ELECTRONICS

ANDING ELECTRONICS

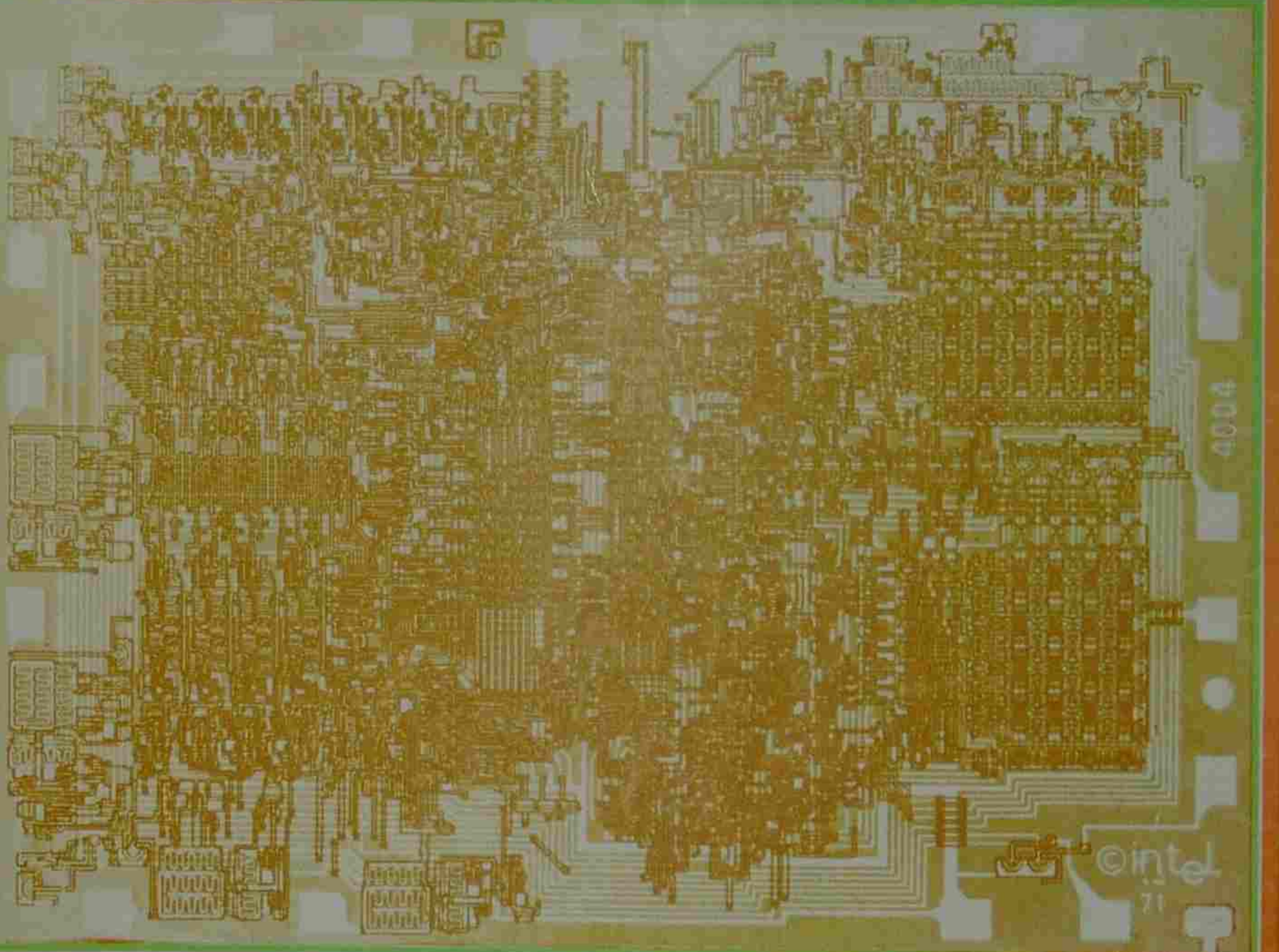
$1.80 ★

$2.40 NZ

LECTOR

Issue No 9

PERCENTILE DICE



STEREO MIXER
DIGI CHASER
8-watt POWER AMPLIFIER
TRAFFIC LIGHTS FOR MODEL RAILWAYS
VIC-20 CLUB

TALKING ELECTRONICS

Editorial...

