Another look at this simple circuit

Courtesy light delay system for cars

Our delay system for car courtesy lights published in the January issue has aroused a lot of interest. This month we give details of modifications of the circuit so that this useful system can be fitted to other makes of cars, with different arrangements of lighting and wiring.

by PETER VERNON and GERALD COHN

A number of readers have written to us asking for modifications of the car courtesy light delay system to enable it to be fitted to this or that make of car. In view of this we decided to publish three versions of the original design which are suitable for a wide range of makes and models, including positive chassis vehicles.

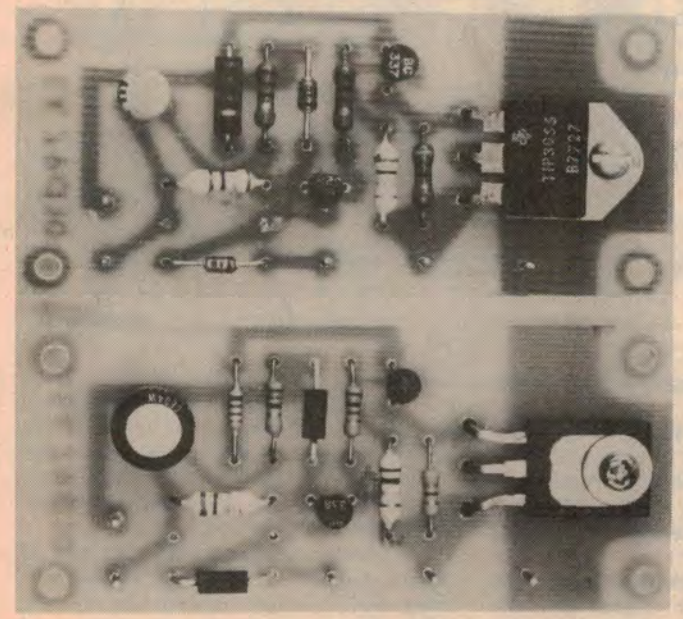
As designed the circuit is actuated by opening the car door, and holds the courtesy lights on for a pre-determined time after the car door is closed. Provision is made for the courtesy lights to be switched off automatically whenever the headlights or parking lights are turned on.

As published, the original circuit is suitable only for cars where both the headlights and the door switches are connected directly to the negative side of the battery via the chassis. On the other hand, many Japanese vehicles use a relay on the negative side of the headlights, while the lights themselves are connected directly to the positive side of the battery.

Again, some vehicles use the same headlight switching arrangement, but the car door switches are connected between the courtesy light and the positive side of the battery.

Other cars use relay-switched headlights and door switches on the positive side of the courtesy lights but the relay connection is between the headlights and the positive side of the battery, rather than to the chassis. In each case the original circuit will not work.

However, these problems are quite easily overcome by modifying the original circuit to suit the particular wiring system of your car. The three versions described are all built on the original printed circuit board, with only slight differences in the layout of the components.



Two versions of the courtesy light delay circuit are shown at left: at top, for negative chassis vehicles; below, for positive chassis vehicles.

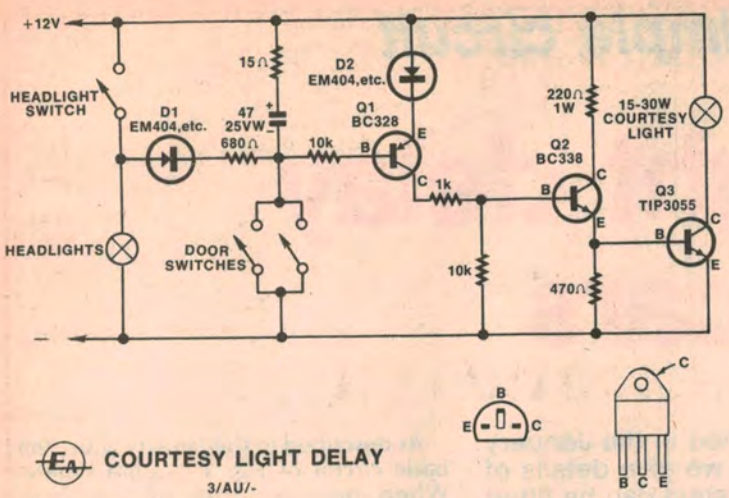
As described in the January issue, the basic circuit of Fig. 1 is quite simple. When one or other of the door switches is closed, Q1 is forward biased and conducts, turning on Q2 and Q3 and switching on the courtesy light. At the same time the 47uF capacitor is charged through the 15 ohm resistor. When the door switch is opened (by closing the car door) the charge on the capacitor maintains the bias on Q1. When the capacitor discharges the forward bias on Q1 is removed, Q2 and Q3 are turned off, and the courtesy light goes out.

