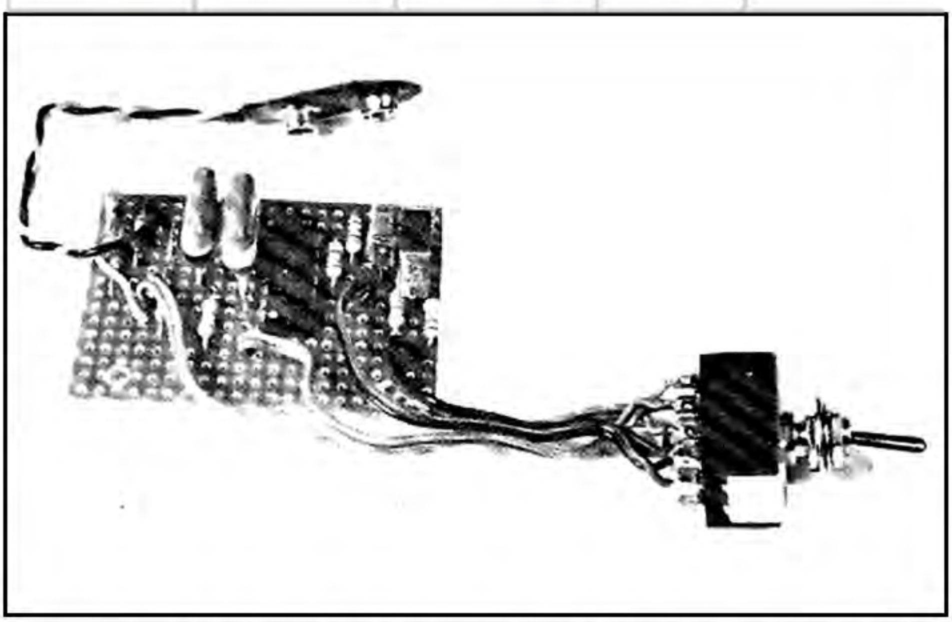
COLOUR SNAP GAME

by Robert Penfold

* Novel variation on this familiar card game

This electronic game is in essence the same as the popular card game of “snap”, but rather than cards there are two LED indicators which flash through their four possible states (red, green, yellow and off) at a fairly fast rate, but not so fast as to make it difficult to see this action clearly. The two indicators are controlled by separate circuits and do not flash in unison. There is a switch which “freezes” the action if it is operated, and the purpose of the game is simply to operate the switch when both LED's are in the same state. If the competitor is successful this will be indicated by both LED's being in the same state when flashing action ceases. It does not matter which particular state this happens to be; it just needs to be the same for each LED.

It may sound very easy to accomplish this, but it should be borne in mind that it can take a short while before a "snap" occurs, and there is no way of knowing what state the LED's will be in when a "snap" does occur. Also, at most the LED's will only remain in the same state for a fraction of a second. To be successful at this game you therefore require both good concentration and quick reactions. The game can simply be played one round at a time, or, for example, the object of the game could be made to score ten "snaps" in as few attempts as possible.



The Circuit

Figure 1 shows the circuit diagram of the game, and this is based on a 40106BE device which is a CMOS hex Schmitt trigger. The Schmitt triggers are inverting types with built-in hysteresis. Thus, if the input starts at zero volts and is gradually taken higher in voltage, at a certain input voltage the output will trigger from the high state (virtually the positive supply potential) to the low state (little more than the negative supply voltage). The input

