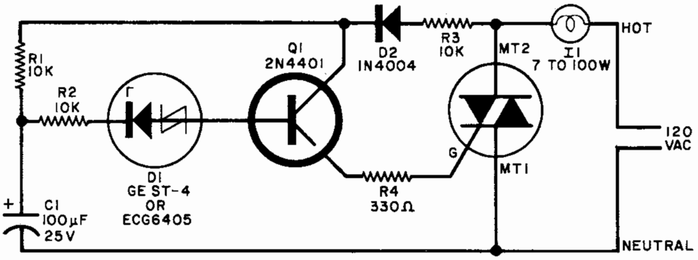
Simple Flasher

Shown here is a simple flasher circuit that can be assembled from standard, readily available parts. With the component values shown, the flash rate is approximately once per second. The incandescent lamp used as a load glows at half brightness for about one-third of the total flasher period and is off for the remaining two thirds.

Electrolytic capacitor *C1* charges up during the positive half-cycle of the ac waveform through *R1*, *R3* and *D2*. When the voltage across the capacitor reaches the breakover voltage of silicon asymmetrical switch *D1* (either 9 or 18 volts), the capacitor starts to discharge through *R2*, *D1*, *Q1*, *R4* and *Q2*. Emitter follower *Q1* is driven by the discharge current from *C1* and in turn provides gate drive for triac Q2. Thus, *Q2* conducts and *I1* glows only while *C1* is discharging. The lamp goes dark when *C1* is depleted of charge and remains dark until the ac power waveform goes positive again and charges the capacitor sufficiently.

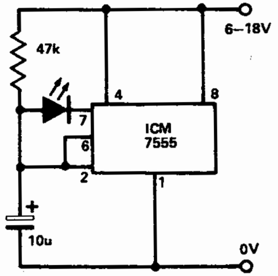
Transistor *Q1*, nominally a type 2N4401, can be any medium-current, high-beta npn silicon device with a V_{CEO} rating of 40 volts or more. A triac used for *Q2* should be rated to handle 10 amperes, to withstand 400 volts rms and should be triggered into conduction by a gate current of no more than 5 mA. In many applications, the triac will not have to be heat sinked. The flash rate can be varied by changing the capacitance of *C1*. Using more capacitance results in a slower flash rate, and less capacitance in a faster flash rate.—*Bertram A. Thiel, Frostburg, MD*

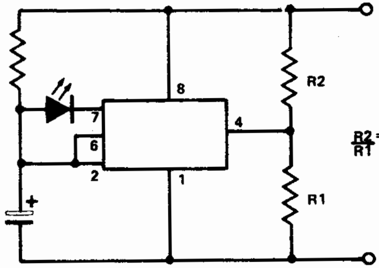


Micropower LED Flasher
D. Stewart

The circuit will brightly flash an LED, yet has a supply current of only 150 uA. In a normal 555 astable, the timing capacitor is discharged straight to ground. Here, the charge is made use of by discharging it throught the LED. A suggested use is for an on-off indicator in a battery-powered circuit.

With slight modification the circuit can be used as a good battery indicator. A potential divider is connected to pin 4 (reset) from the supply rail of the circuit whose battery is being monitored, so that when the supply drops below a predetermined voltage, then the voltage on pin 4 drops below 0V7. Thus the LED will only flash if the supply is higher than the predetermined voltage. Keep the value of the resistors high to reduce current consumption (eg 1M0 for R1).





$$\frac{R2}{R1} = \frac{5}{3} . V_{min} - 1$$

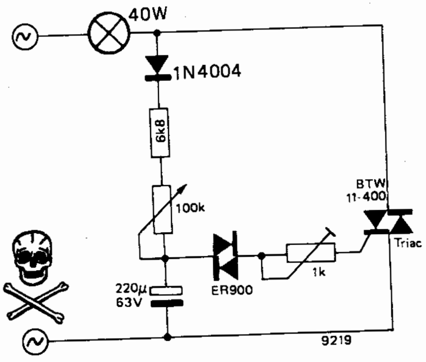
6

This circuit makes a standard incandescent lamp flash at a frequency that can be set between 2 and about 10 Hz. The mains voltage is rectified by a 1N4004 diode followed by an adjustable RC network. As soon as the electrolytic capacitor is charged up to the breakdown voltage of the ER 900 diac, it will discharge through the diac, which fires the triac and flashes the lamp.

After a certain period, set by the 100 k control, the capacitor will be re-charged to bring about a further flash.

The 1 k control sets the triac firing current.

(Transitron)



triac flasher

50 Wink and Blink

UPDATED

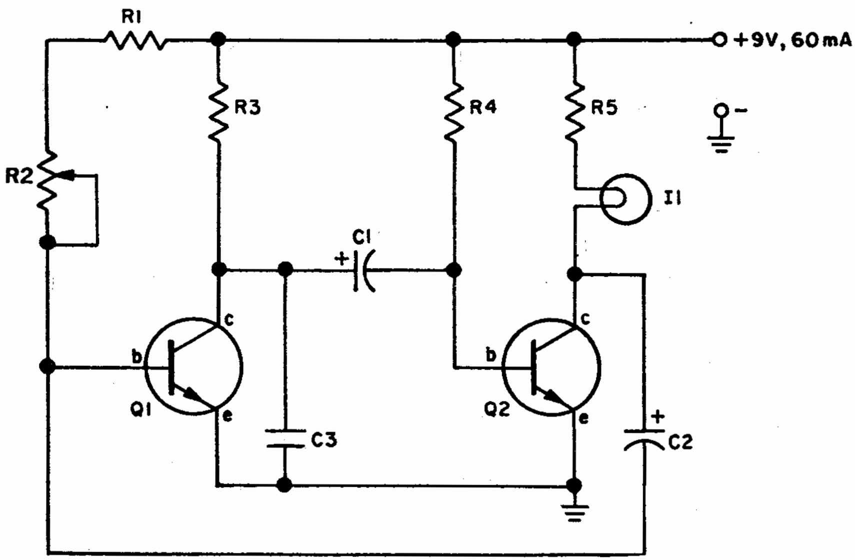
If a light blinks and winks someone will stop and look—and that's the purpose behind this attention-grabber.

When power is first applied, current flows through Q2 and lamp L1 lights. Then, feedback through capacitor C2 causes Q1 to conduct. As C1 discharges through Q2's base, Q2 is turned off, thereby extinguishing the lamp. When C1's voltage equalizes, Q2 turns on again and the cycle is repeated . . . flip-flop, flip-flop. Potentiometer R2 determines the flip-flop rate, hence, the blink rate.

"Junk box" pnp transistors (instead of npn types) can be substituted if polarity is reversed at the battery, C1 and C2.

