SHARK!!

Shark game brings you the sun, surf and sand. All electronic; add absolutely no water!

OVERTIRED, TENSE, NERVOUS HEADACHE? Then this is the game to really send you over the edge. Featuring fingertip control, it is the ideal toy for the squeamish, hydrophobics and non-swimmers. It takes the shark out of water and the mess out of being devoured.

The top panel has two columns of ten LEDs leading to a tropical island. One LED lights in each column to indicate the swimmers' progress towards the safety of the island. Two push buttons are mounted, one either side of a central LED which represents the shark's fin. The power switch, reset button and 'lose' alarm are mounted on the small front panel while a PCB accommodates most of the other components.

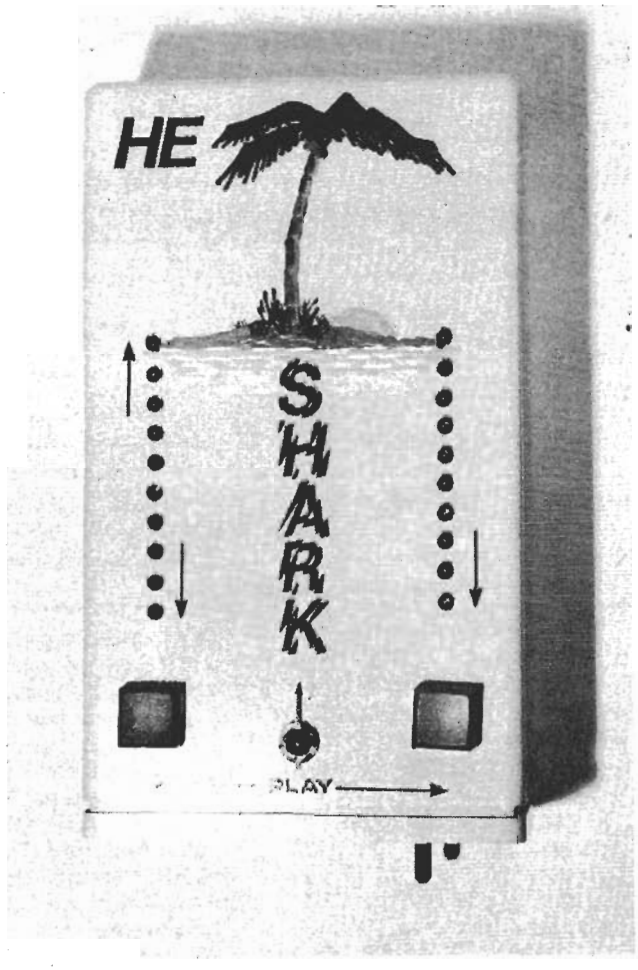
A Bigger Splash

To play, after pressing reset, each player must depress his pushbutton switch for as long as possible while the single 'shark's fin' LED remains lit. This causes his swimmer to appear and begin moving towards the island. Short depressions or failure to play at all will result in that swimmer moving only slowly or not at all. A depression while the LED is extinguished causes the swimmer to slip back towards the shark.

The winner of the game is the player whose swimmer first reaches the safety of the island when the 'lose' buzzer will sound for his opponent and both columns of LEDs will light, the highest indicating the winner.

What! No Chips?

It has often been remarked that most electronic games can be reduced to one; find the 4017. It is true that this chip has been overused and we are pleased to say that this game is an outstanding exception. Featuring a hybrid mixture of analogue and digital circuit techniques it is based on the LM3914. This little known chip from National is an LED dot/bar bargraph display driver and comes in an eighteen pin DIL package. It is very simple to set up and use. LED display current and full scale range are programmable by selection of a couple of resistors and individual constant current outputs remove the need for limiting resistors and tedious LED selection which was necessary with previous devices of this type. CMOS analogue transmission gates are used to multiplex the two signals to the bargraph chip input. This keeps the unit's cost down without sacrificing performance or increasing circuit complexity too much. Any size and colour of LEDs may be used. We used miniature green for one column and red for the other with a yellow standard 0.2" LED for the shark fin. The driver chip sinks about ten milliamps through each LED.



The case for Shark was made from a Vero box, the artwork on the case makes it look very attractive.

