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APPLICATION NEWS

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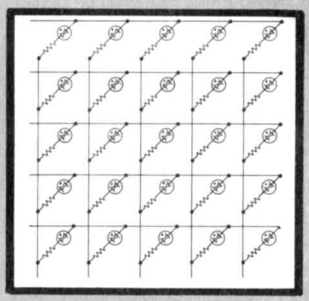

Volume 9, No. 1

Signalite Inc., 1933 Heck Avenue, Neptune, N J. 07753

UNI-IMP: A FAST-ACTING UNITY IMPULSE SURGE ARRESTOR

Protecting sensitive electronic components from voltage transients that may occur without warning under normal operating conditions has become vital in view of the high replacement costs of electronic components and instrumentation. The voltage transients can result from a variety of conditions including high current switching, accidental short circuits, static electricity discharges, lightning, and flashover in high voltage power supplies.

In conventional spark gaps the initial breakdown voltage increases as the rate of applied voltage increases. This phenomenon results from the finite amount of time required for the sequence of events that must precede the passage of large currents through the gap.

One of the most important considerations in surge arrestor applications is the impulse ratio which may be expressed as the ratio between the voltage at which a gap fires in the presence of a steep wavefront and the voltage at which the gap fires on DC. A unity ratio (1:1) means that the device will trip at its rated breakdown voltage regardless of the rate of rise of the wavefront of the transient. Impulse ratios greater

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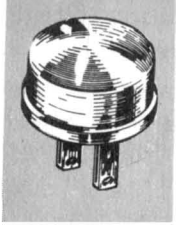

Yours free . . . for telling us how you use or would like to use neon glow lamps

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.

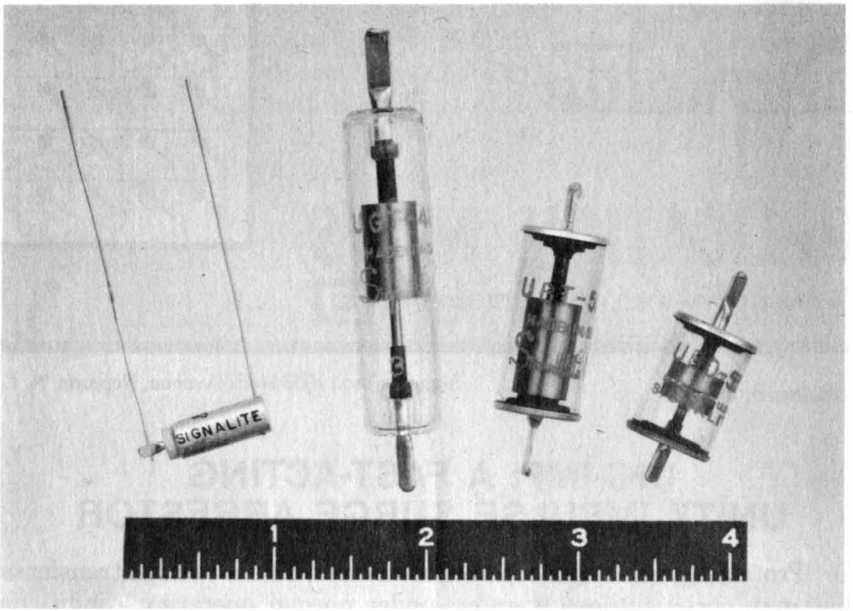

Figure 1

Four styles of Signalite Uni-Imp, unity impulse surge arrestor, are available with ratings from 550 volts to 25 KV.

than 1:1 define the amount of overshoot the device will permit before tripping when the wavefront is very steep.

In conventional gas-filled spark gap surge arrestors, this impulse ratio can be as high as 10:1 as implied in Figure 2. Often this poor impulse ratio causes destruction of the component or circuit due to the face that harmful spikes by-pass the gap before it can operate. To avoid such failures it is necessary to specify the trip voltage in relation to the rate of rise of voltage. Such specifications, unfortunately, cannot usually be met in a conventional gap because of physical constraints.

Recent advances in research and development of gas-filled surge arrestors by Signalite have produced a new series of fast reacting surge arrestors known as the Uni-Imp® These new devices are capable of arresting transient pulses with wavefronts as fast as 50 KV per microsecond in "zero" reaction time. Individual units in the new Uni-Imp line have 1 1 impulse ratios. They operate without voltage overshoot or variations in the trip voltage over a wide range of operating voltage parameters and transient pulse shapes as shown in Figure 3.

