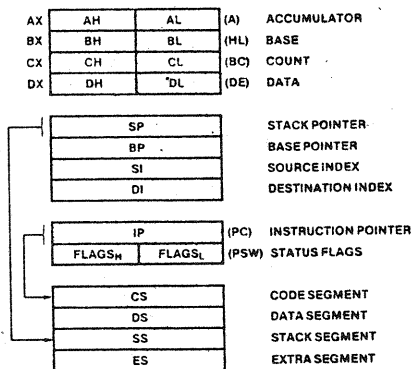


8086 IS COMING

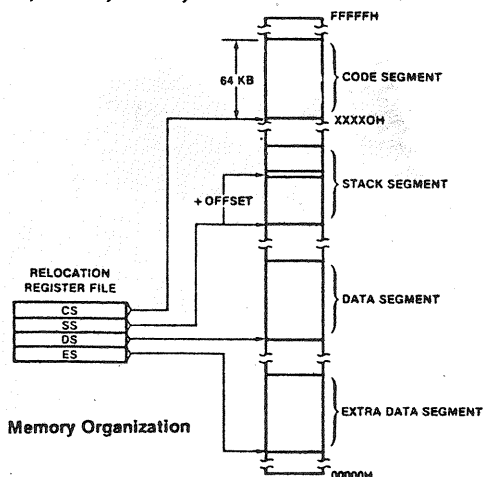
The fabled Intel 8086 seems to be almost with us; preliminary data sheets have been released and Intel are holding introductory seminars on the device.

Although it bears some resemblance to the 8080, the 8086 is essentially a new device. The instruction set is a lot cleaner, but more powerful. For example the basic arithmetic and logical instructions can operate on either two registers or on a register and a memory location, and the result may be put into either a register or into a memory location (one can even transfer between the stack and a memory location). This gives a nice symmetry to the instruction set. Memory is addressed in bytes, even though the data bus is sixteen bits wide, and all data manipulation instructions can be specified to operate on either 8 bit bytes or on 16 bit words.

8086 Register Model



The processor provides a 20 bit address to memory, corresponding to a 1 Megabyte address space (a lot of British 64k RAMs !). To generate the 20 bit addresses, the 16 bit address portion of the instruction is added to the contents of one of the relocation registers CS, SS, DS or ES. These are 16 bit registers but in the calculation of the effective address they are treated as though they contained the 16 most significant bits of a 20 bit word, the least four bits being taken as zeroes. This technique gives the user access to four 64k byte segments; Code, Data, Stack and Extra.



Throughput, relative to 8 bit processors like the 8080, is improved by using a 16 bit memory data bus, and also by an on-chip 6 byte 'instruction queue'. The processor uses what would otherwise be spare bus cycles by filling this queue with bytes from memory immediately after the current instruction. As there is a good chance that the next instruction to be executed will already be waiting in this on chip queue, the processor can get on with the job without waiting for another memory fetch cycle.

All in all a superb design, for which only one more piece of vital information is awaited; the price.

IN THIS ISSUE

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- * CASSETTE STANDARDS

AIM FOR £250

Planned to be available in September, Rockwell's AIM 65 microcomputer is already causing interest and consternation. For £249.50 plus VAT, AIM 65 is a ready built single board machine with;

Inbuilt thermal printer - 20 column alphanumeric, 90 lines per minute.

20 character alphanumeric display.

Full ASCII alphanumeric keyboard.

Powerful (4k byte) ROM Monitor.

Dual Cassette and TTY interfaces.

1k byte RAM.

Spare ROM sockets for 4k Assembler/Text Editor or 8k BASIC interpreter.

6500 MPU and KIM-1 compatible bus connector.

For more details contact Pelco (Electronics) Ltd., Enterprise House, 83-85 Western Rd., Hove, Sussex.

CASSETTE STANDARDS

The ACC is organising several events scheduled to take place between now and March 1979. One of these is a conference/debate on the subject of Cassette Interfaces.

In November 1975 a conference at Kansas City USA adopted the CUTS (Cassette Users Tape Standard) from a choice of about a dozen proposed systems. Because the selected system was slow (300 baud or 300 bits per second) it has often been the subject of criticism.

However;

1. It is a de facto universal hobbyists system and satisfactory for exchange of data between different hobbyists, primarily because of its tolerance to fairly wide mechanical deviations.
2. For loading ones own system with either data or programs, one really requires something faster. There are a whole host of post 1975 developments now available for comparison.

If you have views on the subject, then draw up a brief outline of your position, preferably as a series of short, numbered notes, and despatch these together with drawings or photocopies of any proposed circuit or other details and send them to Alan Secker, 209 Albury Drive, Pinner, Middx HA5 3RH.

All proposed systems will be compared and members with like views will be put in touch with one another with the intention that a debate be staged with a minimum of waffle, repetition or duplication and the maximum of the results of scientific painstaking research.

The exact date will be announced in the Newsletter /.....

Sources of information on the above subject so far encountered by the author are listed below;

1. Popular Electronics - March 1976 - Details of Kansas City Conference.
2. Scelbi Byte Primer - AC30 Cassette Interface (CUTS Formula) by Gary Kaye of SWTPC.
3. ETI - Jan & Feb 1978 - CUTS circuit 68 system by John Miller-Kirkpatrick.
4. Elektor - April 1978- CUTS system. Software controlled, 300 to 1200 baud.
5. Scelbi Byte Primer-"Build a fast cassette interface" by Robert Suding (1100 to 1750 baud).
6. Tarbell System (word of mouth - 1Hz per bit, up to 1500 Baud ?)

7. International Electronics June 8 1978 "Processor Cassette Interface Helps Slash Data Storage Costs" up to 4000 baud, by Powell Mikulski.
8. Signetics Phased-Lock loop applications book, 100 baud FSK system.
9. Unknown Nascom customer - alleges 4k of RAM loaded in 12 sec.