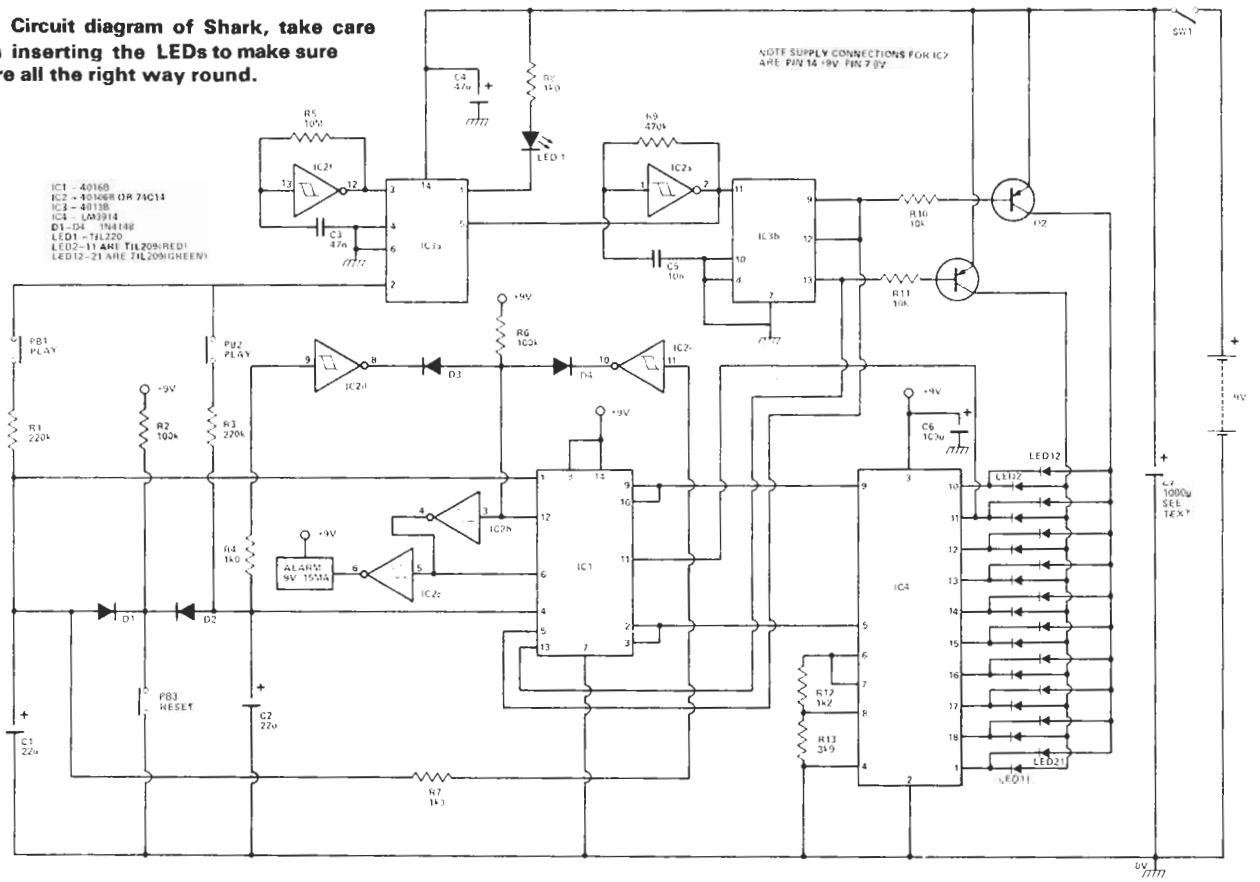
Construction

Construction of the game is greatly simplified if our PCB is used. As the components are closely packed on the board, the PCB tracks have to be made quite thin, so take care when soldering that no excessive heat is applied to any section of the board.

Begin construction by inserting all vero-pins and links followed by IC holders, resistors, capacitors and semiconductors paying attention to the orientation of all polarised components. To allow more space on the PCB, C7 has been mounted off board beside the battery and is held in place by a sticky pad as shown in the internal photograph of the game. The solid state buzzer was glued into position against the front panel of the case.

To complete construction, mount the switches in

Fig. 1 Circuit diagram of Shark, take care when inserting the LEDs to make sure they're all the right way round.