Exhaustive tests conducted by Signalite have shown that the Uni-Imp trip voltage parameters remain constant within 10% under conditions where the rate of applied voltage is varied from DC to

300 KV/u-second. Lifetimes are measured in thousands of discharges with typical results being 3,000 operations at 300 amperes peak and 10 microsecond half width for a 550 volt unit, and 8,000 operations at 4,000 amperes peak and 5 microsecond half width for a 15 KV unit. Impedance is essentially infinite up to the trip voltage, and capacitance never exceeds 15 picofarads on the lower rated units, and 5 picofarads on the higher rated units.

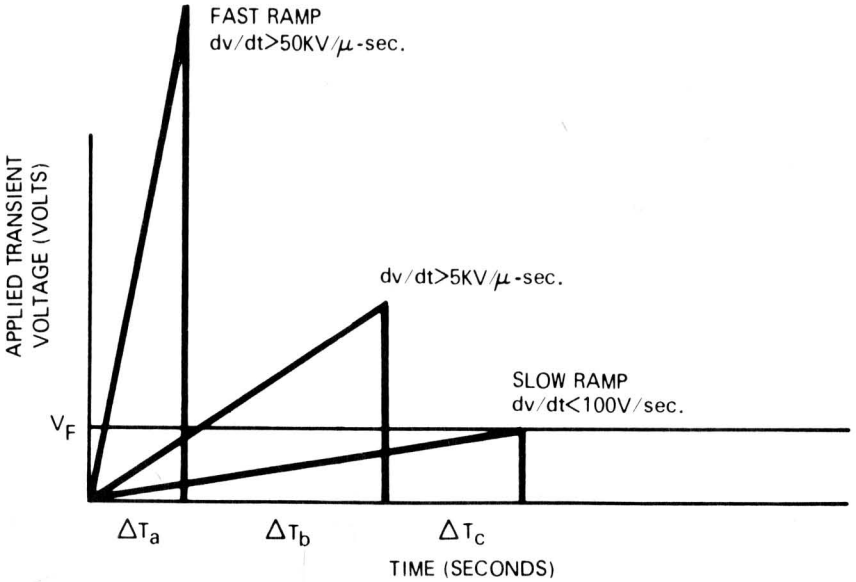

Figure 2:

In a typical gas-filled gap the trip voltage increases as the ramp rate of the transient pulse increases. With extremely fast pulses components or circuitry which the gap is intended to protect may be destroyed because the gap breaks down too high.

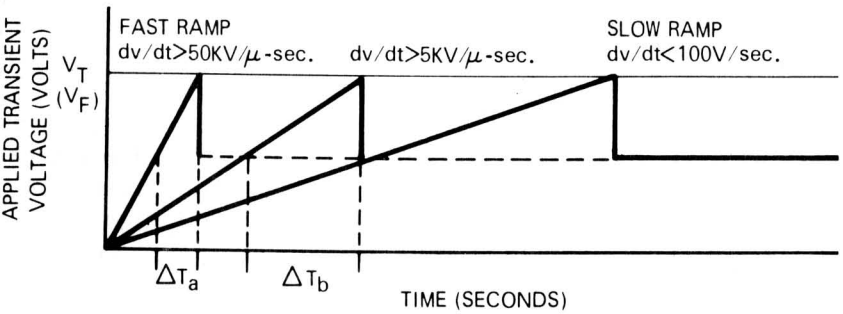

Figure 3:

No variation in trip voltage is experienced with the Uni-Imp surge arrestor regardless of ramp rate of transient pulse.

Four types of the Uni-Imp are presently available with trip voltage ratings as follows

UMT		550 volts to 3.0 KV
UBD	—	550 volts to 4.0 KV
UBT		4.0 KV to 15.0 KV
UGT		4.0 KV to 25.0 KV

Many ratings are available in quantity from stock. In addition many special designs are available to meet specific requirements.

The new surge arrestors are well suited to any applications involving circuit component protection, active switching, as pulse generators, or ignition circuit control. The devices are compact enough to be incorporated within the circuitry being protected. The Uni-Imp is bi-polar, and not limited by the typical energy handling restrictions of solid state devices such as fast rate of current rise.

