AMATEUR COMPUTER CLUB NEWSLETTER

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WHERE TO, NOW ?

WHITHER THE A.C.C.?

A proposed restructuring of the A.C.C. by Alan Secker.

The last twelve months have shown a membership explosion reflecting the impact of micros.

But what now?
Where are we going?
Are we to continue erratically to swap Mickey Mouse circuits and patches or should we syncronise our efforts and push this new industry into the direction that collectively we wish to go. Should the A.C.C. be just a water hole for a natter and a smoke or should it be a co-ordinator and a trend setter.

My views, not necessarily shared with other members, are revealed below. If changes are to be made, they should be implemented at the Annual General Meeting scheduled for March 1979.

Management or Steering Committee Meetings are held approximately six times a year. The proceedings are mainly devoted to solving problems. In other words they are backward looking.

The Annual General Meeting in 1978 was attended by;

The faithful
The vociferous
and the curious.

I fell into the last category. I was a relatively new member yet I was persuaded to join the committee. Surely from amongst the ranks of the A.C.C. there would be many who were more experienced and therefore better qualified than me. I do not regret becoming involved with A.C.C. business, but it does seem to me that its newsletter is really its only claim to fame. In reading the numerous magazines that drop through my door every day, I can see that the rate of production and change in the computer industry is so great that one can be swept along with it as so much flotsam. I believe we should steer ourselves in the direction with which we wish to go and not be driven in a way convenient to offshore manufacturers, both hardware and software.

I propose:

1. That the results of Management Committee Meetings be given a regular spot in the Newsletter and that following it there should be a notice of the date of the next.
2. Local groups should be notified of at least two members of the Management Committee who will represent their views and act as proxies for their votes.
3. Business proposed by local groups should be formulated into an agenda and debated by the committee as appropriate or put out to all the local groups to be debated and voted upon by their individual members. The two members acting as local delegates would present the total votes cast at local group level and these would be consolidated to show the total ayes, noes and abstentions thus producing a national vote.

   In this way everyone gets a say in formulating and determining policy continuously throughout the year.

   An example of the timing (for those keen on such things) would be;

   a) April Newsletter announces June committee meeting and publishes agenda proposed at April meeting and indicating which matters require a local poll.

   b) Local groups debate relative points and cast votes.

   c) Proxy members attending June Management Meeting produce consolidated local group vote.

   d) June Newsletter discloses results (with or without banner headlines).

4. Constitution

   a) Management or Steering Committee

   This will comprise;

   i Secretary
   ii Treasurer
   iii Editor of the Newsletter
   iv Representatives of each sub-committee (see below)
   v Two members representing local group affairs and presenting the consolidated voting results, the committee may co-opt additional members.

   The Chairman will be elected at each meeting and the position of the Chairman will rotate.

   b) Sub-committees

   There will be at least two sub-committees reporting to the menagement committee.

   i A standards sub-committee

   This committee will have no powers for setting standards but will be charged with two functions;

   a. Research
   b. Co-ordination

   The bulk of the work will be done by groups and perhaps by isolated individuals but the sub-committee will organise and bring the matters to a point when they may become the

A quiet moment at the PCW show

:SAVE IT:

The envelope that is ; see 'Ed's Bit', page 7

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subject of (say) a national conference followed by inclusion in the next agenda circulated to local groups for local ballots.

ii One or more Standing Exibition Committees

I have only been to one or two computer exhibitions but the A.C.C. stand in each case was like a wilderness. No displays,no knowledge of local groups and their activities and nothing really splendid on display.

The committee would have an allocation of funds and would get local group assistance to develop displays and ascertain sources of loan of various members systems for exhibit. The sub-committee should also ensure that they have up to date information concerning committee activities,projects, proposed standards and so forth.

There may be a necessity for more than one exhibition sub-committee each devoted to a different part of the country.

5. Membership

Membership will continue to be by individuals and not by the groups. It must however be a condition of membership of a local group that each member subscribes to the A.C.C.

6. Subscription

During the months preceding the Annual General Meeting it should be the Management Committee's function to decide whether or not the amount of the forthcoming annual subscription should be changed. This will be based upon the treasurer's report and requests and suggestions from local groups either for funds or for a proposed allocation. The committee will in their absolute discretion prepare a report for debate at the Annual General Meeting but the final decision would be on the basis of ballots held at the group level.

If the foregoing proposals are published, I will amend them as a result of comments received and will put forward an amended proposal for inclusion in the Agenda at the next Annual General Meeting.

96364 ROM SIM.

ROM SIMULATOR FOR THE 96364 CRT CONTROLLER IC

As stated in ACCN V6 I3, the CRT controller IC SF.F 96364 solved many VDU building problems but it also created a large one, that is the ROM required to decode the ASCII to a code suitable for the control chip. In my system I have used a basic ASCII key-board but modified the control function key so that it controls the input to the 74154 in my ROM simulator.

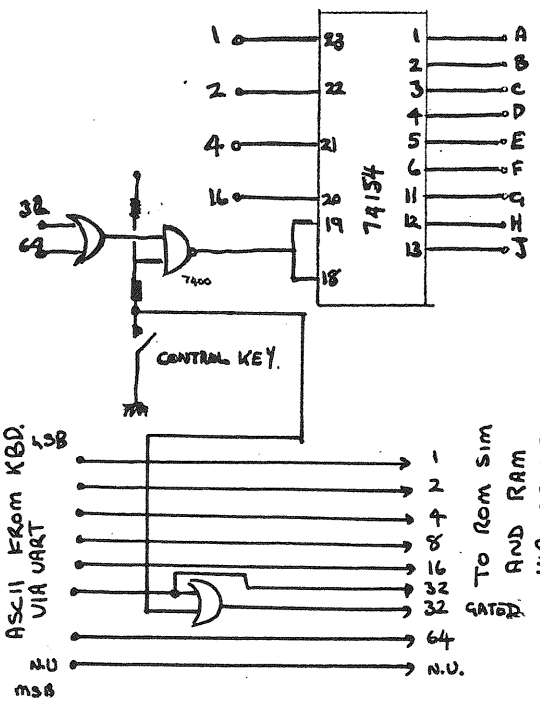
According to the data sheet on the 96364 the ROM is required to act as in Table 1. By using certain keys (I used the ones stated in Table 2) and recoding them you can simulate the majority of the ROM. The only codes that are not checked are INOP key-board codes. (3 HEX) and, as you can see other keys will also do the control functions when the control key is depressed.

There are some parts of the cct eg G1 & G2 i/p control on the 74154 which might not necessarily be required or could be changed, but as mine is working, best left alone for the time being.

As my only real criteria was cost and not time this seemed a fair mod to do. When I built mine I used a 16dil socket where the ROM would normally be fitted and then I made the ROM simulator on a small piece of Veroboard with a 16dil plug plus a couple of fly leads. Planning that some day I might get the correct ROM.

I believe that the 74S287 is the same ROM as required by the 96364 which without blowing is quite cheap, how about somebody in ACC with 'hands-on' a ROM blower running a few off for us (cheap) ?

J A Stephenson



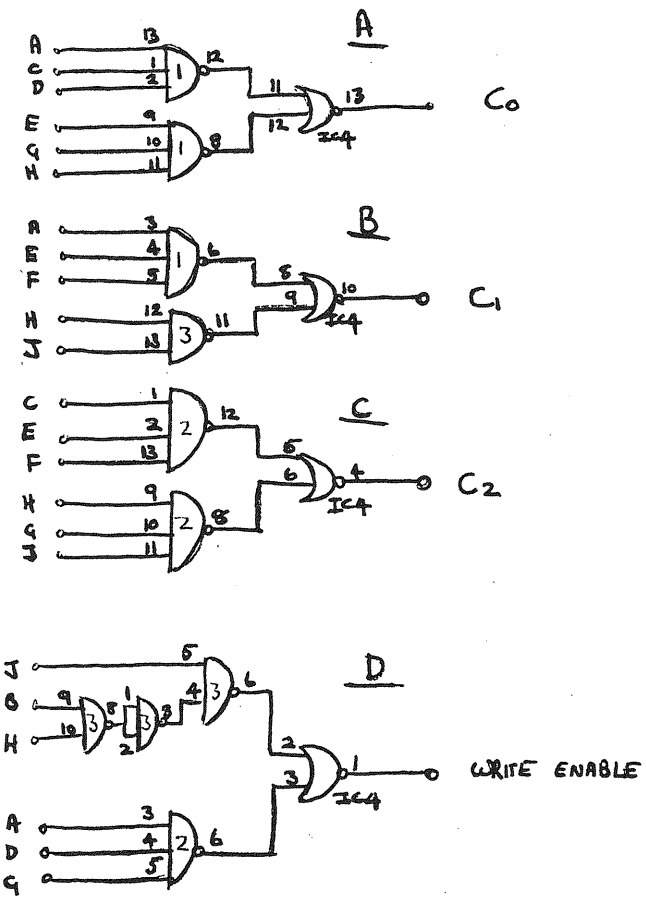


TABLE 1

HEX. ADD.	ADDRESS	C2 O3	C1 O2	C0 O1	O0	
0-7	0-7	0	0	1	1	3 = INOP KBD CODE
8	8	0	1	0	0	4 = CURSOR LEFT
9	9	0	1	1	1	7 = CURSOR RIGHT
A	10	1	0	1	0	A = CURSOR DOWN
B	11	0	1	1	0	6 = CURSOR UP
C	12	1	0	0	0	8 = PAGE CLEAR - HOME
D	13	1	0	0	1	9 = END OF LINE ERASE - CR
-	14-26	0	0	1	1	3 = INOP KBD CODES
1B	27	0	0	1	0	2 = LINE FEED
1C	28	0	0	0	0	0 = HOME CURSOR
1D	29	0	0	0	1	1 = CARRIAGE RETURN (CR)
-	30-31	0	0	1	1	3 = INOP KBD CODE
20-5F	32-126	1	1	1	1	F = ALL NORMAL CHAR.
-	127	0	0	1	1	3 = INOP KBD CODE
-	128-225	NOT PROGRAMMED				

STOP PRESS

LONDON EAST END MEETING.
New local group to be formed, first meeting Tuesday 28th November in the Meeting Hall of the Harrow Green Library from 7.00 to 10.00pm. (Leytonstone E11).

TABLE 2

Rom Simulator For Use with SFF 96364 CRT controller I.C.