In addition to mass storage, papers are requested upon the subjects of utilisation of stereo machines for audio track paralleling instruction tracks; loading blocks of data (say 1k at a time) leaving 1k between the blocks so that data unloaded from the first block can be unloaded into RAM, processed and then reloaded without mechanical pause. Above any suggestions including variations on the above themes will be welcomed and may give rise to follow up conferences.

E78 MEETS 2650

E78 BUS SPEC AND THE 2650

R A Munt

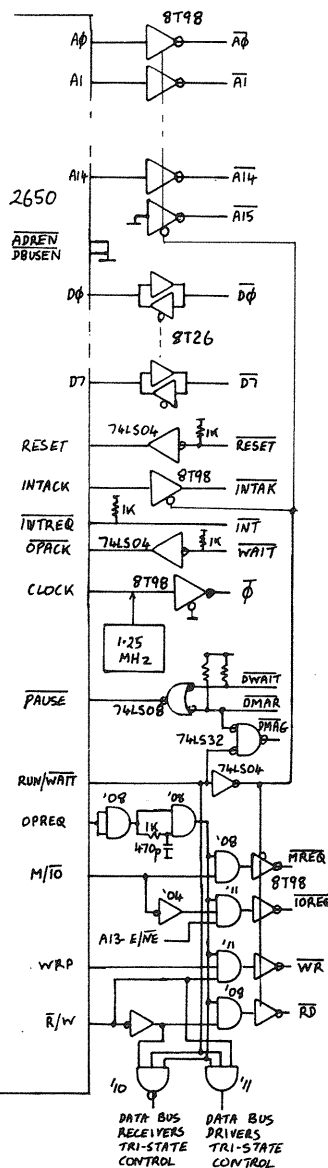
I am pleased to see that a Bus spec has at last been ironed out. My thanks to Dave Howland, Pat Crowe and Bob Cottis. It has turned up just in time for my own system expansion. As ACC 2650 Librarian and a 2650 user the following notes on the E78 bus spec as it applies to the 2650 may interest others.

- AO -A15 Invert via tri-state drivers. Note 5.
- DO -D7 Invert via tri-state transceivers.
- D8 -D15 Not required - leave floating.
- BAI-BAO As defined function.
- IEI-IEO As defined function.
- M1/Ø2 Not required - leave floating. Note 2.
- Ø Inverted CPU clock.
- DWAIT Or'ed with DMAR to drive CPU pin PAUSE. See circuit and note 1.
- INTAK Tri-state inversion of INTACK.
- DMAR Or'ed with DWAIT see circuit, note 2.
- DMAG This can be produced by 'anding' DMAR and RUN/WAIT.
- NMI Not required, leave floating.
- INT Direct i/p to CPU as INTREQ.
- MREQ This can be produced by 'anding' M/IØ and OPREQ.
- IORQ This can be produced by 'anding' M/IØ . OPREQ.E/NE. Note 2.
- WR Produced with OPREQ.R/W.WRP.
- RD " " OPREQ.R/W
- RESET Invert to drive CPU pin RESET.
- WAIT " " " " OPACK
- INHR As defined.
- RFSH Not provided by CPU must be generated elsewhere as for 6800.

Notes;

- 1) When using the E78 bus the 2650 pins DBUSEN and ADREN would normally be held enabled and tri-state bus control performed at the bus inverters, see circuit.
- 2) To comply with the E78 the signal IORQ must be generated as equivalent to 2650 extended IO. This makes non-extended IO inaccessible unless these ports are used directly on the CPU card. The only other solution would be to bring out the M/IØ line on a pin not normally used by the 2650 say pin 15a (normally M1 or Ø2) to be used only for selecting non-extended IO.
- 3) The 200ns delay shown on OPREQ is required on any 2650 setup as this signal can become true up to 200ns before other O/P lines become valid. Not required for the 2650A-1.
- 4) Due to the 50% duty cycle of OPREQ, DMA and/or refresh can be performed transparently in an interlaced fashion, without holding up the processor if DWAIT or DMAR is only asserted when MREQ or IORQ is false. Using this mode DWAIT or DMAR is only used to force the bus tri-state. Instead of waiting for DMAG the DMA or refresh circuitry gets straight on with it having 3 clock periods available to complete a single access.

- 5) For a 2650 system it would be better to leave A15 floating at the CPU end. This line can then be included with A16-A19 for selecting larger memories if required.
- 6) Timing requirements asked for for INT and INTAK will be as required.



LETTERS

1802 4 U ?

As a new member of ACC, my first action was to borrow all past issues of the newsletter from Mr. Cata and scan them eagerly for discussion of the Cosmac 1802 based microcomputers. Not a mention! Has no one else realised the virtues of this simple unassuming yet powerful MPU? For any enthusiast looking for an inexpensive introduction to personal computing the Cosmac is hard to beat.

My system is based on a design published in 'Popular Electronics' in 1976/7. A similar though more complicated circuit appears in the current issue of 'Personal Computer World'. Its simplicity may be judged from its content of only 13 chips, and these include two hexadecimal displays and power supply regulator. This should be compared with 19 or 21 chips in the 7768 6800 design which provide only LED outputs and no PSU. And what about the cost of all those address toggle switches? The basic Popular Electronics design kit is available from the States for about \$90 including two H-P hex displays which themselves cost \$10 each.

The basic system provides toggle switch input, hex display, 256 bytes of RAM, four input lines and a latched output line. An alternative 8 discrete LED output is also described. Importantly the original Popular Electronics articles include a number of simple additions which provide, for example, expansion of the number of input and output lines, 1K of RAM (up to 64K can be added in principle), audio output, and especially a two chip hex keyboard decoder which is an absolute must after the initial euphoria has worn off. A simple monitor is also listed. Some other simple programs are included but clearly software availability is going to be a weakness unless hobbyists get together and exchange programs. I have added a cassette interface using a TTL shift register instead of a UART and outputting software encoded semi CUTS directly from serial o/p. However this uses both channels of a small stereo cassette deck with the second channel for clocking so these tapes will not be directly interchangeable. Doubtless some bright spark can design a full CUTS self clocking interface not using expensive chips. Incidentally the designers of the ACC 7768 system seem to have gone slightly beserk with their additions to what I believe was conceived as a simple inexpensive system. The 7768 MON 1 interface, for example, adds another 29 chips to the system including two UARTs, no less.