PARTS LIST FOR WINK AND BLINK

C1—10-uF, 15-VDC electrolytic capacitor
C2—30-uF, 15-VDC electrolytic capacitor
C3—0.2-uF, 25-VDC capacitor
I1—No. 49 panel lamp
Q1, Q2—npn transistor—HEP-723
R1—4700-ohm, ½-watt resistor
R2—1-megohm potentiometer
R3, R4—10,000-ohm, ½-watt resistor
R5—120-ohm, ½-watt resistor



79 Tenna-Blitz Light

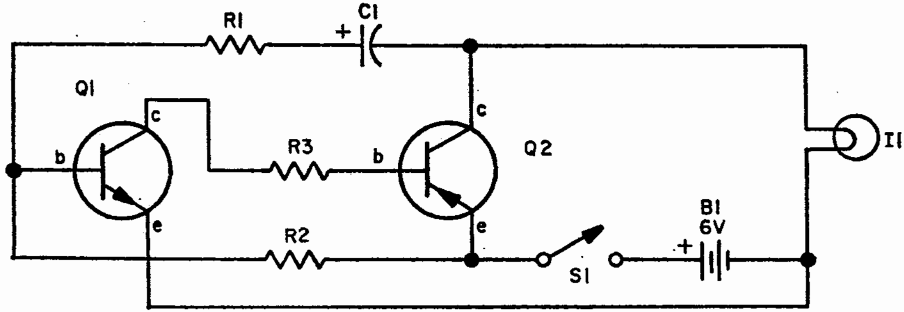
UPDATED

The ballgame is over and your car is buried in the parking lot along with two thousand other cars of the same color. Only yours isn't lost. Sticking above acres of metal is a little lamp going *blink-blink-blink.*

Mount the No. 49 lamp at the top of the antenna and run two wires down to the control unit inside the car. When switch S1 is turned *on* the multivibrator makes the lamp blink away. Changing the capacitor's value will vary the blink rate.

PARTS LIST FOR TENNA-BLITZ LIGHT

B1—6-V battery
C1—2-uF, 10-VDC electrolytic capacitor
I1—No. 49 pilot lamp
Q1—npn transistor—HEP-641
Q2—pnp transistor—HEP-739
R1—470-ohm, ½-watt resistor
R2—1-megohm, ½-watt resistor
R3—2700-ohm, ½-watt resistor
S1—Spst switch



PROJECT OF THE MONTH

Ultra-Simple Power Flasher

BY FORREST M. MIMS

Many high-brilliance light-flasher circuits have been published over the years in this and other electronics magazines. Almost every one of these flashers has employed power transistors or SCRs, components which require heat sinking and careful circuit design.

Figure 1 shows an ultra-simple flasher circuit that I recently built around an FRL-4403 flashing LED, with only a few additional components. It will flash at a typical rate of 3 Hz any lamp whose current and voltage requirements fall within the ratings of the relay's contacts. The particular relay specified in Fig. 1 has contacts that can handle up to 1 ampere at 125 volts. The lamp shown is rated at 150 mA at 6.3 volts.

Incidentally, *FRL* stands for *Flashing Red LED*. The FRL-4403 is a Litronix product (19000 Homestead Road, Vallco Park, Cupertino, CA 95014). This novel LED, which incorporates a flasher integrated circuit, is also available from Radio Shack (stock No. 276-036).

The FRL-4403 LED in the circuit shown in Fig. 1 does *not* produce a visible flash. You can modify the circuit as shown in Fig. 2 if you want the red LED in the FRL-4403 to flash each time the relay coil is energized. Potentiometer *R2* must be adjusted until the relay starts to oscillate. Although the LED will flash, it will not be as bright as if it were powered directly from a 5-volt supply. The circuit shown in Fig. 2 might occasionally cease to oscillate. When this occurs, it is necessary to readjust potentiometer *R2*. For this reason, use the circuit shown in Fig. 1 for such applications as emergency beacons in which high reliability is essential.

Both versions of the circuit might operate erratically or even fail to operate if both the oscillator circuit and the flashing lamp are powered by the same battery. These difficulties are due to the large current demand placed on the battery when the lamp is switched on. In some cases, the circuit will oscillate at much higher than its normal rate.

The oscillator portion of each circuit consumes only 20 to 35 miliamperes. Therefore, it's feasible to power it with a small 6-volt battery if a silicon diode is connected in series with the positive terminal of the battery to drop the voltage to approximately 5 V. A much larger 6-volt lantern battery can be used to power the flashing lamp.

Of course, *both* the oscillator and flashing lamp can be powered from a common supply if it can source a sufficiently large current. You can experiment with different supplies and lamps to determine if you will need more than one supply.

Finally, the circuits presented in Figs. 1 and 2 can both be used to apply power pulses to devices other than lamps. Typical applications include gating power to warning horns, alarm sirens, etc. ◇

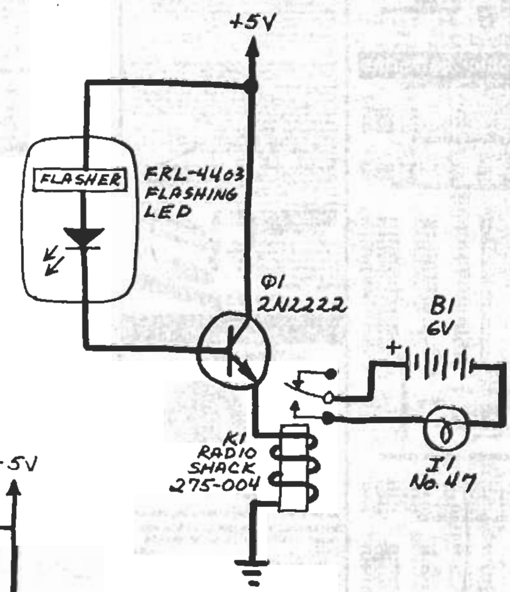


Fig. 1. Ultra-simple high-brightness lamp flasher.

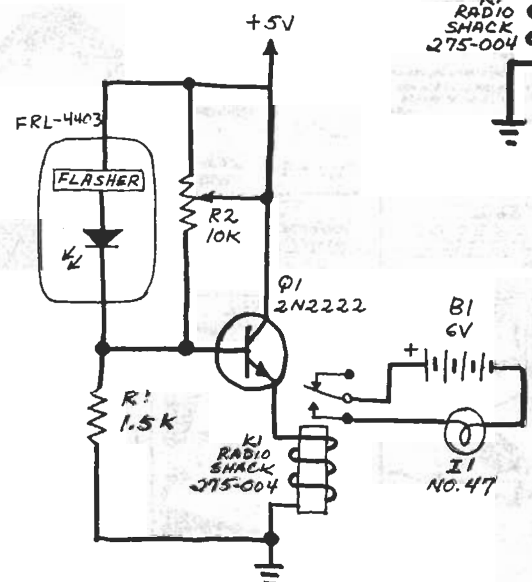


Fig. 2. Relay driver circuit with a flashing LED.

BREAKDOWN BEACON

AN ESSENTIAL DEVICE FOR ANY CAR OWNER............

eti project 239

THE BREAKDOWN BEACON IS A dual purpose device. It can be used atop a disabled motor vehicle as a flashing warning to other traffic — a highly desirable safety device. Alternatively it can be used as a non-flashing trouble light for finding and fixing faults at night. Its three rubber-sucker feet will hold it to the roof of a car, to the underside of a bonnet, or to any other convenient flat surface.

The circuit operates from the vehicle's battery and, as all electrical parts are isolated from the metal case, the same circuit can be used for cars with either negative or positive earth wiring systems. The beacon is fed from a plug pushed into the cigarette lighter socket — however as this plug is polarised, a beacon with a plug for negative earth cannot be used in a car with opposite polarity unless the plug connections are reversed. Alternatively it could be powered from the car battery.

