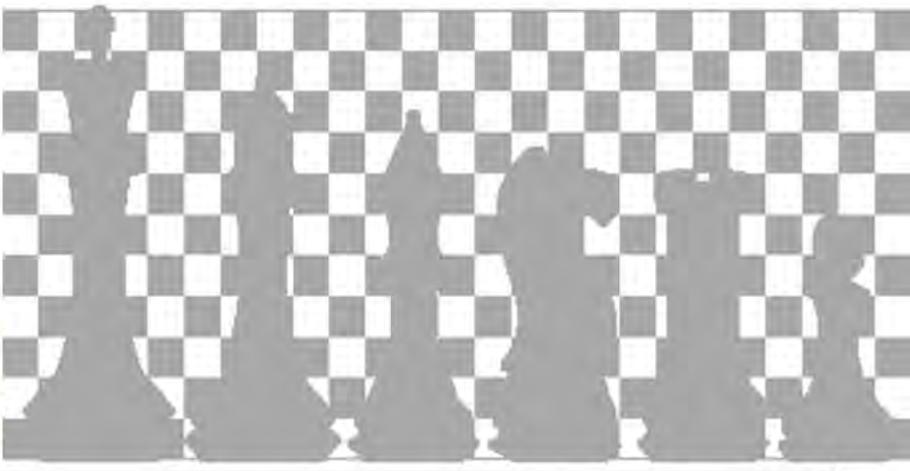
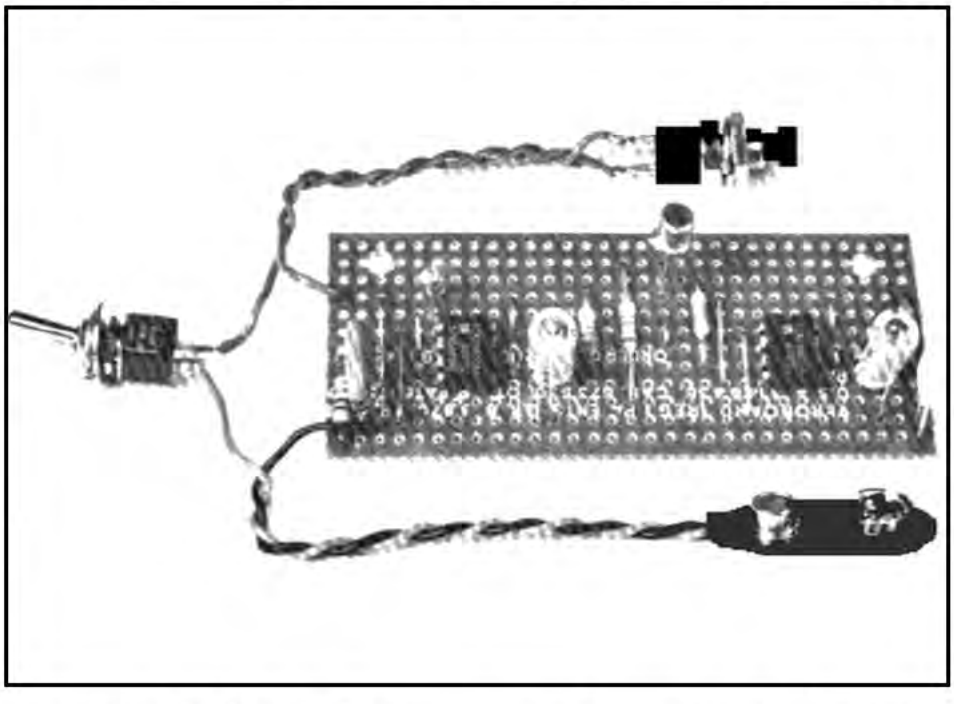
GAMES TIMER

by Robert Penfold



*** Make your board games more exciting with this easy-to-build timing device**



There are a number of games where the players make their moves in turn, and progress can be rather slow and tedious if no limit is set on the time available for each move. Chess, Scrabble, and Draughts are three examples of popular games which fall into this category. Imposing a time limit on moves in games of this type can make them much more interesting and exciting with the more skilful player still ultimately winning and the outcome of the game being unaffected.

This simple games timer has a three colour LED indicator which is green at switch-on, and remains in this state for about 15 seconds. After this time it changes to orange to indicate that the available time is running out, and after about a further 10 seconds it changes to red to indicate that the allotted time has run out. If the display reaches the red state either the player must make his or her move immediately or some form of penalty (such as a missed move) must be imposed, as preferred. Once the player has made his or her move, or the display has reached the red state, the timer is reset by momentarily operating a push button switch.