However, far be it for me to 'knock' any circuit using the excellent 6800 MPU; the point I would really like to make is that there certainly exist many for whom computing is just fun and who find it difficult to justify expenditure rapidly climbing into the hundreds of pounds. Not for them the TTY and 8K BASIC. More likely a hex keyboard, machine code and dreams of converting the cast off black and white TV. I hope the ACC will continue to bear the needs of these true amateurs in mind.

Incidentally, I was glad to see in ACCN plaudits given to James Electronics of California for good mail order service. They have provided me with a wide range of TTL, CMOS and LEDs over the years, usually at a price about half that of the UK mail order market and invariably within 10-14 days. Their price for the RCA CDP 1802 is \$19.95.

R C Sheppard

CPM USERS

I have missed the last two meetings of the ACC and therefore I stopped at the ACC booth at the DIY show to discuss some recent additions to my minicomputer system. I am running an IMSAI 8080-Z80 with Altair BASIC, CPM on 8 inch floppy discs, VDU and an ASR38 teletype. I mentioned that I am grateful that a member had devoted an extraordinary amount of time to help me locate and resurrect a junked 50Hz motor to convert my USA teletype. My next hardware project is to make an interface for the IBM golfball typewriter and write the software to drive it. My current software interests range from word processing and file management to process control.

I now have CPM and a disc BASIC running and a fair library of games, maths and some business packages from the USA. A recent acquisition of the programs from the New York CPM user group has been keeping me busy trying to separate the trivia from the treasure. I would like to discuss programming with other 8080/280 users who may be able to use some of the rather good software which is now in the public domain in the USA. Programs can be exchanged on paper tape, Terbell, Cassette, or CPM discette. Perhaps we can establish a London CPM users group.

Bob Sonner, Esher (63405)

7768 vs ICL

I have recently acquired an ex ICL VDU and Keyboard Model 7191/9 and I would like to interface it to 7768. Has anyone any data on interface levels, connections etc. Postage will be repaid for any information received.
Mike Alger The Old Orchard, Main Rd., Saltfleetby, Louth, Lincs LN11 7PN

ACC SPECIAL PROJECT 1973/9

From ACCN V6 Iss 1 April 1973 pl3, I see that a form of fast mass storage is being contemplated.

I would like to draw members' attention to the LFD-400 floppy disc system marketed in the USA by Percom data at a very realistic price. It comprises (all available separately) as SS50 floppy drive controller (1-2 drives), cables, power supply and manual. Software is available in 2708 EPROM in 1k byte increments. Three EPROM sockets are provided on the controller board. No RAM is needed to implement DOS. Shugart SA-400 mini floppies can be used and can be supplied by Percom if required.

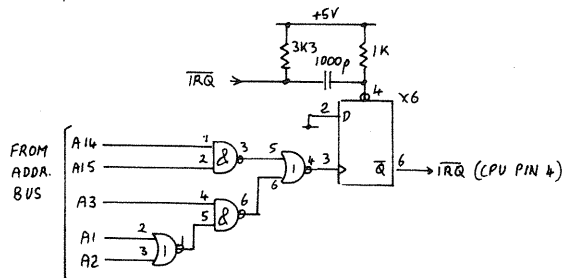
I bought mine using my Barclaycard and telephoning the order. Delivery was ten days and air mail and insurance cost about \$25. Duty is 7% and VAT 8% of the total bill. Typical prices;

Complete 1 drive	\$599.95
SA400 drive	325
Controller board; SS50	105
Mini DOS software on EPROM	39.95

Martin Rowat

PAUL MAPP'S SYSTEM

A Minor Modification; to enable the maskable interrupt to work correctly, the IRQ line must not be low when the interrupt sequence finishes and the interrupt mask removed, otherwise the processor will recognise a further interrupt. To overcome this I have inserted the following circuit in the interrupt line.



The system IRQ line falling presets the D type 7474 to indicate an interrupt. The processor addressing FFF8 or FFF9 clears the interrupt regardless of the state of the system IRQ line. This line must rise, then fall again to generate a further interrupt.

CHIC CHOPPED

The ACC Cheap Hardware Information Centre service has been dropped due to lack of interest. Thanks to Bob Warren for running it well for the past few years.

7768 BUG 2

256 byte Monitor for 77-68 with VDU-1 board and parallel keyboard input.

```

TOPSTK EQU $FOEE      top of BUG stack
TMPXHI EQU $FOF6      temp storage
TMPXLO EQU $FOF7      "
TMPX2 EQU $FOF8       "
TMPSTK EQU $FOFA      "
VDUADR EQU $FOFC      addr of next
                        display pos'n
KBUFF2 EQU $FOFE      char i/p buffr
KBUFF EQU $FBFF       K/B i/p buffer
    
```

Non Maskable Interrupt handler. Takes character from keyboard buffer, jumps to Monitor if it was CTRL/C, otherwise stores character in KBUFF2 & returns.

```

FF00 B6 FBFF NMIHDL LDA A KBUFF      get char
      03 81 03      CMP A #3        CTRL/C ?
      05 27 14      BEQ SWINT
      07 B7 FOFE      STA A KBUFF2     save char
      0A 3B          RTI              & return
    
```

Reset handler, sets up BUG stack pointer & clears screen.

```

FF0B 8E FOEE RESET  LDS #TOPSTK
      0E CE F800      LDX #F800
      11 86 20      LDA A #20      (= space)
      13 A7 00      CLRALL STA A 0,X
      15 08          INX
      16 8C FCOO      CPX #FC00     end of display ?
      19 26 F8          BNE CLRALL
    
```

SWI handler, saves user program stack pointer.

```

FF1B BF FOFA SWINT STS TMPSTK
    
```

