

# ELECTRONICS TOMORROW

by John Miller-Kirkpatrick

LAST MONTH I, very foolishly, announced that the SC/MP Introkit was priced at £50 (which it isn't!). It is REALLY £54.50 plus 8%. The WORST thing that I did was to mention the pseudo-TTY unit called the Telekit which was also supposed to be about £50. It isn't. The prices being quoted for it are in the range £160-£200 and you can build your own for less than that!

One of the main problems with all of the instant MPU kits on the market is that they all require a TTY teletype in order to communicate with the KITBUG or BUGBUG program supplied with the kit. These programs are supplied in PROM form and thus it is rather difficult for the average user to reprogram the kit, especially as you have not been able to practise programming because you cannot communicate with the MPU (except through a TTY which costs nearly £1,000). National Semiconductor came up with an answer to this problem for their own use, teaching people to use SC/MP in their educational courses.

As each course might have 50-100 people, the cost in normal teletypes would be enormous and so the brains at NS in Germany modified a calculator to a very simple TTY compatible unit to talk to the Introkit. Apparently they made about 25 of these units, considered production, then (in the USA) pulled the calculator which they had used out of production. Disheartened, it seems that they gave up for the time being as nobody can quote a delivery date or price for the unit although NS distributors have taken orders for it.

## SECRET REVEALED

Now we tell you the secret -- you can make one for yourself! If SC/MP is intelligent enough to be able to talk to a TTY then conversely

SC/MP is intelligent enough to BE a TTY. So you buy two Introkits and reprogram one of them to be a very simple TTY device. I know I mentioned earlier that it was difficult to program when you have not been able to practise, but the point is that NS already have a TELEKIT program and if they want to sell SC/MP units they MIGHT make this program available.

It only needs one person to have a suitable program, and anybody else can have a copy of the PROM with the program in it.

N.B. If you send PROMs through the post, especially abroad, put a big notice on the outside of the packet about X-raying as this can be a good cheap way to clear U-V erasable PROMs.

## KIT INTROS

Fig 1 shows the components used in addition to an Introkit, Flag 0 and Sense B are used for the I/O, buffered through a pair of opto-isolators. The PROM is programmed to put one "1" and seven "0's" out on the SOUT line and to shift the one bit across the keyboard matrix using another Flag as a clock. Any key pressed will connect the bit in the DM8546 shift register to an input on the 74C175 register.

This register is eventually read back into the CPU chip, and can be used to decode which of the keys was pressed. The code generated by the key is used to look up a table in the PROM to decode it into an alpha-numeric character displayed on the seven segment calculator display (NS have worked out a 40 character set which can be displayed using 7-seg plus a DP). This character is now output to the character register which will eventually direct it onto the display.

## PROGRAMME TIMERS

The other half of the program

accepts any keyboard entry and outputs it with all stop bits etc. to FLAG 0, and eventually to the pseudo-TTY output pins. Similarly, any input at the TTY pins is detected by SENSE B, decoded and checked internally then output to the display.

The 9 digit output is enough for most programming applications, but is not so good for normal I/O requirements. However, if you are using SC/MP for a complex timer, such as a traffic light controller or similar, this does not need to communicate with people via the alphabet, and thus Telekit is great for programming this application.

So off you go to buy two Introkits and reprogram one of the PROMs -- can't afford two plus a calculator, etc? Well, how about programming into RAM instead of PROM? Introkit comes complete with a KITBUG PROM and very thoughtfully a listing of KITBUG, the listing can be used to study programming by working out what the KITBUG program is doing. The PROM comes complete with socket so it can be removed and replaced with RAM chips in a PROM simulator.

