Signalite
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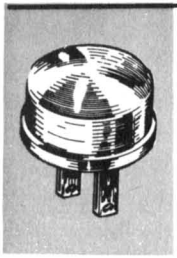
(Note. The equipment described in the following article is manufactured by the Western Electric Company for Bell System use only. This article originally appeared in Bell Laboratories RECORD, June 1966.)

ANI FOR SMALL STEP-BY-STEP OFFICES

by P A. Ghiloni and Hal R. Moore
Bell Telephone Laboratories

Today long-distance calls can be dialed from almost any place in the country without the assistance of a telephone operator. This is made possible by the nationwide system of direct-distance-dialing (DDD) and by automatic message accounting (AMA) and automatic number identification (ANI) systems.

Until recently, ANI systems could not be economically justified in small dial central offices using step-by-step switching DDD calls dialed through these offices had to be routed to an operator, who asked for the identity of the calling number and then keyed this information into AMA equipment. Now, a new, economical automatic number identification system, known as ANI Type C, has been developed for Step-by-Step offices that serve less than several thousand customers The system identifies numbers associated with one-and two-party lines and recognizes numbers associated with multi-party lines. The latter must be identified by operators



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.

This system uses a high-level dc identification pulse and an active number network consisting of three neon glow lamps and a resistor Both the pulse and glow lamps make it possible to reduce the complexity and, hence, the cost of the control equipment. Offices can be equipped with as few as 100 number networks connected together in an assembly that can be wired for identifying any consecutive sequence of numbers. For offices serving more than one central office area, different assemblies can be used for different office codes.

Because the high-level identification pulse is distinguished easily from noise and other signals on the sleeve lead, simple detectors are used in the ANI C system. Each detector consists of two transistors and associated circuitry mounted on plug-in cards.

A minimum of 23 detectors is required for a central office. Five detectors are assigned to each of the four digits of a directory number; three are used to distinguish between a ring, tip, or multiparty line. (On two-party lines, one customer is called the ring, the other the tip party Individual lines are treated as ring parties for identification.) The office code of a number is derived from the output of the ring and tip detectors. If more than one office code is required or if numbers need special billing treatments, up to 10 additional detectors may be added. These, along with the ring, tip, and multiparty detectors, are called "service mark" detectors.

A two-out-of-five code is used for identification of each digit. Although the pulse is divided several times during identification and thereby attenuated, each portion is of sufficient amplitude so that two detectors can be activated for each digit. All four digits are identified simultaneously. Thus, there is no need for the relays and scanning equipment.

The simplicity of the detectors in ANI C also stems from the use of neon glow lamps in the number network. The gas in these lamps ionizes only if a high-level signal is applied to it—the type of signal that must be used with simple detectors. The lamps thus allow this signal, which is applied to the sleeve lead of the calling number, to be transmitted to the detectors but block the low-level signals normally on the sleeve. (Telephone numbers in the central office have three connections the tip and ring leads over which talking takes place; and the sleeve lead over which low-level dc signals are used for selecting idle channels and holding established connections.)

These lamps serve still another purpose; they block passage of the identification pulse to detectors associated with other number networks. All the number networks in this system are interconnected in a matrix and, therefore, the identification pulse can take several divergent paths. However, the signals on these paths are too weak to ionize the glow lamps of other number networks. Lamps that are not ionized present

an open circuit and thus do not affect the amplitude of the identification signal. Therefore, all leads connected to the same numeral, say units 8, can be wired directly to the appropriate detectors. This is one of the features of the system that markedly reduces its complexity and cost.