RSTART; Monitor returns here after executing each command. Switches to BUG's own stack, displays '*', & gets new command character.

```

FF1E 8E FOEE RSTART LDS #TOPSTK
      21 8D 6E      BSR SCROLL     new line
      23 86 2A      PNT* LDA A #'*
      25 8D 58      BSR PNTCH      print *
      27 8D 52      BSR GETCH      get command
    
```

Sort out which command was entered & go to routine. To RSTART if command not valid.

```

FF29 81 41          CMP A #'A      Alter ?
      2B 27 2F      BEQ ALTER
      2D 81 43      CMP A #'C      Continue ?
      2F 27 27      BEQ CONT
      31 81 47      CMP A #'G      Go ?
      33 27 14      BEQ GOGOGO
      35 81 52      CMP A #'R      Reg print ?
      37 27 2C      BEQ REGPNT
      39 81 45      CMP A #'E      Examine ?
      3B 26 E1      BNE RSTART
    
```

'Examine' routine; get address, print contents of that & 7 following locations.

```

FF3D 8D 72          BSR GETADR
      3F C6 08      LDA B #38
      41 8D 68      EXAMPL BSR P2H&S  display contents
      43 08          INX              point @ next
      44 5A          DEC B
      45 26 FA      BNE EXAMPL
      47 20 DA      BRA PNT*
    
```

Go to user program; get starting address & put it on user stack so that RTI will load it into prog. counter, CONT does the rest; restores user stack pointer then returns to user program.

```

FF49 8D 66          GOGOGO BSR GETADR
      4B FE FOFA      LDX TMPSTK     point @ user
                        stack.
      4E B6 FOF6      LDA A TMPXHI  change PC on
      51 A7 06      STA A 6,X      user stack
      53 B6 FOF7      LDA A TMPXLO
      56 A7 07      STA A 7,X
      58 BE FOFA      CONT  LDS TMPSTK  restore user SP
      5B 3B          RTI              over & out
    
```

'Alter' routine; get address of first location to be changed, then get data for that & subsequent locations. Routine HEX2IN jumps to RSTART when a non-hex character is entered on the keyboard.

```

FF5C 8D 53          ALTER BSR GETADR  get address
      5E 8D 62          ALTLP BSR HEX2IN  get data
      60 A7 00          STA A 0,X    store it
      62 08            INX              point @ next loc.
      63 20 F9          BRA ALTLP     back for more
    
```

'Register print' routine; point @ user stack & print registers from it, then print user SP.

```

FF65 8D 46          REGPNT BSR PNTSP
      67 FE FOFA      LDS TMPSTK  point @ stack
      6A 8D 3E          BSR IP2H&S  display CC reg
      6C 8D 3C          BSR IP2H&S  " B "
      6E 8D 3A          BSR IP2H&S  " A "
      70 8D 35          BSR IP4H&S  " X "
      72 8D 33          BSR IP4H&S  " PC "
      74 CE FOFA      LDX #TMPSTK
      77 8D 2F          BSR P4H&S   disp user SP
      79 20 A3          START2 BRA RSTART
    
```

Get character from keyboard; wait for interrupt caused by keyboard then load character into A.

```

FF7B 3E            GETCH WAI
      7C B6 FOFE      LDA A KBUFF2
    
```

Display character in A. Scroll if it is a Car Ret or if end of (32 char) line.

```

FF7F FF FOF8 PNTCH STX TMPX2      save X
      82 FE FOF6      LDX VDUADR   point @ display
                        position
      85 81 0D          CMP A #30D  Car Ret ?
      87 27 08          BEQ SCROLL
      89 A7 00          STA A 0,X    display char
      8B 08            INX              point @ next pos
    
```

FF8C 8C FA00 CPX #FA00 past end of line?

```

      8F 26 0F          BNE ENDPNR
      91 CE F7E0      SCROLL LDX #F7E0
      94 36            PSH A
      95 A6 40          SCRLUP LDA A 40,X
      97 A7 20          STA A 20,X
      99 08            INX
      9A 8C F9E0      CPX #F9E0  end scroll with
      9D 26 F6          BNE SCRLUP   X = F9E0
      9F 32            PUL A
      A0 FF FOFC      ENDPNT STX VDUADR  update VDUADR
      A3 FE FOF8      LDX TMPX2     restore X
      A6 39            RTS
    
```

Hex print routine; print one or two bytes pointed to by X as two or four hex digits plus space. X may be incremented before each byte is read.

```

FFA7 08            IP4H&S INX
      A8 8D 23          P4H&S BSR P2HEX
      AA 08            IP2H&S INX
      AB 8D 20          P2H&S BSR P2HEX
      AD 86 20          PNTSP LDA A #320  (space)
      AF 20 CE          BRA PNTCH    (BR & RTS)
    
```

Get address routine; accepts four hex digits from keyboard, converts them to a two byte address stored in TMPXHI, TMPXLO and also in X.

```

FFB1 8D FA          GETADR BSR PNTSP
      B3 8D 0D          BSR HEX2IN
      B5 B7 FOF6      STA A TMPXHI
      B8 8D 08          BSR HEX2IN
      BA B7 FOF7      STA A TMPXLO
      BD FE FOF6      LDX TMPXHI  copy addr into X
      CO 20 EB          BRA PNTSP    (BR & RTS)
    
```

HEX2IN routine gets two characters from keyboard, treats them as hex digits ('0'-'9', 'A'-'F') then converts them to one binary byte in A. Exits to RSTART if a non-hex character inputs.

```

FFC2 8D 1F          HEX2IN BSR GETHEX  get 1st. hex dig
      C4 48            ASL A
      C5 48            ASL A      shift it left 4
      C6 48            ASL A      bits
      C7 48            ASL A
      C8 16            TAB
      C9 8D 18          BSR GETHEX  get 2nd. hex dig
      CB 1B            ABA
      CC 39            RTS          & combine them
    
```

