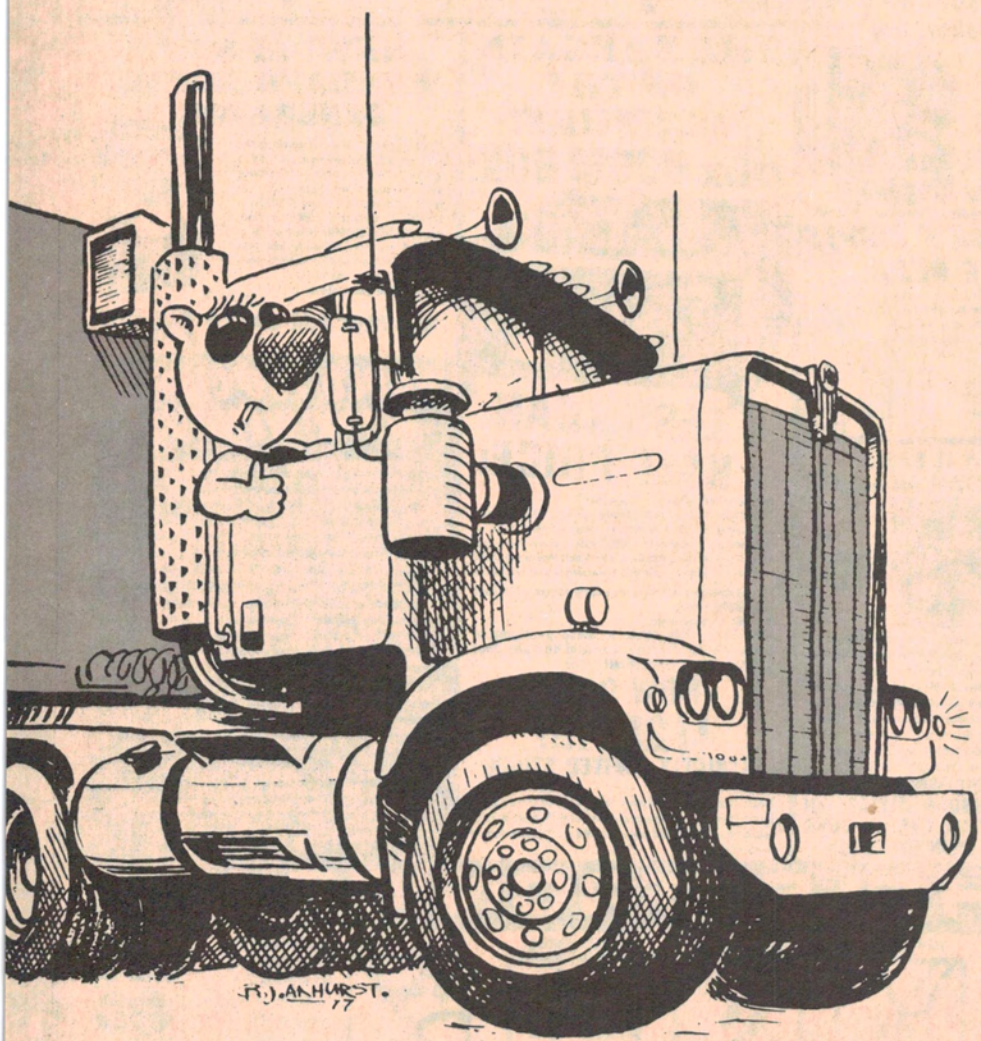
Project 327

Turn and hazard indicator for your vehicle

Staff

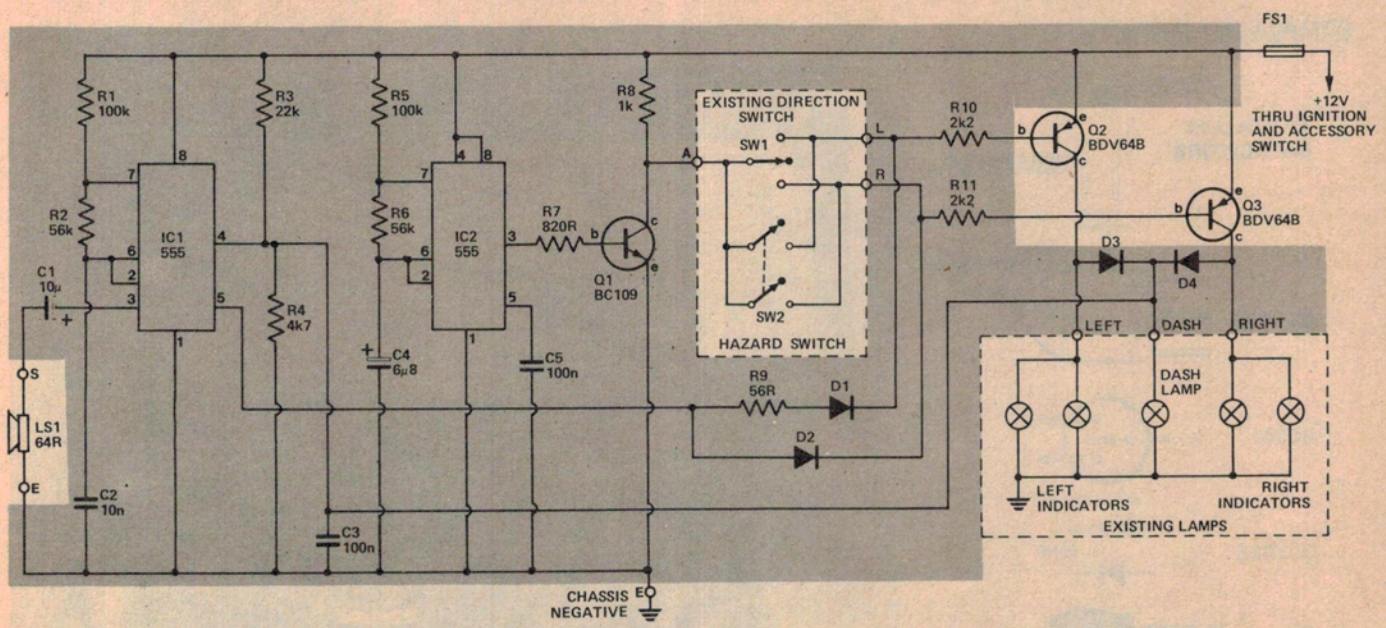
This 'electronic flasher' is a great improvement on the electromechanical flashers fitted as standard equipment on most cars. It features a stable flash rate, high reliability and the ability to drive up to 144 watts worth of indicator lamps!



IF YOUR CAR was made before 1960 it probably doesn't have any kind of indicators, but all cars built after that date are fitted with turn indicators of some sort and post-1970 models have hazard flashers too. However, the conventional bimetallic strip flashers fitted to nearly all cars have a few shortcomings which we have attempted to overcome with our new solid state unit.

The bimetal flashers give only a weak sound indication, which can easily be drowned out by general vehicle noise. They are especially difficult to hear if the ravages of time (or uproarious living, or overindulgence in very loud music etc.) have left you with less than perfect hearing. Another disadvantage of conventional units is that they cannot cope with the extra power drained by the turn/hazard indicators on a trailer or caravan. Also the flash rate of bimetallic units is preset by the manufacturer and cannot be adjusted to compensate for drift caused by battery voltage variations and ageing of the metal strip.

Our solid state flasher connects easily to the car's wiring and is designed to completely replace the existing bimetal unit. It can handle up to 12 amps, which allows it to drive a substantial load (up to 144 W at 12 V). The flash rate will remain substantially the same through-



HOW IT WORKS — ETI 327

The flasher consists of a low frequency oscillator, IC2, producing a pulse at about one Hertz, driving either or both of two Darlington output transistors, Q2 and Q3. These switch the vehicle's battery to the turn indicators and dash light. An audio oscillator, IC1, gives an audio tone through the speaker at a different frequency for *left*, *right* and *hazard*.

