A.C.C AMATEUR COMPUTER CLUB NEWSLETTER

VOLUME 4 ISSUE 1 APRIL 1976

C.U.T.S.

COMPUTER USERS TAPE SYSTEM

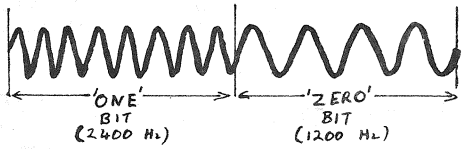
A new proposed standard for recording digital data on cheap cassette recorders was given in the March '76 issue of Popular Electronics (USA, not UK). Apparently it has been agreed by most of the hobby computer manufacturers.

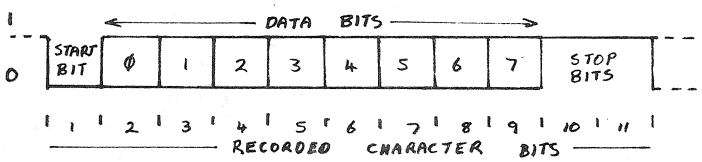
As with HITS, the main problems to be overcome were;

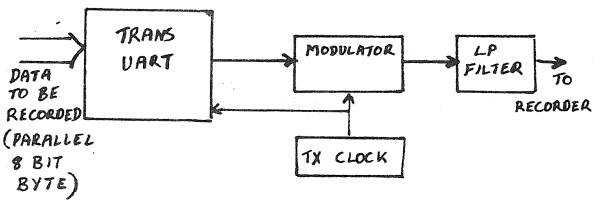
1) The automatic level control incorporated in some machines, which tends to mess up 'tone burst' or amplitude modulation schemes.
2) Variations in tape speed between machines, and wow & flutter, which make people nervous of using normal narrow band frequency-shift techniques as in modems for transmitting data over telephone lines.
3) 'Drop-outs' caused by momentary loss of signal due to non-uniform distribution of the magnetic coating on low cost tapes.This can really only be overcome by 'certifying' each tape used, but choice of data rate and modulation technique are important.

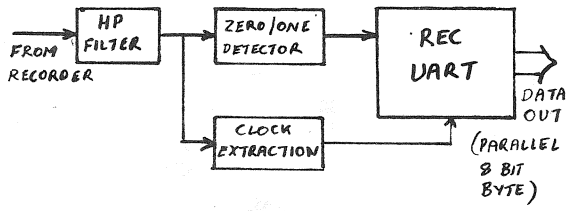
Main problems with the HITS system (see V3 Iss 4) were said to be;

1) In the original HITS proposal, data was recorder synchronously, each byte to be recorded had to follow immediately after the previous one, thus it was unsuitable for direct use with asynchronous 'stop-start' terminals like teleprinters.
2) Some manufacturers were nervous of using a pulse-width modulation system as this has been patented as a data recording system.









In This Issue

I would like to publish a list of members who are , or may be, building the WB-1. So, please drop me a note - even if you have already told me, I've a terrible memory, and please say if;

- have already built.
- are building.
- will be building this year.
- may be building this year.

mike lord

System Operation

As with HITS, CUTS records 8 bit bytes of data, however, as it is an asynchronous system, it adds a start bit (0) and two stop bits (1) to each byte before recording - the recorded character is thus 11 bits long. Any interval between recorded characters is recorded as a continuous '1'. Thus the character formatting is as currently used for asynchronous data transmission and hence standard UART's (Universal Asynchronous Receiver Transmitter I/C) may be used.The least significant data bit is recorded first. If less than 8 data bits are used, as with a 5-level Baudot code, the unused bits will be set to '1'.

The standard data rate is 300 recorded bits/sec (approx 28 data bytes/sec), although individuals could probably use 600 or even 1200 bit/sec if they can withstand the consequently higher error rates.

A '1' is recorded as 8 cycles of 2400Hz, a '0' is recorded as 4 cycles of 1200Hz (something approximating to a sine wave is to be preferred). The playback circuits can therefore extract a 4800Hz clock from the recorded signal and use it to clock the receive half of the UART. The clock extraction circuits can be made relatively tolerant of the exact frequency, and can thus follow any tape speed variations. To get the clock extraction circuit on tune, at least 5 seconds of continuous 2400Hz (1) will precede any block of valid data, and at least 30 sec of continuous 2400Hz should be recorded at the beginning of each cassette. A 5 second gap shall be left between blocks.(Strictly speaking the word 'block' is wrong, as CUTS is asynchronous and doesn't force you to record data in blocks, but I can't think of a better expression).

Block diagram shows one possible hardware solution to recording & playback, using a UART, although others, perhaps more reliant on software, can be devised.

So, can we have thoughts on this proposal as a suitable standard to be adopted(rather than HITS) ?

LETTERS

CQ

Because of the common electronics interest, I feel there may be a number of ACC members who are also radio amateurs. If any members who are licensed amateurs would care to drop me a card (post, or QSL card via the bureau), I would compile a list for inclusion in a future issue of the ACCN. Then when we happen to 'meet' on the air, we would know at the outset of our common interest in computers and the ACC.

W H Ingle G3OIZ
30 Head St., Goldhanger, Essex CM9 8AY
0621 88287

TIME

Can any member recommend a computer bureau that will run programs in FORTRAN, ALGOL or some other such language with a minimum of fuss and at a reasonable price (I don't want to get a bill for a few hundred pounds if I accidentally write a program with a never ending loop). I'm sure such a service would be of interest to many members - perhaps some university computer department with time to spare could make a small profit with little effort by putting such programs in along with their students' programs. I could punch my own cards if this would help to keep costs down.

T Moriarty
53 Highfield Rd., Dublin 6

1901

I have just bought an ICL 1901A (2010/2 proc.) 16K of 24 bit words, with printer (600 lpm), twin exchangeable Disc Stores and approx 100 twin exchangeable discs. Unfortunately it only has a teletype as input, but I hope to rectify that shortly.

Would anyone with a 1900, or anyone with a compiler or translator that they happen to have lying about, please contact me.

Neil Pearce
1 Chapman Ave, Willington, Maidstone, Kent
Home; Maidstone 56360
Work; Medway 44400 ext 228

FREE 1301

Probably the last chance to obtain an ICL 1301 - the last four machines in commercial use are to be scrapped in May.

The Galdor Centre (an ACC member) will continue to run their own 1301, and hope that other ACC members will take up one .

Built in 1960, the 1301 is a 'Cheap & Chearful' commercial design with card reader, printer, five half inch magnetic tapes, drum and core store, card punch - and plenty of scope for alterations. For example Galdor has added a typewriter and an interface to their 1900 series equipment.

Air conditioning is definately NOT needed.

The drawbacks are size (700 square feet) and 3 phase power. Galdor can offer suggestions on these points.

The machines are absolutely FREE, with programs and advice in plenty. It would be a shame if machines of such character and historical significance were lost.

Contact Stuart Fyfe or Andy Keene (ACC Committee) at Galdor 01-399-1300

65XX

Following the MPU survey in the ACCN I decided to try and find out more about the MOS Technology MCS65** series. They are fully TTL compatible, single 5V supply, 56 instruction set, 13 address modes, directly addresses 64K memory and, very important only $20 each which worked out at about £9.50. The company has been very helpful and charged no postage and packing even though the airmail postage for the MPU and two manuals was over $20. I have some data sheets which I would be willing to 'stat off for anyone interested (please include 36p to cover cost) once term begins again. I should have a barebones system operating in a couple of weeks time using a hexadecimal keyboard and LED for input and output but am looking forward to your VDU system in Vol 4 in order to widen the scope of operation.

