Project 813

Race Track Game

We're not really taking a gamble with this game – we know you'll like the project!

THE DESIRE TO place bets upon almost any event, from the outcome of the Melbourne Cup to the likelihood of life on other planets, is a deep seated one in many Australians. That old joke about the guy who bet his friend a couple of quid that he can give up gambling for a week would not be amusing but for the fact that it were so near the truth.

Three Way Bet

Bets fall into a number of different categories. They may be made on disagreements of fact ('I bet mine's bigger than yours'), about events capable of being modified by skill or lack of it ('I bet I can get mine further than yours'), or bets made upon random events (the mind boggles!).

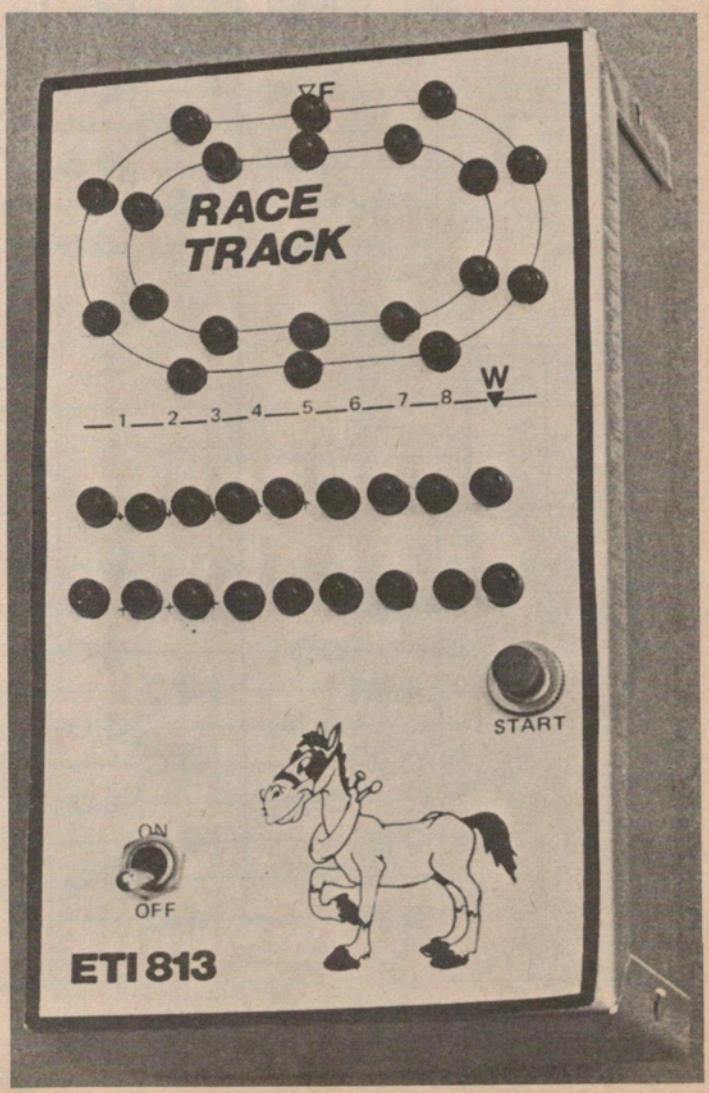
It is this latter type of bet, the toss of a coin, cut of a card or spin of a roulette wheel, that is probably the most popular form of gambling amongst groups of people our race track game provides an exciting means of indulging in this type of activity.

The game is really a development of the well known 'heads or tails' type of game, but whereas most games of this sort are visually unexciting, the race track game more than makes up for any shortcomings in this area!

They're In The LED

When the game's reset button is pressed all the LEDs are off and the 'horses' line up at the starting post. Now is the time to choose a horse and place bets if you wish.