ASCII KEY	ASCII CODE	ASCII CODE LESS 20H (CONTROL KEY WIRING)	CONTROL FUNCTIONS.	ASCII CODE (BIN) 6 4 2 1	O/PUT FROM 74154 (LOW)	CRT LETTERING	GROUP GATING LOGIC: ANY I/P TO GROUP = 0 THEN GROUP O/P = 0 — D (A B D G H)	J (C E F G H)	Q (A E F H)	A (A C D E G H)
(	28	08	CURSOR LEFT	0 0 0 0	0	A	0	1	0	0
)	29	09	CURSOR RIGHT	0 0 0 1	1	B	0	1	1	1
*	2A	0A	CURSOR DOWN	0 0 1 0	2	C	1	0	1	0
+	2B	0B	CURSOR UP	0 0 1 1	3	D	0	1	1	0
9	2C	0C	PAGE ERASE-HOME	0 1 0 0	4	E	1	0	0	0
-	2D	0D	END of LINE ERASE-CR	0 1 0 1	5	F	1	0	0	1
:	3B	1B	LINE FEED	1 0 1 1	11	G	0	0	1	0
<	3C	1C	HOME CURSOR	1 1 0 0	12	H	0	0	0	0
=	3D	1D	CARRIAGE RETURN (C.R)	1 1 0 1	13	J	0	0	0	1
ALL NORMAL CHAR. (64 SET)	20 ↓ 5F	NO CONTROL KEY USE		X X X X	NIL		1	1	1	1

ON SFF 96364 CRT. CHIP

USE A AS C_0
B AS C_1
C AS C_2
D AS WRITE ENABLE

X = DON'T CARE

Hence FORTH

EFFICIENT PROGRAM CONSTRUCTION R Powell

Since I was not committed to any familiar language such as BASIC, APL or FORTRAN in my normal work, I decided to shop around for one that would ideally suit micro computing. This lead me to FORTH, which seems full of gems that hobbyists should know about. If you can persuade your boss to buy it for you you can prove this, but if not you can make use of the gems in your own program writing. Incedentally, the STOIC (Stack Oriented Interpretive Compiler) available on CP/M based systems seems similar.

For efficient writing we need small modules of program. Then each module can be easily debugged by giving it dummy data and checking its behaviour. Modules can also be collected into larger modules of higher and higher level definitions. But instead of creating a high level module by writing out all the low level ones we need only give the locations of the low level ones. This saves memory enormously. So far this is elementary and many micros have JSR or CALL instructions for doing this.

The first practical problem is to decide how modules will communicate data, addresses or truth values. FORTH has adopted Reverse Polish notation so that these parameters can always communicate via the stack. (This may or may not be the hardware stack). Using FORTH is rather like using an H-P calculator with a vast number of keys. Some are FORTH operations but all the remaining memory is user definable, for stores or labels of high level routines. These you can construct out of existing FORTH definitions, your own earlier definitions, or the assembly code of your micro.

We could use JSR and RTS to combine our low level modules. This brings a need for a second stack to keep track of subroutine nesting. This is called the Return Stack (R). The first stack, for communicating parameters, is called the Parameter Stack (S).

Fig. 1 illustrates how micros such as the 8080, 6800 and 6502 can combine subroutines. In such cases however we may want to include parameters in a high level module. For example the low level may output data to a port, but the messages to be output may differ from one high level module to another. In minis such as the PDP-11 it is possible to insert this data after one JSR subroutine call and before the next. The mini keeps the top entry of the return stack in a CPU register where it can be incremented to point to this data when necessary (see Fig 2).

One of the many gems in FORTH is its treatment of this problem. It does not need JSR instructions cluttering up high level modules. Instead it maintains a pointer I which interprets a list of addresses of earlier modules SUB1, SUB2 etc. The form of every module is the same. It starts with another (code) address which is followed by the parameters of the module. This code address is loaded into the program counter to tell it what to do with the parameters that followed the code address. A pointer (W) holds the code address and may be incremented by the machine code to reach the parameters. It is rather like the CPU register of the mini that could be similarly incremented. When the machine code ends it JUMP's to a routine NEXT. This increments I to the address of the next module. Then it loads the W pointer from this. Finally W points to the machine code to go in the program counter.

Symbolically;

⟨I⟩	⟨I⟩ + 1	Increment I. Now ⟨I⟩ points to the next subroutine.
⟨W⟩	⟪I⟫	Load ⟨W⟩ with the address pointed to by ⟨I⟩
⟨PC⟩	⟪W⟫	Load program counter (JUMP) with the address pointed to by ⟨W⟩

At first sight we have traded all those JSR instructions for something rather combersome. Yet on the PDP-11 this structure is 50% faster than the use of JSR and RTS. If you use it on a micro it gives it all the power of a mini. It is so flexible that all routines can be standardised to this form. A few examples are;

1) Machine Code definitions. In this case ⟨W⟩ can point to the next location after W. Then the 'parameter field' following W is the machine code. Alternatively the machine code can be in ROM elsewhere and there is no parameter field.
2) RAM storage. Locations may be labelled and we need a code routine to fetch the address of a storage area or location to the parameter stack. In this case the code puts the address after W on the parameter stack. Other routines can then use this as an address for storing data or fetchnig it from the parameter field storage area.
3) High Level definitions start with a : routine analogous to a high level JSR operating on the I pointer instead of the program counter. This puts the current ⟨I⟩ on the Return Stack and loads ⟨I⟩ with ⟨W⟩ . Then the interpreter starts scanning lower level subroutine addresses in the parameter field that followed the code routine for :.

   A high level definition ends with ; which is analogous to RTS. This routine simply reloads ⟨I⟩ from the return stack.
4) Other Uses. A programmer can write his own code references at the head of a module. Examples might be for tables or output messages.

You can get more information on FORTH in Ref 1, I hope to write it on the 6502, having had some fun benchmarking the NEXT routine on a number of micros. The 6502 and 1802 at 28uS are followed by 6800 at 36uS and 8080 at 41uS. The 16 bit micros are faster e.g. 9.6uS on the CP1600 which can handle the same two instructions as the LSI-11 which takes 11uS.

There are plenty more gems like this one in FORTH, and I have come to believe their fantastic claims even though I don't have it. They claim memory is reduced compared to Assembler once programs exceed approx 2k bytes. It is 10 times faster to implement than Assembler and 4 times faster than BASIC. Its execution time is much faster than BASIC but slower than in-line compilers like FORTRAN that eat up memory. But the programmer has freedom to write in-line machine code for time critical modules which is much harder to do in other languages.

The dictionary created by the compiler is equally fascinating. Although it is a single pass compiler (Pascal takes seven) it supports virtually unlimited users and contexts. The complete package includes virtual memory for holding your source text and virtually unlimited comments can be used since the source text does not enter the compiled dictionaries.

Ref 1; Rather & Moore "High Level Programming Technique for Microprocessors" New Electronics May 1973

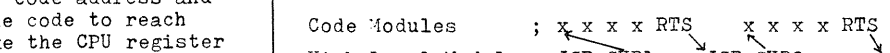


Fig 1 Combining Subroutines in a micro

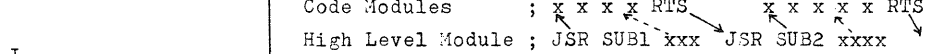


Fig 2 Combining Subroutines on a mini

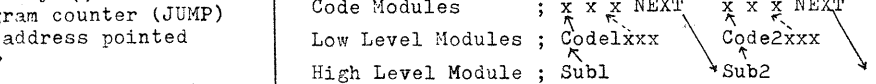
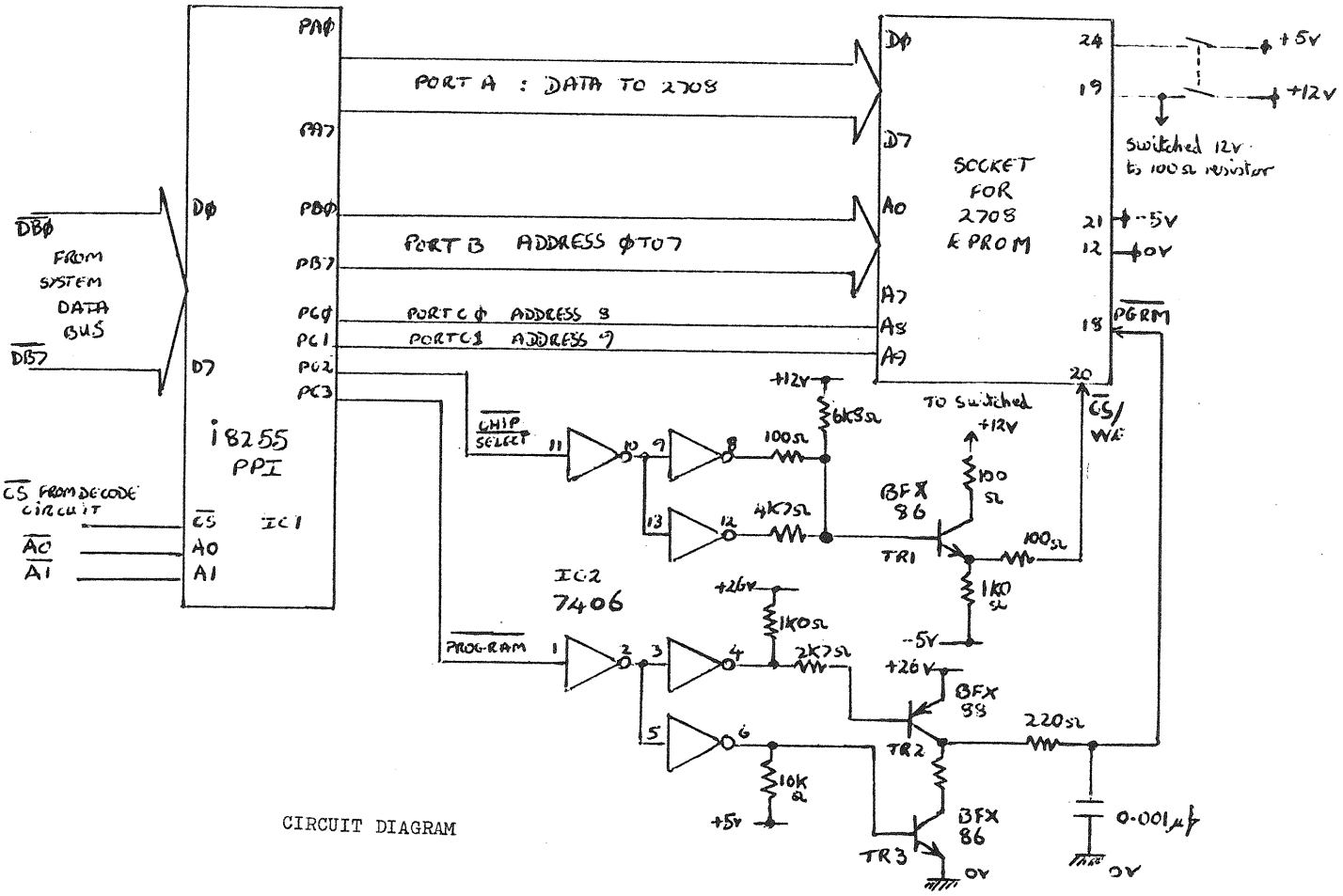


Fig 3 Combining Subroutines in FORTH

8080›2708 PROMGRAMMER



CIRCUIT DIAGRAM

SOFTWARE

This is a program, written in 8080 assembler level mnemonics, to program either 2704 or 2708 EPROMs. With only minor modifications the Texas '2716' could be programmed as well. (N.B. not Intel '2716' EPROMS !).

The routine is entered at 'START', and sets the conditions for a call to an external sub-routine (held in monitor) which gets a sixteen bit number from the keyboard, and returns with this number on top of the stack. This number (which is stored by the program on the stack) is taken as the starting address of the area in memory where the data to be put into the EPROM is held.

The 8255 is then configured for 'all outputs', and the program bit of the 2708 is set to the inactive mode; 0V. The program then waits for the user to strike any key on the keyboard. This is to allow time for the user to: a) put the EPROM into the programming socket, and b) switch on the power supplies. These actions are essential if the rules for programming 2708 EPROMs are not to be violated.

Having received the signal to continue, the program then raises the CS bit to the +12V level and delays for 0.4mS for this to settle. From the 2708 data sheet, to correctly program a 2708, "The number of programming loops (N) required is a function of the program pulse width Tpw according to the relationship;

N * Tpw = 100mS"

Given that Tpw = 0.4mS, then N = 255 (!). The register D is used to count the number of program loops.