N.Titley
1 The Gables, Wellington, Somerset TA21 8JB

WB THOUGHTS

Thw WB1 gives me great enjoyment but I have several queries;

1) $\overline{IA0}$, $\overline{IA1}$, $\overline{IA2}$ are shown from the control unit to address, but they do not seem to be generated, where do they come from ?

*** these lines were originally included to allow a WB2 control unit to generate addresses in the range 0 to 7 to access the A reg, Switch Reg, and High & Low bytes of the PC & Stack Pointer. As the A reg address is 000, and the WB1 uses dedicated signal lines to control input & output from the PC & Switch Reg, they are, as you point out, not used in the basic machine ***

2) No NOR gates were used, has somebody got a bias against them? They could be used to remove some of the inverters.

*** Agreed - no bias, just oversight ***

3) To go from S3 to S9 requires simultaneous existence of I3 & I4 (X19,1,2,3) and $\overline{I3}.\overline{I4}$ (X17,3,4,5,6) which just ain't possible.

****The state diagram in Iss 5 p 6 is somewhat misleading in that it makes it appear that you can go directly from S3 to S9, whereas the hardware doesnt allow this. In fact the path on the state flow diagram is for instructions of the type OP A only, hence you would not want to use it to go to S9,which is only for the GO TO type of instruction ***

4) Gate X31 (11,12,13) duplicates X36 (1,2,3), also gate X24 (1,2,13,12) duplicates X22(1,2,13,12)

*** no excuse for that ! except that the control unit design grew rather haphazardly ****

5) I think a better solution for P.C.Z I0 I1 I2 logic could be abtained using a 74151 (but more costly)

*** Didn't think of using a 74151, wish I had ***

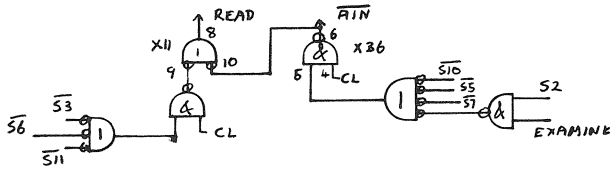
6) If flags C P Z were mounted on control unit, one IC would be saved as would a number of interboard connections.

*** Agree, in retrospect ! ****

7)The modification given in Iss 6 p 8 should presumably show $\overline{C9}$, $\overline{C11}$, $\overline{C15}$ & not $\overline{S9}$ $\overline{S11}$ $\overline{S15}$

*** Yes, my mistake ***

8) Might I suggest a change in the READ & $\overline{AIN}$ generators to that shown below, using one 3 input gate instead of an 8 ip gate.



*** Yes, much better ***

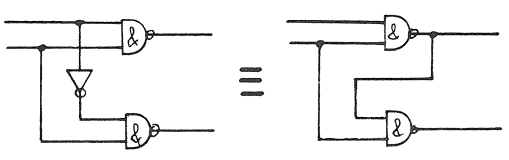
9) Operation B of 74181 gives 0101010 in circuit
Text gives 0101011 ?

*** a misprint, sorry ***

Re WB2; I personally prefer the more elegant solution - though the use of a MPU might be educational to some of us. I do not think that the difference in expense is all that important, I feel that a computer whose logic can be readily followed is of more value.

P.S. One or two inverters can be removed by using this technique;

G Hunt



I am following WB1 with great interest and in the process of buying components for it but having to watch the pence. When the machine is finally completed, I think it will berather limited. I think I would like to expand the WB1 at some later date but I do not have the knowledge to do this myself.

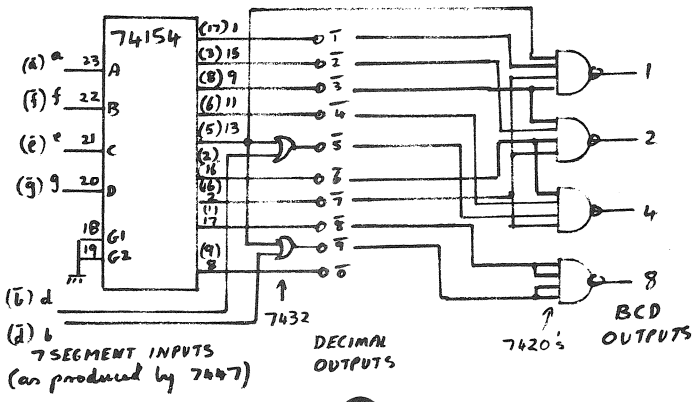
A Page

I was most interested in the WB design and was fully intending to build it. However I didn't want to get involved in construction until July. By that time, judging by current trends, the price of the average MPU will be well below the price of the WB and hence rather defeating the object of the WB as being a cheap CPU, especially taking into account the amount of wiring etc involved. From an educational point of view I think the WB is excellent, as before this article I had very little knowledge of computer 'workings'. If you decide to go ahead with the WB2 I'd be most interested to see how you go about it but I'd put in a preference for cheap CPU based on the Motorola 6800 for instance. I like the idea of a VDU as the next constructional project.

M Valiant

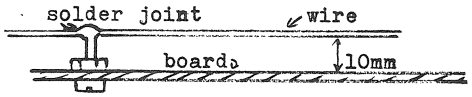
I am driven to put pen to paper by your thoughts of no WB2 ! The important feature I personally like about WB is that at the end of the day I can re-configure the very instruction set if I wish. I have learnt a great deal about the TTL/Instruction set interface, and would like to learn about interrupts, extended memory access etc in the same, easy, way, namely by the efforts of youself and the other WB originators. As I fully intend building a WB2 like machine, I would prefer you to do the donkey work - with due respect - so that I am free to think about interfacing, which is my prime interest. I have currently completed the ALU & memory boards of the WB1, and am working on the control board. On the interface side, I have completed the bulk of the design of a cassette interface conforming to the HITS format and I am working on a very simple keyboard, using Greenweld's type C. I wish to use an outboard calculator chip as a floating point unit, and I have obtained a cheap C500 chip; also I have a useful circuit for a seven segment to BCD converter,see below. On the software side I have written a very simple assembler for WB in FORTRAN on a 1906A, this will probably undergo further development when I finally finish my WB1.

R Mount



For those frightened by wiring problems on the computer boards I suggest;

1) Photocopy the separate circuit diagrams (a blob of hot solder can obliterate an important pin connection of the diagram !)
2) Add any corrections BEFORE building.
3) Try to obtain all components for one board at a time - it is very annoying to commence building and run out of IC, solder etc.
4) Put a sticky label with info as to which board itis to go on, on each IC. Also its circuit diagram no., and mark positions of main components on each board before building.
4) Use different coloured wire for connections. I have used 20 way flat cable (available from SINTEL) which has 10 diff colours.
6) Use bus bars of very thick copper wire for the 5V & OV supply lines (about 1 or 1½ mm Ø), standing proud of the board by about 10mm on 6BA bolts;



To solder this will need a large iron, so may not be suitable, but if it can be done it simplifies layout.

