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EUROPE'S LEADING MICRO MAGAZINE

WHO'LL BE WORLD MICRO CHESS CHAMP?

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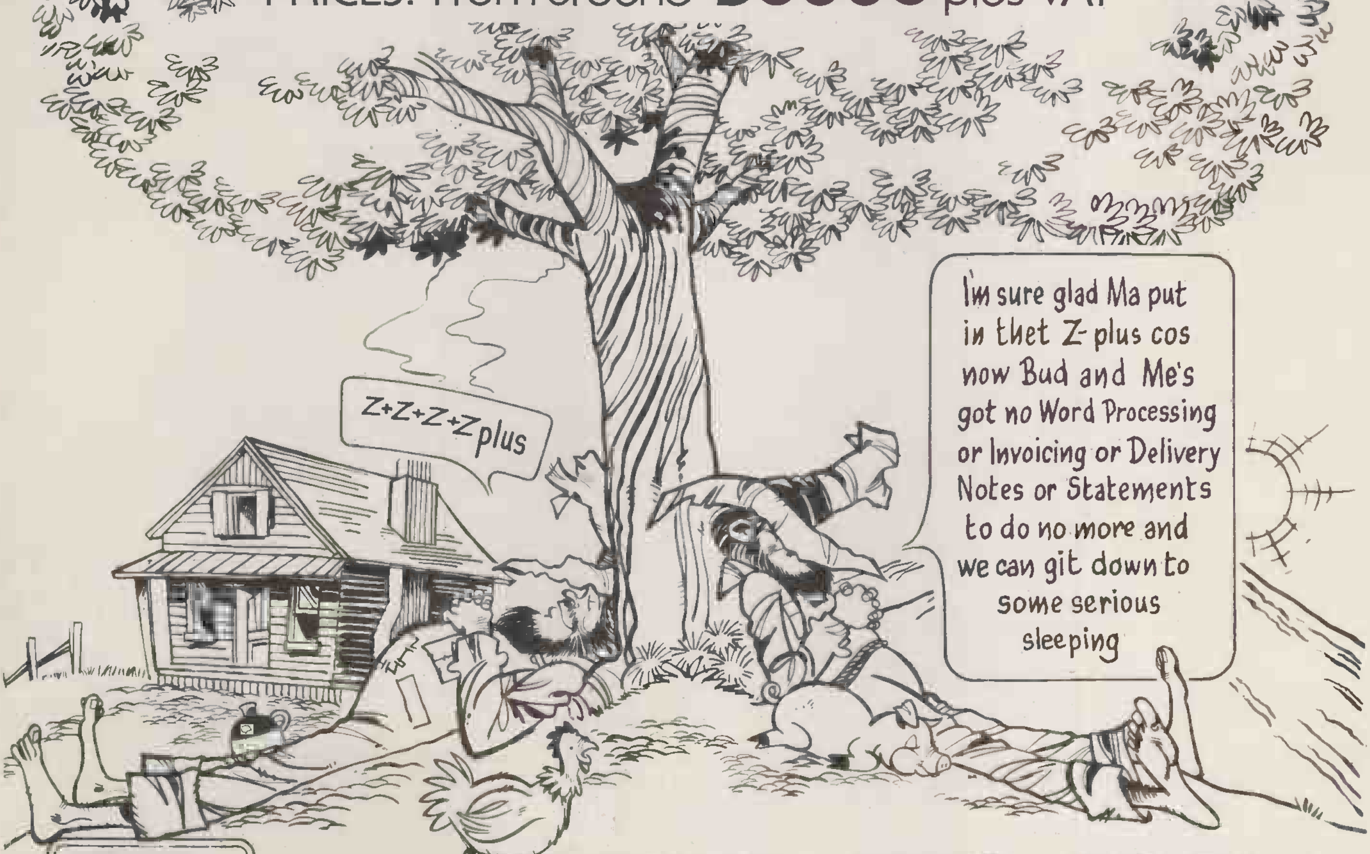

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creative computing

David Ahl in U.K.

David Ahl, editor of Basic Computer Games and More Basic Computer Games and publisher of Creative Computing magazine will be at the PCW show, 4-6 September 1980. Stop by Stand B16 and Mr. Ahl will be pleased to autograph books purchased at the show or just talk.

Creative Computing Magazine

Creative Computing has long been Number 1 in applications and software for micros, minis, and time-sharing systems for homes, schools and small businesses. Loads of applications every issue: text editing, graphics, communications, artificial intelligence, simulations, data base and file systems, music synthesis, analog control. Complete programs with sample runs. Programming techniques: sort algorithms, file structures, shuffling, etc. Coverage of electronic and video games and other related consumer electronics products, too.

Just getting started? Then turn to our technology tutorials, learning activities, short programs, and problem solving pages. No-nonsense book reviews, too. Even some fiction and foolishness.

Subscriptions: 1 year (12 issues) £10.00 by suface or£19.00 by air; 3 years (36 issues) £ 28.50 by surface or £ 55.00 by air.

The Best of Creative Computing

The first three years of Creative Computing magazine have been edited into three huge 324-page books full of programs, tutorials, programming techniques, reviews of books and equipment, articles, fiction, games, puzzles and problems and much more. The material in these volumes has been carefully selected to be useful for years to come. Volumes 1,2 and 3—each volume £4.95.

Basic Computer Games

Edited by David Ahl, this book contains 101 imaginative and challenging games for one, two, or more players — Basketball, Craps, Gomoko, Blackjack, Even Wins, Super Star Trek, Bombs Away, Horserace. Simulate lunar landings. Play the stock market. Write poetry. Draw pictures.

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More Basic Computer Games

Contains 84 fascinating and entertaining games for solo and group play — evade a man-eating rabbit, crack a safe, tame a wild horse, become a millionaire, race your Ferrari, joust with a knight, trek across the desert on your camel, navigate in deep space.

All games come complete with program listing in Microsoft Basic, sample run and description. 192 pages softbound. [6C2] £4.25

Computer Coin Games

Computer Coin Games by Joe Weisbecker aids newcomers to the field of computers by simplifying the concepts of computer circuitry through games which can be played with a few pennies and full sized playing boards in the book. Enhanced by outrageous cartoons, teachers, students and self-learners of all ages will enjoy this 96 page softbound book. [10R] £1.95

The Best of Byte

This is a blockbuster of a book containing the majority of material from the first 12 issues of Byte magazine. The 146 pages devoted to hardware are crammed full of how-to articles on everything from TV displays to joysticks to cassette interfaces and computer kits. But hardware without software might as well be a boat anchor, so there are 125 pages of software and applications ranging from on-line debuggers to games to a complete small business accounting system. A section on theory examines the how and why behind the circuits and programs, and "opinion" looks at where this explosive new hobby is heading. 386 pp softbound. £ 5.95 [6F]

Computer Music Record

A recording was made of the First Philadelphia Music Festival which is now available on a 12" LP record. It features eight different computer music synthesizers programmed to play the music of J.S. Bach, J. Pachelbel, Rimsky-Korsakov, Scott Joplin, Neil Diamond, Lennon & McCartney and seven others. The music ranges from baroque to rock, traditional to rag and even includes an historic 1963 computerized singing demonstration by Bell Labs. £3.50 [CR101].

To Order

Many, but not all, of these items are stocked by Creative Computing in Britain. Those in stock will be sent immediately; other items will be acknowledged and then shipped directly from the U.S.A.

To make payment send cash, postal order or cheque (in sterling drawn against a U.K. bank) plus £2.00 per order shipping and handling on books and records to Creative Computing, 27 Andrew Close, Stoke Golding, Nuneaton CV13 6EL.

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Outline

each heading desc

Conference (4 and 5 September)

Technology Stream I

Processors and Memory
memory chips – special purpose chips – bit slici
– new systems architecture – Motorola 6809 –
Intel 8086 – Zilog Z8000 – 16 bit micros

Storage Systems
diskettes – single/double density – single/doub
sided – hard disks – 8" Winchester technology
fixed/changeable – costs and reliability

Communications
modem technology – PO facilities – data link
controls – high level protocols – local area
networks – Prestel – personal computer netwo

Systems Review
survey of micro systems – Texas Instruments
TI 99/4 – Apple III – Triumph Adler Alphatroni
Sinclair ZX80 – other new releases

Technology Stream II

Monitors and Operating Systems
CP/M – MP/M – low level monitors – multi-testi
– multi-user operating systems – utility
program

Languages
BASIC – Business BASIC – Pascal – PL/1 – API
language developments

Programming and Quality Control
program design – debugging tools – project contr
– program productivity

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gramme –

es a half-day session

Development Systems
development and programming aids – ROM – EPROM – simulators – testing

Applications Stream

Retail and Distribution
stock control – order processing – point of sale – billing – financial management

Manufacturing
process control – production control – inventory management – job scheduling

Word Processing
special purpose/general purpose hardware – peripherals – displays and printers – cost justification

Professional Office Systems
time recording – client billing – diary management – client services

Teach-ins (6 September)

Game Playing on Micros
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++ COMPLETE SEARCH/CREATE/AMEND/DELETE/SORT/FACILITIES ON ANY SIGNIFICANT LEDGER HEADING: AGAINST EITHER OPEN OR GENERAL LEDGER IN DATE/INVOICE/ACCOUNT/AGENT/NOMINAL CODE/HEADINGS, FOR FULL INFORMATION RETRIEVAL SUCH AS A SHORTLIST OF OVERDUE ACCOUNT FOR A SPECIFIED MONTH, ACCOUNT LEDGER CARD RETRIEVAL, NOMINAL ANALYSIS ETC.

++ FAST INPUT ECHO FUNCTION TO ENABLE REDUCTION OF KEY-STROKES ON REPETITIVE DATA, PLUS PRINT AUDIT TRAIL OF ANY FILE CHANGES.

++ ––– NO ––– SPECIAL PRINTED STATIONERY NEEDED SO 50-100 INVOICES COST YOU A FRACTION OF A PENNY EACH, AND THEY ARE FORMATTED PRECISELY TO FIT IN A STANDARD 'RYMAN' WINDOW ENVELOPE FOR CONVENIENT POSTING. TRACKING PROGRAM ENABLING PRINTING OF PAST INVOICES – RECALL ON SCREEN, PLUS MONITOR OF SPECIFIED SALES – PURCHASES OF COMMODITIES BY CODE.

++ MONTHLY QUARTERLY TAX CALCULATIONS PLUS STANDARD MAILING TICKET PRINT FACILITIES.

++ ADD-ON OPTION OF AUTO STOCK MOVEMENT REPORT AND UPDATE QUANTITY ON HAND PLUS VALUATION OF RESIDUE AS RESULT OF PURCHASES AND SALES.

++ ADD-ON OPTION OF AUTO BANK UPDATE FROM RECEIVABLES AND PAYABLES AGAINST LEDGERS.

++ PET STORES UP TO 2200 ADDRESSES OR UP TO 4000 SIMPLE LEDGER RECORDS ON ONE DISKETTE WITH 160K OF USER MENU CALLABLE PROGRAMS FROM OTHER DISK. ––ONLY ONE PROGRAM DISK–– AND THE HARD CORE PROGRAMS CAN'T BE BUSTED.

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++ THIS MUST BE SURELY THE MOST COMPREHENSIVE, COMPACE, PROVEN, AND COST-EFFECTIVE ONGOING PACKAGE ON THE MARKETPLACE AT THIS POINT IN TIME.

++ TOTAL PRICE VERSION3 475 POUNDS . . ADD-ON STOCK OPTION 100 POUNDS . . ADD-ON BANK OPTION . . 100 POUNDS . . REMAINING PROGRAMS 19, 20, 22, 23 JOINTLY 100 POUNDS.

++ THINK OF JUST KEYING IN 100 INVOICES, 50 CHEQUES? (PROVIDED YOU LEFT YOUR PRINTER ON WITH PAPER IN) YOU COULD LEAVE OUR PROGRAMS TO DO ALL THE SECRETARIAL POSTING AUTOMATICALLY' AFTER WHICH YOU MAY SET IN MOTION THE AUTO STATEMENT RUN, THEN YOU CAN SIMPLY POST OUT ALL PAPERWORK WITH STATEMENTS AGE ANALYSED WITH APPROPRIATE COMMENTS . . . .

++ CPM VERSION SPECIAL *** WRITTEN ON THE NEW SUPERBRAIN PROCESSOR WITH THREE HIGHER LEVELS OF OPERATION.
***** 1 = ALL FILES ARE FULLY RANDOM ACCESS SO RETRIEVAL OF ANY RECORD IN THE SYSTEM TAKES NO LONGER THAN SEVERAL SECONDS FOLLOWED IMMEDIATELY WITH THE OPTION TO AMEND/PRINT/DELETE/QUIT/OR CARRY ON SEARCHING THROUGH ANY FIELD.
***** 2 = ENTIRE FORMER SET OF PET PROGRAMS ARE NOW JUST ONE PROGRAM RESIDENT IN CORE. ONCE INVOKED FROM DISK (UNDER MBASIC) THE USER MAY INSERT TWO EMPTY DATA DISKS IN BOTH DRIVES OF THE SYSTEM ENABLING A HIGHER MAGNITUDE OF DISK SPACE FOR MORE DATA STORAGE. (STANDARD SUPER-BRAIN TWIN DRIVES CAN STORE 3000 STOCK ITEMS OR 4500 LEDGER RECORDS. . 800K SUPERBRAINS CAN STORE 7000 NAMES AND ADDRESSES OR 9000 STOCK ITEMS OR 12000 LEDGER RECORDS * ALL INSTANDLY RETRIEVALBE) NEW 20 MEGABYTE HARD DISK STORAGE CAN HANDLE 40000 NAMES AND ADDRESSES OR 60000 LEDGER ENTRIES.
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01=*ENTER NAMES & ADDRESSES. . . . .
02=*ENTER/PRINT INVOICES . . . .
03=*ENTER PURCHASES . . . .
04=*ENTER A'C RECEIVABLES . . . .
05=*ENTER A'C PAYABLES . . . .
06=*ENTER' UPDATE INVENTORY. . . . .
07=ENTER' UPDATE ORDERS . . . .
08=*ENTER' UPDATE BANKS . . . .
09=*REPORT SALES LEDGER . . . .
10=*REPORT PURCHASE LEDGER . . . .
11=*INCOMPLETE RECORDS. . . . .
12=*EXAMINE PRODUCT SALES . . . .
13=*PRINT CUSTOMERS STATEMENTS . . . .
14=*PRINT SUPPLIER STATEMENTS. . . . .
15=*PRINT AGENT STATEMENTS. . . . .
16=*PRINT TAX STATEMENTS . . . .
17=GENERAL HELP . . . .
18=ALTER VOCABULARIES . . . .
19=PRINT YEAR AUDIT . . . .
20=PRINT PROFIT' LOSS A'C. . . . .
21=ENDMONTH MAINTENANCE. . . . .
22=PRINT CASHFLOW FORECAST . . . .
23=ENTER PAYROLL (NO RELEASE) . . . .
24=EXIT SYSTEM . . . .

. . . . ENTER WHICH ONE?

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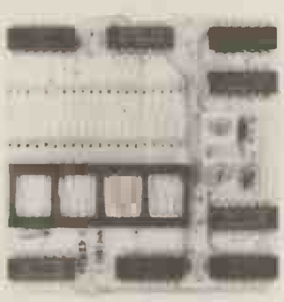

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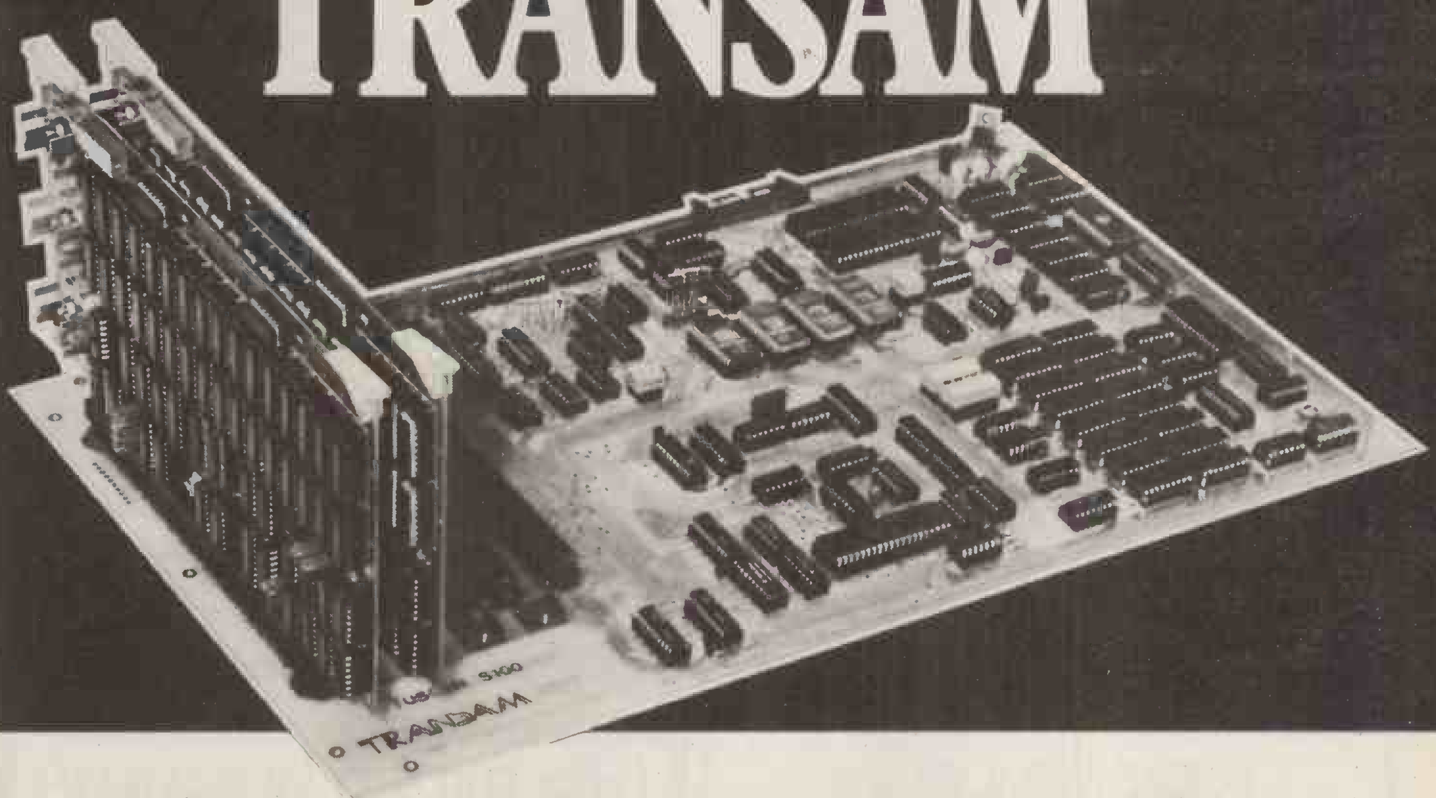

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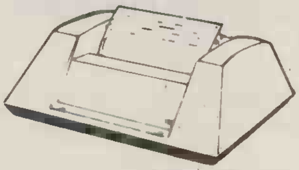

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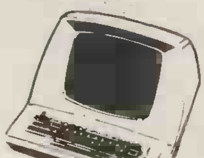

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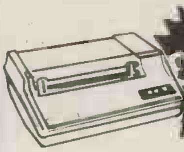

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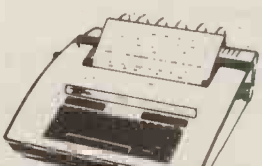

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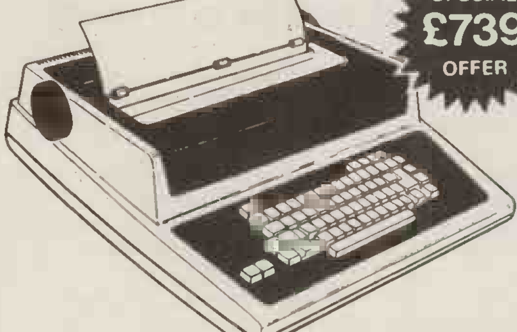

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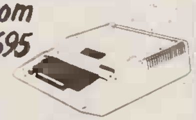

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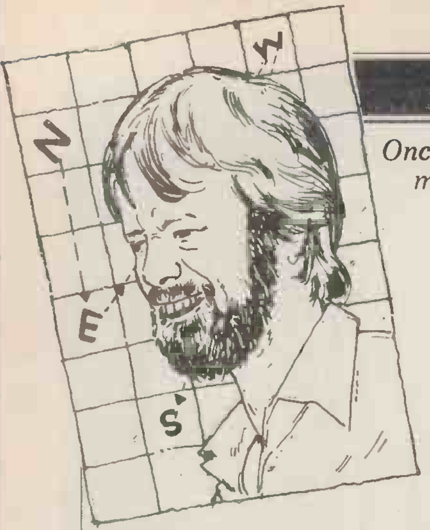

NEWSPRINT

Once again, the ubiquitous Guy Kewney offers his unique monthly manifestation of micro news and bric-a-brac.

Intelligence

Don't be deceived by Intel's claim that it is changing its nature in talking about its plans for a 32-bit micro, an incredibly powerful mainframe computer on a chip.

It is true, as the company says, that normally it tries not to talk about future products, and it is also true that it *is* talking about a whole range of future products. What has happened to do this is not a change of attitude, but a shift of power.

My own relationship with Intel has become a love-hate one (I love them, they hate me) because of the vulnerable position the company has forced itself into. In the market, it has been impregnable, coming out with advanced products, getting the biggest share, and leaving Texas Instruments with egg on its face not just once but several times. In its press relations, the distance Intel has been in front of the competition has made it slightly paranoid about revealing too much, with things getting to the ridiculous stage of an exclusive interview being set up in a London hotel by a top Santa Clara executive, who sat in his bedroom suite and said "no comment" exclusively for an hour.

However it remains true that companies like Intel and IBM cannot keep information truly secret merely by saying no comment. When Motorola, normally number two or three in the micro market, stole a march on Intel with the announcement of plans for the 68000 micro — the big 32-bit micro that looks like a 16-bit micro — Intel's anxious customers approached their supplier and observed that the specification looked a great deal more sophisticated than the Intel 8086. Intel was then compelled to whisper a few secrets behind its hand.

So it was that first, the "8800" was rumoured (it's the basis of Intel's 32-bit microsystem) and second, the unofficial Intel view that the Motorola 68000 was beyond the capabilities of Motorola's technology. This latest rumour backfired. Nobody ever believed Motorola's claims about when the 68000 would be available (nobody seems to believe Intel's claims about the iAPX 432 range, either), but when Intel said that it would be, not just late, but never "because the chip is not viable" people deduced that it was beyond Intel. Intel, they said in the bars, must have tried it and failed. Hence the 'break with tradition' and the willingness to talk about the iAPX (the i stands for intel) 432 and its supporting APX 186 and 286 families.

That willingness doesn't go all that deep. Most of the details released, while very interesting, are more conceptual than factual. The points Intel wants to make are not how many pins, and what voltage, and what clock speed, but first, we can build it and we will, and second, your old software will run on this. Normally, old software claims can be dismissed. There is, for instance, an Intel conversion package for re-writing 8085 code to run on the 8088. The 8088 is an 8086 (16-bit, big memory) with an 8-bit data bus — which means the user of an 8085 can get most of the power of the 8086, without throwing away his memory boards or system buses.

This package, say users who have tried it, is great for converting the sort of assembler code generated by compilers. Run a PL/M compiler, generate 8085 code: or run a Coral compiler, generate 8085 code, and that code can be converted to 8088 with ease and no loss of efficiency. The same does not apply to human generated code because humans tend to be cleverer than compilers. They tend to take advantage of oddities of the code, and no conversion program can really hope to reproduce the function of this sort of assembler writing on the next machine because it won't be aware of what foxy assumptions the writer has made about the condition code and so on.

When one gets to the 32-bit system, the APX 432, the power available makes it largely irrelevant that conversion software may be less efficient. Intel has no intention of providing an assembler for this system — it will provide a high level language, with the chip able to run instructions at a level normally handled by the operating systems on today's 8-bit micros. So Intel strikes a big blow in the credibility stakes, keeps its anxious customers happy, and the micro market can cheerfully ignore the whole thing for another two years. By then memory will be cheap enough for us to use the 8086 and double our memory size (because of the 16-bit words) without crippling the budget. And designers at Ithaca will have produced an APX 432 board for the S100 bus, and nobody will be able to afford it.

A case for £25, to house the best-selling kits or bare boards, is available from Microtype. This is a model 3 of a case which the company made previously; pre-cut main panel for Nascom 1, Ohio Superboard, and UK 101 is available. If, like me, you have moved those stupidly sited 'reset' keys on the Superboard/UK101, the case is available with a blank keyboard panel which you can cut to fit round your own key layout. The flat top will hold a TV set, the base is ribbed so that screws, holding boards down, will not scrape table tops, and there is room for a cooling fan. Details from PO Box 104, Hemel Hempstead, Herts HP2 7QZ.

Bright ideas

There's a great difference between an adult approach to computers ("What is there that I do which a computer could do?") and a childish attitude ("What magic can I do with this Sorcerer?"). I was astonished just how more useful the second approach was when I was one of the judges of the recent *Educational Computing* competition.

By far the most impressive entry (they were all essays or paintings) came from a hybrid mind — David Peard, who won a Video Genie computer for his scheme for computerising a weather station, a station he happens to be building for himself. His idea was simple enough: to be really useful, observations have to be made on a large number of parameters — atmospheric pressure, max and min temperature, air humidity, wind speed and direction — taken at least once a day. Unfortunately, humans don't like doing a lot of boring things regularly every day so he was going to give the job to a computer.

A child would not have had sufficient general knowledge and scientific background to realise that a computerised crocodile, programmed to bite enemy soldiers, was not really feasible (the idea did win a prize). An adult would dismiss the idea of a home weather station as a pointless project because it could never be as accurate as the Met Office. . . or maybe that isn't quite right, but never mind. A teenager was able to blend adventure and sense and find an application that was both truly innovative and genuinely feasible. Remember this in

The industry has largely grasped, satisfactorily, the fact that I don't like sexist pictures selling goods. So somebody sent in this one, of a cash register used at the Cafe Royal. It's obviously designed to make you so hungry that you buy a cash register. (Some mistake here, surely? — Ed.)

your next system design phase.

Neat ensemble

An American designer has come up with a new system which shows some concern for the human who will use it — by concentrating on the display technology. Mark Underwood, product development manager of a San Diego firm called Integrated Research and Information Systems (Itis, or Irisystems), had noticed the strange fact that most microsystems might be either TV screens, or black boxes.

"The display subsystem of today's microcomputers is very important to users, yet tends to be overlooked by designers. We have tried to package a system which accommodates the different needs that users express." he says. The result is a product called Ensemble 120GX, for which most of the product announcement talks about pixels — points of light on a display screen, and normally mentioned only in describing the matrix of dots used in generating screen characters.

The standard Ensemble is not el cheapo — but then the list is of contents of what "might be easily mistaken for a terminal" is impressive. For your $9796, you get a Pascal Microengine — a powerful 16-bit processor that runs instructions written in P-code rather than clumsy machine code — plus high resolution graphics, plus a video screen, plus a 12-slot box of S100 standard (ie cheap) cards for adding memory, special features and so on. There is a keyboard too, plus a 'big' floppy, plus 128 kbytes of memory, and an alternative Z80 processor to let you run CP/M and all the pre-written applications that come with this operating system. A cheaper version, at $3464, offers only the Z80, one mini disk and a much smaller screen.

Underwood is proudest of the pixel count of the Ensemble: "We believe that the greatest need is for higher resolution black and white graphics. The Ensemble can present a 768 by 480 pixel format, in 8 by 16 pixel characters, some of which can be user-designed." Apparently it can handle colour too. Details on (714) 457 3730, or from 10150 Sorrento Valley Road, Suite 320, San Diego, Ca 92121.

They're coming down

Printers are still much too expensive and there are healthy signs that users are starting to realise it. More importantly, there are signs that the manufacturers are starting to realise it, too.

A recent advertising campaign by Anadex promised, "The waiting is over" for its DP950 printer, which can print 120 characters per line for less than £1000. The advertising campaign, unfortunately, was prepared well in advance of the arrival of the printers themselves from America and it seems from the evidence that the American production people let down the marketing ploy.

Anadex is admitting to problems with the plastic cases, saying that the printers will be getting into peak volume in another two months now that there are sufficient plastic cases to match the mechanisms. Customers tell me that there is a more involved problem: the printer works well enough at its slower speeds, but there is a fault with the handshake signal which causes it to send a 'busy' notification back to a computer only after the computer has sent one more letter than the buffer can hold — so the letter is lost — at high print speeds.

Either way, the problem is being worked on, and no doubt the waiting will be over soon. But the moral behind the tale is an economic one: it shows that a printer maker has realised, perhaps for the first time, that availability is getting to be important.

A computer printer is essentially a very simple mechanism. Compared with a mechanical typewriter — say a good manual one, costing a couple of hundred pounds — it has very few components, almost a hundredth the number in fact. This should make it a lot cheaper, not rather more expensive. The electronics are almost as complex as those in a £10 calculator and the motors are costly only in a relative sense — they are more expensive to make than the battery job that shakes itself to pieces in a £5 massage vibrator, for instance. Shortage of printers allows the makers to sell them for the prices they do. That is caused by relatively low production volume, compared with the volume of, say, the new Smith Corona golf-ball typewriter, which is entirely mechanical, and sells for just over £100. However, Smith Corona (SCM) is itself well aware of the production savings it can make by building electronic typewriters rather than motorised clockwork ones and such products can be expected next year from SCM and from most other alert typewriter makers.

At that point, expect the 'office of the future' merchants with their hand-crafted daisy wheel word processors to start wiping egg off their faces. And expect the cost of computer printers generally to come down like mad.

PROMs news

Programmable permanent memory chips with 8 kbyte capacity are available from Celdis. The number is 74S478, from which one can deduce that they are fast — with a 20 nanosecond access time, according to Celdis. The really important thing about them is the fact that Celdis has them: it points out that there has been a shortage. Details on 0734 582211.

Nas comments

The man who founded Britain's most popular micro, Nascom 1, is now trying to handle America's number two, the Apple II. John Marshall, having handed over the reins of the collapsed version of Nascom to the receiver, is running a components company called Interface. He already has a

The sounds of Space Invaders can drive inveterate players mad; now you can take this infuriating concept to the home, office or train, with a £23 toy. It's called Galaxy Invader, and it comes from Computer Games, tel 01-591 5654.

Commodore PET franchise, he says, plus a Sharp agency, and is trying to get an Apple dealership.

He never meant to get into the computer business: he started the whole Nascom enterprise as a way of getting hold of components cheaply and Interface was part of that plan. "It just happened a bit sooner than I originally hoped," he told me, "but it's what everybody was expecting me to do eventually."

The old employees of Nascom have been dispersed, and the receiver/manager says that the business runs from day to day, supplying computers and making a satisfactory profit, paying its bills on a cash basis.

Several people are interested in buying the company. I could make some enemies and print the names of some who were definitely interested, but there seems little point. Experience of these takeovers shows that the person who finally does the deal is more often than not somebody who didn't know the company was for sale until the day before they signed the forms, and a list of three or four companies known to be wandering around with money for investing would be of interest only to people too stupid not to realise that the money was there. Wait until the deal is concluded before you pay any attention to rumour, no matter how well founded.

In the meantime, don't expect a Nascom 3 for ages. The project exists, but by the time it gets under way as a full-scale development, with funds from the NRDC virtually promised, it will need considerable revision, because the market will have changed.

The new Nascompany won't be set up and running (assuming it ever is) for at least another six months, more likely another 12. It will then have to spend at least a year getting the design right, and it'll be a year after that before production starts. Don't hold your breath waiting.

Rumours

I don't like telling you things of which I know less than I want to but you are bound to hear crazy rumours: that Julian Allason, head of the biggest publisher of PET software, Petsoft, has left ACT, the parent company, to run a magazine called *Printout*; that Richard Pawson, former Editor of *Printout* is joining MicroACT as a software marketeer, and that Petsoft, having dabbled in Appleware, is about to launch Sinclair programs. At the time of writing, all I know about this is that it is all true, but as to why, I have yet to find out.

PET plug-in

Plug-in software can make programming on the PET easier: the latest offering is from Supersoft. An unsolicited review dumped in my 'in' tray reads as follows:

Last month it brought you hi-res PET graphics, this month Supersoft launches a ROM-based set of new features — the Petmaster superchip. I counted 15 utilities, of which the most useful was single key entry of many Basic keywords, and the most useless (or should I say least useful?) a variable cursor flashing speed. I've tried the package and I particularly liked: the repeat feature which allows you to define a delay after which a key will repeat itself at any speed you care to choose; a lower-case/graphics 'toggle' which allows you to switch between the two; line insertion and deletion; deletion of characters on a line up to or from the cursor; retrace which lists the last ten lines executed on demand (it slows the program down by about ten percent); and a shrink routine which removes spaces and remarks from your program if you're tight on space. The two-way scroll facility has its uses but once the image disappears off the screen it cannot be recovered. Post your cheques for £45 + VAT to 28, Burwood Avenue, Eastcote, Pinner, Middlesex or telephone 01-866 3326 for further details.

"Give me the data or I fire!"
You too can hold your system to ransom with a polaroid video screen hood. It gives a hard-copy printout without all the odd reflections that amateur photographers get when they take a snap of the screen. The whole outfit, including camera, hood, and two packs of film is between £150 and £200 depending on hood size. Now, get these hoods outa my office, guys....details on 0727 59191.

ACT has launched a mini-floppy disk storage system for the PET, offering 1.6 million characters of storage for £1400. It looks to be better value per byte than the full-size disk drives it already imports from its US associate company Computhink, which also makes this new mini drive. Presumably the older system will soon show a price adjustment. Details on 021-454 5341.

Refreshing memories

Memory chips that can refresh their own memories are just starting to appear — Celdis has announced the new Mostek 4816 chip with 2 kbytes of read and write memory — and they are so obviously useful that it seems a mystery as to why it wasn't done before. The answer is that a memory which needs refreshing can do its own refreshing — but needs to know when to do it.

Refreshing is a very simple process: it involves recharging static electricity charges in memory cells. The circuitry takes care of the problem of deciding whether there was or was not a charge in the cell to start with by reading the cell first. Unfortunately, there is a computer in most memory systems, busily reading the memory cells too. Refresh and computer reads have to be done separately, or things get very confused. The trouble is that different micros do their memory reading at different stages in the instruction cycle. A memory designer looks at the clock cycle of the processor, and arranges for refreshments when the memory is off duty. Put another processor into the system, and it will find the memory enjoying light refreshments when there's hard work to be done.

The Mostek 4816 gives the decision (when to refresh) to the system designer. But it is much easier than normal; you just tell the chip 'refresh' and it does it. In the future, the circuitry on the memory chip that bustles around refreshing each cell, will become even brighter. Next year, Motorola promises to have a 64 kbit memory chip which can study the clock cycles of the micro used and deduce from the pattern of pulses what microprocessor it is — and refresh itself accordingly.

In the club

A discount club for micro buyers has been launched, offering members bargains such as 10% off a PET, 20% off disks and so on. The club is called the Computer Club and it's organised by Roger Frampton, a well known figure in the computer world and previously associated with successful promotions and exhibitions.

Against cynical expectations, Frampton thinks that this one will work. Members pay £7.50 for their cards (the rate goes up after September 1) and get discounts from the following: Comma Computers, Microbyte, Compshop, Lion Computer Centre, Cole Associates, Transam Components, London Computer Store, and Hanover Fair Travel. Discount travel is also to be arranged to next year's US exhibition, the NCC, plus Sicob in France. Details on 01-434 3914.

Nascom multi-tasker

"I'm not quite sure what you would use a multi-tasking monitor on a Nascom 1 for, but I've written one. Is

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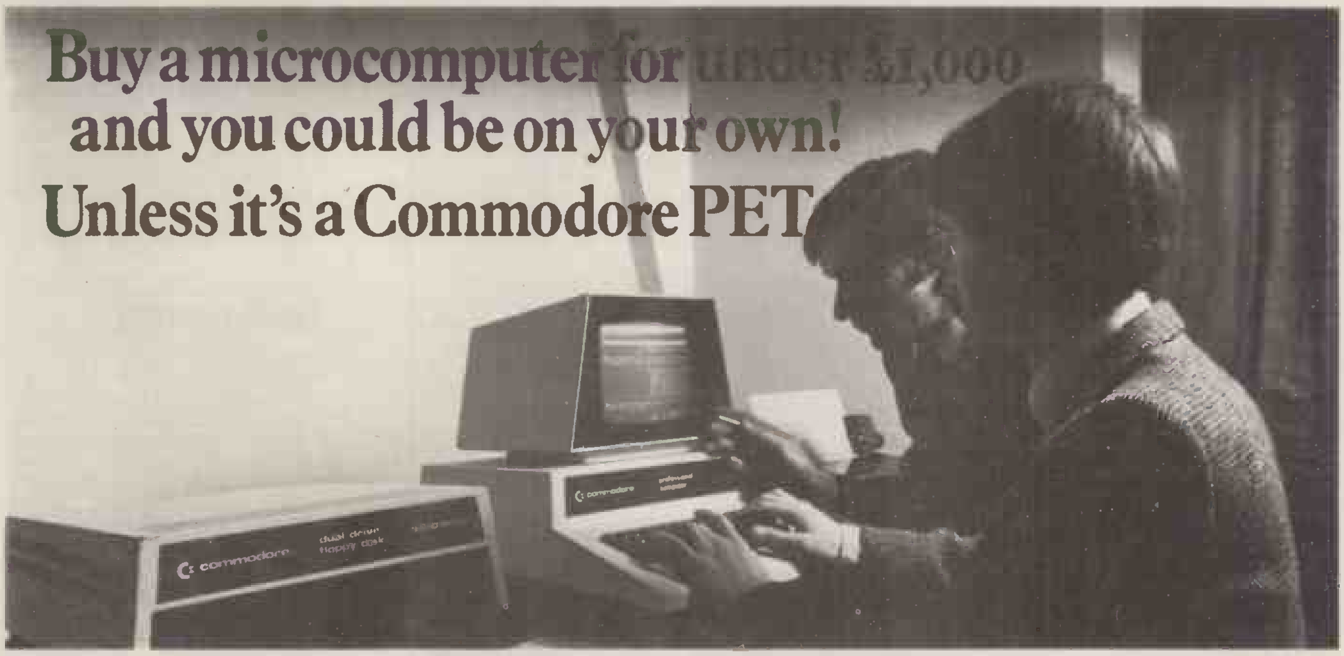

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The chess-playing computer may have become a little less predictable. Texas Instruments, with the aid of David Levy (international master) has devised a chess playing program for the 994 home computer which has three styles of play: it can be set to play normal, aggressive, or passive chess. Picture shows Levy (at the computer) with six leading chess journalists trying out the new software.

anybody interested?"

At a cost of £10 or less for the programs, Ian Turnbull is prepared to load it into eraseable read-only memory chips for anybody who *is* interested.

"I wrote it for my own interest and it'll handle up to eight separate taksks. It's interrupt driven, and it works on a 'round Robin' basis giving priority to the first task. There's a second scheduler which gives priority to no task, but shares time equally."

The code occupies around 1.5 kbytes in two 2708 EPROM chips, which have to be sent to Turnbull to be 'burnt'. Contact him on Pangbourne (07357) 2618 for instructions of how to wire it in and where to send the chips.

Look Sharp, TI!

Two late challengers to the micro market are arming themselves for the real struggle by adding disk and printer capabilities to their product lines. One is the Japanese Sharp MZ-80K and the other is the struggling Texas Instruments home computer. The Sharp machine was cheap enough for this to be not much more than a useful addition: the prices aren't available yet on its disk and printer, but presumably the same price policy will apply. Paul Streeter has let it be known that prices "will be very competitive" and he's the man in charge so we may take his word with some weight.

The Texas machine may suddenly start selling. Its basic handicap of not being compatible with UK colour television sets is not expected to be resolved until 1981 — word from Bedford is that the central processor chip is being redesigned so that it no longer thinks all televisions use the US standard (NTSC, Never Twice Same Colour) but will be switchable to use the UK and German PAL standard. However, with a £500 disk offering 92 kbytes of useable storage plus the option of adding on two more drives at £340 each, the cost of an entire system becomes comparable with other expanded systems, such as Apple.

It would seem that Texas's original hope (that people who wanted a home computer would need another TV anyway) backfired because the sort of people with that kind of money (wait for it) already had at least one colour television set anyway. Texas' printer, at £269, is aimed smack at the new Apple printer and apart from the fact that it attaches to the Texas machine, not the Apple, will be an important peripheral.

Another important breakthrough for the TI machine can be expected in the late Autumn, when it releases its £30 (including VAT) Personal Records software module. This will operate on one 16 kbyte file of data at a time, loading the entire file into memory and performing all sorts of useful functions (searching, matching, transforming and analysing information) on it. This means that the sort of self-employed businessman who would like to buy one for his children to understand computers, can actually use the thing, and justify putting it on his tax allowances. Currently, Texas describes its 'stance' on the 99/4 as "in test market". It will admit to no figures on sales (they are in the low hundreds in the UK) the peripherals and software may start the ball rolling. Details of Texas products on 0234 67466; of Sharp on 061-969 7131.

Colour board

Picture drawing on a Nascom computer is the feature offered by an add-on board produced by Winchester Technology of Eastleigh, Hants. The product is called the WT625, and it is a board which generates teletext compatible colour — like Ceefax, Oracle and viewdata — for UHF televisions. That gives 13 colours plus features like flashing characters, and 5760 individually addressable pixel points or picture dots.

Support in software comes in the form of a memory chip — a 2708 reprogrammable chip which contains graphics subroutines and which your program can call to perform functions — you can call these from Basic or assembler programs. Examples: a chessman can be defined and then moved around the screen without redefinition or laborious, detailed, code writing.

The board is sold assembled and tested, says Winchester Technology, for a £136 price tag, with a 42 page manual with a hardware description in it, plus details of programming, installation and fault finding. Details on 04215 66916.

Spot spotter

When a disk wears out, it doesn't do so all over its whole surface simultaneously. Instead, one or two spots flake away, causing errors. A program which keeps track of these spots and ensures that the system avoids them has been produced by Lifeboat at a US cost of $80 for systems using the CP/M operating system. Details from New York at 1651 Third Avenue, NY NY 10028, or phone (212) 860 0300.

Ball game

Most IBM 'golf ball' typewriters are not electronically driven; instead a system of magnetic actuators (solenoids) pulls the ball into different positions mechanically. However IBM did produce a printer, the IBM 3982, which used the golf ball, but was driven by electronic pulses and many of these have now appeared on the second-hand market.

In their original second-hand form, they are virtually useless, if cheap. The electronic pulses are not in the familiar ASCII code that most micros know and love and the wires that take the codes are colour coded in an intriguing manner designed to baffle anyone who tries to fiddle with them. Having a manual for the colour codes doesn't help much, according to someone who has done it; he describes the IBM colour coding in a highly technical term: 'a lie.' How harsh.

Chess can be played by the Texas Instruments 99/4 home computer. The graphics are beautiful and the amazing David Levy was a major consultant in the design, so it must have something going for it. The point that will ensure that it really takes off is the four levels of playing skill. On the announcement of the chess package, it was said that the chess game plays in three styles — normal, aggressive, or passive. On the version I saw demonstrated, it also offered a fourth. It plays a strategy called "losing", at its beginner level. Irresistable, but I still didn't manage to beat it.

BASF gives a Good Deal

To an entrepreneur building up his own business, or to a company needing to distribute its data processing, the BASF 7120 gives a good deal.

Our 7120 is basically a stand-alone microprocessor giving high performance at low cost. It's a powerful desk-top computer for around £5,500.

The main features include:

* Main memory of 64 K bytes
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* Specially designed keyboard to ease operator interface
* Free word processing package.

The whole deal is offered by BASF, whose computer interests also include supplying media, CPU's, add-on memory and plug-compatible peripherals for large mainframes.

Finally the deal is completed by selected dealers providing sales and technical support where you need. Including Computer Services in Canterbury, Dataforce in Bristol, Dataview in Colchester, Davies & Brown in Shoreham, HB Computers of Kettering and Verles in Birmingham.

For more information and the name of your nearest dealer, please contact: BASF Computers, Haddon House, 2-4 Fitzroy Street, London W1. 01-637 8971. Ext. 30.

CPS also supplies software for the PET, including Newsboy, a program (illustrated in use) to ensure that the right customers get the right paper delivered.

As a reward for having cracked the code, reconditioned the printers, and packaged them ready for use by microcomputer users, the company concerned is allowed to charge £960 each for them. As prices go, I feel this must be what the market will stand — much cheaper than the only real alternative of a Spinwriter, but a bit less generally useful (no keyboard) as a typewriter. It can come down if it must. The new machine is available with a PET interface, or an Apple connection, as well as with the standard (RS232) interface. Details from CPS Data Systems, 021-707 3866 or through SBS on 01-250 0178.

Microdigital takeover

Currys, the washing-machine giant, was the first; now hi-fi vendor Laskys has joined the selling-microcomputers-to-the-consumer bandwaggon. Unlike Currys, which is starting totally from scratch, Laskys has taken a short cut by buying Microdigital, the Liverpool micro retailing company (founded by the flamboyant Bruce Everiss) which also publishes something called the *Liverpool Software Gazette*.

Rumours about a possible takeover of Microdigital have been in the air for a while now, with various immense figures being quoted knowingly as the asking price. What Laskys actually paid remains undisclosed; the firm does, however, say that it intends to set up microcomputer departments in its main shops (it has 40 altogether in the UK), and that Bruce Everiss and Graham Jones, both of whom were Microdigital directors, will remain with Laskys, developing and expanding its microcomputer division.

DTS Counting on Abacus

As mentioned in last month's 'Chip Chat', Derek Rowe's company Abacus has been put up for sale and bought... by Data Type Systems.

As is so often the case when a company runs into some sort of difficulty, various stories about the circumstances surrounding the failure are put about by people whose grapes are less than sweet. I'll confine myself, therefore, to saying that it appears that the backer who put up the original £30,000 to start Abacus decided to withdraw from the scene.

The new boss, Gerry Tuffs, won't tell me what Data Type paid for Abacus but I guess it must have been around £50,000.

Data Type offers some hope for the micro industry. I won't make too much of it in case it turns out to be a false dawn, hence the appearance of this gem at the bottom of the story, not at the top: Data Type started out as a terminal maintenance firm. If the company can extend itself into terminals (a new factory in Cwmbran) and intelligent terminals and microcomputers and also shift its maintenance activities into the micro field, it will set a welcome precedent. I hope it makes a lot of money at maintenance, encouraging others to follow suit.

SuperBrain importers

A phone call from Encotel has clarified the sometimes confused question of who exactly imports SuperBrain. We're told the official importers are Encotel (who provided last month's review machine), Sun, Icarus, Computability and G W Computers.

TV adventure

You've read the book, watched the movie, viewed the TV series, and seen the play. Have you played the game? The well known computer game of Adventure has turned into the basis of a plot for a TV series, apparently on Saturday morning on BBC1. If you get to see it, the computer on which the fiendish Argonds make the Tellurians (people from Tellus, or Earth) play is a Hewlett-Packard 9845B desktop computer.

ZX80 software

There are already 10,000 Sinclair ZX80 computers out in customer's hands. The software available is just starting to appear; first with a product is a new company called Econosoft, of 4 The Loont, Winsford, Cheshire CW7 1EU. It has announced a £5 cassette with four games — Simon, a memory test, Mindbender (like Mastermind), Fruit Machine, and Destroyer. There's little point in expecting these programs to be up to the standard of the latest Petsoft offerings at £100 — the machine isn't up to that and neither is the price — but as an improvement on the crude code in the ZX80 manual it must be a bargain. They run on the basic Sinclair, while programs for the expanded 2 kbyte machine will be launched towards the end of the year. Details from Trevor Daniels.

Sound of the times

Your computer can make rude noises for £20 if it's a Compukit UK101 or an Ohio Scientific Superboard II. An independent company, John Mortimer Electronics has launched an add-on called Sound Box. It runs off the computer power supply and comes with a free program on cassette which plays a game with "interesting" sound effects. A kit is available at £15 — I can't establish whether this includes VAT because Mortimer gives no phone number. He's at PO Box 71, Norwich NR6 7JE.

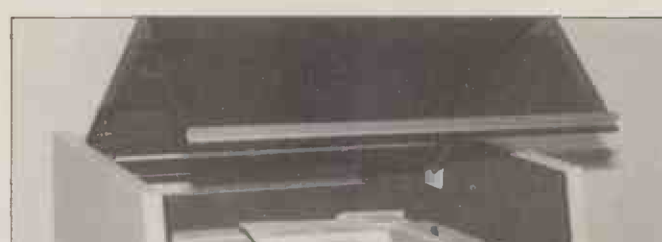
Value for money

"We prefer to sell a lot of software at low prices rather than a little at a high price," says Guy Wilhelmy, managing director of Databank Software Services.

Databank has just launched five new programs on this excellent basis (remember, a program is debugged to a depth directly proportional to the number of people using it). They are two business systems — word processor and Salesman — two maths packages one for graph plotting and statistics, and a crossword game. All run on PET, and on Apple II or ITT 2020. Details on 0509 217671.

A bit of stick

The Editor is coming off his trolley. He has presented me with a press release announcing the 24th Congress of FIPAGO (the federation international of manufacturers of gummed papers, in French, I suppose) in Corsica. He's potty, because, vital though this may be, it already happened in Corsica on May 18 to 21 — plans were made to form a new division to promote the use of flat gummed papers for labels and postage stamps. I shall start a Federation for the Automatic Repetitive Typing of Instructions on Non-Gummed envelopes.



A box to put printers in to keep them quiet may sound like £160 too much to spend until you remember that printers are not as prone to stop typing every five minutes as human typists, and that human typists can make an office into a place unfit for telephone conversation. Boxes for Anadex, Centronics, OKI and other printers have now been joined by the one shown here — for the Qume printers, three models. Details from Power Equipment company, 01-205 0033.

Guy Kewney is the editor of Datalink

YANKEE DOODLES

Tom Williams, our man in Silicon Gulch, reports on the latest US micro marketing dilemmas.

Software dilemma

Here's a puzzle for all who concern themselves with the legitimate use of licensed software — and with the problems that software piracy poses for the industry. Let us suppose there is a business of some kind that has decided to install four or five desktop microcomputers around the office to do word and data processing. The installation comprises stand-alone units, each with its own CPU, RAM and at least one built in floppy disk drive. One of the tasks involved requires that each machine runs the same commercially available software package.

A problem arises when the owner of the business approaches the software vendor. Being a conscientious person, he realizes that quality software is only possible if authors have the proper financial incentive, and that outright piracy of software ultimately harms everyone involved. Besides, it's dishonest.

Now software is generally licenced for use on a single CPU and our hypothetical businessman has four CPUs, possibly in the same room. There's a natural reluctance on his part to purchase four identical copies of the package when he could more easily and cheaply buy one and make copies for each of his stations. The software vendor quite understandably insists that the owner of the business is required to obtain (and pay for) four licences to use the programs.

There the two might remain, locked in eternal and unresolveable conflict until the businessman decides to follow either the dictates of conscience or the purse. Whatever the outcome, the basic question would remain unsolved. But now suppose that the business' expansion plan for the following year includes upgrading the disk storage of the desktop units with a commonly shared hard disk system. Hard disk storage can now be shared by separate CPUs using systems available from Nestar and Corvus; more such devices are under development by various other manufacturers.

When a program is written or purchased it is placed on the hard disk for use by as many of the computers as may need it at the time. We now have the rather ludicrous scenario of the conscientious businessman buying four copies of a program on floppy disk, copying one onto his hard disk for use by the attached CPUs and then carefully storing the four floppies away as backup copies. Such a scene, I submit, will never take place.

When you start using a shared disk storage system of this type, it looks to the user almost like a time shared system. Now if our businessman had purchased, say, an S100 multiuser system with four terminals, I doubt very seriously if any software vendor would have dared suggest that he pay a licence fee for each of the terminals accessing the program. The question is, for the end-user, *what is the difference?*

If there really is no difference from the point of view of the people who ultimately will decide whether or not to purchase a program as a commercial product, then some solution must be found which will render, in the eyes of the user, the relative software expense for the shared disk resource and the timeshared type system to be as equal as their functionality. You are simply not going to find that many businessmen willing to forego their own interests for the sake of conscience in the face of what appears to be a truly inequitable situation.

One possible solution is that more programs for microcomputers be licensed for use at a given 'site' or 'installation' with provision for a multiple use fee — which would be a fixed surcharge. This latter provision, though difficult to enforce, would at least have the appearance of being just. Great moral arguments could be made for paying multiple use fees in order to encourage the development of more and better software; they would no doubt fall on deaf ears — just as do today's pleas against software piracy.

Nontheless, an intransigent attitude on the part of software vendors is not going to help anybody. The only advice I can offer at this point is that it's much easier to induce people to comply voluntarily with a situation if they feel that all are getting equal treatment. That's not to say that they will, but a sure way to make them not to is to give them a feeling of righteous indignation.

OSI's department store experience

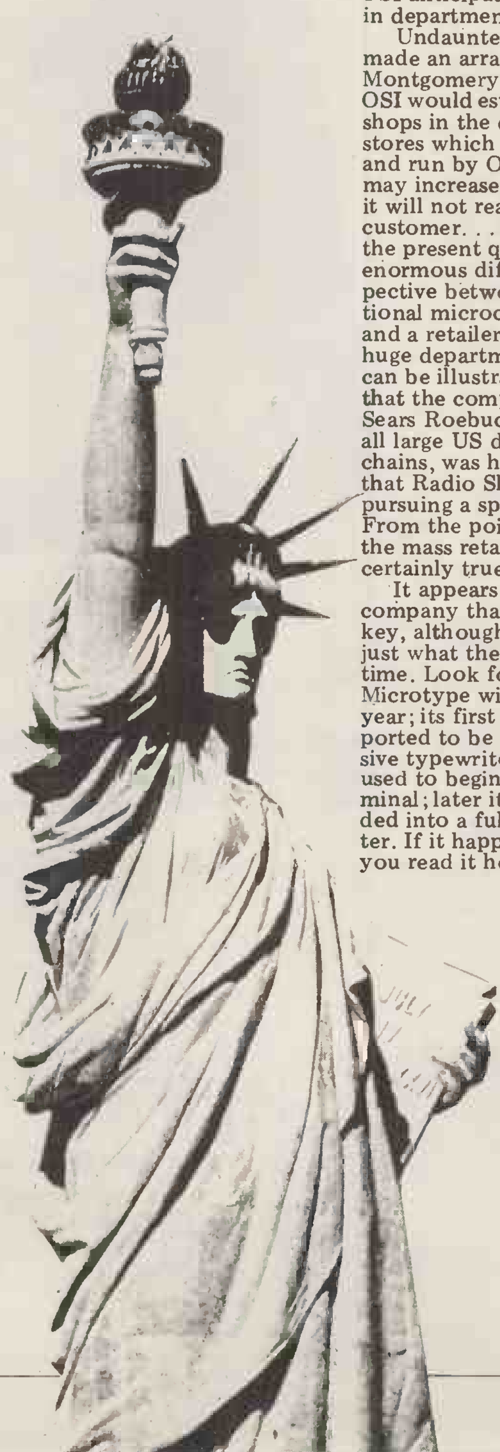
There's a vague feeling in the microcomputer industry that there lurks an as yet untapped but incredibly vast mass market awaiting the lucky company that discovers the key to placing a computer in every home. Although this particular grail has not yet been found, there are many knights-errant galumping about in search of it.

One idea has been that if micros were placed in the proper distribution channel — say a large chain of department stores — they would find their way into the home and win mass acceptance. Ohio Scientific Instruments, whose main computer line is concentrated on higher end machines for business, recently completed an experiment in marketing their low-end computers through selected Montgomery Ward stores in the US.