Releasing the button starts the action



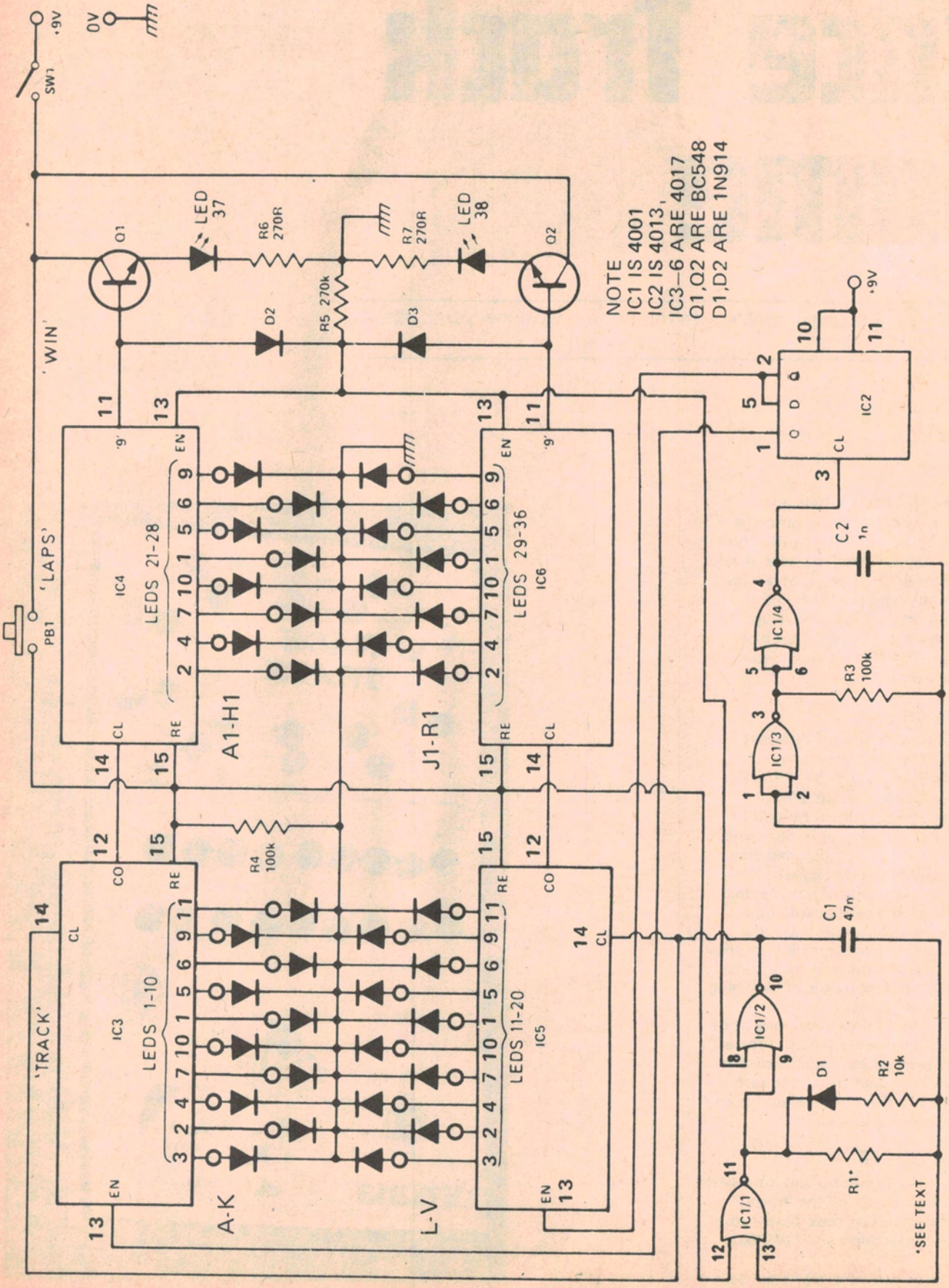


Fig. 1. Circuit of the race track game.

with the circles or LEDs representing the 'horses' starting to flash as first one horse then the other takes the lead. As each horse completes a lap the appropriate lap LED lights. The first horse to cross the finish line lights his 'win' LED and halts the racing horses. If lady luck did not smile on you this time, pressing the reset button gives her, and you another chance.

Construction

Mount all the components on the PCB as indicated in our overlay diagram. We recommend that sockets are used for ICs 1–6 as these are CMOS devices and should not be placed in circuit until all constructional work is complete. The LEDs are hard wired to the PCB and the interconnection information is given in Tables 1 and 2. Note that LEDs 37 and 38 have their cathodes taken to 0 V via R6 and R7 and not directly to ground as the rest.

The value of R1 should be selected to give the best display on the race track. A value somewhere between 4M7 and 10M should suit.