7) Tie all capacitors to board to stop them moving about when carrying computer.
8) It is worth buying IC pins or sockets to put all expensive IC in.

Suitable transformer (9V,3A) from J Bull Electrical for about £2.80. I tried Chromasonics for a 9V 4A transformer but stocks had run out.

W Beer

I am building the WB (using a small ROM for AU control inputs) though very slowly, having completed about 30% of the package wiring. I intend to add 256x8 bits of ROM accessed by means of a dummy input/output port, and to use a calculator type keyboard for input of programs & data.

The ROM is an MM5203 electrically programmable, UV erasable type. I have some data on this which I could loan to anyone interested but I have no information on the erasure procedures apart from the recommended wavelength of the UV (253.7 nm). If anyone can help with this and/or the circuit of a programmer I would be most grateful.

G Walker
7 Pool Lane, Brocton, Near Stafford, Staffs

You invited comments on future club projects in the February issue of the ACC Newsletter. I should like to add my voice to those in favour of building a VDU.

At present there is a series in Practical Television and a design series culminating in a constructional item in Wireless World on a Teletext decoder for receiving digital information broadcast by the BBC and IBA. The code is ISO-7 which is essentially ASCII, and the same code and display format are used in the BPO Viewdata system. In a recent BPO demonstration a Datel 600 series modem provided a 1200 baud rate for the display and a 75 baud rate for a keyboard on line to a computer. The designers of the WW article hope to produce a modification for Viewdata towards the end of the year. I would suggest that with access to the RAM stage of the decoder we could have a VDU, a microprocessor being used for the editing function. Graphics such as histograms can be built up on the screen in colour or black and white.

The main advantage would be a compatible system tor Telefax, Viewdata and our own VDU. However I imagine the cost of about £120 for the complete kit from Catronics or around the £100 for a Texas Instruments development module consisting of 14 DIL packages would mitigate against the idea. The cost may be reduced by using the same circuit design but without the serial decoder and error correction circuitry but with a simple synch timing generator. Mullard have produced a decoder in just three chips.

N G Douglas

I am building the WB on a 19" chassis. The bus consists of 48 bare wires stretched between chocolate-block connectors fitted to the top front and back edges of the chassis. Circuit elements on Veroboards hang from the approprate bus wires by short leads. This makes all the bus lines very

accesible for trouble shooting, and gives plenty of room to hang extras on the bus. I am keen to meet anybody else in the Reading area who is also building the WB.
A Cassera
140 Tilehurst Rd., Reading, Berks

●

We have today finally received the RAM from R R after a long delay and will be wiring up the boards within the next month. We have adopted a slightly different approach to the construction than suggested in the ACCN. Four Vero cards are used, 1 for AU, 1 for memory and two for the CU. The LED drive for data and address and the switch register circuitry are mounted on the front panel of a 19" card frame rack. A further card will be introduced for I/O so that the WB is bufferred (protected) from the outside world.

Another addition to the WB is LED's mounted on the cards to indicate the contents of the A,B,M & I registers - this is a luxury and the LED will probably be removed after testing - they are driven off the unused OP's of the 7475's. The power supply arrangements to be used are distributed raw DC and on card regulators (7800 series).

The construction is a joint effort between Alan Pretty of Ipswich and myself. The purpose in building the machine is principally for use in 5th form studies as part of a computer principles course.

When the WB is complete we intend to investigate the possibility of introducing a remote control panel so that individuals in class can operate the WB and see what happens by means of a large display mounted near the blackboard. The single shot operation will also include a slow speed clock for examining the contents of the store locations - these are only ideas at present.

Should any member in the Woodbridge Ipswich area want to see the machine or just have a 'chin wag' I would be pleased to hold an open house.
D Monro
7 Andersons Way, Woodbridge, Suffolk
Ipswich 643473 (office), Woodbridge 3267 (home)

●

I think the WB is an excellent idea and admirably fulfils the aim of introducing hardware techinques to the software man and the amateur. I have been intending to build a machine for a while but shall wait until a more powerful machine is described, since the data processing activities which interest me require considerably more memory than the WB1.

With regard to the future course of action, I would favour proceeding to the WB2 because;

1) Being designed araound numerous IC each having simple functions, it is more flexible than a commercial MPU and could more easily be modified for individual users requirements.
2) disasters would normally be cheaper if they ruined a number of TTL IC than if an MPU were wrecked. I am not sure how fragile CMOS is, but articles in magazines suggest they need more care than TTL.

In addition I should like to suggest the following for consideration;

a) A library of WB software subroutines should be maintained (presumably in the ACC's voluminous archives !) from contributions by members; users will doubtless need algorithms for long operand arithmetic, display/packed/binary conversion etc.
b) Longer memory versions should cater for the possibility that owners may find 2nd hand core cheaper than IC RAM; in particular this will mean an article on decoding memory addresses in registers for up to 65k words.

D Metcalf

In response to popular request, for ACC members' use only, names and addresses of members at the 20th April 1976.

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J G Barnes, 44 Wordsworth, Great Hollands, BRACKNELL,Berks
D Barnhoorn, Delftsekade 12, Leidschendam, NETHERLANDS
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F V Breame, 'Ellacombe',68 Church Rd,Bramshott,LIPHOOK,Hants,GU30 7SH
S J Brodie, 11 Melbourne St, Newland Ave, HULL, HU5 2ET
B Brook, 169 Laund Rd, HUDDERSFIELD, Yorks, HD3 3TZ
H Brothwell, University of Sussex, Falmer, BRIGHTON, Sussex
A J Bullock,'Roland',Stafford Mill, Thrupp, STROUD, Glos, GL5 2AZ
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P Catmull, 5 Woodside, LEIGH ON SEA, Essex
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R Chappelle, 95 Kingsfield Drive, Didsbury, MANCHESTER, M20 0HU
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I Harris, 10 Mill Close, Credenhill, HEREFORD, HR4 7EQ
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L Helsby, 44 Mount Pleasant, BIGGIN HILL, Kent
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P R Horton, 2 Teeling Rd, WEYMOUTH, Dorset, DT3 5JT
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M A Johnson, Churchill College, CAMBRIDGE, CB3 0DS
N R Johnson, 6 Elliot St, The Hoe, PLYMOUTH, Devon, PL1 2PP
T Johnson, 18 Arkwright Rd, S CROYDON, Surrey, CG2 0LD
J C Jones, 46 Burstellars, St Ives, HUNTINGDON, Cambs, PE17 4XX
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K Langley, 9 Beaumount Rd, Hesterway, CHELTENHAM, Glos
K R Lawson, 49 The Highway, Croesyceiliog, CWMBRAN, Gwent, NP4 2BQ
M Laylon-Smith, Carmecken,Bradon Rd, Aston Cross, TEWKESBURY, Glos
R A Leach, Orchard Croft, 1 Church St, Burton Pidsea, HULL, HU12 9AU
A L Lee, Greencroft, STOCKTON ON THE FOREST, York, YO3 9US
The Leys School, Cambridge, CB2 2AD
P T Littlewood, 24 Talbot Ave, WATFORD, Herts
M Lord, 7 Dordells, BASILDON, Essex
T Lough, 543 Warwick Rd, Tyseley, BIRMINGHAM B11 2EX
R W Lucyk, 106 Peet St, DERBY, DE3 3RG
S Luttrell, 47 Westminster Rd, Stoneygate, LEICESTER LE2 2EH
S Lynch, 6 Sutherland Way, STAMFORD, Lincs, PE9 2TA

