CAR BURGLAR ALARM

by Keith Baker

There are many car alarms available on the market, but none can offer complete protection against theft. Though no alarm will foil the professional thief, it will act as a deterrent to the small time thief or joyrider. This circuit, like most alarms, is triggered off by the door contacts for the courtesy light and will only work when fitted to a 12V negative earth car. The switch to the alarm is fitted on the inside of the car as opposed to the outside, thus ensuring that the switch is not tampered with.

The idea is, that when leaving the car the alarm switch is turned to the on position and the 'arm' button is pressed. It is now safe to open the doors and get out of the car. After pressing the 'arm' button a timer circuit allows approximately 60 seconds to leave the car and shut the doors. After the 60 seconds, providing the doors are shut, the circuit will arm itself. If a door is then opened, the horn will sound after 15 seconds. This 15 second delay is sufficient time for the occupant to turn off the alarm, but not enough time for the thief to tamper with the switch. The horn will sound for a further 1½ minutes and the alarm will then arm itself again. If the door is left open the alarm will sound continuously.

The Circuit

Figure 1 shows the circuit diagram of the alarm and this is based on three timer circuits.

When the car door is opened the negative side of C2 is biased negative, C2 is charged and TR2 is biased hard on. TR2 now conducts down to -V and RLB changes over.

With RLB in its normal condition, it is keeping C3 fully charged and TR3 biased hard on. When RLB changes over, as described above, C3 starts discharging as R4 goes positive. In this state RLC is being shorted out, but as C3 discharges, the voltage drop across the collector and emitter of TR3 becomes larger until RLC 'pulls in' (approximately 15 seconds from RLB changeover). This causes +12V to be transmitted to the horn and allows C2 to start discharging.

When the base emitter voltage of TR2 starts to decrease, the voltage drop across RLB also decreases, until RLB 'drops out' cutting off the supply to RLC, which in turn cuts off the horn.

When leaving the car, to prevent the alarm circuit energising, C2 has to be kept discharged. This is done by making a break in the negative potential supplied by the door contacts for the courtesy light. By turning on the supply and pressing the push to make button S2, C1 charges up, TR1 turns hard on and RLA changes over, making a break between the door contacts and the negative side of C2.

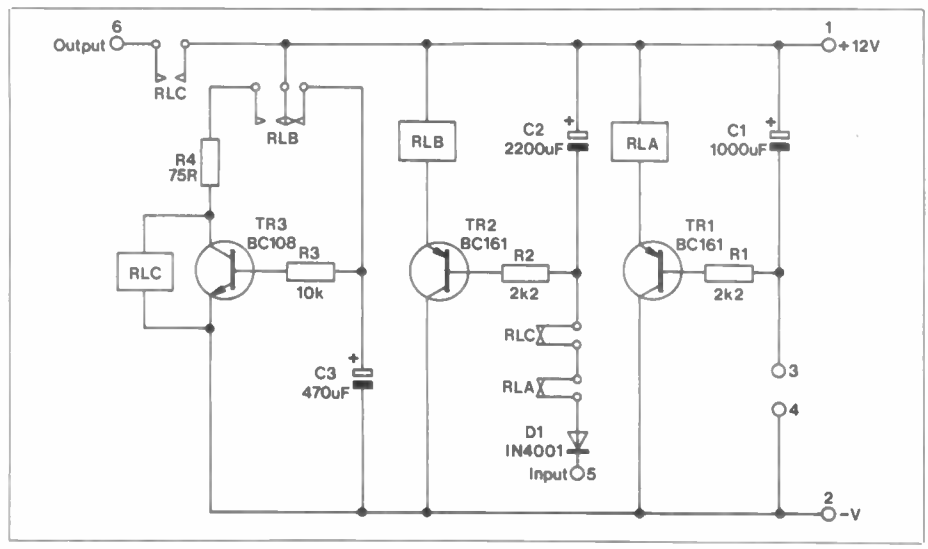

Figure 1. Circuit diagram.

R4 is in the circuit to provide a load when TR3 is biased hard on. D1 is in the circuit to prevent C2 from discharging. R1, R2 and R3 govern the discharge rate of capacitors C1, C2 and C3 respectively. These values can be varied to alter the time delays.

Construction

The complete circuit fits into a small plastic box 71.5mm x 49mm x 24.5mm and it is therefore suggested that a PCB is used. The track side and component side of this can be seen in Figure 2. Fit and solder into position the resistors and the diode, then mount RLA, B & C, TR1, 2 & 3 and solder in position. Lastly, fit C1, 2 & 3 taking note of capacitor polarity.

On the completion of the circuit board, a small hole can be drilled in the box, as an exit for the wires and a piece of plastic foam at the top and bottom of the completed PCB will protect it when installed. The supply switch is inserted in the circuit between supply and +12V.