CONSTRUCTION

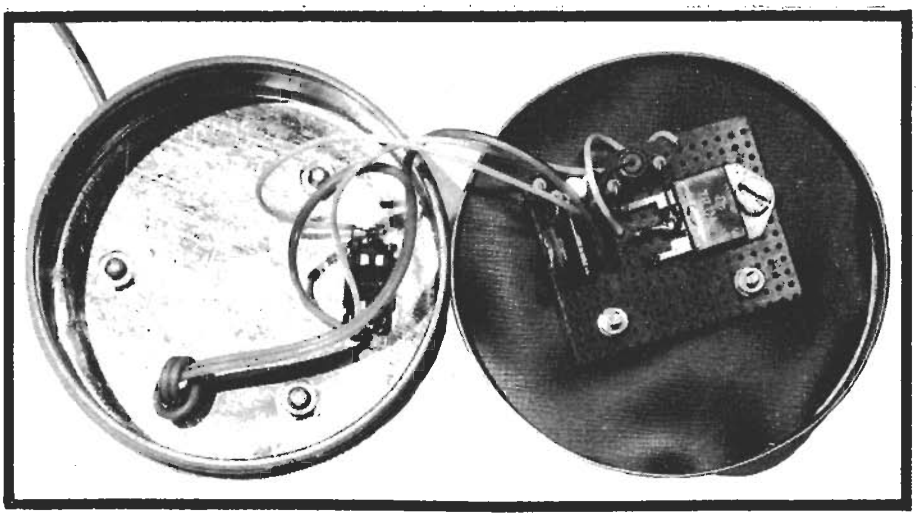
The nicest thing about the construction of this project is that first you have to eat half a pound of jam, in order to get the empty glass jar for the lamp housing. Other, jars about 70mm dia. and 70mm high with a twist off cap would do. You'll need also a round tobacco tin about 75—80mm dia. and 30mm high with a twist off cap. These two parts make up the case.

First solder the lids of the jar and the tin together, concentrically — outside to outside. Then before fitting the batten lamp holder fit the lamp to it and check that it will fit inside the jar when the jar is screwed into its lid. If it will, then mount the lamp holder by three bolts through both lids. Two of these bolts should be longer than the third as they will carry a piece of Veroboard. If the jar is slightly too short to accept the lamp holder and lamp — as was the case in the prototype — then cut a hole for the lamp holder through both lids, and fit the lamp holder so that its flange finishes up inside the tabacco tin. Spacing washers may be added if necessary. Again the lamp holder is secured to the lids with one short and two long bolts.

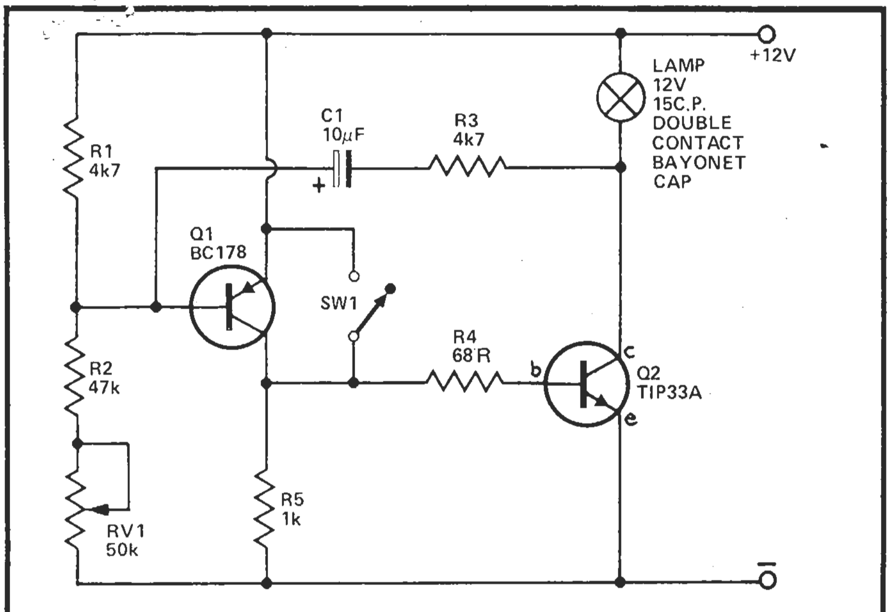
The electronic part of the beacon is constructed on 0.1 inch matrix Veroboard 45mm x 36mm. Only one break needs to be cut in the copper strips — between the two leads of capacitor C. Only the outer legs of RV1, are passed through the Veroboard. The centre leg is connected to either outer leg above the board and the excess cut off. Note that all resistors except R5 are vertically mounted. The upper end of R4 is soldered straight on to the base terminal of Q2, and the upper end of R3 is soldered straight on to the collector. A wire is also run from the collector terminal of Q2 through the board to the strip below it. Another wire is run from the emitter terminal of Q2 to the negative rail which is the copper strip just below.

The Veroboard is mounted into the case below the lamp holder, using two of the lamp holder mounting bolts.

The switch SW1 is mounted on the bottom of the tobacco tin where it is out of the weather. The switch must be positioned such that it does not clash with the components on the Veroboard when the tobacco tin is screwed



Inside view of the completed unit. Note the plastic disc used to replace the normal airtight seal of the jar.



Circuit diagram of the Breakdown Beacon.

PARTS LIST – ETI 239

R1	Resistor	4k7	¼ watt
R2	"	47k	"
R3	"	4k7	"
R4	"	68R	"
R5	"	1k	"
RV1	Preset pot	50k	
C	Electrolytic capacitor 10 μF at least 15 volts		
Q1	Transistor PNP BC 178 or similar		
Q2	Transistor NPN TI P33A or similar		
SW1	small on/off slider switch, single pole		

Lamp 12 volt automotive lamp 15 candlepower double contact cap.
Lampholder – to suit lamp, batten mounting, double contact bayonet catch type. (This is an electricians line not an automotive line. They are used for pilot lamps).
Tobacco tin, jam jar, or similar. Nuts and bolts, hook up wire.
Lead to battery – 7 m speaker extension lead.
Cigarette-lighter plug.

HOW IT WORKS

The circuit is an oscillator of a not very common type. It is *not* a multivibrator as both transistors conduct at the same time rather than alternately as in a multivibrator. Most 'explanations' of this type of circuit state that the circuit oscillates by a regenerative action from Q2 to Q1. This doesn't really explain how it works, so perhaps the following is a little clearer.

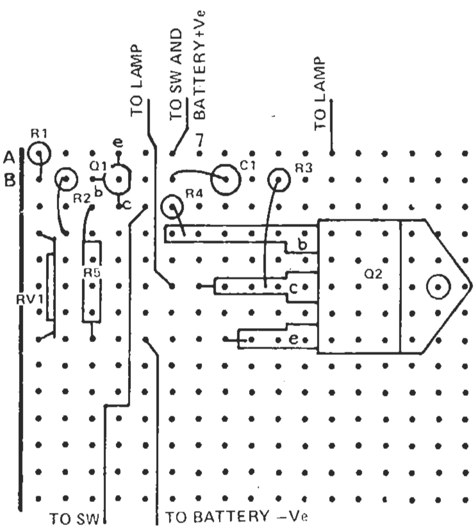
The setting of the pot RV1 is such that when power is first applied Q1 is turned on slightly. By varying RV1 the circuit can be made to 'lock' with the lamp on or off. In between these extremes the circuit oscillates. The setting of RV1 is not critical.

As said above, when power is applied Q1 turns on slightly. Current through Q1 feeds into the base of Q2 and turns it on. Capacitor C charges through R1, R3 and Q2. This increases the current through R1 and so lowers the voltage at the base of Q1 thus turning it on harder – hard enough to turn Q2 full on and light the lamp.

As C charges, the voltage at the base of Q1 rises and so tends to turn Q1 off, thus reducing the base current in Q2 and hence the current through the lamp. This increases the voltage across Q2 quite rapidly. As the voltage across the capacitor cannot be changed rapidly, the increase of voltage across Q2, i.e. the voltage change at the collector of Q2, is transferred through the capacitor to the base of Q1 – so turning it off. This turns Q2 hard off. The voltage at the collector of Q2 then rises rapidly to 12 volts, so the voltage at the base of Q1 is forced up through capacitor C, turning Q1 hard off.