VOL. 1 No: 9.

Recently we had need to increase our staff. The demands put on the present members of staff were too great. So we turned to the first medium to come to mind. Advertise in the daily paper under Vacancies.
Obviously enough, the response was not astounding. After all, we did not advertise *"$400 per week, NO skill needed"*. We required an electronics expert with a thorough understanding of Digital Principles. Maybe the advert was too vague because we received 40 - 50 calls of which 90% could not describe a 1N 4002, a CD 4017 or a 555!

What has happened to the teaching of electronics?

Some of the applicants said they were attending first or second year electronics courses. How could you go through a year of electronics and not come across a simple power diode?
Fortunately, I know most readers of TE will be saying to themself "why didn't you let me know?" As it happens, the requirements and qualifications would be far and beyond the knowledge already presented in the magazine. . . we are already working on a baby micro-computer for under $100, using the Z80 chip. The understanding of machine language for this project would need to be one of the basic requirements.
So, maybe in a year or so, you will be in the qualifying bracket. Also you would need to live close-by and put up with a room full of non-smokers.
This incident brought home a drastic need. That of a practical digital course in Secondary Schools. We are working on it and in the interim, hope these pages of the magazine will provide a starting point for more students to grasp the basic concepts of electronics.
Never fear, we will be putting out feelers at a later date for design and construction personnel. Watch the papers, you may see our 3 line advert amongst the hoards of "con" adverts, and recognise us by the phone number.

Before I go, don't forget the phone enquiry service. Ring anytime. Lots of readers do. We can help you in a couple of minute if it's an STD call. Also you can order any of the kits and bits by Bankcard over the phone.

Until the next issue with the computer . . . . . .

Colin Mitchell.

TECHNICAL

Ken Stone

ARTWORK

Paul O'Callaghan

ENQUIRIES

10 Minute queries will be answered on 584 2386

ADVERTISING

Talking Electronics (03) 584 2386

PUBLISHER

Registered by Australia Post
Publication Number VBP 4256

TALKING ELECTROICS is designed by Colin Mitchell of CPW INDUSTRIES, at 35 Rosewarne Ave., Cheltenham, Victoria, Australia. 3192. Articles suitable for publication should be sent to this address. You will receive full assistance with final presentation. All material is copyright. Up to 30 photocopies for clubs or schools is allowed. But not on a regular basis!

Printed Web Offset by Std News.

Distributed in Australia by Gordon & Gotch.

***Maximum recommended retail price only.**

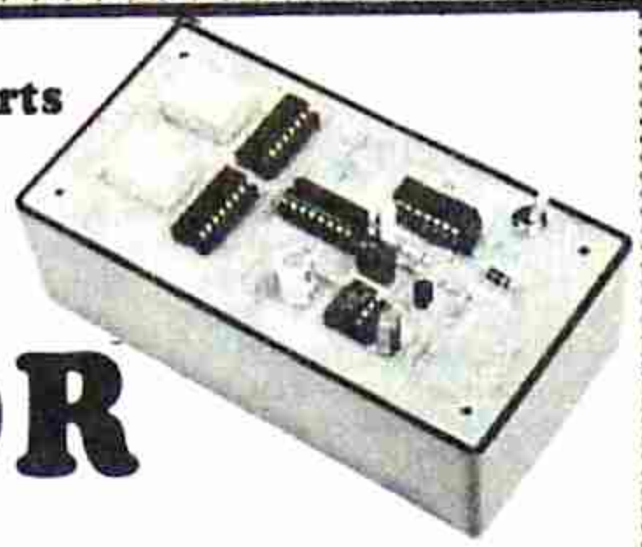
INDEX

Our Cover: Microphoto of an early Intel 4-bit Micro-processor

Ken's Tanya using our LOTTO SELECTOR.

