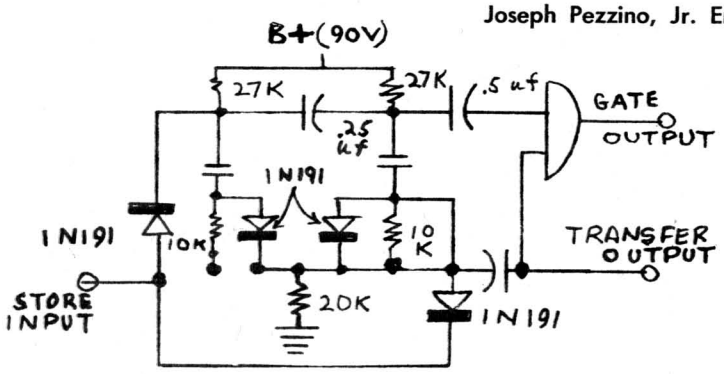
Neons for Computers

Gentlemen:

I'd like to make up a small computer using neons instead of transistors, but NE-2's are unstable. What bulbs would you have with more stability. Something that can be matched as close as possible to another bulb.

Joseph Pezzino, Jr. Engr.



Since NE-2's are produced for indicator applications, it is true that they will not have the stability required for circuit component uses. A lamp suitable for your circuit is our AO16 which has a breakdown voltage of 64 to 80 volts, and a maintaining voltage of 52 to 60 volts. We are presently supplying this lamp in groups of within 1 volt on maintaining voltage and ±1 volt on breakdown. These lamps have been specifically designed to hold the maintaining voltage over a lifetime of 5,000 hours.

Another possibility you might consider would be to use 3 element lamps in your driven flip-flop. With essentially the same circuit, tie the anodes together with the original .25 uf capacitor, bias the triggers to a neutral point and drive them in parallel.

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Arc Suppression in Vibrator Power Supply

Dear Sir:

I would like to ask if your glow lamps are applicable for arc suppression in vibrator power supply circuits.

Thomas R. Macy, Electronics Technician
KOOTENAI NATIONAL FOREST, MONT.

If you are operating the vibrator supply at 12 to 24 volts on the primary, it is conceivable that by placing a neon lamp across the outsides of the primary we can remove the back EMF that has developed during that portion of the cycle when the contacts are open.

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Neon Lamps Protect Relay Contacts

Dear Mr. Bauman:

Your article "Neons As Arc Suppressors" in the July, 1963 issue of Electronic Equipment Engineering was very interesting. The equipment we manufacture contains a large number of relays and silicon diodes, so we are interested in all methods of protecting the diodes from transients.

Your article suggested the use of neon lamps to protect relay contacts; but is the ionization time short enough to protect diodes? If so, any information you could forward on the types of lamps best suited for this type of protection would be greatly appreciated.

Our equipment uses 50 volts D.C. power.

Robert C. Totz, Circuit Design Engr.
AUTOMATIC ELECTRIC CO.

Generally speaking, the silicon diode in the reverse direction has a given amount of capacitance. The ionization times of neon lamps are a function of voltage. When the overvoltage (transient voltage) being applied exceeds the breakdown required by 30%, the ionization time of the lamp is approximately 5 usec. Therefore, it can be seen that under certain conditions a neon lamp can protect rectifiers against interrupted line or load transients. The limitation is in amount of stored energy.

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Congratulations to Mr. Gailand Childs of the E. F. Johnson Company for his story on a Latched Light Circuit. The story was placed by Signalite in Electronics World and his $50.00 honorarium from the publication has been mailed to him.

ANSWERS TO VOL. 1, NO. 2 CAN YOU SOLVE THIS?

Editor's note:

The following four circuits were typical of those submitted as possible solutions to Mr. Nelson's request for a roadside warning blinker. While all four are relaxation oscillators with minor variations, it should be born in mind that the light output from neon glow lamps is normally low and may be difficult to be seen in daylight. The following suggestions may help:

1) The lamp should have large electrodes to handle high currents, and should have a special gas, such as Signalite's L gas which has a higher order of conversion efficiency (light per milliampere). Such a lamp is our LT2-32-1.

2) A resistor can be placed in series with the lamp to increase the discharge time to about 1/10 second.

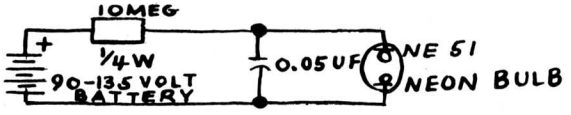
3) A 180V power source should be used.

4) A suitable lens should be used to increase visibility.

E.B.

Fred G. Degler
Senior Electrical Draftsman
LEEDS & NORTHRUP CO.

I have been operating a blinker light of this type for approximately one year without a failure.