□□□

CONTACT SENSING SYSTEM FOR PRECISION MACHINING

By· W L. Zemberry
Applied Research Laboratory
United States Steel Corp.

Precision machining is a combination of mankind's imagination and special skills that has become a cornerstone of every industrialized nation in the world. Almost every manufacturing facility in a modern economy either depends upon precision machinery as production aids, or precision machining in the fabrication of the end product. As the future manufacturing processes turn more and more toward automation, the need for precision machining will be greater than ever.

Because the machinist has to be absolutely accurate where very close tolerance mechanical parts are concerned, he draws upon a vast array of measurement devices and accurately functioning control surfaces. To assist the machinist in the performance of his trade, many devices have been created that either perform the more mundane mechanical functions of machining, or assist the machinist in appraising the accuracy and progress of his work on a continuous basis. One such device is a simple and relatively foolproof electronic sensing circuit for indicating machining tool contact with the workpiece instantaneously

The sensing circuit was originally developed to signal the instant at which contact is made between the first tooth of a milling cutter and

the workpiece it is approaching. The need for such a device arose becasue visual observation is very often inadequate for an accurate determination of initial contact between tool and work. Precision measuring devices such as feeler gauges or micrometers were not practical as indicators or measurement devices when the work was in motion, as in the case of milling cutters, drills, or shapers.

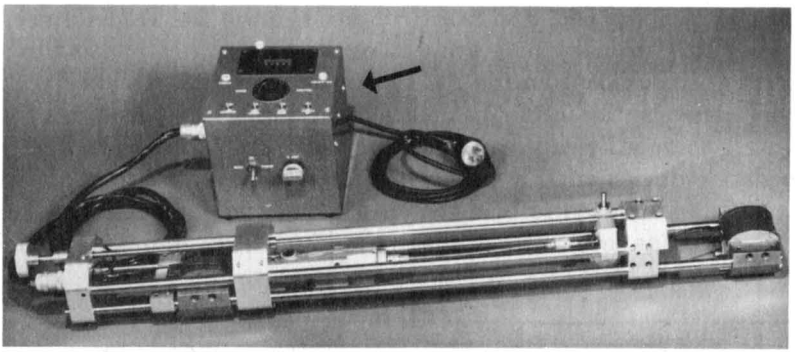

Figure 1:

A portable notch milling machine incorporating the contact sensor device. The arrow shows the location of the neon glow lamp used to indicate work-tool contact.

Determining the point of tool and work contact electrically is not unique to the machining industry. For many years various methods have been employed to indicate initial contact through exposed low voltage circuits. One such method is to insulate the workpiece from the cutting tool in such a way that a circuit is completed when contact is made, and thereby energizing a small incandescent lamp or other such simple indicator. This method is satisfactory with stationary single-edge cutting tools that maintain continuous contact with the workpiece once the initial contact has been made. But problems arise when more sophisticated cutting tools, such as rotating multi-edge devices, are used. With such tools, any eccentricity of the tool arbor or of the tool itself will result in a high spot that would normally establish the desired base point, but not provide contact of sufficient duration. The end result would be a lack of visible response from the relatively slow heating lamp filament, and continuous overshooting of the cutting process.

Neon glow lamps offer the best solution to the problems of instant visibility and minimum amounts of tool and work contact in a simple circuit-completion set-up, but usually require a starting voltage far in excess of that permitted for exposed circuits under many safety regulations. A device developed and patented (#3,476,013) by the

Applied Research Laboratory of U.S. Steel, eliminates the problems and potential dangers associated with high firing voltages in a neon indicator. The new system provides instantaneous tool and work contact indication in any precision machining operation, even one employing a moving multi-edge cutting tool.

The new contact system combines the advantages of a quick reacting neon glow lamp as an indicator, and a low voltage electrical circuit for sensing tool and work contact (Figure 2). Transformer T1, with a 110 V primary and a 3 V secondary, electrically isolates the contact open circuit from the AC line neutral ground. The low voltage cannot cause bodily injury or create any sparks large enough to pose a danger to volatile solvents or cutting oils. Transformer T2 is a high impedance device with a primary of 10 K ohms and a secondary of 3 K ohms, and is used to bias the neon glow lamp indicator just below ignition voltage level. The primary windings of T1 and T2 are placed in series across the 115 VAC line.