R D Chawda, 104 Baggrave St, LEICESTER, LE5 3QT
G Chiba, 19 Thurlow Rd, Hampstead, LONDON NW3
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T Clarke, The Long House, Woodgreen, FORDINGBRIDGE, Hants, SP6 2QY
A J Clayton, 17 Clovelly Rd, Glenfield, LEICESTER, LE3 8AD
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W Collis, 47 Croxley Rd, LONDON W9
J Conneely, 11 Woodpecker Drive, NORTHWICH, Cheshire, CW9 8EQ
T J Connell, 38 Dagnam Park Drive, ROMFORD, RM3 9XP
T R Cook, 'Della' 280 Sandhurst Rd, CROWTHORNE, Berks
P J Cousins, 55 Medoc Close, Wymans Brook, CHELTENHAM, Glos, GL50 4SP
K Cox, Willow Cottage, Brook Rd, Chiltworth, GUILFORD, Surrey, GU4 8ND
D Cradock, Redhill Farm, Twyford, SHAFTESBURY, Dorset, SP7 0JD
N R Creighton, 2 Torgrange, HOLYWOOD, Co Down, N Ireland, BT18 0NG
P R Crellin, 35 Stainforth Rd, ILFORD, Essex, IG2 7EJ
J Creutzberg, 135 Thornton Rd, LONDON SW12 0LJ
P A Crowe, 43 Cypress Rd, Woodley, READING, RG5 4BD
C Cubison, Talbot House, 13 Church Yard, ASHFORD, Kent, TN23 1QG
G B Davies, 47 Stirling Cresc, Marshalls Cross, St HELENS, Merseyside
P Davies, 14 Burcot Park, Burcot, ABINGDON, Oxon
M Davison, 23 Adair Rd, Eastney, PORTSMOUTH, Hants
C C Dawkins, Portora Royal School, ENNISKILLEN, Co Fermanagh, N Ireland
P S Dick, 140 Latymer Court, Hammersmith, LONDON W6 7JG
A F Dix, 7 Peplins Way, Brookmans Park, HATFIELD, Herts, AL9 7UR
C Doran, 89 Lennard Rd, Penge, LONDON SE20 7LY
P G Dorey, Le Grand Jardin, Rue du Friquet, Vale, GUERNSEY
N G Douglas, 24 Wellington Gdns, BANGOR, Co Down, N Ireland, BT20 4PL
M F Driscoll, 177 New Ireland Rd, Rialto, DUBLIN 8, Ireland
M D Dunne, 76 Gypsy Lane, Marton, MIDDLESBROUGH, Cleveland, TS7 8NH
J P Dyer, The Hall House, Moor Hill, HAWKHURST, Kent
E R Edwards, 27 Highmead, Penllwyn,Pontllanfraith,BLACKWOOD,Gwent,NP2 2PF
T D Edwards, 114 Potters Field, HARLOW, Essex, CM17 9DB
C R Eld, 3 Pentridge Close, WIGSTON, Leicester, LE8 2RN
D England, 7 Partridge Ave, TONYPANDY, Glam, CF40 2NA
A D Evans, 50 Nightingale Rd, RICKMANSWORTH, Herts, WD3 2DE
R Fennell, 14A Homelands, Ball Lane, WOLVERHAMPTON, WV10 7E2
A J Fisher, 2 Elgar Ave, HEREFORD, HR1 1TY
S J Forrest, 11 Woodrow Way, Ashley, MARKET DRAYTON, Salop
D R Frost, 28 St Dunstans Rd, Barons Court, LONDON W6 8RB
L G Fulcher, 11 Mount Pleasant, Framlingham, WOODBRIDGE, Suffolk, IP13 9HQ
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D V Goadby, 5 Queens Rd, HINCKLEY, Leics, LE10 1ED
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W Goshawke, 68 Barrington Rd, BEXLEYHEATH, Kent, DA7 4UW
J R Gould, 18 Lombard St, LIDLINGTON, Bedford, MK43 0RP
P Grain, 95 Harvist Rd, LONDON NW6
P Grave, 60 Shaftesbury Way, TWICKENHAM, TW2 5RP
J H Gray, 46 College Rd, Cranwell Village, SLEAFORD, Lincs
J Gray, Prospect House, Oakhill, BATH, BA3 5HU
A Gregory, 5 Glebelands, Moss Pit, STAFFORD, ST17 9ER
R Gryp, Biest 70, 9110 St Amandsberg, BELGIUM
J Hampshire,'St Clair' 8 Hall Garth Rd, Thorpe Audlin, PONTEFRACT, W Yorks
M Harding, 16 West Ave, Heald Green, CHEADLE, Cheshire, SK8 3DX
R Harman, 40 Oldfield St, Fenton, STOKE ON TRENT, Staffs, ST4 3PN