What OSI discovered was that the customers who were interested in microcomputers wanted to know about business applications. Unfortunately the Montgomery Ward sales clerks were not qualified to answer the type of questions these customers kept asking. Most department store personnel are only able to handle concepts at the washing machine and hair dryer level and thus a great many potential sales were lost — admittedly sales to a different type of customer than OSI anticipated it would find in department stores.

Undaunted, the company made an arrangment with Montgomery Ward whereby OSI would establish computer shops in the department stores which would be staffed and run by OSI dealers. This may increase OSI's sales, but it will not reach that magic customer. . . the object of the present quest. There's an enormous difference in perspective between the traditional microcomputer dealer and a retailer on the level of huge department stores. This can be illustrated by the fact that the computer buyer for Sears Roebuck, the largest of all large US department store chains, was heard to remark that Radio Shack was still pursuing a specialised market. From the point of view of the mass retailer that is most certainly true.

It appears there may be a company that has found a key, although it's not saying just what the secret is at this time. Look for the name Microtype within the next year; its first offering is reported to be a very inexpensive typewriter that can be used to begin with as a terminal; later it can be expanded into a full-blown computer. If it happens, remember you read it here first.



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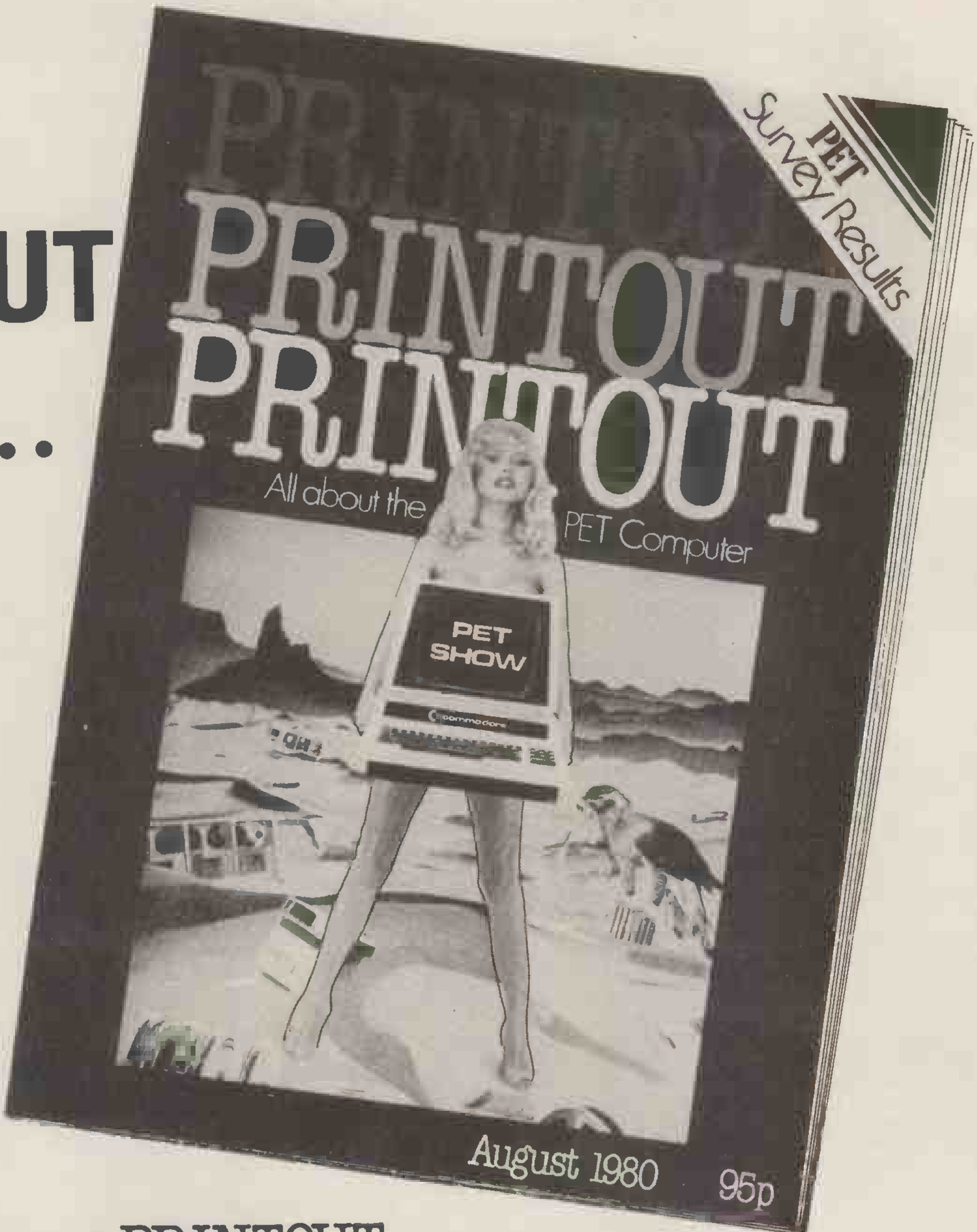

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A GROWING AWARENESS

Ian Lloyd MP reports on recent debates in Parliament on information technology.

After a great deal of prodding from the backbenches, the Leader of the House has at last agreed to a debate on information technology. Appropriately the week in which it was held started with a first-class presentation on the subject by a GEC team — led by Sir Robert Clayton — to the All-Party Committee. This was the last of a series which has included John Diebold, Professor le Gates (Director of the Information Technology Programme at Harvard), Herbert Grosch, Ferranti, the Post Office, Inmos and Lucas. At the beginning of the parliamentary year these were poorly attended, but interest has grown and some of us find it encouraging that within a fortnight there should have been a half-day debate on Inmos, a full Friday's debate on the general issues, and a front-page article in *The Times* summarising a 'confidential' Labour Party policy statement on the subject. Nothing, of course, remains confidential at Westminster these days and if we put an Information Technology Act on the statute book we shall doubtless find ourselves obliged to hold confidential discussions in secure rooms lined with lead.

The growth of complexity

Though I invariably learn something from every lecture, article or presentation on this subject, during the last few weeks my perspective on information technology has been altered as a result of a series of visits which I have just made to the control rooms at Three Mile Islamd (there is a separate system for each reactor), the operating reactor at Zion, the incredibly realistic simulator at the training school nearby, the new reactor being built at Byron, near Chicago, and the CANDU reactor (heavy water) at Pickering near Toronto. In addition I have visited the control rooms on the Murchison rig in the North Sea and at the Isle of Grain power station in Kent.

All three systems rely heavily on big computers. The computers at Three Mile Island were installed some years ago and although they don't control the detailed operation of the reactor, they do record and monitor virtually everything that happens. I enquired why it was then that, when the operators obviously had difficulty taking in and reacting to the information appearing on several thousand dials (at least), the computer could not be programmed to deal with an 'incident'. The answer was illuminating. The computer, I was told, became swamped with data once something such as the pressure failure at Three Mile Island occurred. It ran several hours behind 'reality' and by the time the print-outs started arriving the instructions and information were irrelevant except for diagnosis. At the peak of such an incident, my guide added, the computer was receiving an input of several million units of information a minute.

Progress may be an illusion, but the simulator control room at Zion had even more powerful hardware and software of conspicuous sophistication and, at least to my impressionable mind, sheer brilliance. All the lessons of Three Mile Island have now been incorporated in the system and the operators, who come from all over the world for training in pressurised water reactor operation, can be placed at a console which even an expert would not be able to distinguish from the real thing. Here every conceivable normal routine and abnormal incident can be simulated and the trainees' responses sharpened and tested. It is an expensive course, well beyond the reach of individuals, but I cannot imagine a better way of achieving the important objectives of safety and efficient operation.

The oil rig in the North Sea and the oil-fired station at Isle of Grain are no less complex and must conform to equally rigorous operating and safety criteria. Doubtless all three systems could be run without computers, but the loss of efficiency would probably be considerable and acceptable safety levels would certainly have to be lowered. Human beings cannot monitor complexity on this scale continuously without great strain.

There are of course, outstanding examples of modern information technology. At the Isle of Grain several hundred analogue inputs and over a thousand digital inputs have to be received, processed and transformed into meaningful information. By any standards these are impressive performances and reveal the high-powered computer at its best. Incidents such as the failure of the NORAD defence computers still encourage some to complain that the computer is a monstrous and dangerous device, but I share Sir Robert Clayton's view that our judgment should really be based on the fact that all the safety procedures worked. Ten further steps would have had to have been taken before any missiles could have been fired. There is, of course, no other way in which we could assess the significance of satellites appearing over the Arctic Circle every few seconds.

There is, equally, no other efficient way of dealing with the information complexity inherent in the operation of a nuclear power station, a North Sea oil rig, or even a conventional oil-fired power station, such as the Isle of Grain, one of whose alternators produces a power output equal to the whole of Battersea. Their complexity is as staggering as the information technology which has been developed to control them.

The information technology debate

Hansard — a product as yet of the old technology of Gutenberg has recorded every word spoken during the debate. It was a fairly broad and useful tour d'horizon but three issues dominated the exchanges. The first was the extent of Government support for and involvement in the industry; some invidious comparisons were made with the United States, France and Japan. The second was whether the cause of information technology would be advanced by the appointment of a Minister with a clear responsibility — such as the position Pierre Aigrain enjoys in France. This was first suggested in a brochure produced by a group which I chaired just before the '79 election and has been strongly endorsed by Kenneth Baker, both at a recent Online Conference and in his speech during the debate. It merits more serious consideration than it appears to have received so far, but I would not support a second-rank appointment at this stage. The subject is too important, the Government machine is still too lethargic and only a man with the drive and authority of a Lord Beaverbrook could match the contribution to the requirement of the hour — as he did when he took Merlin production and repair by the scruff of the neck in the nick of time before the Battle of Britain.

The third issue was the Inland Revenue computer order and the appropriate treatment of ICL in this context. Both points of view were expressed in the debate, but most speakers considered that it would be at best unfortunate and at worst iniquitous if ICL lost the order. We shall doubtless hear more of this issue before it is resolved, but my own view is that the geographical boundaries of the nation state are now a severe handicap to rational thinking and that this is particularly true in the sphere of information technology, which, as I argued in the debate is an industry whose rationale, structure, markets, research and development and competitive challenges are no respecters of frontiers. I wish ICL the best of luck in an important contest, but it is the country's overall growth, performance and standards in the whole field of information technology which must decide the issue.

Readers may buy this relevant copy of Hansard (vol 998 No 211) at 80p from HMSO — Ed

COMMUNICATION

PCW welcomes correspondence from its readers. Be as brief and concise as possible and please add "not for publication" if your comments/questions are to be kept private.
Address letters to: "Communications", Personal Computer World, 14 Rathbone Place, London W1P 1DE.

Get the connection

Being something of a novice to microcomputer systems and to electronics generally I was intrigued in this month's edition of your excellent magazine to notice reference to 7-pin DIN plug, 64-pin Eurocard connector, BNC video socket, and phono plugs, all within the article on the Acorn Atom (p48).

I wonder how many of your other readers are perplexed by the proliferation of connection types available and in use in different applications. Would it be possible for your magazine to produce a guide to connection types (at least the "standard" ones), their normal uses and wiring configurations? (Perhaps as a set of Friends and Enemies in the Face to Face column?!).

Personally and particularly, I would very much like to know what relationship the 7-pin DIN plug to cassette from the Acorn Atom may have to the 5-pin DIN which my music system bears.
Christopher E Mathews,
London

What a good idea. Anyone out there an expert on connectors? Perhaps you'd like to tell us all you know. We'd like to hear from you — Ed.

Cut it out

My employer has recently taken delivery of an Apple II with two disk II floppy disk subsystems. Since the manuals state that only one side of the disks can be used I was surprised to find that a disk containing demonstration programs for the Supertalkers peripheral had data recorded on both sides. There were no problems in reaching this data.

On trying to write data to the "back" of an Apple disk I got a message indicating that the disk was write-protected. This was because the write-protected cutout is on the wrong side and an examination of the Supertalker disk showed that it had cutouts on both edges of the disk casing. I carefully cut another write permit cutout opposite the one already on a BASF floppy and found that I could use the second side without any trouble.

It seems to me ridiculous that one side of a floppy should be rendered useless simply through the lack of a hole punched in the disk case.
D Watson
Banchory, Kincardineshire

We definitely do not advise readers to follow Mr Watson's example. Manufacturers test both sides of each disk; if one side is faulty then it's sold as a single-sided disk, using only the good side; so any data recorded on the reverse side of a single-sided disk could be corrupted. Now it's possible that, to satisfy the demand for single-sided disks, some are sold which are fault-free on both sides; however you can't take advantage of this because inside the disk's protective envelope there's a wiper which collects any dust or dirt from the disk's surface as it revolves; inserting the disk the other way round to use the reverse side will, by reversing the disk's rotation, spread the collected dirt over the good side — and then you've really got problems! For the same reason, you shouldn't try using a proper double-sided disk in a drive designed for single-sided disks — Ed.

Atom postscript

We would like to comment on the Acorn Atom review in the July issue of PCW. The fact that you were supplied with a prototype machine and an incomplete manual may explain some of the inaccurate comments made; despite this we think the record should be put straight.

First, we would like to comment on points where the reviewer suggests there are imperfections without apparently having any evidence to support this. For example, he expresses doubt about the Atom's ability to produce a good colour display; in fact we paid particular attention to the display quality and can only judge by the number of favourable comments received that we have achieved our aim to produce a high-quality display.

Again, the reviewer claims, "you will almost certainly have to adjust the vertical hold of your TV set" without saying that he has had this trouble; we have obtained clear displays on a whole range of different makes of domestic TV sets and have not yet found one that needed any adjustment. Again, he states, "I found I had to drive the tape well into overload in order to load programs reliably." It is no oversight that the Atom's tape output overdrives the input of the tape recorder; this was chosen after much experimentation with different makes of recorder, and gives considerably better results than the approach suggested by the reviewer of providing an input with an "adjustable high gain".

Next we would like to reply to the statements that the "memory map is a bit weird" and that the Atom is "spoilt by some basically unsound thinking at the system level"; while the first statement perhaps reveals a lack of understanding, the second is stated as a fact without any support and is untrue. In fact the Atom's memory map is designed in a very orderly way: above 8000H is the graphics memory, ROMs containing the Basic, assembler, and operating system and on-card peripherals. Below 8000H is the system RAM and the Basic text area. It is not true that the 32k memory card can only be fitted by 'wasting 9k'; it is perfectly feasible (by inserting a link on the Atom board) to have a 32k memory card from 0H to 7FFFH with no wastage, and the zero-page memory chips can be moved up to a graphics area. This will result in over 20k of contiguous text space, as well as providing all the workspace and stack memory required by the system. The graphics memory *can* be used as the text space (as on the minimal cost system), but surely this is a bonus and not a disadvantage as implied in the review. Another feature of the system design is that it maintains total compatability with the existing Acorn range, which includes the larger System Three and System Four disk-based systems. The Atom even uses the same I/O vector addresses.

A number of comments were no doubt prompted by the fact that the manual supplied was incomplete — a fact not mentioned in the review. The final version of the manual (available separately for £8, refundable on purchase of an Atom) does have an index, page numbers and a full list of error codes.

The reviewer says that "the only real criticism of the assembler. . . was the inability to comment on individual lines." Comments can be put on individual lines if they are preceded by a backslash. With reference to the floating-point extension; "it's a pity it doesn't support degrees in addition to radians."; the functions RAD and DEG are provided for this purpose and provide conversion from degrees to radians or radians to degrees. "Unfortunately there is no TAB function."; true, but the reviewer failed to mention the COUNT function, which can be used to achieve the same effect. And, with reference to the graphics facilities, "The only criticism is the fact that, in the high resolution mode, the effective display area shrinks noticeably to about two-thirds of its previous size. . ." In fact the display area stays exactly the same; it is simply that the black border is replaced by a white border in the high-resolution modes, thus neatly framing the graphics area. Finally, it should be pointed out that the Atom communications interface uses the IBM standard SDLC protocol, which is not the same as the Cambridge Ring.

Finally, we hope that readers will take the time to visit one of the computer fairs or one of our distributors, and supplement the review with their own judgement.
David Johnson-Davies
Member of the ATOM design group

Thanks for the clarification. As you rightly point out, the documentation did cause a few misunderstandings — Ed.

68XX pleas

Let me first congratulate you for your fine magazine; I confirm this opinion by enclosing my first subscription form.

I have one gripe though. You are missing a column of 68xx micros. Users of 6800/6809/68000 equipment are a relatively small yet very proud pack (after all, *everybody* knows that the 6809 is the best 8-bit micro ever, 68000 is the best 16-bit micro ever, SS50 is the best bus ever and FLEX the best operating system ever, exception made perhaps for UNIX and its derivative UNIFLEX . . .). You would be surprised at the response you would be getting from us. Besides, in this world of animals, fruits and rubbish bins we are probably one of the few groups still doing serious computing.

In case you go along with this idea, I am ready to offer my support and collaboration, and I think that many other 68xx users would assume the same position. The lack of a 68xx column is a glitch in an otherwise excellent magazine.
Alberto C Moreira,
Chalfont St. Peter

We have a secret master-plan to overcome this problem. It'll take us a few more months and then we'd like to consider your offer. Hope last month's 68000 feature will tide you over — Ed.

Algol 68

I have followed with interest the correspondence from Raymond Anderson and Melvyn Anderson concerning Algol 68 for microprocessors. I do not know if possession of this surname is a prerequisite for entering the correspondence, but in any event I should like to offer a few comments of my own.

There is no doubt that Algol 68 offers many programming advantages over Pascal. The only question is whether these extra facilities justify the implementation effort — which will be an order of magnitude greater than for Pascal. Certainly there is little to be gained by going for the older version of Algol (ie Algol 60) unless there is a severe lack of memory space. One gains dynamic arrays in Algol 60 but any possibility of decent data structures or character handling is irretrievably lost.

No, the only way forward is via a language which combines all the good points of Algol 60 and Pascal and throws in a lot of extra goodies as well. Algol 68 fits this bill exactly. However, we have to remember the very potent advantages possessed by Pascal from the point of view of implementation. The very limitations that Algol fanatics find so annoying — the static nature of array bounds, the restricted ways in which pointers can be used and so on — are precisely those which ease the compiler writing task considerably. In addition Pascal can easily be parsed with a class of parsers known in the trade as LR(1). Essentially these allow the compiler to recognise the nature of an incoming Pascal construction simply by knowing the next character in the input stream.

Algol 68 on the other hand is the very devil to parse by such methods, for there are constructions which, in general, require you to look indefinitely far ahead in the input stream before you discover what kind of Algol 68 construction you are dealing with! Equally, the extra facilities offered by 68, such as array slices, free use of pointers and the ability to deliver objects of any type as a result of a procedure do lead to some very knotty run-time problems, and even going to the Algol 68S subset will not completely get rid of them.

Nevertheless, the aim of producing an Algol 68S compiler for microprocessors is a very worthy one. The only generally available 68S compiler known to me at the moment runs on a PDP 11 and produces code only for that machine. A less differing a full new compiler would be to modify this compiler to be a cross compiler for a range of microprocessors. Unfortunately few personal computer users will have access to a PDP 11. . .
Dr D F Brailsford,
Nottingham

ZX80 answers

Recently my father bought a Sinclair ZX80. I have discovered it is a delightful machine, but cannot find two things: how to work the 'timer under program control' (as the adverts put it), and how to display the amount of memory left. The second point I found very irritating as I only have 1k of memory to play with.
Richard King, Bristol

To answer your questions we must first explain how a two-byte value is translated into an integer. In the ZX80 it is necessary to multiply the contents of the second byte by 256 and then add it to the value of the first byte. Having said that, you'll be interested to learn that locations 16414 and 16415 contain the number of frames displayed since the machine was switched on. By PEEKing these addresses and then doing the necessary arithmetic you have the equivalent of a clock. In the UK this count is incremented 50 times per second and in the USA 60 times.

After much study of the Sinclair manual we reckon that locations 16394 and 16395 give the address of the top of the program while 16396 and 16397 mark the bottom of the display file. Once again, by doing the necessary arithmetic and then subtracting the former result from the latter you will then know how much space is left — Ed.

Ripple raspberry

As I am at present engaged in designing and building a PSU, I read the two articles on power supplies in June PCW with considerable interest. A point which I feel should have been mentioned in one or both of these otherwise very good articles is the ripple current rating of the capacitor immediately following the rectifier diodes. As the value of this capacitor increases, so the ripple current is decreased, but so is the time available for the capacitor to recharge during each half cycle. Hence the ripple current through the capacitor rises. A quick calculation for the PSU presented in Derek Chown's article indicates a ripple current of about 11 amps. (for a 6 amp load current). If premature failure of this capacitor is to be avoided, a suitably-rated capacitor must be used.

Now a suggestion for a topic you might wish to explore in future editions. I have been unable to find any designs from EPROM programmers in any text books. Could you run a series on the mechanism of EPROM programming and erasure, and perhaps a design for a programmer for, say, a 2708 EPROM?
A. A. Huntingdon,
West Wickham, Kent

We published an article on converting the MK14 (now available cheaply on the secondhand market — see our 'Transaction File' each month (into an EPROM burner in September 1979 (Vol. 2 No. 5) with a follow-up in March this year (Vol. 3 No. 3). — Ed.

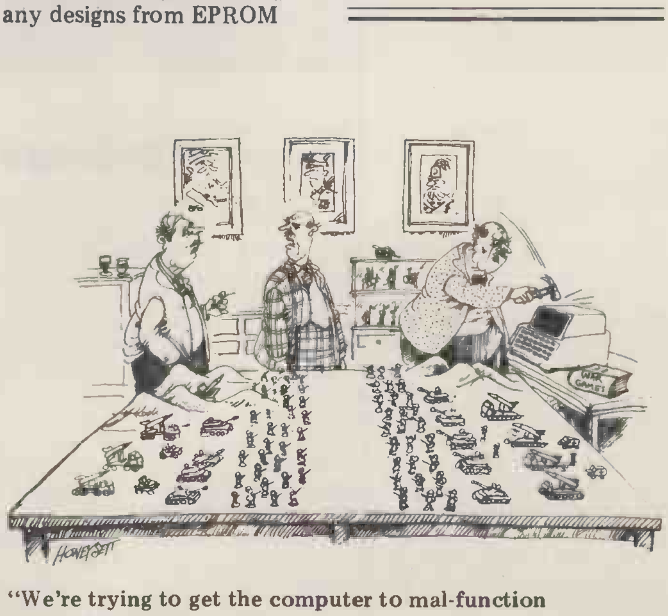
School system

We have just read with interest the article entitled 'Pupil Power at Sandbach' in the June issue describing a 'low cost, very flexible system based on radically new lines'.

As an official Ohio Scientific dealer we have been offering a very similar system for over 12 months. This is based on an OSI C2 or C3 'parent' system supporting up to 16 Superboards (or any other system with Basic in ROM and an RS232 port).

At a price of less than £2000 for the 'parent' machine (including twin 8" floppies) and approximately £160 per 'daughter' Superboard, we do not think this system can be bettered on price or performance — and it's available now.

We can, of course, provide further information to any interested parties.
S Hawley, CTS, 1 Higher Calderbrook, Littleborough, Lancs.



"We're trying to get the computer to mal-function so we can start the war".

BASF 7120

BASF is one of the largest companies in the world and it manufactures a seemingly endless variety of products. For some time now it has manufactured a range of floppy disk drives and diskettes but the 7100 series is BASF's first venture into the world of complete systems and is aimed quite definitely at the top end of the market. Two models are currently in production and this is the first review ever of either of them. By Mike Dennis.

Rather than design a completely new system from scratch, BASF cast around for a machine that was closest to its own ideas as to how things should be done — the search ended with an American firm called Digilog. With typical Teutonic thoroughness the company injected large sums of money, ideas and engineering expertise and the result of this 'merger' turned into the 7100 series.

Both machines in the range feature the same integrated approach, with all the essential components — such as screen, keyboard and disk storage — being grouped in the one housing, thereby eliminating the usual bird's nest of wires. The two models in the range, the 7110 and 7120, are very similar in specification, the main differences being the addition of an extra disk drive and multi-tasking package in the 7120.

Hardware

The machine is enclosed in a functional and pleasant looking two-tone grey moulded case that measures 21" wide x 13" high x 20" deep. A substantial cast chassis provides support for all the electronics and the total weight is fairly low at around 50lbs; it can be quite easily moved around. Inside, the electronics are mounted on six main boards with at the front the boards for the keyboard and VDU and to the rear, three boards consisting of the disk controller, 64k RAM card and CPU board — mounted horizontally on top of one another. Interconnection between these three is via a 50-way IDP cable and all the boards can be quickly removed for servicing. The bus is BASF's own design.

A substantial power supply completes the complement which has its heatsink located outside at the rear of the case — just as well as it gets pretty hot to the touch (i.e. it's doing its job). All the internal gubbins are kept cool by a fan which on the review sample was a bit 'grumbly'; I suspect that this could be easily remedied. The general standard of internal construction was very professional indeed and I particularly appreciated the ease with which the monitor and disk drive assembly could be hinged and fixed well out of the way to allow easy access for board changing and maintenance.

The system sports twin Z80A processors running at 4 MHz; one is delegated to handle the File Control System on the disk drives, the other looks after the rest. The disk equipment is isolated from the remainder of the system and data is passed between the two by the DMA controller. As can be seen from Figure 1 this also controls access to the display screen — it must be really beavering away to itself while the system is up and running. I judge the whole concept to be quite innovative in the world of micros and as the only ROM in the system is on the disk side; this means that all the available 64k of RAM is available to the user. Admittedly, some of this is needed for storing the Basic interpreter but conversely the set-up also means that the user is not tied to any one operating language — as is usually the case with ROM. Other manufacturers such as Cromemco adopt this approach but BASF scores by keeping all the disk handling elsewhere.

Much use is made of LSI circuits, particularly the Intel range of support chips for the 8080, and I counted about five 8255 peripheral interface chips, one 8251 communication interface and an 8259 interrupt controller. The disk controller, which uses the Western Digital 1791 chip, also has its own 16k of dynamic RAM separate from the main system RAM. Even the VDU card has its own complement of LSI chips and I think I spied another micro — an 8040 — on the keyboard itself.

I found the whole design concept aesthetically very pleasing and devoid of irritating compromises. Indeed the only fly in the ointment was a very annoying high-pitched whistle that seemed to originate from the power supply. It wouldn't have been so bad

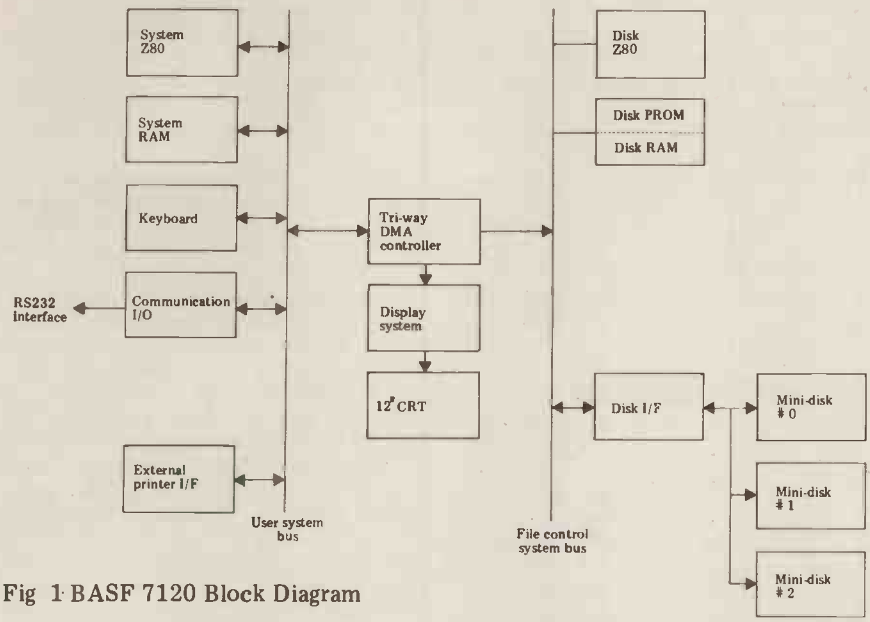


Fig 1 BASF 7120 Block Diagram

had it been constant in pitch and intensity but as it fluctuated with the demands placed on the power supply, it was most upsetting. BASF says it is aware of this problem and is looking into it.

Communication with the outside world is via a 15-pin DIN parallel printer socket; this is slightly non-standard as most people tend to stick with '25-pinners'. Two RS232 serial ports are available (although only one is fitted as standard) and there's also an output for an auto-dialler which enables the 7120 to hook up to automatic calling equipment (I hear British Telecom approval is still being sought). Small DIP switches at the rear enable the baud rate, character length and parity to be selected for the serial ports. Two other user-controls are provided for adjusting the screen brightness/contrast and the internal loudspeaker volume — which is perhaps just as well as the chirps it emits remind me of a strangled chicken!

The keyboard is comprehensive — indeed it has a plethora of facilities. The keys have a very silky action and all except the ESC key (which is easily confused with shift until you get used to it) fall easily to hand. The Qwerty keyboard has both shift lock and caps lock — the latter is very useful as only letters are shifted, as the name suggests. Function keys are provided by using the top row of keys in conjunction with the FUNCTION key. There are a total of 26 function keys but as 13 of them necessitate the use of shift, they aren't as convenient to operate as dedicated ones would be.

The on-screen editing is one of the best that I have seen. Fourteen keys are used and both lines and characters can be inserted, deleted and altered at will. The screen can be cleared completely, to the end of a line or to the end of the screen from the current cursor position. More important, perhaps, is the added convenience that these controls can be used at virtually any time during program development. The cursor can be moved in any direction and all of the keys can be emulated by suitable control characters from Basic.

The operating system or OIM is a separate software module and it provides the interface between keyboard, screen and program. The basic principle that it works on is that all lines normally must have an SOM (start of text) and EOM (end of text marker). Everything within these two markers is interpreted by the software and processed. If you type in a Basic statement such as: 100 PRINT "Now is the time for all good min" then all you have to do to correct the error on the last word and re-enter the line is to cursor up and along to the offending character, change it and then hit ENTER; the OIM automatically looks back over previous characters until it finds the SOM and then reads in the line until it hits EOM. It's a difficult concept to put over and probably sounds more complicated than it really is. However, providing you remember to hit EOM and ENTER (which is virtually one continuous action as they are adjacent to each other) then it all works exceedingly well. Indeed I soon found the system a joy to use, my happiness marred only by the slowness at which the interpreter checked out the syntax of my offering (of which more later).

A separate numeric keypad is sensibly provided to the right of the edit/enter keys and the final feature of the keyboard are the seven MODE keys at the extreme right. These are used in conjunction with the screen highlighting. Again they are very flexible in their approach and many features are available such as reverse video, reduced intensity, underlining or flashing or any combination of these that you may require. These features can also be selected from Basic and together with another facility they enable the formatting of the screen to be carried out very easily.

This other facility is the 'protected' field feature whereby the entire screen can be set to protected — and then selected windows defined into which data can be put. The basic technique might be to define the screen as fully protected, having typed in messages such as Name, Address etc and then to open windows opposite these headers. If the windows are opened only so wide, say seven characters, then only seven characters will be allowed to be entered in the gap. This, plus a little bit of Basic, effectively formats your data fields for you because once the program is running, the cursor only appears in these windows and can be moved from window to window by use of the TAB key. Only when ENTER is pressed will the data be committed to the rest of the program and hence alterations to the data can be very easily handled with the minimum of fuss and bother. Yet another advantage of the protected field is that when you retrieve a long string of data from the disk and print it to the screen, the OIM automatically puts the correct number of characters into each window for you — which again is very convenient.

Screen layouts can either be effected from Basic statements or generated by a utility program called FORMGEN which allows you to 'draw' the screen layout in free-form and then to save it away to disk for use by other programs.

These facilities are usually enabled

Basic Commands:

ABS	INT	LEN	SGN
RND			
ASCII	RIGHT	MID	LEFT
LDROP	RDROP	RPAD	LPAD
LTRIM	RTRIM	FIND	COUNT
TRANSLATE	CHAR	CHARIN	CHARRDY
PRINT	TAB	INPUT LINE	INPUT
PRINTA$: "###"		POKE	PEEK
IF. .THEN	IF.AND.THEN	IF. .THEN. .ELSE	
FOR. .NEXT	GOTO	CALL	GOSUB
ON. .GOTO	ON. .GOSUB	DISABLE	ENABLE
RUN	STOP	CHAIN	END
COMMON	FUNCTION	CONT	
SYS.WIDTH	SYS.DIGITS	SYS.BREAKCHK	
SYS.BREAK	SYS.ERRLIMIT	SYS.ERRTRAP	
SYS.ERRLINE	SYS.TRACE	SYS.SPACE	
SYS.LEVEL	SYS.LENGTH	SYS.PLENGTH	
SYS.RAMTOP			
Absolute disk operators:			
NEW	NEWI	CLOSE	OPEN
SECURE	READ	READ NEXT	WRITE
REPLACE	DELETE	SORT	ERASE
POSITION	STEP FORWARD	STEP BACKWARD	
INITIALIZE		COPY DISK	MOVE FILE
ATTRIBUTE		CHANGE FILE	STATUS
DIAGNOSTICS			REORGANISE FILE
and in MATHLIB:			
EXP	LOG	^	SQRT
SIN	COS	MOD	TAN
ASIN	ACOS		ATAN

by outputting a non-printing control character before the word or character to be highlighted; this can be a problem because one character slot is used for this control character. Usually this is effectively hidden by a space but should that not be possible, the 7120 provides the facility whereby special bytes can be poked into the highlight port. Individual characters can then be highlighted — or not — by the setting of their respective most significant bits . . . another example of the flexibility built into this machine.

Graphics are supported and although limited in their capability to producing box outlines, vertical and horizontal lines, they are nevertheless very useful aids in producing a decent screen layout. These graphics are contiguous in a 10 x 12 character slot although the normal letters etc are displayed in a 7 x 11 format. Both upper and lower case characters are available and are very well formed. The screen itself is 12", green and of high-resolution; the format of 80 x 24 characters gives a rock steady, crisp display.

Storage

Three 5" disk drives (two on the 7110) provide the on-line storage. They are, not surprisingly, made by BASF, single sided/double density and offer approx 162 kbytes per drive. The maximum current capacity of this system is therefore limited to a little under 500 kbytes — which for some applications won't be enough and is therefore rather disappointing. Micropolis manage to squeeze 315 kbytes onto their single sided/double density drives but whether or not they are any more or less reliable than BASF drives, I wouldn't like to say. The saving grace with the 7120 is that a 5 Mbyte hard disk drive will soon replace two of the floppies; that'll leave the third, suitably upgraded to 318k capacity, for backing up, which will then make the 7120 a very potent system. Further expansion is planned with a separate small box of twin 5 Mbyte fixed disks to increase the capacity even further.

System memory map

Because of the novel approach of the 7120, it's worth spending a bit of time looking at the memory map — see Figure 2. The bottom 40 kbytes of system RAM can be accessed by the disk system but not vice versa. System control and status words are passed between the two by a 'mailbox' and I shall explain just how useful this is later on. Other special features are the communications emulators, multi-tasking executive and spooler program areas.

This particular multi-tasking executive is not to be confused with multi-user systems (although BASF say that this is under development and that all future software and systems will be compatible with that currently available). Instead, this MTX comes into its own when the 7120 is being operated in a system for which it is especially suited — i.e. a terminal capable of being easily connected to a main-frame or mini computer but with extensive off-line computing powers of its own. Enter the spooler module and the communications emulators, for these mean that you can configure the MTX to keep the system on-line to your mainframe, while printing out address labels, in between interrogating the 7120 for your latest sales analyses. . . This concept should be attractive to a number of users and will probably give one or two other manufacturers some potentially nasty headaches. A real-time clock facility is built into MTX together with protective time-out facilities that prevent the system from being 'hung' because of external events not happening; all this still leaves quite a generous 35 kbytes of RAM for Basic program storage.

System utilities

Perhaps one of the most significant utilities is the fact that the 7120 supports ISAM. What, you may ask, is that? Well, ISAM or Indexed Sequential Access Method is a powerful way of accessing and manipulating data in files with the speed of random access but coupled with the space-saving features associated with sequential filing. There are many ways of implementing ISAM files but the way that the 7120 does it is essentially based on just one key (although with a bit of jiggery-pokery I guess that it should be possible to key across several fields). It may not be as powerful as some other ISAMs but let's face it, very few micros support ISAM at all so more power to BASF's elbow.

The other form of file handling is called sequential; really though, it's a form of random-access as the record length must be specified and individual records can be accessed. With ISAM, records can be of variable length and can cross sector boundaries; with 'sequential' files this cannot happen. Since the sectors are 930 bytes long, this theoretically places an upper limit on the size of 'sequential' records. However, in practice this probably won't be a problem and I suspect that most applications will end up using ISAM. What's a little more disturbing about this 930 byte chunk is that the DOS will squeeze in as many records to a sector as possible; if your record size is 466 bytes, you'll effectively halve the available storage as the other 464 bytes in each sector will be wasted.

The catalog function of the BOS (BASF Operating System) is an apology and, unfortunately, one of the worst that I've seen. The basic command is a bit cumbersome (you have to type in PRINT STATUS (":1") which will give you the catalog for drive 1. The catalog contents are printed out one after the other along the line and will overflow from one line to the next — even in the middle of a file name. No indication is provided as to whether files are programs, data or Jimmy Young recipes! I suppose we should be grateful that they put commas in between the file names. True, you can ask for a PRINT STATUS on a specific file name, but it's all unnecessarily clumsy.

Another minor point is that you are never sure whether quotes are needed or not. For instance, they are used in the PRINT STATUS command but not in RUN UTILMENU: 1 — which conveniently brings me to a very nice package, for here lies all that is most useful to the serious programmer. The usual facilities such as delete files, copy disks and re-organise ISAM files are here and there are also other utilities that link two BASF machines together — for data transfer under MTX, for example. DINF is very useful for displaying more information about the specific files and DIG will let you display the contents of files right down to track and sector level. There's a bit too much chaining between individual elements in the utilities — and some minor bugs — but generally they are very versatile; I particularly appreciated XREF which can print out all the line numbers in a Basic program that use GOTO and where each variable is used and where there are any ON ERROR lines. This facility is of great use when debugging other people's programs — your programs, of course, are so well documented that you won't need it(!).

The disk access times, although nothing spectacular, are nevertheless quite acceptable and it's perhaps unfortunate that our existing tests fail to provide any method for demonstrating the access and speed advantage when using ISAM. As can be seen from Table 1, the random access in both directions is very evenly matched and where the tests show a perhaps longer time than normal, it should be borne in mind that unless specified, the BOS will verify after each write; therefore many of these timings are for 100 write and read operations.

Error handling is exceptional and can either be effectively carried out at the system level or. from the Basic interpreter. SYS.TRACE can be carried out at eight different levels of complexity and even goes right down to machine code level.

The sheer number of facilities in the 7120 are almost mind-blowing in their flexibility and versatility and I've only really just scratched the surface. I haven't even begun to discuss the absolute disk operators that allow manipulation directly at the track and sector level because, unfortunately, that would take too long.

TECHNICAL SPECIFICATION

CPU:	Z80A running at 4 MHz; real time clock
Memory:	64k dynamic RAM
Keyboard:	60 keys. Qwerty, 14 edit/cursor, numeric keypad, mode switches, function keys.
Screen:	80 x 24 green 12" high-res screen
Cassette:	n/a
Disks:	Three 162 kbyte single-sided, double-density BASF 5" drives, ISAM and random access supported.
Disk controller:	4 MHz Z80A, 16k dynamic RAM, 8k ROM
Languages:	Basic, Cobol, communication emulators, multi-tasking, spooler.
Ports:	1 parallel, 1 RS232 (+1 opt. extra)

Software

Two languages are supported at the moment. The first is CIS-Cobol from Micro-Focus and also included is an ingenious program suite called FORMS-2. Basically, this allows you to 'draw' screen layouts, lines and headers etc and even print out the screen so that you can see what the final result looks like on paper. Input fields can be defined and when you are happy with the result, FORMS-2 will generate all the necessary Cobol statements for you — and without any errors! This is a facility that most Cobol programmers should definitely find appealing.

Time did not permit me to delve too far into CIS-Cobol and so I pass onto the Basic interpreter.

Basic

Here again there are one or two surprises. The first thing you notice is a definite pause after hitting EOM while the interpreter checks your syntax. After a while I began to get annoyed at the rather pedestrian rate of this procedure. . . although I'm not a trained typist I still found myself waiting for the machine, which is wrong. But other people don't find this a problem and so maybe it's just me. Any errors found are reported with the appropriate error code and line number, although no indication is provided as to where along the line the error occurred. I counted nearly 100 available error codes, got most of them while I was familiarising myself with the machine, and subsequently settled down to Error 523 which means UNKNOWN STATEMENT (which is very similar to the ubiquitous SYNTAX ERROR).

Actually I think that the 7120 provides a very fair and creditable attempt at decent error-reporting and one that is all too lacking in some other systems; once I remembered to enter EOM at the end of a line, most of my errors seemed to vanish.

Remember the "mail-box"? Well, if you make a Basic line 10 W$ = WRITE FILE etc. . . then W$ will return with the appropriate error code (if any) from the BOS. Your Basic program can then interrogate W$ and you can therefore very easily route your error handling routines as appropriate by simple "IF W$<>0 THEN. . .".

Most Basic statements are present, with some exceptions and a few good additions. Missing is VAL and STR because K$=1 (yes, no quotes) then PRINT K$/4 will give .25. K can be converted to K$ by using a bit of syntax that I personally found a little clumsy. You can't have multi-dimensional arrays of any sort, which may be a disadvantage to some. Interesting additions are TRANSLATE which can, for example, effectively convert a mixture of lower and upper case letters into one or the other — very useful for input handling; the DROP commands will lose the specified number of characters from the appropriate end, PAD will increase a string to a specified length with a specified character (e.g. space) and TRIM will remove extraneous spaces. All three can either be carried out from the left or the right. PEEK and POKE can be either hex or decimal and one extra feature is that POKE ("@0CF0", "This is a string") will poke these letters into memory starting at address 0CF0. Another string handling feature that I liked was that Print 18*&"M" will print a string of 18 Ms, which is quite handy. PRINT USING is supported but the German comma and decimal point mean different things to us over here! As a consequence results aren't always quite what you'd expect them to be and although these difficulties can be got round with a bit of extra coding, it could be improved.

LISTING is also excellent as the system will only print one screenful at a time and prompt you at the bottom as to how many lines are left to go. Since the prompt is inside SOM and EOM markers and starts off with list, it's simplicity itself to use the screen editing controls to alter the line numbers at will, whereupon ENTER will execute your wishes — certainly, one of the best listings I've seen. Full chaining is possible and no variables are cleared between chains unless the COMMON statement is used to effectively free up memory that might be wasted on unused variables. Chaining can also request program execution to commence at a specified line number and also which lines of the old program are to be deleted. Yet another interesting feature is that if you alter or enter a program without saving it, any subsequent action such as a request for RUN will initiate the response "NO SAVE??" and wait for your reply. This may appeal to some but again, I personally found this feature a trifle annoying as I'm sufficiently big-headed to believe that I don't need a cocky computer reminding me all the time — even though on the odd occasion it may be right!

The Benchmark timings reveal one or two problem areas. The first thing I noticed was a pause of about one second while the MTX girds up its loins to respond to your request to run. This is of no real consequence as once the program is running properly, then this delay is over and done with at an early stage; I would, however, have liked to have seen whether this delay was apparent when MTX was running other tasks. The main point is that one second should be deducted from each of the Benchmark timings to reflect this. Table II shows the various timings and, surprisingly, at BM3 they really take a dive. This is due to the divide and multiply functions which each add about ten seconds to the total time taken for this particular test. After that the Benchmarks settle down to a sort of plateau and begin to look quite favourable when compared with some of the competition. Before BM8 could be run, MATHLIB had to be loaded. This is usually a one-time exercise as it remains in memory unless CLEAR is executed. However, the execution time of BM8 with this package is excruciatingly slow and BASF is currently looking at ways of improving it.

Since the accuracy of the system can be altered with the SYS.DIGIT command (it defaults to 12), execution time will depend on the figure selected. Unfortunately, increasing the number of digits didn't always improve the accuracy and so there isn't a real opportunity for a trade-off in speed versus accuracy. For example, sin(0.785398163) yields 0.707106779066 with 30 digit accuracy but 0.707106781187 with 12 digit accuracy. The true answer is $1/\sqrt{2}$ and the figure achieved with 12 digit accuracy is better than that achieved with 30 digits. As far as business users are concerned I doubt very much whether these fine distinctions will be of any great import but they may be to scientific circles or those with a mathematical bent. One additional feature of MATHLIB is that the three inverse trig functions (ARCSIN, ARCCOS and ARCTAN) are provided but all trig functions are in radians only and there is no direct conversion.

Reading through Basic programs was a little difficult at first, partly due to the strangeness of some of the Basic commands and also because of the quite large number of CALLs to sub-routines within the system itself. This is quite a useful technique for designing programs. Write them in Basic first and then debug them using Basic. Then, whereever possible and only if the system allows it, replace some of the Basic lines with equivalent machine code or assembler routines to speed things up. The sheer versatility of the 7120 makes it eminently suitable for this particular method of working.

There are other useful little features such as the fact that you can't delete the whole program in one go but have to type CLEAR instead, which is a

BENCHMARKS (timings in seconds)	
BM1	2.4
BM2	7.0
BM3	35.0
BM4	36.5
BM5	39.0
BM6	50.0
BM7	63.0
BM8	114.0

Table 2

DISK TIMINGS	RAND/ SEQ.	ISAM
2	50	70
3		71
4	30	34
5	26	34

Table 1 (in seconds)

Prices

System	
BASF 7120 with 64K + 24K	£5,155 + VAT
BASF 7110 with 64K + 24K	£4275 + VAT
Additional RS232 Port	£250 + VAT
BASF 7153 120 CRS Matrix Printer	£1671 + VAT
Software	
BASF Extended Business Basic	£150 per system
CIS-Cobol (including Forms 2)	£500 per system
2780 Emulator	£320 per system
3275 Emulator	£540 per system
Formgen (Screen/Formatter)	£250 one payment only

System prices include a range of utilities as well as a text editor, an assembler and a word processor. The system is supported by a six month parts and labour guarantee.

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HP85

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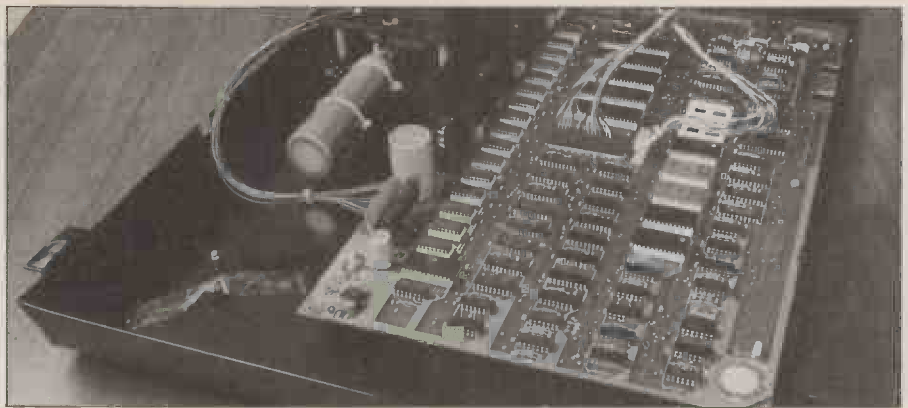

character within quotes. However, because there is no key on the keyboard that will generate these characters directly, you must press the escape key (taking you out of the mode in which control characters are normally displayed), then REVERSE, then the appropriate letter — which may be shifted. No doubt it will seem very natural after a few years, but it would be so much easier if Commodore had provided a control key.

Returning now to the subject of garbage collection — one characteristic of Microsoft Basic is its dynamic storage of strings. Each time a string varaible is redefined it's rewritten elsewhere in memory, the previous representation becoming redundant. When the memory available for strings is exhausted, program execution halts while a 'garbage collection' routine disposes of the redundant strings and gathers together those that are still valid. At worst garbage collection now takes less than a second, against 20 minutes (in an extreme case) with earlier PET Basics. A slight disadvantage is that each string variable now takes up two additional bytes which are used for a vector pointing from the string storage area to the variable table. Each element in a string array now uses five bytes in addition to the length of the string, and for string variables the overhead is nine bytes. Another disadvantage is that creating a new non-array variable now takes up to half a second because the whole of the array table must be moved up — the secret is to mention each variable before setting up the arrays. String operations seem to be slightly faster overall by about 10%. However Benchmark timings, which don't test string handling, give identical timings to those for the new ROM PET.

Potential use

The CBM 8032 is a convenient computer, easily transportable and sturdy, the only essential add-on being the cassette deck or the disk drive. The Basic includes all the common mathematical functions and, while not as comprehensive as most disk Basics it is faster than average. The 80-column screen is ideal for business use and, though the 8032 may be more difficult to program than many machines, this will not affect the vast majority of business users as there are sure to be plenty of packages available.

Whether this new model will be bought for use in schools, colleges and the home is more questionable. The screen handling functions are impressive, but hard to use, and most of the graphics characters are inaccessible from the keyboard. The recommended price is £200 more than that of the 32k PET and more than twice that of an 8k machine with a built-in cassette. Commodore has aimed the 8000 series at the business market and it looks to have a good chance of achieving its objective. Because the 8032 is this year's model, a particular sector of the personal market will rush to buy but, at present prices, the existing range should have plenty of mileage left in it yet.

Compatibility

If you are thinking of upgrading from your existing PET, it won't be too difficult to modify existing software. Most of page zero is virtually unchanged and, while routines in ROM have been shuffled around, the majority perform exactly the same functions. Games programmers should note that the values stored in locations 151 and 166 have changed — they are no longer keyboard values, but garbled ASCII.

The 'window' facility makes it easy to simulate a 40-column screen, although programs that poke the screen will need changes as it now occupies RAM addresses 32768 to 34767.

Machine code programs that call Basic routines or use the second cassette buffer will need rewriting but most others will run without modification. The 'merge' technique can still be used to load subroutines or utility programs, although it founders if a line which lists more than 80 characters (including line number) is included.

To summarise, conversion of new ROM programs for the 8032 will be fairly easy, in many cases easier than converting between old and new ROM PETs.

Documentation

Two manuals were supplied with the review machine — a Users' Guide and a preliminary Basic/DOS manual. The users' guide is a good introduction to the mysteries of computer operation; as well as covering the physical controls, it describes all the command functions necessary for successful machine operation.

The preliminary manual was exactly that. Essentially written for Commodore dealers, it assumes a fair degree of prior knowledge. We hope that the version supplied to users of the 8032 is more comprehensive, though in this respect Commodore's track record is not enviable. Even this dealer's manual leaves out such useful information as the fact that auto-repeat can be disabled and that the length of the keyboard buffer can be altered. A good start, but serious programmers will need more, much more.

Conclusions

Commodore set out to widen its influence on the business market and without doubt it will succeed with the model 8032 which looks, feels and behaves like a business computer. Programmers used to the PET will find the 8032 an irritating machine to work with but no doubt they'll learn to love it. Let's face it — they'll have to.

The gaps in the memory map give hints of greater things to come — we hope it's not too long before Commodore extends the system software to make up for the odd weaknesses in the present version.

Finally, whether or not you're a businessman, if you require a display of more than 40 columns then you must put the 8032 on your shortlist of possible machines.

Memory map

Address	Use
FFFF	
B000	Basic + OS
9000	ROM expansion
8800	Unused
8000	Screen RAM
	User RAM
0400	
0000	Basic RAM

Benchtest timings (in seconds)	
BM1	1.7
BM2	10.0
BM3	18.4
BM4	20.3
BM5	21.9
BM6	32.4
BM7	51.0
BM8	11.9

At a glance

FIRST IMPRESSIONS	
Looks	****
Setting up	*****
Ease of use	*****
HIGH LEVEL LANGUAGES	
Basic	***
PACKAGES	Being planned
PERFORMANCE	
Processor	***
Cassette	****
Disk	***
EXPANSION	
Memory	*
Cassettes	****
Disk	*
Bus	****
COMPATABILITY	
Hardware	*
Software	**
DOCUMENTATION	***
VALUE FOR MONEY	***

*****	excellent
****	v. good
***	good
**	fair
*	poor

BASIC BASIC

The problem with Basic is that there are so many mutually incompatible versions around that transferring a program from one machine to another can often be quite difficult. Mike Parr suggests a way of presenting programs so that they can be easily implemented by users of any machine.

Welcome to the world of 'Microsoft' Basic! On flicking through the pages of PCW you've probably seen many systems which claim to run a version of Microsoft Basic — e.g. Tandy Level II, PET, UK 101, C2—4P, Apple, Nascom 2, RML 380Z and Sorcerer. You could be forgiven for thinking that programs are easily transferred between these machines. The fact is though that a considerable amount of rewriting may be required. For example:

```
10 IF A=B THEN X=INSTR(L$,"A")
ELSE GOTO 50
```

will happily run on a Tandy but not, for example, on a PET. The latter machine cannot handle either the ELSE or the INSTR functions.

Bearing in mind that a PCW program might be typed in and edited by people as diverse as typists, businessmen or teachers then the problem of compatibility is a major one. There have been various approaches aimed at facilitating program 'portability', including the use of a 'universal' assembler-type language, which is easy to adapt for any machine, and even rigorous high-level language definition, such as Algol 68. It would be nice to say that Pascal allows machine-independent software but, even here, it seems that dialects are going to differ. Already we see Transam and UCSD compilers being based on different standards.

However, all is not lost — the different versions of Microsoft Basic are sufficiently similar to enable you, with a bit of care, to write programs that run on any system with little or no modification.

There are four main areas where portability problems occur — statements, data types, functions and input/output. I shall now examine each of these in turn.

Statements

The following statements occur in almost all Microsoft implementations: GOTO, IF. . .THEN, END, STOP, LET (or just plain =), FOR. . .TO. . .STEP, NEXT, DEF FN(numeric only), DIM, REM, GOSUB, RETURN, PRINT, INPUT, READ, DATA, RESTORE, CLEAR, ON. . .GOTO, ON. . . GOSUB and, finally, a colon may be used to separate statements.

It's clear that you can achieve maximum program portability by restricting your published programs to the above Microsoft subset. It will, of course, mean that some of your routines may not be as elegant as you might like but then again it does ensure that your efforts reach as wide an audience as possible.

Before moving on to data types I shall illustrate a few of the more common Basic functions which I have had to leave out of the subset:

```
10 IF A=B THEN PRINT C ELSE STOP
20 IF C=D, PRINT E
```

LINEINPUT, which reads a complete line of text, including spaces, commas and quotes into a single string variable. Believe it or not, this too is absent from many systems.

File OPEN and CLOSE is missing as well, because some systems don't have data files, and PEEK, POKE and USR are definitely out of the question as they are the very essence of machine dependency. Finally, CLEAR is similar on most machines but not identical, so it must also be banned.

Apart from the statements themselves there's the question of line lengths. PET for example is 80 characters, while UK 101 is 71 (yes, 71!), and Altair is 255.

The moral is clear. . . when it comes to statements keep the lines short and work as far as possible within the subset.

Data types

The second aspect of portability concerns data types. Microsoft Basic includes floating point numbers, strings of up to 255 characters, arrays of either type with no limit on the number of elements or dimensions and where only the first two letters of a variable name are significant.

On some systems, other variable types are allowed. An integer, for example, is sometimes defined by following its name with a % character thus:

```
20 I%=I%−1
```

Tandy and Altair have a more powerful system, including a set of statements like DEFINT I—N, which automatically causes all variables starting with the letters I to N to be treated as integers. In many programs, leaving out any special integer use has no serious effect (unless memory happens to be very tight). Finally, I should mention accuracy. Most hobbyist programs don't rely on high numerical accuracy, which is just as well since many systems have only 6 or 7 digits of precision. In general I would suggest that you stick to single precision floating point numbers unless memory size and arithmetic precision are particularly important to your application.