The program assumes that 1024 locations are to be programmed, and the HL pair of registers are used as an address counter to reference these locations.

There are two main program loops. Outside the outer loop register D (the main loop counter) is initialised once only. In the outer loop registers HL are set to the start point address of the 2708 (zero), and the registers BC are set to the initial memory location to be programmed from. This value is then re-saved on the stack.

Inside the inner loop the low eight address bits (from register L) are sent to port B of the 8255, the two high address bits (from register H) are sent to port C, and a ten microsecond wait subroutine is then invoked while the addresses settle.

The data is then fetched and the data pointer is incremented. This data is then sent to port A, and another ten microsecond delay is forced. The Program pin is then set from 0V to 26V for 0.4mS, and then set to 0V again.

The address pointer is incremented and then tested to see if 1024 locations have been programmed. If they have not, then the inner loop is repeated. If they have, then the loop counter is decremented. If this counter is not zero, then the outer loop is repeated. Finally, when all is finished, the 8255 is set to the 'all inputs' mode and the routine returns to the monitor via a restart instruction. There is enough space here for a jump, call or return instruction. The routine occupies 74 hex bytes, and the maximum subroutine nesting level is 6 bytes (comprising two 'pushes' and a 'call'), excluding the two external calls.

HARDWARE

Some hardware comments and explanations are necessary. The microprocessor in use is the Intel 8085, running at about 0.5 microseconds per machine cycle. Therefore a 'call', three 'nop-s' and a 'return' occupy just ten microseconds, and forty cycles.

The 'DELAY' subroutine, at 0.4mS, was found experimentally. The value of 132 hex will almost certainly need changing for different machines, but note that the register B (set to 01) is decremented before being tested for zero.

```
                        ORG     3E00H
                        ;
                        P2708:  ; PROGRAM TO PROGRAM 2708 PROMS
                                ;THROUGH AN 8255 INPUT/OUTPUT PORT.
                                ;
                                ; PORT A = BI-DIRECTIONAL DATA.
                                ; PORT B = LOW 8 ADDRESS BITS.
                                ; PORT C, BITS 0,1 = HIGH ADDRESS BITS.
                                ; PORT C, BIT 2 = CS BIT.
                                ; PORT C, BIT 3 = PROGRAM BIT.
                                ;
                                ; THE 8255 IS MEMORY MAPPED TO 0F800H+
                                ;
                                ;
                         ;TO RUN THE PROGRAM, ENTER THE START ADDRESS
                         ;OF THE AREA OF MEMORY TO BE PUT INTO THE PROM
                         ;(FOLLOWED BY C/R). THEN PUT THE PROM INTO THE
                         ;PROGRAMING SOCKET, AND STRIKE ANY KEY ON THE TTY
                         ;TO INITIATE THE PROGRAMMING OPERATION.
                        ;
                        ;
                        GETNM   EQU     00433H  ;ROUTINE TO GET A NUMBER
                        CI      EQU     00012H  ;CONSOLE INPUT ROUTINE
                        PPIMD   EQU     0F800H  ;PPI CONTROL PORT
                        PPIA    EQU     0F803H  ;PPI PORT A
                        PPIB    EQU     0F802H  ;PPI PORT B
                        PPIC    EQU     0F801H  ;PPI PORT C
                                ;
                                ;
3E00 0E01               START:  MVI     C,1     ;SET FOR 1 HEX PAIR
3E02 CD3304                     CALL    GETNM   ;GET 1 HEX PAIR
3E05 3E7F                       MVI     A,07FH  ;SET TO ALL OUTPUTS
3E07 3200F8                     STA     PPIMD   ;SET THE MODE
3E0A 3EF8                       MVI     A,0F8H  ;SET PORTC, BIT 3
3E0C 3200F8                     STA     PPIMD   ;SET THE BIT
3E0F CD1200                     CALL    CI      ;GET AN INPUT TO CONTINUE
3E12 3EFA                       MVI     A,0FAH  ;SET /CS TO 12V
3E14 3200F8                     STA     PPIMD   ;BIT SET MODE
3E17 CD673E                     CALL    DELAY   ;DELAY TO SETTLE
3E1A 1600                       MVI     D,000H  ;D IS THE LOOP COUNTER
3E1C 210000             P27A:   LXI     H,000H  ;HL = ADDRESS COUNTER
3E1F C1                         POP     B       ;START ADDR. TO BC
3E20 C5                         PUSH    B       ;RE-SAVE ON STACK
3E21 3EF3                       MVI     A,0F3H  ;TO RESET BITS 0,1
3E23 3201F8                     STA     PPIC    ;IN PORT C. (HI ADDR.)
3E26 7D                 P27B:   MOV     A,L     ;FETCH LO ADDRESS
3E27 2F                         CMA             ;INVERT
3E28 3202F8                     STA     PPIB    ;SEND TO PORT B
3E2B 3A01F8                     LDA     PPIC    ;GET PORT C
3E2E 2F                         CMA             ;INVERT
3E2F E6FC                       ANI     0FCH    ;CLEAR ADDR.BITS
3E31 B4                         ORA     H       ;THEN COMBINE FOR NEW ADDR.
3E32 2F                         CMA             ;INVERT
3E33 3201F8                     STA     PPIC    ;TO PORT C
3E36 CD633E                     CALL    SLEEP   ;WAIT 10 U-S.
3E39 0A                         LDAX    B       ;GET DATA
3E3A 03                         INX     B       ;SET FOR NEXT DATA LOC'N
3E3B 2F                         CMA
3E3C 3203F8                     STA     PPIA    ;TO PORT A
3E3F CD633E                     CALL    SLEEP   ;WAIT 10
3E42 3EF9                       MVI     A,0F9H  ;TO RESET PROG BIT
3E44 3200F8                     STA     PPIMD   ;BIT SET MODE
3E47 CD673E                     CALL    DELAY   ;DELAY 400 U-S.
3E4A 3EF8                       MVI     A,0F8H  ;TO SET PROG BIT
3E4C 3200F8                     STA     PPIMD   ;BIT RESET MODE
3E4F 23                         INX     H       ;NEXT ADDRESS
3E50 7C                         MOV     A,H     ;GET HI ADDRESS
3E51 FE04                       CPI     004H    ;TEST FOR 1024 BYTES
3E53 C2263E                     JNZ     P27B    ;MORE TO DO, SO JUMP
3E56 15                         DCR     D       ;ANY MORE LOOPS TO DO?
3E57 C21C3E                     JNZ     P27A    ;JUMP IF SO, ELSE
3E5A 3E64                       MVI     A,064H  ;SET FOR ALL INPUTS
3E5C 3200F8                     STA     PPIMD   ;MODE SET. INPUTS FLOAT HI.
3E5F C1                         POP     B       ;CLEAN UP THE STACK
3E60 C9                         RET             ;RETURN TO CALLER
3E61 00                         NOP             ;OR
3E62 00                         NOP             ;SOMETHING !
                                ;
                                ;
                        SLEEP:  ;A SUBROUTINE TO WAIT 10 MICROSEC'S
                                ;
3E63 00                         NOP
3E64 00                         NOP
3E65 00                         NOP
3E66 C9                         RET             ;RET AFTER 40 M/C CYCLES
                                ;
                                ;
                        DELAY:  ;A SUBROUTINE TO DELAY 0.4 MILLISEC'S
                                ;
3E67 C5                         PUSH    B       ;SAVE THE REG'S
3E68 013201                     LXI     B,00132H  ;COUNT FOR 0.4M/S
3E6B 0D                 DEL1:   DCR     C
3E6C C26B3E                     JNZ     DEL1    ;OBVIOUS!
3E6F 05                         DCR     B
3E70 C26B3E                     JNZ     DEL1    ;WHEN ALL DONE,
3E73 C1                         POP     B       ;RESTORE ALL, AND
3E74 C9                         RET             ;RETURN TO THE CALLER
                                ;
                                ;
                                ;
                                END
```

The whole program takes about two minutes twenty seconds to completely program a 2708, rather than the calculated minimum time of;

1024 * 256 * 0.4 * 10E-3

this is about one minute forty-five seconds. The difference is accounted for by a total wait time between program pulses of 0.2mS, which is the time given for the program to loop and the addresses to settle.

The 8255 is memory mapped to locations F800 hex upwards. However, the lower eight address bits are inverted in this system, so that ports A,B,C and Control are not addressed in the obvious way. The same is true for the data bus. Hence all the 'cma' instructions in the listing, and the inverted form of all the mode and bit set instructions.

FURTHER THOUGHTS

a) The routine does not verify the EPROM after programming. This could well be implemented, perhaps with a code section to tell the operator which locations have failed to program, inside a total of 256 locations.

b) Three output ports could be used instead of the 8255. This would necessitate the programmer keeping a copy of port C in memory. Register E is available for this purpose.

c) I have not tried coding this routine for another processor, but the task should be fairly easy. The only dificulty that I had was in keeping track of the two high address bits, hence the copy of port C inthought (b).

d) The routine does not use the top four bits of port C. Hence these are available for other use, as the programmer may wish.

e) Do not forget to invert ALL the 8255 references when re-coding the program, if necessary.

I Roll

SEEING THE LIGHT — John Howden

Paul Rodman's plaintive cry (August issue) about having to develop hardware by trial and error prompts me to pass on a couple of tips re LED drivers.

Firstly, a standard TTL output can easily sink enough current to drive a LED via a current limiting resistor (Fig 1). This would save a transistor and a resistor in Paul's Fig 2.

Not so easy with CMOS you say. Wrong ! It can be even easier. Here is a tip from RCA'a CDP1802 development kit. The CD4049 (inverting) and CD4050 (non-inverting) buffers can drive several LEDs directly without limiting resistors if the chip supply is limited to 5V or so. (Fig 2).

In this circuit the CMOS drivers saturate at 10mA. With 1.6mA dropped across the LED there is 3.4V across the output transistor giving 34mW dissipation,well within the 100mW per driver limit. Even all six drivers only give 204mW, much less than the package limit of 500mW. Just don't increase the rail voltage without thinking ! These buffers have the additional advantage of being level converters able to accept up to 18V on the inputs even with a 5V chip supply.

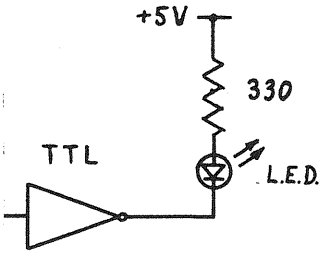


Fig. 1

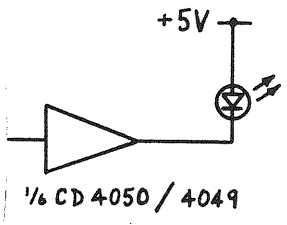


Fig. 2

Ed's Bit

CHECK THE ENVELOPE THIS ISSUE CAME IN.
If it carried a printed address label then please check that for accuracy, and let me know of any errors as soon as possible as it will have come from the first run of the ACC's new computerised mailing list program, which will be used to generate a 'list of members' to be published in the next newsletter, and so we'd like to be sure that the records are correct.

Quite a few people have asked me recently for advice on how to set up a club, since many of the local groups that are springing up all over the place are reaching the point where they need a formal structure. I have therefore persuaded Jim Cunnungham (ACC Chairman) to write a comprehensive article on the subject for the next newsletter.