A Scott, 15 Acorn Close, ENFIELD, Middx
R C Selby, 145 Bedfont Lane, FELTHAM, Middx, TW14 9NH
A Shead, 8 Chestnut Ave, WOKINGHAM, Berks
R Shearing, 41 Oliver Rd, SOUTH ASCOT, Berks, SL5 9DN
P Shephard, 13 Highcliffe Gdns, ILFORD, Essex, IG4 5HP
M Shirazi, Abadan Institute of Technology,Abadan, IRAN
R I Shreeve, 40 Kendall Rd, COLCHESTER, Essex, CO1 2BN
W Siddons, 21 Springfield Cresc, WEST BROMWICH, W Midlands, B70 6LL
C Sinclair,Sinclair Radionics Ltd,London Rd,St Ives,HUNTINGDON, Cambs
R K Slater, 102 Cowlishaw Rd, SHEFFIELD, S11 8XH
J J Smith, 7 Kettlebaston Rd, Leyton, LONDON E10 7PE
J J Spalding, 40 Boughton Ave, St Johns, WORCESTER, WR2 5EW
I D Spencer, Am-Museum 3,5353 Mechernich, WEST GERMANY
M A Spinnler, 9 Westbank Quadrant, GLASGOW, G12 8NT
E C Sprigg,University of Strathclyde,Livingstone Tower,26 Richmond St,GLASGOW
P C Staton, 847 Lincoln Rd, PETERBOROUGH, PE1 3HG
I Steinberger,20 Altham Court, Barnet By Pass, HATFIELD, Herts, AL10 9SS
D Stobbs, 44 Barracks Lane, WALSALL, W Midlands, WS3 1LR
M Stokes, 30 Kensington Drive, WOODFORD GREEN, Essex, IG8 8LP
A H Stopford, 39 Stanway Rd, CHELTENHAM, Glos
X R H Stopford, 14 Uplands Rd, Flixton, MANCHESTER
M H Tariq,c/o PO Box 3683, Tripoli, LYBIAN ARAB REPUBLIC
S Tate, 22 Ryehey Rd, St ANNES ON SEA, Lancs, FY8 2HA
H C Taylor, 43 Thornton Rd, THORNTON HEATH, Surrey, CR4 6BD
J D Thewlis, 14 Green Rd, DIDCOT, OX11 8SX
S Thompson, Rawdon, Copt Hewick, RIPON, N Yorks, HG4 5DB
S L Thompson, 1 Ford Close, RAINHAM, Essex, RM13 7AU
R Thorpe, 21 Sandall Rise, Wheatley Hills, DONCASTER, S Yorks, DN2 5NL
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N R Titley, 1 The Gables, Waterlco Rd, WELLINGTON, Somerset, TA21 8JB
G A Tompsett, 46 Manor Wood Rd, PURLEY, Surrey, CR2 4LE
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M J Walsh, 41 Beechwood Ave, WOODLEY, Berks, RG5 3DF
C E Walton, 32 Porlock Gdns, Mead Park, Nailsea, BRISTOL, BS19 2QY
K D Walton, 74 Northfield Rd, THATCHAM, Berks, RG13 3ES
C D Ward, 3 Northway, MORDEN, Surrey, SM4 4HE
L S Warner, 62 Beech Rd, St ALBANS, Herts, AL3 5AT
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M F Whelan, 7 Lorcan Drive, Santry, Dublin 9
W J Whitehouse,c/o Hean Castle Estate, SAUNDERSFOOT, Dyfed
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P Maddison, College Montefiore House B4, Wessex Lane, SOUTHAMPTON
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X D G Metcalf, Culcheth New Hall, Church Lane, Culcheth, WARRINGTON,Cheshire
P V Monk,'Mandimu',Green Lane, Elsing, DEREHAM, Norfolk, NR20 3ED
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O F Morgan, 'Norcombe', Tile Barn,Woolton Hill, NEWBURY, Berks, RG15 9UZ
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C Murray, 32 Craiglockhart Cresc, EDINBURGH, EH14 1EY
S Newall, 19 Meridian Way, NEWCASTLE, Tyne & Wear, NE7 7RU
N P Nicolaou,Dept of Elec Eng,Brunel University,Kingston Lane,UXBRIDGE,Middx
J D Nicoud, LCD EPFL, Bellerive 16, CH-1007 Lausanne,SWITZERLAND
T H Normanton, 71 St Georges Rd, CHELTENHAM, Glos
S Odneal, 3 Hurnford Close, SANDERSTEAD, Surrey, CR2 0AN
B O'Gorman, 85 Foxley Lane, PURLEY, Surrey, CR2 3HP
Orwell High School, Maidstone Rd, FELIXSTOWE, Suffolk, IP11 9EF
G T Otway,'Northern Lights',Ham Lane, Dundry, BRISTOL, BS18 8JA
J Owen, Castle Lloyd, PENDINE, Dyfed, SA33 4PT
A Page, 31 The Birches, STOURPORT ON SEVERN, Worcs, DY13 9NW
X H Patel, Barclays Bank Ltd,Radbroke Hall, KNUTSFORD, Cheshire, WA16 9EU
I B Paterson, 19 Melbourn Close, Stotfold, HITCHIN, Herts, SG5 4LB
N Pearce, 1 Chapman Ave, Willington, MAIDSTONE, Kent, ME15 8EG
R J Peck, 14 Freehold Rd, IPSWICH, Suffolk, IP4 5HN
R J Perkins, 63 Wheatley Drive, CARLTON, Nottingham
S Peyton Jones, Fairlawn, Riverwoods, MARLOW, Bucks, SL7 1QX
C F Pfefferle, 469 Harwicke Rd, Springfield, Penna 19064, U.S.A.
X C Phillips, 44 Glebelands Rd, KNUTSFORD, Cheshire
W Phillips, 81E Bromham Rd, BEDFORD, MK40 2AH
B Pinkerton, ARAMCO, Box 5426, Dhahran, SAUDI ARABIA
D Pitchforth, 300 Northridge Way, HEMEL HEMPSTEAD, Herts, HP1 2AA
D Pollard, Hypothermia Ltd, 6 Chippenham Mews, LONDON W9 2AN
A J Poppleton,Headquarters Mess, Royal Signals,Blandford Camp,Dorset
D Porter, 1 Eaton Gardens, FELIXSTOWE, Suffolk, IP11 8HN
H B Pufal, 32 Avon Walk, Town Centre, CUMBERNAULD
A A Rawsthorne, 5 Heather Bank Close, Simmondley, GLOSSOP, Derbyshire
X J Raynor, 6 Butt Mill Drive, Prestwich, MANCHESTER
I D Read, 45 The Knoll, Hayes, BROMLEY, Kent, BR2 7DD
C W Reece, 80 Windrush Drive, OADBY, Leicester
E Richmond, 2 Bryanstown, Dublin Rd, DROGHEDA, Ireland
R A Rimmel, 15 Ellenborough Rd, Bishops Cleeve, CHELTENHAM, Glos
X K M Roberts, 56 Victoria Ave, Grappenhall, Nr WARRINGTON, WA4 2PD
C R Robertson, 94 Showering Rd, Stockwood, BRISTOL, BS14 8DW
P J Rodman, 53 Sherwood Cresc, Amanzimtoti 4125, Natal, SOUTH AFRICA
M P Rowlands, 43 Rylett Rd, LONDON W12 9ST
C Rowley, 77 All Saints Rd, BROMSGROVE, Worcs, B61 0AQ
P Rutter, 11 Lebanon Park, TWICKENHAM, TW1 3DF
G Salvini, 81 Middleton Hall Rd, BIRMINGHAM, B30 1AG
S Sandler, Bonpland 1060,Dept 1,Buenos Aires,Capital Federal,ARGENTINA
A J Sansom, 81 Clareville Rd, ORPINGTON, Kent, BR5 1RU

PTR

I HAVE DISCOVERED A SUPPLY OF VERY GOOD PAPERTAPE READERS IN NORTH LONDON AT £16 EACH.

I DEMONSTRATED ONE OF THEM TO THE MEMBERS THAT ATTENDED THE A.G.M., AND MANAGED TO GET ORDERS FOR 10 UNITS. WHEN I WENT TO COLLECT THEM I GOT A FEW EXTRA IN CASE OTHER MEMBERS WERE INTERESTED. I ENCLOSE A SPEC. ON THEM BELOW.

IF YOU ARE INTERESTED IN ONE, WANT MORE DATA OR WANT A DEMONSTRATION YOU SHOULD WRITE TO ME AT HOME OR RING 01-977-3222 EXT. 3809. (OFFICE HOURS ONLY).

THERE ARE MORE UNITS AVAILABLE IF WE WANT THEM BUT THE PERSON INVOLVED IS ONLY INTERESTED IN SELLING IN BLOCKS, SO IF I GET ENOUGH ORDERS IT MAY BE POSSIBLE TO GET MORE.

OPTICAL READER.

MADE BY:-	G.E.
SPEED:-	150 CHARACTERS PER. SEC.
DRIVE:-	SPROCKET,STEPPING MOTOR,ALL DRIVE ELECTRONICS INCLUDED.
STEP PULSE:-	30 US.,NEGATIVE GOING, (0V,-12V,0V).
DATA OUTPUTS:-	NINE (8 DATA,1 SPROCKET),HOLE=-12V,NO HOLE=0V. COULD BE MADE TTL COMPATIBLE VERY EASILY.
POWER SUPPLIES:-	240V MAINS (INTERNAL REGULATORS).
COST:-	£16 INCL. CCT. DIAGRAM, AND TESTED BUT WITH NO GUARANTEE.
SIZE:-	APPROX 12" X 10" X 6".