The output of IC2 (a 555) gives the flash frequency. The frequency and duty cycle (on to off time) are set by the values of R5 and R6 and can be made variable by substituting trim pots for these two resistors.

The pulses from IC2 are fed to an inverter, Q1, and then to the vehicle's turn and hazard switches. If the vehicle doesn't have a hazard switch, one can be added. Transistors Q2 and Q3 are Darlington output transistors used here for their very high current gain. Darlington transistors have two transistors in the one package in a gain multiplication configuration.

The pulses are fed to either of the Darlington transistors for turn indication, or to both for the hazard indication. The transistors switch the battery to the appropriate indicator lights on the vehicle.

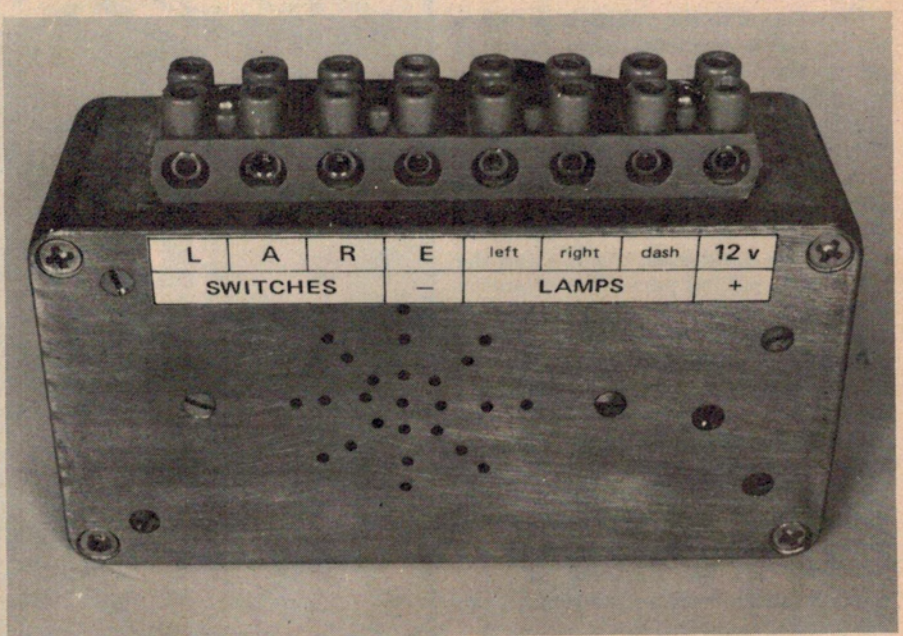
The dash light is illuminated through D3 and D4 whenever either of the Darlington transistors are turned on.

IC1 is an audio oscillator with a variable frequency controlled by the voltage on its control input, pin 5. This pin is tied to the bases of Q2 and Q3 through D1, D2 and R9 in such a way that the oscillator gives a different tone for left, right, and hazard. The oscillator is enabled by the voltage on pin 4 which is normally held low through the dash light. When the dash light turns on pin 4 goes high and the oscillator starts, beeping in time with the flash of the indicators.

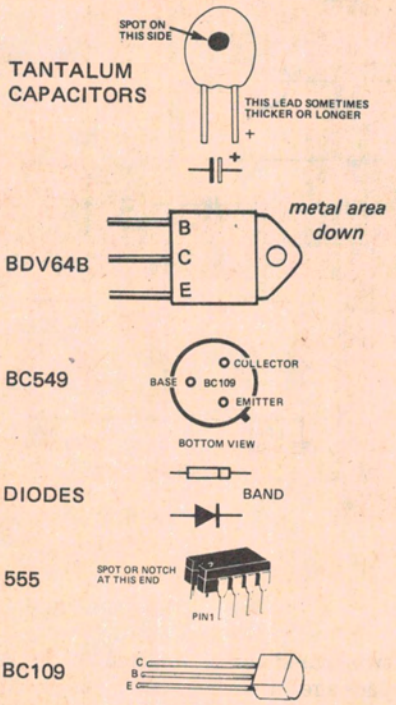
out the life of the unit. A special feature is that it provides an audio tone whose pitch is different for each of the three modes — 'left turn', 'right turn' and 'hazard'. If you want to alter the flash rate, two of the fixed resistors can be replaced by trimpots to allow variation of the frequency and duty cycle.