Input/Output

The remaining (and most involved) area deals with data-file I/O and memory-mapped graphics. The suggested approach is to use subroutines for primitive functions, commented in such a way that the average user (given reasonable system documentation) can amend them to fit any computer. As an examply, consider memory-mapped graphics, instead of just writing:

```
10 POKE 16300+Y*40+X , 65
```

you could write:

```
10 C=65 : GOSUB 2000
```

then:

```
2000 REM PLOT CHAR C AT X,Y.
(0,0 IS TOP LEFT)
2010 POKE 16300+Y*40+X , C
2030 RETURN
```

. . . with the result that the user only needs to alter the subroutine, not dozens of POKES throughout the program. Ideally you would also incorporate checks on the ranges of X and Y, as screen sizes vary between machines.

Looking now at file I/O, PET and Tandy users may be amazed to learn that many systems have no provision for cassette data files, other than resorting to PEEK,POKE and USR facilities. On most disk systems however, typical statements are:

ASC, CHR$, LEFT$, LEN, MID$, RIGHT$, STR$, VAL.

The main omission here is the useful

INSTR string searching function, which is missing from many systems. For complete compatibility, one can use a subroutine which performs a similar function (albeit slower) but, if you must use it, avoid the nested form:

10 A$=LEFT$(L$,INSTR(L$, "A"))

as the PET user may be replacing INSTR by GOSUB, and would prefer:

10 P=INSTR(L$, "A")
20 A$=LEFT$(L$,P)

this being much easier to edit.

Finally, most systems include the FRE function, used with either a numeric or string argument. This is fine, but bear in mind that, as with CLEAR, certain assumptions about free space may be machine-dependent (for example, one might use FRE to determine the maximum subscript for a numeric array — however, don't assume that all systems use the same number of bytes to store each array element).

Standard Functions

All Microsoft systems have these numeric functions:

ABS, ATN, COS, EXP, INT, LOG, RND, SGN, SIN, SQR, TAN, TAB.

They also have the logical functions (actually operators) of AND, OR and NOT which treat their operands as 16-bit two's complement integers. The 16-bit number, consisting of all ones, is regarded as logical TRUE, (its value being −1).

The only major difference between the built-in functions concerns RND. Most machines will produce a value between 0 and 1 whereas Tandy, for example, will give a value between 1 and n. To make such a program more portable, you should only assume the presence of random numbers from 0 to 1, and modify the result using a scale factor and the INT function.

Character functions include:

OPEN, CLOSE, PRINT#1, INPUT#1, LINEINPUT#1

. . . together with the EOF(N) function, which returns a 'true' value if there is no more information in file number N. As an example, one could list a file on the VDU by:

```
10 REM OPEN FILE CALLED JIM
FOR INPUT AS UNIT 1
20 OPEN "JIM", I , 1
30 IF EOF(1) THEN CLOSE 1 :END
40 LINEINPUT#1, L$:PRINT L$:
GOTO 30
```

In fact, very few cassette systems could handle this (reasonable) program. PET and Tandy machines, for example, have no LINEINPUT and the Nascom 2 and Sorcerer can't even read text from tape, as data is only allowed to be in the form of numeric arrays.

A further problem exists concerning motor control. Examining cassette handling on 'good' systems such as PET and Tandy, one sees that the task of tape I/O consists of:

Output	Input
Start motor	Start motor
Wait (and transmit 'null' chars.)	Ignore 'null' characters.
Transmit line.	Read line.
Stop motor.	Stop motor.

On a machine with no cassette motor control, problems will arise when trying to run this type of program:

1. Read data from tape.
2. Process data.
3. Goto step 1.

If step 2. involves lengthy calculations,the cassette (which is still running) may be in the middle of the next data line before the program is ready to read from it. Once again, the approach to take is to write all machine-dependent software in commented subroutines, which provide the primitive operations of reading and writing complete lines of text. Output is straightforward, except for the proviso that, if no motor control exists, sufficient 'null' characters must be used to enable the program that will eventually use the data to "keep up":

```
4000 REM. L$ TO FILE
4010 PRINT#1, L$
4020 RETURN
```

The UK101 user, for example, may replace this by a routine to transmit 'null' characters for a second or two, then to transmit L$ character by character.

The file input routine is the equivalent of:

```
5000 REM. READ LINE TO L$
5010 LINEINPUT#1,L$
5020 RETURN
```

. . . where the PET user may replace 5010 by a loop using GET to build up L$, and Nascom 2 and Sorcerer users might use CLOAD, converting the input numeric array to a character string in L$. Obviously, the input and output routines should be compatible in the sense that strings transmitted to and read back from file should appear identical.

Additionally, one requires an end-of-file test, and an easy machine-dependent solution is to denote the end with a special peculiar line such as "/+/+". If this is adopted, the EOF() function is not required, and the 'higher-level' input routine becomes:

```
6000 REM LINE TO L$. SET EF TO
—1 ON EOF
6010 EF=0 : GOSUB 5000
6020 IF L$="/+/+" THEN EF= —1
6030 RETURN
```

To complete the I/O routines, we require open and close facilities for our files:

```
7000 REM. OPEN OUTPUT FILE
7010 PRINT"PRESS RECORD AND
PLAY, THEN ENTER ANY CHARAC-
TER":INPUT L$
7020 RETURN
8000 REM. OPEN INPUT FILE
8010 PRINT "PRESS PLAY , THEN
ENTER ANY CHARACTER": INPUT
L$
8020 RETURN
```

(If you have an 'open' statement, insert it at 7005 and 8005)

```
9000 REM. CLOSE INPUT FILE
9010 RETURN
```

(The PET user may insert CLOSE at 9005)

```
1000 REM. CLOSE OUTPUT FILE
10010 L$="/+/+" : GOSUB 4000
10020 RETURN
```

(Again, if you have a CLOSE, place it at 10015)

These routines assume no named files — though modification would be trivial if you have such luxuries — and one file device only (a cassette deck perhaps). In common with the 'subset' approach, only the minimum facilities are assumed.

To summarise I/O, the benefits of this method appear when you attempt to transfer programs between machines with widely differing I/O methods. Finally, if you think that these routines preclude numeric I/O, it's no trouble to use the built-in conversion functions, so instead of:

10 PRINT#1,N

you may write:

10 L$=VAL$(N): GOSUB 4000

Conclusions

With a little forethought and a bit more typing, portable software is possible. It must be admitted that some defy portability — some flashy graphics could give problems, and memory size may be significant in large programs. However, there's no reason why the remainder should not see much wider use once a Microsoft subset has been followed.

Example

To illustrate what I mean here's a useful example that conforms as near as possible to the 'rules' that I've proposed. The program is an interactive data-file editor for any single-cassette system, illustrating the use of a subset, and the file I/O routines. The data lines are read into a large text array T$(), and may then be edited by the following commands, typed in response to "C?".

Back — by a specified number of lines.
Forwards — by a specified number of lines.
List — as Forwards, but display lines.
Delete — delete current line, and move to next one.
Insert — insert a new line after the current one.
Replace — replace the current line by a new line.
SAVE — save the edited text on cassette.
Search — search for a line containing a specified string.
Top — move back to 'top' of file.

(Only the initial, capital letters of the command should be used.) The commands relate to the current line, usually the last line displayed. e.g. to move forward 3 lines:

F is typed in response to C?
FOR? is printed by the program.
3 is entered by user.

To actually use the program, load it from its own cassette, then place the data tape in the recorder, ensuring that it is rewound. Type "Y" in response to the 'existing file' question, and perform the edits. Before typing SAVE, either rewind the data tape, or load a fresh one (thus giving you a back-up copy). To create a new file, type "N" instead of "Y".

The program occupies around 2200 bytes thus leaving, in an 8k system, some 6000 bytes for text (about 200 lines of 30 characters). On your system, alter line 20 to clear your maximum string space, estimate your average line length, and dimension T$() to the maximum possible number of lines. If your data doesn't have commas or leading spaces, INPUT#1 can be used in place of LINEINPUT#1. For those with no cassette motor control, only a very short delay is needed in routine 8000, as the lines are rapidly read and stored in TS(). In fact, the cassette control on PET and Tandy, involving a delay of several seconds, is a disadvantage in this type of input.

GOTO page 124 for Listing

The 3rd Personal Computer World Show

It's the show you can't afford to miss! The 3rd Personal Computer World show takes place on 4-6 September at the Cunard International Hotel, London.
And what a show it's going to be! A bumper collection of all the latest hardware, software, peripherals, accessories and books; special stands for parents and teachers interested in learning how to spread computer literacy among the young, one from a school and one from Young Computer World; MICRO UK, a three-day series of seminars, conferences and 'meet the expert' discussions; and the first official World Microcomputer Chess Championship.

For full details of the show's opening hours and admission prices see page 82.
For details of MICRO UK, see pages 12 and 13. And for an introduction to the chess contest by our resident microchess expert Kevin O'Connell, see page 60.
Meanwhile, here's our stand-by-stand guide to all exhibitors who had confirmed their bookings when we went to press.

Don't forget to call in at the PCW stand where you can buy T-shirts, badges, back numbers and binders, and where, when they're not bar-propping or hiding, the PCW editorial team will be on hand.

SEE YOU AT THE SHOW!

ACT **B30**
66-68 Hagley Road
Edgbaston
Birmingham
B16 8PF
021-455 8585

Appleware
Britain's best range of Apple software is there for you to try on the Appleware stand, some of the products appearing for the first time. Look out for the latest version of the award-winning VisiCalc program, Tiny Pascal, Talking Disk and the amazing Apple Invaders program. They are on sale direct from the stand, some at specially reduced prices.

Petsoft
Petsoft are offering a new range of low-cost ready-to-run business programs covering ten key applications. Word Processing, Payroll, Ledgers, Stock Control and Mailing List packages will be on sale direct from the stand.

VisiCalc, the award winning forecasting package, and the superb Programmers Toolkit plug-in ROM chip are also there for you to try.

Petsoft also offer the widest range of Educational, Scientific and Games programs.

CCS MICROHIRE/ MICROSALES **B8**
7 The Arcade
Letchworth
Herts
04626 73301

CCS will be launching its Data Manager package for the Apple II and PET. This is a modular data handling system for incorporation into programs, handling five files (can be expanded or reduced), and which takes care of all file processing including computer-guided definition and storage of file descriptions for as many files as the user requires.

The company will be demonstrating and selling its range of software and hardware packages, including stock accountint, word processing, modelling and scheduling for the ABC-80, Apple II and PET machines.

CHROMASONIC ELECTRONICS **B34**
56 Fortis Green Road
Muswell Hill
London N10 3HN
01-883 3705/2289

Details not known at time of going to press.

COMP SHOP **A3**
14 Station Road
New Barnet
Herts EN5 1QW
01-441 2922

Comp Shop's range of stock includes the TRS-80 Models I and II, Apple II, Compukit UK101 and PET, together with various peripherals. At the time of going to press, Comp Shop was promising unusually special offers on all its products, which carry a full one-year warranty.

COMPUTABITS LTD **B13**
PO Box 13
Yeovil
Somerset
0935 26522

Nick Hampshire, writer of *The Pet Revealed*, will be at the show selling his book and his latest product — a library of PET subroutines. Routines include input validation, screen formatting, plotting, sorting, various file access methods and a number of general utilities. All these are supplied on a 3040 format disk.

THE COMPUTER BOOKSHOP **A14**
Temple House
43-48 New Street
Birmingham B2 4LH
021-643 4577

Computer Bookshop is a trade distributor of books and training courses supporting the UK microelectronics and personal computer industries and is the sole UK distributor of Sybex books. New titles this summer include *Programming the Z8000* and *6502 Games*, both by Sybex. Among the 250 titles on display will be new books from well-known computer publishers such as Sams, Addison Wesley and Hayden, plus a range new to Computer Bookshop from TABS. Computer Bookshop also hopes to have some of the new books coming out from British publishing houses.

CREATIVE COMPUTING **B72**
PO Box 789-M
Morristown NJ07960
USA
(201) 540 0445

Creative Computing is a leading US publisher of magazines, books and software for personal computers. *Creative Computing* magazine publishes practical applications for home, school and small business, evaluations of the newest computers, peripherals and software, games, book reviews and fiction. *S-100 Microsystems* magazine is designed for the serious user of S100 bus systems. Books from Creative Computing Press include the popular *Basic Computer Games* and *More Basic Games*, copies of which will be autographed by editor David Ahl at the show. The Sensational Software line includes cassettes and floppy disks for Apple, PET, TRS-80, Sol, Sorcerer and CP/M systems.

DATAC LTD **B36/B57**
Tudor Road
Altrincham
Cheshire
WA14 5TN
061 941 2361/2

Datac Limited "The Printer People" will be showing a substantial part of their large range of digital printer units, including mechanisms, electronic interfaces, and complete packaged units. Also on display will be a new range of Philips high-resolution C.R.T. monitors, which Datac are distributing in the U.K.

Of particular interest will be the following brand-new printer products:
The Centronics 737 80-132 column impact printer featuring 9-needle printhead and proportional spacing.
The DMI-40P free-standing terminal version of the DMI-40 40-column impact matrix printer mechanism.
A new serial input version of the well-established 20/40 column 410 serial printers.

3D DIGITAL DESIGN & DEVELOPMENT B35
43 Grafton Way
London W1P 5LA
01-387 7388

3D specialises in microprocessor interfacing for industrial, medical and educational applications and will quote for custom interfacing packages which include both hardware and software.
On show will be some micros plus a fast data acquisition system (40,000 samples per second) and a 12-bit analogue-to-digital converter for the PET.

FACIT DATA PRODUCTS B58
Maidstone Road
Rochester
Kent
0634 401721

Data products will be showing an interesting and extensive range of printers. The new Facit 4520 is a low-cost, high quality matrix printer which prints bidirectionally, in a high-quality 9 x 7 matrix character font. The Facit IPS 5000, also brand new, has 150 cps printing speed and operates a 9 x 9 dot matrix with true descenders, guaranteeing clear-cut printouts.

Showing for the first time in the UK will be the Facit 4542, a matrix printer with impressive capabilities. It can print in 2 colours, and has a 14 x 9 dot matrix, allowing it to produce graphics as well as very high quality printout.

GALATREK ENGINEERING A15
Scotland Street
Llanrwst
Gwynedd LL26 0AL
North Wales
0492 640311

This company will be showing a new range of constant voltage transformers in ratings up to 5 kVA. Representing an innovative development based on the established ferro-resonant saturable reactor technique, they offer output stabilisation to ±1%, attenuation of high voltage transients and power back-up to 1 cycle duration in case of transient supply breaks. At the same time, size, weight and cost have all been reduced; they are thus well suited to providing the clean mains input necessary for maximum operating reliability of small computer systems. Other related devices will also be shown, and Galatrek will also be providing clean power supplies for contestants in the first World Microcomputer Chess Championship,

GRAHAM-DORIAN SOFTWARE SYSTEMS A17
17 The Gallop
Yateley
Camberley
Surrey
0252 874790

Terodec (Microsystems) Ltd has combined with Graham-Dorian Enterprises Inc to form Graham-Dorian Software Systems. Terodec's range of microcomputers includes the TMZ-80 and Delta Products DPS64 range. Both machines have hard disk/multi user expansion capability. Graham Dorian's software products are among the most detailed packages on the market today. These are currently 15 packages each fully documented, including source code and easily understood operator instructions. GDSS is the European distributor for Compiler System's CBASIC-2 and MicroPro's WordStar, DataStar and MailMerge. Operating Systems Software include CP/M for the Tandy TRS-80 Models I and II.

A J HARDING (MOLIMERX) B19
28 Collington Avenue
Bexhill-on-Sea
East Sussex
0424 220391

This company specialises in the supply of software for the TRS-80, both Model I and Model II. Mr Harding and his staff will be available to demonstrate any of the Model I software, including the new Microsoft utilities such as the Basic compiler and the Editor/Assembler Plus. A broad selection of other utilities, business software and games will also be available. You will be able to buy software at the stand, together with the line of accessories which Molimerx carries, such as disks, special formula tapes for the TRS-80, its well-known green screen and books.

HOUGHTON COUNTY PRIMARY SCHOOL B40
Houghton
Huntingdon
Cambs
0480 63398

Houghton County Primary School, Huntingdon, Cambridgeshire was one of the first schools in the country to buy a microcomputer of its own. Since January 1980, Don Walton has been developing software for computer assisted learning in a wide range of subjects, with children aged 4½ to 11 years old. Every child and teacher in the school is an enthusiastic user of their Commodore PET and although most of them are not able to program, Don Walton has implemented a pilot project to teach the elements of Basic to his top class of 11 year old children with some success.

As a result of this experience Don and the headmaster of the school Keith Luton are well able to answer questions on the problems facing a primary school wishing to introduce a microcomputer.

INTERACTIVE DATA SYSTEMS B23
14 Buckman Close
Greenleys
Milton Keynes MK12 6AB
0908 313997

Interactive Data Systems will exhibit its range of UK-made S100 boards, including Z80-based CPU boards, memory boards, double-density floppy disk controllers and analogue and parallel I/O boards, together with motherboards, power supplies and Saracen mainframes. Also on show will be the first showing of IDS's new low-cost VDU. A full, professional standard VDU housed in a very attractive structural foam case. The unit features 24 rows of 80 characters, 96-character ASCII set plus 128 graphics characters, reverse video, underlining, flashing characters and half-tone background.

INTEX DATALOG LTD B67-B50
Eaglescliffe Industrial Estate
Eaglescliffe
Stockton-on-Tees
Cleveland
0642 781193

Datalog is primarily a shop window for a range of popular microcomputers and accessories, being an authorised dealer for the PET, Apple and Nascom machines and a main dealer for Computhink products. The company also handles a range of printers and sundry items such as cassette tapes, diskettes, paper and dustcovers. Datalog intends to expand its activities, keeping abreast of current developments in the microcomputer field to consolidate its already established position.

KANSAS CITY SYSTEMS B6
Unit 3
Sutton Spring Wood
Chesterfield
0246 850357

KCS specialises in quality software for the Tandy TRS-80 and the comparable Video Genie. The introduction this year of Level IV Basic resulted in "virtually a new computer", such is its extra exclusive facilities, commands and utilities. The company also sells Video Genie hardware at a discount price.

KINGSTON COMPUTERS LTD B45/24
Scarborough House
Scarborough Road
Bridlington
North Yorkshire
0262 73036

Details not known at time of going to press.

KOBRA MICROSYSTEMS LTD B10
14 Broadway
West Ealing
London W13 0SR
01-579 5845

A new low cost multiuser system for the Commodore PET will be demonstrated by Kobra Microsystems, a subsidiary of Adda Computers. Called MU-PET, it allows up to eight PETs to access one Commodore disk and share a printer. The hardware connects via the PET IEEE bus and has been designed so that each PET thinks that the disk is its own and no program changes are necessary. MU-PET, costs £595 + VAT for a three-user system and has been officially approved as a PET peripheral by Commodore UK.

L P ENTERPRISES A1
8-11 Cambridge House
Cambridge Road
Barking, Essex IG11 8NT
01-591 6511

L P Enterprises is the longest-established UK company selling microcomputer books, magazines and software to the public, dealers and OEMs. It imports the best available from the USA and will be showing the bulk of its product ranges, most of which will be on sale at the show. Software demonstrations will take place at regular intervals and professional help will be available for business and educational users as well as for hobbyists.

LITTLE GENIUS B4
Suite 504
Albany House
324 Regent Street
London, W1
01-580 6361

Details not known at time of going to press.

LONDON COMPUTER CENTRE LTD A11
43 Grafton Way
London W1P 5LA
01-388 5721

London Computer Centre specialises in daisy wheel and dot matrix printers and will launch a new, full-width daisy wheel printer for under £1000. Also on display will be TRS-80 Models I and II and SuperBrain computers. Word processing, accounts, ledgers, payroll and other software will be demonstrated to support the above hardware.

LOWE ELECTRONICS LTD A18
Bentley Bridge
Chesterfield Road
Matlock
Derbyshire DE4 5LE
0629 2817

Lowe Electronics distributes the Video Genie and will be exhibiting the system together with its new range of peripherals which includes an expansion box, disk drives, RAM card, sound box and various interfaces, all as competitively priced as the system itself. With these peripherals, the Video Genie 'comes of age'.

MICROMARK B62
Publicity House
Ravenscroft Road
Henley on Thames
Oxon, RG9 2DH
04912 77926

Details not known at time of going to press.

MICROTREND B21/B2
PO Box 51
Pately Bridge
Harrogate
N. Yorkshire
HG3 5DP
0423 711878

Microtrend will demonstrate packages from its Professional Software range and 'work station' products to run under CP/M on 8080/8085/Z80-based systems; these latter include word-processing and inter-system communications packages. Microtrend will also exhibit additions to its Popular Software range, including the new chess program 'Gambiet/80' which will compete in the first world Microcomputer Chess Championship.

MIND YOUR OWN BUSINESS B70
106 Church Road
London SE19 2UB
01-771 3614

Mind Your Own Business is a monthly magazine read by 40,000 businessmen which explains in a practical and non-technical manner how to choose and use modern office equipment to improve business efficiency and manage information. Subjects covered include word processing, small business systems, facsimile, microfilm, telex, speech and digital exchange systems, communications, dictation, copying and many other subjects of importance to those responsible for the efficient running of both large and small businesses.

MINE OF INFORMATION LTD B61
1 Francis Avenue
St Albans AL3 6BL
0727 52801

The company was formed in 1977 as consultants, publishers and booksellers in the microcomputing field. Today MoI is one of Britain's foremost microcomputer booksellers. The emphasis is on quality: books are selected by an experienced computer consultant on the basis of accuracy, relevance and value for money. MoI will exhibit the latest selection of microcomputer books for perusal and purchase. MoI is independent of any other organisation and is therefore free to choose or reject each title from each publisher, depending solely on the merits of the book itself.

NEWTONS LABORATORIES B9
123 Wandsworth High St
London SW18
01-870 4248

Details not known at time of going to press.

OXFORD COMPUTING LTD B53
48 Crown Street
Reading, Berks
0734 661054

Oxford Computing Ltd is a new company formed to launch a major breakthrough in positional intensifiers. The OCL DataPad 1 is an entirely British innovation which enables data entry into virtually every micro and minicomputer and some mainframes without using a keyboard. It eliminates the need for trained operators and overcomes the problem of delivery in data entry. The device also has a very comprehensive graphics plotting capability, enabling graphics to be produced instantly, also without a keyboard.

PAKENORTH LTD B51
600 Kingston Road
London SW20 8DN
01-543 4477

Pakenorth specialises in producing tailored software for most micros and minis. Packages for the PET and Sharp MZ-80K which will be demonstrated at the show include payroll, general ledger, costing and an interactive database management system for users who wish to produce their own tailored systems without writing programs. Sharp MZ-80K hardware is also available, including floppy disk drives and printers, and a complete small MZ-80K-based small business system will be on sale.

PERSONAL COMPUTERS LTD B20
194/200 Bishopsgate
London
EC2M 4NR
01-626 8121

Personal Computers intends to show Apple III, financial planning and word processing software for Apple II, together with a new 80 character card and alpha numeric keypad. Also on display will be their own word processor, Format 80. A range of printers will be on the stand, including Qume 5/45 RO, Paper Tiger, TCM 100/200 and the Centronics 730.

A number of new interfaces will be on show, including a parallel/serial card and the Super Sound Generator.
A specialist will be on hand to

demonstrate the Apple graphics tablet and the well-received plotter and plotting software. The Sharp MZ-80K will be on display with its recently announced disks and printer.

PLUS BUSINESS SYSTEMS A9
88 High Street
Slough
Berks
Slough 38319

Details not known at time of going to press.

RESEARCH MACHINES LTD B42
Mill Street
Botley Road
Oxford
0865 49791

RML will display its Z80A-based 380Z microcomputer in various configurations. Disk systems include dual double-sided mini drives and twin 8" double-sided drives. One system will display the RML High Resolution Colour Graphics option. Recent and future developments include a 16-channel, 10-bit A/D board, a full IEEE 488 implementation for scientific users, a 40/80 character VDU board and a multi-access system.

SCIENCE OF CAMBRIDGE LTD A10
6 Kings Parade
Cambridge
Cambs CB2 1SN
0223 311488

The highly-acclaimed Sinclair ZX80 will be featured on the company's stand. Extremely portable, measuring 8 x 6 x 1½ inches, and weighing 12 ounces, the ZX80 is intended for use at home, work, college or school. To ensure maximum flexibility of use, the ZX80 may be plugged directly into the aerial socket of any domestic colour or black and white TV. A conventional home cassette player is used to store programs.

THE SOFTWAREHOUSE A7
146 Oxford Street
London W1
01-637 1587

Come and see the widest selection of business, games and educational software in Europe. Our personal and after sales services are second to none.

ST COMMERCIAL SYSTEMS LTD B12
24 Ranelagh Road
London W5 5RJ
01-840 1926

STCS specialises in the sale and support of systems based on the Intertec SuperBrain with the OKI Microline 80 for normal printing and the NEC Spinwriter for letter-quality printing at 55 cps. Application packages include word processing, interactive data entry and full accounting systems.

TANDY CORPORATION B16, 18, 25, 27, 29, 31
Bilston Road
Wednesbury
Staffs
WS10 7JN
021-556 6101
01-236 9424

The TRS-80 is the world's best selling microcomputer. It's not hard to see why. It's an attractively packaged, user-orientated unit having a detachable keyboard and the sort of features you'd expect with a £2000 plus price tag. The TRS-80 range has found uses in a wide range of settings, including homes, small businesses, schools and colleges. The system being modular can be expanded to deal with changing or developing user needs.

TANGERINE COMPUTER SYSTEMS LTD B39
Forehill Works
Forehill
Cambs
0353 3633

Tangerine is a British-owned, young company which produces British-designed microcomputers. The Microtan system has been designed to satisfy the needs of both personal and business users. On show will be the Microtan 63 System, based on the 6502 microprocessor, a fully expandable and powerful microcomputer which uses the 10k extended Microsoft Basic. Peripheral modules include Bulk I/O, Ceefax-compatible, high definition colour graphics, 40k RAM on a single board Tanex expansion module, IEEE Interface, Tandos controller and drives, mini racks and system racks.

TRANSAM COMPONENTS LTD B14/B33
59/61 Theobalds Road
London WC1
01-402 8137

Transam will be exhibiting its latest computer system — the Tuscan S100. This innovative product is an economical single board computer with integral S100 expansion capability and is available with system monitor (Z80A), resident Basic, resident Pascal or CP/M compatible 5¼" or 8" double density drives. In kit or assembled form, this system offers unique flexibility and potential to any computer user in any section of microcomputing today. The complete unit including two 5¼" drives is housed in a single case with hinged lid.

Also on show will be a range of TCL software products including TCL Pascal.

VERO ELECTRONICS LTD B3
Industrial Estate
Chandlers Ford
Hampshire
04215 62829

Having been in electronics for the last 20 years, Vero now boasts a wide range of products for both the electronics hobbyist and research/development engineers involved with microelectronics. They have products ranging from solderless breadboards (Verobloc) to complete 19" racking systems.

On show will be the latest range of Microboards, Backplanes, keyboard enclosures and, from Verosystems, a range of British-made wire wrapping tools and accessories.

VLASAK ELECTRONICS LTD A6
Thames Building
Dedmere Road
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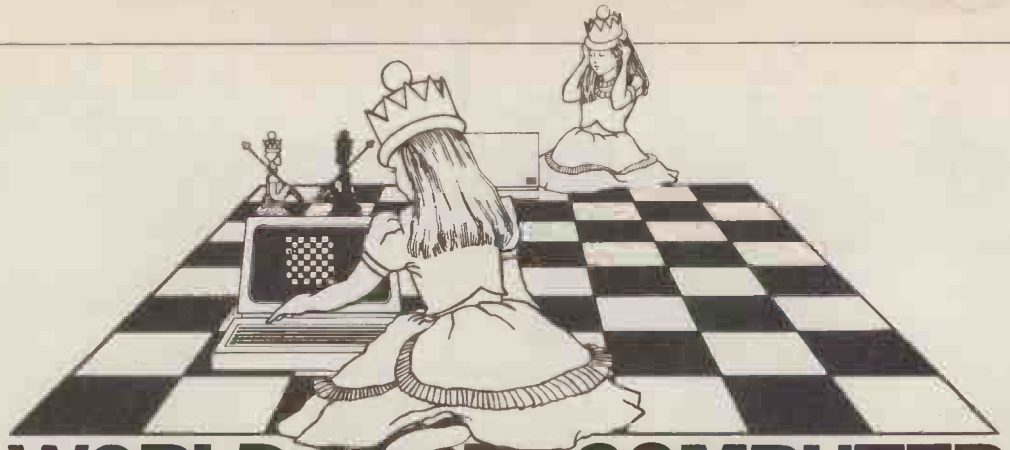

WORLD MICROCOMPUTER CHESS CHAMPIONSHIP

To set the scene for the first World Microcomputer Chess Championship at the 3rd Personal Computer World Show, Kevin O'Connell takes a light-hearted look at chess and computers.

In the beginning

Man's dreams of flying not only anticipated the aeroplane, they also predated his dreams of chess computers. However, as early as 1770 a chess machine had appeared. That was The Turk — a life-sized figure, dressed as a Turk, seated behind a chest that was about four feet long, two feet wide and three feet high. It was one of the sensations of the day, for it played very good chess and defeated all comers.

Even IBM was a somewhat unknown quantity in the late eighteenth century and The Turk's audience naturally suspected that a man, or perhaps a child prodigy, was concealed in the contraption. When confronted with such natural scepticism, the gifted inventor, Baron von Kempelen, would open the front of the cabinet to reveal a mass of cogs and levers. He would repeat the process at the back and hold up a lighted candle so that the audience could see right through the machinery. A door in the back of the human figure would also be opened, revealing still more machinery. The only conclusion left to the spectators was that the machine was genuine or, like the reaction which computers elicit from so many people today, that it was all done by magic. But of course the cabinet had been constructed in such a way that a man could be hidden inside it. The machine's various owners, including Johan Maelzel, better known as purveyor of ear trumpets to Beethoven, took care to employ some of the strongest (and smallest!) chess players of the day and The Turk was rarely defeated.

Other chess automata followed, most of them straight copies of The Turk, until the first genuine chess playing machine appeared at the turn of the nineteenth and twentieth centuries. This apparatus was rather limited and could play only with king and rook against king, a mere three pieces out of the full complement of 32. But this ingenious invention of Torres y Quevedo, head of the Laboratorio de Automatica in Madrid, naturally excited great interest when exhibited in Spain and France in the early years of this century. This fascinating precursor of today's computer chess machines can be seen in the museum at the Polytechnic in Madrid.

"Now let me see you shake hands!"

There followed Zuse, Shannon et al. To avoid unnecessary duplication, I refer you, for the early development of computer chess, to my article in the July issue of PCW.

The last decade

The image of chess among the general public has changed. Once it used to be regarded as a slow-moving game, played by grey-bearded men at cobweb-covered tables. However, photographs, news reports and TV programmes showing top players in track-suits doing weight-training to build up their stamina, big money prizes and the advent of computer chess machines have changed all that. The cognoscenti have always known, that chess, despite its deceptive outward appearance, is a game of great tension and enormous speed. The Germans call it a *Denksport* (thinking sport) and it's rapidly coming to be regarded as just that by more and more people around the world!

To master chess completely is an exceptionally difficult task and only a handful of humans have ever gained such proficiency. As programming skills improve and programs get closer to the goal of joining that select band of chess players who can claim such a degree of mastery, so the world gets nearer to the point of being able to use computer power to solve other, more pressing, problems — such long-range planning and, perhaps, the creation of real artificial intelligence.

The first World Microcomputer Chess Championship this month ushers in a new decade that follows ten years of often frantic progress in the field of computer chess.

The very first chess tournament for computer programs was held in New York in 1970 as part of the annual conference of the Association for Computing Machinery. Then six programs took part, all but one of them clearly playing weaker chess than virtually any of the 20 or so chess machines that have come on the market in the last three years. The following year, 1971, saw the second machine versus machine event in Chicago. At that time there was a new product on the market, made by Intel, called a 4004 — the first of the microprocessors.

Improved microprocessors followed and more and better mainframe computers and chess programs. The last two years of the decade opened with the very first chess tournament for micros. These little babies then promptly went on to compete against (and sometimes beat) their big elder brothers, — machines which used chess programs 20 or 30 times the size. One of the programs expected to play in the 3rd World Computer Championship later this month in Linz, Austria, uses no less than two megabytes of RAM. Despite the ever-increasing capacity of micros and the steadily falling cost of them, that kind of memory space will remain out of the reach of all but the most affluent of micro programmers for some time to come. Therefore, they have to make up for the deficiency in memory by finding superior evaluation functions (for an outline of evaluation functions and their use see 'Computer Games' — the series by David Levy that's currently running in this magazine).

Here, an analogy with the development of top-flight human chess skill is not inappropriate — I have yet to hear of any candidate for the world championship undergoing brain surgery to have more neurons inserted! The human way is a two-part process. First any aspiring player must learn to calculate as accurately and as quickly as possible. The second more important and more difficult task is, having once acquired a primitive evaluation function, to refine it to the stage where it will give an accurate assessment of any position which may arise either on the chess board itself, or in the course of his analysis from that position.

The evaluation function is also the most important and most difficult part of any chess program. However, it's one where the micro programmer is at little or no disadvantage to the mainframe machine player with almost unlimited memory space to play with. Several programs now have evaluation functions which permit them to play quite good chess, using a total memory space of only 8—12k. Although it's impossible to define any theoretical requirements, it seems unlikely that more than 64k should be required to produce, if not a world champion, at least a machine of world-class playing ability. Perhaps one or more of the competitors in the World Microcomputer Championship will have cracked some, if not all, of the problems associated with producing such an evaluation function. We'll soon see.

FIDE
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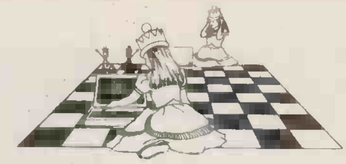
Ideas and recognition

Greater availability of computing power, more people writing chess programs, greater cross-fertilisation of ideas — all these things can only speed the appearance of a really top-class program.

If you have any good ideas about how to improve chess programs, drop me a line, or come and discuss them at the show. I'll be able to spread the glad tidings to those who are chasing after the $ 50,000 offered by the Dutch software house of Volmac for a program to beat the 79-year-old former world champion Dr Max Euwe, and the $ 100,000 Fredkin Foundation prize to the first program to gain the title of World Chess Champion

It's only to be expected that these tempting cash prizes will lead to increased effort on the part of programmers. They may also have an even more important benefit — that of increasing the already considerable prestige attached to computer chess. Recognition is probably a prerequisite of prestige and it's therefore especially important that the World Chess Federation (FIDE) has this year recognised and granted its auspices to the two most important computer chess competitions: the World Computer Championship and the World Microcomputer Championship. As 'real' chess players continue to take a greater and greater interest in computer chess we can expect two benefits to accrue: top-class players will become increasingly available for consultation — which should help programmers to increase greatly the sophistication of their evaluation functions — and the wider recognition, implying greater prestige, should help to increase still further the cash incentives being offered to anyone who can make a breakthrough in the field.



Boos and giggles not out of place in normally silent game

Thus ran the headline to a recent magazine article about a chess game in which costumed actors took the place of wooden chessmen.

At most chess tournaments silence is the rule because the players have to concentrate. Obviously no amount of talking, giggling or even cat-calling is likely to disturb the players if they are all machines. That is one of the best things about a computer chess tournament — everyone is free to chat, laugh and generally enjoy themselves.

Come along to the tournament on Thursday, Friday and Saturday. It will be fun. You can delight in the anguished looks on the faces of the programmers whose programs stumble into disastrous errors. You may chuckle at any machine failures, although this is not recommended procedure if you happen to be in the immediate vicinity of the aggrieved owner. Chess is a game to enjoy and you will be able to revel in it at the first World Microcomputer Chess Championship.

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CHECKOUT

HI-TECH S100 COLOUR VDU BOARD

Stephen Withers examines a British colour VDU board for S100 systems.

Introduction

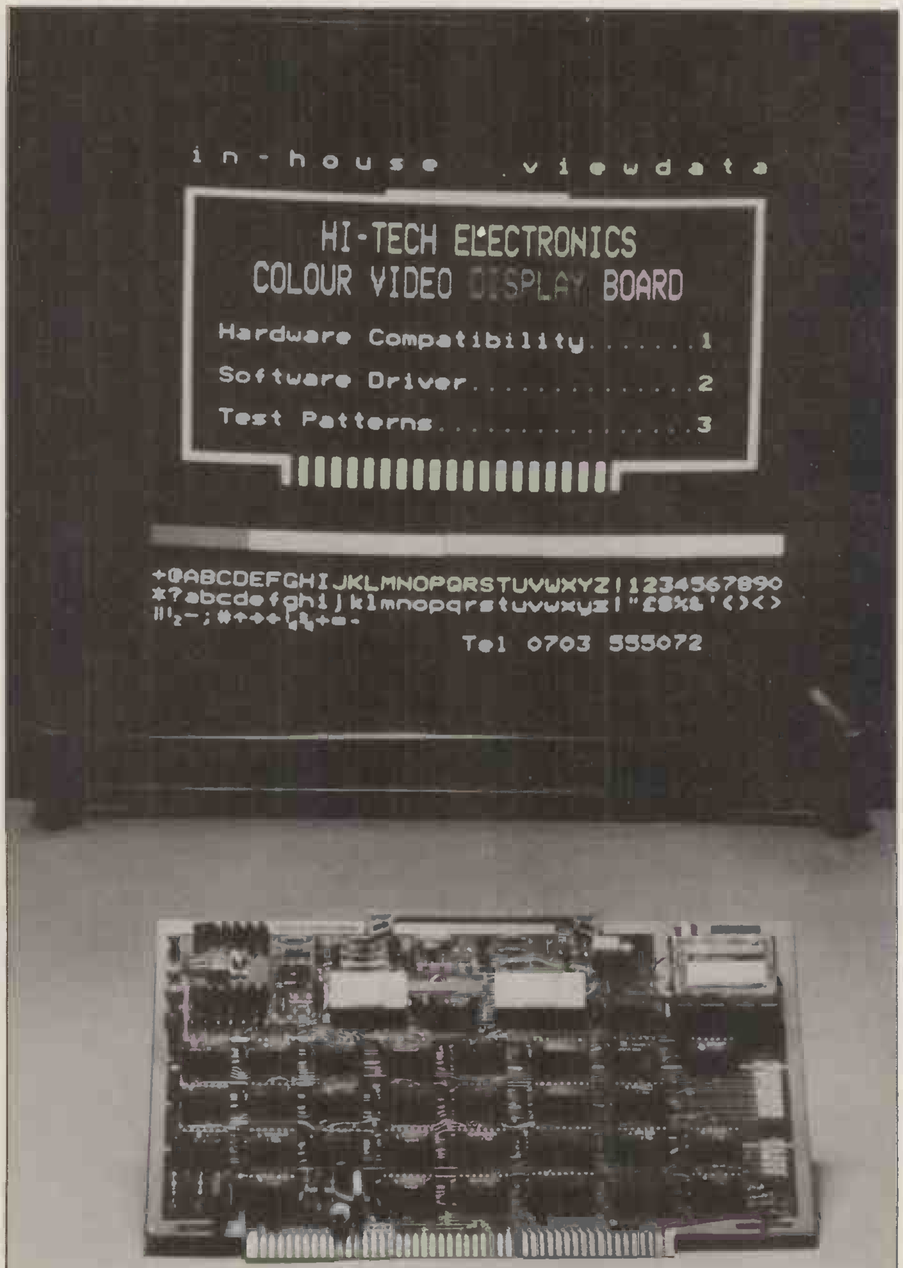
The Hi-tech VDU board is a memory-mapped device which generates a colour display when used with a colour TV or monitor. Since it's teletext compatible it produces 24 rows of 40 characters and has a limited graphics capability. It's designed for use in S100 systems and is available in three versions — giving the choice of UHF, video or RGB outputs. This Checkout describes the UHF version, although most of the comments made will apply equally to the other two.

Hardware

All the circuitry is socketed and mounted on a single fibreglass PCB. It appears to have been carefully designed with no sign of the bodges that are to be seen on some circuit boards. Figure 1 is a block diagram of the circuit's functions.

To the processor the VDU board appears as a chunk of RAM plus an output port. As the display shows 24x40 characters, you might expect the board to occupy the best part of a 1k block of memory -- if you did, wrong again! For 'historical reasons' (that's the history of teletext) it takes up 2k, the difference being made up of 24 unused locations at the end of each screen row, plus a further 512 after the bottom row. Figure 2 makes this arrangement clearer. Apart from the 'wasted' kilobyte of memory space, the non-contiguous mapping used means the driver software must be more complicated to achieve a given result.

DIL switches are provided to locate the board on any 2k boundary in the processor's address space, a much neater method than soldered jumpers. The same method is used to select the output port, which is used to control the mode of output to the TV; the red, green and blue outputs may be independently inhibited or the display may be switched to double height, with either the top or bottom 12 lines being shown, or in single height mode it's possible to display background colours



Hi-tech's S100 colour VDU board in front of the display it produces.

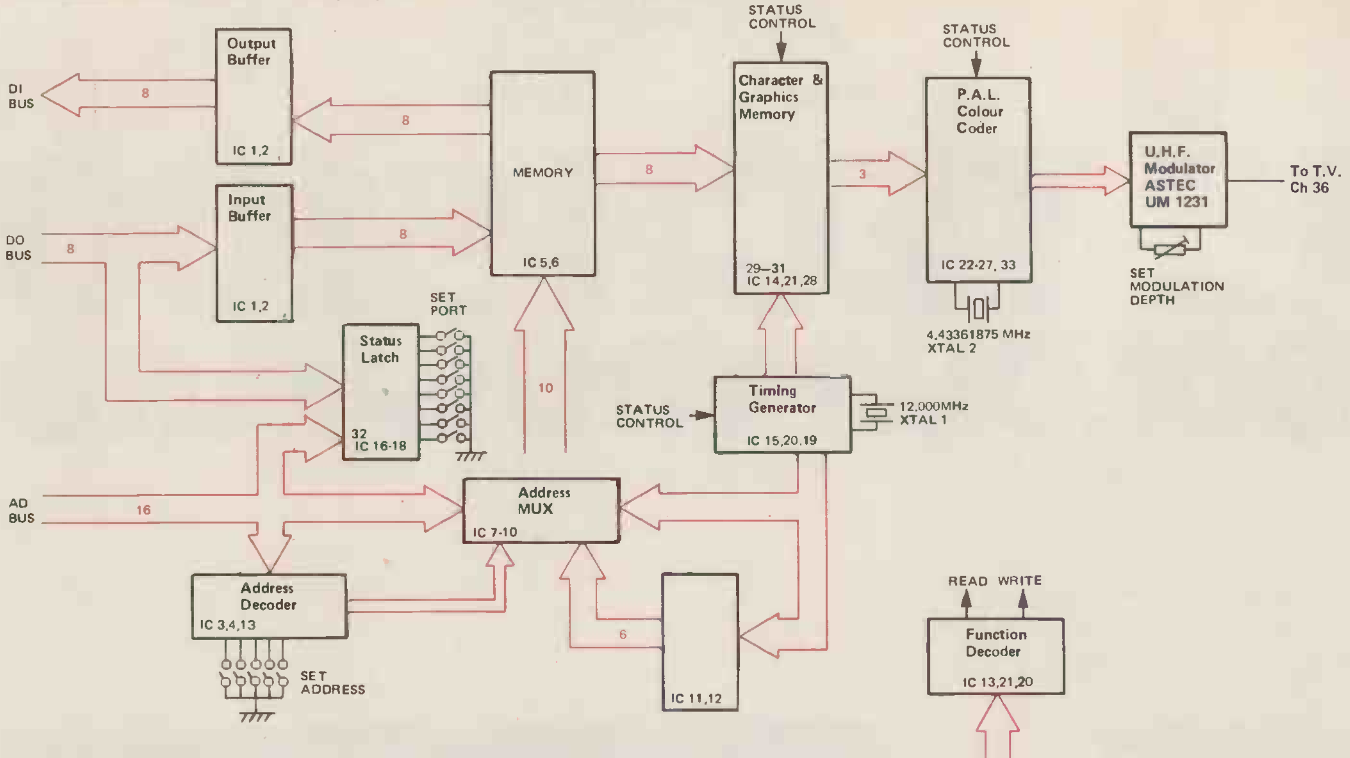


Fig 1 Block Diagram

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HI-TECH ELECTRONICS

only.

Since switching between these modes is instantaneous, the way is clear for a wide range of displays. For instance, in double height mode, alternative frames of an animated display could be written into the two halves of the screen, with a crisp switch from one frame to the next.

The display uses the ISO-7 character set, which is basically ASCII with a few modifications, such as the provision of a £ symbol and the fractions ¼, ½, ¾. In graphics mode there are 64 symbols on a 2 by 3 grid. This makes it possible to plot to a resolution of 78 by 72 — not 80 by 72, as one character position will be occupied by the 'hold graphics' control character. This is probably the greatest limitation of the teletext format: each mode change, such as specifying a new colour or flashing characters, takes up a character position and is only effective for that line. Take a look at a Prestel frame and you'll see what I mean.

The number of available symbols is further enhanced by the choice of continuous or separated graphics. The former is the normal state, where the graphic character with all six cells 'on' occupies the whole character space. The alternative mode slightly shrinks each cell, revealing some of the background (Fig 3).

The colour VDU board gives a pleasant display on the TV screen. As you may know, a TV picture is split into two fields, the even numbered lines in one, and the odds in the other. Most displays feed the same information to both fields, halving the effective resolution. The Hi-tech board differs by producing an interlaced signal, which results in smoother, clearer characteristics. My subjective impression is of characters which are somehow denser than normal.

The colours available (foreground and background, alphanumeric or graphic) are red, green, blue, magenta, cyan and white. Black is the default background colour, and by setting the output port correctly it is possible to obtain black characters on a limited number of background colours. In case that's not enough for you, there's more to come. As ISO-7 is a seven-bit code, and the display uses eight-bit memory there is a spare bit. Hi-tech have used this to provide an alternative colour set on a character-by-character basis. If the most significant bit of a character is set, the colours become brown, lime, lemon, navy, purple, aquamarine, and white respectively. Apart from the general usefulness of extra colours, this additional set allows two adjacent characters to be in different colours. Admittedly this only allows one alternative colour, but that's often preferable to a blank space on the screen where a control character is used.

All in all, I calculate that there are over 215,000 combinations of symbol, colour, size and 'flashiness'. If you are still unsatisifed, I give up!

Software

Listings are provided of four Basic programs which exercise the board in various ways. For example, one displays horizontal bars in randomly selected colours. A 'proper' VDU driver (DRIV 6.7 is supplied; this sets the VDU board as the main console output device and offers most of the features of a conventional VDU — including erase page, cursor up, down, left, and right, and scroll or page mode.

The hex listing of DRIV 6.7 is of limited usefulnesss as it's been assembled for use with the Exidy Sorcerer, but other versions are available for the North Star Horizon and the Vector MZ. The availability

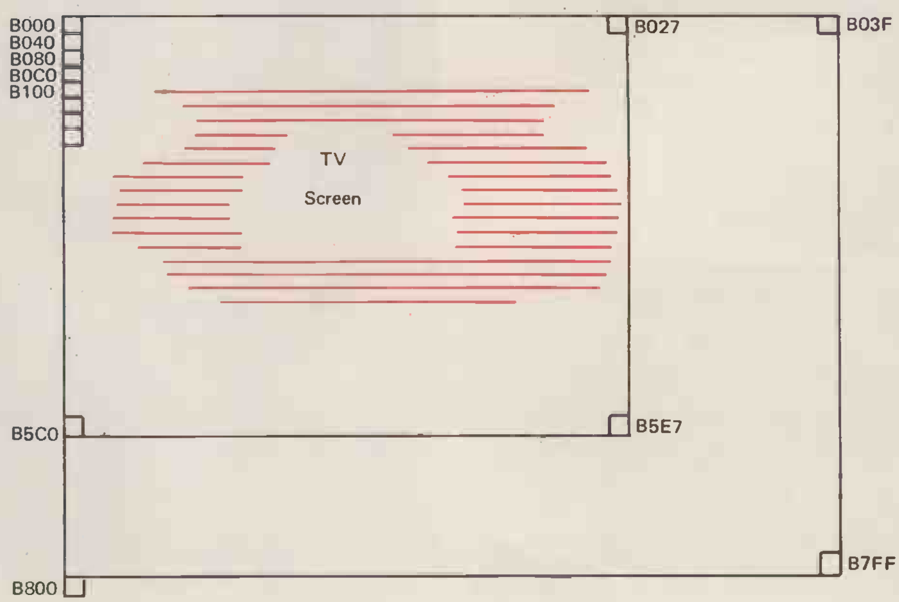


Fig 2. Memory map of screen in 2k, at B000

of the source code on CP/M disk caters for other machines.

Since our board was purchased for use as an auxilliary output device for a North Star Horizon, I wrote a driver routine which was compatible with CP/M Fortran (currently the most frequently used language on the machine). The basic function of any such driver is to keep track of the memory location corresponding to the current screen position, and then stuff the ISO-7 code of the next character into that location. Of course, it's not quite that simple — certain control characters need special handling (e.g. carriage return), and many of these characters are needed to control the mode of display. It's probably best to follow the example of DRIV 6.7 and prefix control characters that must be passed to the board with ESCAPE.

You'll certainly need some kind of driver, as the alternative is to POKE everything into place, which is not very elegant, and leads to confusion. If you plan to make extensive use of the graphics characters, it would make life very much easier if you wrote a driver which would plot points on 'graphics' coordinates, and perhaps draw the best line between two specified points. If you do, why not share it with the rest of us? (I plan to offer my Fortran driver to the UK CP/M Users' Group.)

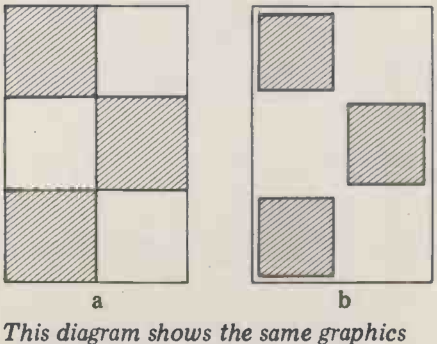
Hi-tech also sells a program which facilitates the use of a computer fitted with one of its VDU boards as an in-house viewdata system. This allows the storage of 170 frames, complete with routing information, on a single North Star diskette. If a suitable modem is available, Prestel pages may be captured, stored and edited locally for future use. The system may also be used as an editing terminal for information providers.

Documentation

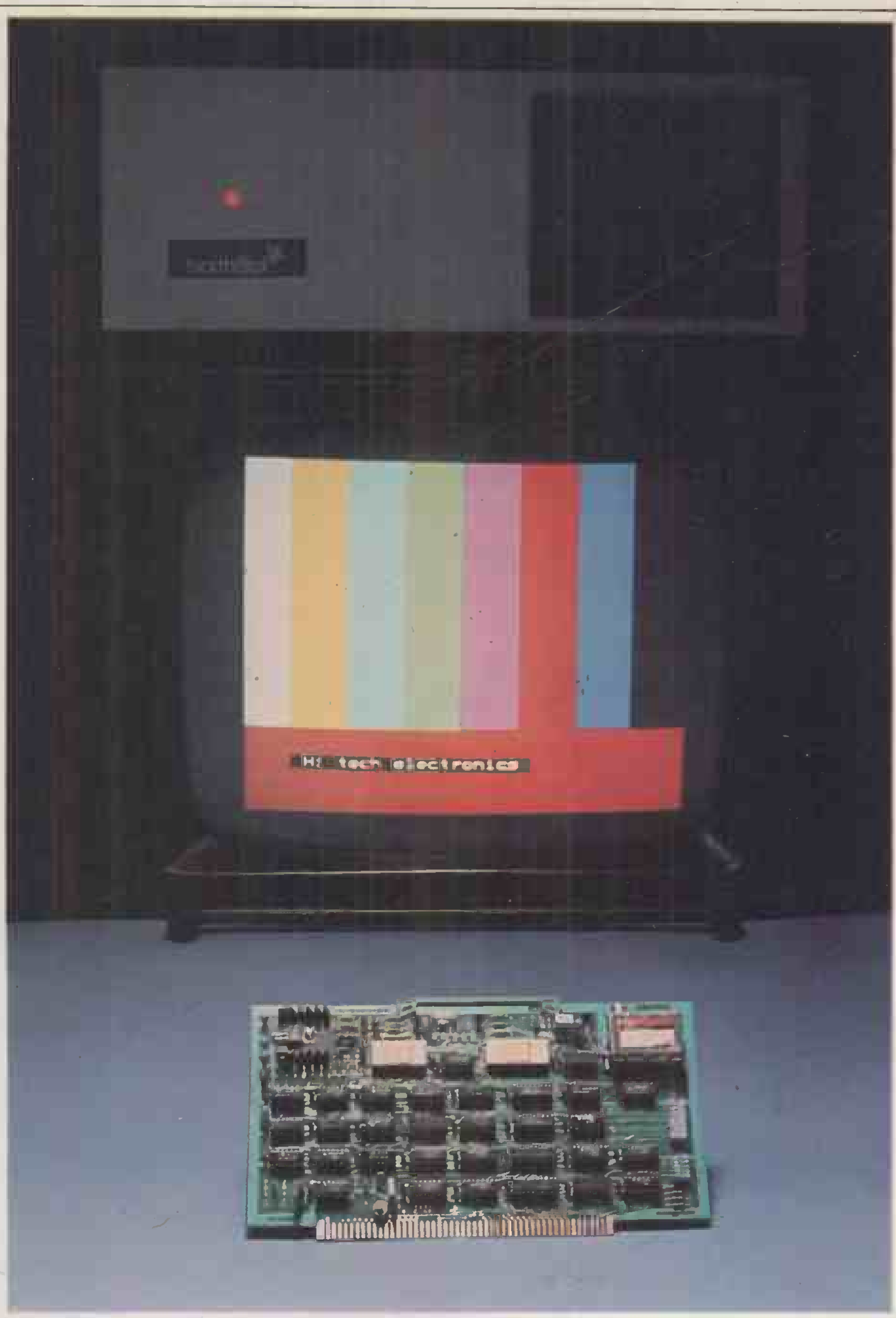
A 32-page manual is supplied with the device. Installation is one of the first topics covered — very sensible, as few of us have the patience to wade through reams of paper having received a new toy! The booklet then goes on to explain some of the theory behind the workings of the device, and how to adjust the TV and the board for optimum performance — although our board needed no adjustment.

Appendices include tables of the character set and details of the control character set and details of the control characters, decimal/hex/binary conversion, the S100 pin definition and explanation and listing of DRIV 6.7.

Figure 3



This diagram shows the same graphics character in (a) contiguous, and (b) separated modes.



Use of the spare bit generates these non-standard colours.

Photo by Mike Harlow

The presentation of the manual is adequate, being the usual 'duplicated typescript plus comb binder'. This is better than using staples — here at least the manual lies flat when opened — but cardboard covers would have made it more durable. Still, these things cost money, and the price is already high enough. What's important is that the manual is organised in a sensible way and contains all the information you're likely to need (except for the source code of DRIV 6.7 which is available on request.)

Conclusions

The Hi-tech colour VDU board works well if you are prepared to accept the limitations of the teletext format. I've seen the video output version connected to a Barco colour monitor, and the result was absolutely beautiful. The TV version, though naturally less spectacular, is capable of giving good results when the set is correctly adjusted. The availability of viewdata software is a strong selling point.

My main reservation is the £295 + VAT price. There seem to be few functional differences between this product and the Acorn VDU board (for instance they both use the SAA 5050 character generator), yet the latter is less than half the price of Hi-tech's offering. I must admit that I've not seen the Acorn in action so perhaps this comparison is slightly unfair. In any case the 'overhead' of the S100 system must be considered (size of PCB, the voltage regulators, etc).