The Circuit

The circuit is based on two 555 timer devices, one being used to drive each section of the LED indicator. Both are used in the monostable mode. The ICM7555 (CMOS) version of the 555 is employed in this design because this gives a reduction in current consumption of about 16 mA when compared to the standard device, and enables a small 9 volt battery to be used as an economic power source for the unit. The circuit diagram of the Games Timer is shown in Figure 1.

IC1 is used to drive the green section of LED indicator D1, and at switch-on this must immediately switch on its section of the LED and keep it switched on for a period of about 25 seconds. R1 and C1 are used to generate a negative trigger pulse when power is initially connected to the circuit so that a positive output pulse is immediately produced from the output at pin 3 of

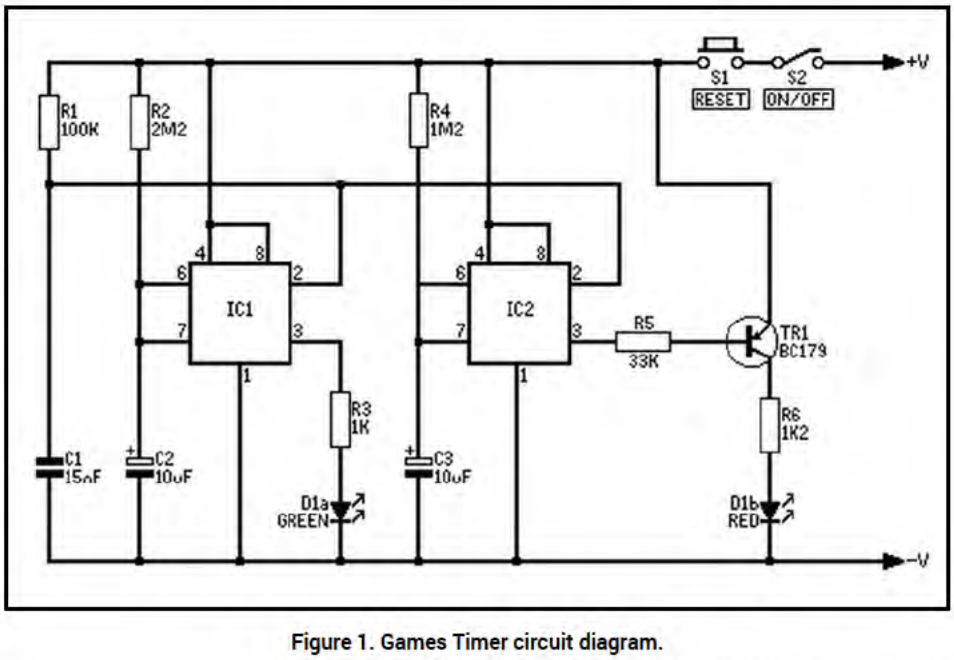


Figure 1. Games Timer circuit diagram.

