

**Introductory unit comes as a kit . . .**

# Mk 14 Micro Computer

Designed around the SC/MP microprocessor chip, the MK 14 Micro Computer from Science of Cambridge Ltd (England) is a fully functional microcomputer system for the novice. Main features of the unit include 256 bytes of RAM and 512 bytes of ROM, with room for expansion of the RAM to 512 bytes. An 88-page Training Manual is included in the basic price.

**by GREG SWAIN**

The Mk 14 Computer is based on the SC/MP chip, an 8-bit microprocessor made by National Semiconductor. It comes as a kit of parts and is primarily intended for training and evaluation.

One objective of the kit, as implied in the accompanying Training Manual, is to introduce the novice to microcomputers and programming. Just how successfully the system does this we shall see later on in the review. Let's first take a look at what you get with the kit, and how it all goes together.

As supplied, the kit includes all the parts needed to make a complete working microcomputer. Standard hardware includes the SC/MP chip, 256 bytes of RAM (2 x 2111s), and 512 bytes of ROM which houses a resident monitor program. There is provision on the board for expansion of the RAM capacity to 512 bytes, should this amount of memory be required.

Provision is also made on the board for the Mk 14 to accept a 40-pin RAM I/O device, type INS8154N. This device can be added without any additional modification, and provides the user with a further 128 bytes of RAM and a set of 16 lines which can be used utilised as inputs or outputs in any combination.

These 16 lines are divided into two groups, designated Port A (8 lines) and Port B (8 lines). Both are brought out to an edge connector.

Clock requirements for the Mk 14 are met by a 4.43MHz crystal connected across the on-chip oscillator contained in the SC/MP microprocessor. The display consists simply of a small 9-digit 7-segment LED readout of the type often found on electronic calculators. Only eight digits are available for use.

Assembly of the kit is fairly straightforward, although the construction notes are rather sparse and, in some places, a little confusing. For example, resistors R4 and R6 are specified (in the

component list) as 1.2k. These may in fact be any value between 1k and 15k, and 5k types were supplied in the case of the kit we assembled.

Again, nowhere in the construction procedure does it tell you to solder in the crystal. And resistors R11 — R14 are wrongly labelled on the component placement diagram. They should be labelled R12 — R15.

All components, including the keyboard and the display, mount on a double-sided, plated-through fibreglass PC board measuring 115 x 255 mm. Assembly is greatly simplified by the fact that the board is coded and pre-tinned, and it only took us about 2 hours from unpacking to switch-on. Our unit worked as expected, but only after we thought to go back and make the corrections set out in the amendment slip!

We suggest that you carry out the corrections first to avoid being caught like we were.

Most of the parts supplied in the kit seem of good quality. However, in our opinion this is not the case with the keyboard assembly. This consists of four parts: a keyboard separator made of self-adhesive clear PVC, a contact sheet of conductive silicon rubber, a legend sheet, and a keyboard panel. These components are held sandwiched together on the PC board by four plastic "press-fit" buttons.

In use, the conductive silicon rubber is meant to make contact with PCB pads through a hole in the keyboard separator whenever a key is pressed. This arrangement makes the keyboard both tiring and difficult to use. A great deal of pressure must be exerted on the key to ensure reliable contact, and key "feel" is virtually non-existent.

In our case, the press-fit buttons also proved inadequate for the task of holding the keyboard assembly firmly in position, and we had to substitute

machine nuts and bolts. If you choose to do the same, make sure that the nuts don't foul the copper pattern on the underside of the PC board.

All in all, we believe the keyboard assembly can only be described as "crude". It detracts considerably from an otherwise neatly presented product.

Power supply requirements for the Mk 14 are +7V (minimum) at 400mA for the basic kit. A further 50mA is required to drive the optional RAM I/O IC, while the optional RAM complement would require another 30mA.