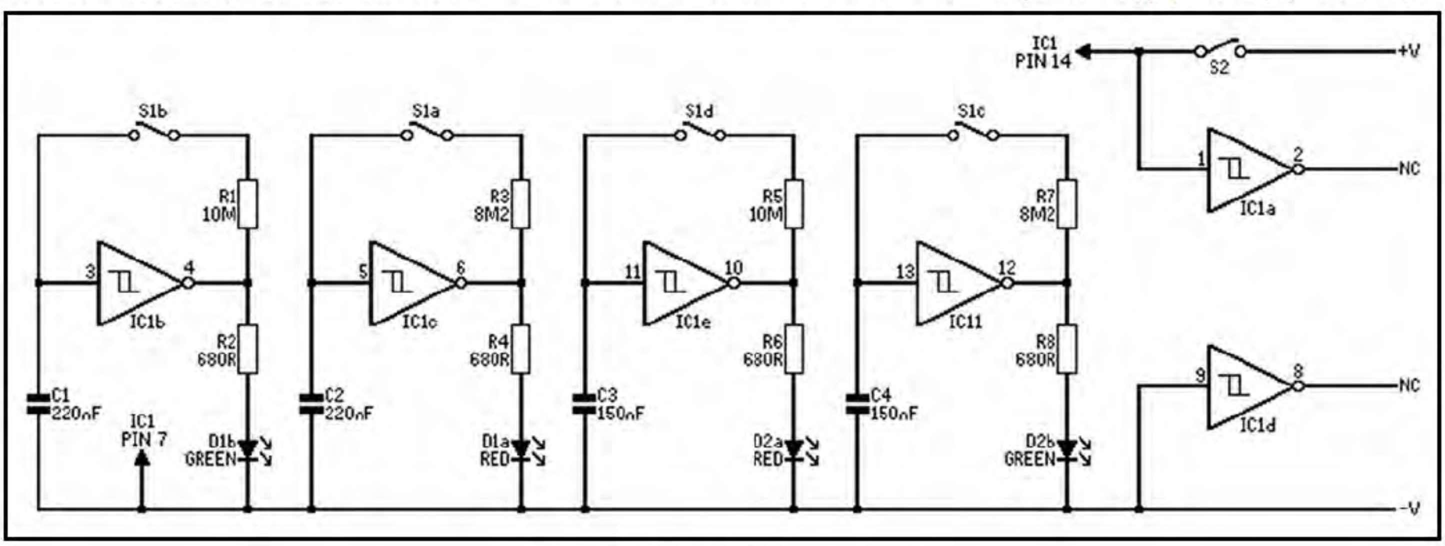


Figure 1. Circuit of the colour snap game.