In the original circuit, a diode is connected between the negative side of the capacitor and the headlight switch to prevent the capacitor charging through the headlight circuit as long as the headlight switch is open. Closing the headlight switch forward biases the diode and discharges the capacitor, so that switching on the headlights overrides the delayed turn-off of the courtesy lights. A resistor is included in series with D1 to limit the current through the diode to a safe value.

In cars which have the headlights connected to the positive side of the battery this diode override arrangement will not work because the diode will prevent the capacitor from being charged. This is corrected by connecting the diode from the headlight switch to the base of Q2. Fig. 2 shows the modified circuit.

Operation of the headlight switch now forward biases the diode, removing the bias from Q2 and causing it to turn off, turning off Q3 so that the courtesy light goes out. (Note that the 47uF capacitor remains charged, discharging slowly through the 10k resistor and the base/emitter junction of transistor Q1. If the headlights are turned off again before the capacitor has discharged, the courtesy light will come on again for a brief period.)

The third version of the circuit is intended for use in cars which have door switches on the positive side of the courtesy light while the headlight switch is connected to the negative side of the battery. This circuit, shown in Fig. 3, works in exactly the same way as the original design but is reversed in



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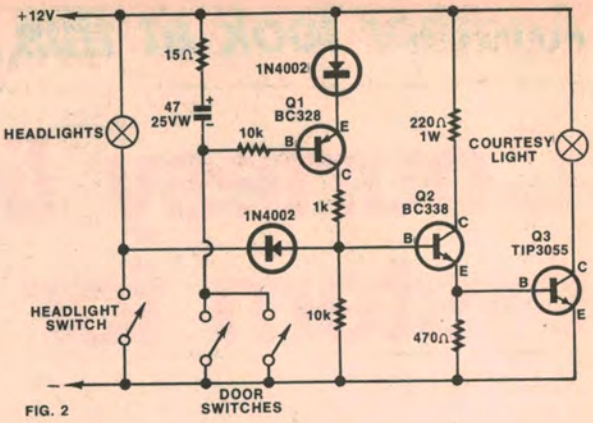


FIG. 2

Fig. 1, top left, is the original circuit while the three other diagrams are variations on the same theme.

