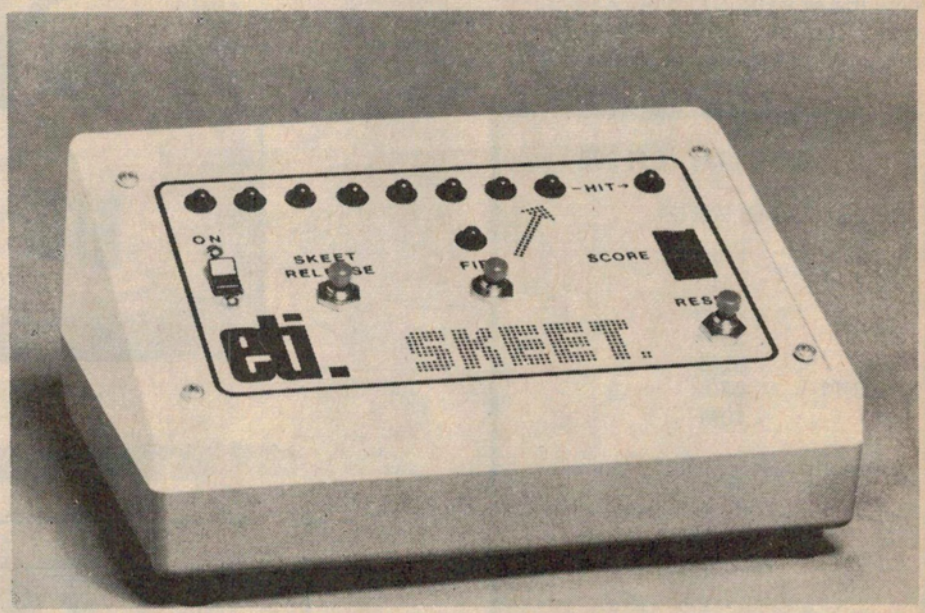
Skeet

Electronic clay pigeons, yet! Play the game!

GAMES, BE THEY electronic or otherwise, may, in general, be divided into two broad categories. There are those which entertain by stimulating the mind and those that involve the more mechanical of skills. In general all games will involve a mixture of these two elements.

The game described here cannot claim to tax the grey matter to any great extent, but certainly provides a test of hand/eye coordination.

We have also introduced an element of luck which helps the game meet, perhaps, the most important requirement of any game — it is fun play!



Game Bird

Before going on to describe the game it might be best to explain just why we called it Skeet.

Skeet is the term used in the USA to describe the sport we know as Clay Pigeon Shooting. We thought that a title like ''Clay Pigeon Shoot'' would be too much of a mouthful, and nobody wants a mouthful of clay pigeon. We therefore chose the American name for the sport that our game attempts to emulate — hence Skeet.

Flight Of Fancy

The line of LEDs, seen in the photographs of the game, represent the flight path of the Skeet. The ''gun'' of our game is permanently aimed at the last LED of the flight path. This means that there is no aiming involved, the object of the game being to correctly estimate the delay between ''firing'' the ''gun'' and the ''shot'' reaching the Skeet. This delay represents the time of flight for a real shot.

When the firing button is pressed the ''shot'' LED lights and the time that this remains on indicates the travel time of the ''shot.''

At the instant that the LED turns off, if the Skeet has just reached the end of its flight, a ''hit'' is registered and the ''hit'' LED lit.

Whether or not a ''hit'' was scored the LEDs representing the flight path will stay off until pressing the skeet release button starts another ''bird'' on its way.

Score With A Bird

The game is made more interesting because the speed of the Skeet varies from one flight to the next, this is where the luck, and skill come in. You cannot become used to firing the gun at the same position in the flight path as the ''bird's'' speed can be any one of eight different values determined randomly.

After eight shots the score display, blanked until now, lights up with your score out of eight. This signals the end of a round. In a competitive game, make a note of your score, press the reset button and pass the game to the ''hot shot'' competing against you. For practice games, the score need not be reset, the counter continuing to register.

Building Birdie

The majority of parts are mounted on the PCB and should be assembled according to the overlay shown. We recommend that sockets are used for mounting all of the ICs as this makes the task of any fault finding that may be necessary far easier than would be the case if the ICs were soldered directly to the PCB.