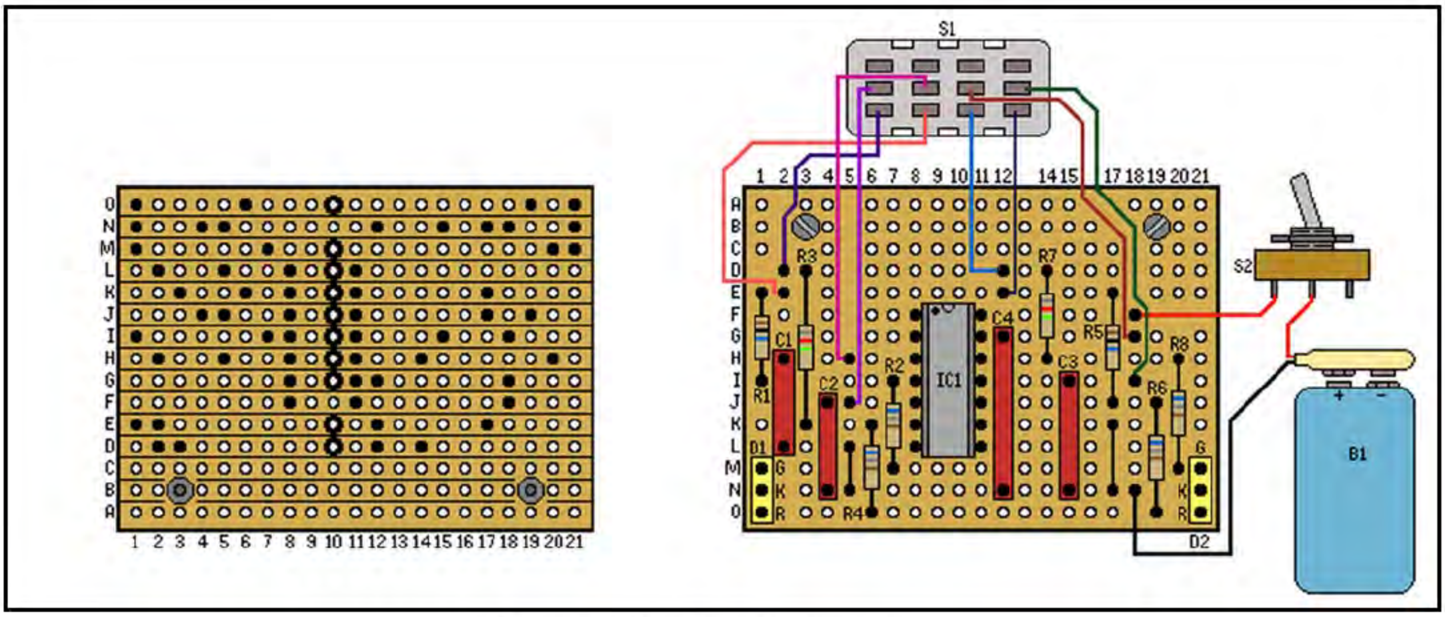


Figure 2. Veroboard layout for the snap game.

voltage must then be reduced quite substantially in order to trigger the output back to the high state again. The hysteresis is incorporated in Schmitt triggers to prevent instability, but paradoxically it enables an inverting Schmitt trigger to be used in the very simple oscillator configuration which is employed here.

Four oscillators are used, one to drive each LED section, and all four oscillators use the same configuration. Each oscillator operates at a different frequency so that each LED runs through its four states in a pseudo random fashion. It is not a true random sequence since the pair of oscillators driving each LED will eventually arrive simultaneously back in their original states and the sequence will then be repeated. This is not likely to be apparent to an observer though, since the sequence of each LED is quite long.

Each oscillator requires just two components apart from the Schmitt trigger; a resistor connected between the input and output, and a capacitor connected from the input to the negative supply rail. At switch-on the capacitor charges from the output of the Schmitt trigger via the resistor until the output switches to the low state. The capacitor then discharges through the resistor and the output of the Schmitt trigger until the output switches back to the high state again. The capacitor then starts to charge up again, and continuous oscillation is produced. Each oscillator drives a separate LED section via a current limiting resistor (R2, R4, R6 and R8).

Two of the Schmitt triggers are not needed and the inputs of these are tied to one of the supply rails in order to prevent spurious operation and possible damage to IC1. Apart from this the unused triggers are ignored.

The display is "frozen" by opening S1 so that the charge and discharge paths of the capacitors are broken, and the charges on the capacitors hold the triggers in whatever state they happened to be in at the instant S1 opened. As a CMOS IC has been used the input impedance of each Schmitt trigger is extremely high, and the charges on the capacitors leak away at a rate which is too slow to be of consequence. In order to set the unit operating again it is merely necessary to close S2.

PARTS LIST FOR THE COLOUR SNAP GAME

Resistors - all ¼ watt	
R1, R5	10M 10% (2 off) Brown Black Blue
R2, R4, R6, R8	680R 5% (4 off) Blue Grey Brown
R3, R7	8M2 10% (2 off) Grey Red Green
Capacitors	
C1, C2	220nF Carbonate (2 off)
C3, C4	150nF Polyester (2 off)
Semiconductors	
IC1	40106BE
D1, D2	Two colour LED (2 off)
Miscellaneous	
S1	4-pole miniature toggle switch
S2	SPST miniature toggle switch
	Case
	Veroboard 21 holes x 15 strips
B1	PP3 battery and connector

Construction

A Veroboard having 21 holes by 15 copper strips accommodates most of the components, and the component layout plus the positions of the ten breaks in the copper strips are shown in Figure 2. This also shows the wiring to the off board components. As IC1 is a CMOS device it requires the usual MOS handling precautions if the danger of damage by static charges is to be eliminated. Connect this component last of all and leave it in its protective packaging until then. Handle it as little as possible, and either solder it in place using an iron having an earthed bit or use an IC socket.

If desired, the game can be made a little less difficult by using capacitors having slightly higher values than the specified components. On the other hand, if the game seems to be too easy after it has been in use for some time, slightly reducing the values of the capacitors will increase the difficulty factor of the game.