MY HOME ADDRESS IS:- R.C SELBY,
145 BEDFONT LANE,
FELTHAM
MIDDX.,
TW14-9NH.

LETTERS

BITS

I am interested in the Teletext and Viewdata systems which should be available in the near future. As teletext decoders will have to be made so that information can be fed into them from a phone line they should be quite easy to interface to a computer. I wonder who will be first to produce the ultimate in games - a microprocessor with a few k of RAM store, simple keyboard & cassette reader. Every time the kids get bored you buy a new cassette.

Another new idea in computer games - Mrs M Stubbs 176 Midawbury Lane, Southampton, who publishes the M500 Maths Newsletter has produced a manual version of the STAR TREK game (ØSTTR1 on OU Timesharing System) It costs 50p and looks like it can keep you throwing dice and doing sums for weeks.

A book I found fascinating; I read it twice before putting it down, is Travels In Computerland by Ben Ross Schneider Jr. Printed by Addison Wesley ISBN 0-201-06737-4. A good review of this is in Scientific American Oct 75 p 136.

I would also recommend the course units of the Open University TM221 THE DIGITAL COMPUTER to anyone with an interest in small size computers. I found particularly interesting unit 15 which deals with the British Rail TOPS system and the use of the Datapoint 2200 as a remote terminal for the system. The Datapoint 2200 was originally designed around the 8008 MPU. BR has at least 400 of them connected to their IBM system. The unit number is ISBN 0 335 027571 1

I've only data on the 8080 & 6800. I like the 8080 for hand programming but don't like 3 power rails. 8 internal registers hold as much data as I can think about at one time and addressing with H & L seems reasonably efficient for handling larger amounts of data. The only way I can envisage writing long programs is by writing sections in subroutines, with all needed registers saved at the start of each subroutine, and make the final prog a Round Robin of calls to subroutines. This technique is used in the BR TOPS terminals. The main advantage I can see for the 6800 is that with its Indexed addressing and Relative addressing modes programs can be easily mobile within your memory. However I have a nasty feeling that Relative addressing on all Branch instructions could greatly increase the number of errors in my programme when converting from assembly language to object code by hand. However one could, in the future, be more dependent on software availability . Never having tried an Editor-Assembler package I can't comment on it but though I don't fancy PDP8 Assembly language I would not object to BASIC and FORTRAN compilers. However I've deferred design of the CPU until I've sorted out I/O.

J D Owen

IPSWICH 49

Against all good advice - 'no backing store, stuck with machine code etc.'- I eventually got one of the BEA outfits, a Univac 49 Buffer Processor with Printer, Keyboard & 'Programmer'. I haven't got the BP working yet but think I am nearly there.

The outfit is intended as a sophisticated multiplexer taking the traffic of 32 keyboards and printers and compacting for transmission to & from the main 490 computer in booking seat reservations. It also provides local editing facilities (when programmed) & does arithmetic.

The BP is 6'2" by 2' by 2' and wieghs 600lbs. The Programmer, with ancillary logic for 2 printers & keyboards is about a 2' cube & weighs about 200lb. Keyboard & printer are linked via the programmer and a program in the BP which I don't have. It is put in from the 490.

The BP has 8k of 7 bit words and a 14 bit 2 address instruction word. Memory cycle time is 4uSec, and it takes an average of 28uSec to execute an instruction.

The I/S has 33 basic functions which can be extended by specified designators to perform 71 operations. There are four decremental clocks for timing purposes, and the Processor can switch randomly between 8 levels (7 interrupts) without any program getting out of step. There are four in-memory accumulators per level, a total of 32, and seven 14 bit in-memory Program Address registers, so no housekeeping is required.

There are 3 I/O channels, 2 general purpose e.g. Main Computer 490, and Uniset, keyboard and printer, and a paper tape reader/punch interface. There is an excellent maintenance panel with all hardware registers and many important flip-flops brought out to neons/switches for setting and clearing or fault-finding.

Are there any 49 purchasers near here ? Or any Univac Computer Card experts. I suspect my processor was none too gently treated in transit and though memory is cycling some flip-flops won't set or clear. Perhaps the ACC could start a '49 Users Group'.

L Woolford
The Old Kennels, Woolverstone, Ipswich, Suffolk

WOTSIT

I have obtained a board containing a 40 pin DIL IC, 672kHz XTAL and misc transistors. The IC appears to be a UART, but the chip is too old to get data from the manufacturer (GIM - 1970). Can anyone help ?

IC serial no A417216T G7029
PCB serial numbers; PCB 81340111
81341311/D CLC/1
0805.390 (or 0805.990)
inspection stamped ICL

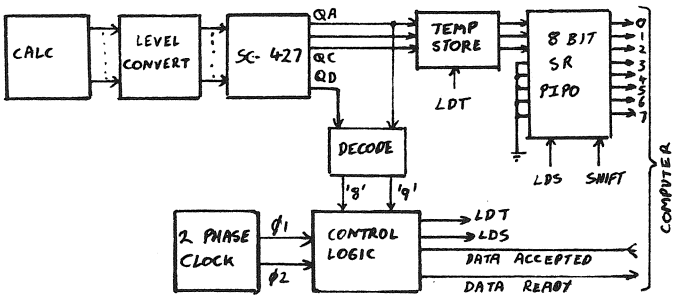
L S Warner
62 Beech Rd, St Albans, Herts AL3 5AT

CALC IN

Calculator as input device

Object;
To provide a means of entering 8 bit code as 3 octal digits with a means for visual verification and correction of keying errors using a calculator.
General;
a) Using 7 segment to BCD converter chip SC-427 connected to LSB of display (my calculator enters digit key depressions there)
b) Since octal digits 0 to 7 are to be entered two unused digits 7 & 8 are available as control digits and since only one digit is entered at a time a shift instruction is needed, therefore define 8 as the shift instruction.
c) When the three digits (0-3)(0-7)(0-7) have been entered the computer must be informed that the octal word (byte) is ready and assembled, therefore define 9 as the ready instruction.
Operational Sequence;
To enter the octal word 123 the following keys would be depressed; 1 8 2 8 3 9 and the display would show this. Each 8 digit will cause a shift of 3 bit positions towards MSB of the computer word. The 9 will inform the computer that the word is ready. Operate calculator CLEAR button prior to entering next octal word.
Operation of Logic;
The control logic produces LDT pulses from Ø1 and LDS pulses from Ø2 when '8' or '9' are not present. Detection of '8' or '9' suspends LDS. '8' causes three SHIFT pulses from Ø2. Upon the clearing of '8' LDS recommences. '9' causes DATA READY as Ø2 rises and is cleared by DATA ACCEPTED. Upon the clearing of '9' and DATA READY, LDS recommences.
Conclusion;
The above method allows for the visual display of data entered and also allows for correction of keying errors, since only the digit immediately preceding the 'shift' or 'enter' codes remains in the 8 bit shift register.
P.S.
No doubt some of the hardware can be saved by software but since the WB1 has only limited storage the method proposed may have some merit.