If you own an S100 system and want colour output, then apart from using an expensive colour terminal you have a choice between the Hi-tech VDU and the Cromemco Dazzler (which is also cheaper than the Hi-tech board, but I have heard conflicting reports as to its suitability for use with PAL TV sets). The big advantages of Hi-tech's product are that it may be used in conjunction with an in-house viewdata system software; it will be compatible with the Hi-tech Teletext Aquisition Unit (currently under development); and that it's made in Britain.

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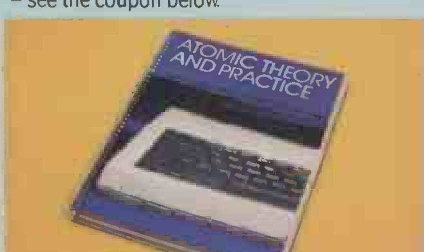

FREE MANUAL

Free with every ATOM, kit or built, is a computer manual. The first section explains and teaches you BASIC, the language that most personal computers and the ATOM operate in. The instructions are simple and learning quickly becomes a pleasure. You'll soon be writing your own programs. The second section is a reference manual giving a full description of the ATOM's facilities and how to use them. Both sections are fully illustrated with example programs.

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● Full-sized QWERTY keyboard ● 6502 Microprocessor ● Rugged injection-moulded case ● 2K RAM ● 8K HYPER-ROM ● 23 integrated circuits and sockets ● Audio cassette interface ● UHF TV output ● Full assembly instructions

SOFTWARE

● 32-bit arithmetic (±2,000,000,000) ● High speed execution ● 43 standard/extended BASIC commands ● Variable length strings (up to 256 characters) ● String manipulation functions ● 27 x 32 bit integer variables ● 27 additional arrays ● Random number function ● PUT and GET byte ● WAIT command for timing ● DO-UNTIL construction ● Logical operators (AND, OR, EX-OR) ● Link to machine – code routines ● PLOT commands, DRAW and MOVE

The ATOM modular concept

The ATOM has been designed to grow with you. As you build confidence and knowledge you can add more components. For instance the next stage might be to increase the ROM and RAM on the basic ATOM from 8K + 2K to 12K + 12K respectively. This will give you a direct printer drive, floating point mathematics, scientific and trigonometric functions, high resolution graphics.

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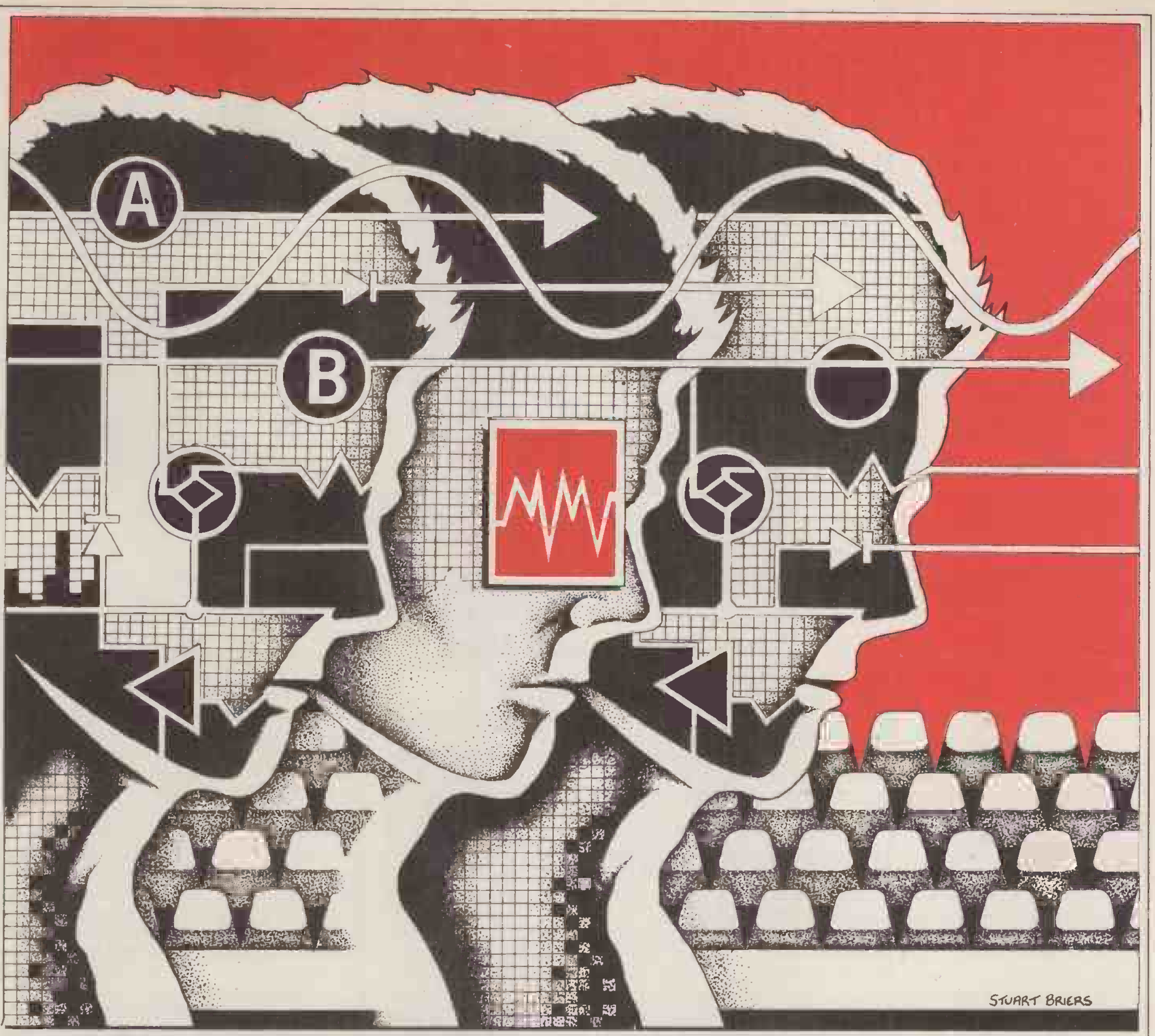
PCW/9/80



SECRETS OF SYSTEMS ANALYSIS

Lyn Antill presents this country's first serious attempt to enable prospective computer users and micro specialists to bridge the gulf of misunderstanding that undoubtedly exists between then. The aim of this series is to enable users to analyse their own problems so that both sides are able to work constructively together towards successful system implementations.

PART 1: IN THE BEGINNING

Whether or not you find the following series of articles relevant will depend primarily on why you are interested in micros. The pure hobbyist who just wants to try things out on the machine, or the electronics wizard whose delight is in soldering bits of equipment together, may feel it covers an area too far removed from their own. They may reason, in particular, that systems analysis is work, not pleasure, and would not be moved by any tale I might tell them about the intellectual satisfaction to be derived from designing and implementing a system that actually does something that needs to be done. They probably haven't read beyond the title anyway!

At the other end of the spectrum from the hobbyist there's the person using the micro because he has to. He might find it a chore — or even a nightmare — but he has a problem which can only be solved with the aid of a micro; he must therefore come to terms with the machine. For such a reader, the series should act as a guide through the stages of implementation of a computer system — from the definition of the problem in the first place to the monitoring of the working solution.

Most readers of the magazine would probably place themselves somewhere in the middle ground, using a micro for both profit and pleasure. They will, I hope, find some things of interest and use to them in the series. Teachers and students should note that, although I shall not be covering an entire conventional systems analysis syllabus — because not all is appropriate to micros — nevertheless I shall be taking in a very good part of it.

I'm using the term 'Systems Analysis' in its broadest sense, to cover the whole area of activity between the user on the one side and the manufacturer, salesman and programmer on the other. (Sometimes the title is restricted to the investigation of the needs of the user, excluding the aspects of systems design and implementation.) The main areas to be covered are:

Definition of the user's requirements
The design of a computerised solution
Selection of hardware and program packages
Getting someone to write programs for you
Testing a system
Getting a system running
Maintenance of a system

As the series is aimed at the user with little knowledge of computers, I have tried to avoid jargon. However, after many years of dealing with users in other professions and trades it has become clear to me that we are all aware of other people's jargon, though seldom of our own. . . and that there is no such thing as plain English. Not that I think jargon is a wholly bad thing, for it represents a useful form of shorthand. It's just that technical terms in computing are notoriously elastic as to precise meanings (not least because manufacturers find it easier to come up with new terms rather than new products). The worst misunderstandings often occur when you *think* you understand, simply because you are using the same term with a different connotation.

No systems analyst worth his salt ever embarks on a systems design without asking the question "WHY?" several times over — "Why use a computer?" "Why write this program?" etc. Therefore I start off by asking "Why systems analysis?".

Many of my programmer friends assure me that "It's all common sense" and apart from the standard (and perhaps cynical) riposte that common sense isn't all that common, my retort would be to look at a few situations where people have dived in at the deep end (either by going straight out and buying machines, or by writing programs) and then see where this approach has led them.

I start with the true saga of Mr Bloggs' Garage, for it illustrates very well the difference of approach required when purchasing a computer as against any other similarly priced gadget. Mr Bloggs had a stock control problem which will be dismally familiar to most shopkeepers, and he made the very reasonable (and I imagine correct) decision that the stock control could be combined with the accounting, and the whole thing handled most efficiently with the aid of a micro. Indeed, it's quite likely that a successful solution could have been implemented on the very machine he bought. Sadly this was not to be. Here is a letter that Mr Bloggs wrote to PCW recently; all I've changed is the names — to protect the innocent:

As a motor accessory retailer we first considered the idea of using a computer to control our stock two years ago. This was because we had approximately three thousand different lines, many of which were stocked as one-off items. We thought that if we introduced the computer whilst having only the one outlet, by the time we expanded the system would be streamlined.

Our stock control system was rather irregular in that it required each item to be noted down at the point of sale. Needless to say, we didn't always have time to make a note of the item sold thus the item would be permanently out of stock. With stock such as oil filters it required two or three hours work comparing actual quantities against an ideal stock level book, the differences being the order for the following day. Stock orders were done this way twice weekly. We hoped that by using a computer we could cut out a great deal of this type of laborious work.

The original concept was to code all the stock in the shop. At the point of sale the assistant would key into the cash register the item code and the price. Then when a stock order was needed the item code and price would be fed into the computer from the audit roll. The computer would then analyse the information and produce an order sheet for each supplier. These could then be despatched by post or taken to the cash and carry. As goods were received they would be entered into the computer to keep quantities in stock up to date. At the same time the cost price of the goods would be keyed in if different from that held in the record. The computer would automatically calculate the new retail and trade price, producing a list of all such amendments. Meanwhile stocks would be sold at the last price until the amendment sheet arrived.

With these ideas in mind we purchased a TRS-80 Level I. We were told that the Tandy would do everything we wanted of it but that we would need to purchase additional equipment at a further cost of approximately one thousand pounds. If we found that the Tandy was incapable of doing what we required we could return it up to a period of three months. We were lead to believe that by using the instruction manual we would be able to program the computer ourselves within the same period.

"...when tested, the program failed to work."

Eight weeks later we were still only half way through the manual when we realised that we wouldn't be able to write the program ourselves. Hence we contacted a chap who wanted to write programs for the Tandy machine. He had not yet bought his own computer so we purchased the rest of the equipment costing approximately three thousand pounds.

After several weeks the programmer said that he had finished but, when tested, the program failed to work. After repeated attempts to correct the faults and many weeks later we were still no nearer to having the system installed. We took a copy to Tandy to ask them if it would ever work. They said that in trying to correct the faults further errors were being created and that it would be best for us if we found someone who was more familiar with the TRS-80.

We then contacted a software house which dealt specifically with the Tandy but they were unable to help us as they were busy for several months. They put us in touch with a gentleman who agreed to write the program for us with a few modifications. Instead of using a conventional cash register and then having to enter the information manually into the computer from the audit roll, he suggested we use the computer in the first instance. Thus the information would be stored on a disk until run against the main program which would analyse the data and clear the disk at the same time.

He then wrote a program which kept track of sales. Each sale would be registered under an operator key, a V.A.T. category, and whether it was a cash or cheque sale. Refunds were to be dealt with in the same way but amount would be deducted off the corresponding V.A.T. category. The program allowed us to keep records of deposits, surcharges and monies paid out of the cash register. At the end of the day an X total or Z total could be used to cash up and a new disk would be inserted for the next day. The disk would store all the information so, when fed through the master program, would produce stock orders etc. This first part of the system worked very well when installed.

We found after an extensive period of use that the staff were unhappy with the system. The main reason for this was that the computer could absorb information much faster than the operator could key it in. Speed is essential when serving customers especially on our busiest days when customers are not prepared to wait. The staff found that they were having to concentrate more on what they were keying into the computer than on the parts they were supplying. Instead of speeding up the process at the point of sale the computer was causing confusion. This was especially noticeable when a deposit or surcharge was being taken as it required details to be keyed in as opposed to a code number. This had been designed to prevent having to write out the details on paper and then register it in the till as we had previously been compelled to do. Basically, instead of simplifying our procedures it made them overcomplicated. This, combined with a cash flow problem, decided us on selling what we considered to be our only expendable asset. Now all experimentation with computers has ceased we cannot say whether or not the system as a whole would have worked being as we never had chance to test the stock control side of the system. We have, however, come to the conclusion that using the computer in the manner as described above is far too complicated for our needs and that the conventional cash register that we have purchased operates at a much faster rate and has proved to be reliable and efficient.

So what went wrong? There's no reason to suppose that Mr Bloggs was unintelligent. . . he simply had no way of knowing quite what was involved.

Microcomputers come in a price range comparable to that of domestic appliances or family cars; unfortunately, although I don't need to do much more than look at my bank balance and the sort of motoring I do to make a reasonable car purchase, I can't make a reasonable computer purchase in the same way.

Part of the reason is that I'm not really all that ignorant about cars — I see them going past me every day, I've driven thousands of miles in them, and I'm bombarded with advertisements and press and TV articles concerning their vices and virtues. Another part of the answer is that I know how to use a car — I've had more lessons than I care to count, and learnt from my husband's criticisms and my own observations of my performance. The final part of the answer is that cars all perform the same *function* (i.e. they get you from one place to another) the only difference between them being such variables as the speed at which they get you there, the amount of luggage they permit you to take with you, the likelihood of your breaking down en route. . . or the envy they provoke in your neighbours. When you buy a car, you are only really choosing between the *attributes* of the various models. The same applies to almost every gadget you ever buy — they all have fixed functions. A computer, on the other hand, offers a totally new experience in that you are also able to choose the *functions* that it is to perform.

So the first difficulty that confronts the potential user is that of defining exactly the function(s) the micro is to perform. The second hurdle is that of communicating these requirements to the salesman who supplies the hardware (the machinery), or the programmer who provides the software (the machine's instructions). Already therefore we have two distinct stages in the systems analysis — deciding what is to be done, and specifying it in a way that other people can follow.

Was Mr Bloggs deliberately misled by the salesman into believing that he would be able to write his own programs after studying the manual? — or was he over-confident of his abilities and under-appreciative of the problems that lay ahead? Just as there are people who regularly spend time doing their own car servicing, on the other hand, most of us lack the skill or experience or time or interest and simply take our cars to the garage. We pay more, and are never quite sure how well the work has been done. . . but we learn to live with the situation.

It's a useful analogy, for the level of skill required to get a micro to perform a specific function is broadly comparable to that required for servicing a car. Some car jobs are more complex than others — as are some programs. A person lacking in experience can only find out by trial and error whether the problem he's trying to solve is simple or complex. He'll know it's complex when he fails to solve it! Had the programs Mr Bloggs required turned out to be simple ones, he might well have succeeded in programming them himself. . . as he might also have done if he had had the time and interest to play around with the machine before getting down to business.

There are plenty of horror stories about 'cowboys' in the motor trade, and micro programming must also have its fair share. But the best programmer in the world will still be unable to present you with good working programs that do what's needed, if you have failed to give him a sound specification of the functions you want the computer to perform.

This is why in any large computer installation there are two types of people (other than the user) involved in the creation of any computer system: the analysts who find out — and specify — what the system must do, and the programmers who work out how it can be done in terms of computer programs. Of course, it's not as clear cut as that, and in fact there's a large grey area in-between the two jobs. Indeed there's a continuous translation between the user, the analyst and the programmer, the number of people involved depending upon the complexity of the work. With a microcomputer system, there's usually only the user and the programmer. The analyst/designer function must be shared between them.

Now, the chances are the average user has no real idea what is involved in systems analysis, and he is tempted to rely on the technical expertise of the programmer. Problem. . . the trouble is many of the people who write programs for micros have little real knowledge of systems analysis either — perhaps because they are youngsters only just starting out, perhaps because their primary interest is in the machine rather than its uses. Formal training in systems analysis is harder to come by than training in programming and many lower level courses gloss over it or worse, leave it out altogether. It's also certain that, at best, programmers will have only two years experience of the machine they are programming. . . that's about how long these machines have been around. Some programmers will have had previous experience of other small machines, some will have 'come down' from big machines.

I shall have more to say in a later article about how to recognise a good programmer when you see one, or even a good analyst/programmer. At this stage though, I simply want to point out that just because someone knows more about micros than you do, don't automatically believe that he's going to be able to design you a satisfactory computer system. It's something you'll have to work at together.

My own early experiences as a programmer are probably typical: after taking an Arts degree, I joined Burroughs as a trainee programmer, took a one week course on the language, wrote a couple of programs to someone else's specification — and was then sent along to my first customer! I quickly realised that I didn't understand any of the names of the jobs I was required to do, let alone what they entailed. Fortunately, I had the presence of mind to ask for a practical demonstration of the work — before being written-off as a complete idiot. We started all over again, the customer going through all the stages, and me turning them into program instructions. Had my boss not picked an easy job for me to begin on, or had I tried to bluff an understanding of general ledgers, or had the user been less patient and careful in his explanations, that program would never have got off the ground.

"...the average user has no real idea what is involved in systems analysis."

It's conventional to start teaching the subject of systems analysis with an overview of the various stages in the implementation of a computer system — feasibility study, analysis, design, purchase of equipment, programming, testing, changeover and maintenance. This is basically the path the series will be following. The general approach remains the same whether you are dealing with a PET or an IBM 370. The differences lie in the relative complexity caused by the number of jobs and people involved (and the communication problem that may ensue) and the degree of specialisation called for. Systems analysis on a micro can be much less formal than on a mainframe and so, perhaps, much more fun.

I would like to complete this introduction by covering one of the stages in an implementation which is frequently skipped over by teachers and practitioners alike. . . one I call 'terms of reference'. A large company with its own DP department will be quite careful, when setting up major projects, to spell out in advance what jobs are to be computerised, and how much they are willing to spend. Unfortunately, as Mr Bloggs found out, it's easy to approach a problem with a strong idea that 'it ought to be computerised', without really knowing what 'it' is, or how much money is available.

To illustrate, another true story, or at least the gist of it, as told to me by the analyst concerned. A small business, I'll call it Smiths, had just been taken over by a larger firm who were very enthusiastic about computers. They saw that Smiths' books were in a bit of a muddle, and decided that the remedy would be a particular ledger posting package; Smiths' only book-keeper was therefore sent on a training course. As a concession, the parent company sent in an analyst to help them through the changeover. The analyst observed the piles of unposted bills etc., but refrained from comment.

He asked the supervisor to show him how each type of bill/payment was processed from the time it was received. The system seemed to be thorough and well thought out, and he was puzzled as to why it failed to work in practice. They had a standard NCR accounting machine which was slow and noisy, but quite adequate for the volumes being dealt with. It was only when he asked to see that actual posting process that he got a clue as to the real problem. The book-keeper was away on the course and no-one else know how to work the machine. It turned out that she also doubled as relief telephonist and general dogsbody and often had to leave the posting on one side where it inevitably got into a muddle. The supervisor, and everyone else in the office, knew that this was the problem — but no-one had felt brave enough to point this out to the boss, let alone to the firm who had taken them over.

So there was the answer, they didn't need a swish new microcomputer system, they needed a book-keeper who was allowed to concentrate on keeping the books! Unfortunately, there was nothing the analyst could do about it. The decision to buy the new system had been made before he was even called in. His terms of reference had been to help Smiths change over to the new system, and this he went on to do to the best of his ability. Of course if the bills were still left lying on the desk because the operator had to jump up and man the switchboard, then they wouldn't get posted to the micro any more than they would have been to the NCR machine, and all that money and effort would appear to have been wasted. The analyst had been given the wrong terms of reference.

Back again with Mr Bloggs and his garage, he knew very well he had a problem with his stock control. He felt sure the problem lay in the analysing of the data, and that a micro would make a much better job of this. Perhaps

GOTO page 124

Apple Price List

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Product Code	Description	Retail Price (£)
	HARDWARE	
A2S1016P	APPLE 16K VIDEO OUTPUT ONLY	695.00
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A2M0016	16K ADD ON RAM	69.00
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A2M0019	PROGRAMMERS AID 1	27.00
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A2D0006	CONTRIBUTED SOFTWARE VOLS 1-2	27.00
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A2D0010	DISC UTILITY PACK	15.00
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A2D0018	APPLE BOWLING DISCETTE	9.00
A2D0025	APPLE CASHIER PROGRAM	194.00
A2D0026	APPLE WORD PROCESSING PROGRAM	42.00
A2T0013	MICROCHESS 2.0 CHESS CASSETTE	15.00
E2D001	VISICALC DISC & BOOK COMPLETE	95.00

Product Code	Description	Retail Price (£)
	DOCUMENTATION	
A2L001A	APPLE II REFERENCE MANUAL	11.00
A2L0002	6502 HARDWARE MANUAL	9.00
A2L0003	6502 SOFTWARE MANUAL	9.00
A2L0005	APPLE II BASIC PROGRAM MANUAL	6.00
A2L0006	APPLE II REFERENCE MANUAL	6.00
A2L0012	DOS 3.2 MANUAL	6.00
A2L0018	APPLE II BASIC TUTORIAL MANUAL	6.00
	GENERAL ACCESSORIES	
A2D0000	(10) BLANK APPLE DISCETTES	32.40
A2M0009	VINYL CARRYING CASE	16.00
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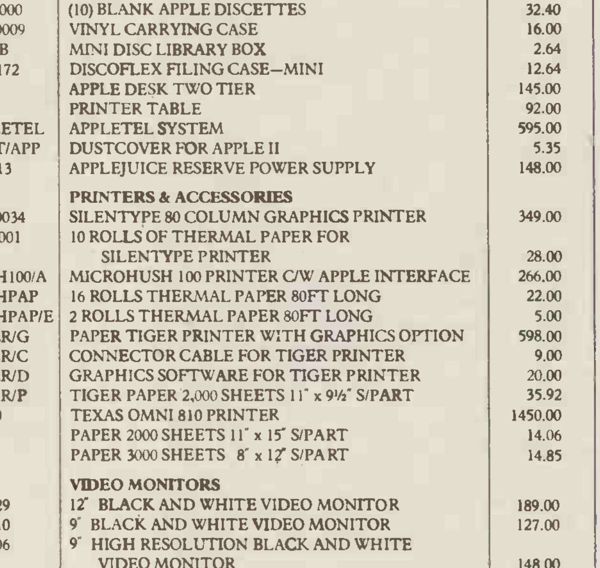

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COMPUTER ANSWERS

Each month Sheridan Williams and his panel of consultants answer readers questions. Topics may be hardware — from kits to mainframes, or software — from differential equations and statistics to file handling or sorting; the choice is yours. Send your questions direct to Sheridan Williams at 35 St Julians Road, St. Albans Herts.

Touchy technology

I know that mainframe computer installations are always air-conditioned. Would this also benefit my micro? Are there any other similar special conditions that are desirable for microcomputers?
K McGregor, Dundee.

Your question reminds me of the (true) story of one of the smaller mini-computers. Being aware of the air-conditioning needs you mention, the manufacturer was asked if its machine needed any special conditions or surroundings. "Just a normal office environment" was the answer. Came the day that the Installation Engineer arrived to size up the computer's future location, prior to delivery. "You can't put it in here!" he said, "With a South aspect" . . . "And where's the air-conditioning?"

When they thrust the bit about "just a normal office environment" in front of him, he said "but you must realise that we are an American Company!"

There was a happy ending, for it turned out that the air-conditioning was only partly for temperature control, it's other main function was to hold down dust levels. The machine was put in a room on the other side of the building — with a North aspect — the carpet was removed and all was well.

Now all this has two lessons for us microcomputer users. Firstly, that precise temperature control is not vital. What is important is to make sure that all the parts of the system are at the same temperature before use; that not only means *not* blasting a fan heater at the keyboard and expecting it to warm through instantly, it also includes all other parts of the system — tapes, disks, etc. Preferably, they should all have been in the same room for at least half an hour before use . . . longer if possible.

The other thing about temperature is the need to stop parts of the system suffering from their own manufactured heat. If the unit incorporates a cooling fan you should have no trouble (except during heat-waves!) but if it does not, then overheating — especially during long sessions — may account for inexplicable problems. The answer is to provide some kind of cooling fan yourself.

Why was the carpet taken up? Well, that particular system had hard disks (the removeable type), and these are very sensitive to dust. Floppy disks are not so affected, while tape will probably be quite happy in the average home environment. Also, carpets are breeders of static electricity and that's something which will cause errors if it gets near any kind of computer. One solution is to have a special 'anti-static' mat by the machine. Another is to have a convenient water-pipe or other electrical 'earth' by your computer (*don't* use the earth pin of a plug). Just touch this as you come up to your machine, and most static problems will be removed.

Probably the biggest environmental problem with microcomputers is interference through the electricity mains. This takes two common forms. Firstly, there can be voltage fluctuations, not only due to variations in the supply voltage (these are usually small, and slow to change), but also because some fairly large unit on the same circuit has just switched itself on or off. Deep freezes and ovens are well-known culprits.

The second form is even worse in terms of what it can do, especially if you have a program actually running at the time. This is the so-called 'mains spike', a sudden, brief, sharp increase (or sometimes decrease) in the voltage. These are also often caused by equipment being turned on, or more often, off. Fluorescent lamps are one of the main sources. Not only can this kind of interference travel down the mains lead, — it can also travel short distances through the air — as a magnetic field. So try to keep your equipment away from sources of 'spikes', and fit 'mains filter' units in the power lead if you are still troubled by them. Differing microcomputers are affected to varying extents, depending on the amount of built-in mains filtering they have.

One last point. Keep all your tapes and disks well out of the way of magnetic fields, whether from actual magnets, passing vacuum cleaner motors, or even screw drivers (which have a curious tendency to become quite strongly magnetised all on their own!). One of the best solutions is to keep them in a steel filing cabinet or cupboard . . . even a biscuit tin might do very well, always providing they don't make them out of aluminium these days!

P McIlmoyle

Letdown

I was delighted to see a games program called 'Sweeper' in the June issue of PCW. At last, I thought, a short program that will allow me to analyse and understand PEEKs and POKEs on my PET. After copying the program and running it I found that it didn't work. Have you any clues as to what the PEEKs and POKEs are doing so that I may correct the error? (I have a 32*k* PET.) E J Aston, Stafford.

First of all, it's not so much an error, more a difference between the new and old ROMs. Replace the 547 by a 151 *(or 166 — Ed.)* in line 370. In many respects PEEK and POKE are the most powerful commands in Basic. Each command looks at or alters a specific memory location. There are three general areas of interest that concern a PET owner. The first 1024 bytes of RAM, the display RAM from locations 32768 to 33767, and the peripheral interface and ROM above 59000. In the following notes I will refer only to 'new ROM' PETs — 'old ROM' figures are in brackets if they are different.

One of the major tasks performed by the 'sweeper' program is to scan the keyboard to see if a key is being held down; note the difference between this and the GET command. The GET command will only detect if a key has been pressed, not whether or not it's being held down. A two digit code unique to each key is stored in location 151(515) whenever a key is depressed. If no key is depressed, location 151 is set to 255. You'll need a table of values for each key before they can be used sensibly, but having explained what this location does then you should be able to write a program to produce this table for yourself. That ought to sort out your immediate problem. In 'Sweeper' — line 300 decodes the depressed key — for example if a one is pressed PEEK(151) returns a 26, D%(26) has the value 39 in line 300 so we add 39 to the last position of the cursor which moves it just short of one whole line further on. Perhaps you'd better read on a little further before you try to understand that bit.

Nothing to do with the program, but information about the 'shift' key is held in location 152(516), it being a 1 when pressed and a Ø when not. Locations 32768-33767 hold the screen contents, not in ASCII but in PET ASCII; POKE 32768, 1 will put an 'A' in the top left hand corner of the screen. Try 10 POKE 32768+INT(RND(1)*960), INT(RND(1)*255+1):GOTO 10.

There are two locations above 59000 that are of special interest—POKE 59468, 14 which produces a character set with upper & lower case and POKE 59468,12 which reverts to normal mode. POKE 59409,52 turns off the display and POKE 59409,60 will turn it on again. The difference between this and the 'clear screen' key is that the latter destroys the screen contents. Finally I suggest you, read *The PET Revealed* for any further information on the subject.

But whats it all for?

I am considering buying a small personal computer, paying no more than £200. Possibilities are the 'Acorn Atom', the 'Microtan 65' and the 'Nascom 1'. I learn far better by seeing and doing, rather than by reading, so my use of the machine would basically be for personal details/information/budgeting, etc — plus games. Obviously use would not be limited to these, but I am a little bemused as to what you can actually do with a computer, especially the machines mentioned. Can you help?
B.P Gower, Basildon.

Well, someone had to finally get around to asking the $ 64,000 question, "just what can you do with a microcomputer?"

For the person with enough interest to learn about them (and who has at least one ready application) many uses will soon emerge. Give a computer free to each family, and most would sit around gathering dust (and they're too big to make good paper weights!). But give one to the right person, and it will be kept really busy.

Just think through some of the fairly recent questions that have been answered in this column: an application in timing orienteering contests, keeping track of the competitors in pony trials, 'number crunching' for scientific work, and word processing, as well as the more usual book-keeping, invoicing, and stock control. Perhaps too the majority of the small machines are used quite extensively for games playing — partly just for the fun of it (and why not?), but also with educational bonus of getting children interested in maths.

One of the most constructive uses for these machines is in teaching people about computing, an area of expertise in which the country is crying out for more skilled people. Like you, I find that practical application is by far the best way of learning about computing. In fact 'hands-on' is widely regarded by computer professionals as being an essential aspect of effective learning. It most certainly speeds up the process.

There are a number of different areas of computing that you can investigate with machines of the type you mention. You can learn to program in a 'high-level' language such as Basic and from there you can go on to tackle assembler language and machine code. In fact, if you start with the simplest of machines you will have to begin with machine code, and work up to a high level language as you up-grade the computer to include an interpreter. However, I would strongly urge you to start with at least a 'tiny Basic'; it's quite enough to begin programming with Basic — grasping the fundamental ideas of logic, flow charts, and so on — without having to struggle with machine code as well.

If you buy your computer as a kit, then you can also learn about how computers are constructed, and how they work. A word of caution though — if you don't know anything about electronics, and soldering, then perhaps a kit is not the right approach for you. That said, however, I do know of at least one person who very successfully built a kit without previous practice of such skills.

These are a few of the things you can do with personal computers. If you keep an eye on the magazines (especially PCW!) you will soon learn of many more.
P McIlmoyle

Post analysis

Perhaps you could throw some light on the topic of 'information retrieval'. Basically what I require is to split my customers into geographical areas so that I may analyse results and plan delivery schedules using these areas.
J Baxter, Hythe

I feel that your choice of scheme will probably greatly affect the ease of use of your final system; as such, a fair amount of thought ought to go into the design. You could choose to use the Ordnance Survey grid system; or areas bounded by counties and towns; or even a quadrant of latitude and longitude! I think, though, the best solution would be the Post Office postcode system. It's come in for a lot of stick over the years, but it's bound to succeed in an age of computerised sorting. It has numerous advantages for large and small businesses, and from what I can see it has few, if any, disadvantages. Here are some advantages:

1. Every address in the UK is postcoded, and all new addresses are quickly added. Sets of directories are given free to businesses and reference is therefore easy.
2. Postcode boundaries are based on ease of access and distribution, rather than by other more arbitrary means.
3. Different sized reference units are available, from large areas right down to a few addresses.
4. It's meaningful to other organisations, and two-way exchange is made easier between companies using the postcode system.
5. Space is at a premium in computers and postcodes are compact. They are both shorter and more precise than most existing references and can be used as a key to generate full addresses.
6. As the system already exists you are saving the cost of devising your own in-house alternative.

The postcode system is being used by such large companies as Schweppes Ltd and Cadbury Typhoo Ltd. The Post Office offers many services, booklets and maps — they also offer micro-fiche and magnetic tape files covering the whole country. In addition they will generate postcodes for all addresses that you already have on file, or will supply Ordnance Survey grid references for postcodes. There are also lists of post towns and sectors.

I must admit to being shocked at the price quoted for the above mentioned magnetic tape — £5000; given that they needed to produce the file anyway for their own use, I would have thought that £100 would have covered costs. I'm not aware, at the present time, whether the data would fit onto an 8" floppy disk and whether they envisage offering the file on such a medium.

I feel that post codes could help a small business because, even if the company only operates within limited boundaries, the subdivisions of the postcode will allow small enough areas to manage;

for example the code MK42 9WA is broken down as follows: MK refers to one of 120 post-code areas (Milton Keynes in this case) MK42 is an area divided by carefully chosen units called districts (there are 2700 districts); each district is divided into smaller areas (MK42 9) called sectors — there are 8900 sectors; finally the complete postcode pinpoints one street, or part of a street, or in some cases a whole company. There are 1.5 million postcodes in the country.

I've referenced a good deal of this information from the booklet *Using Postcodes in Business Systems.* This and further details can be obtained from Cledwyn Davies or Kathy Buckley, Postcode Marketing Section, Postal Headquarters, St Martin's-le-Grand, London EC1A 1HQ Tel: 01-432 1620.
SW

Into the unknown

With regard to the Sinclair ZX80 and the Acorn Atom:
(1) Would it be possible for a user to construct a printer interface for the ZX80 that's currently on the market? Which printers would be suitable?
(2) What is the significance of the statement that the Acorn Atom printer drive consists of a 6522 and a pair of LS244 buffers? Which printers would be suitable?
(3) Would the fact that the ZX80 has a Z80 type CPU rather than the Atom's 6502 give the ZX80 any great advantage so far as the user is concerned?
L Wood, Bourne End.

I never fail to be amazed by what some people get up to! However, I shall assume in this case you mean an average user, without specialist electronic expertise, but with the ability to follow instructions carefully — and who can solder well.

Taking that as our basis, then I think I must answer 'no' to your first question. The ZX80 is indeed ingenious in offering the facilities it does — in a compact unit, and at a low price. However, this is achieved at the expense of a number of non-standard (perhaps I should say 'innovative') features. These combine to make the interfacing of a standard model of printer a difficult matter.

For a start, virtually all printers (apart from IBM ones, and Telex printers) use the ASCII character code. The ZX80 does not. That means you would have to use a lot of the ZX80 memory to contain a code translation program — or have another micro between it and the printer do to the job!

Secondly, the I/O routines make more than one use of some areas of memory (hence) the screen blanks out during keyboard input and program running) . . . therefore I/O routines are also non-standard.

And finally you need to buffer the bus lines before really contemplating connecting anything to them. I'm sure someone will soon prove me over-pessimistic by letting us know how they've attached a printer to a ZX80; for the rest of us it's a question of waiting for the special Sinclair printer to become available.

Turning to your second point, the whole I/O system of the Atom is much more like those we are used to, and there should be little real difficulty in interfacing a range of printers through the buffered interface. Apart from the ubiquitous Teletypes, you could consider printers such as those from Anadex, Centronics or Paper Tiger.

On your third question once again the answer really hinges around 'who is the user'. If you are only working in Basic (or some other high-level language) then there is really no noticeable difference in principle between machines using 6502s and those using Z80s. In fact, other things, such as the particular implementation of Basic used with your machine, will cause the most marked differences. The one that might show up is speed, and then only if the Z80 is a Z80A being run at a full 4 MHz. Even then, I sometimes wonder if a difference in speed of that order is significant to the typical amateur user.

Where the differences do show up is in machine code, or assembler language programming. Even then, while the Z80 has a more powerful instruction set, there are those programmers who prefer to work with 6502 assembler language. So, to sum up, the type of micro-processor used is unlikely to be significant in choosing between the Acorn Atom and the ZX80.
P McIlmoyle

Program puzzle

I've seen expressions like X=A AND 127 in programs and I can't work out what they are. Can you help? H Elliott, London.

You will need to know a little about binary and machine code to actually understand their purpose rather than just what it is they do. Essentially the statement above chops off the left-most bit of an 8-bit byte. The operators AND, OR and NOT are called logical operators. If Ø represents 'false' and 1 (on some Basics -1) represents 'true' then here is a table for the most commonly used operators:

A	B	A AND B	A OR B	A EQV B	A XOR B
Ø	Ø	Ø	Ø	1	Ø
Ø	1	Ø	1	Ø	1
1	Ø	Ø	1	Ø	1
1	1	1	1	1	Ø

There are others like NAND, NOR and IMP, but not many Basics support these. So, to answer your question; 127 in 8-bit binary is Ø1111111 and, if A has the value 1ØØØ1111, then X=ØØØØ1111. The expression you gave could be replaced by IF A>127 THEN A=A-128. You can try PRINT 143 AND 127 in the direct mode. Be warned, however some Basics do not support logical operators in arithmetic expressions.
SW

Routine suggestion

Can you suggest a routine for calculating the number of days between two given dates, either in the same year, or more cleverly, between different years.
L N Parlett, Bridport

The following program works, but you must have previously validated the dates; so, provided they are legal, this will work for any two dates between 1/3/1901 and 28/2/2400. (Can you see why it won't work outside this range?)

The year should be input in full. Some versions of Basic represent logical 'true' as a -1, some as 1. If you try PRINT 2<3 in direct mode and get -1 printed then use the bottom symbols; if you get 1 then use the top ones.
SW

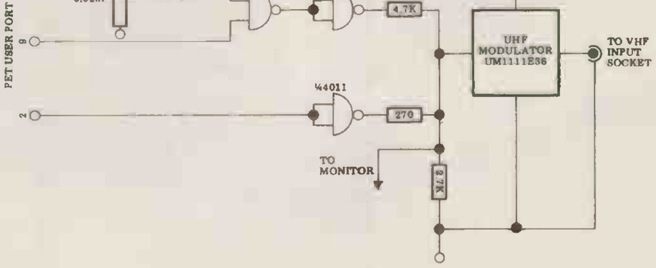
```
10 INPUT "FROM";D1,M1,Y1
20 INPUT "    TO";D2,M2,Y2
30 A=INT(365.25*(Y1±(M1<3)))±INT(30.6*(M1+1±(M1<3)*12))+D1
40 B=INT(365.25*(Y2±(M2<3)))±INT(30.6*(M2+1±(M2<3)*12))+D2
50 PRINT ABS(B-A),"Days"
```

PET display link

We have an 8k and a 32k PET and would like to link one of them to a large television set for classroom display. Can you please tell me what equipment is needed and how the connection is made.
G Cattanch, Tyne and Wear.

It's easy to attach an extra screen to the PET and I'm sure that your physics department will be able to make up the following circuit.

Fortunately the three video signals which go to the internal display are taken to contacts on the user port edge connector. The signals are: vertical sync, horizontal sync, and video – appearing at 9, 10, and 2 respectively. It's possible to combine these signals to drive a monitor or television set. The circuit shown is one that I've used successfully between a PET and my television. The horizontal sync pulse is shortened and inverted and combined with the vertical sync. The video signal is also inverted and added to this, to provide the composite video signal. A standard modulator module is used to give the necessary UHF output for a standard television set. The vertical hold will need some adjustment as the PET field scan runs at 60 Hz (American) rather than our 50 Hz.
Mark Wratten



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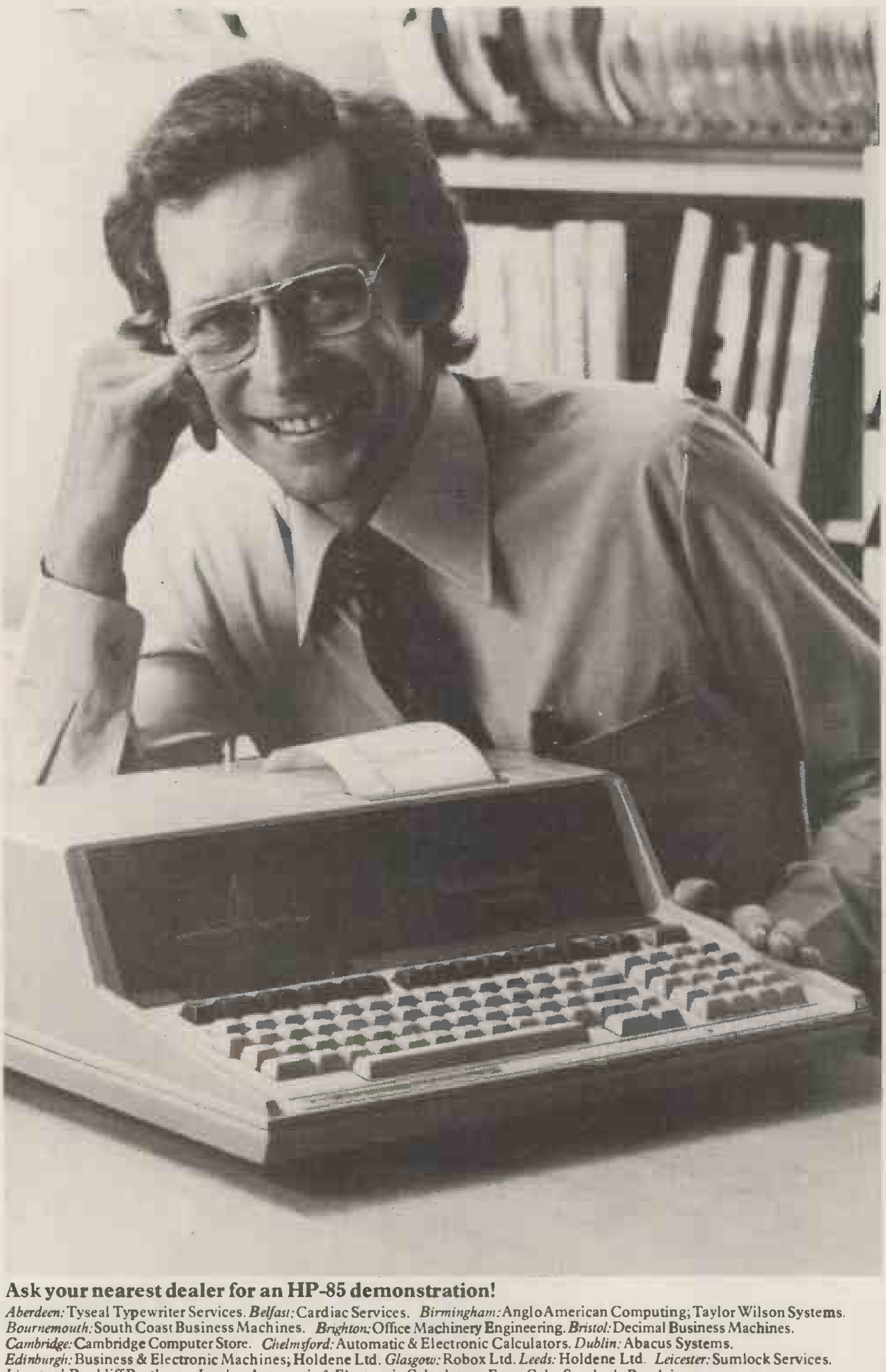

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PCW SUB SET

In a letter printed in the May issue of PCW readers were asked to submit Z80 general purpose routines to defined standards — for critical scrutiny and comparison with work done by others. The aim was to finish up with a valuable set of top quality routines that anyone could use. Several people said they liked the idea. . . even more important, some actually wrote in with suggestions. So the idea still lives and Alan Toothill tells how it has been shaped and where it moves on to from here.

8080 Compatibility

There was quite some support for forcing Z80 routines to be compatible with the 8080 and 8085 processors. No IX and IY registers! No relative jumps! No alternate register set! No block moves! Let's just collect the best routines the Z80 can execute, they said, and if they happen to be 8080 compatible, simply mention the fact in the documentation. Your Z80 routines that can be made compatible with the 8080, by changing a few instructions, may be changed and offered separately as 8080 datasheets.

Passing parameters

The original rules suggested that registers HL, DE, IX and IY be used as pointers to RAM and that registers B and BC be used to pass single and double byte counts.

It seems everyone has their own approach to passing parameters. I liked this one, adapted from the method used by PL/M, sent over from Holland by Ian Wilson:

— A single parameter is passed in BC (word) or C (byte).
— Two parameters are passed in BC (first) and DE (second) or C and E for bytes.
— A single result is returned in HL (word) or A (byte).
— Where a result may or may not be returned, the carry flag may be used as a status indicator.
— If more than two input parameters are passed, these are pushed onto the stack.

On balance, it's best to have no rules about passing parameters but rather to ensure that the documentation clearly shows what is done about this. Those with a system of their own can then adapt the routines to conform to their own standards.

Ian Wilson is against parameters embedded in the main program, following the CALL. Since he does show how we can access them, I quote him again:

Accessing these parameters is messy and inefficient with the Z80 architecture, especially when the called routine has no 'free' registers. The best I can do is something like this:

```
UGH:  EX (SP),HL   ; save HL & get
                   ; argument list
                   ; address in HL
      PUSH HL      ; save that, too
      INC  HL      ; point HL past
        :
        :
      INC  HL      ; end of arguments
      EX (SP),HL   ; return address
                   ; onto stack
                   ; arg list address to
                   ; HL
       / / /       ; body of routine
       / / /       ; stack has original
       / / /       ; HL
                   ; followed by
                   ; return address
EXIT: POP HL       ; return address
      EX (SP),HL   ; restore original
                   ; HL
      RET          ; phew!
```

You must admit that the extra coding needed in the routine is a bit much for the average byte-miser to stomach. On the other hand, routines with their parameters following the CALL can be easy to use. Those who rate ease of use higher than memory space will stick with them.

Routines with or without parameters after the CALL will be accepted. If the system you don't like is presented, you can have fun converting it to the other.

PROMable code

There was general agreement that routines shouldn't alter their own code — so that they can be put into some form of read only memory, if required.

Local RAM

The suggestion that the stack be used for any local RAM needed was not so well received.

Before we consider this, here is an important point about its use, put by R. J. Chance of Birmingham University:

If the stack pointer does not delimit the used RAM area, data could be overwritten by interrupt return addresses etc. Thus:

```
PUSH HL
LD HL,—2
ADD HL,SP   ; (HL), (HL+1) =
       SCRATCH
```

is not allowed.

The system might go:

```
PUSH HL
LD HL,—2
ADD HL,SP
LD SP,HL   ; (HL),(HL+1) = SCRATCH
; rest of
; subroutine
LD HL,2
ADD HL,SP
LD SP,HL
POP HL
RET
```

This clearly illustrates the penalty, in extra bytes of code, for having this system of allocating RAM only as needed and releasing it when it's no longer required. The penalty might seem excessive if only small areas of work space have to be provided.

An alternative is to dedicate to the routine an area in RAM not accessible by any other code. This might well take less RAM than the extra code (ROM?) needed to handle the stack; however, these dedicated areas would need careful mapping or labelling.

Re-entrant code

Having an area of RAM reserved exclusively for a particular routine wouldn't do if the routine were to be interrupted by some other code that called the same routine. In this case, the second time the routine was called it would also use the reserved RAM area and corrupt it for when execution of the original routine was resumed. Using the stack as local RAM avoids this problem.

Many of you might not be at the stage yet of switching control between programs running, in different time slots, over the same period. But some are doing this now and everyone is likely to want to do this some time in the future. So general purpose routines should allow for re-entrant code where possible.

Relocatable code

How much we want code that will function in any location without re-assembly, depends on whether or not we have an assembler.

With an assembler that requires a displacement with a relative jump, there's a case for absolute jumps. They are less error prone and the labels they use are unaffected by the deletion and insertion of code.

Even so, there's something very satisfying about code that functions regardless of where it's placed and, because it fits everybody's circumstances, must be preferred for general purpose routines.

New recommendations

Having been fairly taken to task for trying to impose rigid rules, we've now chosen to have two classes of routine, the class to be declared in the documentation.

Class 1 routines will be re-entrant, relocatable and will not be self-modifying.

The recommendations for these have been put most succinctly by R J

Chance:

. . . the purpose of such recommendations is to enable programmers to use package subroutines 'blind' or modify with least trouble for their own purposes. How about:

a) Promable code:
Routines should not alter their own opcodes.

b) Re-entrant code:
No explicit RAM addresses — supply data following subroutine call or in registers — use stack as scratch pad.

c) Blind use:
Save and restore registers not used for data transfer.

d) Interruption:
Addresses below the stack pointer (SP) must be unused. Do not use alternate register set.

e) Position independent code:
No absolute jumps or calls except to general routine area.

All 'rules' are breakable with justification, understanding and documentation. For example, routines that don't use the alternate register set may not be interruptable through time restrictions and may be degraded without the alternate register set.

The question of relative calls on the Z80 will be dealt with next month.

Routines not conforming to these recommendations will be in Class 2. They can either be incorporated with care into one's own system or after conversion into Class 1 routines.

Locating the routines

We can't give addresses for the general purpose routines, as different users will have already committed different areas of memory for various purposes.

It's worth adopting the suggestion of one reader that other routines in the library will be called by their labels in the mnemonic listing and the memory address in the machine code will be represented by the dummy symbols 'XX XX'. Should it be necessary (against standard practice) to make an absolute jump or call within the current routine, the address in the machine code listing will be represented by the symbols 'YY YY'.

Time critical routines

It was thought that time critical routines, such as DL1S given as an example in May, should be declared as such and documented down to the T states per instruction. There's now a section, inserted after the name in the second part of the documentation, to declare whether or not the routine is time critical.

DL1S was also criticised, by more than one reader, for not defining the number of repetitions of the loop, at the head of the listing:

N EQU 42551

and writing the third instruction

LD BC,N.

The second part description of DL1S now includes the additional explanation, 'Delay of 47*N + 103 T states.' At the end of each line of comment against the mnemonic, the number of T states for the instruction is given thus:

```
PUSH AF    ; save flags    T11    F5
```

Revised documention

1. The first part of the documentation, marked ';=', contains a header name of the routine.

2. The second part, marked ';/', contains a technical description, from which the routine could be used in a system, without necessarily understanding the code:

Section 1 gives the name, level and class of the routine. Routines that call no other routine are level 0; others are level 1. Routines that follow the recommendations are class 1; others are class 2.
Section 2 declares whether or not the routine is time critical.
Section 3 gives a brief description.
Section 4 gives the main actions carried out by the routine.
Section 5 specifies flags, registers, parameters, stack or other areas assumed to have meaningful values when the routine is called.
Section 6 specifies flags, registers and other areas containing results when the routine returns.
Section 7 gives the registers disturbed by use of the routine.
Section 8 gives the maximum number of bytes that could be added to the stack. This includes growth from the routine calling other routines but excludes the two bytes used by the main program call for its return address.
Section 9 gives the memory size of the routine.
Section 10 lists any monitor or general purpose routines on which the routine depends.
Section 11 gives any I/O interfaces, peripherals or local RAM areas needed.
Section 12 states whether or not the machine code is 8080 compatible.

3. The third part is a complete listing of the routine, with assembler mnemonics, comments (including T states if applicable) and machine code.

GO TO page 125

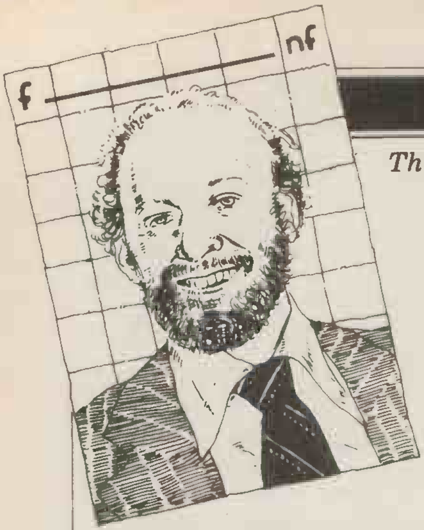
Datasheet

Roger Hargrave of Crawley sent this routine. He uses it to convert validated ASCII digits (from where he has entered them in video RAM) to a packed BCD field for processing elsewhere in RAM.

I would like to see in how few bytes readers can write a conversion routine, BFSN, which will convert a packed BCD field (and leave it unchanged) to an ASCII field with leading zeroes, but not the least significant of an all zero field, suppressed.

```
; =SNBF—ASCII/packed BCD
; /"SNBF" — level 0, class 1
; /TIME CRITICAL?: No
; /Converts valid ASCII decimal to packed BCD digits.
; /Leading spaces or zeroes converted to leading zeroes
; /ACTION:  A ← (DE)
;           high nibble (HL) ← low nibble A
;           DE ← DE—1
;           B ← B—1
;           A ← (DE)
;           low nibble (HL) ← high nibble (HL)
;           high nibble (HL) ← low nibble A
;           B ← B—1
;           DE ← DE—1
;           HL ← HL—1
;           Repeated until B=0
;           If B was odd number then:
;           low nibble (HL) ← high nibble (HL)
;           high nibble (HL) ← 0
; /INPUT:   DE contains address of least significant
; /         ASCII digit
; /         HL contains address of least significant byte
; /         of destination
; /         B contains number of digits to be loaded
; /OUTPUT:  The destination contains packed BCD corresponding
;           to the ASCII digits
; /REGS USED:  A,B,DE,HL
; /STACK USE:  Nil
; /LENGTH: 19
; /SUBR DEPENDENCIES: None
; /INTERFACES: None
; /8080 COMPATIBLE? No

SNBF:  LD A, (DE)    ; get ASCII                       1A
       RRD           ; load its low nibble into        ED 67
                     ; (HL) high nibble
       DEC DE        ; point next ASCII                1B
       DEC B         ; decrement counter               05
       JR Z, ODD     ; if finished,B was odd number    28 08
       LD A, (DE)    ; get next ASCII                  1A
       RRD           ; shift high to low nibble (HL)   ED 67
                     ; & replace with low nibble of A
       DEC DE        ; point next ASCII                1B
       DEC HL        ; point next destination          2B
       DJNZ SNBF     ; repeat if not finished          10 F2
       RET           ; return — B was even number      C9
ODD:   XOR A         ; clear A                         AF
       RRD           ; shift high to low nibble (HL)   ED 67
                     ; & replace with leading zero
       RET           ; return                          C9
```



BOOKFARE

This month Malcolm sets out to offend 95% of UK Micro users. Wethinks an unworthy ambition!

Getting down to Basics

Basic is a two-edged weapon. Its well-honed educational edge may slice through the 'mysteries' of software, but its jagged other-side could seriously wound some user relying on Basic to solve his business problems.

There are many experienced computing professionals who feel that the time cannot come quickly enough when Basic is at last relegated to a footnote in history — a bright comet which illuminated the world for a brief spell, then faded out. This is a view I wholeheartedly support, particularly after having had my anti-Basic prejudices reinforced by an interesting new book from the National Computing Centre, *High-Level Languages for Microprocessor Projects.*

The book's authors, *David Taylor* and *Lyndon Morgan*, don't themselves make a full-frontal assault on Basic, although they clearly point out its limitations. The most direct criticism comes in an Appendix written by R J Griggs of Software Architects Ltd (SAL) which explains why Cobol was preferred to Basic for an accounting package that was being developed.

Cobol outscored Basic on virtually every factor evaluated — efficiency of program execution and memory usage, reliability, flexibility, portability and data handling. Even when looking at the speed of implementation — one of Basic's strong points — SAL concluded that, in practice, "there is no difference in development effort (between Basic and Cobol) given a competent programmer in either language." As Griggs points out, program design and structure should involve about 60% of total development effort; therefore Basic's efficient interactive programming feature is outweighed by other considerations, particularly as interactive Cobol compilers, such as Microfocus' CIS Cobol, are now available on micros.