P2HEX prints byte pointed to by X as 2 hex char.

```

FFCD A6 00          P2HEX LDA A 0,X    get byte
      CF 47            ASR A
      D0 47            ASR A
      D1 47            ASR A      shift it right
      D2 47            ASR A      4 bits
      D3 8D 02          BSR PNTHEX  print 1st. hex
    
```

```

D5 A6 00      LDA A O,X      retrieve byte
D7 84 0F      PNTHEX AND A #30F blank left 4 bits
D9 8B 30      ADD A #330      convert to ASCII
DB 81 39      CMP A #339
DD 23 A0      BLS PNTCH      (BR & RTS)
DF 8B 07      ADD A #37
E1 20 9C      BRA PNTCH

```

GETHEX takes an ASCII character from the keyboard and converts it to Hex if it is in the range '0'-'9', 'A'-'F'. Else it jumps to RSTART

```

FFF3 8D 96      GETHEX BSR GETCH      get ASCII char
E5 80 30      SUB A #30
E7 2B 90      BMI START2
E9 81 09      CMP A #9
EB 2F 08      BLE RTS2
ED 80 07      SUB A #7
EF 2B 88      BMI START2
F1 81 0F      CMP A #F
F3 2E 81      BGT START2
F5 39      RTS2 RTS

```

FFF6 & FFF7; space for expansion

Interrupt vectors;

```

FFF8 FF1B      SWINT      (IRQ vector)
FFFA FF1B      SWINT      (SWI " )
FFFC FFO0      NMIHDL     (NMI " )
FFFE FFOB      RESET      (RESET " )

```

Notes; The monitor has been squeezed into 256 bytes so that it can be loaded via front panel switches. Resulting limitations are; display restricted to 16 lines of 32 characters each; any other I/O can't be interrupt driven.

Commands;

```

E aaaa      displays contents of 8 memory loc's
             starting at address aaaa (hex).
A aaaa bbcc store bb in loc aaaa, cc in loc aaaa+1,
             etc (terminate with non-hex character).
G aaaa      start running user program from loc'n
             aaaa. If user program encounters SWI
             instruction, or if CTRL/C entered on
             keyboard, system returns to monitor.
R           displays registers & PC from user
             program in format;
             CC B A X PC SP
C           continue running user program after
             break caused by SWI or CTRL/C.

```

77-68 VDU 1 ERRORS

Character Generator IC is 74S262, from Texas Instr.

Wrong pin connections given for X8 (feeding X16 pin 1); output should be pin 4, inputs pins 5 & 6.

KEEP UP THE PACE

- R.G.Silson.

The PACE instruction set minimises hardware costs by simplifying programs using hex code or hand assembly.

The base page gives 256 words (384 indirect) which may each contain 16 bit branch address labels (or variable or constant data) each usable by a single instruction.

Most MPU's need several instructions, the use of a register and multiple base page address contents to give this facility.

A practical program method is to build up a library of sub routines which, when used, may be located anywhere in memory. A single amendment to the base page, for each, deals with all program cross references. There is never the risk that one or more have been missed. Properly organised this approach needs a fraction of the memory necessary for high level languages and is simple to use with large programs.

Time and effort will be saved if the base page, and perhaps part of the main memory, uses low power RAM (e.g. 5101 or MM74C920) to give long term retention of variable material minimising keyboard entries and the risk of errors.

SC/MP BLOCK MOVE

Norman Riggs

```

01 WXYZ C5      Ld @ P1
02          80      disp = E
03          CE      St @ P2
04          80      disp = E
05          BB      decrement byte count
06          DE
07          9C
08          F8      loop if not zero
09          3F      return

```

To Use, load; (Kitbug register image area)

Addr Data

```

OFF7 WX
OFF8 YZ
OFF9 HIGH      Source, P1
OFFA LOW
OFFB HIGH      Destination, P2
OFFC LOW
OFFD No of bytes to be moved
OFFE + or - 1 ; OL or FF

```

and go (G,C/R)

Program returns to Kitbug.

May be stored in ROM. Uses 9 bytes.

This program will move up to 256 bytes between any two addresses in memory, auto-indexing in either direction as described.

A LONDON DIARY

WHITHER THE ACC AND ALL THAT

The ACC now has about 1000 members around the country. (1230 at the moment .. ed). For a lot of people membership means receiving the Newsletter every two months. Surely the ACC should mean more than this.

I believe that the club should actively encourage small groups of people to get together. Whether these groups should consist of a number of people meeting in a pub for a chat and a drink or a few members with a common interest getting together to swap and develop ideas on a subject (Special Interest Groups) it doesn't matter so long as we get together and talk.

To do this it is essential for people to be in contact with other members in the same area, and to let everyone know when there is going to be a get together.

The newsletter comes out too infrequently to arrange anything through it at short notice, so what I propose is that we start up an 'ACC Diary' for each area where there are a number of members living fairly close to each other.

This Diary will come out at regular intervals, say every month. It will probably consist of one A4 sheet and can be used by anyone to let others know something's afoot.

Joe Bloggs will use it to let people know that he will give a cup of coffee and a demonstration of the IBM 370 he has in the garden shed to anyone who phones him up and offers to buy him a drink at the local pub.

Now for the catch. Sending out the Diary once a month will cost money. So anyone who wants it will have to pay extra, £1 say. Also to keep organisation down to a minimum someone in each area will have to gather together the times, dates and places of meetings etc. which other people will send to him.

For the London area I'll put something together for the 'ACC London Diary', but if you live elsewhere and you're interested in arranging something let me know and we'll get something going in your area.

For interested people in the London area, if you send me your name and address and £1 I'll put you on the mailing list. If you send it pretty soon it will give me a chance to arrange things because I want to send out the diary at the beginning of September, after holidays.

Also, if you want to meet some other members in a pub or whatever during September get in contact with me in good time and I'll let everyone else know.

Jim McDonald 19 Cowper Rd., London W7 1EL

TK 80 ADD-ON

EXPANDING THE TK80 SINGLE BOARD MICROCOMPUTER

The TK80 from Nippon Electric Co. has been available under various names for some two years. Sold in its own right, it also appears as a Training Kit with various instruction manuals. As supplied the TK80 has up to 1k of ROM and 1k of RAM and includes a hardware single instruction and breakpoint facility as well as a well designed hex keyboard and display. Unfortunately, many of these units are forgotten after use and the owner probably goes on to buy an expensive machine with all possible accessories. It was finding one of these machines at a very low price that led the writer to investigate its use as a 'real' computer.