For cheapness, a concealed switch can be used, e.g. fitted under the dashboard or in the glove compartment etc. A key switch proves quite effective and is relatively easy to install. The most novel idea is a combination lock, a simple version of which is shown in Figure 3.

The switch arrangement is achieved by using three 1 pole 12 way rotary switches. By connecting all of the terminals of the switch together except one, there is only one position where the switch will not conduct from the outside terminals to the inside pole. By connecting the three switches as shown, there is only one combination that will cut off the supply. In the example it is 6, 3, 6. These three switches connected in this way allow a possible 1728 different combinations.

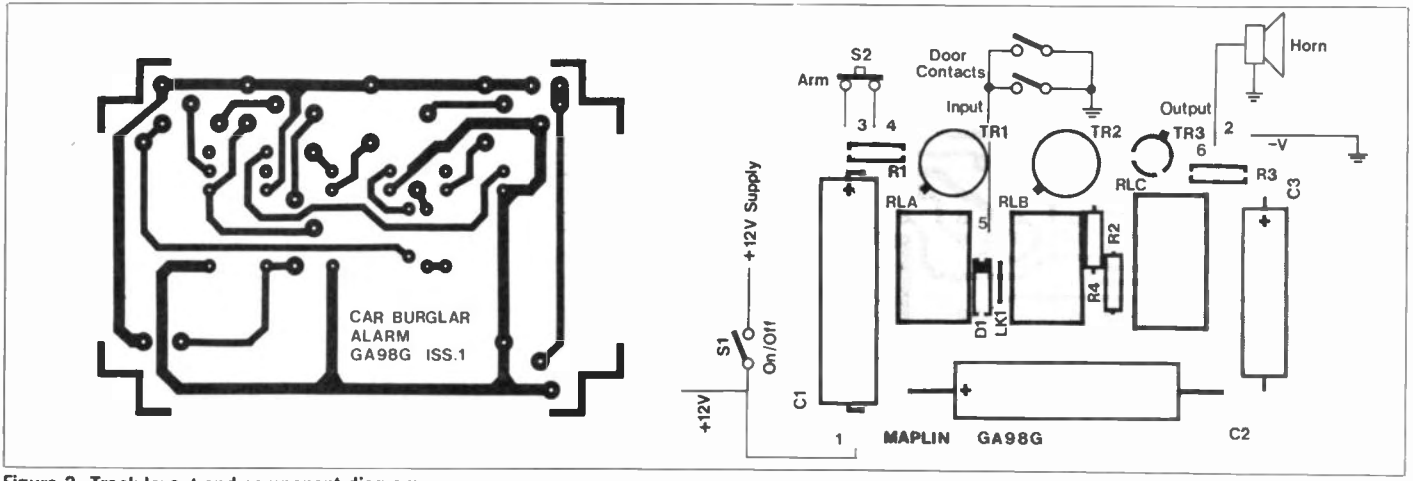

Figure 2. Track layout and component diagram.

Installation

With reference to Figure 2 proceed as follows:

1. Find a convenient positive supply source and fit one of the switches as described in the previous paragraph, between the supply and the +12V of the circuit (pin 1).
2. Take a single wire from the negative of the circuit (pin 2) and connect it to a metal part of the car body.
3. Take a single wire from the negative side of the courtesy light and connect to INPUT (pin 5).
4. Take a single wire from the positive horn contact and connect it to OUTPUT (pin 6).
5. Fix the 'arm' button to a convenient position on the dashboard and connect to the PCB at pins marked 3 & 4.

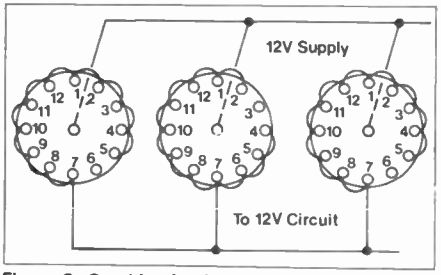

Figure 3. Combination lock.

CAR BURGLAR ALARM PARTS LIST

			Maplin Code
Resistors — all ¼W 5% carbon unless specified			
R1,2	2k2	2 off	(M2K2)
R3	10k		(M10K)
R4	75R (½W)		(S75R)
Capacitors			
C1	1000uF 16V axial electrolytic		(FB82D)
C2	2200uF 25V axial electrolytic		(FB90X)
C3	470uF 16V axial electrolytic		(FB72P)
Semiconductors			
TR1,2	BC161	2 off	(QB49D)
TR3	BC108		(QB32K)
D1	1N4001		(QL73Q)
Miscellaneous			
RLA,B	Ultra-min relay SPDT	2 off	(YX94C)
RLC	Ultra-min relay DPDT		(YX95D)
S1	See text		—
S2	Push switch		(FH59P)
	Verobox 301		(LL12N)
	Veropin 2145	6 off	(FL24B)
	PCB		(GA98G)
	Wire		As required

A complete kit of parts is available for this project.
Order As LW78K (Car Burglar Alarm Kit). **Price £6.95**