Talking about formalisation leads to the thought that the whole amateur computing scene is changing rapidly as the number of interested people grows exponentially, as commercial magazines devote space to the subject, and as local groups proliferate. Thus the ACC must change itself if it is to remain viable, and establish a new niche for itself in the marketplace, presumably as a 'Representative Body'. One aspect of this change will be the need to elect a new Editor/Treasurer for the next ACC year. For, apart from personal considerations like wanting time to play with my own system,I'd feel unhappy, and unsuitable, in taking an active role in the ACC of the future. The ACC was originally formed as a means of communication between the (relatively few) enthusiasts who were alive at the time. Communication is now possible over a variety of channels, and the need for the ACC to perform this function is correspondingly less. Therefore I can bow out, leaving the job to someone with a fresher vision.

Mike Lord

7768

First, to correct a couple of errors that have appeared in 77-68 designs published in ACCN;

X28 on the MON 1 board is supposed to provide low baud rate clocks by dividing the 1200 x 16 Hz signal by any integer in thr
signal by any integer in the range 2-15. In fact, it will only work for division ratios of 8 or less if the output is taken from X28 pin 15, rather than X28 pin 11.

Some people have complained that the full 24 line by 40 character display from the VDU 1 board is too low on the screen, so that in some cases the bottom line cannot be completely seen. This can be cured by connecting X8 pin 4 to X10 pin 8 instead of X10 pin 9 (other connections to X10 pin 9 remaining unchanged). This will 'lift' the display on the screen by one character line.

Three new boards are currently at various stages of the development cycle and will be featured in future issues of the newsletter. They are;

A 32k byte dynamic RAM board using 4116's

A board to hold up to 8 2708 or 8 2716 EPROMs

A general purpose interfacing board which can be equipped with two PIO's and a 6840 timer/counter, and which has a generous 'prototyping' area.

NewBear have recently released a MON 2 board, which supports a ROM monitor e.g. MIKBUG or SWATBUG, and provides a hardware single step facility. It should be noted that this board is an alternative to the MON 1 board, and requires an external serial terminal.

For those using the MON 1 and VDU 1 boards, a new monitor program is being written which will, among other things, support the full 40 x 24 character display, and allow programs to be saved and loaded in MIKBUG format.

TTY 33,38,390

Part 2
Tony Smaith

Before commencing with adjustments, I feel it will be benificial to go into more detail as to the various types of Teletype, their mechanical layout, and give a basic idea of how the standard TTY works.

Models and variations

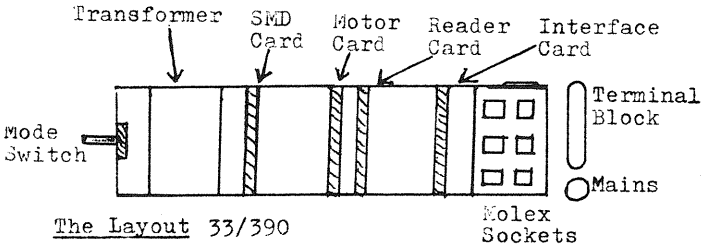
The 33 Teletype comes in three versions; the KSR (Keyboard Send Receive) consisting of a keyboard, typing unit, and the electronic package called the line unit.
The second version is the ASR (Automatic Send Receive) which, besides having the previous components, is further anhanced by a reader and punch.
The third and least common version is the RO (Receive Only), having a typing unit and line unit only.
The main distributors of TTYs in this country are Westrex and Data Dynamics, the main difference in product being the line unit in 33s, and the various model numbers and covers in other Teletypes.

Component Differences

As most Teletypes operate from an 110V supply, a 240/110V transformer is required. On Data machines this is usually mounted on the front of the line unit, but with Westrex machines it can be mounted in the back of the TTY stand. Caution; some machines do not have this transformer and require one to be fitted, and Westrex have two smaller transformers on their line unit for providing other voltages, so look for 240/110 volt markings. The motor voltage plate is also a good guide for the voltage required.

On Westrex 33s the reader control card is mounted in the back of the stand, while on Data machines it is one of the cards in the line unit. The only card mounted on a Westrex line unit is the SMD (Selector Magnet Drive), this is found half way down on the right and is a plug-in PCB.

Many variations do occur in line units, due to the numerous applications they can be put to, but in general the various points I have mentioned should be standard. The Westrex line unit I have based my main points on is the UCC6, 20 or 60mA current loop version.



The Layout 33/390

Data Dynamics Line Unit FIG 1

ASR38s and ASR390s

The ASR390 is almost exactly the same as the ASR33, the only differences being a heavy duty sound proofed cover and an internal chad box. The latter point making it ideal for use on a table top.

The ASR38 is an upper and lower case TTY coming in various carriage widths and having the capability of red or black print by automatic selection. It also uses ICs, having a PCB mounted on the keyboard and the bulk of its electronic circuitry mounted in the stand. Automatic on/off reader and punch are also available, but these can also be found on 33s and 390s. Most of the various applications a TTY is needed for can be easily carried out by the 38, interfacing requiring a few wiring mods, unlike the 33/390 which may require the line unit to be completely changed.

The ASC Keyboard

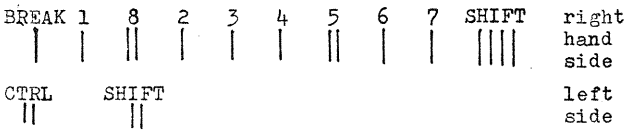
These keyboards come in two different types;Parity and Non Parity. The Parity keyboard adds or leaves out bit 8 to make all bytes even parity

i.e. (A) is bits 1&7; being even bit 8 is left out.
(T) is bits 3,5,7,8. Bit 8 is added to create even parity.

A Non Parity keyboard will punch bit 8 all the time causing odd and even parity
i.e. (A) is bits 1,7&8

The visual difference between the two keyboards is the contacts are on the right only for a Non Parity keyboard, whilst a Parity keyboard also has shift and control contacts on the left.

Parity Keyboard Contacts



Non Parity Keyboard

BREAK 1 SHIFT 2 3 4 5 6 7 8 CTRL

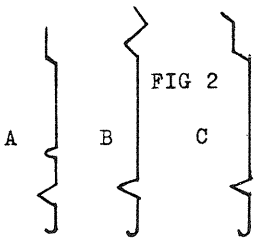
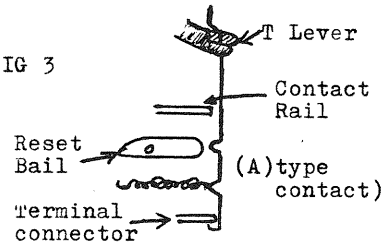


FIG 3



In Fig 2 I have shown the three different types of contact and for easy reference called these A,B & C. All three types are held and controlled by individual T levers as shown in Fig 3. The T lever positions the contact to make or be held away from the contact rail. In the case of an (A) contact, this is not only controlled by the T lever, but also needs to be released by the reset bail. Contacts (B) and (C) are totally controlled by their respective T levers. One of the most common faults on TTYs is caused by (A) type contacts being bent and not being held away from the contact rail by the reset bail, and as all contacts are in parallel, an (A) contact making on the keyboard will cause wrong characters to be read by the reader.

How The Teletype Works

In this section I shall attempt to give a brief outline of how the TTY works, should you require a more detailed explanation it is advisable to read Vol 1 of the 33 Technical Manual.

A TTY sends and receives in a serial mode. That is, all the information passes down a single line. When required to send and receive in the serial mode simultaneously, two wires are employed, this condition is called Duplex operation. With one wire you can only send or receive at any one time, this is called Simplex operation.

One machine cycle allows 8 bits of data, or one byte, to be sent or received by sending a series of high and low electrical pulses down the line. A high pulse is called mark, a low a space.

The opposite to serial is parallel, this requires 8 lines, one for each bit. As parallel information is sent simultaneously down all 8 lines, it has to be converted to serial before the TTY can act, and when this is required a parallel to serial interface is fitted.

As signals from the TTY reader, keyboard and Answer Back unit are all in parallel, a distributor (Fig 5) is used to convert this information to serial.

One machine cycle allows 8 bits of data to be sent. A high pulse is called a mark and the time taken to send a mark or space we call a unit. In the case of the distributor, the wiper assembly goes round the disc checking if any contacts are in the marking or spacing condition.

Besides the 8 units required to form a byte, stop and start units are also needed. To start the

machine cycle a space, one unit long, is used, and to stop the cycle a mark, two units long. From this a timing of 11 units can be deduced as the required time for one machine cycle.
Example; a 'U' is bits 1,3,5,7 ; so the ideal signal should look like Fig 6.

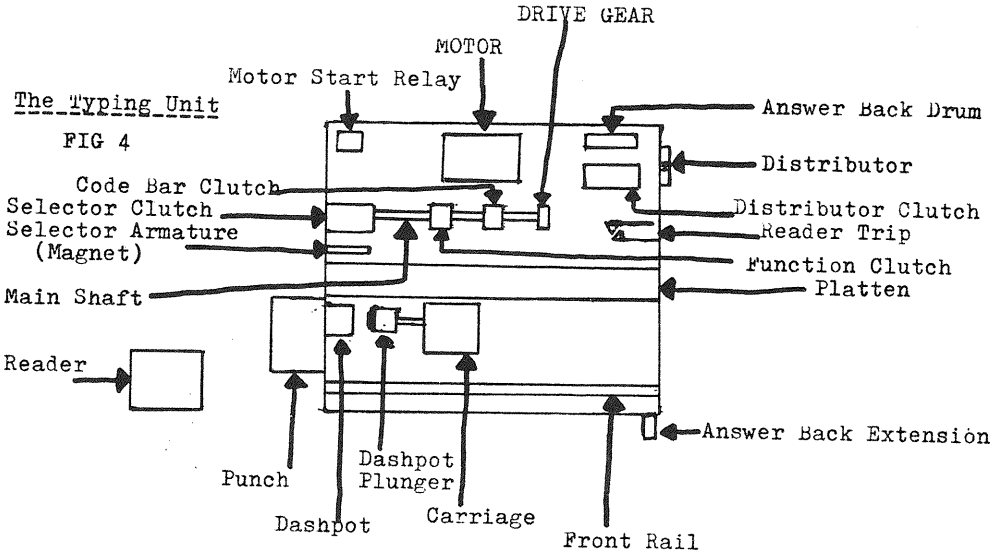
On the left of the typing unit is the Selector Drive Magnet or Selector Armature. This converts the electrical pulses into mechanical action. In front of the selector magnet are the blocking levers which allow the codebars, running horizontally below the carriage, to move or be blocked.
Example Fig 7.
The action of the codebars moving up and to the left transfers motion to the printer and to the punch. On the underside of the codebars are extensions which we call tines, and when the codebars are positioned for a function operation, like carriage return or line feed, the tines are positioned so as to allow one of the function levers, running under and across the codebars, to rise. The function lever latches on to a function pawl and through linkage carries out the required function. Example Fig 8.

All these movements are made possible by spring tension, cam action and the rotation of clutches.

You should now have a basic idea of the principles employed on a TTY, and be able to follow various actions with the help of the manual.