The matrix of number networks is formed in a novel way The common leads of the three glow lamps and resistor are twisted and soldered. A heat-shrinkable plastic band holds the components together as a module. (See Figure 1) Ten such modules are placed between groups of terminals

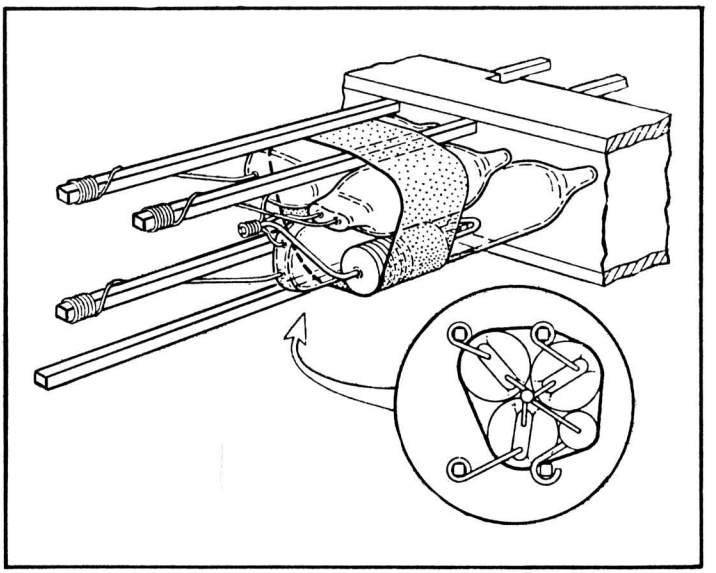


Figure 1

Three Signalite type T2-27-1W760 neon glow lamps and a resistor are held together by a heat-shrinkable plastic band and placed between terminals.

on the rear of a mounting strip. These terminals project to the front for strapping and cross connections. A 100-number network assembly is formed by stacking these mounting strips 10 high so that the front terminals nest between an array of pre-assembled vertical buses. (Figure 2) By connecting the front terminals to points on the buses, numbers can be designated as ring party, tip party, or as multiparty (those requiring operator identification). Special service marks may also be provided by these connections.

Two 100-number network assemblies are housed in a framework with two plug-in diode cards and a common terminal array between them, forming a 200-number unit. Connections are made at this ter-

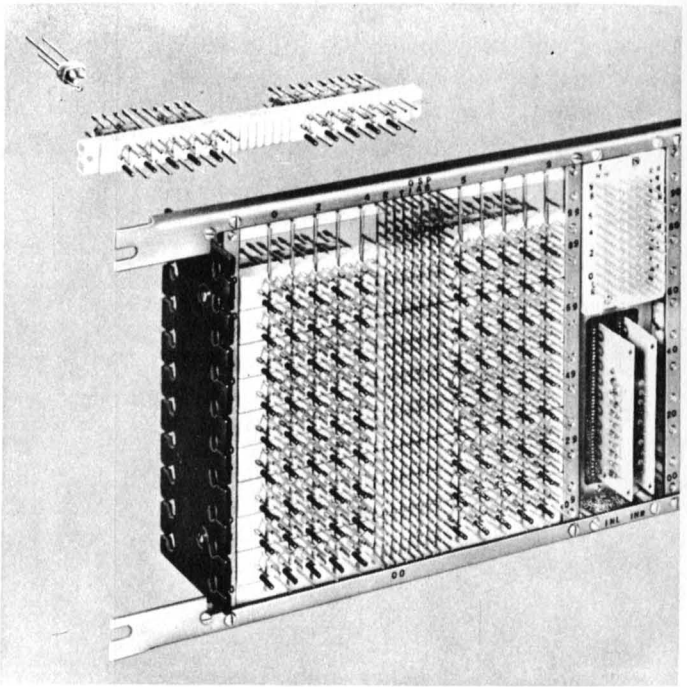


Figure 2

Two 100-number network assemblies (left side only is shown) with two plug-in diode cards and a common terminal array between them form a 200-number unit.

minal array to designate the thousands, hundreds and service mark identities for each 100-number assembly When removed from the framework, the diode cards isolate the 200-number unit from others in an office to simplify maintenance. Because the equipment is simple and has few components, testing is done manually This also helps minimize the cost of the system.