M A Baker



PROM

You may be interested to know that Texas Instruments seem to sell 256x4 ROM at £4 each with a programming charge of £2-£3, so even for the amateur, this way of providing control circuitry could be competitive with ad hoc microprogram methods as well as permitting a 'machine' to be 'changed' simply by plugging in a couple of IC !
Perhaps the ACC might benefit from having some sort of ROM programmer available. I'm sure they're not difficult to build and with computer control should be useful and save members money (its not very economical to have to build one for just 2 or 3 ROMs).
P Davies
P.S. Could you somehow encourage students to give two addresses, then it would be easier to find out who else in the ACC is at the same university.

CORE

Anyone want a 512 x 8 bit Mullard stack ?
J Barnes
44 Wordsworth, Great Hollands, Bracknell, Berks

IRISH ACC

Members in Ireland should contact Thomas Moriarty 53 Highfield Road, Dublin 6. He is anxious to put Irish members in contact with one another, and possibly to organise a local group, a social get together or visits.

IDEAS

A few suggestions and questions;

1) I think that a page or so of adverts or recommended (by ACC members) 'goodies' be included in the newsletters; also possibly a list of average prices of various items (to help us newcomers), though this only need be included say once a year.

2) An extra sheet be added to the newsletter to accomodate the above idea and to increase space for other material.

3) I don't think anyone would complain if the yearly fee went up to £1.50 or £2.00 to cover (2), and also to allow expansion to, say, a pool of equipment bought by the ACC (only items in demand up to a value of say £50 each, and up to a maximum pool value of about £200 for the present) at sales or at significantly lower than average prices. This would allow people who can't make it to sales, or who miss offers, to be in with a chance of getting some good bargains. Maybe it could operate on requests from members being published and other members who find these bargains to report to a specified person who could perhaps coordinate the system.
By only using requests, the ACC would not get lumbered with warehouses full of 'goodies' just on the offchance that someone may want one particular item.
I realise of course that this would require a lot of organisation and a lot more members as it is doubtful that the ACC would want to invest say £200 in a few items (How about 8 ACCN's a year, with 1 'annual' ?)

4) After reading through the nearly 3 years of ACCN I discovered that I kept losing articles, how about an index ?

5) Some explanatory articles are required, for example on TTY's (what is a Flexowriter or an ASR33 for instance)

6) Some interesting items;
Cannon plug 37 pin flex grip, ditto socket, £2 per pair J Bull (electrical) Ltd

Teleprinter Creed 7B few @£22.50, Johns Radio, 424 Bradford Rd, Batley, Yorks

Articles on CMOS in PE & ETI

Would recommend; Transistor Switching & Sequential Circuits by J J Sparks for hardware enthusiasts. This is a text suitable for learners. Goes from design of flip-flops to a serial multiplier. 235 pages, £2 Pergamon Press.

Electronic Computers H Jacobowitz (made simple books) covers analogue/digital basics. Building blocks, number systems, Boolean algebra, storage This one is fairly simple if you have done 'O' levels.

A Guide TO Fortran IV Programming by D D McCracken. £4. Goes from basics to quite complex programs. Plenty of exercises and less worked cases. About 280 pages.

G Beer

803 HELP

I am moving next September to Felstead School, near Dunmow. They have an Elliott 803, donated a year or two ago and put into commission last month.

Are there any ACC members living within range of Felsted who might be able to help me 'stretch' the Felsted machine in various ways. At present it has only one teleprinter for hard copy and two punches and two readers for I/O; but it does have four tape units. It operates in 5-hole code. I would like to extend it to 8 hole ASCII and fit up a video unit for the operator, I'd like to fix it up with the time-sharing executive that Dr.Tagg implemented on the Hatfield machine some years ago. I'd like to play Life, chess and other games on the aforementioned video unit and I'd like to do dozens of other things on it that I haven't a hope of doing without help and sources of very cheap circuits & equipment.

C C Dawkins
Portora Royal School, Enniskillen,Co Fermanagh,
N Ireland

MicroScope

This is a new publication, an 'International Bulletin For Microprocessor Users'. Edited by J.D. Nicoud, Swiss Federal Institute of Technology. The first issue is well produced and covers, in 30 pages, Basic Microprocessor Structure, Binary Addition & Subtraction, 6800 MPU Hardware among 7 articles. Individual subscription (outside Switzerland) is about $30 US (£15) for the first eight issues. Details from MicroScope, PO Box 141, CH 1007 Lausanne 13, Switzerland.

MPU NEWS

Data General have brought out a series of 16 bit microcomputers using a MPU chip - the MN601. The chip alone is £57 in quantities of 500, a single board computer using the chip with 4k words of memory is under £600 for single units.

SGS-ATES has announced details of its M38 MPU system, based on a set of rour chips; CPU, ROM, RAM and combined ROM/RAM. It is said to be similar to the GI LP8000 family and AEG Telefunken's CP3F.

RCA has announced a single chip version of its CDP1801 two chip COSMOS MPU. The new version comes in either a +5 or a +15V version , runs much faster, and has some new, additional, instructions. The new device, the CDP1802, will be second sourced by Intersil, and several memory and I/O circuits will also be released to support the basic CPU, including a multiply-divide unit and an analogue to digital converter.

Intel is expected to announce a new MPU soon. The 8048, will be an 8 bit device, software compatible with the 8080, which will incorporate a 8k bit erasable PROM, 27 I/O lines, and a 512 bit RAM on the same chip.

Signetics 2650 MPU is now £18, one off.

Intel 8080A is now £29.

Watch for the Motorola 6800 price to drop soon, also they they are expected to bring out a new version; faster, perhaps simpler clock drive, in a few months.

ACC AGM minutes delayed, should be in the next issue.

ASCII KEYBOARD

This was designed as a basic capability keyboard which would, nevertheless, give all ASCII upper & lower case alphanumeric codes.

The prototype was built with ex-calculator key switches from Greenweld (3 type C keyboards are needed), but any single pole normally open switch with a contact resistance less than 25 ohms will do. 57 switches were used alltogether, the SPACE bar was actually made from three individual keys, and the SHIFT key is duplicated. Most of the keys are wired into a sparse 8 x 10 matrix which does most of the coding, the final stage of coding is performed by the diode arrays plus the TTL gates used for the SHIFT and CTRL functions.

To simplify things a little, some of the characters occupy slightly diferrent positions from those normally used on terminals, for example the , and . are upper case characters.

Individual keys have been provided for the ESC (or ALT MODE), Rub Out and Carriage Return keys, although ESC and CR codes are also produced by holding the CTRL key down while keying [and M, as these functions are used a lot. If anyone wished to they could similarly provide separate keys for some of the other commonly used control functions e.g. Horizontal Tab (CTRL/I).

To facilitate working with computer programs that don't like lower case alphabetic characters, the keyboard can be set to produce upper case only, my version has a switch for this function.

Fig 2 shows the codes produced by the basic coding circuits, note that for alphabetic characters the coder actually produces the upper case code, which is then changed to lower case if the SHIFT key is not depressed AND the keyboard is set for full upper/lower case output.