LOTTO NUMBER SELECTOR

$11.50 Parts
$2.95 PC board



USE OUR LOTTO SELECTOR TO WIN A FORTUNE!

This project is a real winner - in more ways than one. When you understand how the circuit works, it is really 4 projects in one. And it has two modes of operation: MANUAL and AUTOMATIC.

Everyone likes a little flutter. The recent introduction of so many outlets in competition for the gambling dollar is positive proof of this.
Every week the total prize pool for these games rises and this alone must draw in many new customers.
The possibility of winning something for nothing lures even the most cautious person into buying a ticket.
Nothing has been more successful than LOTTO.
The concept of choosing your own numbers is brilliant. It has fooled the greater percentage of punters into thinking they are closer to picking a winner by this method, than buying a pre-numbered ticket.
Although nothing could be further from the truth, no amount of explanation will deter the avid investor from his weekly punt.
So, rather than being against them, we have decided to join forces and produce our contribution to selecting a winning combination. . . we have called our electronic number predictor:
LOTTO NUMBER SELECTOR.

This is our cover project. It will almost certainly create a fortune for someone and provide lots of fun in construction and operation.
Our circuit is a real gem. It looks simple but lurking within the 5 chips are a number of interesting building blocks.
The most significant feature of the circuit is the absence of 14 display resistors. Both the 4511's are display drivers and under normal conditions, a set of dropper resistors would be required. We have designed our circuit to eliminate them.
At the other end of the electronics ladder we have used a single-pole switch with a centre off to provide 2 functions.
To achieve ths we have had to insert the switch in the negative line. All these features are fully explained in the following pages.
For now, lets look at some of the mis-conceptions of chance.

- ★ LOTTO or POOLS selector - to help you win a fortune!
- ★ Single or Dual dice for games such as Monopoly.
- ★ Percentile Dice for war games or other strategy games.
- ★ As a random number generator for pure amusement.

THE EFFECT

When the power switch is turned on (to either MANUAL or AUTOMATIC), the two displays will show two figure '8's'. These will gradually slow down to a flicker and numbers will start to flick onto the displays. This will slow-down even further until double numbers can be identified. Finally, a random number will remain on the screen.

A BRIEF SUMMARY OF HOW THE CIRCUIT WORKS

When the switch is turned on, a Schmitt trigger oscillator supplies a 10kHz signal to a 4518 chip. This is a divide-by-ten counter with 2 separate stages. The output of these is in binary and these 4 lines of binary are fed to individual display drivers.
The numbers appearing on the two displays are randomly generated due to another slow cycling oscillator providing the halt condition. Between each number appearing on the screen, the high speed oscillator is generating up to 40 clock counts.

TWO-UP!

Take a simple penny (we will have to convert to a 20c coin for the younger readers however a penny has much more feeling and authenticity when it comes to gambling). A penny was used anywhere from a cricket field to the bar in a hotel for decision making. It provided answers to complex questions such as "who will shout next", "who bats first" or "who pays the taxi fare".
The chance of a coin landing heads is 50%. Thus it is obvious to everyone as being a fair way of solving a dispute.

A die or dice is also used in decision making and the chance of scoring a high number is one-in-six.

These are easy figures, However if I asked about the probability of selecting 6 numbers from a total of 40, most people would give an answer which would be so far from reality that they would be astonished.

Very few people understand high numbers. As proof, try a friend with this simple problem. Take a sheet of paper and tear it in half. Place the two halves on top of each other and tear the stack again. Repeat the operation 20 times. How high do you think the pile of paper will be? If I said it would reach the moon, would you be impressed? Such is the enormity of multiplication.