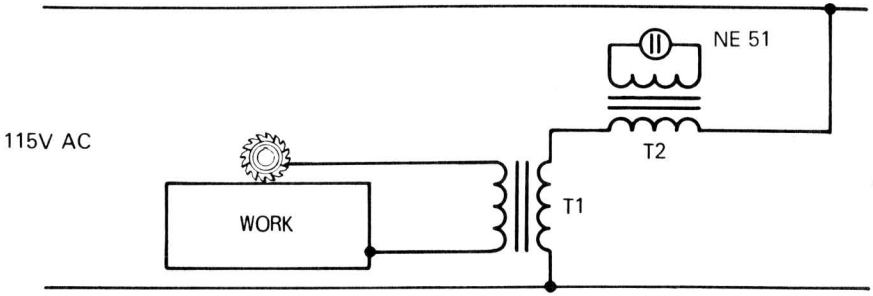

Figure 2:
Diagram of the low voltage contact sensing circuit.

When the tool and work come into contact, current in the T1 secondary increases, and causes a consequent increase in the primary winding current. This causes a corresponding current change in the primary of T2, and causes the neon glow lamp to fire. The lamp remains lit as long as the contact point between the work and tool remains.

If a multi-edge cutting tool is employed in the machining process, the new contact system functions equally as well. Even though the tool contact with the work may be high speed repetitions of momentary contact, the neon lamp ignites upon initial contact, and remains lit during the short duration between tool contacts, due to the hysteresis effect in the transformer windings. Although the neon glow lamp may not appear as steady as a continuous tool and work contact indication, it still nevertheless is bright enough to give a positive visual indication of initial and maintained contact.

The contact sensing system need not be limited only to applications in the machining industry, but should find use in any circumstances where a low voltage circuit must be used to contact between two conducting materials. The use of a low voltage AC circuit to sense contact will permit the use of relatively long lengths of wire between the contact area being monitored and the neon glow lamp indicator. The long reliable life of the neon device assures dependable performance far in excess of incandescent lamp service life. All the sensor components are non critical items, commonly found at electronic supply houses throughout the country. The contact sensing system has proven to be a valuable tool to indicate tool and work contact to machinists, and should prove a valuable and useful tool to many other industries requiring a similar device.

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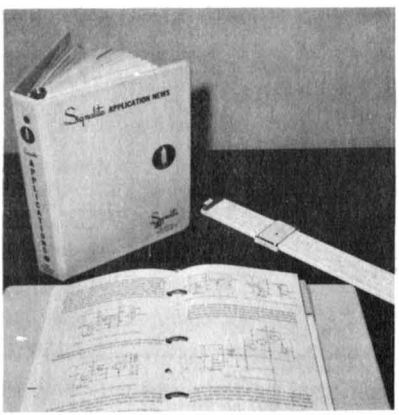

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It is Signalite's policy to publish letters based on their intrinsic interest only. We do not necessarily agree with all comments and suggested uses and will upon occasion wait for your reaction before taking editorial space for ours.