In ANIC automatic number identification works this way· when a customer dials a DDD call, a path is established over one of the ANI trunks, to a distant tandem office. As soon as the equipment in the toll office receives all the digits of the called number, it requests the identity of the calling number by reversing the potential on the tip and ring of the ANI trunk conductors. Then the trunk circuit is connected to the outpulser, which in turn is connected to the identifier

The pulse generator transmits the high-level identification pulse directly to the identifier and also over the sleeve of the calling number to its network. The glow lamps ionize and transmit the pulse over three output leads. (See Figure 3.) On the leads connected to the units-and tens-digit buses, resistors divide the pulses and transmit them to two units-digit and two tens-digit detectors. On the remaining lead, diodes

on the plug-in isolation cards divide the pulse into three signals and transmit each to the common mark detector while the other two, each divided again by resistors, travel to two hundreds-digit and two thousands-digit detectors.

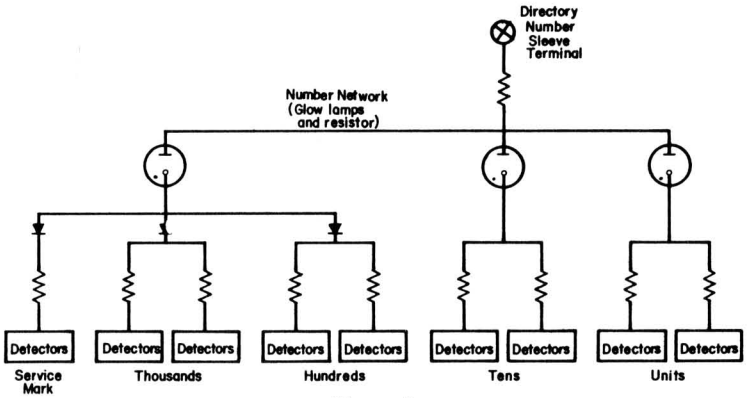


Figure 3

Identification pulse transmitted by glow lamps is split by resistors on two leads and sent to two units and two tens detectors. Diodes divide third pulse. One portion goes to service mark detector, the other two—divided by resistors—go to two hundreds-digit and two thousands-digit detectors.

The four digits and service mark are identified simultaneously by the detectors, and this information is gated out to the outpulser register where the office code is derived from the service mark. Finally, the three-digit office code and four-digit number are transmitted over the ANI trunk to the CAMA equipment using conventional multifrequency pulsing. Prior to this transmission, a two-out-of-five check is made of the digits registered in the outpulser If the check fails, a second identification attempt is made. If that is unsuccessful, the ANIC system requests the assistance of a CAMA operator

When calls are made from two-party lines, two networks are pulsed because both numbers share the same sleeve lead. The ANI trunk tests whether the calling number is a ring or tip party and then signals the identifier through the outpulser If a ring party is calling, for example, a relay, part of a "party discrimination" circuit, is operated, preventing the tip party's number network from transmitting pulses to the detectors.

Safeguards in the equipment are taken to prevent false identification of numbers. For example, if a high-level transient on the sleeve of a number network ionizes the glow lamps, it will not operate the detectors because they require simultaneous inputs from the number network and from the pulse generator (The pulse sent directly to the identifier appears at the input of each detector at the same time that the pulse is sent through the number network.) Since the detectors are gated only for a 150-microsecond period, there is little chance of transients

and identification signals occurring simultaneously However, if they do, the outpulser will discover two numbers in its register and will ask for a re-identification.

Ed. Note:

The lamps described in this application are Signalite type T2-27-1W760 designed specifically for long term, multiple operation with the following characteristics:

Breakdown voltage	*170 to 200 V dc*	*Length*	*.844" max.*
Maintaining voltage at 6mA dc	*60 to 70 V dc*	*Diameter*	*.244" max.*
Firing time	*Less than 60 μ-second with 250 volt pulse, with white light illumination of 1 ft. candle.*		

FRANK MCKENDRY IS THE MAN TO CALL

The appointment of Francis J. McKendry to the position of Manager, Applications Engineering and Product Development has just been announced by A. W Gershon, president of Signalite Inc. Frank's primary responsibility is to assist Signalite customers in the application of neon glow lamps in their circuitry, solving circuit design problems, and recommending or designing new lamps wherever necessary

Prior to joining Signalite, Frank had been Manager of Research and Development for Buck Engineering where he was instrumental in forming the R&D department. Earlier, he had been a Project Engineer on injection lasers for RCA and a Circuit Design Engineer on solid state circuits for IBM

Frank has worked with semiconductors of all types and has a total of 14 patent disclosures to his credit. He has authored several papers on semiconductor device properties and presented a paper at the Photovoltaic Specialist Conference. He is a graduate of Syracuse University where he earned his BSEE degree.