## SIMULATOR PLUG

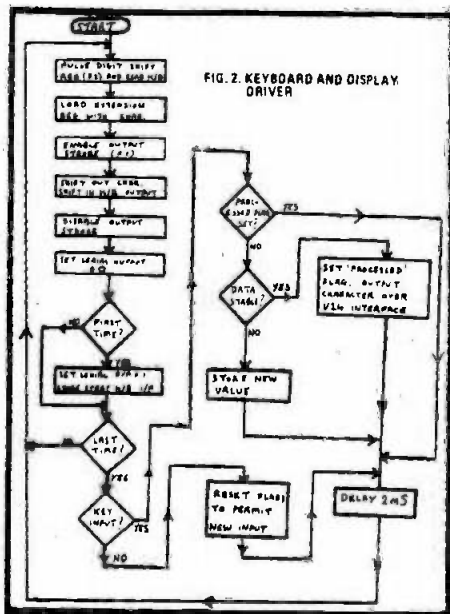
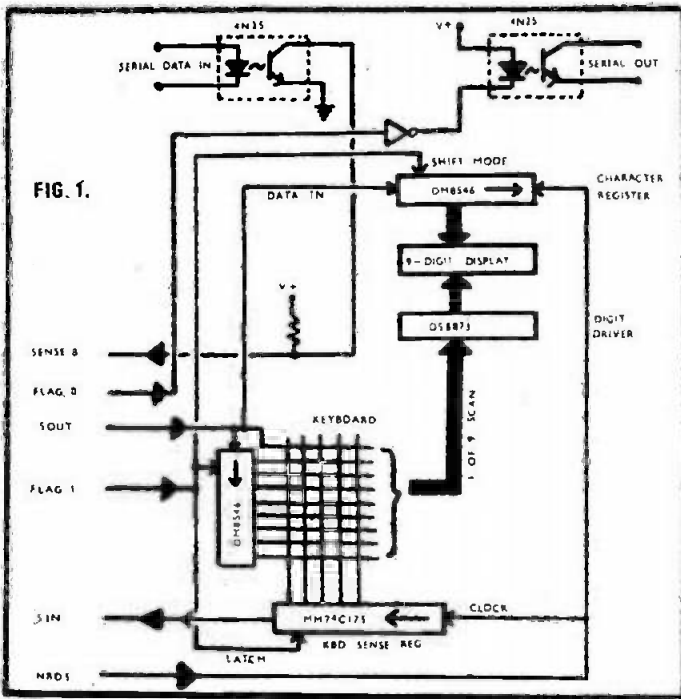
This can be simple to build and requires four MM2112 256x4 RAMS plus a MM74C00 (CMOS 7400) to replace the 512x8 bit PROM plus about 20 switches and buttons and some LED lamps. The Simulator is made to plug into the 24-pin socket normally used by the PROM and looks like a PROM to the CPU chip.

The difference is that this 'PROM' can be programmed by 9 address toggle switches, 8 data switches and a 'program' button connected to the R/W pins. Power for the unit is derived from the socket, but it may be an idea to include a large storage capacitor to allow for temporary disconnection without loss of memory.

If you really want low power you can use some of the new CMOS RAMs available which will store the memory for several days from a small battery or for a couple of hours from a large capacitor. Cost of such a simulator would be about £20 for MOS 2112 RAMs, or £50 for CMOS RAMs. This plus an Introkit allows you to program your own MPU for less than £100.

## DO IT WITH YOUR MPU!

We now have an MPU kit which can be programmed to your own



requirements (you could even copy most of the KITBUG program if you so wished) so now what can you do with it?

How about using the ETI 560 VDU to enable you to play games on your own TV set? Total cost is in the area of £150 we know, but for this you have a unit MUCH more sophisticated than any other TV game. You could play Draughts, Nim, Scrabble, Chess, Go, Backgammon, Monopoly etc with the CPU generating the dice.

Invent NEW MPU games -- after all **you** are the programmer.

If you come up with any programs, or with a TELEKIT program for SC/MP or 6800 let us know at ETI -- then we can pass this information onto other readers, in MICROFILE perhaps. ●

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