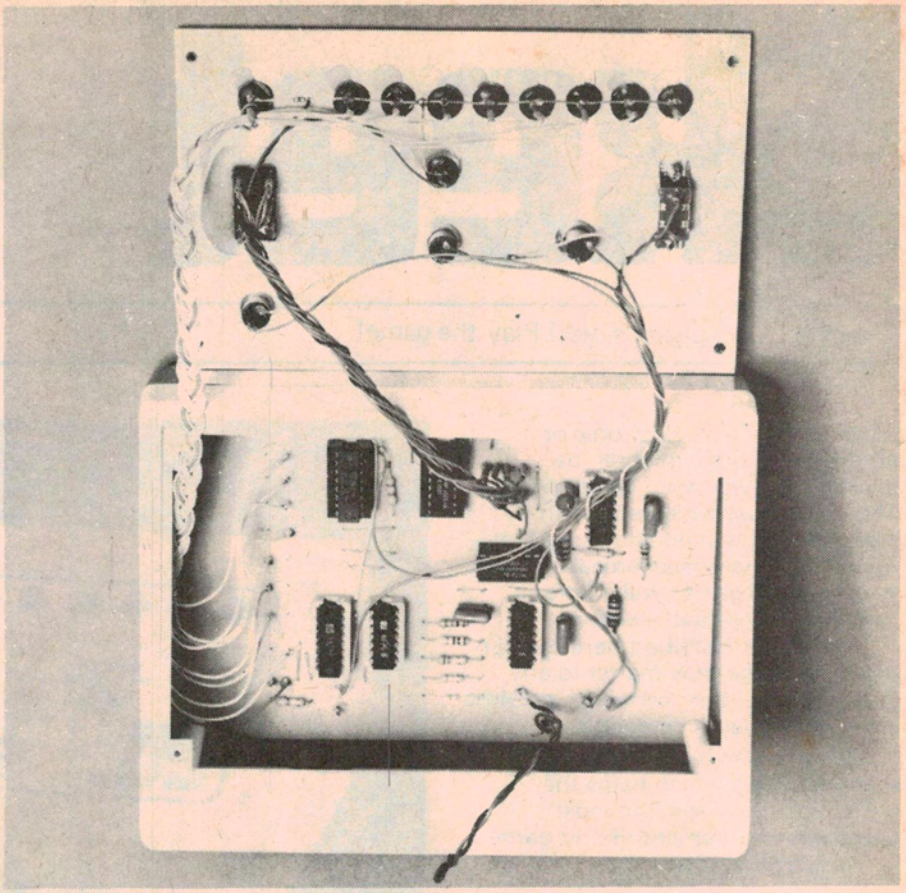
Note that the link from IC1 pin 16 to IC2 pin 16 is insulated.

The switches, seven segment display and LEDs are all mounted off-board on the front panel and wired to pins on the PCB. The layout of our game can be seen in our pictures.

Space inside the box was, as is usual in our designs, at a premium and the PP6 battery was squeezed into the back of the case, insulated from the PCB by a piece of foam rubber.

An internal view of completed unit. The wiring of the front panel switches and display to the PCB board can be seen. Note the insulated sleeve from IC1 pin 16 to IC2 pin 16 and the insulation on the wires to the display.

Below right we show the full size PCB foil pattern (140 x 105mm). ▶



The first pull

When power is first applied the condition of the various counters is undetermined. To start a game, press the skeet release button first and allow the skeet to complete one cycle. Press the reset button and you're ready to begin shooting Skeet.

PARTS LIST - ETI 806

RESISTORS all ¼W 5%

R1,9	10k
R2,7	1M
R3	220k
R4	390k
R5	820k
R6,8,11	470k
R10	10M

CAPACITORS

C1,3	100n polyester
C2	1u0 35V tantalum
C4	220n polyester

SEMICONDUCTORS

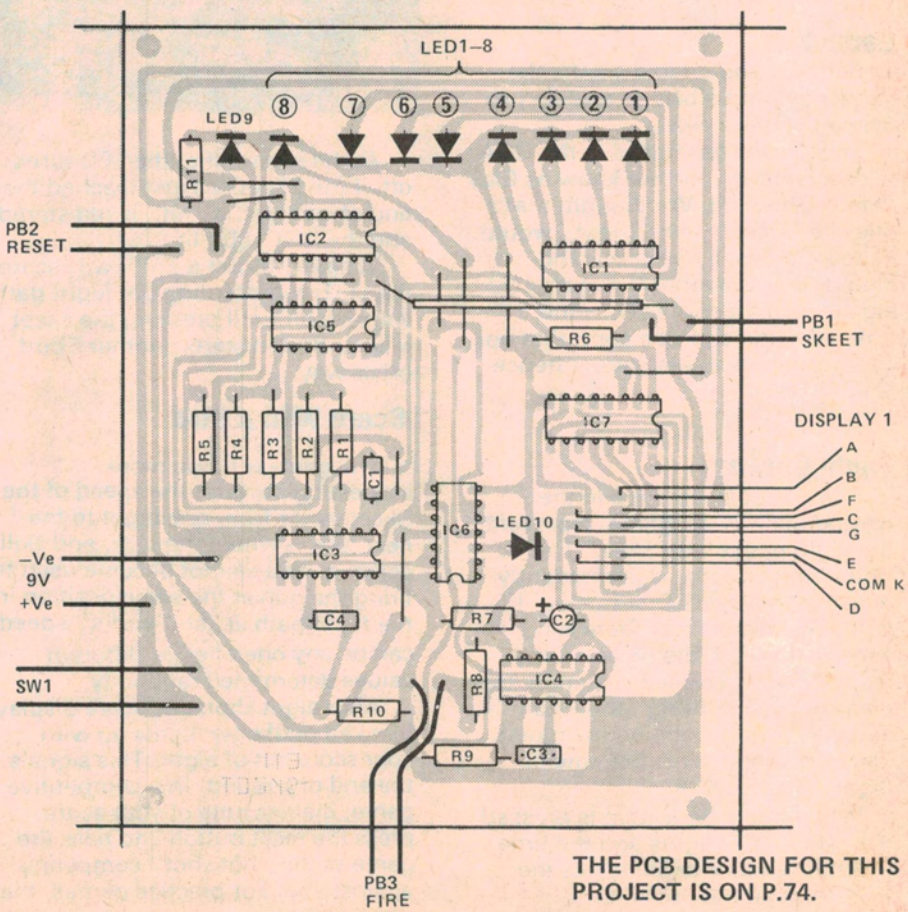
LED 1-9	.2" type red
LED 10	.2" type green
DIS 1	DL704 common cathode or similar
IC1	4017
IC2	4518
IC3,4	4001
IC5	4016
IC6	4081
IC7	4026