Capacitor C then discharges round R1, the lamp, and R3 until, when fully discharged, Q1 turns on slightly and the cycle is repeated.

The switch SW1 (connected across Q1) is used to disable Q1 and so give a steady light when SW1 is closed.



Veroboard layout for the beacon circuit. The copper strips run from left to right across the board. Only one break is required, and this is at B7

together.

The long twin-lead to the battery is run through the bottom of the tin (to prevent moisture entering) and connected to a cigarette-lighter plug taking care to wire with a polarity to suit the car system (positive or negative earth). Speaker extension lead is good for this purpose as it has polarity marking.

It is likely tha the operation of soldering the two lids together will have destroyed the air-tight seals in the jar and tin; they should be replaced with a disc in the tin and a ring in the jar cut from fairly heavy plastic sheeting.

TESTING

Before connecting up make sure that switch SW1 is open – otherwise the unit will not flash.

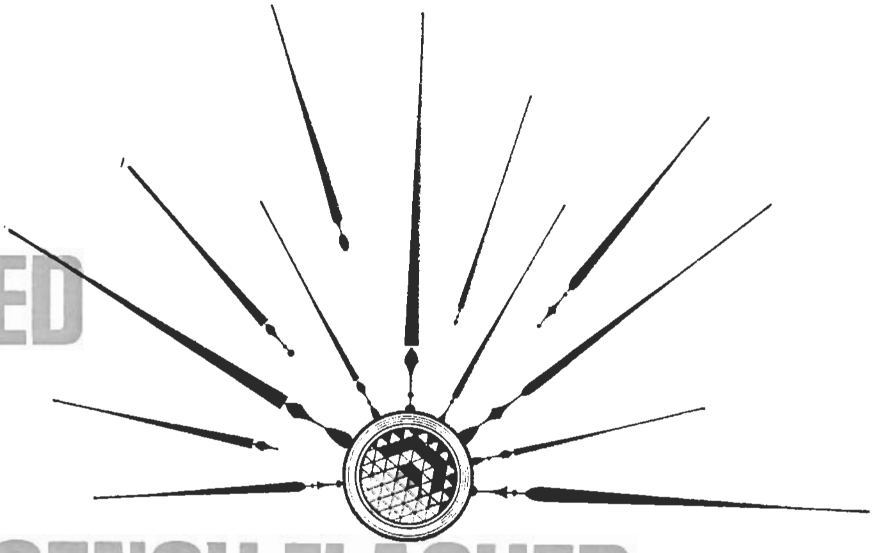
Connect the unit to the battery by inserting the plug into the cigarette lighter socket. It may now be found that RV1 needs some adjustment to make the circuit operate correctly, so don't be disappointed if the lamp does not light at first or alternatively, stays on all the time. The flashing rate may be altered by changing either C or R3 if thought necessary. About 70 to 100 flashes per minute is right.

The value of R4 shown in the circuit was selected to suit the transistor Q2 used in our prototype. If the lamp lights at less than full brilliance then R4 may be reduced until Q2 saturates and the lamp is turned on fully.

USE

The illustration shows the prototype with a clear glass 'lens'. This is ideal when the beacon is used as a trouble light – turned permanently on. However, if it is thought desirable to have a amber or red colour when the beacon is flashing, then it is a simple matter to make a sleeve of suitable coloured material to be dropped inside the jar. ●

BY RONALD L. IVES



RUGGED AUTO EMERGENCY FLASHER

NEITHER RAIN, NOR DUST, NOR BUMPS WILL STAY ITS ACTION

ALTERNATELY flashing blue lights used on emergency vehicles (and increasingly on campers, trailers, etc.) are either mechanically or electronically driven and they operate fine as long as the going is smooth and they are not subjected to extremes of temperature and humidity. But the vehicles that use such lights are just those that are required to travel occasionally where adverse environmental conditions are encountered.

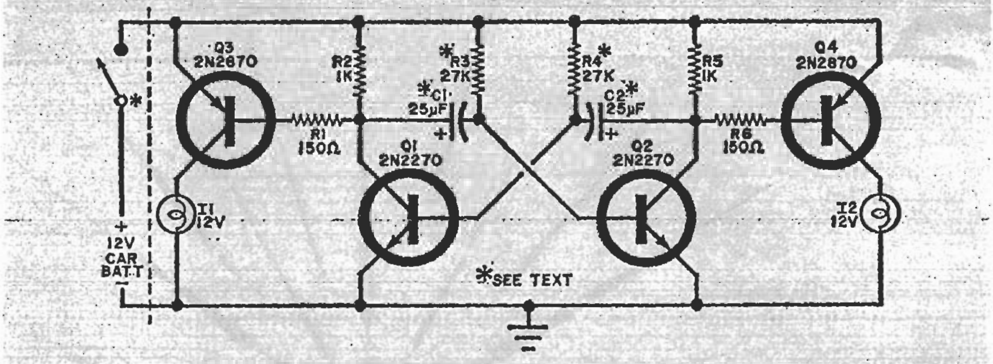
Little can be done to improve the reliability of mechanical flashers due to their sensitivity to vibration but electronic units can be made to be quite dependable. This is achieved through good circuit design, careful selection of components, and rigorous assembly techniques.

The improved electronic flasher whose circuit is shown overleaf was designed to eliminate thermal problems—primarily by separating the timing function (*Q1* and *Q2* multivibrator circuit) from the lamp switching function (*Q3* and *Q4*).

Silicon transistors are used for *Q1* and *Q2* in the symmetrical multivibrator circuit. Transistors *Q3* and *Q4*, the lamp drivers, are germanium power types, biased well into cut-off to prevent continuous conduction at high temperatures. Further protection against thermal damage is obtained by mounting *Q3* and *Q4* on the project case and using small slip-on heat radiators on *Q1* and *Q2*.

No "revolutionary new" design principles are employed in the improved flasher. Simple reliability and ruggedness under difficult conditions were the only really important requirements looked for in the design stages. Fortunately, it was found that the simple no-nonsense multivibrator/power switching system more than adequately filled the bill if certain common-sense assembly techniques were applied.

When selecting components for the improved auto flasher, get the best. For example, use only metal-cased transistors for *Q1*-*Q4*. Substituting plastic-encapsulated "equivalent" transistors will likely cause erratic operation under changing humidity environments. Also, use silicone paste when mounting *Q3* and *Q4* to the project case and when slipping onto *Q1* and *Q2* Thermalloy No. 233OC-5 heat radiators.



Transistors Q1 and Q2 in multivibrator circuit are silicon types, while Q3 and Q4 lamp drivers are germanium power types. The flash rate of the system is determined by the RC time constants of the R3/C1 and R4/C2 combinations.

PARTS LIST

C1,C2—25-μF, 25-volt electrolytic capacitor (Sprague Atom Type TVA 1205—see text)
I1,I2—12-volt lamp (see text)
Q1,Q2—2N2270 silicon transistor
Q3,Q4—2N2870 germanium power transistor
R1,R6—150-ohm, 1-watt resistor
R2,R5—1000-ohm, 2-watt resistor
R3,R4—27,000-ohm, 1-watt resistor (see text)
Misc.—7" x 5" x 3" aluminum utility box; epoxy-glass circuit board with push-in solder terminals; 4-lug barrier block Cinch-Jones No. 4-142-Y); Teflon tubing; heat radiators for Q1 and Q2 (Thermalloy No. 2230C-5); mica insulators for Q3 and Q4; machine hardware with stainless steel lockwashers; flat black paint; potting compound (optional—see text); hookup wire; spacers; brass strip; solder; etc.