For the Zilog MCZ systems being used by SAL, it was found that the available Basic interpreter was twice as large as the Cobol one and that, on execution, Cobol code proved to be three times as fast as Basic. On memory optimisation, Griggs comments, "Basic allows little or no programmer control over how much memory variable data will occupy. Cobol, on the other hand, has quite extensive facilities to describe both size and format of memory storage locations. Furthermore, Cobol provides control over memory into which data received from peripheral devices will be stored. Again Basic is sadly lacking in this respect. For these and other reasons we found that the intermediate code produced by Basic was less compact than Cobol." Further comments from Griggs could be strung together to form an all-round attack:

"Cobol is certainly more self-documenting (than Basic) and lends itself to clear, orderly structures (which) are a considerable guarantee to a correctly functioning system . . .

"Basic proved incapable of providing the type of flexibility needed to create a system which could run in various modules with various extensions being added as required . . . . .

"Basic . . . suffers from a lack of any accepted industry standard and rewriting source code may be the price of adopting a new machine . . .

"In short, there is no doubt that Cobol provides by far the most comprehensive facilities for data management (compared to Basic) . . . ."

With reviews like this, even the most optimistic enthusiast would have difficulty in claiming that "Basic will run and run . . . . " But it will, primarily for those historical reasons which hitched Basic to the personal computing bandwagon.

In the main body of the book, the authors (Taylor and Morgan) place Basic and Cobol into a wider perspective by examining the general reasons why high level languages should be used on micros, the criteria that can be used to judge a 'good program' and the factors that should be taken into account when choosing a language for a particular application.

On Basic, they comment, "Basic is an enigma. Anyone approaching a microcomputer *must* know Basic because it is so universal. However, they must be aware of its limitations and the variety of implementations." They confirm Griggs' comments that its lack of standardisation and portability and its unsuitability for use in a structured approach to program design are serious drawbacks.

Taylor and Morgan's comments on Basic come in one of the most valuable parts of the book, a summary of the attributes of 17 high level languages available on micros. They are each considered under a similar set of headings such as history and background, program structure, data definition, input and output, implementation information and a summary of the main features. Although there is too much variation in the depth of information and analysis given to different languages, these succinct descriptions are useful for gaining an insight into the qualities and disadvantages of the languages.

A minor irritation, however, is the strange way in which the languages are ordered, which makes quick reference troublesome. I can detect little logic behind arranging the language summaries in the sequence: Algol 60, Pascal, PLZ/SYS, PLM, MPL, Coral 66, RTL/2, Fortran, Basic, Cobol, APL, Forth, Ada, BCPL, Lisp, Pilot and PL/1, particularly as an earlier summary in the book placed them in alphabetical order.

The number of languages included surprised even the authors; they started out imagining that the choice would be limited, given the initial orientation of the microprocessor industry towards low level assembler languages. In order to decide on which languages to include, they conducted a survey of manufacturers towards the end of 1979, which resulted in the 17 included.

Throughout the book, Taylor and Morgan rightly stress that the selection of an appropriate language is not the be-all and end-all of software development. Two chapters focus on the importance of using structured software design methodologies and implementing installation and international software standards in order to produce programs that meet their GRAPES criteria for good programming — Generality, Reliability, Adaptability, Portability, Efficiency and Simplicity.

Although they point out that good programming techniques are independent of any particular language, it's clear that Basic fails on some of the major criteria. Some language purists have also argued as vehemently as the anti-Basic brigade against such popular languages as Cobol — on the grounds that they were cobbled together from ad hoc standards and lack the elegance and coherence of the Algol-inspired language family, which includes Pascal and Ada. Over the last few decades however, sufficient support has been given to Cobol to overcome many of the criticisms. Taylor and Morgan quite rightly separate general language considerations from any particular linguistic partisanship. Their main proselyting pitch is in favour of high level languages in general. The book is therefore likely to be of most interest to those engineers or managers who have yet to realise the benefits of the high level approach — although data processing staff are likely to be illuminatingly surprised at the range of languages available. In pre-micro days, don't forget, the size of high level languages and the associated expense of storage restricted a language like Cobol to larger machines.

The book's main value is as a 'taster' to the possibilities of high level languages and software engineering techniques. To those Basic freaks who are bitten by the Cobol bug, *Structured Cobol Programming* by *Nancy and Robert A Stern*, now in its third edition, is a good training guide. It will also be of interest to those computing professionals who are sceptical about Cobol's suitability for structured techniques.

The Sterns have written the latest edition by assuming from the start that structured programming is to be used. The description of Cobol is therefore presented without any preliminary justification of structured techniques although these are introduced intrinsically in the example programs described. As the use of GO TO statements are generally anathema to structured programming techniques, they are avoided until over half way through the book — and are then introduced only to show the few instances in which GO TOs can be used effectively within well-structured programs.

All this talk of Cobol and structured techniques may seem remote from the programming life of some personal computer 'hobbyists'. But everyone wishing to use a computer for more than educational and game playing applications will be foolish to ignore us anti-Basicists; let them beware their enigmatic, two-edged Basic desires.

Understanding roadblocks!

"Now, how do these robots differ from the silicon chips we heard about six months ago." That was the opening question of a recent interview on Radio Wales which left the interviewee dumbfounded. I know, because I was the interviewee.

And something funny also happened to me on my way to the interview at Broadcasting House (in London). At the recording studio I met a Beeb lady on her way out carrying a bundle of tapes. "What have you come to talk about?" she enquired. "Robots," I (think) I said. She too looked dumbfounded. "Oh what's interesting about them," she asked, edging out of the door. "Lots," I started rambling, "they use silicon chips and . . . . " Before I could finish, she was gone, muttering, "I hope you have an interesting discussion about roadblocks."

Such is the confusion that currently reigns in the media about technology. And I still wonder if somewhere in the Beeb there is a rumour going round — or even a programme being made — about the way silicon chips are revolutionising roadblocks.

The Radio Wales interview took place earlier this year, when robots had suddenly become the current technological 'miracle' — one which could cure Britain's industrial decline and entirely changing the nature of society. And after robots (not to mention roadblocks) came bio-technology. By the time this is published, who knows what new technological revolution may be upon us.

All this is by way of introduction to *Robots in Industry* by *G L Simons*, a no-nonsense factual description of the current state of the industrial art of robotics. Appropriately, it's published by the National Computing Centre, an organisation that's in the business of providing factual information about the nature and uses of computing.

If you would like to know what's actually happening with the use of robots in industry rather than what *might* happen, this is an excellent starting point. Simons provides sufficient historical backing and futuristic perspective to place current developments into context; the meat of the text, however, concerns the types of robots and robot applications that actually exist — and nothing whatsoever about roadblocks!

Intro and Outro

As I have written before in PCW, there are two types of 'Intro to Mini/Micro' books. There are those which begin with binary numbers and other nitty grotty (sic) details — which are suitable for potential computer scientists, perhaps — and there are those which start from the perspective of the user which usually offer a more effective insight into the nature of the technology for the average, non-specialist reader.

Introduction to Minicomputers and Microcomputers by *M E Sloan* stands firmly in the binary-oriented camp. As such, it contains the topics you would expect, moving from binary representations, through flowcharts programming on minis and micros, systems software to data structures, high level languages and so on.

It has almost 500 pages and never stints on going into detail. It's workmanlike in its presentation, without showing any particular communicative flair. But if you feel drawn to this type of thorough-going approach to the technology, you might as well take a look at this (for me, boring) example of one school of Intro books.

Free plug

One of Malcolm's many hats is that of Chairman of the British Computer Society's Computers and Employment Group. Using that as an excuse, he's slipped us its annotated bibliography *Computers and Employment* and asked us to mention it — review it even.

Well, despite the fact that PCW doesn't even rate a mention, it must be said that this publication is an essential reference work for anyone seriously concerned about the impact of computers on employment.

The aim of the bibliography is to indicate sources of information about the 'Great Debate' on the effects of computers, microelectronics and telecommunications on the workplace. Its scope is far wider than just the question of how many people will/will not be thrown out of a job by the chip. Particular emphasis is given to information on changes in the nature of work and new skill requirements. There are, therefore, sections on specific job categories and skills, such as engineers, designers and managers in manufacturing industry, as well as on applications such as banking, printing and the health services.

In addition some key issues are identified such as health and safety, the Third World, education and job design, which indicates the wide range of interrelated topics which need to be considered. The main publications in each section are described briefly.

The bibliography ends with a general list of relevant articles which have appeared in newspapers and magazines recently but not, we're astonished to note, in PCW!!!

The first edition was published with assistance from ICL. It is planned to publish updates from time to time. The first edition costs £3.50 including postage and packing — cheques with orders please to the lad himself: Malcolm Peltu, 33b Chiswick Lane, London W4 2LR. If you're interested in future updates we suggest you contact Malcolm for further information.

This month, Bookfare reviewed:
High-level Languages for Microprocessor Projects by D Taylor and L Morgan (NCC Publications, £15.00)
Structured Cobol Programming by Nancy B Stern and Robert A Stern (John Wiley & Sons, £8.65)
Robots in Industry by G L Simons (NCC Publications, £10.00)
Introduction to Minicomputers and Microcomputers by M E Sloan (Addison-Wesley, £10.50).
Computers and Employment BCS Computers and Employment Group (BCS/ICL, £3.50)

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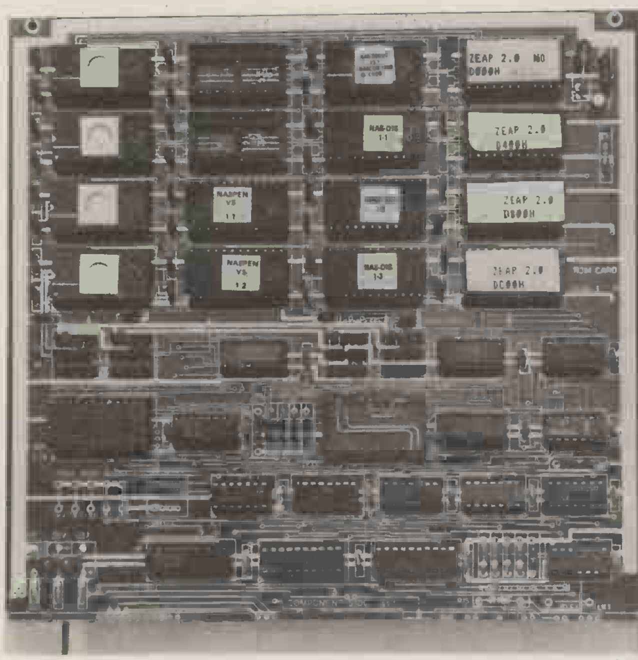

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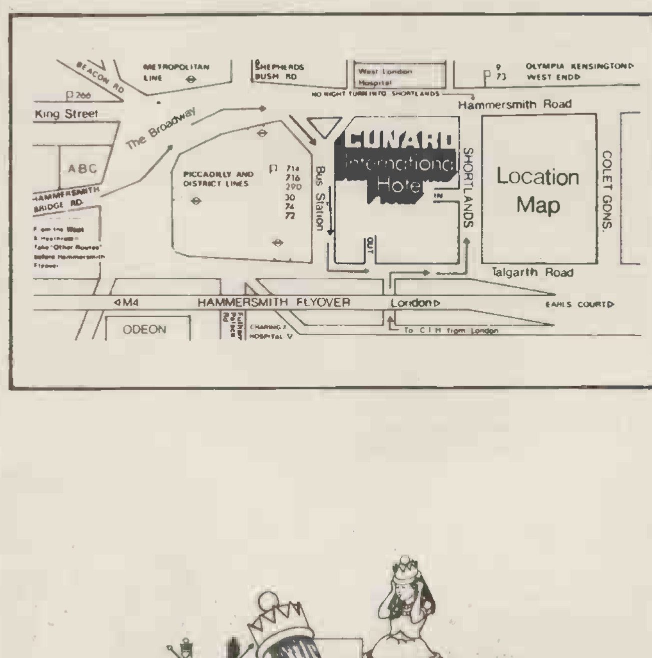
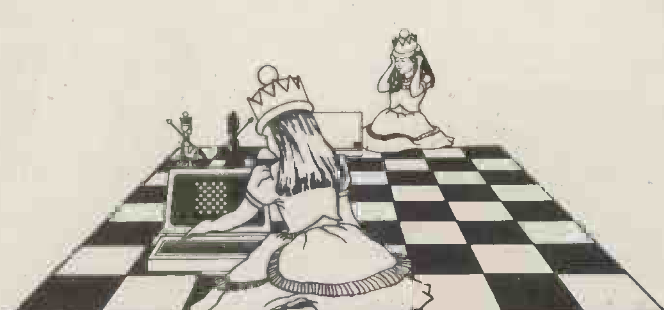




WORLD MICROCOMPUTER CHESS CHAMPIONSHIP

The chess championship runs concurrently with the 3rd PCW show; admission to the show includes admission to the chess contest.

Our resident micro chess expert Kevin O'Connell reports on an interesting chess contest with a difference — it's one that's being fought out in the law courts.

WHO'S KING?

The strongest chess playing program currently on the market is that produced by the husband and wife team of Dan and Kathe Spracklen. The program is 'Sargon 2.5' or, alternatively, 'Boris 2.5'; they're identical except that Sargon is manufactured by Applied Concepts Inc. of Texas and marketed by Chafitz Inc of Maryland, while Boris is both manufactured and marketed by Applied Concepts. A little disagreement between the two companies has given rise to the two names and at least one lawsuit that's reputed to involve around 12 megabucks.

Applied Concepts, who have registered 'Boris' as their trademark, use the advertising slogan 'Boris is King', while 'Sargon', for those of you who have forgotten more Assyrian and Babylonian than you ever learned, means 'Declared King'. The direct line of descent, incidentally, is: Sargon I (ca 3000 BC), Sargon II (722—705 BC) and Sargon 2.5 (1979 —). One more juicy palace intrigue before looking at the program: the Spracklens were made a rather tempting offer by Fidelity Electronics (manufacturers of the Chess Challenger range) to commit infanticide and join the forces of the vociferous young pretender to the throne.

Boris 2.5/Sargon 2.5 usually comes in the form of a module for the Applied Concepts/Chafitz Modular Game System. Before I go any further along this treacherous path I propose to adopt the following terminology: Sargon for the program and Applied Concepts for the manufacturer/marketer.

The concept of a modular system is basically a good one. The idea is that when the program is improved, you can simply buy a new module rather than a whole new machine. However, it's somewhat doubtful whether any significant increase in playing strength can be effected with 8k of ROM and 1k of RAM. If you increase the amount of RAM you can certainly achieve more. The trouble with that, though, is that you may be left in the somewhat unhappy position of keeping the 8k ROM module and buying a new system to plug it into! Nevertheless, Terry Knight of Competence (the UK distributors) has the novel idea of an 8k module to play the opening, then another to handle the middlegame and, finally, almost 8k of look-up tables to play a formidable endgame.

Sargon is one of the very few machines to have established a significant track record in competitions. Way back in March 1978 an early version won the first ever microcomputer chess tournament in San Jose, California, with a clean score, finishing ahead of the Commodore Chessmate, Boris and Chess Challenger — all of whom tied for second place. In the 1978 North American Computer Championship Sargon II finished third behind two monsters: Belle and Chess 4.7. Last year the upgraded version, Sargon 3, won the PCW tournament with a clean score and placed 7th equal in the North American Computer Championship. That same year it also played in a tournament that was basically for humans in the Paul Masson vineyards in California. The program, unaffected by the vinous surroundings, made a plus score and achieved an official rating of 1641 (playing on its level 4).

There is a worldwide rating system for chess players: Here are a few figures to help put Sargon in perspective. The reigning world champions are: Anatoly Karpov (human) 2725, Maya Chiburdanidze (human, female) 2400, Yasser Seirawan (human, junior) 2510, Chess 4.6 (computer) 2100. A rating of 2200 indicates master level. Sargon currently rates about the same as a moderately good club player.

Sargon has seven levels of play, five of which have a reasonable average response time: level 0 (instant response), level 1 (10 seconds), level 2 (20 seconds), level 3 (45 seconds), level 4 (2 minutes). In play it can seem to respond even more quickly because the program, having played its move, continues to analyse a tree based on what it considers to be the most likely reply by the opponent.

Sargon's playing strength vis-a-vis the other good chess machines on the market can be judged from its 10—7 victory over Chess Champion System III (reviewed last month), which in turn defeated the Voice Challenger by 10—7. If you are one of the very few thousand serious chess players in this country, playing regularly in club and tournament competition, then at the moment Sargon may be the only program to offer you stiff enough opposition.

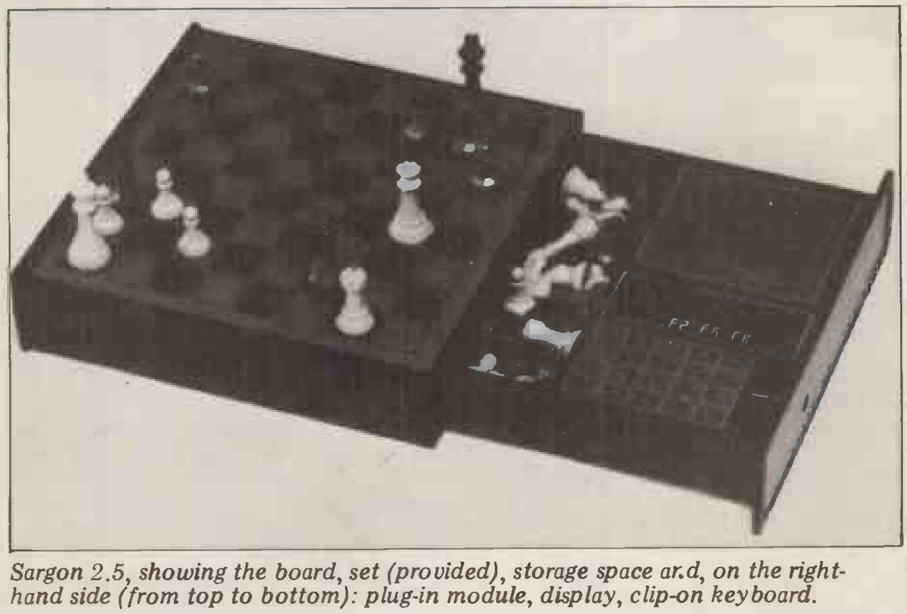
The basic operation of Sargon is easy enough in its game playing mode and setting up a position is also quite straightforward. There is a 'restore' key which enables you to take back up to six ply (three moves for each side), two ply at a time, but you can never restore back to the original position. Thus, if you are anxious to play a particular opening, you have to run through the laborious process of switching the machine off and on, each time waiting while 'Sargon awaits your move' scrolls across the display and hoping all the while to achieve the opening of your choice.

There is one thing about Sargon 2.5 which I hate — the 60-odd (or 60 odd) messages which appear on the display from time to time. They range from the sublime ('woops') to the ridiculous ('are there ladies present?'). Apparently customers are about equally divided in liking or disliking them. However, it seems to me to be simply a waste of about 1k of ROM and an unforgivable mistake on the designer's part that you cannot exclude them, even if you want to.

You can find Sargon in most department stores or mail order firms such as AJD Direct Supplies, 102 Bellegrove Road, Welling, Kent DA16 3QD, whom I have to thank for the loan of my review copy. It will cost you in the region of £270-280. As an alternative, you can get a slightly weaker version of the program, for about £8.90, in the form of *Sargon, A Computer Chess Program* by Dan and Kathe Spracklen, published by Hayden (UK distributor — Butterworth). Of course, for this version you will need a few other things: some time, a steady typing speed and a system that uses Z80 assembler, (minimum 8k RAM). Preferably your Reset button will be safely mounted at the back of your system, if not then allow *lots* of time for keying in!

There is also a more expensive ready-made version, with an 'auto response board', which sells at £695. If money means nothing to you, then take a look at it; the craftsmanship of the inlaid wooden board is superb. This version has another great asset: since it has no display (moves are indicated by LEDs inset into the 64 squares) the comments have been excluded and replaced, I am told, by extra openings.

GOTO page 123



Sargon 2.5, showing the board, set (provided), storage space ar.d, on the right-hand side (from top to bottom): plug-in module, display, clip-on keyboard.

CBM 8032

Some call it the Jumbo, others refer to the SuperPET, but image-conscious Commodore has christened its 80-column PET the CBM Model 8032. It no doubt feels that PET is a bit of a silly name for a machine so clearly aimed at the business market. This month PET wizard Peter Calver of Supersoft and our own David Tebbutt put the system through its paces and assess its chances of success.

Commodore's long-awaited new computer comes as welcome news to all those who want a PET but feel it's not quite 'grown-up' enough for them. Mainly businessmen, they will find the 80-column screen and full keyboard overcome most of the earlier machine's limitations. Programmers used to the PET will find the new computer a bit annoying at first but they'll soon get over that.

Only one model will be offered — the 8032 with 32k of RAM of which 1k is reserved for system use; the rest is available to the user. As with PET, the Basic interpreter and the monitor are safely tucked away in ROM.

Apart from one or two problems when the machine was delivered (it was 'dead on arrival') it performed well during the review period. The faults were identified as a disconnected video cable and a crimped-through keyboard wire. Our thanks to Cream Microcomputer Shop and Commodore for the swift diagnosis and repair.

Hardware

The 8032 retains many of the features of its illustrious predecessors. The integral 12" 'green screen' monitor is fixed to the main unit which incorporates a standard typewriter keyboard, numeric keypad and half a dozen control keys. With its metal casing it weighs in at around 50 lbs (for the benefit of younger readers, that's about 22 kilograms) and the whole unit fits adequately into the passenger seat of

Technical Data

CPU:	6502
Memory:	32k (31k user) RAM
Keyboard:	Full ASCII, numeric pad, full cursor controls
Screen:	25 lines x 80 characters, green, memory mapped
Disk Drive:	Coming soon — twin 5¼", 950k
Bus:	IEEE-488
Ports:	Cassette, memory expansion, parallel
System Software:	DOS and Monitor
Languages:	Basic

an MGB although, for the review, it seemed more at home on the dining room table.

Despite Commodore's anxiety to dissociate the 8032 from the PET, the two are very similar in appearance and performance. Games addicts will be pleased to learn that all the graphics characters can be displayed, although only 26 of them are accessible from the keyboard. 'Pi' is one useful character that's all but lost. While Commodore is clearly right to offer a typewriter keyboard there are many thousands of PET programmers who will find it strange that they must press the shift key to generate even common characters such as plus signs or quotes. Perhaps Commodore would like to consider a graphics keyboard option as it does with the PET. Three new keys have been added — tab, escape and repeat, and the run/stop key has been sensibly moved out of harm's way to the top right of the main keyboard. The feel of the keys is neither better nor worse than on most other machines, and they have the same tendency to emit strange 'boings' when released quickly.

The screen can display 2000 characters in 25 lines of 80 columns. The character generator in ROM contains two sets of 128 characters, each of which may be displayed as green on black or vice versa. Although Commodore isn't offering alternative character sets, it would appear that the standard chip could be replaced by a 2716 or similar EPROM. Switching between the two character sets is performed in software, either by POKEing location 59468 (as on PET) or by printing a control character.

The usable screen area is about 8½" wide by about 6½" deep and, to maintain the proportion of text, there is a blank strip between each line of the display while in text mode. Although graphics characters may be displayed while the screen is configured for text, they appear strangely disjointed so Commodore has incorporated a special 'graphics' display mode. The key sequence print-quote-escape-reverse-shift-N-return (don't worry, you'll soon get the hang of it) removes the interleaving blank strips from the display which then reduces in height to a little over 5". The characters don't alter in size and text is quite readable, albeit a little cramped.

Programs and data may be stored either on cassette or disk though neither unit is supplied with the machine. Commodore sells a cassette unit without sound or tape counter for £55 plus VAT, and the 3040 floppy disk unit, costing £695, provides 343k of user storage. Only one unit can be connected, so it is good news that a new dual drive (the 8050 offering 950k) is due for release shortly at £895. A 3040 disk unit was loaned for the review and any comments will relate to this model.

The innards of the 8032 appear little different to those of its more recent predecessors, though the layout of the main board has been turned through 90 degrees so that the RAM chips now run alongside the heatsink. A larger Basic and operating system mean that only two sockets are left for ROM/PROM expansion — the addresses from B000H to BFFFH have already been taken. Given that the 8000 series is meant for serious users, it's not surprising that Commodore has failed to publicise the built-in soundbox. Come to think of it they might have trouble with the Trades Description Act if they did. Its only built-in function is a 'bell' that chirps five characters before the end of each line with a sound reminiscent of chalk on a shiny blackboard. The bell effect is achieved by playing a jolly jingle, the speed of which can be varied from 0 to 2¾ seconds by POKEing 231 with a value from 0 to 255 — Commodore uses 16. Prospective buyers are strongly recommended to try 'POKE 231,0' when the salesman's back is turned.

Connections to the outside world are exactly the same as on the PET: an IEEE-488 interface, a parallel user port, a cassette interface and a memory expansion port. The most useful of these is the IEEE-488 edge connector to which Commodore printers and disks may be attached as well as the more usual scientific and laboratory equipment. Other makes of peripheral may require a special interface between them and the 8032.

Software

The 8032 comes with Basic 4.0 in ROM. Existing PET owners will be pleased to learn that the garbage collection problem is responding to treatment, though it has unpleasant side effects — more about that later. The other major change is that 15 disk commands have been added, representing a vast improvement on the previous disk handling procedures.

One of the 8000 series brochures refers to 24k of ROM. The review machine was presumably still growing, because we could find only 18k, of which 1k was unused. If Commodore expands its Basic it should consider adding commands such as LINE INPUT, INSTRING and MERGE, which are very noticeable by their absence.

An interesting feature of the CBM range is that only the most rudimentary disk handling is carried out by the main processor. Most of the work is carried out by another 6502 housed in the disk unit, and therefore many functions take up very little of the 8032's processor time. The disk unit tested was fitted with DOS 2.1 ROMs which are free from most of the bugs which plagued earlier versions. However, the use of DLOAD to chain from one program to a larger one results in the second program being corrupted and this could prove a slight problem for those writing large systems. Although CBM's relative (ie random) file handling is somewhat esoteric, after a few hours we felt quite at home with the commands.

Data storage efficiency is somewhat erratic, ranging from the sublime, in which records are allowed to cross physical sector boundaries, to the ridiculous, where numbers stored on disk take up one byte per digit plus one for the decimal point, if any. (In RAM, integers are stored in two bytes while five are used for floating-point numbers. Unfortunately, there is no easy way of writing data to disk in this form.) There are two basic methods of inputting data from a disk record: GET# which fetches one character and INPUT# which reads until it reaches a carriage return — more than 80 characters in a field will give a 'string too long' error.

The good news for machine code freaks is that the 'TIM' monitor is unchanged; the bad news is that the second cassette buffer is no longer freely available. It appears that 40 bytes at the bottom are used by the disk commands, and 20 bytes just below the start of Basic are used for tabs and other, unidentified, purposes. Up to 80 horizontal tabs may be set by pressing shift-tab, but the same key combination is also used to clear them, so you must be careful. Unfortunately tabs do not affect a printer and pressing the tab key when past the last tab stop takes you to the end of that line, not to the first tab position on the next.

The most exciting new function must be the auto repeat on the cursor movement, INS/DEL and SPACE keys. All other keys will repeat when pressed in conjunction with the REPEAT key. Other screen handling functions allow you to insert or delete a line at the current cursor position, erase the current line up to or from the cursor and even scroll the screen up or down irrespective of the cursor position. Text editing is an obvious application for these new features, but no doubt programmers up and down the country will be frantically searching for others.

The facility that sets the 8032 apart from many other micros is its ability to restrict scrolling and all other screen functions to a rectangular 'window', the size and position of which is set by the user. Four locations in page zero are used to define it, and it's probably simpler to POKE these locations rather than move the cursor to the corners of the window and print the appropriate control characters. The window can be dismantled by pressing the HOME key twice in succession — something the programmer will have to trap. For some reason (a bug?) tabs included in the Basic statements are calculated not from the left margin of the window, but from the left of the full screen.

Even more mysterious is the 'STRING TOO LONG' error which appears only when the left margin of the window is set greater than 10, and the RETURN key is hit immediately after the CLEAR key.

The only criticism of the screen functions is that they're not readily available from the keyboard — they're generated by printing an appropriate reverse field

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A Member of the Grand Metropolitan Group different and definite command; that's something that should help to minimise accidental loss of programs. Dotted throughout the 7120 are little attentions to detail like this and while some grate a bit, many others are well worth while.

Documentation

In a word — poor — but BASF is re-writing it and the new issues should be out soon. I don't know quite how it got as bad as it has for essentially it lacks any structure whatsoever and flits from talking about the BOS to Basic to machine code routines willy-nilly. I suspect that it may have originated from the US as I have yet to see any consistently good documentation from over there that can be read through and understood in one go — in fairness I'd very much like to see the re-write. I sincerely hope that BASF drops all references using 8080 mnemonics when dealing with machine code routines. The assembler does that and it's positively archaic; BASF would appear to agree with me as the company isn't actively marketing any assembler per se at the moment.

Potential users

Clearly, the 7120 has been designed with the business market in mind and in particular those areas where communication to other computers etc is important. Applications software is rather scarce at the moment but BASF is building up a library of suitable programs that will be circulated among its dealers.

The poor accuracy of the MATHLIB package, lack of multi-dimensional arrays, and the apparent lack of facilities for connecting up scientific paraphernalia directly to the bus would seem to rule the 7120 out from this area. Likewise, its high price may effectively exclude it from all but the richest educational establishments.

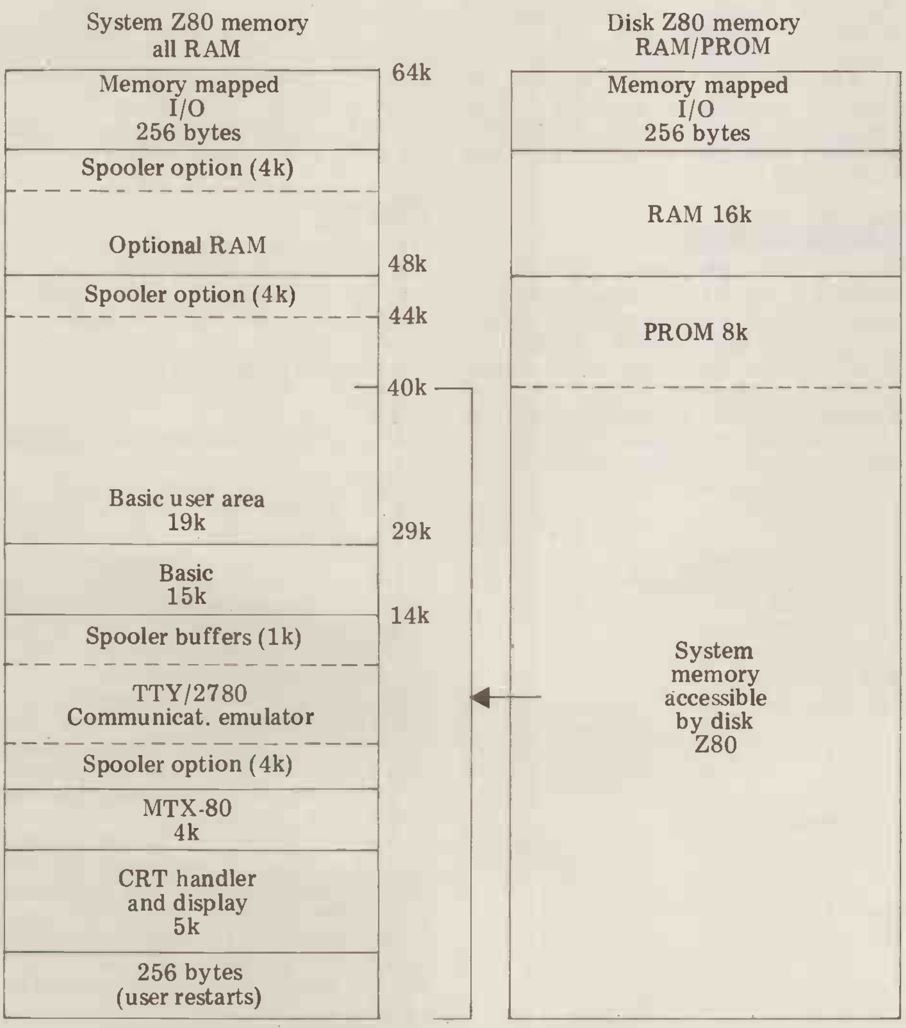
Conclusion

The 7120 is an extremely well integrated system that possesses many extensive extra facilities built-in. It has definitely been designed to be used in conjunction with other computers via its comprehensive communications and multi-tasking routines and I regret to say that I've only had the time to scratch at the surface of all the possibilities; I've probably left out many features that others might consider to be more important than the ones that I've chosen to mention. There are some other systems around that possess some similar facilities — although not necessarily all that the 7120 offers. These systems tend to compare more favourably on cost. . . I feel the price of the 7120 is a shade high, even with all its facilities. To some, the current storage capacity may not be enough — particularly as right now further expansion is limited. However, when the fixed disk is added next year, these problems will disappear, although that'll possibly leave behind the question of ease of back-up with the remaining floppy drive.

The catalog is poor, as is the documentation, but steps are in hand to improve the latter. The maths handling — particularly the trig functions — are slow and don't always reflect the system's intended precision (although in practical terms this is of little consequence for most application programs). Again, BASF is aware of this and is taking steps to remedy it.

Once the user has got used to the SOM/EOM operation the on-screen editing leaps out at you and is a joy to use. So too is the machine in general. . . it's very user friendly once you've got used to some of its little quirks. The system utilities are generally very good although their ease of operation could be improved and the very minor bugs that I found ought to be removed.

The 7120 wins hands down on the sheer versatility and number of facilities offered — albeit at a high price. It was a brave move of BASF to avoid the S100 CP/M bandwagon and, providing enough application software comes along, then this decision should prove to be the right one.



NOTE: System Z80 can not access any of the disk Z80 memory

Figure 2 BASF 7120 Memory Map

Acknowledgement

My thanks to go Paul Raggett and Gordon Hughes of BASF for patiently answering my many questions.

At a glance

FIRST IMPRESSIONS	
Looks	*****
Setting up	****
Ease of use	***
HIGH LEVEL LANGUAGES	
Basic	****
Cobol	***
Fortran	n/a
Pascal	n/a
System software	*****
PACKAGES	n/a
PERFORMANCE	
Processor	*****
Cassette	n/a
Disk	****
Bus	n/a
EXPANDABILITY	
Memory	n/a
Cassettes	n/a
Disks	n/a
Bus	**
COMPATIBILITY	
Hardware	**
Software	**
DOCUMENTATION	*
VALUE FOR MONEY	****

***** excellent
**** v. good
*** good
** fair
* poor

FREE-FORMAT DIALOGUES

David Hebditch continues his series on the man/machine interface.

Dialogue styles fall into two very broad categories, free-format and formatted (or structured).

We will consider the latter next month and in this article I shall concentrate on free-format interactions between user and system. Most commercial dialogues tend to be highly structured, using formatted screens for data-entry, multi-choice menus, query-by-example and so on. The general view seems to be that the structured approach increases the ease with which the dialogue can be learned and used in practice.

There are no clear definitions which could help us to differentiate between the two categories; the boundary is very fuzzy. But essentially 'free-format' dialogues are those relatively free of syntax and formatting rules. The use of the word 'relatively' is important — nothing can be entirely free of restrictions. Perhaps the key concept is concerned with providing the maximum amount of flexibility in the way in which data can be presented by the user to the system (and vice versa). This contrasts with the structured approach which aims at restricting possibilities.

So different dialogue styles offer users varying *degrees of freedom*. To appreciate this is important; a dialogue has to be designed to offer its most likely users the level of flexibility with which they feel most comfortable. To provide a user with too many possibilities can be as disconcerting for him as offering too few. And, of course, users do vary in their needs; I am sure that after 12 years of working with interactive systems of great variety, I am happier with very open and flexible dialogues than the average first-time user.

If 'free-format' dialogues are not being used too much in regular commercial applications, where *are* they being used? Well, when you type a Basic program into your PET (or whatever) you are making use of a special-purpose free-format dialogue. The CP/M operating system also employs a relatively 'free' approach; obviously, syntax rules do exist but the program does not control your input on an individual item-by-item (or even character-by-character) basis.

What are the various elements we need to consider in designing a free-format dialogue? These are shown schematically in Figure 2. Each is discussed individually below.

Delimiters

Because free-format input messages are entered as a character string, some convention needs to be employed in order to mark the beginning of one item (or field) and the end of the previous one. In many dialogues, a space may be employed for this purpose but this will obviously be ambiguous when text is being entered. Popular characters for use as delimiters are:

'—' hyphen
':' colon
'/' oblique stroke
'( )' left and right brackets
'=' equals
'.' point
',' comma

and so on.

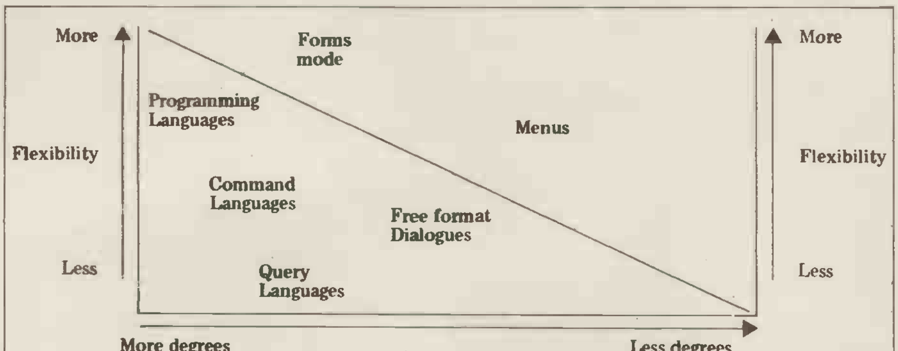


Figure 1 Interactive Dialogues and Degrees of Freedom

A number of factors condition the choice of delimiters:

— avoidance of ambiguity
— ease of location on the keyboard and
— special usage (e.g. the comma used to separate items entered to a Basic INPUT statement).

In many cases, a delimiter can be *implied*. For example, the 15th August 1980 may be entered as:

15.8.80

using the point as a delimiter or as

15AUG80

using the changes from numeric to alphabetic and back again to differentiate the various sub-items. In some cases, a choice delimiter (e.g. ' — ', ' / ' or ' . ' in dates) might serve to make the dialogue more user-friendly

Items

The items which the delimiters frame may be employed for a number of purposes according to the function of the dialogue. Items usually contain:

— commands
— command parameters or, more usually,
— data.

Some examples will serve to illustrate this:

PIP B:PROG1.BAS=A:PROG2.BAS

This is a CP/M PIP utility input line which means "Copy the Basic program file called PROG2 on diskette drive A to diskette drive B and rename it as PROG1." A space delimits the PIP activation command from the rest of the text. Colon (:) prevents the drive designators from being confused with the file names and the point (.) separates the file type subscript from the name. The equals sign (=) is more of a parameter than a delimiter and is best remembered as having the same functional meaning as in a Basic program.

Another interesting feature in this context is that the parameters at each side of the equals sign have positional significance; they will not do the same thing if they were the other way around (quite the opposite!) If it is thought that the positional significance could be a problem, a solution could be the use of 'keywords'.

For example,

PIP FROM=FILE2 TO=FILE1

would mean the same as

FACE TO FACE

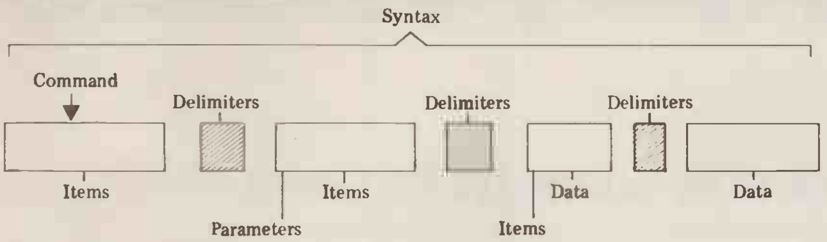


Figure 2: The Elements of a Free-format Message

PIP TO=FILE1 FROM=FILE2

The use of keywords obviously requires more key depressions (*and* you have to remember the words) but where a lot of items could be entered in each, and only a small number are in practice, then the technique might prove to be more economic and reliable in practice. It is also a relatively simple matter to write programs for such formats (especially if the Basic interpreter has an INSTR function).

Free format dialogues can be very economical for simple data entry. For example, to add a new book to a library catalogue file one might type:

0-87626-345-7/GILB & WEINBERG/ HUMANIZED INPUT/WINTHROP/ 1978

In this case, the only 'overhead' characters are the ' / ' delimiters and no coding is employed at all.

Another possibility is to type:

ADD NEW BOOK TO CATALOGUE. ISBN IS 0-87626-345-7, AUTHORS ARE GILB & WEINBERG, TITLE IS HUMANISED INPUT, PUBLISHER IS WINTHROP, YEAR OF PUBLICATION IS 1978.

This is an example of a *natural language dialogue* all of which are 'free format'. Many system designers set out with the good intention of making their dialogues as much like English (or French, Dutch, etc) as possible. This however is much easier said than done; the programming problems alone are enormous. I shall therefore devote a special article to this subject.

A programming technique called 'Finite State Automata' is very appropriate to handling free-format input data and I will write a special article on that topic. In the meantime, here is a checklist of points to keep in mind when designing free-format dialogues:

1. Choose delimiters which are easy to locate on the keyboard (i.e. not in upper case).
2. Avoid possible conflicts in the choice of delimiters.
3. If there are any length limits on items, use prompts of some kind to guide the user.
4. Place optional and/or least used items at the end of the message (so they can be 'dropped off').
5. If the occurrence of items in an input message is low, use a keyword technique or split into a selection of shortened messages.
6. Avoid formats which require awkward keying sequences for non-typists; try typical messages before finalisation.
7. Keep the item sequence as close as possible to that in any related input documents.
8. Minimize the 'overhead' characters and get the computer to use as many cursor/print head functions as possible.

Next month I shall look at structured dialogues.

NETWORK NOTES

I recently got my first opportunity to have a serious 'hands-on' session with a TRS-80 and all my original conceptions of the system were confirmed. (Make what you like of that!)

So I am not a great TRS-80 specialist and that was made quite clear by the way in which I maligned the machine's communications features in the last Network Notes. By way of defence, I should add that my local Tandy Micro shop helped ably in this plot to mislead you all! I was soon put straight by Derrick Rowe and I can do no better than quote extensively from his letter:

"Following close on a previous PCW reviewers 'discovery' of the Model II's missing PEEKs & POKEs, I now find that the Tandy RS232C board which I have been using for over 12 months has become a much-awaited communications adapter. No excuse for you Mr. Hebditch as it is clearly listed in their parts list.

"In fact there is a large amount of communications software available for this machine. Tandy provides some useful terminal software together with a package which allows the TRS-80 to be run from another terminal, and I have run a TRS-80 from an HP 2647 intelligent graphics VDU. It certainly improves the display and keyboard but is a somewhat expensive exercise.

"In the independent market there are a number of offerings. Lance Micklus of PROG 80 fame has written two assembler level utilities, ST80D and KVP. ST80D provides a smart terminal capability allowing the transfer of data/ programs from the TRS-80's disks to a remote computer. In addition, there are user definable tables which allow the TRS-80 to be configured for those odd little ASCII characters such as character delete and clear screen. This allows the software to operate on a number of different timesharing systems and I have used ST80D to achieve a Model 1 to Model II conversation at 9600 baud.

"KVP provides a different approach in that under INPUT, LIST or LLIST can be optionally directed at the RS232C channel. While it is only practical to operate up to 30 cps, it allow the programmer to write some quite useful communications routines and it is quite possible to use the TRS-80 to run a remote computer even to the extent of re-transmitting when transmission errors occur.

"Both the popular word processing programs — Scriptsit and the Electric Pencil support output through the RS232 which may have some interesting implications for telex!

"As usual the USA is well ahead of the UK and I understand that The Source and Micronet are already used by TRS-80 enthusiasts for electronic mail and telesoftware.

"The Model II has two built-in RS232 channels and a sophisticated terminal program is provided as a DOS utility.

"Poor old Tandy seems to be getting a rough ride in the press so it would make a change for the machine to be given credit for software capabilities probably some way ahead or at least at the top of the field."

Well, thank you Derrick — I look forward to an opportunity to try some of these good things myself.

Now I've done my good turn, I want to find some micro manufacturers, distributors or dealers to do a good turn for the disabled. Local area networks (LANs) are this year's 'hot topic'. There is a strong case for suggesting that microcomputers do not reach maturity when they become multi-user systems but when you can interconnect multiple single-user systems to become a coherent co-operative — this could change.

Chris Bennett is Withernsea's big specialist in chips (and his fish come highly recommended, too..). Chris read my 'On the Line' series and called me to get some ideas about low-cost techniques for inter-connecting roomsful of micros. His idea was to combine LANs with aids for the disabled to facilitate teaching, communications and so on. I have to admit that not only was I a bit short on constructive suggestions but I was a bit negative about his plans to use the cassette I/O ports as the basis for a bus configuration.

The next time Chris telephoned me was to tell me that he had successfully linked up an Apple II and a Research Machine 380Z using a bus originating from the cassette ports at speeds of up to 4-8 kbits/s! He had also simulated a third device on the bus.

Chris needs the loan of more micros, particularly a PET, Sinclair ZX80, TRS-80 and so on. The project is private and non-commercial; Chris' motives are genuine and he has a personal interest in the success of the project.

Companies who want to support this innovative work should contact me (c/o The Editor, PCW) and I will put them directly in touch with Chris.

Response to the first 'Network Notes' about the Personal Computer Network was good and I will give you an update as soon as possible.

Next month David will do a special review of the proposed relaxation in the Post Office monopoly and its implication for the microcomputer world.

GATEWAYS TO LOGIC

CHAPTER 3: HOW COMPUTERS THINK

Derrick Daines continues his unique guide to teaching others the basics of microcomputing.

Number sentence cubes

Time and again in computing we come across conditional jumps. So far I have confined myself to the IF A THEN B variety, but the 'A' part can and does take a wide variety of forms. An excellent aid to conditional jumps, in number work especially, is the type of dice sold under the name of Number Sentence Cubes. (See Appendix for suppliers.)

Five dice make up a usable set, although frequently two sets are sold together in one box. The plastic type is best, although wooden ones will serve quite well, especially if their edges and corners are sanded round to give a better roll. Readers will find different ways to use them, but my method is as follows:

The five dice are rolled together and then sorted to make a sensible number sentence. One number die begins the number sentence; next there's an operations die that has its faces printed with the four operations symbols +, −, x and ÷. Another number die follows and then the one that we are particularly interested in, the resultant die. Finally another number die finishes off the sentence.

Notice that although the sentence may or may not be true, it does make sense — it is understandable.

The resultant die has its six faces inscribed as follows:

= (is equal to)
≠ (is not equal to)
> (is greater than)
≯ (is not greater than)
< (is less than)
≮ (is not less than)

The student copies down the number sentence and then has to decide whether it is true or false, writing the appropriate word after it. Unfortunately for teachers, this exercise is difficult to mark. Obviously there's no answer book to work from and having done the first 10 or 12 — continually asking oneself questions like, "Is it correct that that statement is false?" — one begins to tick things that should have been marked wrong, and vice-versa. Luckily, a great deal of practice is not normally necessary. Twenty or thirty examples are usually sufficient for anyone (Fig 1).

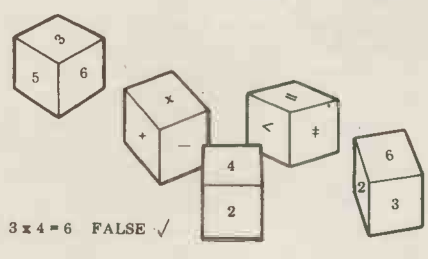


Fig 1 NUMBER SENTENCE CUBES

Other conditional jumps are sometimes encountered, and the teacher may wish to adapt a spare dice for them:

⩾ (is greater than or equal to)
⩾̸ (is not greater than or equal to)
⩽ (is less than or equal to)
⩽̸ (is not less than or equal to)
≈ (is equivalent to)

One manufacturer supplies his number sentence cubes with 'empty set' symbols, △ and □, which can be used in the following ways. (i) A special value is set aside for each, such as ½, 50, 100, zero, infinity; (ii) two or three times the next roll, (iii) the next roll is negative, (iv) the student may freely choose any number, (v) the number is unknown.

Other dice recommended for this work have 4, 8, 10, 12, or 20 faces. They are available commercially (see Appendix), or else they can be made in school in conjunction with work on three-dimensional solids. (Cundy & Rollett, *Mathematical Models*)

Every computer program save only the very simplest contains numerous examples of conditional jumps, and readers may rest assured that the practice I've outlined is well worth the time and effort devoted to it. For examples of conditional jumps, the reader might like to turn to Figs 2, 6, 9 and 10.

Hexadecimal

It's a simple fact that when a human being works in binary (0s and 1s), (s)he is very prone to error. However, the computer can only work in binary . . . the first computers relied entirely on an input of binary, and also gave out only binary. Not only was this error-prone, it was also excrutiatingly slow to execute. Early 'Computer Man' needed some method of working that would cut down on human error and if possible speed up the operation of putting binary information into the computer. Various methods have been tried over the years, but of all these middle-level computer languages (as they are called), hexadecimal seems to have gained the most adherents — particularly following the advent of the relatively cheap home computer. The reasons are worth going into.

A computer word in binary comprises a certain number of bits. This is the number of binary bits that the computer can hold in any one memory. In large (or 'main frame') computers, a memory may hold 16, or even 32, bits; for home computers this is quite excessive . . . they don't normally need to handle numbers of that size or accuracy and on the odd occasion that they do, the work can still be carried out at the expense of a little time. Some home computers use a four-bit word, but the majority use 8. For the time being, we'll take an 8-bit word as standard.

1 WORD = 8 BITS (= 1 BYTE)

1	0	1	1	0	0	1	0

2 SETS OF 4 BITS → 1011 0010

HEX EQUIV. FOR EACH → B 2

Fig 2 BINARY TO HEX

For convenience, the 8 bits can be divided into 2 lots of 4 bits each (Fig 2). The decimal value of four binary bits ranges from 0 to 15, which is sufficiently close to our normal 'tens' counting as to be very interesting. We can use the symbols 0 − 9 to start off with and then invent or adapt other symbols for the remaining 6. For economic reasons it's better to adopt other symbols without adaptation and so it has come about that we use the capital letters A — F. Now by using the range of symbols 0 — F, we have an easy and convenient notation for counting up to 15 (Table 1). By using two such symbols -- one for each set of four — the eight binary digits are reduced to manageable proportions. Which would you rather type in . . . 10110111 or B7?

In devices that use the hexadecimal input method, there's a clever little silicon chip that converts the hex into binary form, so don't let a hex input blind you to the fact that the microprocessor is still working in binary output from the micro into hex for the human to read.

Children in particular grasp the idea very quickly — even at the age of 8 or 9.

HEX	DECIMAL	BINARY
1	1	1
2	2	10
3	3	11
4	4	100
5	5	101
6	6	110
7	7	111
8	8	1000
9	9	1001
A	10	1010
B	11	1011
C	12	1100
D	13	1101
E	14	1110
F	15	1111

TABLE 1

HEXADECIMAL CONVERSION TABLE

HEX COLUMNS											
6		5		4		3		2		1	
HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC
1	1048576	1	65536	1	4096	1	256	1	16	1	1
2	2097152	2	131072	2	8192	2	512	2	32	2	2
3	3145728	3	196608	3	12288	3	768	3	48	3	3
4	4194304	4	262144	4	16384	4	1024	4	64	4	4
5	5242880	5	327680	5	20480	5	1280	5	80	5	5
6	6291456	6	393216	6	24576	6	1536	6	96	6	6
7	7340032	7	458752	7	28672	7	1792	7	112	7	7
8	8388608	8	524288	8	32768	8	2048	8	128	8	8
9	9437184	9	589824	9	36864	9	2304	9	144	9	9
A	10485760	A	655360	A	40960	A	2560	A	160	A	10
B	11534336	B	720896	B	45056	B	2816	B	176	B	11
C	12582912	C	786432	C	49152	C	3072	C	192	C	12
D	13631488	D	851968	D	53248	D	3328	D	208	D	13
E	14680064	E	917504	E	54344	E	3584	E	224	E	14
F	15728640	F	983040	F	61440	F	3840	F	240	F	15

Table 2

There is one reservation people have about hex, however. "If we're counting in 16s," they ask, "why is it that we haven't got 16 numbers?"

"Oh — haven't we?"

"No. We go up to 9, then A, B, C, D, E, F — that's 15."

"What about 0?" I ask

A puzzled frown crosses the face and they go away to count all over again.

I hear the same thing for binary. "We're counting in 2's, so why can't we use a 2?"

If such a misunderstanding has arisen, the solution lies in pointing out that although we talk about counting in tens, we have no special symbol for the value ten. We use a 1 in the next column and a 0. People forget that zero has a place value, even though it has no numeric value.

It's worth devoting considerable practice to converting decimal to hex and vice-versa before going on to addition and subtraction. It's best not to use this sort of 'hand' work on numbers above 50 or so; for them, Table 2 should help.

Decimal to Hex conversion

Find the number on the table that is the highest possible but is not greater than the decimal number to be converted. Note its hex equivalent. Find the remainder and continue in the same fashion.

For example, to change 3600 to hex, the largest number on the Table less than this is 3584, hex value E. The remainder (3600 — 3584) is 16, hex value 1 in the second column. There's no remainder, so we put a place holder 0 in the last column. The hex value of 3600 is E10.

To change 9999 to hex — the largest number less than 9999 is 8192, hex value 2 in the fourth column; the remainder is 1807. The largest number less than this is 1792 in the third column, hex value 7; the reminder 15. This is worth hex F in the last column. Since we have had no value from the second column, we insert a 0 place holder. The hex value of 9999 is 270F.

Hex to Decimal conversion

Find each hex digit in the appropriate column and add together their decimal equivalents.

For example, to change 4A0F to decimal, we look up the value of the 4, (16384), the A (2560) and the F (15) in the appropriate columns, and add them together to make 18959.

Flowcharts

A flowchart consists of a series of boxes — instructions and condition tests — linked by arrows in such a way that following it leads inevitably to the correct outcome. Note the word 'inevitably'. A flowchart must be free of ambiguity and have no room for error of any kind if it is to work properly. The attainment of this aim is not necessarily as easy as it might seem at first sight. Most computer programs are drawn out in flowchart form first and even then it's astonishing how even the most experienced programmer will find unforeseen and unwanted results occurring when the program is run.

For most students, a good start is to flowchart a well-understood and familiar sequence of events — such as getting up in the morning, getting a book out of the library, or making a cup of tea. (Fig 3). As the chart is developed, the students' suggestions can be guided by such leading questions as, "What if I don't want sugar?" or "Who likes cold tea?" This process can continue until the teacher is satisfied that the flowchart is detailed enough.

It's a fact quickly determined by experiment that any flowchart can be made more and more detailed — a process that can continue almost ad infinitum. Judgement is therefore needed to determine the optimum amount of detail in a flowchart, but as a rule of thumb it's wise to assume that too much is better than too little. For tuition purposes, even the simplest flowcharts should contain at least one each of the differently-shaped boxes of Figures 4 and 5.