The Typing Unit

FIG 4



The Distributor

FIG 5

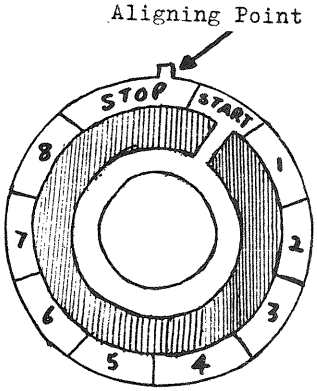


FIG 6

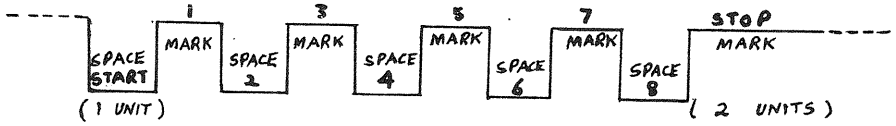
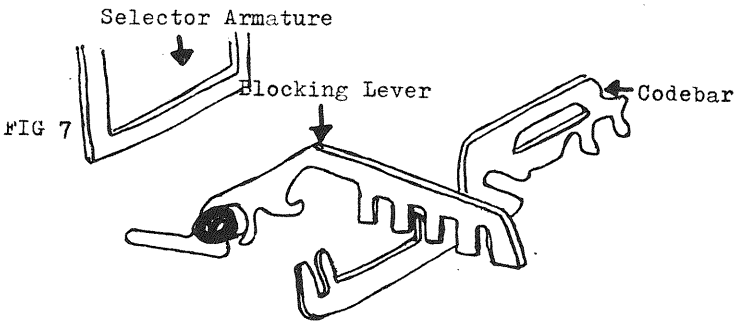


FIG 7



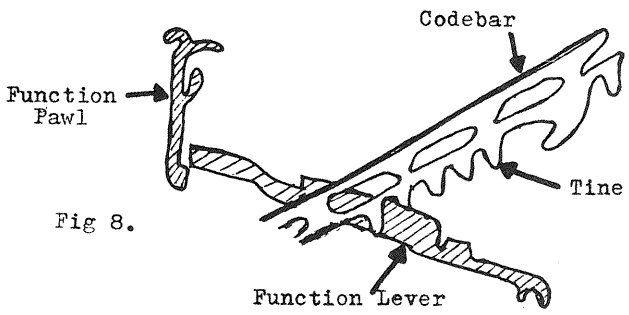


Fig 8.

Tools Needed For Adjusting TTYs

Two spring hooks, one push and one pull (made by Longs or supplied by Westrex).
A spring guage capable of measuring 3 oz (prefarably 0 - 32 oz with a shaft running right through, giving the alternative of a push or a pull action).
Good set of Imperial feeler guages.
TTY oil and grease (available from Data and Westrex part numbers Oil 88971 Grease 145867)
Electrical screwdriver, the longer the shaft the better, as this will be used for setting up codes in the selector)
Spanners 3/16 5/16 ¼ 4BA & 6BA
Armature clip (to be made)
Handle (can be made or bought from Data/Westrex ; part numbers Handle 161430 32/33 Adapter 181465)
Some clean rags and an oily rag.
TTY manual Vol 2 (Adjustments)

Making an Armature Clip

Materials needed; 8" strip of 1/16" x ½" mild steel, 4BA x 1" screw & 2 nuts. Heavy stretched spring to fit screw shaft.
Bend the strip in half over the shaft of a large screwdriver;

Drill a hole one inch from the top of the clip in the centre to take 4BA screw. Fit stretched spring between both blades and on the shaft of the screw;

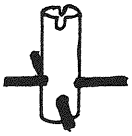
Slightly taper and round off the ends. Bend plates slightly in vice and make sure when squeezed below spring both faces contact flush;

Making a TTY Handle

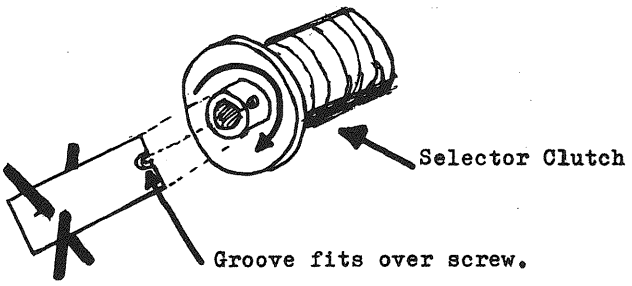
Materials needed; Piece of metal tubing 3 to 4 inches long, 5/8 inch overall diameter with 1/32 inch thick wayy (The diameter and wall thickness are not critical and are only offered as guidelines) Two metal shafts about 3 inches long, diameter about ⅛".

At one end of the tube cut a ¼ x ¼" groove across the centre;

Now drill two holes right through the tube at right angles, one ¼" from the top, the other just over½" from the top. These holes should be almost the exact diameter of the shafts, so that when the shafts are fitted through, they fit tightly;



You now have a method of turning the machine over by hand. The handle is designed to fit over the selector clutch drum extension; should it prove too loose or too tight when fitted the grooves can be opened up or the tube squeezed in a vice.
NOTE: always turn the TTY over in a clockwise direction, towards the front;



The fitting of the armature clip is a bit more complex and requires the selector to be set up first. I shall cover this, plus cleaning and adjustments, in my next article.

68 HELPERS

Having spent two months getting the S68 VDU to work I understand the problem some of the ETI readers are in, so I would be glad to help any in the area who contact me.
I don't actually run a S68 system as after having so much trouble with the VDU I stripped it down and re-built it on a 77-68 DIP board and now drive it with a 77-68. During the re-build it also 'lost' all its CMOS ICs.
Maurice Oakley 94 Elkington St.,Bell Green, Coventry CV6 7GH

My system is based on S68 and is currently running well. I feel that this is more due to good luck than my trouble-shooting ability as most of the modules worked first time. However I would be pleased to help anyone in difficulty.
One factor which probably helped me was that I did not use the VDU A board - the one with most of the errors. Instead my VDU is constructed around a modified PW Videowriter, with the video RAM on the VDU B board. The videowriter is in a separate case with its own power supply and features switch selectable graphics (128 x 64), upper and lower case characters and 64 characters per line. This is displayed on an unmodified domestic TV, thanks to an article by Don Lancaster in the January 1978 edition of Kilobaud.
Apart from the videowriter I have the CPU card (modified so that it works), the TTY card with one UART, the CUTS card (currently with 2k of RAM) and an additional two Veroboards. The first of these holds 1k of memory and allows the upper four address bits plus some other control lines to be taken to the 31 pin connector. The second has some address decoding logic.
In order to save space in the case I have not used the ETI power supply but a separate unit. This also has the advantage of supplying more power; 5V at 10A. The keyboard is a Hall effect unit with an encoder of my own design.
Software development so far has concentrated mostly on utility routines such as a scrolling display driver and cassette load and dump programs (I am not using ETIBUG2). I have also written a 6800 cross assembler in APL, however this really burns up computer time.
I would be interested to know if anyone has designed a fully buffered static 8k memory board for S68. I am sure that it would be possible to get sixteen 2114s plus their support circuitry on a Eurocard, but do not have the facilities to do it myself.
Ronald M Yorston 24 Balgownie Rd.,Bridge of Don, Aberdeen AB2 8JP

After reading ACC's latest news letter, I was interested to hear that a number of people have not got ETI's system 68 working yet, so I would just like to tell you that my system works. I did have a lot of problems but these seem to have been ironed out now. So if anybody would like to get in touch with me about 'S68' I would be glad to try and help. I would also be interested to hear from anybody who would like to start a 'S68' users club (or non-users club as the case may be !).Would anyone wanting a reply please supply a sae as being a student I have a limited budget.
M Lewis 17 Claremont St. Bath St. Leicester

I have a system 68 running, but stress that I'm no expert and would only be of limited help to other system 68 builders. My system consists of an ASCII keyboard, ETI VDU, CPU with 4k RAM. I would be interested to hear from anyone who has interfaced a Creed type 7 teleprinter to a 6800 as this is my next project.
Nick Parker 3 Ford Close, Dronfield, Sheffield tel; Dronfield 416455 (evenings)

I am having difficulty in getting system 68 to run and would like to hear from someone who has built one, or anyone locally running a home built system using a 6800.
J C Wood 9 High View Close,Loughton,Essex tel 01 508 5189

WHY NOT START AGAIN ?

Hewart Microelectronics, 95 Blakelow Rd.,Macclesfield, Cheshire SK11 7ED (tel; 0625 22030) are willing to sell a part 6800 kit to ACC members who have given up with S68. For £55 plus £4.4VAT plus £2.50 post they get a PCB, monitor ROM, crystal and construction manual for Hewart's Single Board 6800. They will have to buy some ICs and will end up with a lot of scrap 74C but will have a good fully Mikbug compatible 6800 computer that works.

ETI 68 ; MORE OFFERS OF HELP FROM

Roger Currier, 35 Winchester Ave.,London NW6 tel; 328 6106

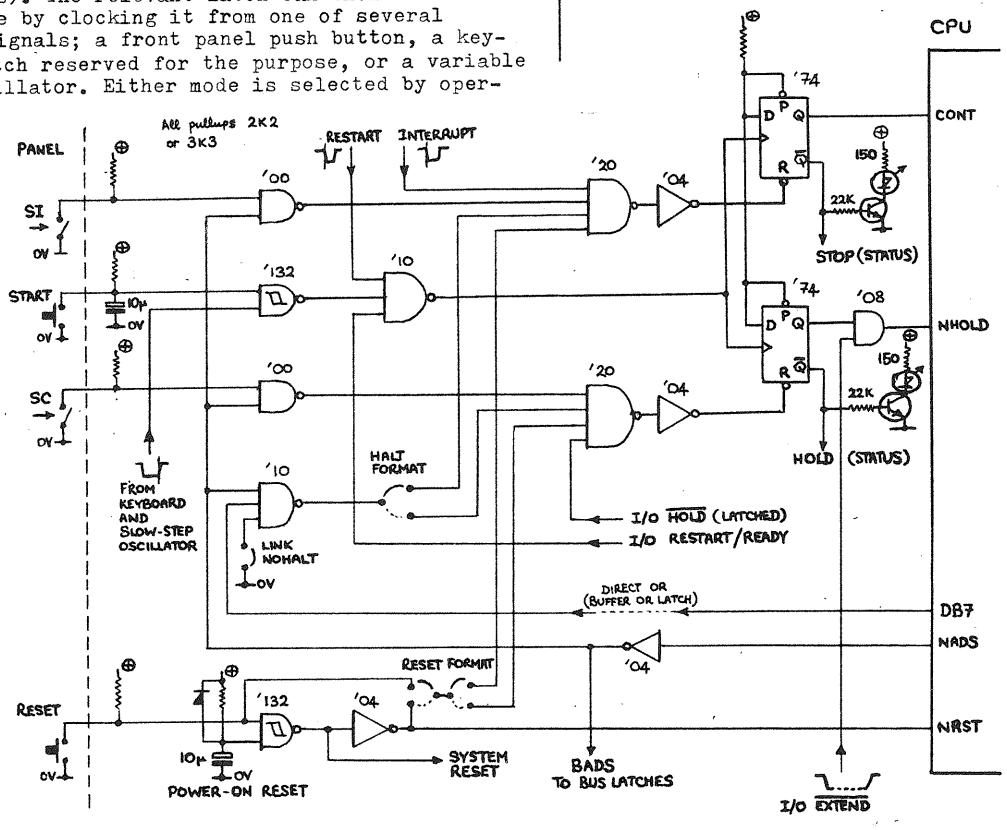
John Bailey 24 Priestly Hse.,Athlone St., Kentish Town, London NW5 4LP

J2-A cycle control (sc/mp)

J R Knight

Most single board computers using the SC/MP fail to take proper advantage of the special hardware features such as the one-bit inputs and outputs, and also the almost unique ability of the machine to execute not only single instructions, but also to suspend its own bus-transfer operations indefinitely with both data and address remaining 'live' on their respective busses. In fact some monitors (such as that on the MK14) provide software to single-step, despite the fact that the hardware is so much simpler than on, say, a 6800. The circuit shown here is part of a larger system, and contains features not usually required. The essential principle, however, is to arrange that either CONT (for single instructions) or NHOLD (for single IO cycles) is forced low by a latch when the NADS strobe appears (indicating that a valid address is on the bus). The relevant latch can then be reset at leisure by clocking it from one of several restart signals; a front panel push button, a keyboard switch reserved for the purpose, or a variable speed oscillator. Either mode is selected by operating the SI or SC switch - both can be used. To run at full speed both switches are closed and the processor will then run at the next START signal. The software HALT instruction can be executed in either mode, or disabled altogether. Using HOLD, the address of the next instruction, and the code itself, will rest on the busses; whereas the busses will be Tristate off if STOP is used. Likewise, on RESET or power up, the processor can be prevented from starting immediately.