The flash rate of the system is determined by the time constant of the *C1*/*R3* and *C2*/*R4* combinations. The flash rate is determined by the formula: $F = 1/(1.4RC)$, where R is *R3* or *R4* and C is *C1* or *C2*; R is in megohms, C is in microfarads, and F is in hertz. For the values given, the flash rate will be about once every second. Slower and faster flash rates can be obtained by increasing or decreasing the values of *R3* and *R4*, or by decreasing or increasing the values of *C1* and *C2*. The flash rate, however, should not exceed five times/second. Remember, if you change either R or C in one side of the circuit, the same change must also be made in the other side to obtain symmetry.

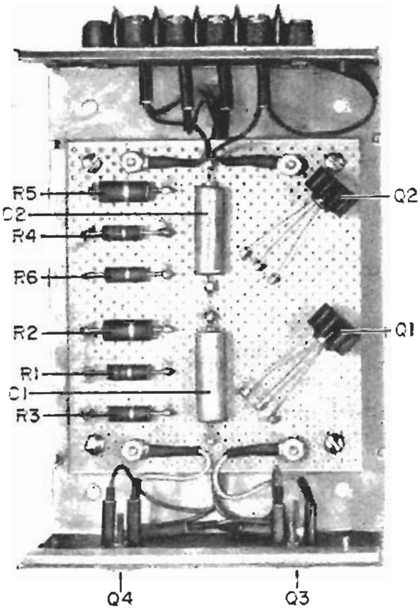
The capacitors used in the prototype for *C1* and *C2* are Sprague Atom Type TVA 1205. These capacitors demonstrate somewhat more resistance to temperature extremes than the manufacturer guarantees. Their effective temperature range is from about −50° F to about 200° F. Low temperatures do not harm the capacitors; when the capacitors warm up again, they operate within specifications. However, temperatures exceeding 200° F will usually cause these capacitors to exhibit permanent high leakage, requiring their immediate replacement.

Another item you should take care in selecting is the circuit board. Phenolic boards just do not stand up to vibration stresses and environmental conditions as well as do epoxy-glass boards. The epoxy-glass board you select should be of the heavy-duty variety with solder connectors to match.

Now, you can begin assembling the flasher system. Use an aluminum case to house the components after painting all outer surfaces of the case a flat black to improve heat radiation. Mount *Q3* and *Q4* to one wall of the case with mica insulators and appropriate hardware. The best lockwashers to use here and wherever mounting is to take place are stainless steel. They bite better, assuring a more vibration-resistant anchor.

On the opposite end of the case, mount the barrier block. Make the clearance holes for the solder terminals to the barrier block a bit oversize to permit plastic sleeving to be slipped over the lugs after hookup wires are soldered to the lugs.

Referring to diagram above, wire components on the circuit board, making all interconnections with hookup wire from the bottom side of the board. To insure good vibration resistance, pinch shut the push-in terminals after the component leads are inserted and



Use perforated G-10 epoxy-glass board and heavy-duty push-in connectors to assure rugged assembly. Heat radiators on Q1 and Q2 bolt down to board.

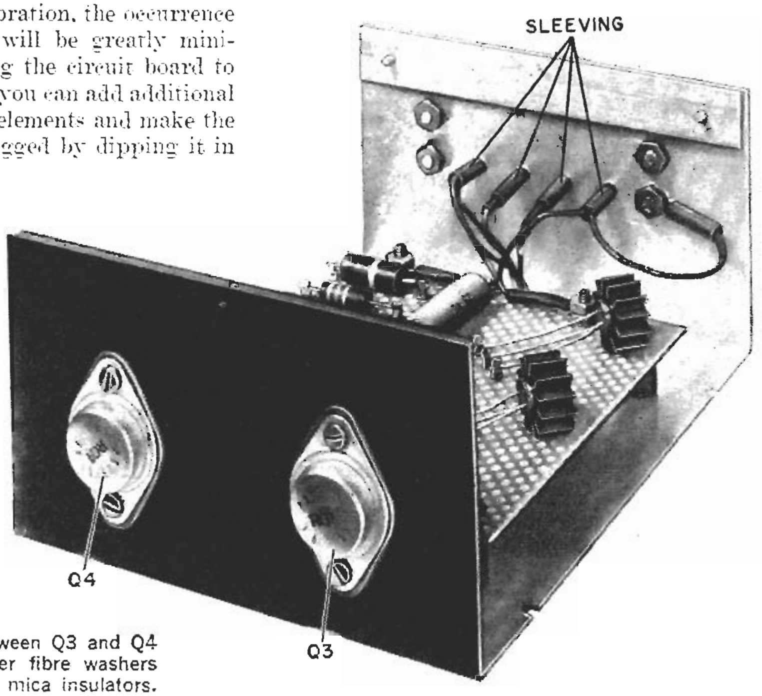
before soldering. Likewise, firmly wrap around the terminals all wire leads on the underside of the board before soldering. With these steps taken, even if the solder eventually crystallizes under vibration, the occurrence of connection failure will be greatly minimized. Before mounting the circuit board to the floor of the chassis, you can add additional protection against the elements and make the assembly even more rugged by dipping it in or coating it with a semi-solid plastic or silicone-rubber compound to seal it. However, if you take this step, make certain that the compound used does not require heat curing and is an electrical insulator.

Once the circuit board is mounted in place, connect and solder the wires coming from it to the appropriate points on the terminal block and switching transistors.

The aluminum case is not designed to withstand heavy vibration. To overcome this deficiency, it is a good idea to back up the upper lip of the chassis channel with strips of hard brass or bronze bar stock that has been drilled and tapped to accept the cover screws. Two lengths of 5/8" × 3/32" stock will do nicely. An alternative approach would be to fasten the case together with pop rivets at 2" intervals and place electrician's *rubber* tape between the metal surfaces to be joined to provide an almost air-, water-, and dust-tight assembly.

The lights to be operated by the improved auto flasher are standard blue truck clearance lights (DoRay No. 1130) designed to use GE No. 67 IJ lamps which draw about 0.6 ampere at 12 volts. If you wish, you can substitute GE No. 1156 lamps which are about three times as bright and draw about 1.7 amperes. Even brighter lamps can be used—

(*Continued on page* 98)



To provide insulation between Q3 and Q4 and chassis, use shoulder fibre washers or transistor sockets and mica insulators.

BUILD

200-WATT DUAL FLASHER

Off-On-Off Blink Incandescent Bulbs

BY JOHN S. SIMONTON, JR.

THERE ARE few devices which the electronics experimenter can build that have a wider variety of uses than light flashers. Alternately blinking lights attract attention to displays in store windows, guide the seafarer home to a safe harbor, and warn the unwary of all types of obstacles and perils.

Whether your need for a lamp flasher is serious or just for fun, the "SCR Dual Flasher" can handle it easily and economically. Using only a few components, this simple circuit (Fig. 1) will alternately flash two 117-volt light bulbs with ratings up to 200 watts each. The bulbs need not be the same wattage, and their ratings do not noticeably affect the flash rate. The component values shown produce a cycle of about one second on and one second off for each lamp.

Construction. The circuit can be assembled using any conventional wiring techniques, but a circuit board simplifies the job and lends a professional appearance to the finished product. A board can be etched using Fig. 2 as a guide or one can be purchased (see Parts List). Install the individual components as shown in Fig. 3.