The 'Key Pressed' output goes high when any key, except for CTRL or SHIFT, is pressed, but after a delay to take care of key bounce. The three series connected gates sharpen the edge up enough for most uses.Ideally the leading, positive going, edge of the 'Key Pressed' signal should be used to strobe B0 - B7 into a buffer (74L74 is ideal) because;

- you might get funny results otherwise as the Key Pressed signal actually continues for a short time after the key has been released (and the code dissapeared).
- it gives you a 'two key lockout' feature; depressing a second key before releasing the first won't have any effect.

One serious point, the B0 - B3 lines will only drive one standard TTL input, and must be buffered if you want to drive anything more.

Incedently, the Greenweld keys are not PC board mounting but are designed to fit onto a panel ; one large circular hole plus two small locating holes per key means a lot of drilling !

The 22uF capacitor value might have to be increased if you've got keys with a long bounce time.

I used the original calculator keytops, obliterated the original markings with a few coats of car undercoat (light grey, from a spray can), then put on new ones using LETRASET & a couple of finishing coats of Humbrol clear enamel.

Two final points; the +5V supply shouldn't be allowed to fall much below 5V, and although almost any PNP silicon transistor can be used, I started off with some very old anonymous ones which turned out to have a very high base-emitter voltage, so check that, when turned on, none of the transistor base-emitter voltages are more than about 0.9V, or you'll have a rather touchy keyboard.

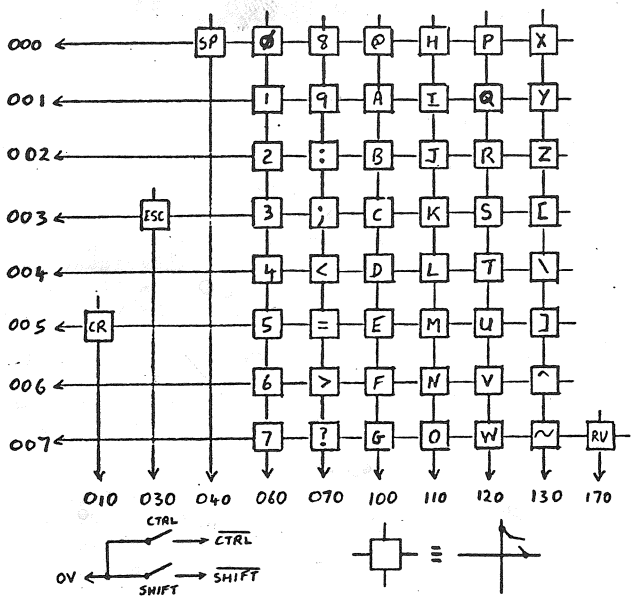


Fig 1 BASIC KEY WIRING

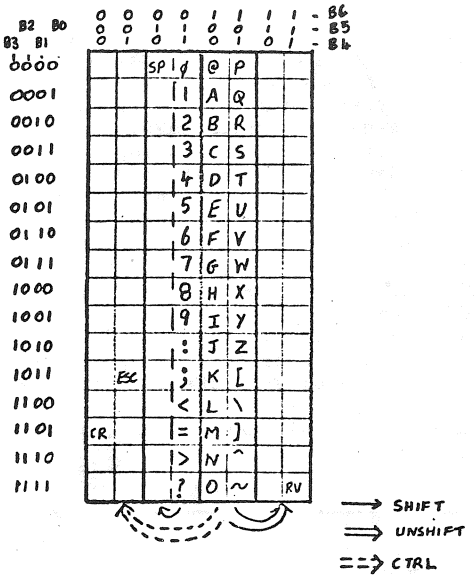


Fig 2 BASIC ASCII CODES GENERATED BY KEYBOARD

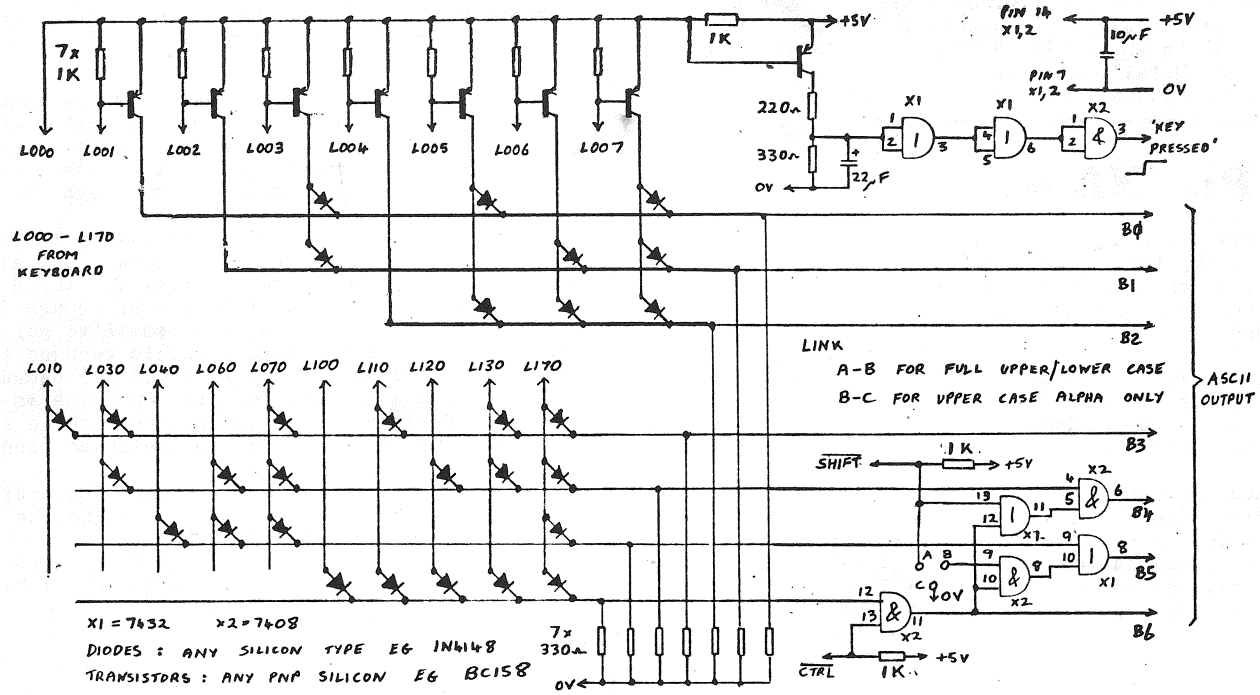
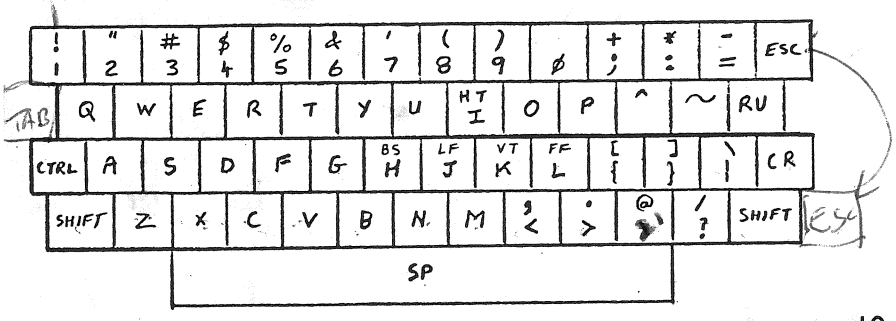


Fig 3 CODER

Fig 4 KEYBOARD LAYOUT



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