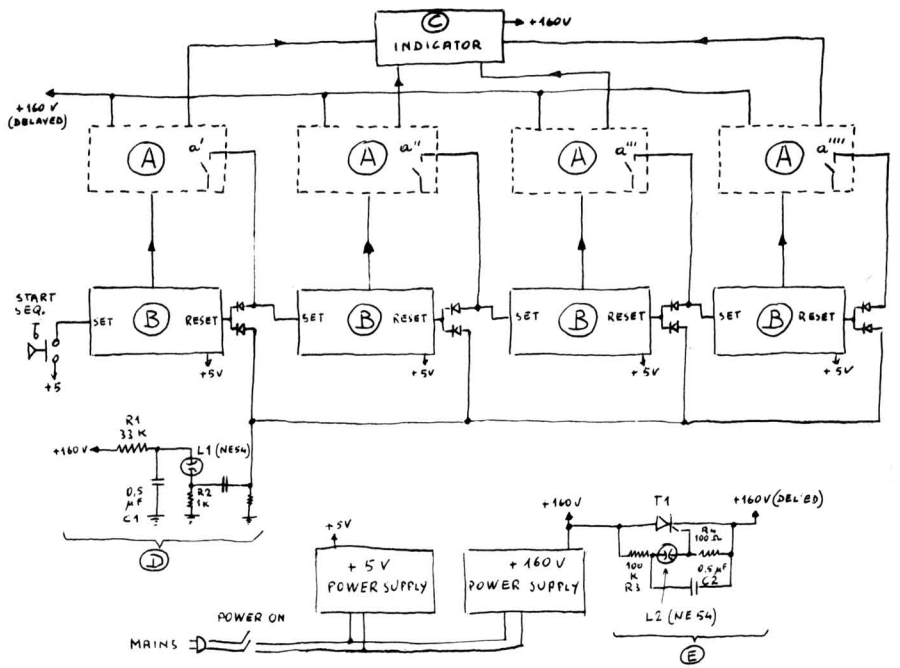
AUTOMATIC ZERO SETTING OF SEQUENCE GENERATOR

Dear Sirs.

In the block diagram of fig. 1, A is an electromechanical process control with 4 steps. each step has to be executed in sequence, and each step must start only when the preceding step is completed. This condition is indicated by the closure of the contacts a' to a''''

B is the sequence generator composed of 4 bistable circuits. The sequence starts by depressing momentarily switch b. C is a neon digital indicator tube, displaying the number of the process step going on

Switching on the power, one must be sure that all the bistable circuits are in the same zero state, corresponding to a stand-by condition. This is automatically done by the circuit D: when the power is switched on, B and C are immediately under tension. Capacitor C1



starts to charge toward 160 volts through R1 When the breakdown voltage of L1 (NE54) is reached, L1 fires and produces a positive pulse across R2 which sets to zero all the 4 bistable circuits. R1 and R2 are chosen to allow L1 staying on, once it has fired, acting also as POWER ON indicator lamp.

Shortly after the zero setting of all B, power is applied also to A, thanks to a similar delay circuit E comprising neon lamp L2 (NE54), resistors R3 and R4, capacitor C2 and thyristor T1 as switch.

Therefore, a few tens of milliseconds after the power is switched on, with no other operations required, the system is in the STAND-BY condition, ready to start the control sequence by depressing b.

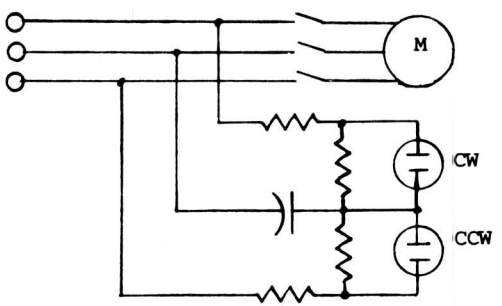
The neon glow lamp and R-C network as a delay circuit is simpler and more economical than thermal relays or other electronic delay circuits.

Gustavo O. Kuhn
Geneva, Switzerland

PHASE SEQUENCE INDICATING CIRCUIT

Gentlemen

In response to your call for neon lamp applications, I submit the following Phase Sequence indicating circuit.



This simple circuit is connected to the line side of the switch on each induction motor in our Energy Conversion Lab. The students will know the direction of rotation of the motor prior to actually starting it, and can make any changes desired.

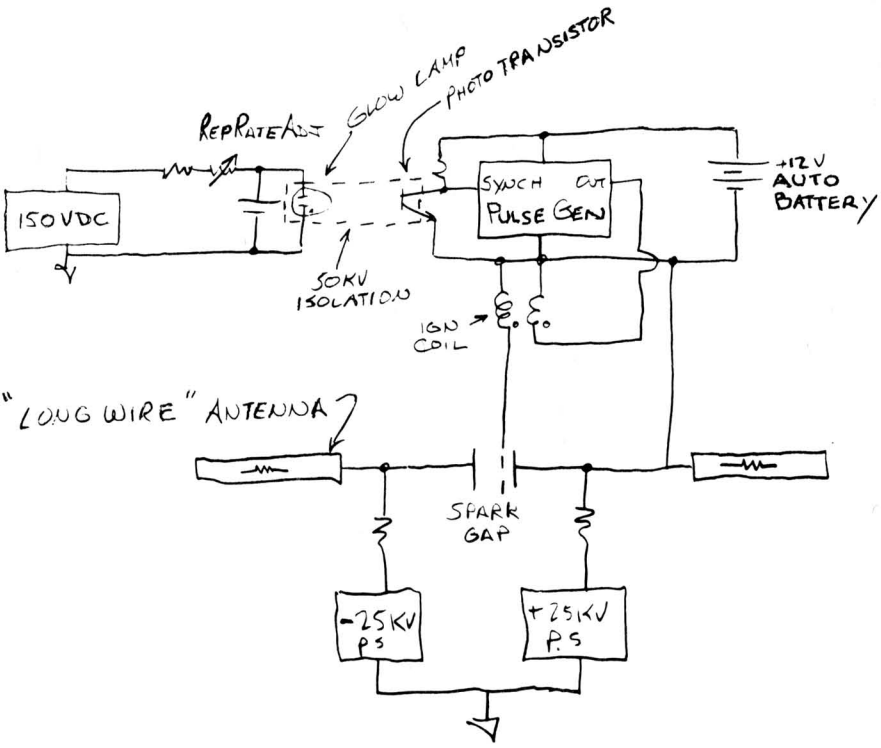
Capacitor: 01 uF, 600V
Resistors. 200K Ω , ½W