The author's prototype was built in a 1⅝" × 4" × 2⅛" plastic enclosure. Metal housings can be used, but every precaution must be taken to prevent any part of the circuit from coming in contact with the metal case. Because 117-volt

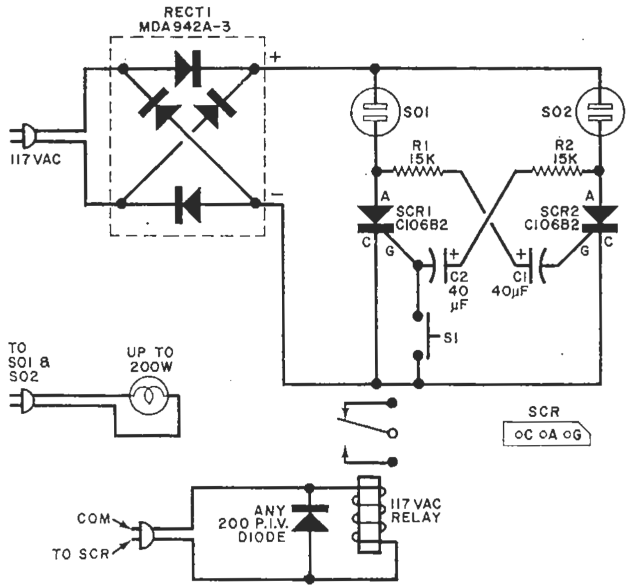


Fig. 1. The circuit is basically a high-power flip-flop using SCR's instead of transistors. Because of the high current capability of the SCR, it will load up to 200 watts.

PARTS LIST

C1, C2—40-μF, 150-volt electrolytic capacitor
R1, R2—15,000-ohm, ½-watt resistor
SCR1, SCR2—Silicon controlled rectifier (General Electric C106B2)
SO1, SO2—117-volt socket
RECT1—Bridge rectifier (Motorola MDA942A, see text)
S1—S.p.s.t. normally open pushbutton switch
Misc.—1⅝" x 4" x 2⅛" plastic case, line cord, 117-V. a.c. relay (optional), 200-PIV diode (optional), pair of 117-V lamps (any wattage up to 200 watts including line cord and plugs), hardware, etc.
Note—An etched and drilled printed circuit board is available from PAIA Electronics, Inc., Box 14359, Oklahoma City, Okla. 73114 for $1.50. A complete kit of parts, including the PC board, is available for $11.95. All orders are postpaid continental USA. Oklahoma residents please add 3% sales tax.

a.c. line power is used in this device, be very careful of component polarities and short circuits, as a wrong connection can easily destroy components or vaporize the conducting path on the circuit board.

The author used a Motorola MDA-942A-3 bridge rectifier assembly because it is compact and the price compares favorably with the cost of individual components. However, if you have a supply of four rectifier diodes with an inverse voltage rating of 200 volts or better and an average current rating of at least 1 A (such as 1N4721), they will work just as well.

Operation. All you have to do to operate the Flasher is to plug a pair of incandescent lamps (up to 200 watts) into *SO1* and *SO2*. If alternate bulb blinking does not occur immediately, momentarily depress *S1* to start the operation.

To create an eye-catching effect, use two lamps of different wattage (150 and 25, for example) and put them in the same frosted-glass enclosure. When the

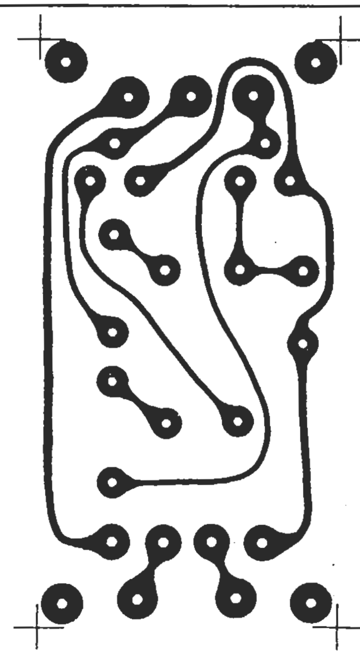


Fig. 2. You can make an actual-size PC foil pattern by following this layout.

HOW IT WORKS

The circuit of Fig. 1 is an astable multivibrator using SCR's as the active elements. Plug incandescent lamps into *SO1* and *SO2*. Their wattages need not be equal. To visualize the operation of the unit, assume that *SCR1* is conducting and *SCR2* is not conducting (*SO1* powered and *SO2* unpowered). The voltage drop across *SCR2* causes a current flow through *C2*, *R2*, and the gate-cathode junction of *SCR1*. As long as this current is above the value required to hold *SCR1* in its conducting state, lamp *SO1* remains powered; but, as *C2* charges, the current decreases until it is below the minimum needed for triggering. At this point, *SCR1* turns off, removing the power to *SO1*, and the voltage drop across *SCR1* jumps to line potential. This causes a current to flow through *C1*, *R1*, and the gate-cathode junction of *SCR2*. This current turns on *SCR2*. The operation is now the mirror image of the sequence when *SCR1* was on, *C1* charges, and *SCR2* turns off placing the circuit back at the starting point. As each SCR is triggered, it places the positive end of the capacitor which was being charged at ground potential. Because of the stored charge, the gate of the non-conducting SCR is held at a more negative voltage than its cathode, assuring that it will remain off.

If the unit has been off several hours, both lights may go on when it is first plugged in. This is caused by the initial surge of current through *C1* and *C2*, turning on both SCR's simultaneously, and will only happen if both capacitors are completely discharged. Depending on more or less random conditions, this may or may not be a stable state and the lamps may both remain on. Pushbutton *S1* provides a means of initiating oscillation if this situation arises. Closng *S1* shorts the gate of *SCR1* to ground and causes it to stop conducting. The resulting voltage drop across *SCR1* causes *C1* to begin charging and starts the flashing sequence. Since it takes several hours for the capacitors to discharge completely, power failures of up to an hour or more will not prevent the unit from flashing when power is restored.

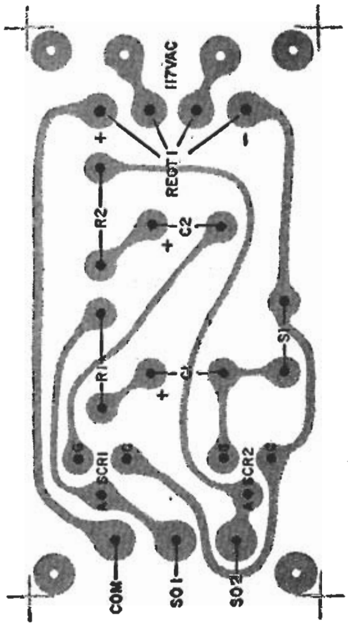
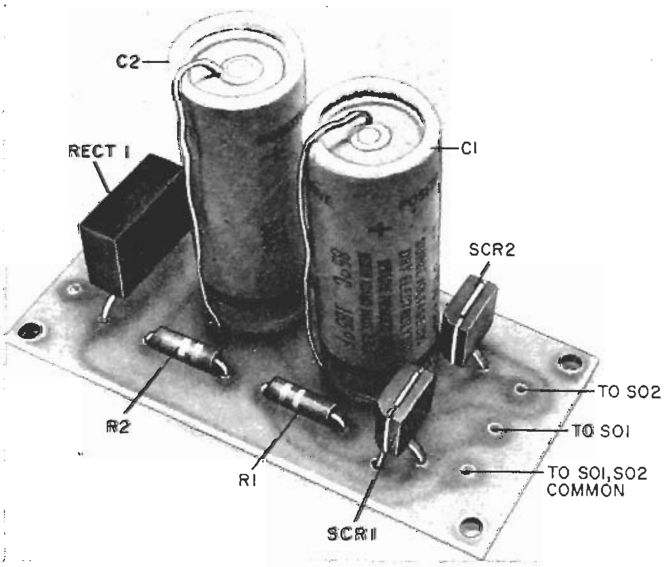