The principle value of this is, naturally, in debugging; but the processor can also be stopped by certain types of (non serviceable) Interrupt, and restarted by external hardware; and IO cycles can be extended by slow peripherals or by a wait state (e.g. request for keyboard operations by the user) with or without latching. The circuit can easily be simplified to a 7474 and a few Nand gates, to be added to any SC/MP based system.



LETTERS

PRINTER INTERFACE

I have designed an interface for an ICL 667 printer which works, and very well too ! It will accept parallel data at up to 3 mega-byte/sec (for one line at a time, obviously) and prints after 96 characters or 'new line' have been received. It includes an automatic switch-off if data are not sent within 10sec of the last complete line, and a ½sec start up delay on new data, for motor run-up.

It does 150 lpm, with ample time for one or two line feeds in between lines (14mSec for first LF, 7mSec for any subsequent ones).

E Insam in Feb '78 issue thinks anyone who bought one of these printers was unlucky. Mine works beautifully, so should my second, when I complete the logic.

As the circuit diagram would take about five pages of the newsletter, if anyone wants a copy, I can get reprints from the master locally. The board uses 31 ICs, and 48 74123's on a separate card. Supply is +5V at 3.2A approx.

My next job is an interface for a CDC 5¼ Mbyte disc file to 6800. Anyone interested ?
Dave Morton 20 Camberwell Ave.,Cefn Glas, Bridgend, Mid Glam tel; 0656 57994

KIM BITS

My firm have provided me with a KIM 1 system in order to see what potential microprocessors have in analytical (chemical) control and data processing. I would be interested to hear from any other KIM 1 users who have used it in any external applications. An excellent training manual for microcomputers has come my way from a friend in the USA. It is called 'Programming a Microcomputer' and whilst written especially for the 6502 as used in KIM,PET and Apple, the basic principles apply to all computers. Frankly, it is the first book which I, as a beginner, was able to understand and it assumes no prior knowledge. It is written as a student course. The Publisher is Addison-Wesley Publishing Co, Reading, Mass.,USA. Author; Caxton C Foster. Date; 1978. Title; Programming a Microcomputer - 6502. £8.75
Martin Clift 49 Manor Lane, Halesowen, W Midlands B62 8PZ tel; 021 422 3041

TRS-80 CORRECTION

Under 'Meeting Points' in the last newsletter, it is stated that (or at least implied) that the TRS80 could not be run in machine code. This is not correct. Any TRS-80 will run machine code with the TBUG, which costs about £13.

F W Nicholls

LIBRARIES

COSMAC USER'S LIBRARY STARTS

R.C.Sheppard, of 15 Kinnaird Way, Cambridge, has started a COSMAC (1802) library for the ACC. To start off, the following information is available for loan to ACC members; please send an A4 sae with all enquiries.

1 The Cosmac Elf. Low cost experimenter's micro. 3 articles from Popular Electronics 1976/7

2 Graphic display for the Elf. Popular Elec '77

3 Cosmac Microprocessor based system. PCW '78

4 CDP 1802 data sheet

5 Hex keyboard i'face for RCA Cosmac development systems. RCA app note ICAN-6516

6 Alphanumeric display for Cosmac development systems. RCA app note ICAN-6488

7 Power-on reset/run circuits for 1802. RCA app note ICAN-6581

8 Programmable interval timer & counter for RCA Cosmac development systems. RCA app note 6482

9 Clock generators for 1302. RCA app note 6565

10 Introduction to microprocessors and the RCA Cosmac cos/mos microprocessor. RCA app note 6416

11 Analogue to digital converter for use with RCA Cosmac. RCA app note 6490

12 Adding two-level I/O interface capability to the RCA Cosmac development system. RCA app note 6486

13 Register based output functions. RCA app n 6562

14 Interrupt priority resolution circuit for RCA Cosmac systems. RCA app note 6485

15 PROM programmer for RCA Cosmac development systems. RCA app note 6491

16 RCA Cosmac Microtutor II manual MPM 209

17 DA & AD conversion for microprocessor development. Electron 1973

SC/MP USER GROUP LIBRARY NOW = SMALL PROCESSOR UGL

This is because National renamed SC/MP - it is now INS8060 (a sort of slimmer 8080, the newcomer might think) - and also because the Library is expanding to cover F8 and other things.

Three new commercial systems have come to light. Kemitron are doing a one-board job; cost £5.95 +25p +8%VAT for the board only, all other parts obtainable separately. It is fully buffered, covers 4k in standard form (4 extra address bits not latched) and can accomodate KITBUG or another monitor, and the RAM/IO device INS8154. NIBL BASIC in ROM is to follow. Meanwhile, out in Wiltshire, MUTEK (Formerly I.E.S) of Box have released IDES 8060, which looks very promising as it is not just another Bywood Breadboard, but designed as an expandable and adaptable system as well. BASIC and a monitor are available - the latter has facilities for displaying and altering all of SC/MP's registers as well as memory, and setting hardware breakpoints,aborting and block move or copy. It is based on Eurocards (64 way) and costs £99.50 upwards including the monitor on 2708. It has a more robust keyboard than MK14, and five multi-digit LED displays. The last system is from EMR in Paris, and is a motherboard with keyboard and LED's (7 segment) and a wide range of what is described as 'tout périphérique', including a scientific calculator module and a mixture of ROM and RAM. It is apparently pre-assembled, and costs about £120. BASIC isn't mentioned, possibly because the French didn't invent it ...

New items - hardware

S039 MK14 kit reviews (PCW & ETI)
40 SCRUMPI kit review (PE)
41 Databus Buffer (Elektor)
42 EMR SC/MP system (in French)
43 Minimal cassette interface
44 MK14 - RAM I/O device INS8154
45 SCRUMPI 3 kit review (ETI)
46 Kemitron SC/MP proto board spec
47 MUTEK IDES 8060 system summary
48 IDES system operating details
49 TV Chess machine (SC/MP based) (ETI)

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P004 Digital clock (Elektor)
05 Reaction Timer (")
06 SCMPKB monitor listing
07 Single Step;Hex conversion;relocator
08 Delay; noise gen; clock
09 Music & games programs
10 Misc programs
11 Serial input/output
12 IDES monitor - object listing (1k)

Fairchild F8 series

F8001 FAIRBUG User Guide
02 F8 summary sheet
03 Mostek 3870 data
04 Fairchild 3870 data
05 The F8 System (Byte)
06 The F8 Family (Fairchild)
07 F8 data

For any item in the library, please send 32p stamps and a sae.

In the next Newsletter, I hope to announce a special Interface section, to cover a number of special devices from Data Aquisition, Video Display etc. Special thanks to the members who sent me MK14 data and other things.

J Roger Knight c/o Dept of Meteorology,University of Reading,Harley Gate, Whiteknight's,Reading RG6 2AU

PDP8 SWAPLIST

FOR ALL PDP8 USERS

Do you own, or need, a PDP8, 8L or 8I ? If so it is in your interests to write to me giving brief details of the hardware and software you posess and need. It is my aim to circulate availability and requirements of main hardware, including PDP8 devices like discs and Dectape handlers, spares, and software between all persons interested on an amateur basis.
If interested, please write to Nigel Dunn, 21 Campion Rd.,Widmer End,High Wycombe, Bucks.

MIDLANDS GROUP MEETING AT LANCHESTER POLYTECHNIC

Having moved to the Poly because of lack of space, twice as many people turned up. So we will have to move to yet a bigger room !

Maurice Oakley showed his 77-68 using his own VDU based loosely on the ETI design. A submarine game was demonstrated and the programming strategies used were explained.Alan Hood showed us some very impressive vector graphics equipment coupled to two VDU's; a Newbury Lab and an Elbit. His system is based on the Z80 with North Star 14k BASIC . The North-Share monitor used can run up to seven terminals. Rex Beastall came with a PET this time, borrowed for a couple of months while he writes some programs. One program he ran was a graphic animation of the four strokes of a petrol engine.

In view of the long time between meetings, Roy Diamond is holding open house at 7.0 on Friday evenings. The next general meeting at Lanchester Poly, room B615, starts at 2.30 on Saturday 18th November.

MILD & SHANDY

W Siddons

I have been thinking for a long time about the design of two Amateur computers, to be known as Mile and Shandy, for those who are not yet Bitter men, nor even Weeny Bitter men. But with apologies to the Men of the Midlands, the Ansells Bitter Men. In fact for beginners, and Shandy for the under age beginner at that. Yet, like the mini, skirt and car, they might well prove to have a wider, and more lasting, appeal than was originally envisaged.

Construction would be based on Plugability. So there would be a Root, or Power Unit, with a three core cable to the power point, and about an eight core to the Octopus. But the latter would be far more than just an interface. A CPU, BDEP, and many BJM's, all rolled into one. So it would have chips on one side, and zero dissipation output stages on the other, with power plugs on top (for mains, low voltage AC, and DC), connections in the middle, switches on the front, and multiway cables out of the back.

Operation would be based on FBI, FOUR Bit Input. But FBI stands for FIVE Bit Input as well ! Too true ! FIVE with parity, FOUR without.

Basically, FBI is BCD, with the six redundant combinations made to earn their keep. So 10 is point; 11 space; and 15 delete.

With the digits, that is almost all one wants for pure figure work. So 12,13 and 14 are available for Accasional Alpha, including control combinations and other characters.

For instance, A could be 13,0; and B, 13,1. Double 12 could be tab; double 13, new line; and double 14, some special control combination. It will be noted that these double barrelled characters each require two FOUR Bit words to store them, and two frames of four (or five) channel tape to store them. But digits (including point and space) still require one each, even when Alpha is scattered among them.

This could be made compatible with SBO; Six (or Seven) bit output, with (or without) parity. But it should be noted that this is not quite the same as a six (or seven) bit code. For although it consists of four zones, of sixteen combinations each, one zone has a combination which is ignored, and the three others have no meaning in that zone. So there are 60, not 64, meaningful combinations. But it should be quite easy to arrange an extra zone, of limited scope, simply to supply this deficiency. Or the 'extra zone' might do more, such as to signify choice of output device, or anything else. In fact 91 (or even 106) combinations are available, if you really want them. That would be the digits, space and five zones of sixteen; or the digits and six zones.