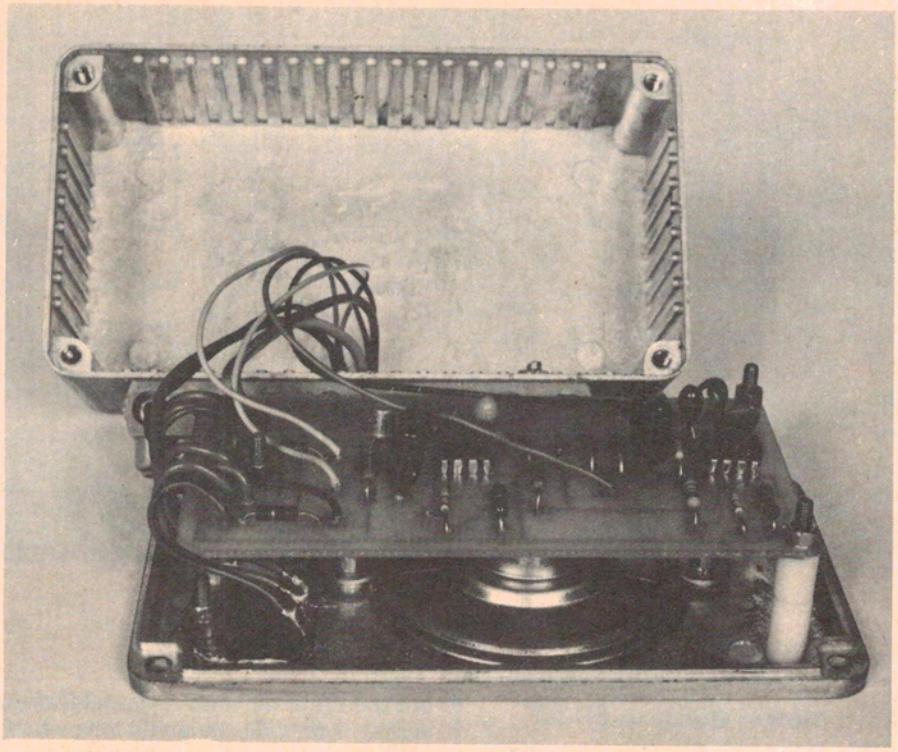
The flash rate is determined by a 555 timer IC, whose output is routed through the car's turn indicator switch on the steering column and turns one of two Darlington power transistors on and off. These transistors are actually two transistors connected in the same package in such a way as to provide a very high current gain. This allows them to be operated with a low base drive current to switch quite high currents, making them ideal for this application.

A second 555 IC is used as an audio oscillator to drive a small loudspeaker. This oscillator is held off until one of the Darlington transistors is turned on and then turns on and off in time with the Darlington, producing a beeping sound which is synchronised to the flashes. ▶



COMPONENT PINOUTS





Our unit was assembled into a diecast box using standoff pillars to support the pc board. If you use an 8 ohm or 16 ohm speaker with a series resistor, the value of the resistor may be varied to alter the speaker volume. With a high impedance speaker, a suitable value resistor may be inserted in series to lower the volume. Try 100 ohms as a start.