Frank's office is at the Signalite plant at 1933 Heck Avenue, Neptune, N J 07753. Call him at 201 775-2490 if you have any problems or questions concerning the use of neon lamps in your circuitry

CAN YOU SOLVE THIS ? ?????

PHOTON TRIGGER

Dear Sir

I am seeking an inexpensive circuit for an application I have in mind I feel certain that the solution appears in one or more of your issues of "Signalite Application News" which I read religiously but unfortunately don't file as well

I would like to employ a glow lamp to generate a single square wave pulse of approximately 0.1 second duration. The pulse is to be initiated by subjecting a shielded glow lamp to a high intensity flash of an ordinary incandescent pilot lamp through an appropriate aperture and lens if necessary

In short, I would like to hold the source voltage just below the normal ionization potential and trigger the discharge purposely via photons.

Can you recommend a glow lamp and circuit for this application?

Very truly yours,
E. J Wren
Gulf South Research Institute

Ed. Note.

For those of our readers who want to solve Mr Wren's problem, a very high intensity light is needed to trigger the neon lamp. Our experience with flash tubes of 50,000 candlepower indicates that the lamp has to be adjacent to the flash tube to be triggered.

NEEDS HELP IN COUNTING NOSES

Gentlemen

We are in the process of developing an accountability system for the food services in the living units. The system must include an identification for each student, an indicating device for each student and a switching circuit to count the total number of students served.

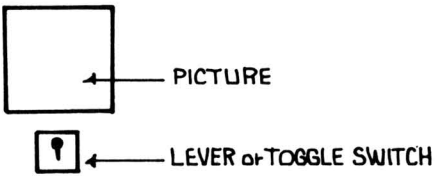
We want to develop about three prototypes one of which will be selected for adoption. The prototypes should include about six stations. The adopted panels will contain about six hundred stations each and there would be about twenty panels.

(Below) are some basic ideas that might be used. Could you help us out with some circuits and/or components that would do the job.

Each student will be identified by a picture. The approximate size of the picture is 7/8" x 1/8" although it can be varied. The students are to be classified by room number There are usually two students to a room. A tally is to be kept of the total number of students by a counter which is activated by a momentary switch contact.

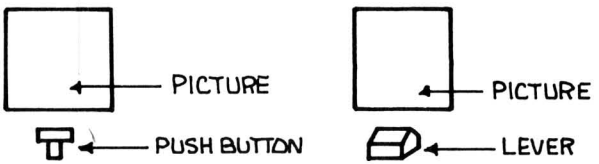
Possible Ideas

Lever or toggle switch



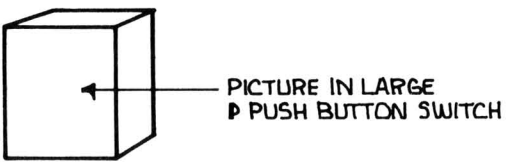
The lever switch should be such that its position clearly indicates whether this student has been served. When the switch is activated it should pulse a counter One way the pulse could be obtained would be a momentary pulse when the lever goes from one position to another

Lighted lever or push button



A push button or lever switch lights or changes color when activated. The switch should also pulse a counter

Large display push button



The student's picture would be encased in a large clear plastic push button The button would be lighted to indicate whether the student has been served. When the button is pushed it must also activate a counter