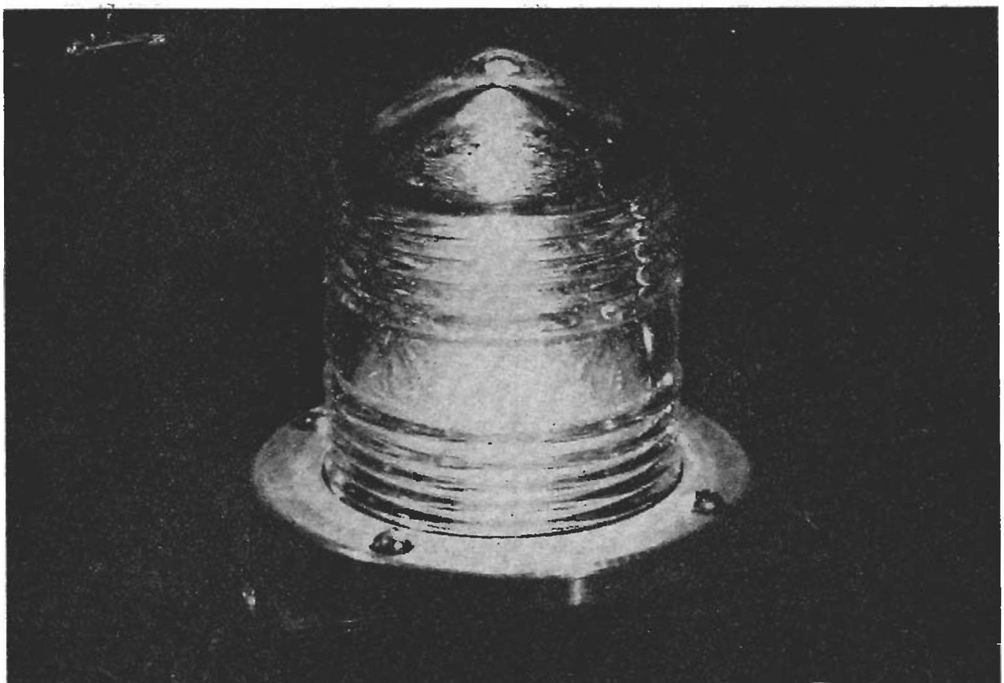
Fig. 3. When installing the components, make sure all polarities are observed.

flasher is operating, you will get the distinct impression of a rotating beacon as a bright flash is followed by a dim flash.

If one or two 117-volt a.c. power relays are substituted for the lamps, external devices can be operated alternately. To prevent damage to the relay coils, don't forget to include the diode as shown in Fig. 1. -30-



Physical arrangement of a finished PC board. Note that both capacitors are vertical to the board while other components are conventionally installed. Two connections to S1 are hidden behind the capacitors. When installing, remember that the circuit is "hot" to ground and you can get shocked if not careful.



SUPER FLASH

WORLD'S BRIGHTEST INCANDESCENT LAMP FLASHER

BY THOMAS COUCH

FLASHING LIGHT systems are one of the most popular types of projects found in electronics experimenters' publications. But wait a minute! No matter how many flashers you may have seen or built, you are in for a surprise when you build the "Super Flash". It uses only a 117-volt, 6-watt lamp, but the amount of light emitted is practically blinding! In fact, an ordinary D26 Christmas-tree lamp was found to deliver slightly more than 500 foot candles in one flash. Because of this extreme brightness, it is recommended that the Super Flash *not* be used indoors where a person might stare at it at close range.

Although this new approach to flashers was designed for use with a disabled vehicle on a dark roadway, it can also be used as a boat light, a pier or dock indicator, or a sure-to-be-seen obstruction light.

Construction. The circuit for the Super Flash is shown in Fig. 1. The prototype was built in a 5″ × 4″ × 3″ metal enclosure, though any type of construction can be used. If you use the metal enclosure, drill a hole in one end large enough to accommodate the two-pin bayonet socket. If you are going to use the Fresnel lens, also drill the four holes required to mount the lens retainer ring.

The two power transistors are mounted in sockets, each socket supported by a pair of insulated standoffs. The two sockets and the transformer are mounted on one long wall as shown in the photograph. Arrange the sockets so that the terminals are facing you and are accessible.

The dual potentiometers, along with a two-lug terminal strip (non-grounded) are mounted on the other half of the chassis. Arrange these parts so that,

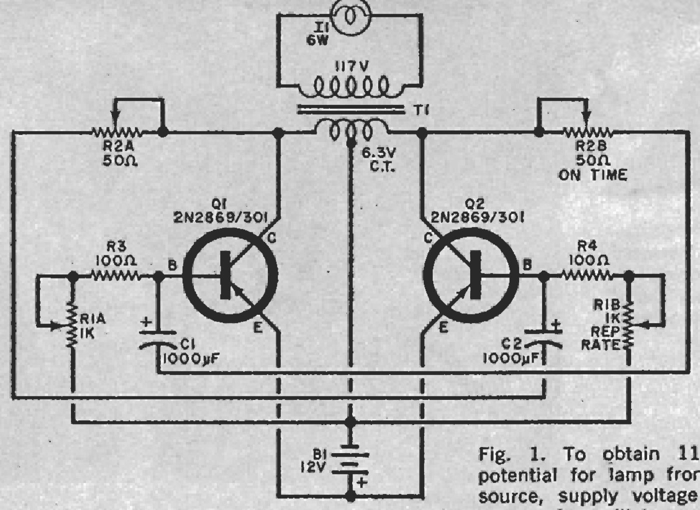
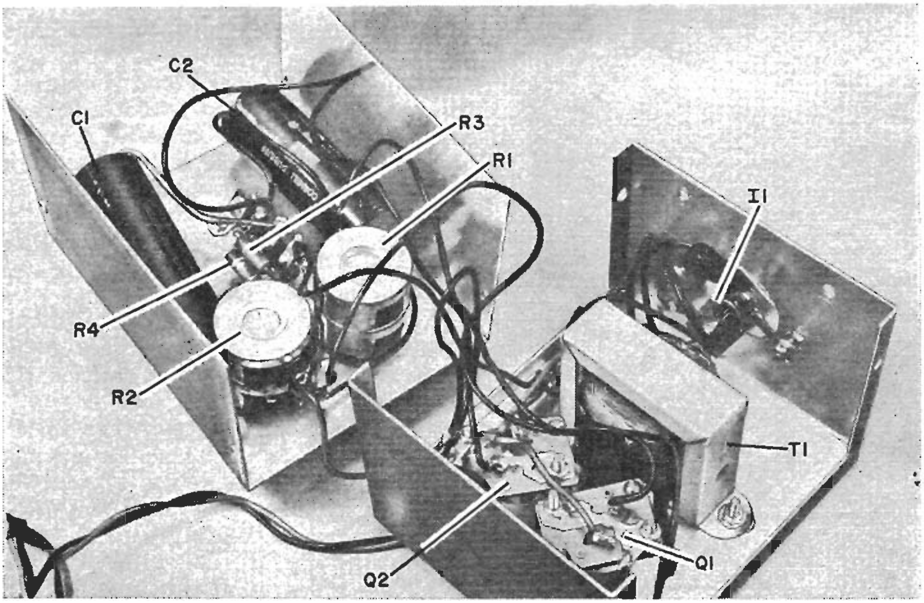