Construction

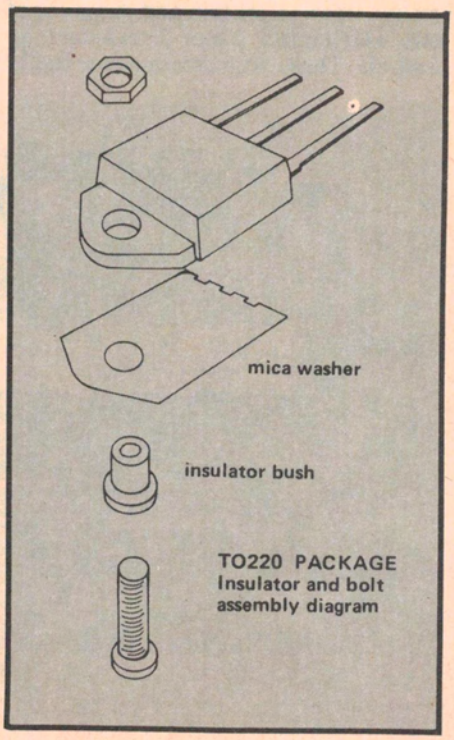
Since the unit is designed to operate inside a car it should be made as rugged as possible. Our prototype was constructed in a diecast aluminium box which doubled as a heatsink for the switching transistors.

Connection to the vehicle's wiring is made via a terminal strip mounted along the outside of the box. The speaker and the pc board are mounted inside the lid of the box to facilitate wiring.

Start by mounting the resistors and non-polarised capacitors on the pc board. Next mount the two tantalum capacitors, the diodes, the ICs and the transistor, paying particular attention to their orientation.

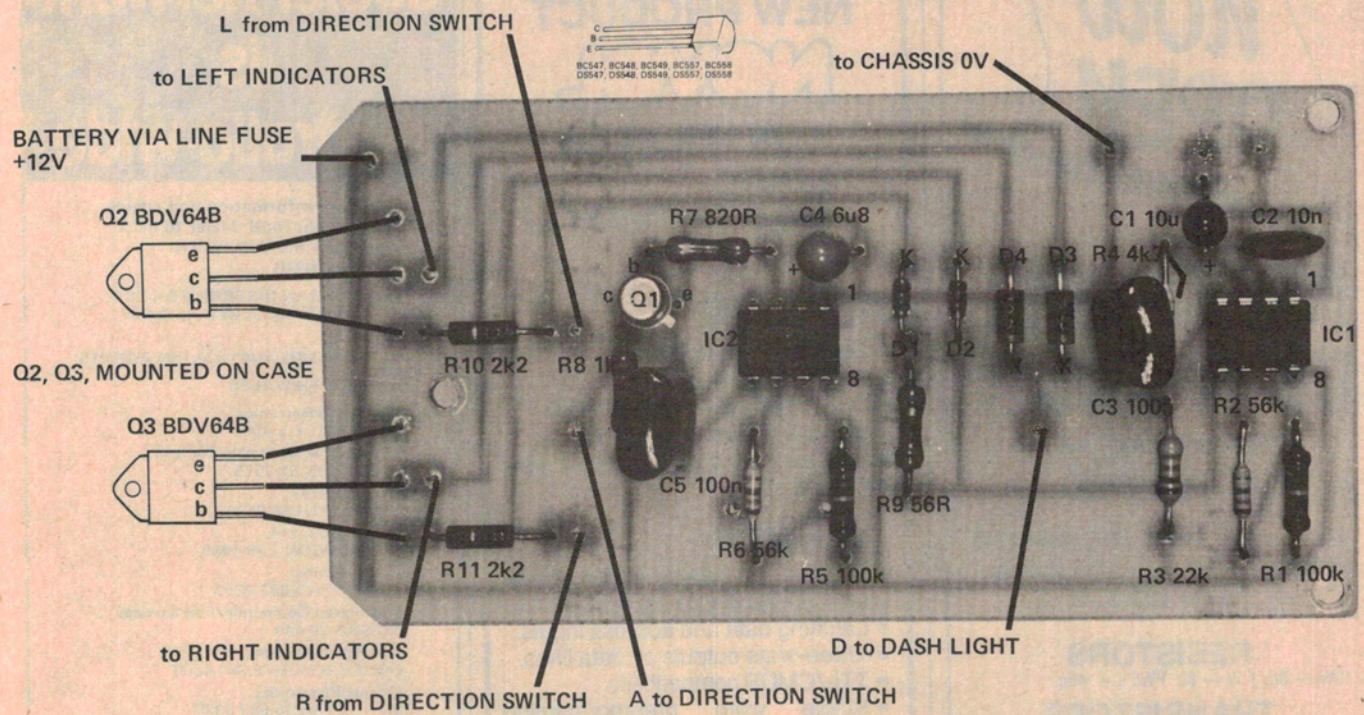
If you wish to vary the flash rate and the duty cycle, the two timing resistors R5 and R6 can be replaced by trimpots as the pc board has been designed to accomodate either trimpots or fixed resistors. Drill holes in the lid of the box for the pc board, the Darlington transistors and the speaker. We drilled a series of small holes in front of the speaker but this may not be necessary in some circumstances because the sound from the speaker is quite loud.