Having created a sample flowchart, students should be urged to create their own. Plastic stencils are available (see Appendix), but those generally available are made for professional draughtsmen and are rather expensive. On the other hand, those issued by the Open University are simple and cheap and will

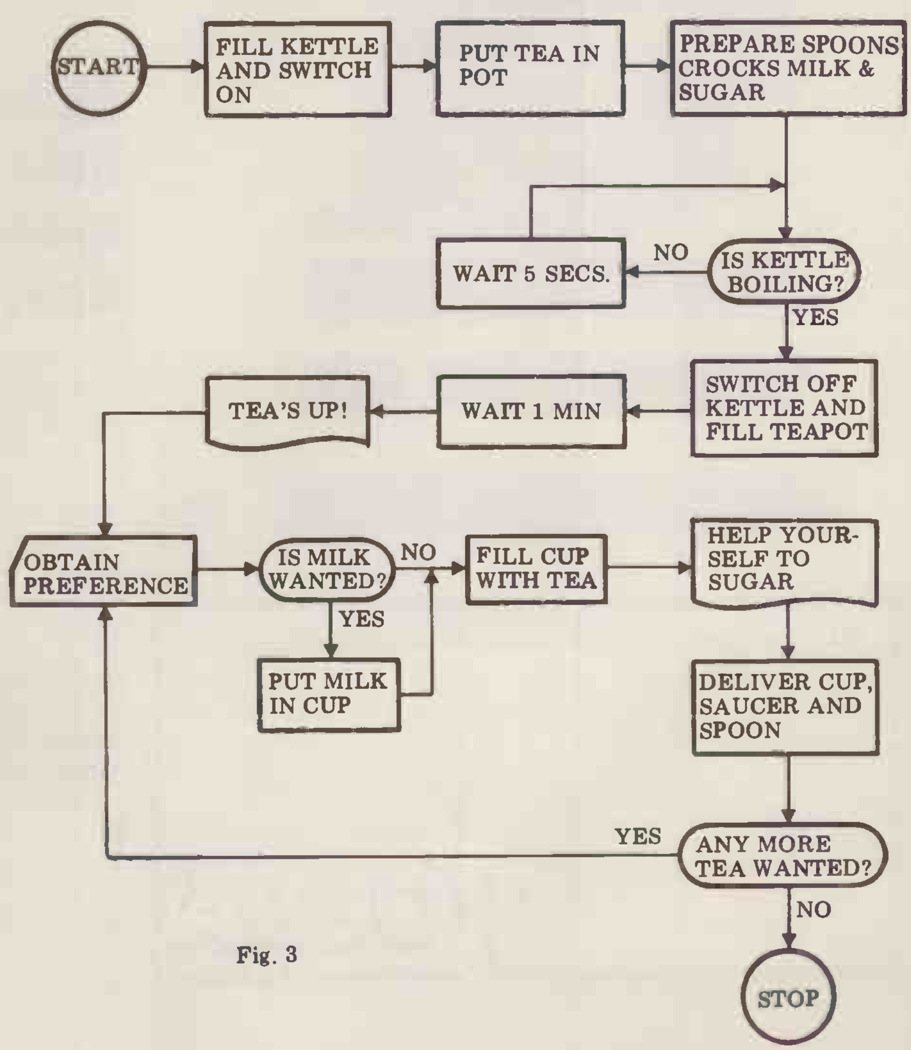


Fig. 3

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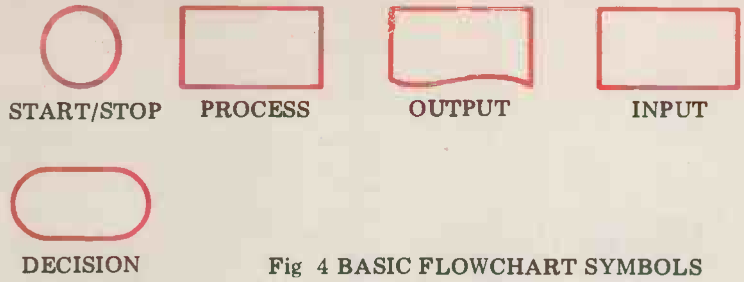

Fig 4 BASIC FLOWCHART SYMBOLS

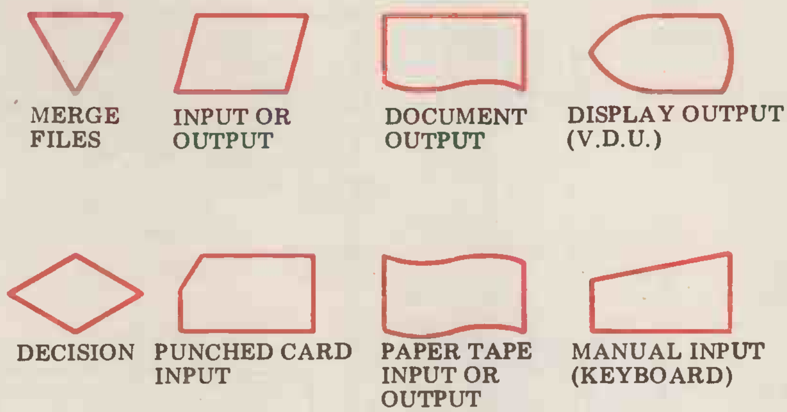

Fig 5 ADDITIONS AND ALTERNATIVES

serve admirably — providing supplies remain available. As a last resort card stencils may be made very cheaply.

If a flowchart is to be displayed, it's worth using a different colour of paper for each box shape — thus an output could be blue, a input red, and so on. When the boxes are stuck down onto a white backing sheet with arrows drawn in black felt-tip, the result can be most pleasing.

Many books on computing carry good flowcharting examples. The example given in Fig. 6 deals with air-line bookings.

Fred

FRED is an acronym for Family Robot Electronic Device in my school and the children love him. I ask for a volunteer to play the part of Fred and try to pick someone with a good intelligence and a lively sense of fun. I tell the class that FRED is a robot and it's their task to instruct or program him to execute a simple task such as standing on a chair placed some distance away, finding and picking up a pencil — and so on. To the child playing the part of Fred we say that he must be pernickety about the instructions that he obeys. He must take nothing for granted, nothing as understood, and must obey every instruction implicitly. If I've chosen wisely, the child's antics and deliberate misunderstandings will teach more about the difficulties and limitations of technological design than a whole year of lessons.

One last thing; I find it a good plan to tell Fred to buzz loudly when he fails to understand an instruction. Also, instructions not preceeded by the 'call to attention' signal, "Fred" are to be totally ignored.

Here, by way of an example, is a distillation of many such lessons; in one or two places I've added interesting points that were discussed later. I've labelled the instructor CHILD, but of course I aim at getting contributions from all and sundry. As you may imagine, the following will have been interspersed at times with quite heated arguments between pupils and between pupils and Fred.

CHILD: Move forward.
FRED does nothing.
TEACHER: You've forgotten the call to attention.

(The call to attention is a kind of switch to filter out all unwanted instruction, extraneous noise and so on.)

CHILD: Fred — move forward.
FRED: Buzzzzz.

(A multitude of reactions can be programmed into a machine to indicate faults. Sometimes the type of signal indicates the type of fault, a technique that can lead to computers printing out details of where and what the fault is, or even to self-repair — see later.)

CHILD: Fred — put one foot forward.
FRED: Buzzzzz.

(Still too general. Fred has got two feet.)

CHILD: Fred — move your left foot forward.
FRED: Buzzzzzz.
CHILD: Fred — move your left foot forward a little bit.
FRED sways slightly
CHILD: Sir — he's being awkward!
TEACHER: Not at all — he's doing exactly what I told him to do. He also did what you told him to do, didn't you, Fred?
FRED: Yes sir — I moved it one millimetre.
CHILD (grimly): Move your left foot forward six inches.
TEACHER: You've forgotten again.
CHILD: Oh! — Fred — move your left foot six inches. Blimey — now he's gone and moved backwards!

(Instructions must be precise and unequivocal at all times. Obviously, the game becomes a battle of wits between Fred and the rest of the class, but they are learning some important lessons. More and more machines are being designed with a fail-safe mode of operation. Simply put this means that, in the event of ambiguity, the machine will adopt one particular mode of operation that the designer considered to be the safest. Usually this is interpreted as doing nothing.)

CHILD: Step on the chair. Er — sorry. Fred — step on the chair.

(Newcomers to computing and other forms of artificial intelligence are frequently to be observed apologising to machines. This is probably a confusion between intelligence and sentience, allied to a sort of personality that all machinery exhibits to a greater or lesser extent.)

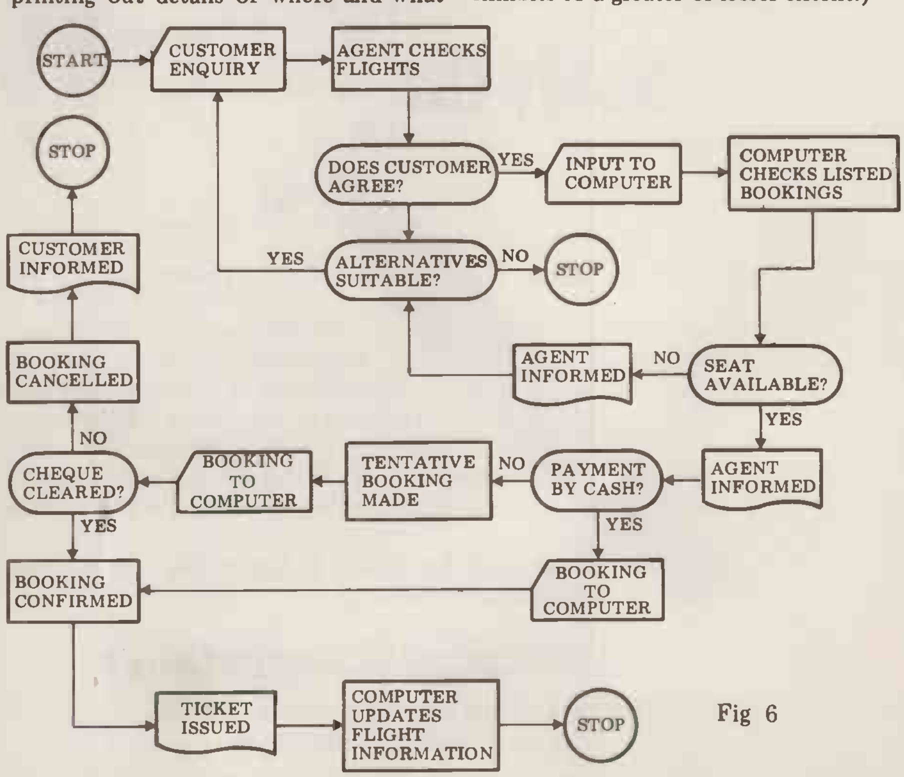

Fig 6

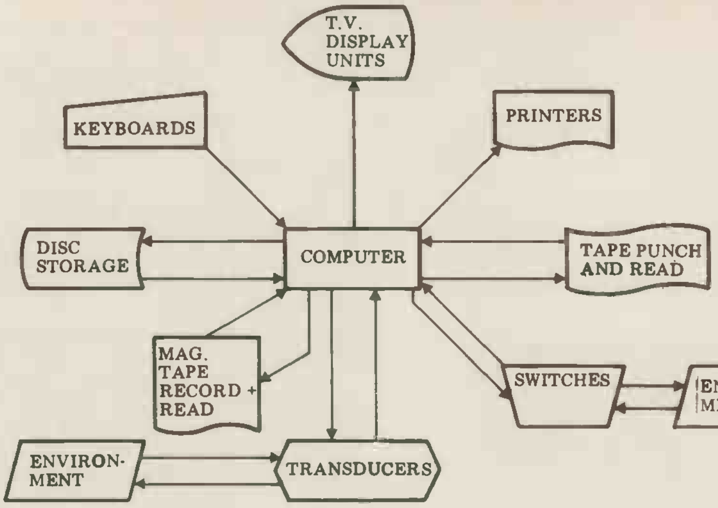

Fig 7

FRED does nothing.

TEACHER: Tell them what's the matter, Fred.

FRED: I'm thick, sir. I don't know what a chair is.

(A good point. Getting the computer to recognise simple objects has been very difficult, whilst recognising more complicated things — such as a particular person's handwriting — has so far proved to be impossible.)

CHILD: It's that thing there in front of you, fathead.

TEACHER (cutting argument): I think we'll accept that for now. Let's say Fred, that you've been programmed to recognise a chair.

CHILD: Step — whoops! — Fred, step up on the chair.

FRED: Buzzzzz.

TEACHER: You'll have to do it bit by bit. He doesn't know how to step up until you've programmed him.

CHILD: Raise your right foot eighteen inches.

FRED does nothing, grinning broadly.

CHILD: Fred — raise your right foot eighteen inches.

FRED falls over with a clatter.

(The action of walking is extraordinarily complicated, involving inter alia the transfer of weight from one side to the other. It's for this reason extremely unlikely that humanoids will ever become a reality except perhaps in research prototypes. It's far more economic to devise other methods of locomotion and, for instance, robotic machines may well end up being tripedal.)

CHILD: Fred — get up.

FRED: Buzzzzz.

(The chaos ensuing is better imagined than described since the act of rising to an upright position is even more complicated than walking. It seems likely that computers and robotic machines will always require the intervention of a human agency at some time or other, for the simple reason that every possible contingency cannot be foreseen and/or catered for — unless the application is relatively simple. The more versatile a machine is then, by a curious paradox, the more likely it is to break down . . . or to find itself in situations with which it cannot cope.)

Later, when Fred has regained an upright position:

CHILD: Fred — raise your right foot eighteen inches.

FRED does so.

CHILD: Fred — put your right

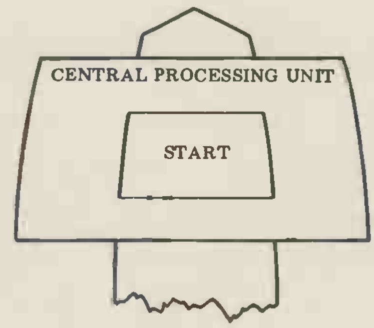

Fig 8

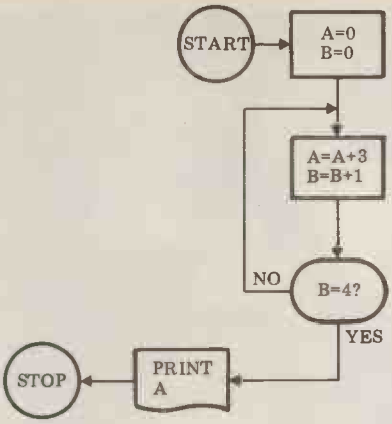

Fig 9

foot down on the chair.

FRED Buzzzzzz.

TEACHER: Do it bit by bit.

CHILD: All right Fred — put your right foot forward — er — twelve inches.

FRED does so.

CHILD: Fred — lower your right foot onto the chair

FRED does so

CHILD: Fred — blimey, he's trodden on my pencil!

(Another reason why robots are not likely to be humanoid. Ensuring the safety of the machine means that all working space must be kept clear and it's best if the machine itself sweeps the area around it. This is not easy with bipedal machines. An alternative is to incorporate a fail-safe device that sounds an alarm if an obstruction is encountered — a solution that brings problems in its wake of determining the difference between an obstacle and a lawful part of the environment. Keen followers of the BBC's 'Doctor Who' series will have observed that K9 must always operate on a smooth floor area, although very often the cameras are trained above the floor to disguise this fact.)

An alternative instance:

CHILD: Fred — put your foot — er — right foot forward nine inches.

FRED does so.

CHILD: Fred — lower your foot until it reaches the chair seat.

(Better. An instruction to "lower your right foot nine inches" could result either in Fred not lowering his foot far enough — hence necessitating more instructions — or else forcing his foot down the full nine inches to either destroy whatever he is putting his foot on, or more likely, tipping himself over backwards. However, there's another teaching point to be made here . . . as follows.)

TEACHER: Fred — lower your right foot one inch.

1. START
2. LET A = 0
3. LET B = 0
4. LET A=A+3
5. LET B=B+1
6. IF B≠4 THEN GO TO 4
7. PRINT CONTENTS OF A
8. STOP

Fig. 10

FRED does so.

TEACHER: Fred — has your right foot encountered a solid surface?

FRED: No sir.

TEACHER: Fred — lower your right foot one inch.

FRED does so.

TEACHER: Fred — has your right foot encountered a solid surface?

(This is known as a reiteration loop — a very powerful tool in the hands of the programmer since it results in a great saving of instructions. The slight cost is the conditional test which offers the machine its only way out of the loop. Conditional tests have already been met in connection with number sentence cubes. Here the important point is being made that tests can be carried out on anything within the environment of the machine or on any condition existing within the machine itself — analogous to the feeling of hunger in the human.)

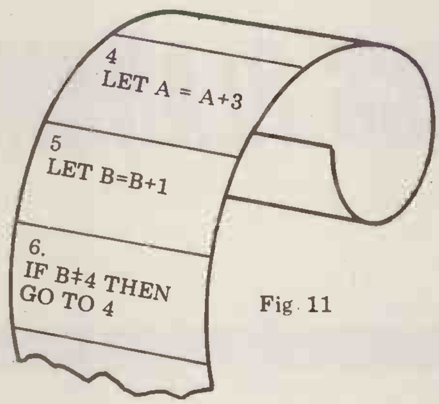

Fig 11

Probably enough has been written about this particular exercise to demonstrate a number of points.

(1) The lesson provides rich information on robots; in addition it dispels many of the myths that, generated by writers of science fiction,

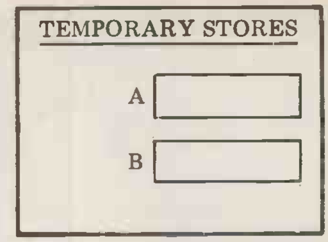

Fig 12

continue to be perpetuated by films and television.

(2) From robots in particular we may draw lessons about all artificial intelligence and all machines in general — whether electronic, mechanical or a combination of both.

(3) Flowcharting is still further understood since we can draw flowcharts incorporating the successful instructions.

(4) Students are better able to understand the step-by-excruciating-step nature of computer and robotic instructions. They begin to ask the question, "What can go wrong?" Remember Murphy's Law — what can go wrong, will.

Do-while

Because of the lightning-fast speed at which computers function, most of their operating time is simply wasted. For example, it's common for the computer to have finished a computation and be ready with the answer before the human operator has removed his/her finger from the GO button. Time is wasted (a) because of the relatively slow print-out of results and (b) because of the extremely long delay (so far as the machine is concerned) before the human requires to make any further computation. This last delay can range from seconds to perhaps days, but of course in computer terms even a second is a very long time. When a

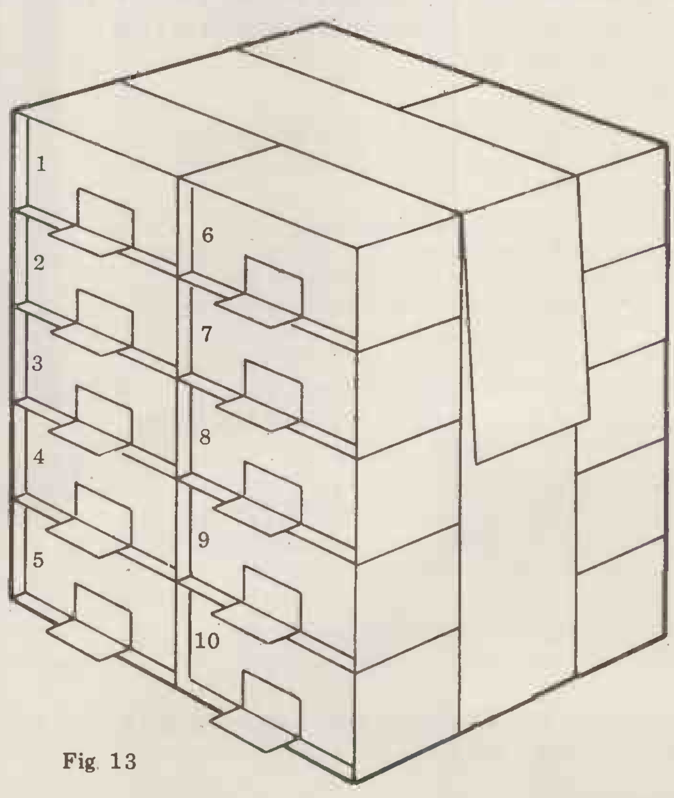

Fig 13

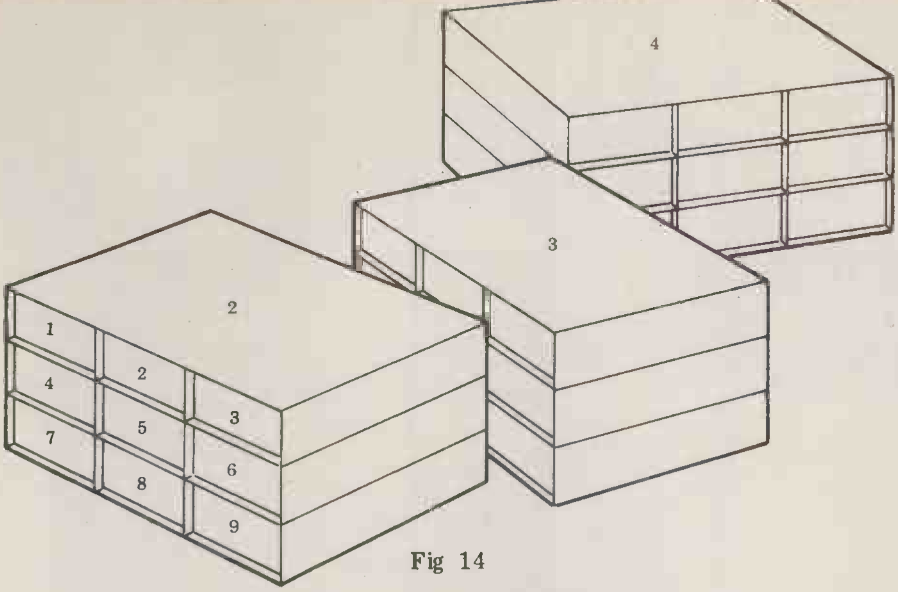

Fig 14

computer is capable of making a million operations a second, there isn't much point in having it hanging around doing nothing.

The answer lies in giving the computer more to do. Some computers can, with the addition of a little hardware, be utilised by four or more people at once, or be engaged in a long printout between bouts of game-playing with the operator. The point can be made by means of a little play. In school I pick the brightest and nippiest child to be 'the messenger' and arrange for four or more other children to play the part of stupid giants; they have the task of writing to each other via the nippy messenger.

The giants must write in their very best handwriting and rather slowly, but their notes may be as brief as they wish. Verbal communication is forbidden. The sort of note that's suitable is, "What did you watch on television last night?" to which the first might reply, "I watched Match of the Day. What did you see?"

Desks may be arranged so that the messenger is in the centre of a square. (S)he buzzes about actively, looking for a message to deliver. As soon as one arrives it's delivered to its destination — and the messenger continues his/her search. If two stopwatches are available, it's useful to have onlookers check the time spent in actually delivering messages in comparison with the time spent in looking for another message to deliver.

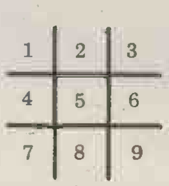

Fig 15

A variation of this play is for the teacher to increase the number of slow stupid giants. A rule is made that no-one may write a second note until they have received a reply to their first. The result will be that the poor messenger never stops running and the giants may begin to wait some time for replies. This gives the opportunity to introduce two other concepts — queuing and priority interrupts. Queuing is already well understood. Priority interrupts can be illustrated by having one child, chosen for top priority, who is permitted to bawl out, "Message!" whenever (s)he has one for delivery. The messenger must complete the task at hand — then go and fetch the priority message.

It's important the teacher points out that the play is a model of computer operation slowed down millions of times, so that although a giant may have to wait, say, five minutes between messages, in real terms a computer user should not have to wait more than a millisecond — even if the computer is overloaded.

Readers with experience of computers may protest that they have had to wait for considerably longer than a fraction of a second, but of course this is because priority users have given the computer not one but many millions of operations to perform. Further, in practice there are often many levels of priority, with top priority going to those matters dealing with the safety of the machine itself and its installation, second priority going to housekeeping matters and maintenance of programs, third priority going to extremely urgent programs, fourth to not-so-urgent programs and so on, down to eighth, ninth or tenth priority. Seen in these terms, the delay is understandable.

The analogy between the play and Figure 7 is clear. The slow giants are the peripheral devices, while the nippy messenger is the computer itself — or more precisely, that part of it called the Central Processing Unit. Other plays of this type may be devised to emulate various functions of the computer and a good source of ideas is "Computer Science — a First Course", a slim volume obtainable from the Open University Press.

Cardboard computer

There are various models of computer operation and this one, from 'Man Uses the Computer' (Blackie, 1977) is as good as any. Give students each a sheet of cardboard some 6" square and have them cut two parallel slots (Fig 8). The name Central Processing Unit is printed boldly across the top and then, if they feel like adding a little realism, the cards can be decorated with rivets, nuts, bolts, handles and dials. Each student is then given a strip of adding-machine paper, about a yard long, which is threaded through the slots so that only an inch or so of paper is revealed at any one time. Draw lines on the paper, top and bottom of the frame, and then pull the paper up so that the bottom line is now at the top. Draw another bottom line. Repeat in this way until all the strip of paper has been marked off in standard-size frames. Pull back to the beginning.

This first step may have seemed superfluous, but experience has shown it to be very desirable; frames drawn at the same time as they are written often turn out to be non-standard in size . . . leading to great confusion later.

The flowchart of Figure 9 can now be displayed and discussed. It could hardly be simpler for it just multiplies 3 x 4 using the technique mentioned earlier of repeat addition. The next step is to translate the flowchart into a listing, as per Figure 10; the students should copy this onto their strips of paper, one instruction per frame (Fig 11). The frames are of course numbered. A separate sheet is needed for temporary stores A and B (Fig 12), and maybe another for output of results. All is now ready.

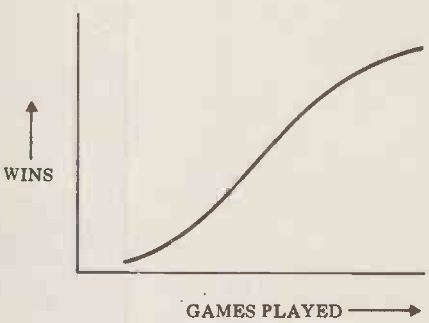

Fig 16

With the long strip of paper pulled down so that the instruction START is displayed, the user pulls the strip up to the next frame and obeys the instruction on it before moving on to the next. Temporary stores A and B are written IN PENCIL, any previous entries being erased. Instructions to jump are of course obeyed by pulling the strip through until the correctly-numbered frame has been found.

This is a salutary exercise and one that's thoroughly recommended. Students soon begin to appreciate how much the computer has to 'whizz backwards and forwards' in order to produce an answer to even the simplest of programs.

Another lesson learned is irretrievable loss of information. Once data has been erased from the temporary stores A and B, there's simply no way of getting it back; indeed the only way of obtaining it in the first place would be to alter the program so that it prints it out.

Students can now be instructed to alter the program so as to produce an answer to a different problem — for example 4 times 5 — and then run it to check that the answer obtained is the one expected. Once this has been mastered, try altering the structure of the program so that they have to program simple division or even to combine operations. It's also useful to

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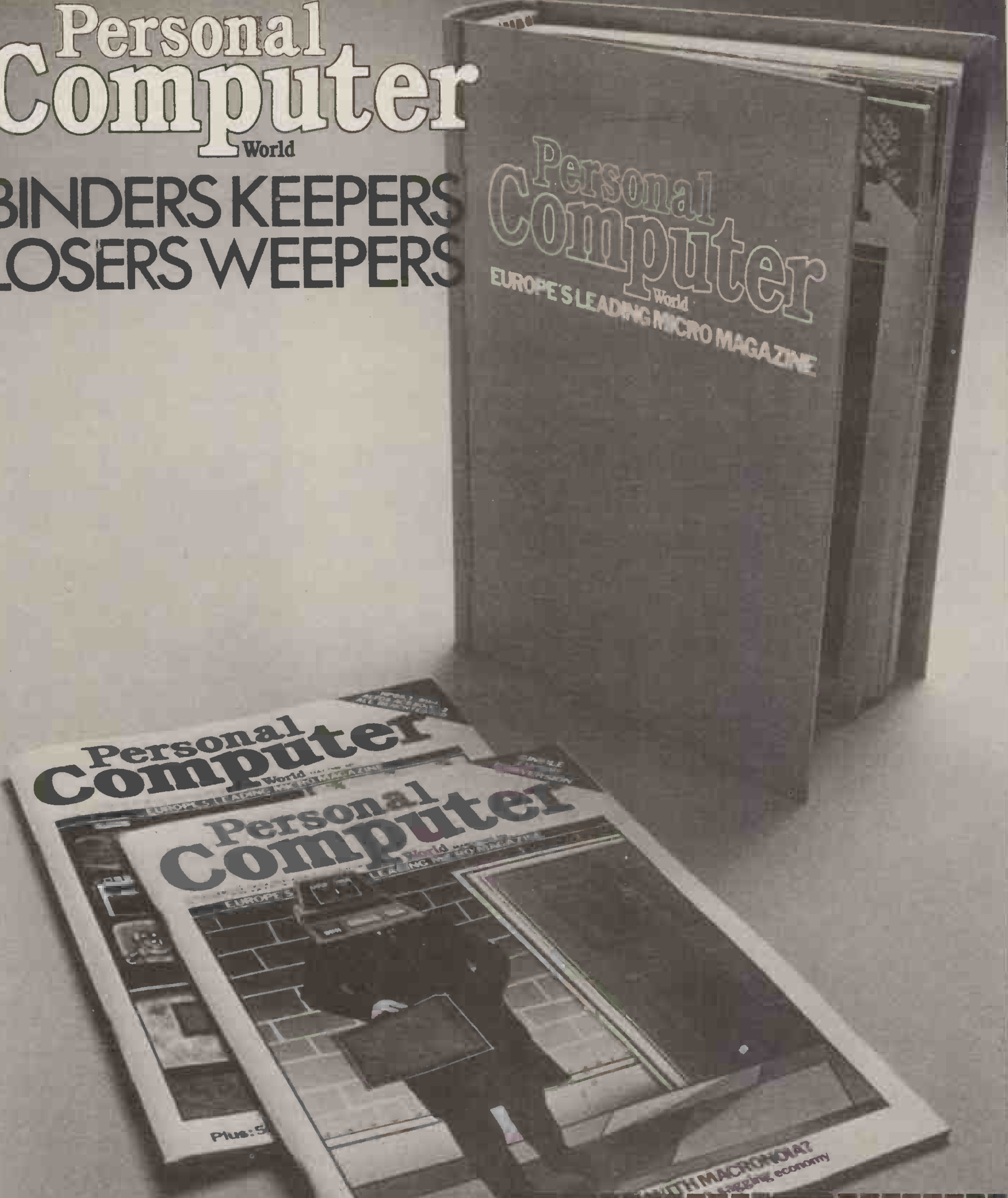

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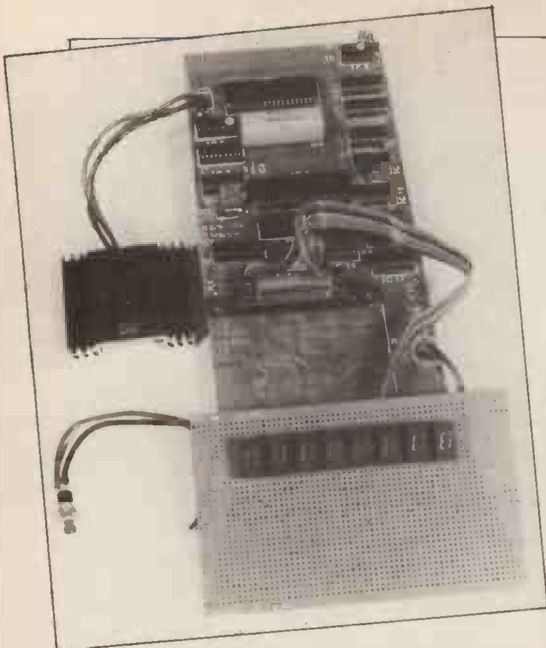


Photo by Elizabeth A Shingler

LARGER LEDS

The Science of Cambridge MK14 is still the basis for the enthusiast who wants to experiment with building his own system — it lends itself to easy modification and expansion. Here Clifford Clark describes an easy way to fit a larger seven-segment LED display in place of the system's original, minuscule unit.

There are many ways of reaching the objective of a larger display. Thus various circuits were designed and tested with reliability and display intensity the factors that decided the final arrangement. The circuit described here gives an acceptable LED brilliance with a red filter fitted over the completed assembly.

The common emitter arrangement is the general way of using a transistor as a switch, since high gain current allows large collector current to be controlled by means of a relatively small base current. First examination of the circuit diagram appears to show that the base resistor alone limits the amount of current available for activating the appropriate LED anode, but a small amount of power is also absorbed by the switching transistors embodied in the 7445 IC which completes the circuits to earth. (The manufacturer's specification for the 7445 IC notes that each of the high breakdown (30 volt) output transistors will sink up to 80 mA.)

Construction Notes

The LED sockets should first be soldered onto the stripboard. All the related anodes are connected together, i.e. all 'a' together, all 'b' together. . . etc, and then connected to their common switching transistor. Note that only 'a' & 'd' are shown connected in the circuit diagram, to simplify the drawing.

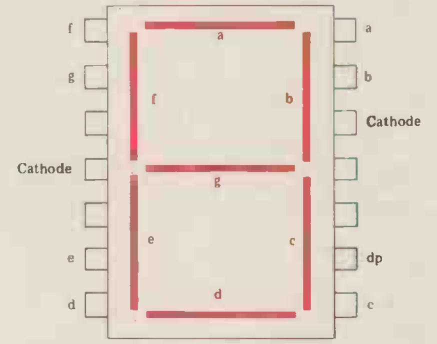
The copper strip on the stripboard must be cut at the appropriate points and 22 SWG wire should be used to make the necessary common connecting links for the anodes. IC 14 & 15 on the Mk14 PCB — originally two 7408s are replaced by two 7400s, because a zero signal is required to actuate the BC477 switching transistors. I used a 'D' type plug and socket for connecting the LED assembly to the MK14 PCB. This is an optional arrangement although I found it a useful way of proving the circuit. The original small LED assembly was connected to a similar plug and could be easily inserted back into the circuit if suspected 7400 IC malfunction or overload occurred.

If this article is used as the starting point for further experiments with display circuits, one must be aware that 'ringing' in switching circuits produces extra pulses which the microprocessor accepts as normal pulses. If the value of the base resistor of the BC477 in the circuit illustrated is too low 'ringing' will occur with resultant 'keying in' problems.

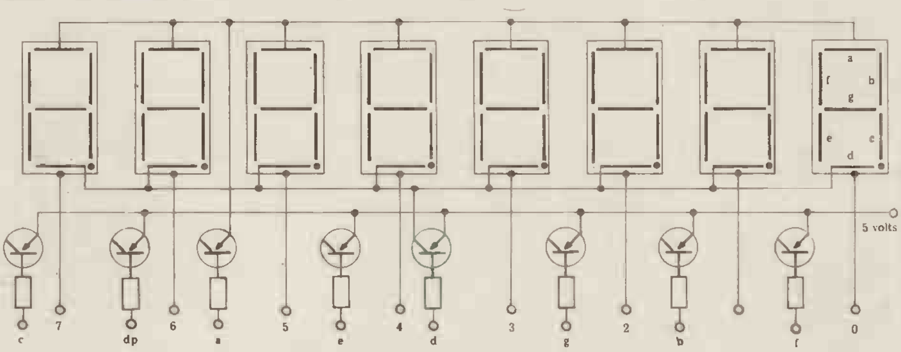
Finally, a software checkout is listed. This test program illuminates all display LEDs, showing figure eight and decimal point.

Hardware required

LEDs: 0.3 inch seven-segment common cathode, 8-off.
Filter strip: for red LEDs, 1-off
Transistors: BC477, 8-off.
Resistors: 220 , 8-off.
ICs: 7400, 2-off
Stripboard: 0.1 inch pitch holes
'D' connectors (optional): plugs, 2-off; socket, 1-off.
Misc: 22 SWG tinned copper wire; other connecting wire.



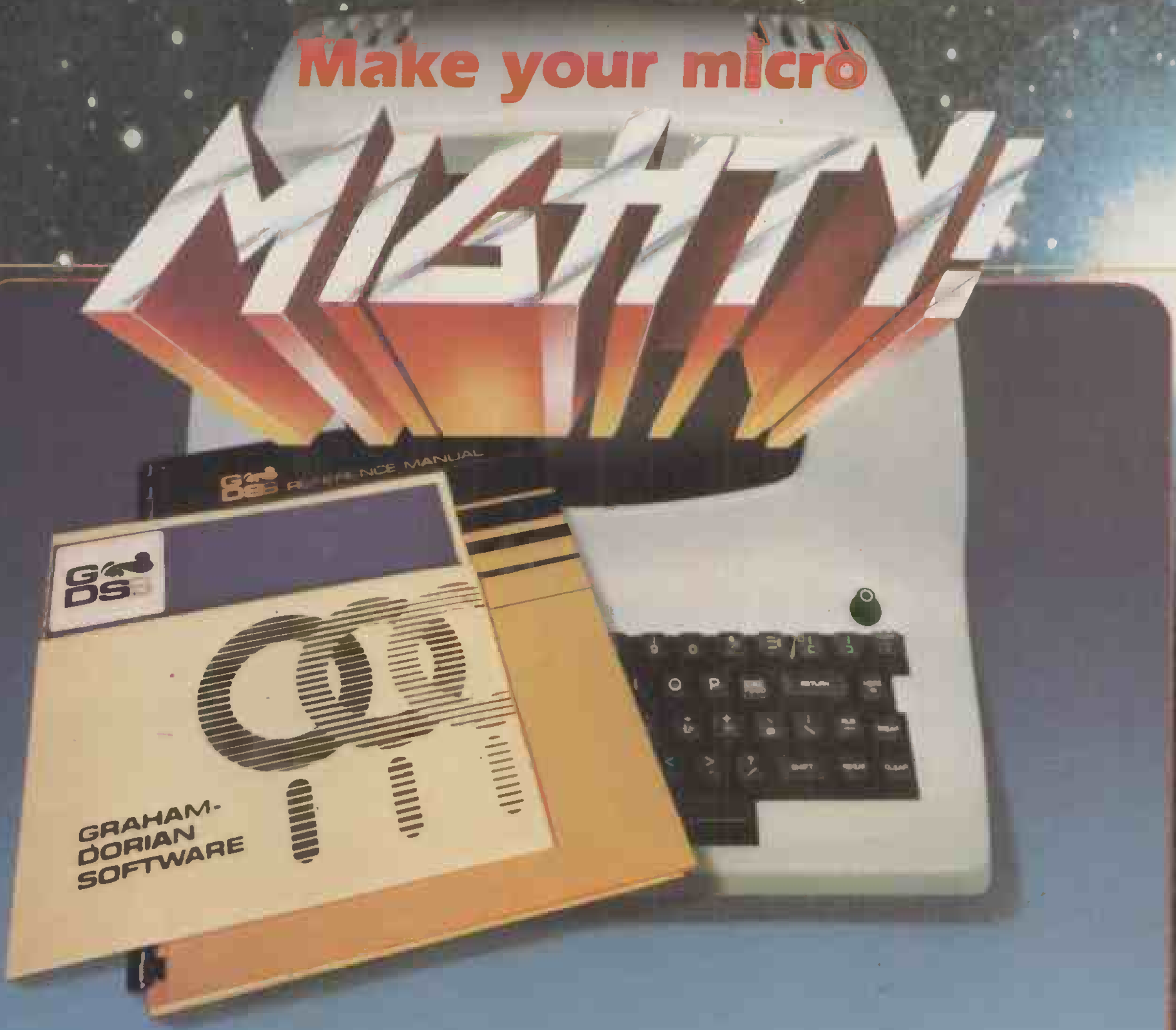
LED connections (front view, pins at rear).



MK 14 DISPLAY CONNECTIONS TOP OF BOARD
Only anodes a & d shown connected — see text
All resistors 220 ohms
All transistors BC477
All LEDs 0.3 inch common cathode

```
MK14 TEST PROGRAM TO ILLUMINATE ALL DISPLAY LED'S

0F12  C4
0F13  0D
0F14  35
0F15  C4
0F16  00
0F17  31   "0D00" INTO PTR#1. CONTENTS=FF
0F18  C9
0F19  00   STORE(DISPLAY) CONTENTS PTR#1 ADDRESS
0F1A  C5   LOAD CONTENTS PTR#1 INTO AC & INCREMENT
0F1B  01   BY 1 (AUTO INDEX)
0F1C  31   LOW ADDRESS PTR#1 INTO AC
0F1D  C8   STORE ADDRESS IN LOCATION 0F28
0F1F  0A   TO BE RECALLED AS REQUIRED
0F1F  F0
0F20  07   EX.OR 07 TO CHECK FOR LAST DISPLAY LED
0F21  98
0F22  FF   JUMP IF ZERO & RESTART LOOP
0F23  C0
0F24  04   RE-LOAD LOW ADDRESS FROM LOCATION 0F28
0F25  31   PUT LOW ADDRESS BACK INTO PTR#1
0F26  90
0F27  F0   JUMP TO LOCATION 0F18
0F28  XX   LOCATION USED FOR LOW ADDRESS STORAGE
```



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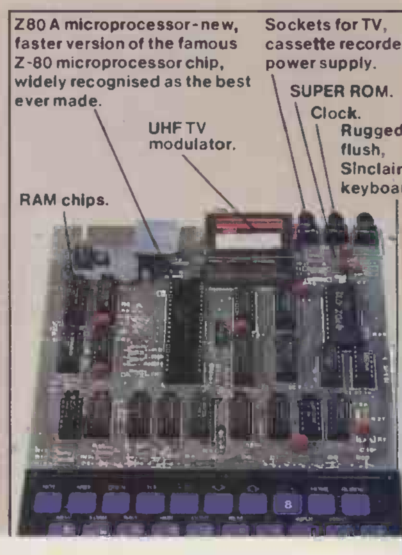

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COMPUTER GAMES

by David Levy

Chess

Of all the games that have attracted the attention of computer programmers, chess must surely rank at the top of the list. This is partly because chess is considered by many to be *the* intellectual game, par excellence, and therefore the creation of a strong chess program can be equated with the creation of an artificial intellect. Another reason is that the writing of a chess program is itself a great challenge.

A measure of the popularity of computer chess programming may be judged from the history of computer chess contests. In 1970, in New York, there was a tournament in which all six of the contestants were computer programs. The event proved so popular that it has been repeated each subsequent year, at the annual conference of the Association for Computing Machinery, and by the end of the 1970s there were usually between 12 and 20 applications for places in the tournament. Now that micros are available in large numbers, chess contests are springing up specifically for microcomputers. Personal Computer World is organizing its third such tournament in London on September 4th-6th this year, and this event has the status of World Championship, and is being held under the auspices of the International Chess Federation — an indication that "real" chess players are now beginning to take computers seriously. Other microcomputer chess tournaments are being held in the USA, France and Germany. Probably there will be a dozen such events in the calendar by the end of 1981.

Because of the enourmous interest in computer chess, a lot has been written on the subject. I have decided that this article and the following one will provide a history of the most important milestones in the field, and I shall discuss how the ideas employed in mainframe programs may be applied to micros. In a third article I shall discuss the current state of the art of microcomputer chess programming, with many examples taken from actual games.

In the beginning

On March 9th 1949, the American mathematician Claude Shannon delivered a paper at a New York conference. The paper was called *Programming a Computer for Playing Chess*, and it is remarkable that many of Shannon's original ideas have permeated through to the programs of today. He pointed out that there are some 10^{120} possible games of 40 moves (the average length of a master game), and that analysing to this depth at the rate of one game per microsecond would take a computer 10^{90} years to make its first move! A similar, though even more emphatic argument, is that the number of possible chess games so far exceeds the number of atoms in the universe, that even were each atom to be replaced by a Cray 1 computer, it would take the whole system rather a long time to make the first move in a perfect game of chess.

Having dispensed with the notion of perfect play through exhaustive search, Shannon set about defining an evaluation function which would give a reasonably reliable estimate of which side held the advantage in a position, and by how much. His example of a crude evaluation function was:

$$200 \times (K_w - K_b) + 9 \times (Q_w - Q_b) + 5 \times (R_w - R_b) + 3 \times (B_w - B_b + N_w - N_b) + (P_w - P_b) - 0.5 \times (D_w - D_b + S_w - S_b + I_w - I_b) + 0.1 \times (M_w - M_b)$$

where K, Q, R, B, N and P represent the number of pieces of each type (king, queen, rook, bishop, knight and pawn), and the subscripts w and b refer to white and black. D is the number of doubled pawns (pawns of the same colour on the same file); S is the number of backward pawns (pawns that cannot be defended by a pawn); I is the number of isolated pawns (pawns with no neighbour pawns of the same colour); M is the measure of mobility (the number of legal moves at a player's disposal).

The king is given an arbitrary high value because loss of the king means loss of the game. The values of 9, 5, 3, 3 and 1 for the other pieces are the rule-of-thumb values which chess players learn early in their careers, though bishops are usually regarded as being more valuable than knights so in your chess program you might experiment with values of 3¼, $3^1/_3$ or even 3½ for a bishop.

Shannon's evaluation function is sufficient to provide a reasonable level of performance in a microcomputer chess program. Chess, however, is a complex game, and Shannon recognized the need for the use of many other features if the evaluation function were to result in a strong program, and he suggested the following additional features:

1. Relative control of the centre by pawns (white pawns at c4, d4, e4 and f4; black pawns at c5, d5, e5 and f5).
2. Weakness of pawns near your own king (e.g. advanced pawns in front of the king after castling).
3. Placing pawns on opposite coloured squares from your own bishops to

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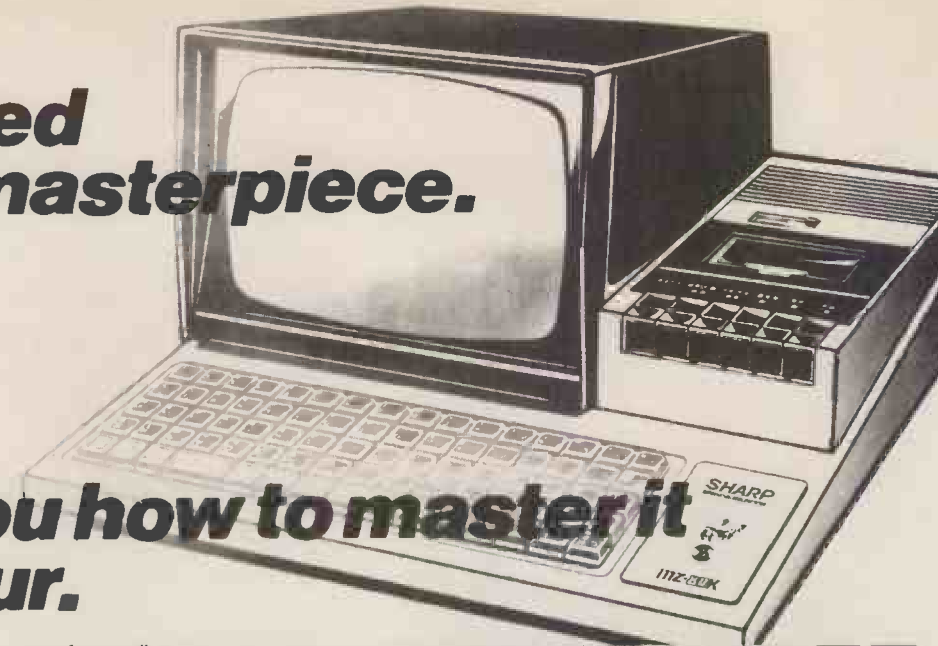

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allow the bishops greater freedom of movement.
4. Passed pawns (i.e. pawns which have no enemy pawns in front of them, either on the same file or on adjacent files). These pawns can often become queens in the endgame.
5. Advanced knights (white knight at c5, d5, e5, f5, c6, d6, e6 and f6; black knights at c4 etc.), especially if protected by a pawn and free from attack.
6. Rooks on open or semi-open files (an open file is one with no pawns; a semi-open file has one pawn belonging to the opponent).
7. Rooks on the seventh rank. (A white rook on a7, b7, . . . , or a black rook on a2, b2, . . . , etc., can wreak havoc in the endgame by picking off the opponent's pawns.)
8. Doubled rooks (two rooks of the same colour on the same file).
9. Pieces which are required for guarding functions and, therefore, committed and with limited mobility.
10. Attacks on pieces which give one player the option of exchanging.
11. Attacks on squares adjacent to the enemy king.
12. Pins. (A pin is a setup in which one piece may not move because of the loss of a piece which it is shielding, e.g. white bishop on g5, black knight on f6, black queen on e7. Black may not move his knight because of the loss of his queen — the knight is said to be pinned by the bishop).

The addition of these features would provide a rther sophisticated evaluation function for middle game play, though as Shannon himself pointed out, different factors apply in the opening and (to a lesser extent) in the endgame.

When and how to use the evaluation function

Shannon understood that it is only safe to use this type of evaluation function in positions which are relatively quiescent. If white makes a move capturing black's queen, it is not sensible to evaluate the resulting position without looking to see if black might be able to recapture white's queen in reply, or whether he might be able to checkmate. In fact it is meaningless to evaluate a position during a series of exchanges, unless the evaluation mechanism allows for the fact that further meaningful exchanges are possible. Chess players recognize quiescent positions intuitively, but computer programs have more difficulty because they cannot immediately determine which capturing moves and sequences are "obviously" wrong, in the way that a human chess master can.

Shannon called a fixed depth search strategy a "type A" strategy. He realized that in chess this type of strategy would lead to weak play, partly because of evaluating many non-quiescent positions once the fixed search depth had been reached, and partly because of the time required for exhaustive search (the alpha-beta algorithm had yet to be invented in 1949). Again he alluded to the thought processes of chess masters, and in particular to the work of the Dutch psychologist De Groot who recorded the spoken thoughts of chess masters as they analyzed a number of typical chess positions. Shannon concluded that in order to improve the speed and strength of the program it would be necessary to:
1. Examine forceful variations as far as possible and evaluate only in quiescent or quasi-quiescent situations.
2. Select the variations to be examined by some process so that the program does not waste a lot of time in totally fruitless variations.

Shannon called this type of strategy a "type B" strategy, and it is the Shannon B strategy which is used in almost all of the most successful programs of today. The key to the Shannon B strategy is the ability to determine which moves and variations are worth considering, a problem on which much has been written but rather little accomplished during the past three decades. When I examine a chess position I can usually make a reasonably good move after looking at only 50-100 nodes of the game tree. In order to play at the same level, the current world computer champion must examine over one million nodes. If it had the same ability to discern which variations are important, it would be able to defeat Bobby Fisher.

In order to help decide whether a move is worth exploring, Shannon suggested the use of a function which would return a large value for forcing moves (captures, checks and attacking moves), medium values for defensive moves, and low values for all other moves. As the depth of search increased, the requirements of this function would be set higher so that fewer and fewer subvariations would be examined. This approach has proved successful in a number of strong chess programs, and can easily be implemented on a micro. One simple method of doing so would be to examine all moves at the root of the tree, then only the most important 90% of moves at ply-1 ("importance" being determined by Shannon's discrimination function), then only the most important 70% at ply-2, 50% at ply-3, 30% at ply-4 and 10% at ply-5 and beyond, down to the limits imposed by search time restrictions or to quiescent positions. My method would call for an examination of fewer than 10% of the number of nodes normally examined in a 5-ply search, and the 90% saving could be used either to increase the sophistication of the evaluation function (which would also make it slower), or to increase the maximum depth of search in tactical situations.

Another idea suggested by Shannon was the use of typical chess positions or fragments of positions, for which a particular move or sequence of moves is known to be effective. Chess masters use this type of information all the time. They recognize a situation and immediately start to examine a move which they know has often proved strong in similar positions. Of course it will not always be the case that exactly the same move is best in a slightly different situation, but as we have seen in previous articles it is extremely important to examine the most likely moves early in the search process. Unfortunately, the only substantial example of this approach was a dismal failure. A strong American chess master, Charles Kalme, implemented a method involving "snapshots" of chess situations. His work was discussed in a Scientific American article in 1973, but shortly thereafter his program fared dismally in the annual ACM computer chess tournament in Atlanta, and little has been heard of the program since then. Perhaps this is one example of a technique used by humans which will be difficult to employ in a computer program. In any event, Kalme's failure should not worry the micro user, since the amount of memory required to use the snapshot approach would be prohibitive at today's prices.

The Bernstein program

Shannon's work was purely theoretical in nature. He did not write a chess program to test his ideas, though if he had done I suspect that his program would have been stronger than some commercially available programs now on the market.

The first example of a program playing full games of chess was seen in the late 1950s. This program was written for the IBM 704 computer by Alex Bernstein of IBM, and three colleagues. Since your own machines will all be considerably more powerful than an IBM 704, any of you who write chess programs ought to be able to do at least as well.

Bernstein et al employed four features in their evaluation function: Mobility, area control, king defence and material. Area control was defined as the number of squares controlled completely by each side, while king defence counted the number of controlled squared around the king. Their material feature was weighted with the ratio of its own material to that of its opponent, in order to encourage the program to exchange material when ahead and to discourage it from exchanging when behind. This simple herusitic is extremely well known, but not all programmers consider it worthwhile to implement it, possibly because programs play worse in the endgame than they do during the middle-game!

Moves were generated in response to a number of questions:
1. Is the king in check?
2. Can material be gained, lost or exchanged (i.e. can the program make an equal or advantageous capture, or is it threatened with material loss)?
3. Is castling possible?
4. Can a minor piece be developed?
5. Can key squares be occupied? (Key squares are those squares controlled by pawns).
6. Can an open file be occupied?
7. Can any pawns be moved?
8. Can any piece be moved?

If the answer to question 1 is "yes", the program generates moves that reply to the check, and these moves are put into a "plausible move table". If the answer to question 1 is "no" the program goes to question 2, and so on. If the answer to question 3 is "yes", no other moves beyond question 3 are examined, as castling was considered so important that no other moves except replies to check and material changing moves are of greater importance to the program.

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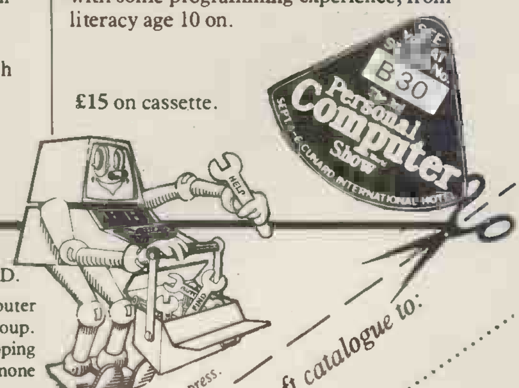

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I have an . . . ☐ 8K PET ☐ 16K PET ☐ 32K PET ☐ No PET yet questions 4 and 7 put moves onto the plausible move list. After the opening stage, the other questions are employed in the move generation process, with questions 2, 5 and 6 being the most often used in the middle-game, and questions 5, 6, 7 and 8 during the end-game. Once there are seven moves in the plausible move table, no other moves are generated from that position. This explains why the programmers felt it important to generate the moves in a particular order — they wished to prune off most of the legal moves in every position, and preferred to do so at the move generation stage rather than use the more modern approach of generating all the moves first and then sorting them before finally discarding some.

This simple approach was used to create a tree with a maximum depth of 4-ply, and therefore a maximum of 7^4 or 2401 terminal positions requiring evaluation. In fact a further pruning mechanism was employed: a move is only put on the plausible move list if it results in an increase in score, or at least an equal score, to that which prevailed before the move was made. With a sophisticated, accurate evalution mechanism this method might work quite well. One problem is that the program may find itself looking at a position in which no move appears to do anything but reduce the score for the side which makes it, and under these circumstances the program will select the best two moves for inclusion in the plausible move table.

Forward pruning mechanisms go a long way towards solving the problem of having the program examine too many junk variations, but to be effective without being counterproductive a forward pruning program must exhibit sound judgement when deciding which moves to prune, otherwise a superficially bad move which is really quite stunning might easily find itself eliminated from the search.

It is interesting to note that the Chess Challenger machines do quite a lot of forward pruning, whereas the stronger commercially available programs do not. This in itself does not necessarily indicate that forward pruning is difficult to accomplish on a micro, and I would be interested to hear from any reader who thinks he has found a satisfactory way of pruning off a significant part of the game tree. I should remind you that Bernstein's approach of a (essentially) fixed depth search is not to be recommended. Evaluating all positions at 4-ply, irrespective of whether they are quiescent, is certain to result in feeble play unless the evaluation mechanism is sufficiently intelligent to cater for future caputres in some way, as for example, Donald Michie's idea of swapoff values which will be discussed in a future article.