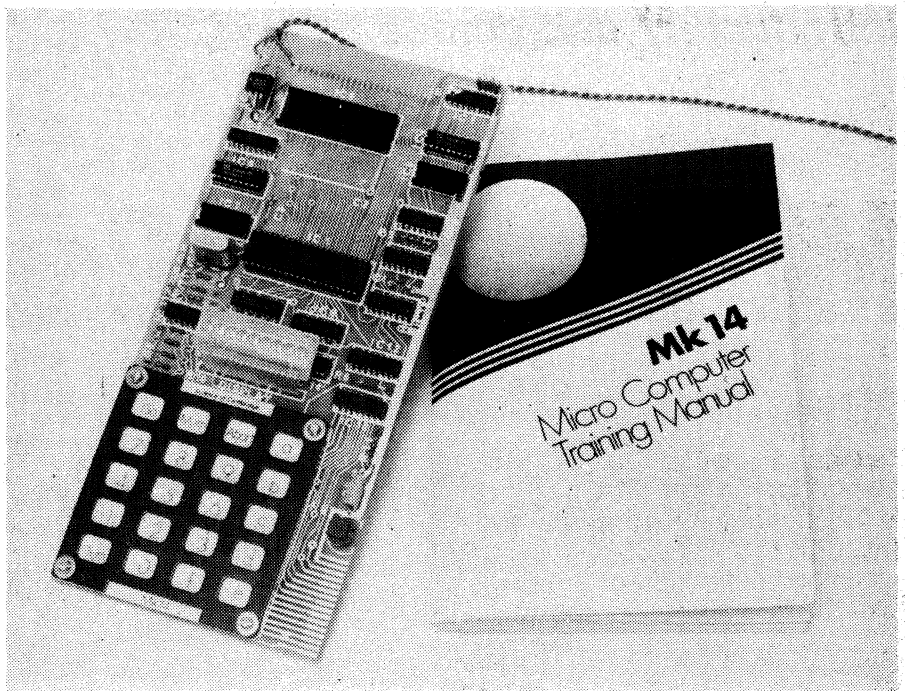
With the unit "up and running", we proceeded to the "Usage Familiarisation" chapter in the Training Manual. Here the user is shown how to examine the contents of the monitor program, and is introduced to some basic keyboard exercises. A step-by-step procedure is used to show how data is keyed and placed in RAM, and how the various RAM locations are stepped through and the contents checked.

The chapter rounds off by showing the user how to enter and run a small program.

One of the things we discovered in this part of the manual is that there is an error in the section on examining the monitor program. When the "MEM" button is first pressed after switch-on the address displayed is location 0001, not location 0000 as stated.

Other chapters in the Training Manual describe the basic principles of operation of the Mk 14, give the architecture and instruction set of the SC/MP microprocessor, and provide brief program notes. This is where the novice is likely to become frustrated. Many of the concepts introduced are not adequately explained; nor is the would-be programmer told how to use them.

The novice is unlikely to know what happens, for example, when you in-



The Mk 14 Micro Computer and its accompanying Training Manual. We recommend that a heat sink be fitted to the regulator IC, as this can become quite hot.

struct the system to "Load AC from Extension" (load accumulator from the extension register). Nor the circumstances in which the instruction is used, or why you would want to do it.

As a novice myself, I was puzzled as to how the pointer registers are used, and for what. Further, why should the "add" instruction be preceded by an instruction to clear the CY/L? What is a base code modifier? Why does Op Code=Base + m + ptr + disp? None of these questions was answered.

So don't think that the Mk 14 system will have you writing programs painlessly and quickly. It won't!

Of course neither will any other microprocessor evaluation system currently on the market, as far as I have been able to find out. So I guess we shouldn't be too hard on the Mk 14; it's no worse than the others. Perhaps all I'm really expressing is disappointment, that it's no better.

I must comment about the strangest chapter of all in the Training Manual. This is chapter 7, entitled "Mk 14 Language — Binary and Hexadecimal". Would you believe that this chapter makes no reference to hexadecimal numbers at all, other than in the title?!

Part 2 of the 88-page manual is far more useful. It begins with a complete listing of the monitor program, and follows with no less than 22 applications programs. Some of the programs are as follows: multiply, divide, digital alarm clock, single step, Moon landing, duck shoot, mastermind, function generator, organ, and reaction timer.

The Moon landing game for example, simulates the landing of a

spacecraft on the Moon. The displays represent the control panel and give a continuously changing readout of altitude (3 digits), rate of descent (2 digits), and fuel remaining (1 digit). The object of the game is to touch down gently, and to achieve this the player has control over the thrust of the rockets.

We fed the Moon landing program and several other programs in the Training Manual into the Mk 14, and all worked as expected. A couple of small points about the Moon landing program though. First, the value of the delay constant at location 0F3A should be increased from 02 to 07 for a 4.43MHz crystal (the value listed in the program is suitable for a 1MHz clock). Second, the memory location listed as 0FBC should read 0FBD.

Our overall reaction to the Mk 14 system is somewhat mixed. On the one hand, it provides an easy introduction to some of the basic terminology and to practical keyboard use. The novice is quickly taught how to enter, correct and run programs, and, in some cases, how to alter certain program parameters. Full marks here.

On the other hand, the system fails to dispel many of the real mysteries of program writing. That is something that will only come to the user gradually, and after a lot of hard work. Some basic exercises on programming, together with detailed explanations, are needed to keep the novice progressing at a satisfactory rate.

The Mk 14 Micro Computer is available from Consolidated Marketing Corporation, 208-312 High St, Kew 3101. Price is just over the \$100 mark.