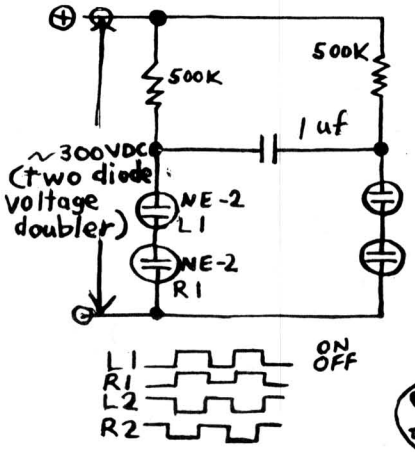


M. L. Aitel
Haddon Heights, New Jersey

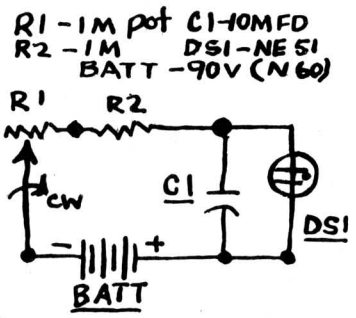
I have used the following circuit for many years to make Halloween "pumpkin eyes" for the kids' amusement. It will serve also, for Mr. Nelson's "blinker" with perhaps, the substitution of a high intensity neon in place of the two series NE-2's in each leg.

For pumpkin use—place lites like so . . . to have pumpkin watch for hobgoblins.

For blinker use—replace NE-2's with heavier neons, adjust voltage and circuit parameters appropriately, and deploy the two lites either back-to-back or about a foot apart facing the same way.



Richard J. Yaroush, Designer
SIKORSKY AIRCRAFT

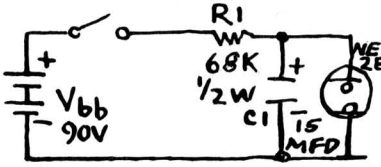


With reference to Mr. Nelson's inquiry in your newsletter Vol. 1, No. 2, I submit the following circuit:

I designed and built the above unit in Oct., 1962 and it has been flashing continuously since with the same battery.

Clockwise rotation of R1 will vary the flash rate from 50 times per minute to 100 or elimination of same will fix the flash rate at 100 times per minute.

David L. Baca, Engineering Aide
CONSOLIDATED SYSTEMS CORP.



With the components shown, about 1 flash per second can be realized. By increasing or decreasing C1, the repetition rate will vary accordingly.

Here is a relatively simple circuit that might be the answer to Mr. Nelson's roadside blinker.

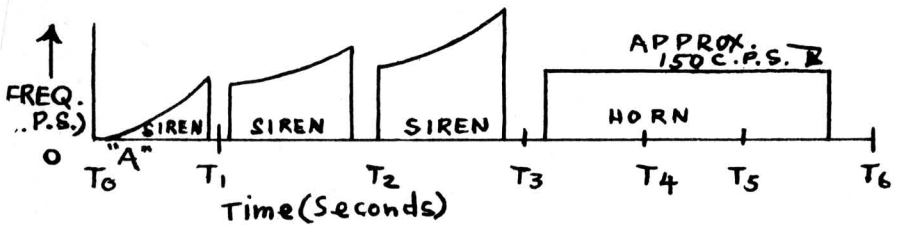
Since the circuit draws so little power, more than one lamp could be used along with a simple reflector and lens which would give adequate light output.

CAN YOU SOLVE THIS?

Dear Sirs:

I am interested in obtaining a light weight, low cost, low current circuit for use in Radio-Controlled ship models. My present circuit uses 6 Transistors and 6 NE-2s and leaves much to be desired.

Requirements: Siren-Horn Generator Amplifier driving a 2" Speaker. (Sequence and approximate frequencies below) Ex-Navy men, having heard a Naval Ship getting underway will know the sounds I am after.



After one complete sequence, it is desired that only the horn will operate on command (B) unless B+ voltage is deenergized in which case the com-

plete sequence would repeat on command (A). A transistorized Flip-Flop is used for on-off command. (+30V on, +5V off.)

I am curious as to whether square waves varied in P.R.F. would sound more realistic than presently used sine waves.

W. Purdum, Elect. Devel. Tech.
Griffin A.F.B. ROAMA-RONEER

Gentlemen:

The following problem is of some interest to me and its solution should prove useful in a range of applications.

Given a string of flip-flop counters operated from 6 v d.c. diode gates to provide a decimal readout and a source of a-c voltage (30-100 v) what circuit can be used to enable the use of Signalite bulbs for decimal display.

Arnold Newton
Forest Hills, New York

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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 the leading technical publications for consideration as articles and featurettes. Your by-line and company credit will be given with your permission.

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