Because it seems so utterly impossible to create an enormous possibility with just 40 insignificant numbers, LOTTO has taken off from its very inception, and never looked back. Chance and probability is a fascinating mathematical study. One which can engrose a dedicated mathematics student for his entire life.
The pseudo study of probability has been the downfall of many a punter as everyone thinks he or she is a good predictor.
Without the correct mathematical data, the casual backing of 'hunches' or 'certs' will eventually bring the novice to bankruptcy.

It is only by using probability correctly that you will increase your winnings. However the gain rate is only 2 to 5 per cent and few people are happly with low margins. They want big wins and quickly!

Don't think I am encouraging this form of wager. Just because I have presented a Lotto Selector does not indicate my acceptance of gambling of any kind. And yet by stating that, I am a hypercrit. Life is a gamble. Running a business is a gamble. Even driving to work or buying a product is a gamble.
Gambling itself is not a danger. It is only the excess of gambling which leads to ruin.
So, away from the preaching.

If you are against any form of gambling, you can use the LOTTO project to play a number of harmless games.
The two readouts can be considered a dual dice, in which the numbers 1 to 6 are used and any other numbers are ignored.
Other games such as war games or MONOPOLY require percentile readout and both digits can be used.
On the other hand you can use it on a personal basis to guess the next number to appear. With the switch set to the automatic position, you can use the project as a guessing game.
This is even more dramatic in a darkened room where the display will give the best results. You can even use it as a sleep inducer and try to stay awake until the batteries run down!

HOW THE CIRCUIT WORKS

THE SCHMITT OSCILLATOR

The heart of the LOTTO SELECTOR is a free-running oscillator. This is made up of a Schmitt trigger between pins 13 and 12 of the 74c14. It oscillates at approximately 10kHz due to the value of the frequency-setting components: the 10n capacitor and 4k7 resistor.
The output of the oscillator has a very short duty cycle due to the presence of the 1N 914 diode. This means the ON time for the output is very short compared with the OFF time. The charging time for the 10n capacitor is provided by the diode and because it has a very small voltage drop, the capacitor is charged very quickly.
When the capacitor charges to ⅔ of the rail voltage, the trigger changes state and the output goes LOW. The diode is not reverse biased and does not have any effect on the discharge of the capacitor. The discharge time is provided by the 4k7 resisitor and these two components are the frequency-setting items. The discharge-time to charge-time is appproximately 25:1. This duty cycle will not affect the counting of the decade counter chip (4518) but is as essential part of a very clever design. More on this later.

The 10kHz signal is passed to the clock pin of one half of the 4518. This chip is a decade counter and will divide the incomming pulses by 10. It is designed to give a readout of the numbers 0 to 10 in binary form and this requires 4 output lines as shown in the diagram.
The highest priority line (pin 14) is then taken to the clock input of the second stage. The result is a counter capable of counting to 100.

Each of the outputs consist of 4 lines of binary information of a decimal number. Thus it is called BINARY CODED DECIMAL.
These outputs are passed to a 4511 display driver chip which is designed to convert the binary information to 7 lines of information to drive a 7-segment display. One chip is fully employed doing this because of the number of pins required.
Another feature of the 4511 is the LATCH or FREEZE capability.
A number can be frozen on the display while another is being set-up on the input lines.
Two pins control this effect.
One pin (pin 4) is called the BLANKING INPUT pin. It has the effect of turning off all the segments when it is LOW. This means it is ACTIVE LOW. (It produces an effect when it is LOW).
The other pin (pin 5) is the LATCH ENABLE pin. It produces the freeze effect when it is HIGH because it enables the latch (opens the latch) when it is LOW.
This is what happens: If pin 4 is LOW, you will not be able to see anything on the display at all. When it is HIGH, the figure on the display will depend on the values of the incomming BCD lines and also the state of the LATCH ENABLE pin number 5.