The two Darlington switching transistors are mounted on the lid of the box as shown in the photo of the prototype. The cases of these transistors are connected to the collectors and must therefore be insulated from the diecast lid. Mount the transistors using a mica or plastic insulator and plastic sleeves as shown in the diagram. Use an ohmmeter to check that there is an open circuit between the collectors and the diecast lid after the transistors are mounted.



Mount the loudspeaker on the lid, using nuts and bolts with two large washers clamping the edge of the speaker against the lid. If you have an eight ohm speaker you can use that instead, if a 47 ohm, ½ watt resistor is connected in series with one of the speaker leads.

Solder all the connecting wiring from the pc boards and Darlington transistors, using heavy gauge wire to the emitters and collectors of the transistors. Then mount the pc board on 20 mm standoffs above the speaker and transistors. Connections to the car's electrical system are made via a length of screw terminal strip with the wires to the pc board run through a grommet in the side of the box.



Component overlay and external component connections.

NOTE: The printed circuit board artwork is reproduced on page 113.

Installation

The flasher unit can be installed in any convenient position under the dash within earshot of the driver. However, it is not a good idea to mount it near the output pipe of the heater as it could get quite hot there. The connection to the battery can be taken from the battery terminal through a 10 A line fuse, or from the accessories position on the ignition switch. This way the hazard flasher can still be used with the engine turned off.

If your car is too old to have turn indicators you can mount a double pole switch on the steering column and run wires under the dash to the unit. You can buy switches with long lever extensions which are ideal for the purpose. The hazard switch should be a push-off/pull-on type (to avoid accidentally knocking it on) and can be mounted in any convenient position on the dash with the dash turn indicator.

External lights are easily mounted and are available from motor accessory stores. Make sure the connection from the light to the chassis is good. If in doubt, run a wire from the light case chassis connection to a good chassis contact point on the vehicle or direct to the battery negative terminal. ●

Flashers and the Law

Flashing turn and hazard indicators fitted to motor vehicles must comply with Australian Design Rule No. 6 (ADR 6), whose provisions are summarised below.

Colour:	Rear and side flashers must be amber or orange. Front flashers on Australian-made vehicles must be orange; on imported vehicles they may be orange or white.
Flash Rate:	Not less than 60 and not more than 120 flashes per minute.
Duty Cycle:	Not specified.

PARTS LIST — ETI 327

Resistors all ½W, 5%

R1	100k
R2	56k
R3	22k
R4	4k7
R5	100k or 250k min. trimpot.
R6	56k or 100k min. trimpot.
R7	820R
R8	1k
R9	56R
R10,R11	2k2

Capacitors

C1	10u/25V tantalum
C2	10n greencap
C3,C5	100n greencap
C4	6u8/25V tantalum

Semiconductors

D1,D2	1N914, 1N4148 etc.
D3,D4	1N4001, A14A etc.
Q1	BC549, BC109 etc.
Q2,Q3	BDV64B Darlington transistor

Miscellaneous

SW2	DPDT toggle switch
LS1	small, high impedance speaker (48-80 ohms) or eight ohm speaker with 47R series resistor.

ETI-327 pc board; line fuse with 10 amp fuse; diecast box to suit (65mm x120mm x 40mm); eight-connector barrier strip.

PCB's

Instructions on how to make your own pc boards using the Scotchcal method and exposing through this page may be found on page 113 of the March '80 issue.