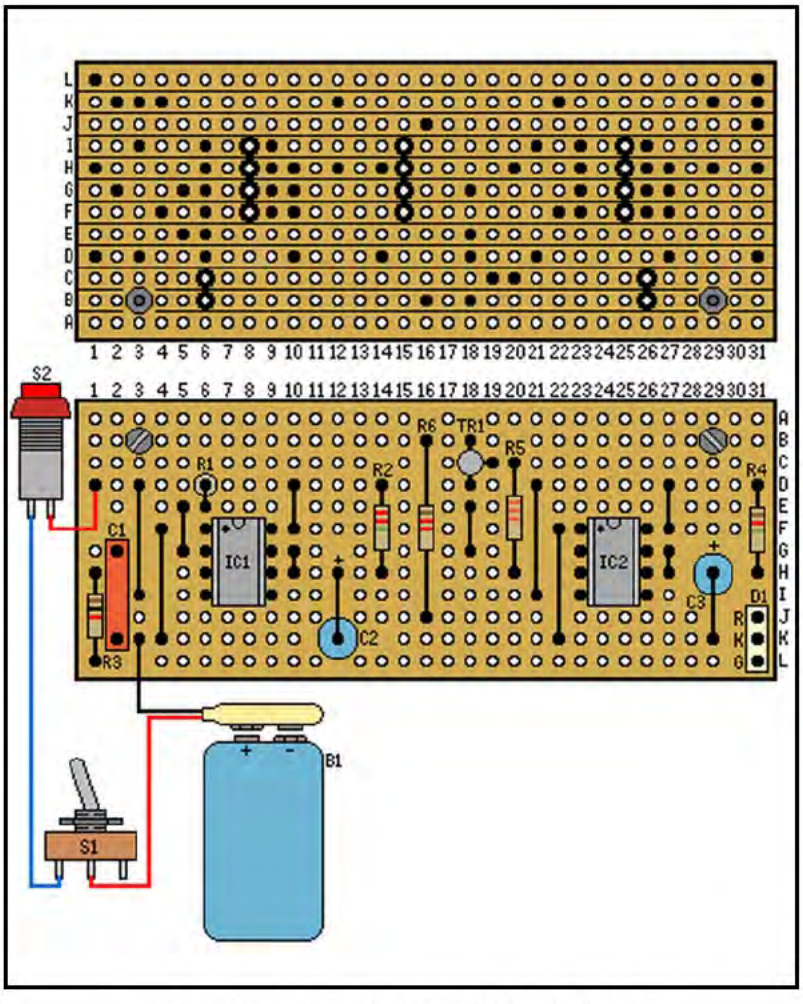


Figure 2. Veroboard layout for the Games Timer.

PARTS LIST FOR THE GAMES TIMER

Resistors - all ¼ watt 5% except where specified

R1	100K Brown Black Orange
R2	2M2 10% Red Red Green
R3	1K Brown Black Red
R4	1M2 10% Brown Red Green
R5	33K Orange Orange Orange
R6	1K2 Brown Red Red

Capacitors

C1	15nF Polyester
C2	10µF 25V Electrolytic
C3	10µF 25V Electrolytic

Semiconductors

IC1	ICM7555
IC2	ICM7555
TR1	BC179
D1	2 colour common cathode LED

Miscellaneous

S1	Push-to-break, release to make switch
S2	Sub-min s.p.s.t. toggle switch
B1	PP3 battery and connector
	Veroboard 31 holes x 12 strips 0.1 inch matrix
	Case

IC1. This pulse drives the green section of DI via current limiting resistor R3. R2 and C2 are the timing components which control the length of the output pulse, and the pulse length is approximately 1.1 CR seconds. This gives a nominal pulse duration of 24.2 seconds, but this is likely to be marginally increased in practice due to slight leakage in C2. Much larger errors can occur due to the tolerances of IC1 and the timing components, but fairly large errors in the pulse length are of little importance since they will advantage or disadvantage all players by the same amount.

The red section of D1 is driven via an inverter stage from IC2. The red section
must be switched on after about 15 seconds in order to mix with the green section to give the orange display, and it must remain on until the unit is reset so that a red indication is given when the green section switches off after about 25 seconds.
IC2, like IC1, is triggered at switch-on by the pulse produced by R1 and C1, and its output pulse duration is set at approximately the required time by using suitable values for R4 and C3. The red section of D1 will not light up during this time since with IC2's output high TR1 will be cut off and no significant current will be supplied to D1b. At the end of the pulse TR1 is biased into conduction by the base current it receives from IC2 by way of R5, and TR1 then drives D1b on via current limiting resistor R6. D1b remains on until the circuit is reset by briefly operating S1 so that the supply is momentarily cut off and the two timer ICs are retriggered as the supply is restored. If S1 is operated before IC2 and (or) IC1 reach the end of their timing periods, any charge on C2 or C3 will be rapidly lost through IC1 and IC2 so that the subsequent timing run correctly starts with zero charge on the timing capacitor and the unit operates properly.

Construction

The timer is built on a 0.1 inch pitch Veroboard which has 31 holes by 12 copper strips, and full details of this are given in Figure 2. Construction of the unit is quite straightforward, and although IC1 and IC2 are CMOS devices they do not need the normal CMOS handling precautions since the ICM7555 device has internal protection circuitry which gives complete protection against damage by static charges. There should be no difficulty in fitting the board, battery, and other components into a small plastic case measuring about 115 x 75 x 40 mm.

The times provided by the unit using the specified timing component values might be inappropriate for some games, but within reason the times can be changed to suit individual requirements. Both ICs require a timing resistance of about 91 kilohms per second of output pulse. Of course, IC2's timing components govern the time for which a green display is obtained, and it is the difference in the pulse lengths of IC1 and IC2 that gives the orange display time. The display goes red after a time equal to the pulse length of IC1.