With the idea of expanding the machine to use an available 8k memory board and a cassette interface, I investigated the circuit to see what was involved. Within minutes it was clear that, as stated on page 5.14 of the users manual, "A decoder should be prepared additionally to perform access to either on board memory or external memory correctly." The TK80 just ignores the address lines AB10 to AB14 so that the ROM is read as starting from every multiple of 400hex in lower memory and the RAM similarly in upper memory.

Cautious examination of the 8255 parallel port revealed that on board only the bits A0, A1 and A2 are decoded so that, unless you are happy with only 124 external port addresses, the remaining bits must also be decoded to arrange that the port is really OF8 to OFB.

The external decoding was eventually done in a manner that requires two small modifications to the printed board itself and the addition of a few short wires. For neatness the very thin wire normally used for wire-wrap was used. It is possible to place the additional components in the area provided on the board for such purposes, but I chose to place them on the end of a mother board which is in any case advisable to carry buffers for the address lines. The decoding of the lower address of core is looked after by a triple 3-input NOR 74LS27 feeding one gate of a 74LS10 3-input NAND to produce a gated MEMR for the memory select 74155 (TK80 IC8) where it is fed in on the chip side of link J5. The link is removed carefully with a penknife.

This now releases all the addresses of the lower part of memory with the exception of the Monitor in the bottom 1k. Although a further decode could be done using a further gate of the 74LS10 to produce a decode of the upper part of memory, this has disastrous effects on the DMA display system, so if you want to use the monitor or display you must be content with 31k of user memory!

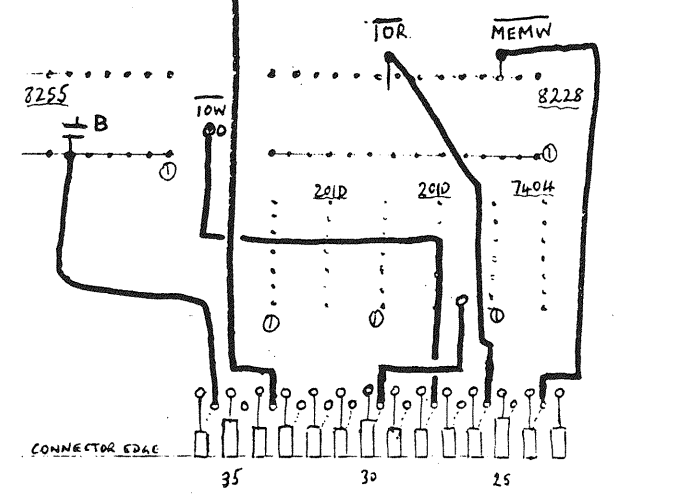
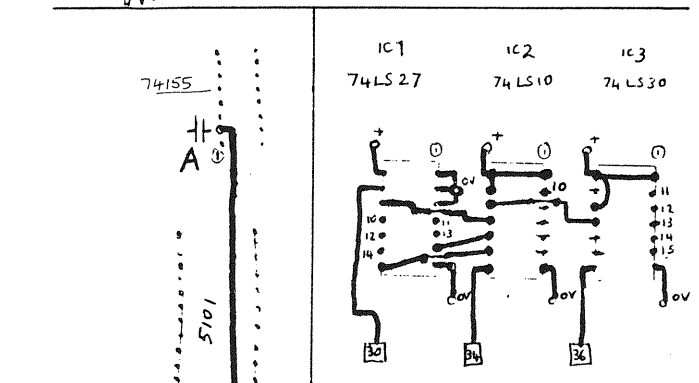
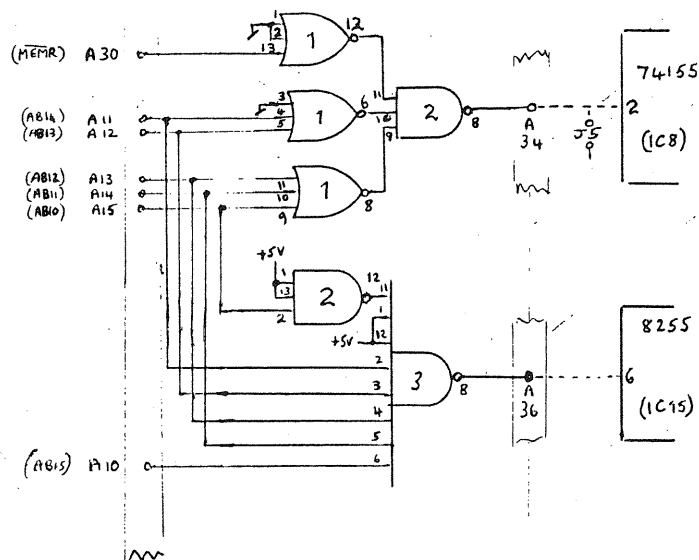
The port addresses can be left alone if you feel that you will be happy with an additional 124 ports. If you wish to use all ports and not be restricted to those ending with 4 to 7 or C to F, then you will need to invert AB2 (or better AB10) using a spare gate of the 74LS10, and connect its output along with AB3 to AB7 (better AB11 to AB15) to the inputs of an 8-input NAND 74LS30. The print connecting pin 6 of the TK80's output port 8255 (IC15) is peeled back about an eighth of an inch and the chip select from the 74LS30 output is wired to pin 6. Since the port addresses are duplicated on both halves of the address bus during IO read or write, using the higher address wires saves a lot of linking.

The three diagrams provided show, apart from the theoretical circuit of the decoding, a layout that could be used for the three IC's, and a wiring diagram for the TK80 board. The two new lines are brought to convenient pins on the 100 way connector and the four control lines are extended for use. The driving capabilities of the address lines are limited to approximately 2 boards with 74LS inputs and for more than this must be buffered by any non inverting TTL driver. I used 8212 single I/O port chips for this. Any memory or peripheral board

using an Intel type bus with bi-directional data lines and IOR IOW MEMR and MEMW control signals should work with the modified TK80.