Broadly speaking, each extra zone, of sixteen double-barrelled characters, is to be had at the cost of one single-barrelled combination. But other methods would be available, if you wanted, either to have a very large number of possible characters, or to conserve single-barreled combinations.

For instance, treble-barrelled characters; each zone of 16 to be had at the cost of one double-barrelled combination. Or a (presumably) double-barrelled combination could give access to a Repertoire of 15 related characters, numbered 0 to 14. The 15 would be EXIT, and could still be used to delete by over-punching.

So two barrels would be needed to enter a Repertoire and one to leave it. But characters within that repertoire would be had at a cost of 'a barrel a piece'.

This method might even be used for the digits, although you are not likely to want to; and a repertoire could be entered by a single barrel combination, if desired. In fact, unlimited variations are possible.

But all this is by the way, as the real benefit of FBI stems from its ability to cope with Occasional Alpha, without the need to expand the whole field. Hence both ease of inputing, and more space in a field. Also, you no longer have to distinguish between two types of field; expanded and unexpanded, all fields being expandable; and as a bonus, Packaged Decimal Fields being splittable.

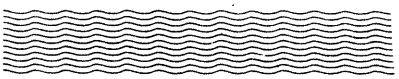
So, to sum up, without putting too fine a point on it;
Four bits give sixteen combinations. So characters are in zones of sixteen.
Each zone (other than the basic one) requires a prefix.
In S form, the prefix is in the same frame of tape.
In F form, it is in a separate frame. So certain combinations (in the basic zone) are reserved for use as prefixes.

Now we come to the Key Board, and here we see both the difference between the two concepts; and the underlying similarity. Mild seeks to obtain the best possible results, within the basic constraints of FBI; while Shandy aims marginally lower, in terms of results, but seeks to obtain these results with a minimum of 'froth'. So each, in its own way, is an optimisation; and gives full scope for individual effort.

At least the Key Board must have the 16 basic keys about like a key-phone, or a condensed keyboard adding machine. But anything else ? Yes. A Back Space would make it easier to delete by over punching; and what if, for some special purpose, you wanted to punch an even parity combination ?
A PBRK (Parity Bit Reversal Key) would be the simple answer. So the diode tree would have six outputs, giving both odd and even parity. Then you could change line 5 of the punch from odd to even by pressing the PBRK just before the key concerned.

That would be the limit of Shandy, because;
You can do everything you want to do,
yet it is still simple.
Also, the Back Space and the PBRK; if you don't want them, you can just ignore them.

Part two of this article will follow as soon as possible. But it may take some time, as Part One took over five years to get to this stage.



PERSONAL COMPUTER WORLD SHOW 21st - 23rd SEPTEMBER

The ACC have now, thanks to the kind generosity of the organisers, been able to exhibit free of charge at three shows devoted to the personal computer user. Of these the most recent and best organised was the PCW show at the West Centre Hotel last September. No doubt, to a degree, the PCWS organisers were able to learn lessons from the two previous shows arranged by Online, but generally I think that the PCW magazine used its greater understanding of what personal computing is about to produce a show which was relevant to the average amateur computer enthusiast.

The ACC had three computers constructed by members on show; two being 6800 based from Pete Birnie and Mike Lord, and an 1802 computer made by Jim Cunningham. In addition we sold club badges and surplus PCB's full of DTL & TTL chips, and generally encouraged people to join the ACC. Throughout the three days of the exhibition the response from visitors was tremendous. The stand was almost continually engulfed, we ran out of printed matter several times and enrolled about 150 new members.

Overall, the exhibition was well worth attending in that there were more exhibitors than at any previous show, and there were many new products of considerable interest. PCW are to be congratulated upon their enterprise, ingenuity, and commercial courage in holding this show, and I personally hope that it will be the first of many.

Bob Warren

Shop

VIDEO MONITORS FOR SALE

15" EMI type 301 in working order with handbook £15 ono.
As above but with some valves missing £7
Tim Moore 0628 29073

KEYBOARD FOR SALE

ASCII keyboard with large auxiliary control/indicator panel £14
F.V.Breame 68 Church Rd.,Bramshott,Liphook,Hants tel; 0428 723168

ETI IS WANTED

Any or all of the copies of 'Electronics Today International' for May,July & August 1978. Will pay 60p per issue, by return, if as new.
Graham Lewcock 0483 73528

ELLIOTT FOR SALE

Our school no longer has the space to accommodate our Elliott 4100 computer, so we have decided to sell it for £500 ono in working condition.
It consists of;
a) CPU 24k words (24 bit word length)
b) Fast paper tape reader
c) Paper tape punch
d) 3 magnetic tape drives
e) Console typewriter
f) Complete set of software including algol and BASIC compilers.

Mr.S.L.Green Bishop Stopford School,Kettering, Northamptonshire NN15 6BJ

BITS FOR SALE

3 Ghielmetti 30x40 way patch panels. No pins but are available from Maplin. Ex eq but in excellent condition. £2o ono each, £50 for 3.
Also other components, TTL - PCB's, signal gens, cheap. Part exchange for a QWERTY keyboard perhaps.
Duncan Willis 21 Oakley Drive, Fleet, Hants tel; Fleet 5332

FOR SALE OR SWAP

Dynamco 72 series 15MHz Oscilloscope, dual beam with delay time base. Must be worth £200, for sale or exchange /part exchange for Z80 based micro.
A R Kelly 109 Daniel Way,Silver End,Witham,Essex tel; Silver End 83048

FOR SALE & WANTED

ICL VDU complete with integral power supply and detachable keyboard. Model 7191. £150 or will exchange for good video monitor.
Wanted; copy of BASIC or other coding sheet.
Has anybody got SWTPC 3k micro basic or 8k BASIC patched and running on a 77-68 with 77-68 BUG 2 and VDU?
Mike Alger The Old Orchard, Main Rd.,Saltfleetby, Louth,Lincs LN11 7SS tel; Saltfleetby 698

ACCN WANTED

Vols 1,2,3,4 of ACCN wanted. State your price. I will also pay all postage & packing.
P Crilly c/o Reid, 7 Kirkoswald Rd.,Auldhouse, Glasgow G43 2YG

WIRE WRAP SOCKETS

I have a number of these surplus to my requirements and am willing to sell tham at cost. The stocks aren't huge and so I see this more as an 'emergency' service.
14 pin 22p. 16 pin 25p. 18 pin 50p. 20 pin 60p.
22 pin 65p. 24 pin 65p. 28 pin 65p. 40 pin £1.
Please send either a Jiffy bag that can be re-used plus about 30p stamps or 50p stamps & I'll return the balance.
R Sinden The Corner House,Birlingham,Pershore, Worcs.. Tel; 0386 750251

FOR SALE : OFFERS ?

Optical tape reader, wooden case with fan, TTL o/p. Croften UHF modulator.
S68 VDU board A, non-functioning.
SC/MP 2 CPU chip, unused.
J A E Sams 24 Elmwood Drive,West Mersea,Colchester

D2 FOR SALE

Motorola D2 kit. £150. Assembled and fully socketed. One year old. Reason for sale - have purchased a TRS-80.
L.F.Heller 8 Morris Walk,Newport Pagnell,Bucks MK16 8QD tel Loughborough 212041 (office hours)

JUMP THE MK14 QUEUE

Unopened MK14. £45 includes postage. Phone 01-794-8419 evenings & weekends.

BOB COTTIS / MIKE BLANDFORD CASSETTE INTERFACE

As previous issue of ACCN; Printed Circuit Board from Newbear for only £3.75 (+VAT + P&P) to ACC members.

FOR SALE

8 Track high speed paper tape punch. Reasonable offers considered.
Graham Japlin 61 Maresfield,Chepstow Rd.,Croydon CRO 5UB tel; 01 680 6915

PHILLIPS 8000's FOR SALE

Two complete Phillips Data 8000's, both with paper tape readers - serviced by Phillips. Forced sale - space urgently needed. £450 ono ; no offer too low to consider.
Nigel Worthington 01 229 8853 day
01 748 1074 evenings

VARIOUS FOR SALE,SWAP & BORROW

For sale;
a) One RO35 from Chiltmead, I have spent a lot of time converting it to print full ASCII. With circuit diagrams, psu and paper winder. Works very well. £60
b) One ASCII electromechanical keyboard, works well, TTL compatible,+5V/-18V supplies, with cct diag. £30.
c) Two ex 1900 Mullard core stacks, one is 16k x 25, the other 8k x 25. No drivers but I do have a spec./connection book. £10 the pair.
d) A 4k x 12 core memory,with drivers, sense amps etc. on one board. £40 with drawings, as seen not tested.

I want to buy/swap/borrow;
a) Engineering drawings and diagnostics for the following PDP8/I peripherals;
   KT8/I Time share I/F
   KE8/I Extended arith element
   CR8/I Card reader I/F
   PDP8/I line printer I/F
b) Any PDP series Positive I/O bus devices incl. Magnetic tape,Dectape,PT08,Disks etc.

Bob Selby Flat 1,8 Larpent Ave.,Putney,SW14 tel; 01 785 6934 (after 8 pm.)

KIM FOR SALE

Never used KIM-1 with motherboard and two 8k memory boards. One Microsoft 6502 BASIC set. Surplus parts for 18A power supply including transformer, capacitors and bridge. £475
John Coleman 9 Altwood Rd.,Maidenhead,Berks tel; Maidenhead 34362

LOTS FOR SALE

KSR-35 teletype ASCII 20mA current loop. Perfect, working every day. Offers around £150
Mikbug 6830 ROM £7
RT-68MX 6830 ROM multi tasking executive for SWTPC £30
A/BASIC tape based BASIC compiler, use with above ROM £25 KC cassette, very fast code; benchmark 7 in 4.6 sec.
SWTPC MP-68 motherboard complete with all connector and part decoding, I've got a bigger one. £20
Percom disc controller & software in ROM £125
Martin Rowat Braeside,Clavach Rd.,Borth,Aberystwith, Dyfed SY24 5LP

BUYING & SELLING

For Sale; Optical tape reader for 8 hole tape. Consists of photodiode array, tape guides, 110V motor & solenoids. No electronics. Data on photodiodes provided. £5
For Sale; Two 1702A EPROMs, one 1uS and one 650nS. Used but OK & erased. £2 each.
Wanted; Dual beam 10MHz scope. Anything considered.
Neil Harrison 24 Copengahen St. London N1

FOR SALE

VDU, Newbury Labs ASCII RS232 110/300 baud teletype compatible, looks like new but needs attention. Full technical manual. Uses common TTL chips.
Also large number of boards full of TTL chips and other bits at £1 for about 3 boards with 50 IC's.
Nigel Dunn 049 47 4483 evenings.

5% DISCOUNT TO ACC MEMBERS

On all subscriptions greater than £10 paid for by cash or cheque from L.P.Enterprises.

PAPER TAPE READERS FOR SALE

Two off. Made by Data-Precision of Switzerland. They come with drive, electronics and data. £25 each includes post & packing.
Terry Cassell 65 Alphington Ave.,Frimley, Camberley, Surrey tel; Camberley 29781

MORE DISCOUNTED BOOKS

The Computer Bookshop, Temple House, 43-48 New St Birmingham B2 4LH offer 5% discount to all ACC members who quote their ACC number - 10% on multiple orders. Catalogues on request.