The report on Bernstein's work included the moves of a game played by his program against a human opponent. I give the game here, with some comments of my own, to illustrate the standard of play that can be achieved using a primitive search process. Here, and in all future chess games, I shall employ the notation which is becoming standard for microcomputer chess games, naming the *from* square and *to* square using conventional chess notation — White has the square a1 in his left hand corner and h1 at his right.

White: IBM 704
Black: HUMAN

1	e2—e4	e7—e5
2	f1—c4	

The program had not been taught any chess openings and was playing on general principles, hence it developed a piece. It is usually a good rule to develop knights before bishops, so question 4 should have been split into (4a), can a knight be developed?, and (4b) can a bishop be developed.

2	...	b7—b6
3	d2—d3	g8—f6
4	c1—g5	c8—b7
5	g5—f6	

Prompted by question 2, but in fact a wasted move. Firstly the bishop is more useful than Black's knight; secondly, the program ought to give more weight to developing pieces during the opening, and a move such as b1—c3 or g1—f3 is called for.

5	...	d8—f6
6	g1—f3	c7—c6
7	e1—g1	d7—d5
8	e4—d5	c6—d5
9	c4—b5+	b8—c6
10	c2—c4?	

An excellent example of why the search should not terminate at a fixed depth of 4-ply. White can win a pawn here by playing 10 f3—e5, because if Black recaptures with 10. . .f6xe5 White will win the queen by 11 f1—e1, when Black must lose his queen for a rook. But the program would only see the variation 10 f3—e5 f6—e5 11 f1—e1 e5—e1+, and since Black is well ahead in material at this point, the program would evaluate the position as being good for black, ignoring the fact that white's next move (d1—e1) captures the black queen. Using Shannon's B strategy, accidents such as this just cannot happen.

10	...	d5—c4
11	b5—c6+	f6—c6
12	d3—c4	e5—e4
13	f3—g5	c6—g6
14	g5—h3	e4—e3
15	f2—f3?	

Here a strong move would be 15 h3—f4, attacking the black queen and preventing mate at g2, but again the program would only have examined to the end of the four-ply continuation 15 h3—f4 e3—f2+ 16 f1—f2 g6—g2 (or b7—g2), and seen that it had lost a pawn!

15	...	f8—c5
16	f1—e1	e8—g8

Of course e3—e2+ does not win the white queen because the pawn on e2 is pinned against the black king. But now 17. . . e3—e2+ is a real threat.

17 b1—c3??

Which the program overlooks. There is a routine which asks "am I in check?", but none which asks "can I give check?", and there is no question of the form "can I attack a valuable enemy piece?" As a result of these deficiencies, the program would not have put black's next move in the top seven places on the plausible move list when considering the replies to 17 b1—c3.

17	...	e3—e2+
18	h3—f2	b7—f3
19	g2—g3	e2—d1=Q
20	c3—d1	g6—c2
21	b2—b3	a8—d8
22	h2—h4??	

Of course the program is totally lost in any case, but this move is worthy of comment because it illustrates another deficiency of forward pruning. The answers to questions 1—6 were all "no". Question 7 generated six legal pawn moves and question 8 generated piece moves, but the plausible move list was full after the first piece move was discovered, and so the program failed to spot the need to defind itself against the threat of d8—d1. Had it done so it would probably have played e1—f1, a move which requires a six-ply search to discover its refutation.

22	...	d8—d1
23	Resigns	

So with a crude search strategy and crude forward pruning, the Bernstein program was able to play recognizable chess, but extremely weakly. One important lesson that can be learned about forward pruning from the last mistake, is that your program should look further afield if the first move that it comes up with is seen to be bad. In this case, after examining the 7 chosen moves from the root of the tree, the program could see that it was losing material to 22 . . . d8—d1, but was powerless to stop it. Had it been permitted to continue its search it would have found a "better" move before too long. There is a parallel here between the drastic forward pruning method employed by Bernstain, and the iterative deepening approach used by many of today's programs. With iterative deepening, a program finds the best move it can after a 1-ply search, then it increases the depth to 2-ply and looks for a better move, then to 3-ply, and so on, until it runs out of time. Similarly, a forward pruning program should be permitted to continue its search by relaxing the pruning requirements, if it cannot find a satisfactory move early on in its search. Instead of searching 7 moves at each level, Bernstein could have examined (say) 5 moves at each level in less than one-third of the time, then when the program discovered that 21 h2—h4 and its four brothers were all dreadful moves, it could have examined all the other moves from the root of the tree, and the best 5 successors to each of them. This would have resulted in only a slight increase in total computation time for the move, but it would have enabled the program to see the immediate tactical consequence overlooked by the "best seven" approach.

Bibliography

The bibilography of material on computer chess is enormous. I shall mention only a small number of particularly significant works. Further references will be given next month:

Bernstein, A., and Roberts, Michael de V. *Computer v. Chess Player*. Scientific American, vol. 198, June 1958, pp. 96—105.

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BETTER THAN BRAILLE

Resident calculator expert Dick Pountain brings you a very useful program for opening up the calculator world to the blind.

Once again, this month I'm turning the column over to a reader — in this case Mike O'Regan of Beeston, Notts. He's produced an ingenious program which allows blind people to calculate on the Hewlett-Packard 41C by converting the display into an audible code. Although the 41C is not a cheap machine it's probably cheaper and more flexible than the Braille-display desk top machines which are produced for the blind, and it's programmable to boot.

As you rattle off your routine number crunching on a calculator, has it crossed your mind to wonder how you ever managed without one? If you have, you probably remember doing your sums with the help of pencil and paper, a slide-rule or, perhaps, log tables. How do you think you would have managed if even these aids were denied you? You may now have some idea of the enormous problems encountered by blind people when faced with anything more than simple mental calculations.

Being a musician as well as a calculator fan, I was analysing the TONE function of my new Hewlett-Packard 41C when it suddenly struck me that I might be able to use audio signals as the basis for a program that would enable blind people to use the calculator!

It's well known that not only have most blind persons an enhanced sense of sound but they can also quickly become adept at using keyboards by touch. So, working on the assumption that the actual keyboard operation was no problem, I concentrated on a program to read the display and convert this into audio signals.

The first step was to check with Hewlett-Packard that I was not about to 're-invent the wheel', somewhat surprisingly I found that, as far as they knew, nobody else was working along the same lines.

I decided that, to be of optimum value, the program should:
- be easily understood by the user;
- read, translate to audio and return the number to the display;
- work with any number combination (ie integers, decimals, minus numbers and, if possible, with scientific and engineering notation);
- not interfere with normal calculations, as far as possible;
- utilise rarely used storage registers without increasing SIZE status too much.

The SIMAUD (SIMple AUDio) program is the first result. (see program listing and explanatory notes).

How far does SIMAUD go to meeting the requirements listed above? Well it *is* easily understood, and the original number is returned to the display unaltered (except that SCI and ENG displays are only returned unaltered when too big for normal FIX display). SCI and ENG displays *are* audio indicated but in long form (counting all zeroes. Normal calculations are not affected and the program utilises storage registers 10 — 14. The only slight drawback to the program was that execution turned out to be rather slow, especially with the higher digits, so another program was developed and named AUDIOP.

AUDIOP (AUDio OPeration) is basically the same as SIMAUD except that each digit is signalled by just one TONE, (a different one for each, with low TONEs for low digits and high TONEs for high). Minus number and decimal indicators are the same as SIMAUD and are easily distinguished from digit TONEs. AUDIOP is much faster, but a certain amount of training is needed in order to be able to link the TONEs and digits (I estimate three to four hours for reasonably fluency). To make training more interesting I went on to develop a number guessing game (TRILOB). Luckily most of the TONEs are widely spaced — being roughly equivalent to pentatonic intervals. Tones spaced closer, as in a diatonic scale, are more difficult to recognise.

Up to this stage the use of the programs had been just theoretical . . . it was high time I arranged a field test. All three programs were tried by blind people (contacted through the RMIB) and SIMAUD was an immediate success; the indications were that AUDIOP could also be readily used after a

```
01♦LBL "SIM
AUD"
02 STO 10
03 0
04 STO 13
05 RCL 10
06 SF 00
07 RND
08 STO 10
09 STO 11
10 X<0?
11 GTO 04
12♦LBL 11
13 INT
14 X=0?
15 GTO 00
16 RCL 11
17♦LBL 02
18 STO 11
19 INT
20 X=0?
21 GTO 03
22 1
23 ST+ 13
24 CLX
25 RCL 11
26 10
27 /
28 GTO 02
29♦LBL 03
30 RCL 11
31 10
32 *
33 INT
34 STO 14
35 X=0?
36 GTO 08
37 GTO 07
38♦LBL 09
39 LASTX
40 FRC
41 STO 11
42 1
43 ST- 13
44 RCL 13
45 X<=0?
46 GTO 05
47 GTO 03
48♦LBL 04
49 TONE 2
50 TONE 0
51 CHS
52 STO 11
53 GTO 11
54♦LBL 05
55 RCL 11
56 X=0?
57 GTO 06
58 GTO 00
59♦LBL 00
60 RCL 10
61 X=0?
62 GTO 06
63 FS? 00
64 GTO 10
65 GTO 03
66♦LBL 06
67 RCL 10
68 CF 00
69 RTN
70♦LBL 07
71 TONE 7
72 DSE 14
73 GTO 07
74 GTO 09
75♦LBL 08
76 TONE 6
77 GTO 09
78♦LBL 10
79 TONE 9
80 TONE 9
81 CF 00
82 GTO 03
83 END
```

```
01♦LBL "AUD
IOP"
02 STO 10
03 0
04 STO 13
05 RCL 10
06 SF 00
07 RND
08 STO 10
09 STO 11
10 X<0?
11 GTO 04
12♦LBL 11
13 INT
14 X=0?
15 GTO 00
16 RCL 11
17♦LBL 02
18 STO 11
19 INT
20 X=0?
21 GTO 03
22 1
23 ST+ 13
24 CLX
25 RCL 11
26 10
27 /
28 GTO 02
29♦LBL 03
30 RCL 11
31 10
32 *
33 INT
34 TONE IND
X
35 LASTX
36 FRC
```

```
 37 STO 11
 38 1
 39 ST- 13
 40 RCL 13
 41 X<=0?
 42 GTO 05
 43 GTO 03
 44♦LBL 04
 45 TONE 2
 46 TONE 0
 47 CHS
 48 STO 11
 49 GTO 11
 50♦LBL 05
 51 RCL 11
 52 X=0?
 53 GTO 06
 54 GTO 00
 55♦LBL 00
 56 RCL 10
 57 X=0?
 58 GTO 02
 59 FS? 00
 60 GTO 10
 61 GTO 03
 62♦LBL 06
 63 RCL 10
 64 CF 00
 65 RTN
 66♦LBL 10
 67 TONE 9
 68 TONE 9
 69 CF 00
 70 GTO 03
 71 END
```

```
 01♦LBL "TRI
LOB"
 02 FIX 0
 03♦LBL 03
 04 0
 05 STO 02
 06 1000
 07 STO 01
 08 RCL 00
 09 9821
 10 *
 11 .211327
 12 +
 13 FRC
 14 STO 00
 15 SQRT
 16 RCL 01
 17 *
 18 INT
 19 STO Y
 20 CLX
 21♦LBL 00
 22 1
 23 ST+ 02
 24 CLX
 25 RDN
 26 RDN
 27 XEQ "AUD
IOP"
 28 STOP
 29 X=Y?
 30 GTO 01
 31 X>Y?
 32 GTO 02
 33 TONE 3
 34 CLX
 35 GTO 00
 36♦LBL 01
 37 BEEP
 38 RCL X
 39 XEQ "AUD
IOP"
 40 RCL 02
 41 PSE
 42 PSE
 43 XEQ "AUD
IOP"
 44 GTO 03
 45♦LBL 02
 46 TONE 9
 47 GTO 00
 48 END
```

suitable period of acclimatisation. Actually, there's room in the CMOS memory of the basic HP 41C to hold both programs, so that one may be checked against the other — another form of training.

In conclusion, since developing these programs I've discovered there are about 15 calculators on the market, especially designed for the blind. However these are, almost without exception, large, mains operated, slow (usually using Braille as readout) and expensive.

SIMAUD Explanatory Notes

Steps 3 & 4	zero the counter
Step 6	decimal trace flag
Step 8	store display number for ultimate recall
Step 9	working register
Step 10	minus number test
Steps 13&14	decimal number test
Steps 17-28	loop to 'decimalise' number (by repeated division by 10) and count the number of loops to complete 'decimalisation'
Steps 29-37	loop to reverse the process of the loop above, one digit at a time, storing each digit in register 4
Step 35	test if digit is 0
Steps 38-47	store for 'remainder' of decimalised number and countdown of counter
Steps 48-53	routine to produce minus number audio signal (TONEs 2 & 0)
Steps 54-58	check for end of number
Steps 59-65	test for decimal part of integer-decimal number
Steps 66-69	end of program
Steps 70-74	routine to produce the correct number of TONE 7s for each digit using register 4 as control
Steps 75-77	audio signal for 0 (TONE 6)
Steps 78-83	audio signal for decimal point (TONEs 9,9)

AUDIOP Explanatory Notes

See SIMAUD Notes for all except:

Step 34	produces individual TONE for each digit

TRILOB Explanatory Notes

Steps 4&5	zero 'guess' counter
Steps 8-18	random number generator
Step 27	uses AUDIOP as sub-routine to produce audio indication of number
Step 28	STOP for player to key in 'guess'
Step 29	test for correct 'guess'
Step 31	test for 'guess' too high
Step 33	audio indication that 'guess' is too low
Steps 36-41	audio indication of right guess and recall guess counter
Step 43	number TONEs signifying number of guesses
Step 46	audio indication that 'guess' is too high

SIMAUD/AUDIOP User Instructions

1. STATUS: minimum SIZE 015*
2. Key in program from listing*
3. Assign SIMAUD and/or AUDIOP to free keys (e.g. LOG, LN)*
4. Test for POWER ON by pressing SHIFT 4 (BEEPs if power on)
5. Test for USER Mode On by pressing any number key(s) (except 0) and assigned key. (If no signal, switch USER on.)
6. FIX number of decimal places, as required
7. Do calculations in normal way, pressing SIMAUD/AUDIOP assigned key to check intermediate or final totals, as required.

TRILOB

1. Ensure that AUDIOP is in program memory*
2. Key in program from listing*
3. Assign TRILOB to free key*

4,5. As for SIMAUD/AUDIOP

6. Start game by pressing TRILOB assigned key
7. 'Secret' number signalled by TONEs
8. Key in 'guess' — press R/S
9. Low guess signalled by low TONE (TONE 3). High guess signalled by high TONE (TONE 9). Right guess signalled by BEEP, number repeated as TONEs, pause, then 'number of guesses' signalled by appropriate TONE.
10. program loops to 7 above.

NOTE: Instructions marked* will require sighted assistance — others can be carried out by the blind person.

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The bottom line

There's this podgy US general (well, an actor, really) pacing up and down the back lot at MGM studios. He wears his tin hat in the office and chews a cigar so savagely you'd think it was the enemy's tender parts. He also sports a couple of pearl-handled revolvers. Boy — is this guy tough!

He glares at the nearest plasterboard scenery and removes his mangled cigar long enough to bellow, "Lootenant — where's that report?"

A skinny nervous actor rushes in, carrying a bundle of papers. "Right here, General, sir!"

The 'General' explodes. "Goddam it, Lootenant! I asked for a report, not the entire US Army Regulations! I gotta war to run – gimme the bottom line!"

The demand to "gimme the bottom line" is not confined to American actors or their scriptwriters. All of us show exactly the same desire at different times. For example, none of us asks a friend what (s)he watched on TV last night, expecting a half-hour blow-by-blow account! We expect a short answer – a Western, the big match or whatever. If that arouses our interest, we may then ask for more details, but initially we mean, 'Gimme the bottom line'.

People who write computer programs are very prone to overdo it. (I know I am!) We start off with an idea and quickly get it working and degugged, but then come the ideas for improvements. Sometimes these are real improvements, but more often they are simply unnecessary elaborations on the original theme.

For example, I recently wrote a program to count the vowels and words in any passage of text. Before I knew what I was doing, I had the thing elaborated to count each different vowel separately, calculate the vowel per word ratio, the average length of each word, the number of punctuation characters, and so on. This process is sometimes called 'gilding the lily' and it's an awfully easy trap to fall into.

You may protest that elaborations really do make the program better, but I counter in two ways: (1) What exactly do you mean by 'better'? (2) Are you going to capture and hold anyone's interest in your program if you are unable to give them 'the bottom line'?

Let's take the first point. Initially, your program – or mine, or his – is simple, neatly numbered and formatted, easily understood and short. Then we start to elaborate and in no time at all it's an untidy mess of inserted lines and a bewildering maze of GOTOs. Come the tidying-up process and you find obsolete or duplicated variables and a whole stack of other problems that you never dreamed of. (Don't worry — I've done it — we all have!) Frequently the only thing to do is to scrap the whole program and start again.

Sometimes we write such elaborated programs simply to exercise our skills. I suspect that more often we get carried away by exuberance. There's no harm in that as such . . . just don't expect others to share the flights of fancy. If you'd like someone to actually USE your program, as distinct from just talking about it or congratulating you on it, then there's no doubt that simpler is better.

If for example your version of Starwars allows the user 25 different commands, you'd be far better advised to forget the majority of them – the user will!

What I'm getting around to in my elephantine manner is to try and encourage those readers who may have small programs to submit, but are a bit shy about it. There may be more merit in a small program than in the longest printout you ever saw. Elaboration is not hard. What is really difficult is to devise a new program – a totally new game or new application for a home computer. That is what everybody is interested in.

Gimme the bottom line! Better yet, gimme something new! There must be a thousand 'shooting' programs about and more come in every week, many very sophisticated indeed. But I have a thousand times more delight in a new application, even if it isn't quite right yet.

I am prompted in the above remarks by the receipt of what was for me a totally new type of program — from a reader in Shropshire. This lad thought of having a compiler for graphics, so you play about animating all sorts of things and the program remembers what you have done. At command, it will then play back or store it on disk for later use. Great! That's innovation for you.

I've suggested one or two minor alterations to him and with any luck we will all in due course see the results of his labours.

Programs received

Graphics Plotter by N. Smith of Telford; Hangman by Neil Sleightholm (17) of Billericay; Clear the Screen, Fruit Machine, Speed and Acceleration and Shoot & Save by Janine Booth (13) of Peterborough; Mastermind by David McKeran (16) of Sunderland; Cesil to Basic Converter by G. Staples (17) of Beckenham; Two Astronomy Programs, Square Roots and Nim by Gary Nugent of Dublin; Lunar Lander by Graham Kirby (14) of Pitlochry; Anagrams by Andre Cockburn (9) of Bracknell; Space Taxi by Torstein Kongshem (17) of Oslo; Basic Renumber by Colin Hughes (13) of Luton; Barricade by Robert Nicholls (14) of Cardiff; Space Target by J. Adams (16) of Ledbury; Graphics Multiplier by Mark Wylkie (16) of Hertford.

This is getting better and better! Notice that girls's name in there? Thanks Janine — you're the first girl to send me a program. (What am I saying? She sent in four!)

And how about young Andre? Not only is he just 9 years old, he's also severely handicapped and types laboriously with only one finger. (So do I — and I'm not handicapped!)

I forgot to mention last month how impressed I was with D Tate's presentation of his program material. It was real 6th Form stuff — neat folder, logical presentation — wow!

Competition

We had a great time sorting through the entries for our logo competition. In the end — what do you know? — the winning entry was sent in by Abigail McLellan of Middlesborough, who is 10 years old! Well done, Abigail! When I can prise the safe keys out of the editor's clutching hand, there'll be a prize on its way to you. Thanks to all those who sent in entries. Our artist has redrawn the design and I reckon it looks pretty good at the top of the page — a worthy winner.

Speed and Acceleration by Janine Booth

```
10 REM
20 CLEAR
21 FOR X=1 TO 15:PRINT:NEXT X
22 PRINT"TIME(S) is the time taken associated with"
23 PRINT"speed and distance."
24 PRINT"TIME(A) is the time taken associated with"
25 PRINT"acceleration,initial speed and final speed'
26 FOR A=1 TO 5000:NEXT A
27 FOR A=1 TO 15:PRINT:NEXT A
30 INPUT"ENTER UNKNOWN";A$
40 PRINT
50 IF A$="DISTANCE" THEN GOTO 120
60 IF A$="SPEED"THEN GOTO 160
70 IF A$="ACCELERATION" THEN GOTO 270
75 IF A$="TIME(A)" THEN GOTO 310
80 INPUT"ENTER DISTANCE(m),SPEED(m/s)";C,D
90 X=C/D
100 PRINT"TIME TAKEN=";X;"SECONDS."
110 END
120 INPUT"ENTER TIME(S)(s),SPEED(m/s)";C,D
130 X=C*D
140 PRINT"DISTANCE TRAVELLED=";X;"METRES."
150 END
160 INPUT"WHICH PAIR OF VALUES IS KNOWN";E$,F$
```

GOTO page 125

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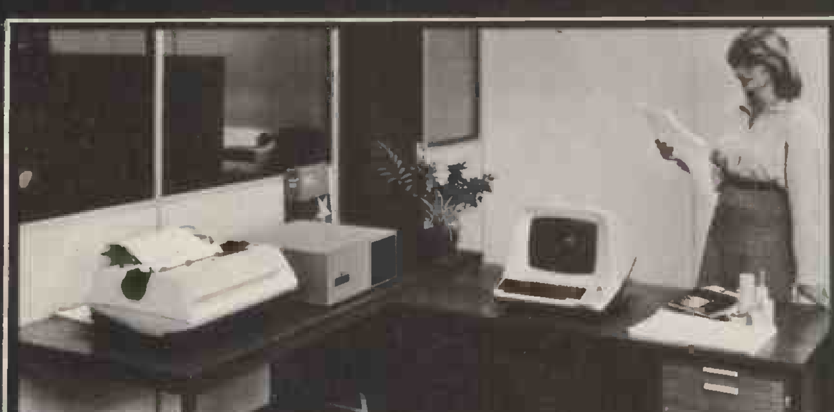

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Birmingham B5 4TD
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Glasgow Tel. 041-221 7409
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48 Tottenham Court Road
London W1 85 4TD
Tel. 01-636 0647

NEWCOMERS-START HERE

This is PCW's unique quick-reference guide for the microcomputing novice. While it's in no way totally comprehensive, it should help you pick your way through the most important pieces of (necessary) jargon which you'll find in PCW. We trust you'll find it useful. Happy microcomputing.

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say "numbering system with a radix of sixteen in which the letters A to F represent the values 10 to 15" when instead we can simply say "hex". No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, PCW will be publishing this guide — every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, processing it, storing the results or sending them somewhere else. All this information is called data and it comprises numbers, letters and special symbols which can be read by humans. Although the data are (yes, it's plural) accepted and output by the computer in 'human' form, inside it's a different story — they must be held in the form of an electronic code. This code is called binary — a system of numbering which uses only 0s and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or bits as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being ASCII (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 — complicated for humans, but easy for the computer! This collection of eight bits is called a byte and computer freaks who spend a lot of time messing around with bits and bytes use a halfway human representation called hex. The hex equivalent of a byte is obtained by giving each half a single character code (0—9,A—F): 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 ...... E=1110 and F=1111. Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of 0s and 1s. The machine detects these 0s and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing them with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in memory as bytes. The rules are called programs and while they can be input in binary or hex (machine code programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the programming language is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is Basic. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To run such a program the computer uses an interpreter which picks up each English-type instruction, translates it into machine code and then feeds it into the processor for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with Basic are PEEK and POKE. They give the programmer access to the memory of the machine. It's possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to hardware, this means the physical components of a computer system as opposed to software — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit (CPU), a single microprocessor chip with supporting devices such as buffers, which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board (PCB) or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a bus system is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the S100.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, RAM (Random Access Memory) and ROM (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — static and dynamic; all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuity to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called PROMs (Programmable ROMs) and EPROMs (Erasable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, cassettes and floppy disks are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, floppy disks are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a read/write head across the disk's surface. The disk is divided into concentric rings called tracks, each of which is in turn subdivided into sectors. Using a program called a disk operating system, the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: soft sectoring where special signals are recorded on the surface and hard sectoring where holes are punched through the disk around the central hole, one per sector.

Half-way between cassettes and disks is the stringy floppy — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. Hard disk systems are also available for microcomputers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit (VDU), which looks like a TV screen with a typewriter-style keyboard; sometimes these are built into the system, sometimes they're separate. If you want a written record (hard copy) of the computer's output, you'll need a printer.

The computer can send out and receive information in two forms — parallel and serial. Parallel input/output (I/O) requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the baud rate and, very roughly, the baud rate divided by 10 equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces; the most common is RS232 (or V24) while, for parallel interfaces to printers, the Centronics standard is popular.

Finally, a modem connects a computer, via a serial interface, to the telephone system allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need British Telecom's permission; instead you could use an acoustic coupler, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — British Telecom isn't so uppity about the use of these.

DIRECT ACCESS — PACKAGES

Mary Knight of Mike Rose Micros presents our guide to widely-available software packages. This will be appearing bi-monthly from now on, alternating with our In Store hardware guide.

	ARDEN DATA PROCESSING 0533 22255		B+B COMPUTERS LTD 0204 26644		BEAM BUSINESS CENTRE 01-636 1392			BENCHMARK COMPUTER SYSTEMS 0726 61000
	PET	Apple	PET/CBM	Altos (CP/M MP/M)	PCC 2000 Simpelec. Triton 3	PET	Apple	North Star Horizon
Stock Control/Recording	15	P.O.R.	300	300	350			450
Sales Ledger		300			350			250
Purchase Ledger		300			350			250
General Ledger/NL		300			350			250
Integrated Accts			300	300				950
Word Processing		75						
Mailing List		300	75	75				
Invoicing			25-50					100
Database Management/ Information Retrieval		150	75					250
Payroll		P.O.R.						350
Incomplete Records								
Personnel Records								
Estate Agent		850			350			
Time/Cost Recording			300		350			250
Job Costing								
Mail Shot					450			
Credit Control								
Cash Flow								
Production Analysis			300					
			Disk Operating System 150			Standard PET + Apple Packages		

	BENCHMARK COMPUTER SYSTEMS 0726 61000	BRISTOL SOFTWARE FACTORY 0272 23430	CAP-CPP MICRO PROD-UCTS LTD 01-404 0911	COMMODORE 01-388 5702		COMP-SOFT 0483 39665	COMPUTASTORE LTD 061-832 4761	
	Cromemco	PET		PET/CBM	8000 Series	PET	Vector	PET
Stock Control/Recording	450	300		150				
Sales Ledger	250	300	800	200	250		400	
Purchase Ledger	250	300	1000	200	250		400	
General Ledger/NL	250			200			400	
Integrated Accts	950			(50)	P.O.R.		1000	
Word Processing				75/150	250		400	325
Mailing List								
Invoicing	100		400					
Database Management/ Information Retrieval	250		P.O.R.	50/150	P.O.R.	170		
Payroll	350		P.O.R.	150	250			200/350
Incomplete Records								
Personnel Records								
Estate Agent								
Time/Cost Recording	250							
Job Costing								
Mail Shot								
Credit Control		650						
Cash Flow								
Production Analysis								
	Revolving Credit 400+			Assembler Dev 50				
	Hire Purchase 400+			LISP 75 Pascal 120				
	Leasing 400+							

PACKAGES

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	COMPUTECH 01-794 0202		DATA BANK 0509 217671			GRAMA (WINTER) LTD 01-636 8210	GREAT NORTHERN 0532 450667
	Apple II	ITT 2020	PET	ITT 2020	Apple II	PET/CBM	8080/Z-80
Stock Control/Recording			10	10	10	150	275
Sales Ledger	295	295					275
Purchase Ledger	295	295					275
General Ledger/NL	295	295					275
Integrated Accts						650	995
Word Processing			40	40	40	75/150	
Mailing List			50	50	50		
Invoicing							
Database Management/ Information Retrieval						150	
Payroll	375	375	10	10	10	150	275
Incomplete Records							
Personnel Records							
Estate Agent							
Time/Cost Recording							
Job Costing							
Mail Shot							
Credit Control							
Cash Flow							
Production Analysis							
	Utilities 20	Utilities 20	Bank Account 10	Bank Account 10	Bank Account 10		Job Order Control 275
			Salesman 10	Salesman 10	Salesman 10		Prof Appts. groups 275
			Cash Register 10	Cash Register 10	Cash Register 10		Prof Appts individ. 220
			N.B. Discounts on multiple sales				Prof Client. Billing 330

	GREAT NORTHERN 0532 450667	A J HARDING 0424 220391	HARTFORD SOFTWARE 0606 76265	H.B COMPUTERS 0536 83922	HIPPOSOFT 0332 23127		INTEREUROPE SOFTWARE DESIGN 0734-786644
	Apple	TRS 80	PET	CBM	PET	ACT 800	MCZ Zilog
Stock Control/Recording	150	200		35/25			
Sales Ledger		225		350			
Purchase Ledger		225		350			
General Ledger/NL		225		200			
Integrated Accts							
Word Processing		15	85/65/40/20	35	375	375	500+
Mailing List		25/38/55	45	35			
Invoicing		25					
Database Management/ Information Retrieval		32.50			225	225	
Payroll		200		10			
Incomplete Records		40					
Personnel Records			85				500+
Estate Agent				30			
Time/Cost Recording							
Job Costing							
Mail Shot							200
Credit Control							
Cash Flow							
Production Analysis							
	Video message 200	VAT Register 15	Lotteries 45	Utility set 78			Screen Generator 75+
	Statistics 150		Membership Accting 85	VAT Master 25			Conference Organiser 500+
			T.A.P. Business System 125	Bureau de Change 8			Budgeting Package 500+
				Price Lister 12			

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	INTEX DATALOG LTD 0642 781193	T V JOHNSON 0276 62506			KATANNA MANAGEMENT SERVICES 0245 76127		KEEN COMPUTERS 0602 583254
	PET	PET/CBM	TRS 80	Apple II	TRS 80I	CP/M	Apple
Stock Control/Recording	195	150	115		200	500	P.O.R.
Sales Ledger		P.O.R.			225	500	300
Purchase Ledger		P.O.R.			225	500	300
General Ledger/NL					325	500	300
Integrated Accts		650	75				
Word Processing		75/150	45/95	75	70	500	75
Mailing List							300
Invoicing		P.O.R.			75	500	
Database Management/ Information Retrieval		150	150				150
Payroll	50/195	150			218	500	P.O.R.
Incomplete Records							P.O.R.
Personnel Records							
Estate Agent							850
Time/Cost Recording							
Job Costing							
Mail Shot							
Credit Control							
Cash Flow							
Production Analysis							
		Petsoft programs 160			Individual designed programs 100 up		

	LIFEBOAT ASSOCIATES 01-836 4663		LIVEPORT (EXIDY SORCERER FIRMWARE) 0736 798157	PADMEDE COMPUTER SERVICES 025671 2434		ACT/PETSOFT 021-454 5348	SUMLOCK BONDAIN 01-250 0505	TRIDATA MICROS LTD 021-622 1754
	CP/M	8080/Z80	Sorcerer	Apple II	ITT 2020	PET	Apple	TRS 80I
Stock Control/Recording	325	325		300	300	12/25/350	P.O.R.	200
Sales Ledger	425	425		300	300	95/350	300	225
Purchase Ledger	425	425		300	300	95/120/350	300	225
General Ledger/NL	375	375					300	225/325
Integrated Accts	950	950		450	450			
Word Processing						25/325	75	
Mailing List						15	300	
Invoicing	325	325		300	300	350		75
Database Management/ Information Retrieval						325	150	
Payroll	475	475	250			50/25/195	P.O.R.	218
Incomplete Records								
Personnel Records								
Estate Agent						25	850	
Time/Cost Recording				300	300			
Job Costing				300	300			
Mail Shot								
Credit Control								
Cash Flow						8		
Production Analysis								
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	TRIDATA MICROS LTD 021-622 1754	VLASAK ELECTRONICS LTD 062-84 74789
	TRS 80II	Apple II
Stock Control/Recording	375	285
Sales Ledger	375	315
Purchase Ledger	375	315
General Ledger/NL	425	225
Integrated Accts		855
Word Processing		120
Mailing List		
Invoicing	125	140
Database Management/ Information Retrieval		
Payroll	375	375
Incomplete Records		
Personnel Records		
Estate Agent		
Time/Cost Recording		
Job Costing		
Mail Shot		
Credit Control		
Cash Flow		80
Production Analysis		
		Letter writer 80

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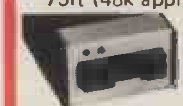

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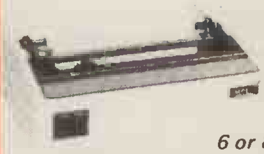

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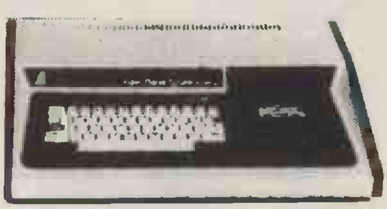

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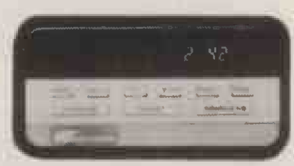

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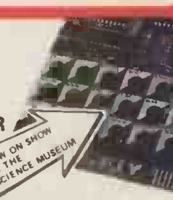

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USER GROUPS INDEX

Here are the details of additions and changes recently notified. If we have failed to include YOUR group (or have published incorrect information) either here or in the complete listing, then please address changes/additions to: PCW (User Groups Index), 14 Rathbone Place, London W1P 1DE. Finally, the next complete listing will appear in our November issue.

INTERNATIONAL

Tangerine Users Group (International). Recently formed for users of the Microtan 65, the TUG will act as a central information clearing house, including exchange of programs etc. Annual membership is £5.00. Details from TUG at 3/22 Donoughmore Road, Boscombe, Bournemouth, Dorset, UK.

USCD System User Society. Set up in San Diego in June for users of USCD Pascal, the society aims to establish a software librar library, promote regional and special interest group activities and liase with USCD system distributer Softech on future development plans. Existing special interest groups include industrial application, word processing, real time, business applications and forward planning. UK contact: John Ash, Dicoll Data Systems Ltd., Bond Close, Kingsland Estate, Basingstoke, Hants RG24 0QB.

NATIONAL

National Personal Computer Users Association. Full membership now costs £8.00, but you'll receive a free datasheet of special routines for the UK101/Superboard on enrolment (routines include a fast Basic line renumberer only four lines long). For detail details send an SAE to: The Secretary, NPCUA, 11 Spratling Street, Manston, Ramsgate, Kent.

Powertran Users Club. Annual subscription £5.00, which includes a monthly newsletter. Contact Mr P L Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ.

LONDON

Southgate Computer Club. The club recently held its AGM and adopted a formal constitution. Annual subscription will be £2.50 from January 1981, including a club newsletter; full-time students under 18 pay half-cost. The club now has 83 members. Contact: Panos Koumi, Southgate Computer Club, 33 Chandos Avenue, London N14.

ESSEX

South East Essex Computer Society. Meets monthly at the Southend-on-Sea College of Technology, has access to the college's micros, and is open to anyone over 14. Contact: R Knight, 128 Lt. Wakering Road, Lt. Wakering, Southend-on-Sea, Essex. Tel: Southend 218456.

"He processed his first word today"

DIARY DATA

DIRECT ACCESS

Philadelphia, USA	Personal Computing 80 (America's largest East Coast micro show). Contact PCAF '80 c/o Philadelphia area Computer Society Box 1954, Philadelphia, Pa 19105.	Aug 21 — Aug 24
Salford, England	1980 Salford Microprocessor and Microcomputer Exhibition. Contact Dr E A Flinn (Exhibition Director), 061-736 5843	Sept 2 — Sept 4
London, England	(Cunard International Hotel) The 3rd Personal Computer World Show. Contact Montbuild Exhibitions Ltd., 01-486 1951	Sept 4 — Sept 6
Stuttgart, W Germany	Hobby Electronics Exhibition. Contact CES (Overseas) Ltd., 01-236 0911	Sept 10 — Sept 14
Paris, France	SICOB. Contact French Trade Exhibitions, 01-439 3964	Sept 17 — Sept 26
Bristol, England	(Eurocrest Hotel) BIZTRONIC. Mini/Micro Computers, Word Processors and Business Machines Exhibition. Contact Groundrule Exhibition Co., 061-928 0406	Sept 23 — Sept 24
Plymouth, England	BEX. Business Equipment Exhibition. Contact Douglas Temple Studios Ltd, Tel: 0202 20533	Oct 1 — Oct 2
Melbourne, Australia	World Computer Exhibition. Contact Riddell Exhibition Promotions Pty. Ltd., 166 Albert Road, South Melbourne, Vic 3205.	Oct 14 — Oct 19
Edinburgh, Scotland	(Ingliston Showground) BEXIBITION. Business Equipment Exhibition. Contact Douglas Temple Studios, 0202 20533	Oct 15 — Oct 16
Doncaster, England	(Exhibition Centre) Business Efficiency and Office Equipment Exhibition. Contact Gwen Shillaber Designs, 0272 312850	Oct 15 — Oct 17
Bradford, England	(Norfolk Gardens Hotel) Business Efficiency Exhibition. Contact Gwen Shillaber Design, 0272 312850	Oct 21 — Oct 23
Manchester, England	(Forum) BIZTRONIC. Mini/Micro Computers, Word Processors and Business Machines Exhibition. Contact Groundrule Exhibition Co., 061-928 0406	Oct 21 — Oct 26
London, England	(Olympia) COMPEC. Computer Peripheral & Small Computer Systems Exhibition and Conference. Contact IPC Exhibitions Ltd., 01-837 3636.	Oct 28 — Oct 30
London, England	(West Centre Hotel) Professional Viewdata Exhibition. Contact IPC Exhibitions Ltd., 01-837 3636	Oct 28 — Oct 30
Cardiff, England	(Sophia Gardens) BEX. Business Equipment Exhibition. Contact Douglas Temple Studios Ltd., 0202 20533	Nov 5 — Nov 6
Birmingham, England	(NEC) Which Computer? Show. Contact Clapp & Poliak Europe Ltd., 01-995 4806	Nov 25 — Nov 28

TRANSACTION FILE

The classified service that's free to non-commercial readers. Advertisements (50 words max) to: PCW Transaction File, 14 Rathbone Place, London W1P 1DE.

For sale

TRS-80 Level II. . . 16k plus cassette, manual, video or TV adaptor, tapes, 1 month old, Tandy warranty, £310. Tel: 01-769 2257.

Data Dynamics. . . KSR 390 terminal, ASCII code, RS232, 10 cps, 80 column, with stand and paper, good condition, £195 ono. Contact S Ross, 44 Premier Ave, Grays, Essex.

Acorn System One. . . VGC with power supply, manuals and some software, factory-built, £60. Tel: 01-979 4696 after 6pm.

SYM 1. . . 4k, £120. Tangerine 1648, £78, Star keyboard, £20, 6522 VIA programmable interface card for Apple/ITT 2020 £65, 16-channel ADC card for Apple/ITT 2020, £68. All in excellent cond. with full documentation. G McArdle, 7 Willow Rise, Kirkbymoorside, York, Tel: 0751 31751 (office).

PET 32k. . . (large keyboard), 800k Computhink disk drive, Centronics 779 printer with unused disks & printer paper, £1850 ono, possibly split. D Payne, The Brambles, Bramley Grove, Crowthorne, Berks. Tel: 034 46 71127.

Cash crisis forces sale. . . static RAMs: 2141 4k x 1, 250 ns; 2114 1k x 4, 200 ns; 4046 4k x 1, 450 ns; dynamics: 4116 16k, 150 ns; UVPROM 2708 3 rail & 2716 5 v only; all new, full spec devices, no reasonable offers refused. Tel: 0524 734470 (evenings).

PET 2001-8k. . . excellent cond, little used, program tapes & PET documentation, £550. Tel: 01-640 1501 (evenings).

TRS-80 Level 1. . . 4k, plugs into ordinary TV, 3 months old, £250 inc. software, ono. Wife wants deep freeze! Tel: Petersfield 61297 (evenings).

Apple II. . . integer firmware card with programmer's aid 1, used only since Xmas (upgraded to language card), £85; Jade 18k RAM expansion kit for Apple II, unopened, £49. Tel: Fisher 01-677 2052 (evenings) or write 98 Moyser Rd., London SW16 6SH.

PET 8k. . . as new, new ROMs, green screen, sound box, plenty of games & utility programs, £500. Tel: 01-554 2533 (after 6pm).

Personal Computer World. . . complete to date except Vol 1 No 9; any offers? S. Reid, 6 Culloden Cres, Arbroath, Tayside DD11 1JX.

TRS-80 Level II. . . 16k, VDU, cassette & tapes inc. Adventure, Microsoft Editor/Assembler & books on assembler programming, boxed as new, £475 ono. Tel: Stirling 3171 ext: 2700 (10 am — 6 pm).

MK 14. . . inc. extra RAM, I/O ports, VDU, new hex keypad cassette interface, PSU, all mounted on wooden board, fully working, £150. Unused ASCII keyboard + data, reqs 5 V, as new £50. Tel: 0302 64244 (Doncaster) after 6pm.

MK 14. . . socketed, PSU, not working, needs attention to keyboard & display, offers to Ed, Tel: Preston 54241 between 6 & 8.

TRS-80 Level II. . . 4k with video & recorder, some software, nearest offer to £400 secures. Tel: Earl Shilton (Leics) 47265.

TRS-80 Level II. . . 16k + exp. interface, Micropolis 5" floppy disk drive, Electric Pencil, NEWDOS & other software. Complete system £850. Tel: 0375 70993.

Nascom 1. . . NAS-SYS monitor, 8k RAM, 8k Basic in ROM, 3 A PSU, complete & working, £250 ono. Also T4 & CCSOFT floating point Basic with all documentation, £25. Tel: Carlisle (0228) 39382.

Sorcerer 32k. . . with S100 exp unit, 16k static RAM S100 board, Micropolis disk drives (315k quad density), converted TV, 32 disks with software, all manuals. Can split; sensible offers. Tel: 0632 876645 weekends/evenings (not Mon or Thurs).

UK 101. . . prof. built, case, full 8k RAM, 12" VDU/TV, new monitor, expansion board with 12k RAM, twin minifloppy interface + 5 V, 3 A PSU; complete & working, will split. Tel: Stevenage (0438) 68624 evenings/weekend.

TI-59. . . programmable calc, excellent cond, complete, with 20 mag cards, £135. Tel: Basingstoke 24880 after 4pm.

MK 14. . . issue 5, extra RAM, I/O, VDU, PSU, memory exp card with 1/4k RAM, room for 1k EPROM, all working, £85 ono. Tel: Nottingham 410514 evenings.

PET 2001. . . 8k, £375. Tel: Rickmansworth 76067.

2114s. . . 16 new 1k x 4 statics, unused. Gone dynamic! £3 each. Tel: Bracknell 23621.

The winner. . . of the BBC Young Scientist of the Year is selling his perfect, as new, 32k green screen PET with Programmer's Toolkit, tape deck, cover, many programs, user port connector, full assembler listing of all the ROMs; in original packing, best offer over £900. Tel: Newcastle (0632) 745771 after 6pm.

TI 59. . . with PC100C printer. Printer still under guarantee, calc 15 months old, all vgc, with navigation module, printer utilities pack, £245 ono. Consider split. P Curran 051-494 0408.

Triton. . . full on-board RAM, V4.1 monitor. Complete with recorder & 9" VDU. Manuals & dem cassettes, nearest £300. Tel: 0743 927 545, 6-8pm.

PET 2001. . . 8k as new with lots of software if req, £375 ono. Tel: 0742 313130.

Nascom I. . . with 40k extra RAM, 8k Basic in EPROM, boxed with PSU & fan, recorder, small TV, misc. software inc. assembler, disassembler, interrupt driven printer routine, T4 or NAS-SYS, £575 or offers for bits. Tel: 0480 66513.

Sorcerer. . . 32k with Basic Rompac, VDU, manuals, games cassettes etc. Bought June 1979, used only by owner, £800 ono. R Cullyer, Chandler's Ford 69565 after 6pm.

UK101. . . built and working, 8k RAM, 8k Microsoft Basic, 2k monitor, TV & cassette interfaces, PSU, manual & tapes, £220. Tel: 031-442 3187

MSI system. . . 6800 processor, 40k, 2 serial ports, parallel port, 5" disk drive, ACT1 VDU, Sanyo monitor, ASR33 (RS232), stand. assembler, disassembler, editor, Basic. full documentation, £2000. Also 4k 550 RAM £45, joystick digitiser £25, slider digitiser £20. Tel: Bromyard (08852) 3707.

Atari. . . video computer with 3 games cartridges, more than 90 games variations, perfect working order, £85. Tel: 0984 23557.

TRS-80 Level II. . . RS232 interface, business progs & manuals, all at half price or exch for PET programs. Tel: Meopham (0474) 812691.

TI-59. . . prog. calc., inc Master Library module, mains adaptor & manuals, 10 months old, £50 ono. Tim Cook, 35 Gunton Drive, Lowestoft, Suffolk NR32 4QA.

Memory chips. . . 80 TMS 4030 type 4k dynamic RAMs; will sell as chips only or on working module with diagrams as 40k x 8 bit. Prev. used with 6800 processor, £50 ono. Tel: 01-904 5792.

HP25A. . . calculator, £25 ono. HP19C calc with thermal printer & standard accessories + extra paper rolls, £75 ono. Steve Yewen Yewen, 6 Pilham Court, Gainsborough, Lincs DN2 1PD.

PET 32k. . . with cassette, spare tapes (new), selection of programs inc. self-teach Basic, only 6 months old, offers around £600. Tel: Hoddesdon 44545.

Casio FX502P. . . & FA1 adaptor, inc both manuals, program library, 3 extra prs batteries worth £1.89 will be sent to buyer for £100 inc. p&p ono. A K Jumat, 363 Gateford Rd., Workso Worksop, Notts. S81 7BH.

Nascom I. . . (NAS-SYS) with PSU & case, recently purchased, still in new cond., tested by Nascom agents, £100 ono. John Griffiths, 22 Alston Close, Solihull, Tel: 021-704 3937.

UK 101. . . 8k RAM, cased, input port with numeric keypad, 300/600 selectable baud rate, over 50 programs on cassette inc. assembler, editor, extended monitor, 20 blank digital cassettes, modified recorder, all manuals + various programming books. Chris Halsey, Tel: 01-385 3333 ext 184

UK 101. . . 4k, only 4 months old old, £200 ono. Tel: 05805 2265 or write N Dangerfield, Lake Side, Stream Lane, Hawkhurst, Kent.

Spring clean. . . PET disk drives £625, Sorcerer 32k £665, Apple Hi-res light pen £140, Apple lo-res light pen £45, TI59 with master stat library £145, S100 CPU board £95, S100 assemb. 16k dynamic RAM board £145 or expanded to 64k for extra £90, Versafloppy disk controller assemb £115, Shugart SA400 disk drive £175, IBM Selectric with Aculab int £535, Telequipment S54A scope £125. Tel Evesham (0386) 870841.

Acorn System One. . . assemb & tested, with PSU, user's manual, "Programming the 6502" by Rodnay Zaks, first offer over £85 secures. Tel: Ian May on Cambridge (0223) 61200.

UK101. . . 8k Microsoft Basic, extended monitor, 4k RAM, built & working, stack of computer mags, £200, buyer collects. S Davis, 21 Church Rd., Cheriton, Folkestone, Kent, Tel: Folkestone 77314.

PET 3032. . . 32k, 5 months old, with cassette, Toolkit, cover, over 30 taped games and assembler aids. Also Epsom TX-80 printer (prints PET graphics) & PET IEEE lead. Best offer; tel: 01-907 7785.

PET 16k. . . new ROMs, green screen, large keyboard etc., cassette deck, Toolkit, sound box, manuals & books, plus approx 40 programs, £700. Tel: Peterborough 202987.

Wanted

Documentation. . . on any 2nd generation computer (op manuals, hard/software etc) from early 1950s to mid 1960s. Specific documentation on obsolete hardware (CPUs, peripherals, etc) also welcome. Tel: C Vuodi on 0525 370369 or write 31 Plantation Road, Leighton Buzzard, Beds LU7 7HS.

Service manual. . . or circuit diagram for Commodore Chessmate Computer. P Bamfield, Flat 5, 24 Windlesham Gdns, Brighton BN1 3AJ.

Sinclair ZX80. . . inc leads & mains adaptor, will pay £70. Zahir, tel: 01-675 3203 after 6pm.

TI59. . . TI58C or T158. Write K Ubbi, 26 St Barnabas Rd., Liversedge, W. Yorks WF15 8BT or Tel: 0274 870105.

Mag tape. . . or disk equipment, floppies, exp memory for TI9900 system, CMOS micro; buy/barter. J Vickers, Tel: Camberley 63377 ext 4250 day else 0252 49316.

Large keyboard. . . 32k PET needed by disabled person only able to operate machine with dowelling held in teeth; will swop for present, unsatisfactory 40k small keyboard PET. Ken Smith, Tel: 0385 49445 (10am — 4pm) else 0385 62127.

Service data. . . for General Electric Terminet 30 terminal. Borrow or buy. Eric Demmon, Bishop's Stortford (0279) 503435 weekends/evenings.

"We can't prevent him from looking but surely we can do something to stop him changing the channels"

Continued from page 83

WHO'S KING?

First Computer World Chess champion

No, it has not happened yet, but the Fredkin Foundation of Cambridge Massachusetts, recently offered a $100,000 prize for the first computer program to win the world chess championship.

While programmers continue to strive for world-class chess skill in their programs, the Fredkin Foundation is offering a series of incentive prizes for computer-against-human competition. Two human players of a specified skill level will be selected each year to play the two top programs. Each will play a two-game match, winner take all. The first competition will take place this November at Carnegie-Mellon University; the prizes will be $1500 and $1000. In each succeeding year, stronger humans will be selected and the prizes will be increased.

When asked what English players should do, in general, to improve their play, the world champion, Anatoly Karpov, replied, "Endgames, study endgames." That is good advice for chess programmers too, but my advice to Karpov is — computers, study computers!

Next month I will be looking at the new Sensory Challengers. In the meantime, see you at the first World Microcomputer Chess Championship — at the PCW show!

GATEWAYS TO LOGIC

Continued from page 97

have them count the total number of operations involved.

Matchbox computer

Another variation on the same idea is to obtain a number of empty matchboxes — say a dozen — and bind them together with sticky tape (Fig 13). The boxes are numbered and, as an added touch, may have a tag of tape attached for easy pulling. To program the machine, slips of paper carrying the instructions or data are inserted into the appropriate drawers.

The method is only really suitable for children — adults find the drawers very fiddly — but a suitable alternative for us old 'uns is a set of those plastic drawers that are sold for the storage of bits and pieces.

Noughts and crosses is a simple game that lends itself admirably to demonstration by matchbox computer and, as an added bonus, we can demonstrate the ability of the computer to learn by its mistakes — a concept that many people find disturbing.

Three sets of boxes are needed, with nine boxes to each set. They are bound together as before and the sets numbered 2 — 4 (Fig 14); set number 2 represents the computer's second move, number 3 its third move and number 4 its fourth move. We don't need a set for the computer's first move since, for the sake of simplicity, the computer always goes first and always puts its 'X' in the top left-hand corner — square number 1 (Fig 15). To complete the preparation, 8 little cards are placed in each drawer, numbered 2 — 9. They may be well shuffled.

Play begins. The computer is assumed to put an X in square 1 and the human player keeps track of the game. (S)he replies as seems reasonable — let us suppose an 0 in square 5. To determine the computer's response, the student takes the set of boxes representing the number of the computer's move (in this case 2) and opens the little drawer numbered the same as his own LAST move — in this case 5. Whatever little card is on top of the pile inside is the computer's move. Let us suppose that it's 4. The player replies, then goes to the set of boxes for the computer's third move (following the same rules as before) and opens the box corresponding to his own last move. In the circumstances given this was probably 7.

Play proceeds in this way until a result is obtained — almost certainly a victory for the human player.

Various conditions of play will arise. Firstly, the computer may attempt a move to a square already occupied, in which case the card with this move is placed at the bottom of the pile in the drawer and the next one taken. If a drawer opened has no cards in it, or if all squares indicated are occupied, the computer withdraws and concedes defeat.

Now for the learning process. When the human player wins a game, the card representing the computer's last move is taken out of the drawer and discarded; it won't make THAT error again. Finally, if discarding a card results in a drawer now becoming empty the previous move is discarded since all paths from it result in disaster. Options are reopened by replacing all the cards for the subsequent drawer. For example, suppose that drawer 2, move 4 becomes empty. We must ask ourselves what led up to this situation? Suppose that it was a move to square 8 in move 3. We remove this card and replace all of the cards in drawer 2, move 4.

You'll find that, over a number of games, the computer first loses all, then slowly begins to win; at the end it'll be very hard to beat — in fact, following the classic learning curve (Fig 16). Children with the stamina to play a lot of games will be interested to watch the process in operation. Other forms of teaching by games will be looked at later.

Perhaps the greatest single lesson to be learned from computer models is the absolute necessity to be accurate when programming. The computer is itself totally on the ball and logical but it relies ultimately on humans both to program it and to feed it with accurate information. There's an old saying in the computer industry that's well worth repeating, 'garbage in — garbage out'.

It's fast becoming a necessity for the

public at large to have some knowledge of programming. I don't mean that all and sundry should be able to sit down and program a computer . . . more that they should know about the basic principles. I feel we must aim to build up a population that will not automatically genuflect when they hear that this or that data has been computerised.

Better than that, the public must begin to question computer results. This is done already to some extent, but the emphasis is in the wrong place, with the result that the computer stands in danger of derision. It's simply not good enough for commercial and industrial concerns to offer the limp excuse, "Sorry — our computer made a mistake." If a hapless pensioner receives a gas bill for £99999.99, then either it was programmed incorrectly or some human fed it with wrong information.

As computers find their way into more and more schools it'll become commonplace to hear adults who don't know any better castigate children as lazy — because they imagine that the computer will do all the child's work for him or her.

All such people overlook the simple fact that in order to use the machine, one must first control one's self. In order to drive a car, we must first learn to gain complete control over legs, arms, hand and eye. Similarly, in order to program a computer to fulfil a task, we must first know intimately how the job has to be approached. In order for our cardboard computer to multiply two numbers, we first had to know how to do it ourselves.

It's totally unacceptable that so many people — including the most articulate and intelligent — still approach me and say, "I'll tell you what you ought to get your computer to do . . .," then go on to describe something for which there is no known solution — like picking the Derby winner, eradicating poverty or banning wars. Their eyes glaze a little when one retorts, "OK, tell me how to do it and I'll shove it through the computer."

Appendix

Number Sentence Cubes may be obtained from Taskmaster Ltd., Morris Rd., Leicester, LE2 6BR, Flowcharting stencils from Open University or better class stationers and many-faced dice from some games shops.

Please note that Hestair Hope Ltd, mentioned in Chapter 1 of this series, no longer supplies binary selection boxes, although the logic blocks are still available.

SECRETS OF SYSTEMS ANALYSIS

Continued from page 71

though the real difficulty involved the recording of the data. If you sell hundreds of small items and have customers queueing impatiently, perhaps you don't have time to key in a record of each sale, any more than you have time to write it down.

So, to conclude this month, the first and perhaps the most important lesson to be learnt in this systems analysis course is. . . get the terms of reference right. Don't start your programmer writing programs for your solution and don't start buying hardware or programs not until you've had a jolly good look at what's *really* causing the problems.

Next month we will examine various ways of looking at and analysing these problems.