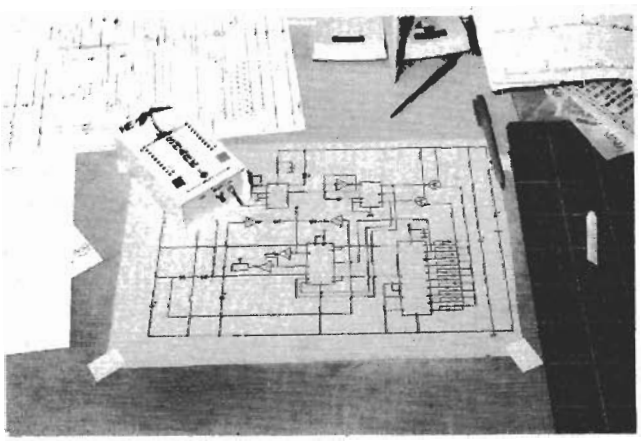


HOW IT WORKS

Each competitor's progress is represented by the charge on C1 or C2. These capacitors are initially discharged at the start of a game by depressing 'reset'. The 'shark's fin' LED is on when the Q output of IC3a is low. During this time the Q output (pin 2) is high and C1 or C2 can charge via R1 or R3 if the corresponding play button is depressed. If the switch remains closed when the output goes low then C1, C2 will discharge. To introduce a degree of chance into the game, the state of IC3a and the 'shark's fin' LED depends on the logic level from fast clock IC2a which is present at the data input (pin 5) during the rising edge of the slow clock signal from IC2f.

IC4 drives the LED displays in dot or bar format according to the state of two of the transmission gates in IC1. These are in turn controlled by the 'OR ed' outputs from IC2d and IC2e and the inverted signal from IC2b. When the voltage on C1 or C2 rises above the transition level of IC2d or IC2e, the display changes from dot to bar mode, one column of LEDs lights and the 'lose' alarm sounds indicating a completed game.

To conserve power and keep construction costs down, the input signals to IC4 from C1, C2 are multiplexed by transmission gates in IC1. These are controlled by the antiphase Q and Q signals from IC3b which also control the LED driver transistors Q1 and Q2. C6 helps to prevent possible oscillations at the output of IC4 while C7 smooths the whole supply and prevents false triggering of IC3.



position and insert all LEDs. It is wise at this point to confirm their polarity. For the Texas TIL 209 series the flat on the body denotes the cathode. Most of the interwiring is concentrated between the LEDs and the PCB so extreme care and attention should be exercised. Flying leads should be taken from the PCB to the case mounted components and the battery fitted. There are no adjustments to make and the circuit should work first time so switch on and swim for your life! ●

PARTS LIST

RESISTORS:—

R1, R3	220k
R2, R6	100k
R4, R7, R8	1k0
R5	10m
R9,	470k
R10, R11	10k
R12	1k2
R13	3k9

CAPACITORS:—

C1, C2	22µ 10V Tantalum
C3	47n polyester
C4	47µ 10V Tantalum
C5	10n polycarbonate
C6	100µ 10V Tantalum
C7	1000µ 10V Electrolytic, (PCB mounting — see text)

SEMICONDUCTORS:—
(All CMOS ICs are 'B' series)

IC1	4016
IC2	40106 (74C14)
IC3	4013
IC4	LM3914
Q1, Q2	MPS6523
D1—D4	IN4148

LED 1 — Standard yellow (0.2" dia.)
LEDs 2-11 are TIL 209 red (0.125" dia.)
LEDs 12-21 are TIL 211 green (0.125" dia.)

MISCELLANEOUS:—
SW1 — SPST Min. Toggle.
PB1—PB3, push buttons momentary action
Audible alarm, 9V @ 15mA.
Vero case — Series 2 casebox No. 65-2066A.
PP7 Battery.