Now is the time to turn on, place your bets and probably lose your shirt.

HOW IT WORKS – ETI 813

The circuit uses two oscillators each based on two of the NOR gates in the 4001 quad NOR CMOS package. One of these (ICI/3 and ICI/4) runs at a high frequency and its output is fed to the input of one half of a 4013 Dual D type flip-flop. The device divides the output of the high speed oscillator by two and provides two signals that are 180° out of phase at its Q and Q outputs. These signals enable either IC3 or IC5, the ICs being enabled if their enable input is held low.

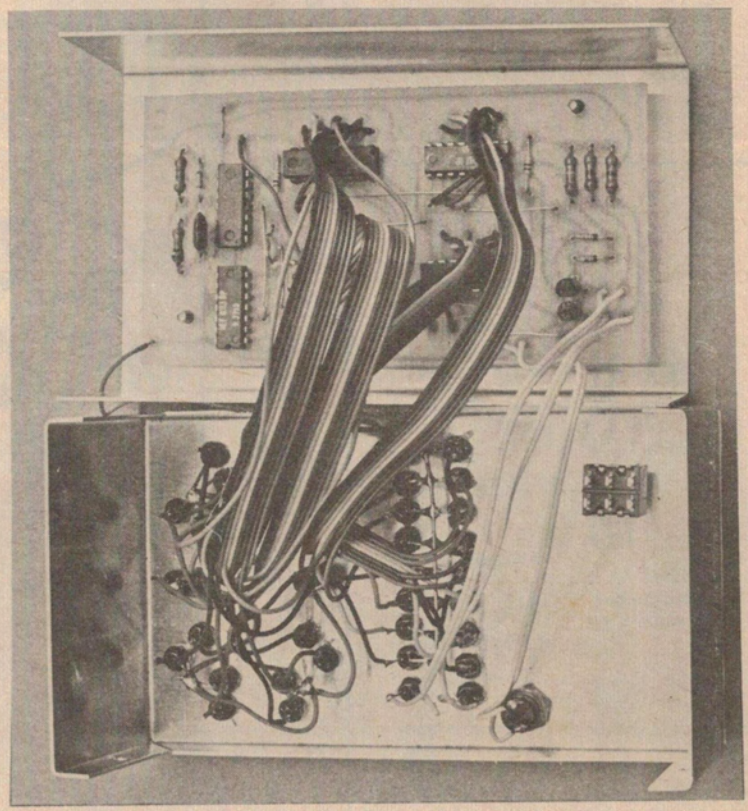
The second oscillator based on IC1/1 and IC1/2 runs at a lower speed and is arranged to provide a non-unity mark space ratio, in fact a very short "high" output followed by a much lower "low". This non-unity mark space ratio is achieved by the inclusion of D1 in the oscillator's timing network. This second oscillator can be gated on and off by signals to be described below.

Circuit action is as follows. PB1 is closed and this resets all the counters to zero as well as inhibiting the slow running oscillator. Upon releasing PB1, IC3 or IC5 will be clocked as the first positive pulse is generated by IC1/1 and IC1/2. Which counter is incremented will depend upon the state of IC2's outputs.

In general as the two oscillators are out of phase the counters will appear to be clocked in a random manner. A further random element is introduced because while a 4017 is normally clocked with positive going pulses at the clock input with enable held low, it is possible for it to be clocked with a negative going pulse at enable while clock is high. Thus occasionally IC2 will act as a clock.