FOR DISPOSAL

Paper tape reader of unknown origin, requiring 240V & 115V AC and having a logic board built in. 19" rack assembly. Around £15.
Paper tape deck, no motor, made by Tally. Very robust mechanical unit with nylon gears etc. £4
Bunker-Ramo desk terminal type 1036A1 requires new mains transformer. Around £20.
The first and third items are quite heavy and would be best collected. Will haggle prices with anyone interested.
Chris Warwick 44 Wellington Rd.,Birmingham B20 2SB

VDU BOARDS FOR SALE

The Practical Wireless system; ASCII in, UHF out, with 1k memory. Ideal for giving SC/MP or similar a video display. I'm open to any reasonable offer.
R Harwood 73 Writtle Rd.,Chelmsford,Essex

WANTED/NOT WANTED

For sale; RO35 Teletype less case as purchased from Chiltmead, not tested. £15
For sale; Telequipment S41 scope. Single trace, DC-15MHz, working order, good condition £30
Wanted; Copy of DEC Small Computer Handbook C800 covering PDP8I
R H Warren 01 979 4193 (home)
01 977 3252 ext 289 (work)

FOR SALE

58 key keyboard with 47 ICs. Unit is in excellent condition. £30 ono.
8 off Motorola RAM 3108003 7738. 4k x 1 (as used in the Apple) Dynamic. £20 ono
F.W.Nicholls H/B Kon-Tiki,1 Strawberry Vale, Twickenham, Middx TW1 4RX

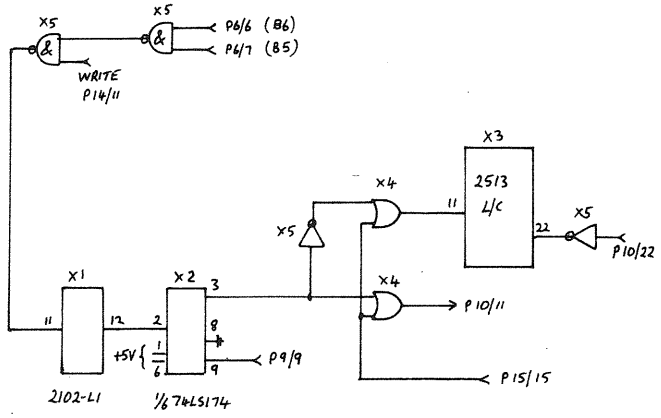
petitevid l.c.

ADDING LOWER CASE TO PETITEVID Martin Rowat

Mount X1 and X3 (and X2 if required) pick-a-back on existing ROM or RAM chips. Ensure non-common pins (X1/11,12),(X3/11,22) are bent outwards and solder connections to these. These chips are otherwise in parallel with existing chips of the same type on the board. Install X2,4,5 in sockets fixed to lower edge of Petitevid board.

Notes;
1. All chip numbers etc. refer to those given in Petitevid diagram given in ACCN vol 6 No 3 p 4, August 1978.
2. Copyright held by ERIS, waived for amateur use.
3. Make sure your 2513 arrives with +ve logic !
4. Petitevid continues to store forced upper case character. The inverter on bit 6 changes it to lower case when the lower case character generator (X3) is selected. X4 gates the cursor control line from the Thomson-CSF VDU controller.

X1 2102-L1 X4 74LS32
X2 74LS174 X5 74LS00
X3 2513/CM3021 lower case



HELP !

SC/MP NEEDS HELP

I have a SC/MP Introkit and Keyboard kit and would like to add the facility of interfacing to a cassette recorded. I have obtained from the Library the listing of load and dump programs and wonder if any member could give me some help in circuitry and interconnections required to use that with my particular kit.
L W King 27 The Beeches,Lydiard Millicent,Swindon

FIELDWORKERS WANTED

I am a postgraduate at the University of Sussex interested in studying the psychological and sociological effects of home computers. As such I need to get a feel for the size of this market as well as speak to individual enthusiasts about the use of their machines. Anybody who is willing to help me in investigating this field should write to;
David Lappra Room 222,Holland House,Holland Rd., Hove BN3 1LG

HELP

Would someone please loan me the NASCOM 1 kit documentation for a couple of days (postage refunded).
L.T.Chanter 19 Lodge Place,Staveley,Derby S43 3DU

WHAT'S A PTS-100 1010 ?

I have the semi-permanent loan of two PTS-100 1010 processors but no hardware data on them. I would be extremely grateful for any information anyone might have, especially on the peripheral interface or the cassette recording system used.
D.G.Fletcher 30 Cantley Cresc.Wokingham,Berks
tel; Wokingham 782461

BRENTWOOD BASIC FANS

I am running a 32k 6800 system with a TI terminal (cassettes), my interests and capabilities being limited to BASIC, and was wondering if there is anyone near me with similar interests.
Bernard Simmons 27 Middleton Rd.,Brentwood,Essex
tel; Brentwood 215604

Meeting Points

Being a list of all those known to your editor.

WEST MIDLANDS
John Tracey 100 Booth Close, Crestwood Park, Kingswinford DY6 8SP tel; 0384 70097

LIVERPOOL
J.S.Stout c/o STEM, 19 Abercromby Square,Liverpool 7

BROMLEY/ORPINGTON
Phil Wheeler 1 Irene Rd.,Orpington,Kent tel; Orpington 23800

SITTINGBOURNE
J.M.Baron 27 Wises Lane, Borden, Sittingbourne tel; Sittingbourne 70160

BRISTOL
Rex Godby 16 Williamson Rd.,Ashley Down, BS7 9BH tel; Bristol 46981

NORTH STAFFS
M.J.Brough 11 Beech Drive, Kidsgrove,Stoke on Trent tel; 07816 4387

CORBY TECHNICAL COLLEGE
Diane Hayes

CAMBRIDGE UNIVERSITY PROCESSOR GROUP
c/o Tim Hopkins, Magdalene College, CB3 0AG

EXETER/TAUNTON
G.V.Barbier, Palmers Mill, Calverleigh,Tiverton.

SOUTH WEST REGION (Devon)
D.Carne, 44 George St.,Exmouth,Devon EX8 1LQ tel; 039 52 74479

NORTHEAST PETS
T Turnbull, 49x9th Row, Ashington,Northumberland.

BELFAST
John Peacocke, 22 Wheatfield Gdns.,Belfast 14

HARROW LOCAL GROUP
Alan Secker, 209 Olbury Drive, Pinner, Middx tel; 01 428 0844

LINCOLN
M Alexander 5 Brattelby Cresc.,Lincoln LN2 2EB tel; Lincoln 23084

BRADFORD
Barry Waite 315 Toller Lane, Heaton, Bradford 9 tel 498 750

MANCHESTER
Ken Horton 50 Lymefield Drive,Worsley,Manchester

BRISTOL-CARDIFF
Pete Hesketh Shire Newton 596

OXFORD & DISTRICT AMATEUR MICROCOMPUTER CLUB
S.C.Bird 139 The Moors, Kidlington,Oxon

TORQUAY
Trevor Brownen Crystal Electronics, 40 Magdalene Rd., Torquay, Devon

BRIGHTON
P Weaver 30 Warren Way, Telscombe Cliff, New Haven E Sussex BN9 7DJ

LEICESTER
G.B.Foden, 11 Gaddesby Lane,Rearsby,Leicester tel; Rearsby 247

HIGH WYCOMBE U.G.
Roy Woodbridge or Ken Spencer, Dept of Eng., College of Higher Education, High Wycombe.

S.YORKS
N.Beard High St, Braithwell, Rotherham.

COLCHESTER
Donald Clarke, 21 The Avenue, Colchester CO3 3PA tel; Colchester 66637

ELTHAM
R.I.Mitchell 58 Kenilworth Gdns., Shooters Hill, London SE18 3JB tel; 01 856 2489

MIDLANDS (Coventry)
Roy Diamond, 27 Loweswater Rd.,Coventry CV3 2HJ

SCOTLAND (Edinburgh & Glasgow)
H Sheldrake 031 332 6849

NORTH LONDON HOBBY COMPUTER CLUB
R Bradbeer, senior lecturer, North London Poly, Holloway Rd., London N7

LINLITHGOW
S Stevenson Lindisfarne, New Well Wynd,Linlithgow West Lothian tel; 2657

SUSSEX PERSONAL COMPUTING SOCIETY
N Latchem 23 Silverdale Rd.,Hove, Sussex

SOUTHAMPTON ACC
P Maddison 13 Westridge Rd.,Portswood,Southampton tel: 558 365

LIVERPOOL UNIVERSITY
Malcolm Taylor 051 709 6022 ext 2955

THAMES VALLEY GROUP (Reading)
Meets first Thursday of the month at The Griffin, 10 Church Rd.,Caversham, Reading. Dave Howland, 4 Kent Lodge,Courtlands,Maidenhead, Berks tel; 0628 36976

NOTTINGHAM
Mr. Braga 3 Troutbeck Cresc., Bramcote,Beeston tel; 0602 256622

BRUNEL TECHNICAL COLLEGE (Bristol)
S.Rabone, Electrical & Electronic Eng Dept.

MEDWAY GROUP
Tony Aylward 194 Balmoral Rd.,Gillingham,Kent tel; Medway 56830

CHELTENHAM
P Pullin 45 Merestones Drive, The Park,Cheltenham tel; Cheltenham 25617

2650 LIBRARY
R A Munt 51 Beechwood Drive,Feniscowles,Blackburn Lancs BB2 5AT tel; 0254 22341

PET UG
Norman Fox 22 Firs Walk, Tewin Wood,Welwyn,Herts. tel; Bulls Green 433

6800 SOFTWARE LIBRARY
Roy Hall 89 Hicks Ave, Greenford, Middx tel; 01 578 9136

TRS 80 UG
Leon Heller 8 Morris Walk, Newport Pagnell,Bucks

COSMAC LIBRARY

COSMAC (1802) LIBRARY
R C Sheppard 15 Kinnaird Way, Cambridge

PDP/LSI 11 UG
P Harris 119 Carpenters Way, Potters Bar, Herts

9900 UG & LIBRARY
Simon Garth 67 De Parys Ave., Bedford

77-68 UG
Newbear Computing Store, 7 Bone Lane, Newbury,Berks

NASCOM UG

Lynx Electronics 92 Broad St., Chesham

PDP8 UG
Nigel Dunn 21 Campion Rd., Widmer End, High Wycombe

IM6100 UG
S.P.Fiala 95 Felmongers,Harlow,Essex CM20 3DL

ACC 8080/Z80 LIBRARY
9"x4" sae for index from Neil Harrison, 24 Copenhagen St.,London N1 0JD

ACC GENERAL LIBRARY

Frank Cato 3 Rykneld Way,Derby DE3 7AT tel; 0332 513769

SMALL PROCESSOR LIBRARY (SC/MP, F8 etc)
J.R.Knight Dept of Meteorology, University of Reading, Earley Gate, Whiteknights, Reading RG6 2AG

6800 HARDWARE LIBRARY
Bob Forster 18A The Barons, St. Margarets,Twickenham, Middx tel; 01 892 1873

U.K.PET USER'S CLUB
Commodore Systems 360 Euston Rd., NW1 3BL

Z-80 UG
Roger Sinden 18 Percival Rd., East Sheen SW14 7QE tel; 01 878 5374

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7 Dordells, Basildon, Essex
tel; 0268 411125 (evenings)