SWITCHES

PB1-3	Push to make push type
SW1	Single pole on/off type

MISCELLANEOUS

PCB as per pattern, PP6 battery and clip, flexible connecting wire.



Right: the component overlay for the skeet game. All the links but for that between IC1 pin 16 and IC2 pin16 may be made from uninsulated wire.

THE PCB DESIGN FOR THIS PROJECT IS ON P.74.

IC1 is a one of ten decoded counter. The "Zero" output from this IC is not used while the next eight outputs are connected to LEDs 1-8, these LEDs represent the flight of the Skeet. The "nine" output (Pin 11) is coupled to the enable input (Pin 13). This means that the counter will be disabled after it has completed one count cycle.

Pressing the skeet release button PB1 resets the counter, removing the inhibit and allows another cycle to take place.

The pulses which clock IC1 through its count cycle are derived from the CMOS oscillator formed by IC3a and IC3b.

This oscillator has the resistor which forms one of the elements in the timing chain split into five sections. Four of these sections are shunted by the transmission gates of IC5 so that they may be bypassed as required and so control the frequency of the oscillator. The remaining resistor, R1, ensures that there is always some resistance in the oscillator circuit.

The oscillator is running at all times when power is applied to the circuit.

Three of the transmission gates of IC5 are coupled to the outputs of IC2b. IC2b is one half of a dual BCD counter and is clocked by the CMOS oscillator. As IC2b clocks through its count sequence the resistance of the timing element changes altering the frequency of the oscillator.

The enable line of IC2b is tied to that of IC1, and since the enable lines of these counters require signals of opposite logic level, when one is running, the other is halted.

This enable line is also tied to the fourth gate in IC5. This straddles the largest resistor in the timing chain and so has the greatest effect on oscillator frequency.

The sequence of events during play is as follows.

PB1 is operated and so disables IC2b and latches its output. This sets the "random" speed of the skeets flight as IC1 is now enabled and is clocked by the oscillator's output.

When IC1 reaches the count of nine, it is disabled and IC2b in turn enabled. IC2b then cycles through its count sequence changing the oscillator's frequency ready for the next skeet flight.

The fact that IC5d is tied to the enable line means that the oscillator runs much faster when performing its "random" frequency selection function than when controlling the flight of the skeet.

The "gun" consists of two CMOS monostables in series (IC4). The first one has a time constant representing the time of the shot travel to the target. It drives a LED via buffer IC6a to allow timing judgements during play.

The second one shot provides a short pulse after the first is complete. This is the "shot" pulse.

This pulse is AND-ed (IC6c) with that from the "eight" output of IC1 to produce the "hit" pulse.

This pulse is applied to the score counter (IC7) and, via a pulse stretcher (IC3c, IC3d), to the hit LED (LED 9).

IC2a is the other section of the BCD counter and is clocked from the "eight" output of IC1. This IC is used to count the total number of skeet flights.

This BCD counter is arranged to blank the score display, via the enable display pin of IC7, until it reaches a count of eight. At this stage the Q3 output will enable the display and inhibit further clocking of the counter.

Lighting of the score display signals the end of a game.

The buffers (IC6a, IC6b and IC6d) are required because while a CMOS output will drive a LED directly, as LEDs 1-8 are driven from IC1 the load that the LED presents brings the CMOS output to below an acceptable "1" level.

Thus if the output is not used elsewhere in the circuit we can drive a LED directly, but where the signal is required to drive other gates we have used a buffer. ■

Circuit diagram of the Skeet game.