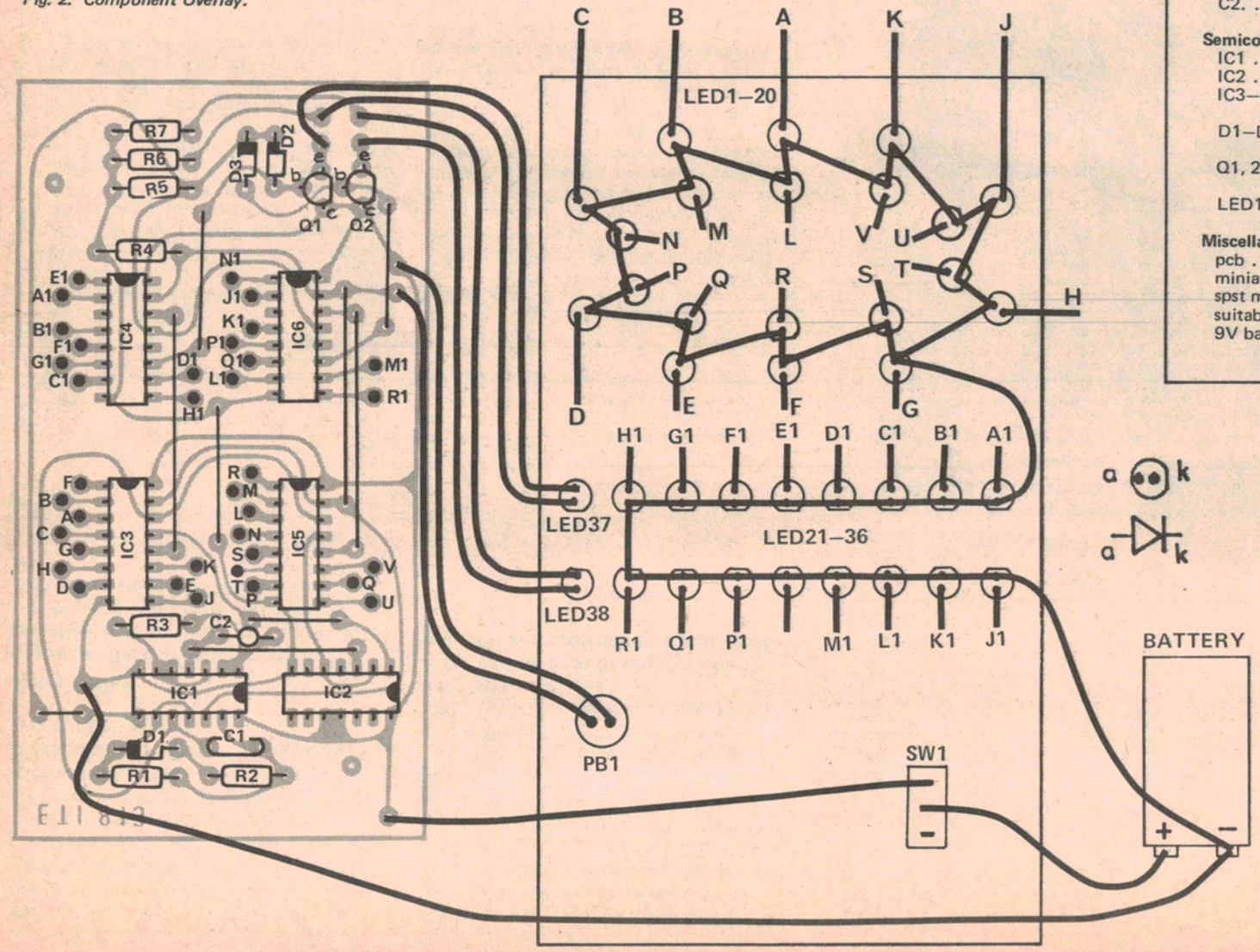
At the end of a lap a pulse is generated from the carry out (CO) output of either IC3 or IC5 and is used to advance the lap counters (IC4 and IC6).

The game ends on the ninth lap when the '9' output of either lap counter goes high. This turns on either Q1 or Q2 and in turn lights the appropriate win LED. The signal from either '9' output is ORed by diodes and this signal used to halt the game by disabling the slow running oscillator.



The completed unit showing the interconnecting wiring between the pcb and the front panel.

Fig. 2. Component Overlay.



PARTS LIST – ETI 813

Resistors all ¼W, 5%
- R1 . . . . . see text
- R2 . . . . . 10k
- R3, 4 . . . . . 100k
- R5 . . . . . 270k
- R6, 7 . . . . . 270R

Capacitors
- C1. . . . . 47 n greencap
- C2. . . . . 1n0 greencap

Semiconductors
- IC1 4001
- IC2 4013
- IC3–IC6 4017
- D1–D3. . . . . 1N914
- Q1, 2 . . . . . BC548
- LED1–LED38 . . Red LEDs

Miscellaneous
- pcb . . . . . ETI 813
- miniature pushbutton
- spst miniature switch
- suitable box
- 9V battery and holder