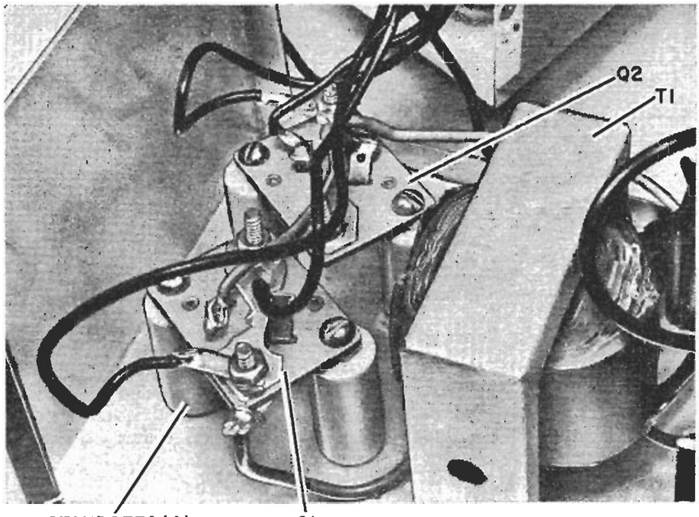
Fig. 1. To obtain 117-volt driving potential for lamp from 12-volt d.c. source, supply voltage is converted to a.c. via oscillator and stepped up.

PARTS LIST

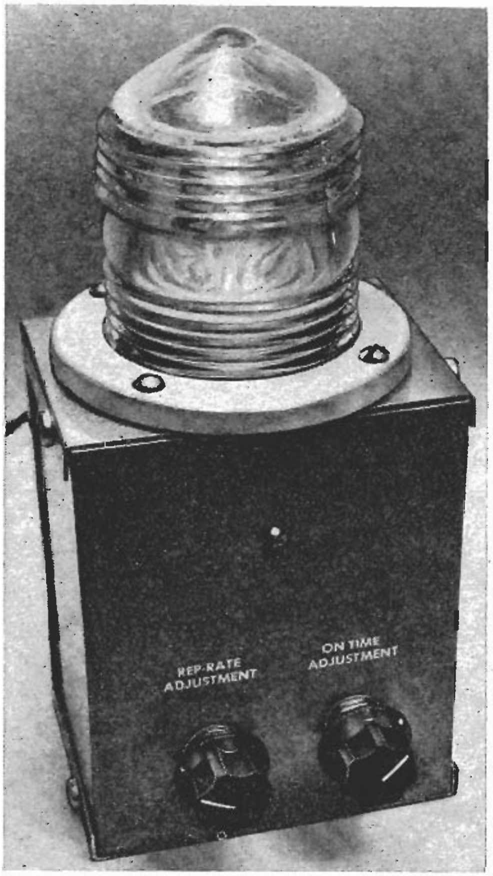
C1,C2—1000-μF, 50-volt electrolytic capacitor
I1—117-volt, 6-watt incandescent lamp, Chicago Miniature 6S6, or similar
Q1,Q2—2N2869/301 power transistor
R1—1000-ohm, linear-taper, dual potentiometer
R2—50-ohm, linear-taper, dual potentiometer
R3,R4—100-ohm, 1-watt resistor
T1—Filament transformer, 117-volt primary, 6.3-volt, 6-amp CT secondary (Chicago Stancor P-3064 or similar)
Misc.—5" x 4" x 3" metal enclosure, 2-pin bayonet socket, power transistor socket (2), insulated standoff with mounting hardware (4), terminal strip, length of twin-conductor lead with cigarette-lighter attachment, Fresnel lens (optional).
Note—A clear Fresnel lens, with gasket and retaining ring, is available at #2826 for $5.00 from Gordon S. Anderson, Mfg. Co., Mabbittsville County Rd., RD #1, Millbrook, NY 12545.



Due to simplicity of circuit, point-to-point wiring, using stranded hookup wire, is best for assembling project. Mount controls on front, lamp and lens assembly to top of chassis box.



With aid of standard phenolic sockets and insulated spacers, mount transistors to rear of chassis below transformer T1 as shown.



The Fresnel lens assembly bolts to the top of the chassis box with four sets of #6 machine hardware.

when the two halves of the metal enclosure are fitted together, the potentiometer metal shells do not contact the transistor socket terminals.

Once these parts have been assembled, wire the circuit in accordance with Fig. 1. Note that *T1* is wired "backwards." That is, the center-tapped low-voltage winding is used as the primary, while the 117-volt winding is used as the secondary. To avoid component damage, make sure that no part of the electrical circuit is connected to the metal chassis.

Power for the Super Flash is obtained from an external 12-volt vehicle battery capable of delivering 2 amperes. A length of two-conductor cable is terminated in a conventional cigarette-lighter plug. Be sure that the proper connections are made to the plug. On a negative-ground vehicle system, the center pole of the cigarette lighter is positive.

If you want to test the flasher on your workbench, use a low-impedance 12-volt d.c. power supply capable of delivering 2 amperes.

Insert the 6-watt lamp in the socket and mount the Fresnel lens. Do not use a lamp with a power rating any higher than 6 or 7 watts as the load may keep the circuit from oscillating.

With the lamp installed, connect up the power. Do not stare at the lamp when it is operating as a very bright flash of light

(*Continued on page* 86)

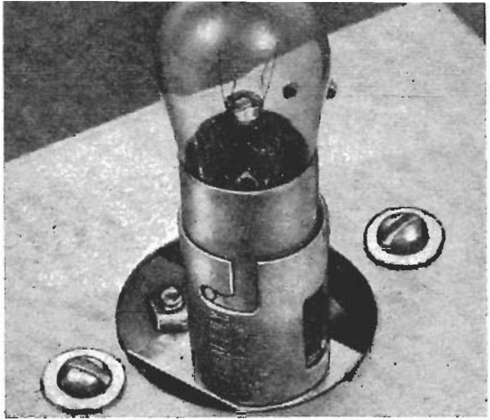
SUPER FLASH

(*Continued from page* 50)

is developed. Since the ability of the human eye to see a signalling device such as this is directly proportional to the amount of time that the lamp remains on, the on time can be set by adjusting dual potentiometer *R2*. Dual potentiometer *R1* is adjusted to determine the flashing rate.

Almost any type of 6- or 7-watt, 117-volt lamp can be used with the Super Flash. However, don't use a Christmas-tree lamp that has its own built-in thermal flasher since it has a mind of its own about when it will go on and off. The best type of lamp (such as a 6S6) to use is that normally used on appliances where quite a bit of mechanical vibration is normally expected.

You may wonder why the lamp doesn't burn out rapidly. At each flash, the lamp is subjected to a considerable overvoltage and would indeed burn out if the duration of the power were for an appreciable length of time. The flashes are so short, however, that the lamp has a chance to cool down between them. The brightness of the flash is due to the fact that a lamp rated at 117 volts delivers an increase in light of approximately 30% for every additional volt above its rating. The current consumption of the Super Flash is low because the circuit draws no current when the lamp is not flashing. –30–



Ferrule of bayonet socket protrudes through a hole in top of box and is fastened with machine screws.

ABOUT YOUR SUBSCRIPTION