This modification has now been carried out on two TK80's, one of which is now fitted with an active mother board and includes 8k of memory, 2758 Programmer and Cassette Interface in its system. It provides a simple way to produce a running 32k 8080 based computer at minimum cost. Because of its well thought out monitor and diagnostic features, along with easy program entry and display facilities, the resultant machine can be made to compare favourably with more expensive machines.

Peter Bendall



NEW WIRES ON REAR OF TK80 BOARD
 A = CUT J5 ON TOP OF BOARD.
 B = CUT PRINT TO PIN 6 OF 8255 ON REAR.

SHOP

FOR SALE

SWTPC6800 (MP-68) computer built working- any demonstration. Available in a variety of configurations, choice of minitors;
e.g. MP-68 + 8k RAM £360
MP-68 + 4k RAM £275
MP-68 no RAM £200
MP-68 box, power supply, I/O & Mother Board
less CPU card £100.

M.J.Rowat Braeside, Clarach Rd, Borth, Dyfed SY24 5LP
tel 097 081 267

FOR SALE

PTR 661A paper tape reader. Up to 150cps with parallel outputs from the 8 channels & sprocket. -12V pulse input to motor drive SCR's for stepping. It is in a rack mount frame, with all power supplies (mains driven). Data supplied. Dimensions approx 22x13x24 cm. Has data channel amps on-board. £30.00.
WANTED 12 or 14 inch B/W video monitor. Must have good resolution, scanning linearity & focus.
Trevor Diamond 150 Wards Rd., Newbury Park, Ilford, Essex tel 01 554 0575 (evenings)

FOR SALE

Polymorphics (5 slot + extender) chassis complete with PSU and fan, 2 4k RAM boards, S.D.Sales Z80 board (blank) with Z80 chip and manual. I will accept £210 for the lot or telephone Stirling 70126 and we can discuss individual prices.
Attention North Star Users. I have written a 2k paper tape emulator for North Star which allows you to save and load serial data. It interfaces directly to any software which normally uses paper tape (without modification). In addition you can issue any DOS command without leaving the current program. Also included is the ability to determine the length of the file before 'punching'. Used with the TDL software package for instance one has disc based editor, assembler, BASIC (without disc data files) and text output processor. For a copy (with documentation) send a North Star disc with your favourite software (and documentation) and £2. (If you don't have a North Star system or any software you can't use it anyway). Please use a re-usable pack for the disc.
I also have written patches for the TDL macro assembler to the CP/M operating system. Depending on interest I can make it available on a similar basis (the patches only of course). The source listing of this program provides a good example of how to write software for use in the CP/M environment. Note also that it runs under CROMEMCO DOS which is a superset of CP/M. Either hard sectored North Star discs or soft sectored (3740) discs for this offer are acceptable.
Ken Talbot 33 Easter Livilands, St. Ninians, Stirling Scotland.

FOR SALE

2 off PTR 661 150 character/sec 8 hole paper tape reader. Circuit diagram etc provided. £16

Novus Mathematician, rechargeable programmable calculator. £15

MM5204Q PROM containing ETIBUG I £13

DM8678CAEN Character generator £10

Various other odds & ends from ETI system 68.

Harry Young 01 432 2257 (day) or 03704 (evening)

JADE IN THE UK

AIRAMCO Ltd. 30 Witches Linn, Ardrossan, Ayrshire, tel 0294 65530 have been appointed UK agents for Jade. They sell microcomputer components, kits etc at very low (by UK standards) prices. 5-10% discount to ACC members depending on quantity.

FOR SALE

Solartron 1400 dual beam 15 Mhz scope.
Vermont 1.2M byte drum (single phase 50Hz 250VAC). Processor; 16 bits upprogrammed uses Intel 3000 series bit slice chips, includes 32k bytes memory, ROM, serial & parallel I/O.
John Florentin 17A Campden Hill Gdns., London W8 tel; 01 229 0859

FOR SALE OR SWAP

Portable 5x7 dot matrix line printer type REPCO M120 made by CASE. Mains operation. Uses 8 1/2" wide electro sensitive paper. Must be collected. Ring 01 349 2896 for details. Richard J Pope

TOUCH KEYBOARD KIT

From Sirton Products 13 Warwick Rd., Coulsdon, Surrey CR3 2EF tel 01 660 5617. Complete with case, requires +5 or 8 volts. ASCII. £38.50 + 60p P&P + VAT.

CHEAP DISKETTES

1-9 off (less for larger quantities);

mini £2.50 each inc P&P

IBM compatible 3.25

double density 3.55

D.Loerns 15 Wickham Place, Basildon, Essex
tel 0268 280852

FOR DISPOSAL

PDP-11/40 System Manual, KD 11-A Processor Manual, KE 11-E and KE 11-F Instruction Set Options Manual. Free to anyone who will collect or pay postage.
M Connell 38 White Close, High Wycombe, Bucks
tel High Wycombe 31314

FOR SALE

Character generator DM8678CAB £8

" " RO3 2513 £5

Keyboard encoder AY-5-2376 £7

Keyboard in metal box, diode encoded (probably not ASCII) would convert nicely with above encoder. Looks a little dated. £10.

Mike Alger The Old Orchard, Main Rd., Saltfleetby, Louth, Lincs LN11 7PN

PETSOFT

Of 318 Fulham Rd., Chelsea, London SW10 9UG, are selling a range of software for PET. Prices range from £3 for TIC TAC TOE to £49 for an Assembler.

PET SOFTWARE/HARDWARE LIBRARY

For details contact Gordon Bell, 55 Belvedere Rd., Hessle, Humberside. (0482) 645724

MICRO PROCESSOR SERVICES

Of 1 Nunburn Ave., North Ferriby, Humberside are dealers for PET & SWTPC.