Sincerely yours,
Donald W Cramer
Michigan State University

ANSWER TO CAN YOU SOLVE THIS Vol. 5, No. 2

INTRUDER ALARM

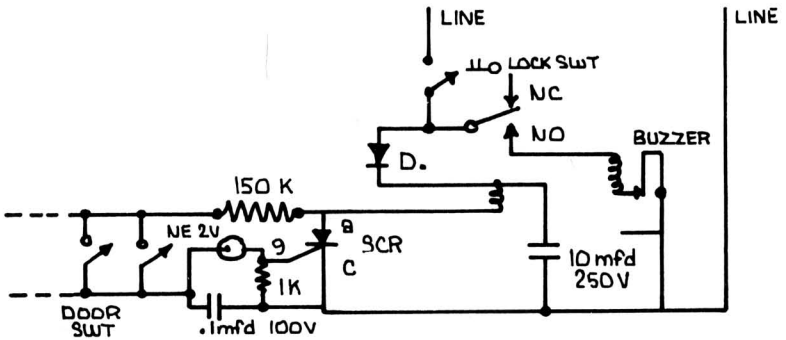
Gentlemen

Enclosed is a suggested solution to the problem presented by Mr Fiedler in the Vol 5, No. 2 issue of your "Application News"

The operation is as follows When the door switch is closed, the 1 mfd capacitor is charged through the lock switch, diode, relay coil, and 150K resistor until the neon fires. The resultant current pulse fires the SCR and the relay pulls in Since the diode and 10 mfd capacitor furnish DC to the SCR, it remains conducting and the relay is held closed until the circuit is opened by the lock switch Since the 150K resistor is connected to the anode of the SCR, the voltage drops after firing to too low a value to fire the neon it therefore does not continue to flash

The neon should be a NE2V or similar with a radioactive additive so it is not insensitized in the dark.

I would like to point out one problem with this circuit, however if the 110 volt ine is turned off or there is a malfunction, the alarm will not sound. To avoid this, it would be necessary to use a battery for the buzzer, and arrange the system so opening a switch or the line would trigger the alarm



RELAY = 110V AC OR DC RELAY SPST
SCR = 1 to 2 AMP SCR
D = 200 MIN. VOLTS 50 MA MIN. Si Diode

Very truly yours,
G. H. Gill
Ridgecrest, Calif

Ed. Note.

We would suggest using our A230 lamp which was made for SCR driving. Also, the use of a 3-element device would allow a high impedance (1 megohm which would lessen shock danger (See Vol. 2, No. 2, page 46 for allowable currents.) The circuit would then have to be redesigned slightly in the SCR trigger area.

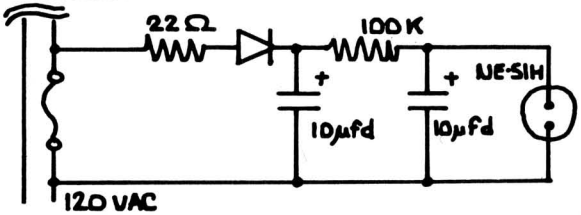
YOUR GLOW LAMP APPLICATION FORUM

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.

BLINKING LIGHT SIGNALS FUSE FAILURE

Dear Sirs.

The following circuit can be used as a blown fuse indicator for a system. It more readily attracts attention by blinking at around a one Hz rate.



Yours truly,
Henry Zykorie
Airborne Instruments Lab
Cutler-Hammer

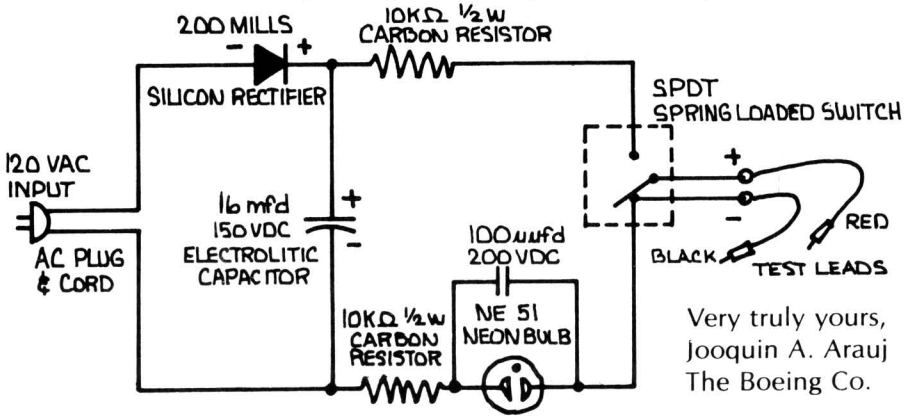
(Ed. Note. While this circuit performs as noted above by Mr Zykorie, it might be noted that elimination of the 22 Ω resistor and the first 10 μfd capacitor would have no appreciable effect on performance.)