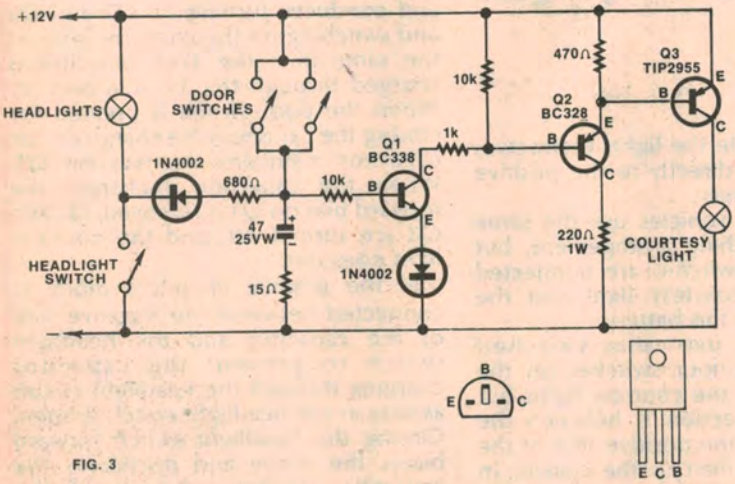


FIG. 3

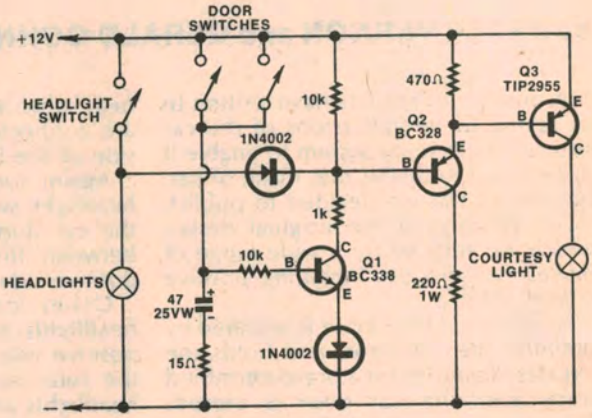
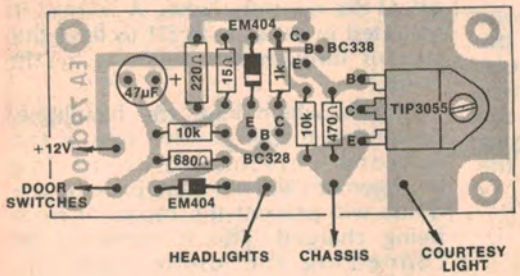
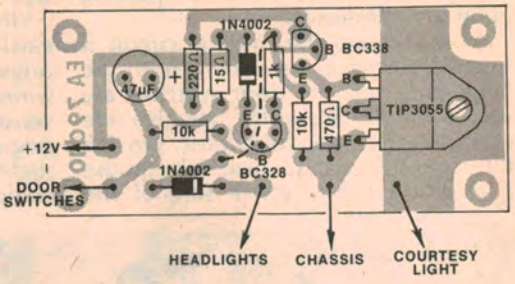
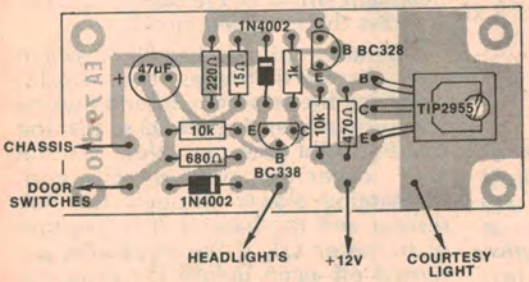
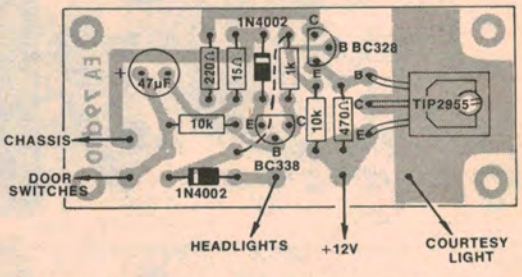


FIG. 4









At top left is the PCB component layout for Fig. 1. Below left, is the component layout for Fig. 3 while at top right is the component layout for Fig. 2. Below right is the component layout for Fig. 4. The PCB pattern was published in the January 1980 issue.

polarity. All component polarities are changed, PNP for NPN and vice versa and the supply connections to the PCB are reversed.

The final variation of the design is shown in Fig. 4. This design is suitable for use in cars which have the door switches on the active side of the courtesy lights and also have the headlight switch between the headlights and the positive side of the battery.

Fig. 4 is very similar to Fig. 3 but swaps the diode over so that it is connected to the base of Q2 (as in Fig. 2). Again, the 680 ohm resistor in series with the diode is no longer necessary and may be omitted.

So far we have not dealt with positive chassis vehicles and those with 6V batteries such as pre-1968 VWs. With the four circuit variations presented, readers will find one that can be adapted for use in their particular positive chassis vehicles. Similarly, all the circuits are applicable to 6V operation without changes.

We have produced a component layout diagram of the PCB for each of the four circuit variations. Those

circuits of Figs. 2 and Fig. 4 which require the diode to be connected to the base of Q2, each have a wire link installed underneath the PCB. Note also that the "+12V" and "chassis" connections to the circuits of Figs. 3 and 4 have been swapped over.

PARTS LIST

1 TIP3055 or MJE3055 NPN power transistor (versions 1 and 2)
1 TIP2955 or MJE2955 PNP power transistor (versions 3 and 4)
1 BC338 NPN transistor
1 BC328 PNP transistor
2 1N4002 or similar silicon power diodes
1 47uF/25VW electrolytic capacitor
1 PCB, 87mm x 38mm, code 79d10

RESISTORS:
¼ or ½ watt unless specified
2 x 10k, 1 x 1k, 1 x 680 ohm (see text), 1 x 470 ohm, 1 x 220 ohm 1W, 1 x 15 ohm

MISCELLANEOUS:
Hookup wire, 3A fuse and fuseholder, stand-off pillars, machine screws and nuts, automotive connectors

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used provided they are physically compatible.

The installation of the circuit is as described in the January issue, regardless of whether the headlights are operated directly from the dashboard switch or via a relay. Make sure that the +12V supply is derived from the active side of the dashboard switch.

Also note that two alternative power transistors are given for both the NPN and PNP versions. The TIP prefix comes in a SOT 93 package, and the lead configuration is as shown. The MJE version is in a TO 127 package, with the positions of the base and emitter leads swapped over. When using this transistor it must be installed face down on the circuit board, so that the leads are in the correct positions. Use a metal washer under the head of the securing screw to improve heat transfer between the transistor mounting base and the PCB copper pattern.

Well, there it is. Four variations of a simple design to make it suitable for fitting to just about every variety of car lighting system. Just pick the design that suits your car and look forward to a little extra convenience in your motoring.