BASIC BASIC Continued from page 71

```
10 PRINT"TAPE EDITOR."
20 CLEAR 5000:DIM T$(100):REM. CLEAR NOT NEEDED ON PET.
30 NC=8:DIM CM$(NC):W1$="*TOP*":W2$="*END REACHED*"
40 CM$(0)="B":CM$(1)="F":CM$(2)="L":CM$(3)="D"
50 CM$(4)="I":CM$(5)="R":CM$(6)="SAVE":CM$(7)="S":CM$(8)="T"
60 INPUT"EXISTING FILE (Y OR N)";L$:IF L$="N" THEN 500
70 IF L$()"Y" THEN 60
80 MX=1:GOSUB 10000
90 GOSUB 6000:IF EF THEN MX=MX-1:P=1:GOSUB 7000:GOTO 110
100 T$(MX)=L$:PRINT L$:MX=MX+1:GOTO 90
110 INPUT"C";C$
120 FOR X=0 TO NC:IF CM$(X)=C$ THEN 140
130 NEXT X:PRINT"BAD COMMAND!":GOTO 110
140 ON X+1 GOSUB 170,200,230,260,310,290,340,370,480
150 GOTO 110
170 REM B-ACK
180 GOSUB 600:P=P-N:IF P(N THEN PRINT W1$:P=1
190 PRINT T$(P):RETURN
200 REM F-ORWARD
210 GOSUB 600:P=P+N:IF P(=MX THEN PRINT T$(P):RETURN
220 PP=MX:PRINT W2$:RETURN
230 REM L-IST
240 GOSUB 600:FOR X=P TO P+N:IF X)MX THEN P=MX:PRINT W2$:RETURN
250 PRINT T$(X):NEXT X:P=P+N:RETURN
260 REM D-ELETE
265 IF MX(1 THEN PRINT"CAN7T DO !":RETURN
270 IF P=MX THEN T$(MX)="";MX=MX-1:P=MX:PRINT W2$:RETURN
280 FOR X=P TO MX-1:T$(X)=T$(X+1):NEXT X:PRINTT$(P):T$(MX)="":MX=MX-1:RETURN
290 REM. R-ERLACE CURRENT LINE
300  PRINT "BY?";:GOSUB 1000:T$(P)=L$:RETURN
310 REM. I-NSERT AFTER CURRENT LINE
320 FOR X=MX TO P+1 STEP -1:T$(X+1)=T$(X):NEXT X
324 REM  MAKE NEXT 330
325 P=P+1:MX=MX+1:PRINT"INSERT":GOSUB 1000:T$(P)=L$:RETURN
340 REM. SAVE
350 GOSUB 9000:FOR X=1 TO MX:L$=T$(X):GOSUB 4000:PRINT L$:NEXT X
360 GOSUB 8000:PRINT"SAVE COMPLETED.":RETURN
370 REM. S-EARCH FOR
380 PRINT"SEARCH FOR":GOSUB 1000:F$=L$:IF F$="" THEN 380
390 IF P=MX THEN PRINT"CAN'T DO !":RETURN
400 FOR X=P+1 TO MX:L$=T$(X):GOSUB 2000
410 IF P8()0 THEN PRINT L$:P=X:RETURN
420 NEXT X:P=MX:PRINT W2$:RETURN
480 P=1:PRINT W1$:PRINT T$(1):RETURN:REM T-OP
500 PRINT"TYPE LINES, TERMINATED BY THE LINE:    END":MX=1
510 GOSUB 1000:IF L$="END" THEN MX=MX-1:P=MX:GOTO 110
520 T$(MX)=L$:MX=MX+1:GOTO 510
```

```
600 INPUT"FOR";N:IF N<0 THEN PRINT"ERROR!":GOTO 600
610 RETURN
1000 REM. SUBR. TO READ LINE OF TEXT FROM KEYBOARD TO L$
1010 INPUT L$
1020 RETURN
2000 REM. SUB TO DO   P8=INSTR(L$,F$)  (OFFSET=0)
2070 IF LEN(L$)<LEN(F$) THEN P8=0:RETURN
2090 FOR P8=1 TO LEN(L$)-LEN(F$)+1
2100 IF MID$(L$,P8,LEN(F$))=F$ THEN RETURN
2110 NEXT P8:P8=0:RETURN
3999 REM ******** TAPE I/O SUBS :- 4000,5000,6000,7000,8000,9000,10000
```

Young Computer World Program Listing Cont. from page 113

```
170 PRINT
180 IF E$="DISTANCE" THEN GOTO 230
190 INPUT"ENTER ACCELERATION(m/s/s),TIME(A)(s)";C,D
200 X=C*D
210 PRINT"AVERAGE SPEED=";X;"METRES PER SECOND."
220 END
230 INPUT"ENTER DISTANCE(m),TIME(S)(s)";C,D
240 X=C/D
250 PRINT"SPEED=";X;"METRES PER SECOND."
260 END
270 INPUT"ENTER INITIAL SPEED(m/s),FINAL SPEED(m/s),TIME(A)(s)";C,D,E
280 X=(D-C)/E
290 PRINT"ACCELERATION=";X;"METRES PER SECOND PER SECOND."
300 END
310 INPUT"ENTER CHANGE IN SPEED,ACCELERATION";C,D
320 X=C/D
330 PRINT"TIME TAKEN=";X;"SECONDS."
340 END
OK
```

PCW SUBSET

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Have a go

Remember that the idea is to put together what everyone has done. . . that way we should all end up having more than we started with. Your code does not have to be brilliant (it could well provoke a bigger and more informative response if it is not) but it must work.

It has been suggested that we gather together routines on the same subject. We might do that although it depends on what you send. Here are some possible groups:

1. Multiplication and division of multiple-length signed binary fields and packed BCD fields.
2. ASCII/binary, ASCII/packed BCD, packed BCD/binary conversions.
3. String matching and sorts.
4. Data (DDMMYY) to binary data conversions — for easy comparison and scheduling.
5. Error checking and correction on memory and peripheral transfers.
6. Random mumber generation.

PROGRAMS

Dots and Boxes

by Jeff Aughton

Here's an intriguing game from one of our regular program contributors. Full instructions are included within the program, so off you go.

```
140 PRINT"WANT THE RULES? (Y/N)
150 GETA$:IFA$="Y"THEN8000
160 X=RND(1):IFA$<>"N"THEN150
170 CLR:INPUT"YOUR NAME  .";N$
180 IFN$<"A"ORN$>"Z"THEN170
190 DIMB%(49),L%(13,19),T%(6),E%(13)
200 C$(0)=LEFT$(N$,1):C$="PET"
210 C$(1)="P"
215 IFC$(0)="P"THENC$=" ME":C$(1)="M"
220 DEFFNA(X)=INT(B%(X)/16)
230 Z$="                ":D$="":R$=""
240 FORI=1TO25:D$=D$+"":R$=R$+""
250 Z$=Z$+" ":NEXT:Z$=Z$+""
260 FORI=2TO8STEP2
270 READC$(I),C(I),C(I+1):NEXT
280 FORI=1TO24:READX:B%(X)=65:NEXT
500 REM DRAW BOARD
510 PRINT"";:FORI=1TO6
520 PRINT"   ●  ●  ●  ●  ●  ●"
530 NEXT:PRINT"":FORI=0TO4:PRINT
540 PRINT"  ";:FORJ=0TO4
550 PRINT"  ";CHR$(65+I*5+J);
560 NEXTJ,I
570 PRINT"":FORI=1TO7
580 PRINTSPC(28)"          "
590 NEXT:PRINT""
600 PRINTSPC(31)"SCORE"
610 PRINTSPC(29)"YOU   ";C$;""
620 PRINTSPC(29)"BOX SIDES"
630 PRINTSPC(31)"●-8-●     |     4   6     |     -2-●
640 GOSUB7040
650 PRINTZ$;"DO YOU WANT TO START?";
660 GETA$:IFA$="N"THEN2000
670 X=RND(1):IFA$<>"Y"THEN660
1000 REM HUMAN MOVE
1010 G=0:SB=0
1020 PRINTZ$;"WHICH BOX ? ";
1030 GETA$:IFA$=""THEN1030
1040 N=ASC(A$)-65
1050 IFN<0ORN>24THEN1030
1060 R=INT(N/5):N=N+9+2*R
1070 IFB%(N)<64THEN1100
```

```
1080 PRINTZ$;"THAT BOX IS TAKEN
1090 GOSUB5000:GOTO1020
1100 PRINTA$,"WHICH SIDE ? ";
1110 GETB$:IFB$=""THEN1110
1120 S=ASC(B$)-48:IFSAND1THEN1110
1130 IFS<2ORS>8THEN1110
1140 PRINTS
1170 IF(B%(N)ANDC(S))=0THEN1220
1180 PRINTZ$;"THAT SIDE IS TAKEN
1190 GOSUB5000
1200 PRINTZ$;"WHICH SIDE OF BOX ";
1210 PRINTA$;" ?";:GOTO1110
1220 GOSUB6000:PRINTM$+C$(S)
1230 GOSUB3000
1240 N=N+C(S+1):S=10-S
1250 IFB%(N)>64THEN1270
1260 GOSUB3000
1270 IFSBTHEN1000
2000 REM PET MOVE
2010 G=1:SB=0
2020 GOSUB4000:R=INT(N/7)-1
2140 PRINTZ$;"I WILL PLAY BOX ";
2150 PRINTCHR$(N+56-2*R),
2160 PRINT"SIDE";S
2170 GOSUB6000:PRINTM$+C$(S)
2180 GOSUB5000:GOSUB3000
2230 N=N+C(S+1):S=10-S
2240 IFB%(N)<65THENGOSUB3000
2250 IFSBTHEN2000
2260 GOTO1000
3000 REM UPDATE STATUS
3005 X=C(S)
3010 ONFNA(N)GOTO3050,3300,3400
3020 B%(N)=B%(N)+16+X
3030 IFB%(N)>64THENGOSUB7000
3040 RETURN
3050 REM CHAIN
3060 SH=0:I=0
3070 K=2↑I:IF(B%(N)ANDK)OR(K=X)THEN3250
3080 B=N+C(2*I+3)
3090 IFFNA(B)<>2THEN3230
3100 FORJ=1TOLC:L=L%(J,0)
3110 FORU=1TOL:IFL%(J,U)<>BTHEN3220
3120 IFJ=SHTHEN3020
3130 IFSHTHEN3160
3140 L%(J,L+1)=N:L%(J,0)=L+1
3150 SH=J:GOTO3250
3160 FORV=1TOL%(SH,0)
3170 L%(J,L+V)=L%(SH,V):NEXTV
3180 L%(J,0)=L+L%(SH,0)
3190 FORV=0TOL%(LC,0)
3200 L%(SH,V)=L%(LC,V):NEXTV
3210 LC=LC-1:GOTO3020
3220 NEXTU,J
3230 IFSHTHEN3020
3240 LC=LC+1:L%(LC,1)=N:L%(LC,0)=1:SH=LC
3250 I=I+1:IFI<4THEN3070
3260 GOTO3020
3300 REM SAVE AS CAPTURE
3310 C=C+1:T%(C)=N:GOTO3020
3400 REM CAPTURE
3410 FORJ=1TOLC:L=L%(J,0)
3420 FORU=1TOL:IFL%(J,U)=NTHEN3440
3430 NEXTU,J
3440 FORI=1TOC:IFT%(I)=NTHEN3460
3450 NEXTI
3460 T%(I)=T%(C):C=C-1
3470 IFL=1THENSH=J:GOTO3190
3480 L%(J,U)=L%(J,L):L%(J,0)=L-1
3490 GOTO3020
4000 REM SMART MOVES
4010 IFC=0THEN4060
4020 FORJ=1TOC:N=T%(J)
4030 GOSUB4900
4040 IFFNA(N+C(2*I+3))>2THEN4870
4050 NEXTJ
4060 V=0:FORI=1TOLC
4070 V=V+L%(I,0):NEXT
4080 IFA>VTHEN4650
4090 REM 3RD PHASE
4100 IFC=0THEN4770
4110 IFLC=1THENN=T%(1):GOTO4860
4120 FORI=1TOLC:L=L%(I,0)
4130 E%(I)=0:FORJ=1TOL
4140 IFFNA(L%(I,J))=2THEN4170
4150 IF(L=3)OR(L>4)THENN=L%(I,J):GOTO4860
4160 E%(I)=E%(I)+1
4170 NEXTJ,I
4180 S=0:FORJ=1TOLC
4190 IFE%(J)=0THEN4330
4200 IF(L%(J,0)=4)AND(E%(J)=1)THEN4600
4210 IFL%(J,0)=2THEN4320
4220 P=0:FORK=1TO4
4230 IFB%(L%(J,K))<48THEN4260
4240 IFP=0THENP=L%(J,K)
4250 Q=L%(J,K)
4260 NEXTK
4270 N=P:GOSUB4900:P=P+C(2*I+3)
4280 N=Q:GOSUB4900:Q=Q+C(2*I+3)
4290 FORI=0TO3:IF(B%(Q)AND(2↑I))THEN4310
4300 IFP=Q+C(2*I+3)THEN4320
4310 NEXT:GOTO4600
4320 S=S+1:X=J:IFS=2THEN4600
4330 NEXTJ
4340 S=0:FORJ=1TOLC
4350 IFX=JTHEN4370
4360 IFL%(J,0)<3THENS=S+1
4370 NEXT:J=X
4380 IF(SAND1)THEN4600
4390 REM SACRIFICE
4400 FORI=1TOL%(J,0):N=L%(J,I)
4410 IFFNA(N)=2THEN4430
4420 NEXT
4430 FORI=0TO3:K=2↑I
4440 IF(B%(N)ANDK)THEN4460
```

```
4450 IFFNA(N+C(2*I+3))<>3THEN4870
4460 NEXT
4600 REM CAPTURE IN CHAIN J
4610 FORK=1TOL%(J,0)
4620 IFB%(L%(J,K))>48THENN=L%(J,K):GOTO4860
4630 NEXTK
4650 REM 1ST PHASE
4660 X=65:IFCTHENN=T%(1):GOTO4860
4670 N=INT(9+33*RND(1)):Q=N
4680 IFFNA(N)>1THEN4740
4690 FORI=0TO3:K=2↑I
4700 IF(B%(N)ANDK)THEN4730
4710 B=N+C(2*I+3):IFB%(B)=XTHEN4730
4720 IFFNA(B)<>2THEN4870
4730 NEXT
4740 N=N+1:IFN=42THENN=9
4750 IFN<>QTHEN4680
4760 IFX=65THENX=-1:GOTO4670
4770 REM MUST GIVE AWAY
4780 M=99:FORI=1TOLC
4790 IFL%(I,0)<MTHENM=L%(I,0):N=L%(I,1)
4800 NEXT:IFM=1THEN4860
4810 FORI=0TO3:K=2↑I
4820 IF(B%(N)ANDK)THEN4840
4830 IFFNA(N+C(2*I+3))=2THEN4870
4840 NEXT
4850 REM FIND SIDE
4860 GOSUB4900
4870 S=2*I+2:RETURN
4900 FORI=0TO3:K=2↑I
4910 IF(B%(N)ANDK)THENNEXTI
4920 RETURN
5000 REM DELAY
5010 FORD=1TO2000:NEXT:RETURN
6000 REM GRAPHICS
6010 M$="■"+LEFT$(D$,4+4*R)
6020 M$=M$+LEFT$(R$,4+4*(N-9-7*R))
6030 RETURN
7000 REM FILL IN
7010 S$="■    ■■■■ "+C$(G)+" ■■■■    ■"
7020 C(G)=C(G)+1:R=INT(N/7)-1:SB=1
7030 GOSUB6000:PRINTM$+S$
7040 PRINT"■■■■■■■■"
7050 PRINTSPC(29)"■";C(0)
7060 PRINT"■■";SPC(35);C(1)
7070 A=25-C(0)-C(1)
7080 IFATHENRETURN
7090 PRINTZ$;"■ GAME OVER ":GOSUB5000
7100 PRINT"■■■■■":IFC(1)>17THEN7180
7110 IFC(1)>12THEN7160
7120 IFC(1)>7THEN7140
7130 PRINT"I SURRENDER !!":END
7140 PRINT"YOU WIN-BUT IT WAS CLOSE
7150 GOTO7200
7160 PRINT"I WIN ! HARD LUCK,";N$
7170 GOTO7200
7180 PRINT"YOU WERE HAMMERED,";N$
7190 PRINT"■TAKE UP CHESS-IT'S EASIER
7200 PRINT"■■PLAY AGAIN?
7210 GETA$:IFA$="N"THENEND
7220 IFA$<>"Y"THEN7210
7236 GOTO170
8000 REM RULES
8010 PRINT"■   DOTS AND BOXES-RULES■■
8020 PRINT"1 WE TAKE IT IN TURNS TO";
8030 PRINT" COMPLETE ONE      SIDE O";
8040 PRINT"F A BOX■■
8050 PRINT"2 IF YOU COMPLETE THE 4TH";
8060 PRINT" SIDE OF A BOX   YOU WIN ";
8070 PRINT"THAT BOX AND MUST PLAY AG";
8080 PRINT"AIN■■
8090 PRINT"3 THE WINNER HAS THE MOST";
8100 PRINT" BOXES AT THE     END OF T";
8110 PRINT"HE GAME■■
8120 PRINT"4 TO PLAY, USE A-Y TO PIC";
8130 PRINT"K THE BOX THEN   2,4,6,8 ";
8140 PRINT"AS INDICATED FOR THE SIDE
8150 GOTO170
9000 DATA"■■■────",1,7,"▌▌■▌▌■▌▌",2,-1
9010 DATA"■■▌▌■▌▌■▌▌",4,1,"■────",8,-7
9020 DATA1,2,3,4,5,6,7,8,14,15,21,22
9030 DATA28,29,35,36,42,43,44,45,46
9040 DATA47,48,49
```

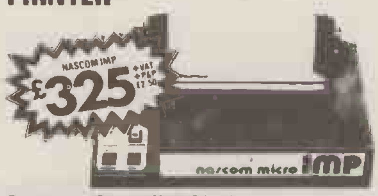
Listing courtesy of Creamwood Software Products

PET Bloobers

by Richard Warner

Here's a fascinating — hypnotic, even — game for the PET. It includes instructions and details on converting it to run on old ROM machines.

```
10 REM
11 REM N.B. ALTER LINE 110 TO CHANGE
12 REM SCREEN SIZE.
13 REM H IS SCREEN WIDTH - MIN=3,MAX=38
14 REM V IS SCREEN DEPTH - MIN=3,MAX=23
15 REM BAD SUBSCRIPT ERROR MAY OCCUR
16 REM ON OLD ROM MACHINES IF H*V>256.
100 P=C:T=R:S=RND(-TI)
110 H=20:V=12
120 TP=32768+INT(19-H/2)+40*INT(12-V/2)
130 P2=TP+H+1
140 P3=TP+V*40+40
150 P4=TP+41+H+V*40
160 IN=166
161 REM OLD ROM'S IN=515
162 REM NEW ROM'S IN=166
170 SS=H*V-1
171 REM OLD ROM'S ONLY:IFSS>255THENSS=255
190 GOSUB1000
```



NORTH LONDON HOBBY COMPUTER CLUB

Notice of Annual General Meeting

The AGM will be held in the Students' Common Room at the Polytechnic of North London on Wednesday 24th. September, starting at 1930. Nominations for the Committee must be in the hands of the Committee not less than ten days prior to the meeting. They must be signed by a proposer and seconder and accompanied by evidence that the nominee is willing to serve on the Committee.

Notice of two Extraordinary Motions for discussion:

1. That item 6 of the Constitution be amended to permit notice of any General Meeting to be given either by post or by advertisement in two nominated journals.
2. That item 13 of the Constitution be amended to permit the Committee to accept further nominations at the AGM if insufficient are to hand to fill the number of vacancies.


```
200 DIMC(3),D(3,1)
210 FORF=0TO3:READC(F),D(F,0),D(F,1)
230 NEXT
250 DATA85,1,40
260 DATA73,40,-1
270 DATA75,-1,-40
280 DATA74,-40,1
290 DIMP(SS),R%(SS),C%(SS),T%(SS)
300 PRINT"□"
310 FORF=TPTOP2:POKEF,102:NEXT
320 FORF=TPTOP3STEP40:POKEF,102:NEXT
330 FORF=P2TOP4STEP40:POKEF,102:NEXT
340 FORF=P3TOP4:POKEF,102:NEXT
400 C=INT(RND(1)*4)
410 R=INT(RND(1)+.5)
420 P=TP+INT(RND(1)*(H-2))+40*INT(RND(1)*(V-2))+82
430 IFPEEK(P)<>32THEN420
440 IFPEEK(P+D(C,0))<>32ORPEEK(P+D(C,1))<>32THEN420
450 S=0:T=0
500 POKEP,C(C):P(S)=P:T%(S)=T:R%(S)=R:C%(S)=C
510 S=S+1:P=P+D(C,R)
520 IFPEEK(P)<>32THEN600
530 T=INT(RND(1)+1.5)
540 IFR=0THEN570
550 C=C-T:IFC<0THENC=C+4
560 GOTO580
570 C=C+T:IFC>3THENC=C-4
580 IFT=2THENR=1-R
590 GOTO500
600 IFP=P(0)THEN700
610 GETZ$:IFZ$=" "THEN800
620 S=S-1:P=P(S)
630 IFT%(S)=0THEN690
640 R=1-R%(S):IFR=1THEN670
650 C=C%(S)-1:IFC<0THENC=C+4
660 GOTO680
670 C=C%(S)+1:IFC>3THENC=C-4
680 T=0:IFPEEK(P+D(C,R))=32THEN500
690 POKEP,32:GOTO610
700 T=C%(0)-C:IFT=0THEN610
710 IFR=0AND(T=-1ORT=3)THEN610
720 IFR=1AND(T=-3ORT=1)THEN610
750 T=TI:P=0
760 GETZ$:IFZ$>""THEN800
770 IFTI-T<600THEN760
800 S=S-1:POKEP(S),32
810 FORF=0TO50:NEXT
820 IFS=0THEN400
830 IFPEEK(IN)=6ORP=0THEN800
840 P=P(S):R=R%(S):C=C%(S):T=1:GOTO500
1000 PRINT"□";TAB(15);"■BLOOBERS■"
1010 PRINT"  BLOOBERS RANDOMLY GENERATES PATTERNS"
1020 PRINT"ON THE SCREEN.
1030 PRINT"■  IF YOU GET BORED, PRESS THE SPACE BAR"
1040 PRINT"AND THE PATTERN WILL BACKTRACK UNTIL"
1050 PRINT"YOU TAKE YOUR FINGER OFF."
1060 PRINT"■■■         PRESS ANY KEY TO GO"
1070 GETZ$:IFZ$=""THEN1070
1080 RETURN
```

PET Giant Slalom

by P L Brown

```
1 PRINT"□■■■■GIANT SLALOM BY P.L.BROWN"
2 PRINT"■■DO YOU NEED INSTRUCTIONS ?"
4 GET A$:IF A$=""THEN4
6 IF A$="Y"THEN GOSUB 800
10 CLR:Q=32767
20 FORN=1TO10:T(N)=9999:NEXT
25 GOSUB1000:RESTORE:PRINT"□"
40 FOR N=32810 TO 33730 STEP 40
50 FORM=1TO37
60 POKEN+M,160
70 NEXTM,N
80 FORN=Q+47TOQ+52:POKEN,32:NEXT
81 FORN=Q+63TOQ+69:POKEN,32:NEXT
82 FORN=Q+88TOQ+92:POKEN,32:NEXT
83 FORN=Q+104TOQ+108:POKEN,32:NEXT
84 FORN=Q+129TOQ+132:POKEN,32:NEXT
85 FORN=Q+170TOQ+172:POKEN,32:NEXT
86 FORN=Q+145TOQ+147:POKEN,32:NEXT
87 POKEQ+211,32:POKEQ+186,32
88 FORN=Q+282TOQ+362STEP40
89 FORM=1TO7
90 POKEN+M,32
91 NEXTM,N
92 FORN=Q+370TOQ+374:POKEN,32:NEXT
93 POKEQ+335,32
94 FORN=Q+296TOQ+311:POKEN,32:NEXT
95 FORN=Q+257TOQ+258:POKEN,32:NEXT
96 POKEQ+272,32:POKEQ+233,32
97 POKEQ+194,32:POKEQ+195,32
98 FORN=Q+236TOQ+596STEP40
99 POKEN,32:NEXT
100 FORN=Q+612TOQ+772STEP40
101 FORM=0TO18
102 POKEN+M,32
103 NEXTM,N
104 FORN=Q+567TOQ+589:POKEN,32:NEXT
105 FORN=Q+544TOQ+548:POKEN,32:NEXT
106 FORN=Q+465TOQ+505STEP40
107 FORM=0TO2
108 POKEN+M,32
109 NEXTM,N
```

```
110 FORN=Q+671TOQ+791STEP40
111 POKEN,32:NEXT
112 FORN=Q+712TOQ+792STEP40
113 FORM=0TO1
114 POKEN+M,32
115 NEXTM,N
116 POKEQ+794,32:POKEQ+876,32
117 FORN=Q+643TOQ+963STEP40
118 POKEN,32:NEXT
119 FORN=Q+684TOQ+764STEP40
120 FORM=0TO3
121 POKEN+M,32
122 NEXTM,N
123 FORN=Q+821TOQ+824:POKEN,32:NEXT
124 FORN=Q+981TOQ+984:POKEN,32:NEXT
125 FORN=Q+916TOQ+996STEP40
126 FORM=0TO3
127 POKEN+M,32
128 NEXTM,N
130 READ N
135 IFN=-1THENP=223:GOTO130
140 IFN=-2THENP=233:GOTO130
145 IFN=-3THENP=95:GOTO130
150 IFN=-4THENP=105:GOTO130
152 IFN=-5THENP=194:GOTO130
155 IFN=-9THEN200
160 POKEN+Q,P
165 GOTO130
170 DATA -1,46,62,79,87,103,128,144,169
171 DATA 185,210,235,611,636,772,820
172 DATA -2,53,70,109,148,187,212,234,273
173 DATA312,336,375,404,767,804,825
174 DATA-3,218,196,259,289,330,467,508
175 DATA549,590,631,672,713,754,795,836
176 DATA877,644,687,964,985,-4,193
177 DATA217,232,256,271,295,334,465
178 DATA504,543,980,-5,84,97,74,154
179 DATA127,143,164,174,177,180,188
180 DATA190,207,223,254,260,268,270
181 DATA277,279,345,379,392,409,416
182 DATA422,425,484,452,459,472,486
183 DATA489,496,502,517,519,532,594
184 DATA604,606,649,650,674,676,729
185 DATA730,756,758,838,853,818,866
186 DATA 868,875,886,888,898,910,933
187 DATA946,948,955,990,-9
200 POKEQ+915,134
205 X=123:POKEQ+X,147:S=400:G=0
210 GETC$:IFC$=""THEN210
215 TI$="000000":GOTO440
360 A=PEEK(Q+X):IFA=134THEN600
370 IFA=32ORA=194THEN590
380 B1=PEEK(Q+X+1):B2=PEEK(Q+X-1)
382 B3=PEEK(Q+X+40):B4=PEEK(Q+X-40)
383 IFB1=194ANDB2=194THENG=G+1
384 IFB3=194ANDB4=194THENG=G+1
390 POKEQ+X,147
400 FORN=1TOS:NEXTN
410 GETC$:IFC$=""THEN450
440 IFC$="F"THENS=S-25:GOTO450
445 IFC$="S"THENS=S+25:GOTO450
447 A$=C$
450 POKEQ+X,160
455 PRINT"■■";MID$(TI$,3,2)":"MID$(TI$,5,2)
460 IFA$="1"THENX=X+39
470 IFA$="2"THENX=X+40
480 IFA$="3"THENX=X+41
490 IFA$="4"THENX=X-1
500 IFA$="6"THENX=X+1
510 IFA$="7"THENX=X-41
520 IFA$="8"THENX=X-40
530 IFA$="9"THENX=X-39
540 GOTO360
590 PRINT"■YOU'VE CRASHED!!!"
592 T=9999:GOTO700
600 T=VAL(TI$)
603 PRINT"■WELL DONE-YOU'VE COMPLETED THE COURSE"
604 G=G-33:T=(T-G*10)/100
605 PRINT"YOU MISSED";-G;"GATES"
607 PRINT"YOUR TIME WAS";T
610 FORN=1TO10
620 IFT<T(N)THEN640
625 NEXT:GOTO700
640 FORM=10TON+1STEP-1
650 T(M)=T(M-1):N$(M)=N$(M-1)
660 NEXT
670 T(N)=T:N$(N)=N$
700 PRINT:PRINT"HERE ARE THE BEST TIMES SO FAR:"
710 PRINT"■■NAME","TIME(SECS.)
720 FOR N=1TO10
725 IFT(N)=9999THEN750
730 PRINTN$(N),T(N):NEXT
750 FOR N=1TO5000:NEXT:GOTO25
800 PRINT"■YOU MUST GUIDE THE ■■ FROM THE TOP LEFT"
810 PRINT"OF THE COURSE TO THE BOTTOM RIGHT"
820 PRINT"■EACH RUN IS TIMED AND 10 SECONDS ARE"
830 PRINT"ADDED FOR EACH GATE YOU MISS. THE BEST"
840 PRINT"TIMES ARE SHOWN AT THE END OF EACH RUN"
860 PRINT"■THE DIRECTION OF THE SKIER IS CONTROLLEDBY ";
870 PRINT"USING THE NUMBERS 1-9(EXCLUDING 5):
880 PRINT"■                7 8 9"
890 PRINT"                 \|/"
900 PRINT"                4-■■-6"
910 PRINT"                 /|\"
920 PRINT"                1 2 3"
930 PRINT"■THE SPEED OF THE SKIER CAN BE ALTERED AT";
940 PRINT"ANY TIME DURING THE RUN BY TYPING 'S' TO";
950 PRINT"SLOW DOWN AND 'F' TO GO FASTER"
960 PRINT"■MAKE SURE YOU'RE INSURED FOR ACCIDENTS"
970 PRINT"AND THEN PRESS ANY KEY TO BEGIN"
980 GETA$:IFA$=""THEN 980
990 RETURN
1000 PRINT"■■■■■■"
1003 PRINT"PLEASE TYPE YOUR INITIALS"
1120 INPUT N$:RETURN
```

Listing courtesy of Creamwood Software Products

PET Demolition

```
1 READA:IFA=0THEN3
2 GOTO1
3 FORL=832TO878:READX:POKEL,X:NEXTL
4 SYS(832):RESTORE
5 K=255
8 GOSUB3500
9 N=59464:POKE59467,16:POKE59466,1:POKEN,1:R=0
10 TI$="000000":T1=700:D=40:PRINT""
11 B1=33489:B2=33526
12 FORBB=1TO7
13 FORB=B1TOB2
14 POKEB,208:NEXTB:B1=B1+40:B2=B2+40:NEXTBB
30 T1=700-(P/2):A=INT((100)*RND(1)):FORPE=32848TO32888:IFPEEK(PE)=208THEN2000
31 NEXT:IFTI>T1THENGOSUB1000
32 POKE32887,31:POKE32847,32
40 IFA<51THENX=32809:M=1
50 IFA>50THENX=32846:M=-1
60 POKEX,42:POKEX-1,32:POKEX+1,32
70 GETA$
75 IFA$="E"THEN7000
80 IFA$=" "THENPOKEX,32:GOTO200
90 X=X+M
100 IFX>32846THENPOKEX,32:M=-1
110 IFX<32809THENPOKEX,32:M=1
120 GOTO60
200 X=X+D
210 IFPEEK(X)=208THENPOKEX-D,32:POKEX,32 :POKE59464,K:P=P+1:GOTO500
220 IFX>33768THENPOKEX-D,32:POKEN,255:FORL=0TO500:NEXT:POKEN,1:GOTO30
230 POKEX,42:POKEX-D,32:GOTO200
500 READDA:IFDA=0THENRESTORE:K=255:POKEN,1:GOTO1200
510 IFPEEK(X-DA)=208THENP=P+1:POKEX-DA,32:POKEN,K:K=K-9: GOTO500
530 GOTO500
900 DATA-40,-1,1,39,41,42,38,83,82,78,77,124,123,117,116,165,164,156,155
901 DATA206,205,195,194,245,246,235,234,233,247,0
1000 R=R+1:IFR>7THEN1050
1010 PRINT:TI$="000000":RETURN
1050 IFR>13THENR=0
1100 PRINT:FORRR=33729TO33766
1110 POKERR,208:NEXT:TI$="000000":RETURN
1200 PRINT"POINTS:"P"        HIGH SCORE"HP"    ":GOTO30
2000 FORB=32887TOPE+1STEP-1:     POKEB,31:NEXT
2001 FORB=0TO100:POKEPE,32
2010 POKEPE,224:POKE59464,B:NEXT
2020 POKE59464,1
2030 PRINT"";
2040 POKE525,0:PRINT"YOUR SCORE IS"P
2050 IFP=>HPTHENHP=P:PRINT"IT IS THE BEST SCORE SO FAR":GOTO2070
2060 PRINT"THE BEST SCORE IS"HP
2070 PRINT"       TO PLAY AGAIN PRESS ANY KEY       "
2075 PRINT"  TO END THE PGM PRESS  'E' "
2080 GETA$:IFA$=""THEN2080
2085 IFA$="E"THEN7000
2090 P=0:GOTO9
3500 POKE59409,52:PRINT"":FORA=0TO22
3510 PRINT"";
3520 NEXT:PRINT""
4000 PRINT""SPC(14);" DEMOLITION "
4010 PRINT""SPC(11);" BY  PETER WRIGHT "
4100 POKE59409,60:FORA=0TO3000:NEXT
5000 PRINT"          DO YOU NEED INSTRUCTIONS ?"
5010 GETA$:IFA$=""THEN5010
5020 IFA$="N"THENRETURN
5030 PRINT"THE OBJECT OF THE GAME IS TO DEMOLISH"
5040 PRINT"THE WALL AT THE BOTTOM OF THE SCREEN."
5050 PRINT"THIS IS DONE WITH THE '*'.
5060 PRINT"THE 'SPACE' KEY IS USED TO FIRE THE '*'"
5070 PRINT"AT THE WALL."
5080 PRINT"THE WALL WILL ADVANCE AND IF IT"
5090 PRINT"GETS AS HIGH AS THE ARROW ON THE RIGHT"
6000 PRINT"OF THE SCREEN IT IS THE END OF THE GAME."
6002 PRINT"THE STOP KEY HAS BEEN DISABLED AND"
6003 PRINT"THE 'E' KEY MUST BE USED IN ITS PLACE"
6010 PRINT"         PRESS ANY KEY TO PLAY          "
6020 GETA$:IFA$=""THEN6020
6030 RETURN
7000 POKE59467,0:POKE59466,0:POKE59464,0:SYS(845)
8001 DATA120,169,99,141,25,2,169,3,141,26,2,88,96,120,169,133,141,25,2,169,230
8002 DATA141,26,2,88,96,169,0,72,72,72,72,76,133,230,32,90,3,234,169,255,141,9
8003 DATA2,76,126,230
```

Listing courtesy of Creamwood Software Products

Showpiece

Here's an Apple II program by Les Solomon, technical director of the US magazine *Popular Electronics*. We won't tell you what it does — just type it in and see for yourself!

```
10 DIM P$(8),C$(10),W$(5)
15 P$="PERSONAL"
17 C$="  COMPUTER"
19 W$="WORLD"
20 CALL -936
25 A=30
30 FOR B=2 TO 20: VTAB B: TAB A: PRINT P$;: VTAB B-1: TAB A: CALL -868
35 A=A-1
40 FOR C=1 TO 10: NEXT C
45 NEXT B
47 B=2
50 FOR A=2 TO 20: VTAB B: TAB A: PRINT C$;: VTAB B-1: TAB A-1: CALL -868
52 B=B+1
55 FOR C=1 TO 10: NEXT C
57 NEXT A
60 B=22
65 FOR A=33 TO 18 STEP -1
67 VTAB B: TAB A: CALL -868: PRINT W$
70 FOR C=1 TO 10: NEXT C
72 NEXT A
75 PRINT : PRINT
```

```
 77 POKE 50,127: TAB 17: PRINT "PRESENTS": POKE 50,255
 80 PRINT : PRINT : TAB 4
 81 PRINT : TAB 12: PRINT "THE THIRD ANNUAL"
 82 PRINT : TAB 4
 87 PRINT "  PERSONAL COMPUTER WORLD SHOW"
 92 PRINT : TAB 4: PRINT "    SEPTEMBER 4,5 AND 6, 1980"
 95 PRINT : TAB 4: PRINT "CUNARD HOTEL, HAMMERSMITH, LONDON"
 97 PRINT : PRINT : PRINT
100 FOR X=1 TO 39: PRINT "*";: TAB X: NEXT X
105 FOR X=23 TO 1 STEP -1: VTAB X: TAB 38: PRINT "*";: NEXT X
110 FOR X=38 TO 1 STEP -1: TAB X: PRINT "*";: NEXT X
115 FOR X=1 TO 23: VTAB X: TAB 1: PRINT "*";: NEXT X
150 FOR X=1 TO 2000: NEXT X
155 GOTO 20
```

Listing courtesy of Lion House

PEEK and POKE for Apple Pascal

by Stephen Withers

Apple Pascal provides routines to control all the standard Apple hardware but controlling additional devices can be a problem. For example, the communications card initialises to 300 baud but should you want to use a 110-baud Teletype then you'll have to load the ACIA's control register with the appropriate value. Instead of writing a routine to do just this, why not make it as generalised as possible by adding a POKE routine? It's then only logical to complement this with a PEEK facility. Just a couple of notes to accompany this listing: using macros in such a short listing is obviously unnecessary but the Pascal Editor allows such items to be copied into a program from a library file; if the value to be POKEd is higher than 255 then the high order byte is ignored; the printer used to produce this listing reproduces the character '#' as '£'.

```
   .MACRO  POP     ;SAVE TWO BYTES FROM STACK. THE PARAMETER MUST
                   ; BE A FREE PAGE 0 ADDRESS. USEFUL FOR SAVING
                   ; A SUBROUTINE'S RETURN ADDRESS.
   PLA
   STA     %1
   PLA
   STA     %1+1
   .ENDM
   ;
   .MACRO  PUSH    ;THE COMPLEMENT OF POP
   LDA     %1+1
   PHA
   LDA     %1
   PHA
   .ENDM
   ;
   .MACRO  DISCAR  ;DISCARD 4 BYTE STACK BIAS
   PLA
   PLA
   PLA
   PLA
   .ENDM
   ;
   ;
   ;ALLOCATE SOME STORAGE SPACE IN PAGE 0
RETURN    .EQU     0
ADDR      .EQU     2
   ;
   ;
   .FUNC PEEK,1
   ;---------------------------
   ;EQUIVALENT TO BASIC'S PEEK, AND
   ; FUNCTION PEEK(ADDRESS:INTEGER):INTEGER;
   ;---------------------------
   POP     RETURN  ;SAVE RETURN ADDRESS
   DISCAR          ;DISCARD STACK BIAS
   POP     ADDR    ;SAVE ADDRESS PARAMETER
   LDA     £0      ;MSB OF RESULT
   PHA             ; IS ALWAYS ZERO
   TAY             ;ZERO Y FOR DUMMY INDEXED ADDRESSING
   LDA     @ADDR,Y ;GET CONTENTS OFLOCATION REQUESTED
   PHA             ;SAVE LSB OF RESULT
   PUSH    RETURN  ;PUT ADDRESS BACK ON STACK
   RTS             ;ALL DONE!
   ;
   ;
   .PROC POKE,2
   ;------------------------------------
   ;EQUIVALENT TO BASIC'S POKE AND
   ; PROCEDURE POKE(ADDRESS,VALUE:INTEGER);
   ;------------------------------------
   POP     RETURN  ;SAVE RETURN ADDRESS


   PLA             ;THAT'S THE BYTE WE WANT
   TAX             ;SAVE IT
   PLA             ;IGNORE HIGH BYTE OF VALUE
   POP     ADDR    ;SAVE ADDRESS PARAMETER
   LDA     £0      ;DUMMY INDEX FOR INDIRECT ADDRESSING
```

PROGRAMS

```
        TAY
        TXA              ;GET LOW BYTE OF VALUE PARAMETER
        STA    @ADDR,Y   ;DO THE POKE
        PUSH   RETURN    ;RESTORE RETURN ADDRESS
        RTS              ;AND FINISH...
        .END
```

Submitting programs to PCW

Our programs section thrives on contributions from you, the readers. In particular we're looking for original ideas (no more Nim, decimal-hex conversions, Masterminds, digital clocks, etc please!) and we're not just interested in games — if you've a handy business/scientific/educational program then we'd be interested to hear from you.

Once you've written and *thoroughly* debugged your program, send it to us on cassette or disk with, if possible, a clear printout made with a new ribbon on plain (not lined) paper. Write a covering letter stating briefly what the program is, *exactly* which machine it's for (ie old/new ROM PET, or TRS-80 Level I or II) and how much memory it requires. On a separate sheet list any special instructions which aren't included in the program and write your name and address on each piece of paper you send us as well as on the cassette/disk. If you'd like your cassette/disk returned then enclose a suitable SAE.

The fact that we publish so many PET programs merely reflects the market share of this machine — we're always happy to see programs for other machines. If your program does not use machine-dependent graphics and can therefore be used on other micros, try to keep it as 'portable' as possible (see 'Basic Basic' this month). Don't purge your listing of unnecessary spaces unless you're really tight on memory as spaces improve program legibility and make it easier for others to key in.

Finally, we're not 100% biased in favour of Basic; we're always interested in short assembler programs and we're eagerly awaiting our first Pascal program!

Send your programs to: PCW Programs, Personal Computer World, 14 Rathbone Place, London W1P 1DE.

LEISURE LINES

with J J Clessa

Some of you have protested that I haven't been allowing enough time for you to work out your answers and get them to me! So last month I extended the deadline to 31 August, which means that I can't announce a winner now for Puzzle No 12.

Quickie

There are eight oranges in a box. How can you divide them between eight people so that each person gets one and one orange is still left in the box. The oranges must not be peeled or cut. As usual, no prizes for this one.

Prize puzzle

I've been told on numerous occasions that the problems aren't tough enough — well, here's one which should bend a few micros.

a. Which 10-digit perfect square contains the most zeros? b. Which 10-digit perfect square contains the most ones? and so on up to (j) Which 10-digit perfect square contains the most nines?

I want ten answers please, for the digits 0 through 9. If more than one perfect square is possible for an answer then any of the possibilities will be accepted. Your answers please on a *postcard* (letters are filed in the bin instantly) to Puzzle No. 13, PCW, 14 Rathbone Place, London W1P 1DE, to arrive by 30 September.

Prize of the month

Sorry to be so boring, but this month I'm giving away a book token.

BLUDNERS

Quite a few this month, starting with two algebraic errors in July's "Computer Games". Michie's formula for evaluating the discernability of a chess player should read:

$$d = (M+1)\frac{3(r+3)}{(r+e)}$$

and Box 3 should read:
Probability of opponent calling bet = p
Probability of opponent *not* calling bet = 1—p.

The address of acoustic-coupler supplier Anderson Jacobson Ltd., mentioned in last month's "Communication" has changed to 752 Deal Avenue, Slough, Bucks. And Peripheral Hardware is now at Armfield Close, West Molesey.

The suppliers of the Paper Tiger were accidentally omitted from our printer survey grid; they are Teleprinter Equipment Ltd of Tring and anyone wanting further details should contact Kaye Brooks on 044 282 4011.

Finally, our Stock Control packages review in July described Amplicon as originators of a package for the PET. In fact, although Amplicon sells the package, it originates from Anagram Systems, 9 Michell Close, Horsham, W Sussex, tel: 0403 68601.

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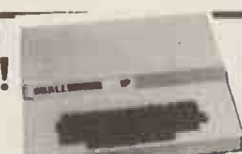

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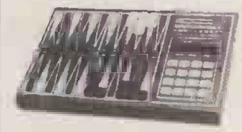

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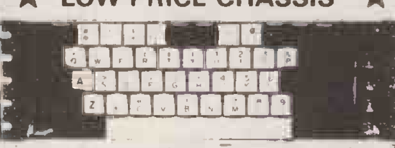

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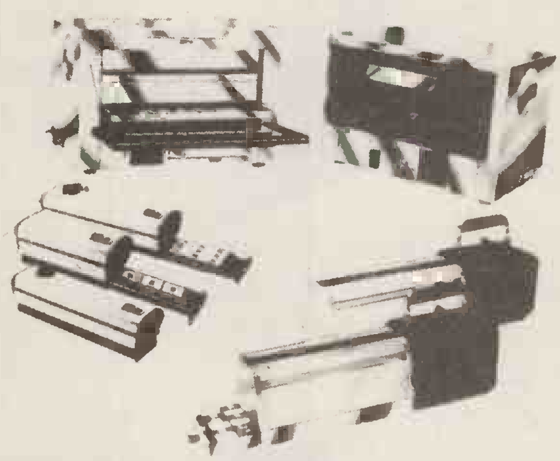

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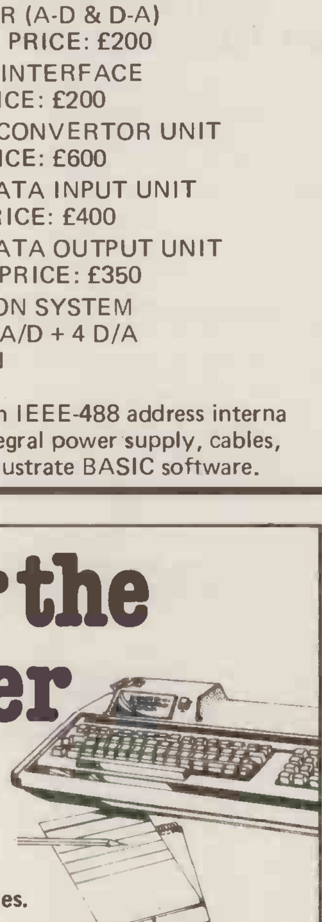

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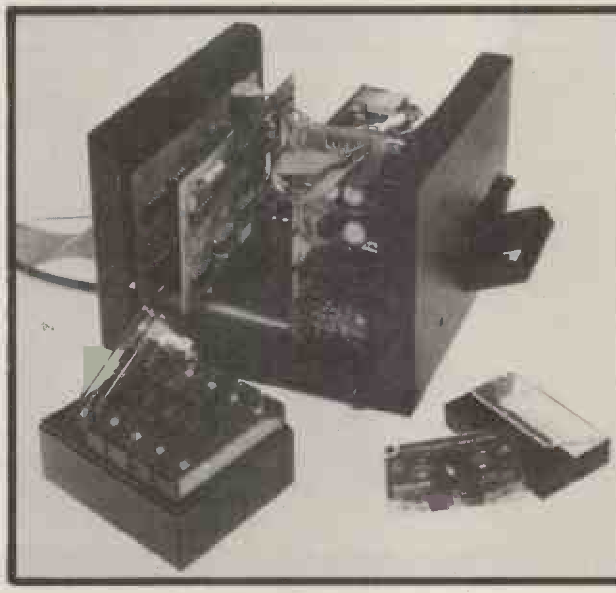

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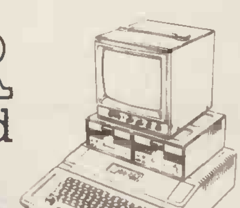

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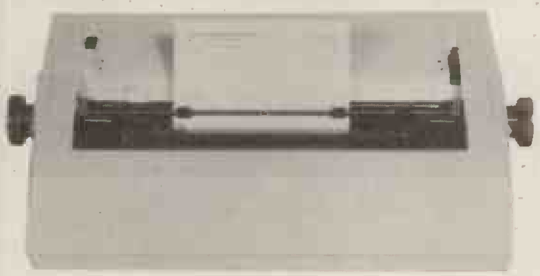

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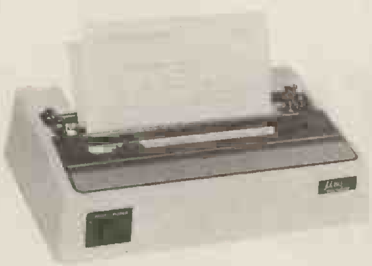

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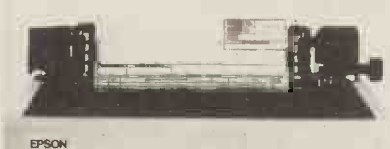

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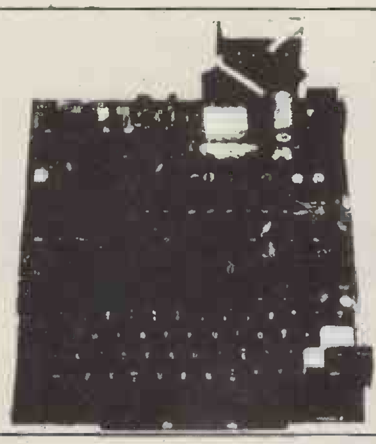

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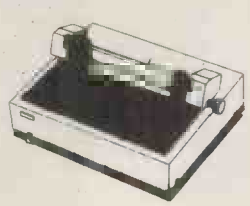

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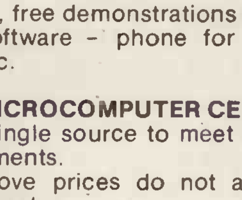

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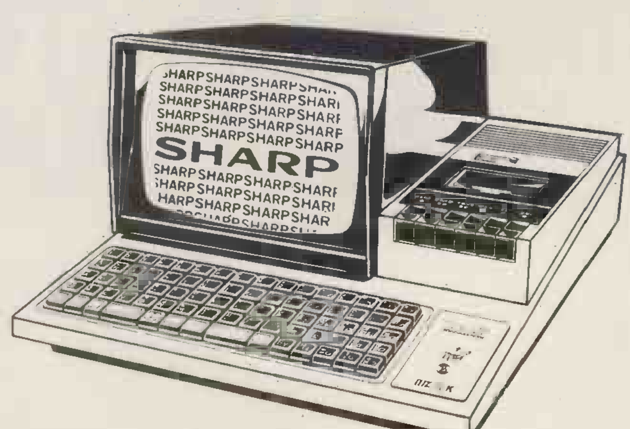

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380Z BASIC is not frozen in ROM. An enhanced BASIC could be loaded in mid 1980 and a BASIC with structured features sometime later.

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Does our research-oriented design pay off in classroom hardware?

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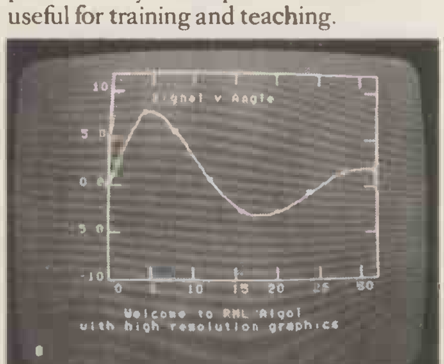
Our standard machine comes with low resolution graphics and support for this from BASIC allows you to plot a point directly with a plot command – useful for training and teaching.



It is worth remembering too that neither our low resolution graphics nor our optional scientific (high resolution) graphics has any limiting effect on your memory usage, and in both you can

freely mix upper and lower case text and diagrams.

Mains noise can cause system crashes which result in loss of programs and data. All current 380Zs include a mains filter which significantly reduces the chances of this happening.

Don't buy a 380Z on patriotic grounds.

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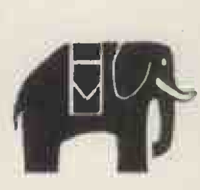

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ADVERTISERS INDEX

CHIP CHAT

Once upon a time a PCW Benchtester ran into problems with a machine under review. The company which loaned the system was contacted and the faults were confirmed; the company then added, "Look, if we forget to collect the machine from you, why don't you forget to mention these faults in your Benchtest?" Needless to say our Benchtester refused, the machine was returned and the faults duly reported in the Benchtest. Just in case anyone else is thinking of trying this, be warned: next time we shall Name Names...Still moralising, we can't approve of the latest marketing technique being pioneered by one 'H' of a well-known Tottenham Court Road outfit. HB Computers had a massive multi-dealer stand at the Online show, on which 'H' was seen to be doing brisk business selling hardware. Some time elapsed before HB realised that this particular firm was not part of the HB stand and in fact wasn't even exhibiting at the show! 'H' was duly invited to remove himself from the stand. "It was just accidental," he told us later, denying that he had gone on to sell hardware on other stands at the show: "I was selling books," he said... The HB stand was by far the biggest at the show. "Next year we're inviting Online to take part in our show," said HB man Stuart Whittaker... Our newshound Guy Kewney was seen leaving the Online show with a Transam Tuscan Kit tucked up his sleeve (he wears a kimono especially for this purpose when visiting shows); what's he up to? No doubt we'll find out sooner or later ...About to burst onto the scene, with a rumoured $ 8 million advertising budget, is Atari, determined to dominate the home market (although the Japanese will give them a run for their money); supremo in this country is Steve Bernard, a one-time mobile disco DJ — sounds like he'd get on well with ex-DJ 'Spangles' Cary of Comp Shop...Talking of Comp Shop, have you noticed their ad for refurbished ZX80s? Already!?... Look out next month for news of a giant jolly to next April's Sixth West Coast Faire at an astonishingly value-for-money price... This month's Interesting Idea: an ingenious use of a bar code reader for inputting Basic command words, speeding up programming immensely. If the pioneer would like to contact us, we'd be most interested... Who are Diego Rincon and Halina di-Lallo? Persons answering to these unlikely names allegedly inhabit the offices of *Computnig Toady*; who'll be the first to unscramble these anagrams? Personally, we don't believe they exist at all and this opinion will only be altered by their appearing at our office, offering to buy us lunch (which we'll accept)... The identity of microgossiper 'Inside Trader' of *Printout* has been revealed at last; he confessed, in confidence, to Guy Kewney who, naturally, immediately told us. If you want to know who it is then come to the PCW show, bearing a bid in a sealed envelope. Bids will be examined on the final day of the show and the Truth will be passed on to the donator of the highest bribe — er, bid that is...Commodore is now selling a new accounting package in favour of their own. The proud owners? — no less than Colin Stanley and Mick (not Mike) Hambly of HB....US software houses have an uncanny knack of coming out with games which accurately reflect the American version of the real world. The latest offering to come to our notice is called "Free the Hostages!" (sick), in which you have to rescue "the beautiful Delilah" and her friends who are being held by the "High Tollah" and his mates following the removal of their leader, the "Shah Tollah"; the ad doesn't say whether the game is approved by Jimmy Carter. On similar lines, another company advertises a game called "Interlude" which, it's claimed, will "turn your love life into exciting, adventurous, delicious fun!" Among the features offered by the full-colour advert (which shows a scantily-clad lady lounging on satin sheets with an Apple II) are "wet fun on a hot summer night" and "a bubble bath that ends with a bang"... Good to see that 'Uncle' Clive Sinclair recognizes quality when he sees it. His latest ZX80 ads in the national press call PCW "the leading journal in the field". A pity, then, that this truism appears directly below the over-enthusiastic statement that the ZX80 is "sophisticated enough to do quite literally anything", including "managing a business"!

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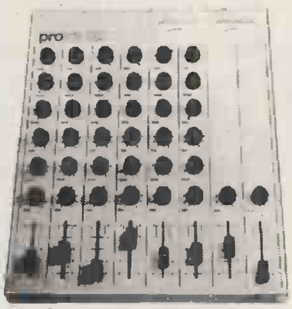

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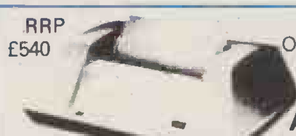

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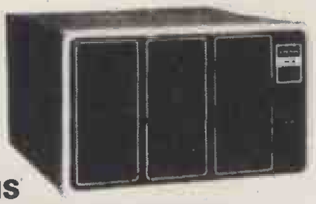

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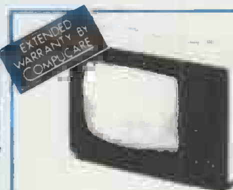

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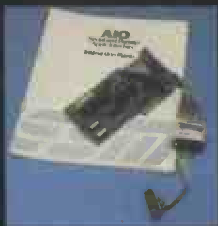

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