TESTER FOR CAPACITORS AND OTHER THINGS

Dear Sirs

For the last 15 years I have been using this design to check capacitors. (Please see schematic diagram below).

When testing a good capacitor the neon light will blink *ONLY* once, for a leakage capacitor will keep blinking (the more blinking, the higher the leakage). For a shorted one (the lamp) will stay *ON* all the time and I found out that it will check with reasonable accuracy capacitors from 250 uufd to 2 or 3 μfd. Of course, it has many more other uses as well, for instance: continuity tester, H V tester, AC-DC tester, etc.



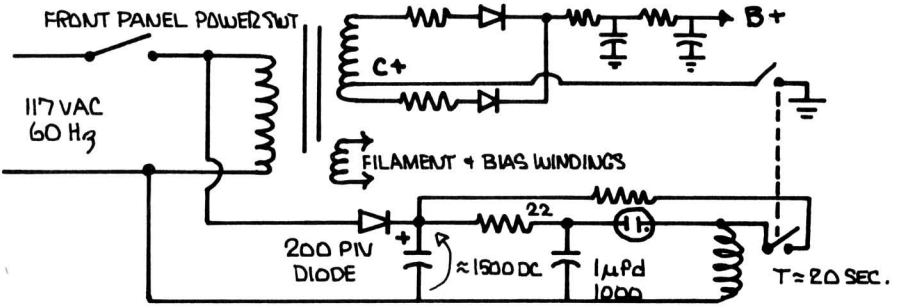
Very truly yours,
Jooquin A. Arauj
The Boeing Co.

HIGH B+ IN "COOL" AMPLIFIER

Dear Sir,

In an attempt to "beat the heat" in a hi-fi amplifier, the rectifier tube was replaced with silicon diodes. However, now that the warm-up time of the GZ34 filament was no longer present, very high B+ voltages were present as soon as the amplifier was turned on. A neon lamp timer as suggested in your "Application Notes" seems to offer a good solution. The proposed circuit appears below;

This should save filter capacitors from overvoltage as well as allowing the output tubes to warm up before B+ is applied.



Ronald Richey
Sperry Marine Systems

Ed. Note.

A very low leakage lamp and capacitor are needed for this time length.

NEW BROCHURE ON NEON INDICATOR LAMPS

A new 8-page illustrated comprehensive brochure has been published by Signalite describing neon glow lamps for indicator applications, as well as a listing of 2- and 3- element circuit components and voltage regulator and reference tubes.

Information on how to evaluate and apply neon lamps, definitions of terms used with neon lamps, and a testing circuit for measuring various parameters are included in the brochure. Complete catalog information for selecting and ordering lamps is also included.

The brochure is available free upon request. Simply write for "Neon Glow Lamps Catalog", Signalite Inc., 1933 Heck Avenue, Neptune, N. J 07753.

Return Requested

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Neptune, N.J. 07753

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Drop Us A Line.

If you have an interesting application of neon glow lamps in your circuitry or a problem concerning the use of neon lamps, drop us a note telling about it Interesting letters will be published in a future issue of the **Application News**—and we will send you an Owl Eye Nite Lite for your home.

Applications which in the opinion of Signalite have significant interest will also be brought to the attention of the editors of leading technica publications for consideration as articles and featurettes. If you would like help in preparing your material for publication, just send us the facts and data. We will put it in the correct form for publication. Your by-line and company credit will be given with your permission.

For immediate technical application or circuit design assistance, you may contact Signalite 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:

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