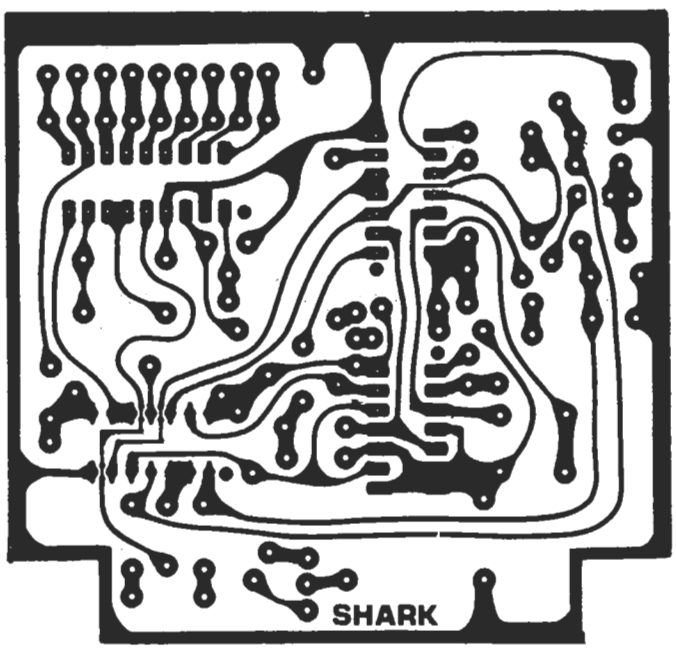


Fig. 3. PCB foil pattern for Shark, using a PCB will lessen the amount of interwiring that has to be made.

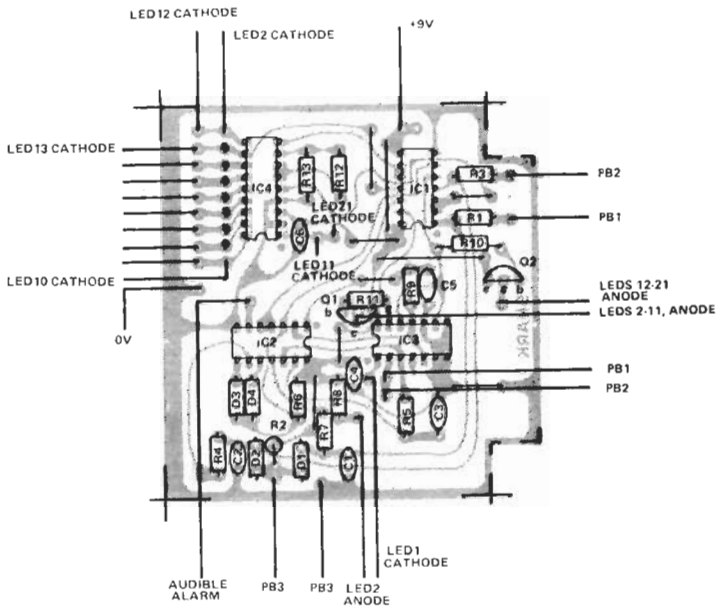
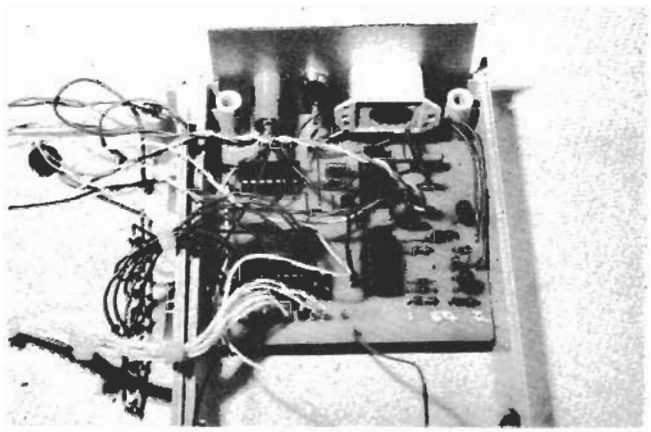
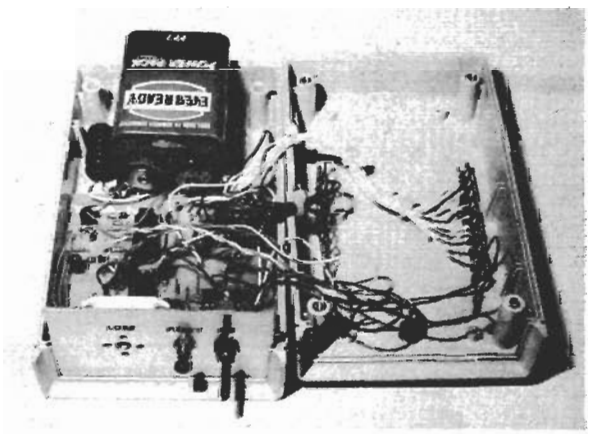


Fig. 2. PCB overlay for shark. It's a good idea to use IC sockets.



Inside Shark, you can see the buzzer that operates when the shark catches the luckless swimmer.



The case of Shark opened for inspection, using a large battery ensures the game will not suddenly die on you. Note C7 mounted next to the battery, using a PCB type makes the wiring easier.