FOR SALE

77-68 CPU board, built tested and working, all busses fully buffered. Manual included, prototype binary front panel if required. All components top spec. PC board from Newbear. About £60 but prepared to haggle.

TMS 6011-NC UART, direct replacement for AY-3-1013 £5 inc P&P.

AY2513 character generator £8 inc P&P

16 x 1k*1 2102-2N memories. £16 together inc P&P.

J.Stark Jnr 50a Anson Rd., London N7 OAB (01 6070366)

FOR SALE

Welmac 8 channel paper tape punch, 15 ch/sec, with manual and PSU £20.

F.V.Breame 'Ellacombe', 68 Church Rd., Bramshott, Liphook, Hants GU30 7SH tel (0428) 723168

FOR SALE

Best of Creative Computing Vol 1 £3.50 or swap for similar computing book. J.Morton 39 Appach Rd. London SW2 2LD tel 01 674 8069

FOR SALE

RO35 Teletype (heavy duty receive only) with stand, very good condition, ASCII code, converted to RS232 interface. £150 or persuade me to settle for less. PTR 661A paper tape readers. £16 each tested with data. Transport for above to be arranged. Mike Lord

MEETING POINTS

LEICESTER

Anyone interested in forming a club in the Leicester area please contact G.B.Foden 11 Gaddesby Lane, Rearsby, Leicester tel Rearsby 247

DRAMATIC APPLICATIONS

I am considering the problems involved in developing a computer controlled stage lighting board, and would be interested to hear from anyone with a similar interest.

Mike Wild Harlow 29531 ext 2372 (day)

HIGH WYCOMBE U.G.

At the College of Higher Education, High Wycombe. Contact Roy Woodbridge or Ken Spencer, Dept of Eng.

JUMPING MICROS

H.T.Mallinder of 15 Nairn House, Cameron Close, Brentwood, Essex (tel 212038) would like to contact anyone interested in computer animation using up.

CROMEMCO/NORTH STAR/CPM USER GROUP

Meets at 313 Lingston Rd., Ilford.

OPEN LETTER TO ACC MEMBERS.

This letter is to all members of the ACC in the London area who wish to rejuvenate the London Group.

I would like to try to organise meetings in the London area, and I would like to know how many members would like to do the same. If those of you who are interested would like to write to me enclosing a s.a.e. with your comments and suggestions, I will correlate them and let you know if a meeting can be arranged, it will take two to three weeks before I will have a sufficient number of replies to assess, so wait for three weeks before you expect an answer.

The information I am seeking is frequency of meetings, composition of meetings, place of meetings (central preferred). Remember that in some meeting places we will have to pay for premises. Pubs are not always popular with the parents of junior members.

My address is; Jim Turner, 63, Millais Road, London. E. 11. 4 HB.

Please write in the first instance. I am a shift worker and I work peculiar shifts, so if you call you may not get an answer to your knock.

Hope you keep the mailman busy

THERE MUST BE SOMEONE ELSE IN THIS AREA WITH AN INTEREST IN COMPUTERS !! PLEASE CONTACT ME!!!!

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

COMPUTER EDUCATION SOCIETY OF IRELAND

For details contact Diarmuid McCarthy, 7 St.Kevin's Park, Kilmacud, Blackrock, Co.Dublin

PUG

Norman Fox & Tom Turnbull feel that an independent Pet User Group would be worthwhile, so would anyone interested get in touch with Norman at 22 Firs Walk, Tewin Wood, Welwyn, Herts tel; Bulls Green 433

COLCHESTER COMPUTING

A new group has been formed in the Colchester area. Anyone interested in joining should contact Donald Clarke, 21 The Avenue, Colchester CO3 3PA. S.A.E or phone Colchester 66637

ELTHAM ENTHUSIASTS

Mr. R.I.Mitchell, 58 Kenilworth Gardens, Shooters Hill, London SE18 3JB (tel 01 856 2489) would like to start a local group in his area.

MIDLANDS MEETING 20 May

The meeting is now becoming so popular that we shall soon have to move to bigger premises !

Nick Wright set the ball rolling by showing his new VDU which he built from scratch using the Thompson CSF VDU chip. This gives a display on a TV set of 16 lines of 64 characters. 'Newbear' are offering a kit using this chip, which must be the cheapest means of getting a VDU.

John Diamond then showed us his latest acquisition; a Creed 7B teleprinter, which he has interfaced to his 7768. Despite its obvious shortcomings it has proved perfectly adequate for all work so far, and at £18 it must be the cheapest form of hard copy.

Keith Harja brought a KIM 1, and while he set it up Rex Beasall explained the operation of the 6502 microprocessor which is used in KIM. This showed it to be similar to the 6800 though lacking some of the 6800 instructions, but this was made up by a greater range of addressing modes, which made it particularly effective when running a BASIC interpreter. Keith rounded off the demonstration by getting KIM to play 'The Star Spangled Banner'.

For details of further details contact Roy Diamond at 27 Loweswater Rd., Coventry CV3 2HJ

SCOTTISH AMATEUR COMPUTER CLUB

For details contact H.Sheldrake; 031 332 6849

BULK BUYING

Anyone interested in forming a bulk buying group (Mainly Memories) get in touch with Tony Elwood, 194 Balmoral Rd., Gillingham, Kent.

HAPPENINGS AT THE D.I.Y.SHOW, JUNE 22-24 1978

The ACC stand was busy all three days, enrolling 119 new members and disposing of piles of forms. Pete Birnie's 6800 based system and Barry Biddles' "Worlds Largest Single Board Computer" were on display.

Several school parties arrived. Several exhibitors went grey.

PETs everywhere, and Apples, and TRS80's.

Housewives shopping for computers.

Jade came, and sold, and sold. Not quite British.

'Practical Computing' was launched, next issue will be September.

Adam Osborne came to the ACC stand. The seal of approval.

A good show for the ACC, but some commercial exhibitors were disappointed; attendance wasn't very high.

AMATEUR COMPUTER CLUB NEWSLETTER

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