Maurice A. Simmons, Asst. Professor
LeTourneau College

TRIGGER FOR "LONGWIRE" ANTENNA

Gentlemen:

Here is an application of your neon glow lamps we considered in a design of a trigger system for a "longwire" antenna. Please note use of spark gap.

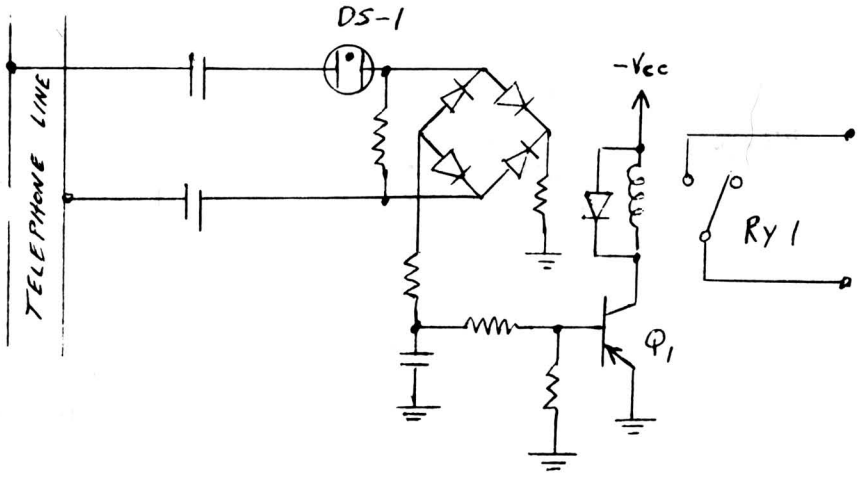


Richard T Wheeler, Mgr —New Products
Procedyne Corporation

ARE YOU THERE?

Gentlemen:

The circuit below was designed as a ring detector on a telephone line. When high voltage ringing current is applied to the telephone line, the neon lamp (DS-1) fires and provides base drive for transistor Q1 As Q1 saturates, the relay Ry1 is actuated giving a contact closure during the ringing cycle.



If the neon lamp is panel mounted, it serves the dual function of providing visual indication as well as acting as a high voltage detector

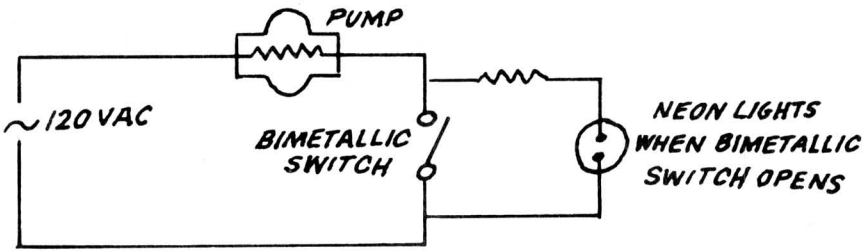
Robert M. Brown, P.E.
Woodbridge, Va.

TELL US IF THE PUMP IS WORKING

Dear Sirs

We have several diffusion pumps, with bimetallic temperature switches which open when the cooling water stops flowing. Because of water pressure fluctuations, the switches often open, and because the pumps are silent, we had no indication of this.

So:



—and now we see immediately why the pump is not working.

L. X. Finegold
University of Colorado

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

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

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