Windfall

Volume 2 No. 1 July 1982 £1

The Apple computer users' magazine

VisiCalc – new series on the world's best-selling planning tool

Earth Defence: an arcade game you can adapt yourself

At last! Interrupt handling explained

Features on Forth, CP/M and Ormbeta

Make your own device controller

ABC of the Apple: a beginner's guide

"Test-drive your software?"

You can buy software without trying it first...

The trouble is — sometimes it doesn't meet your particular needs.

— **And** it doesn't *always* live up to all of the advertising claims made for it.

— **And** often the write-ups you read about it (even in the best magazines), are just not *specific* enough.

— **And** even though your dealer *wants* to help, he's hard pushed to find the time for a full demonstration.

When it comes to purchasing software, the list of pitfalls is endless.

We have started the **Software Rental Bank** because we believe you should have the opportunity to evaluate software, on your own machine, with your own data, *before* committing yourself to a purchase.

And if you do decide to purchase — **the rental is free.**

The Software Rental Bank offers a unique range of services

- ★ Short-term rental of software packages and firmware products for 7, 14, or 28 days depending on your class of membership.
- ★ Free rental if you decide to purchase.
- ★ Access to the newest software available - a chance to simply 'taste' some of the latest and most controversial products.
- ★ A really wide range of software including most of the well-established packages available such as the "Visi" range, Micromodeller and the Wordstar range.
- ★ Speedy Service. Join the Bank and rent software by telephone or by mail. - all the items on our Software Asset Listing are held in stock.
- ★ An advisory 'hot line' in case you have difficulty with a rented package.

Our service is designed to give you all the time you need to evaluate the software packages you rent, and to find out if they suit your particular application. The Software Rental Bank takes the risk out of software purchasing.

The Software Rental Bank is operating now

The Bank is already in operation and is currently supporting the Apple II computer - including CP/M products for use with the Z80 softcard. Software for other microcomputers including the Sirius, the IBM Personal Computer and certain CP/M machines will be added to the Bank shortly.

Members will periodically receive our *Software Asset Listing* which gives details of the packages available for rental. Members are encouraged to nominate new items for addition to our stock.

Membership is open both to individuals and to organisations and can cost as little as £30 a year.

To receive our brochure phone Ruth Elks on 0908-53491 or clip the coupon below.

I would like to receive the Software Rental Bank brochure.

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Organisation_____

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Send to: The Software Rental Bank **WF** Jul 82
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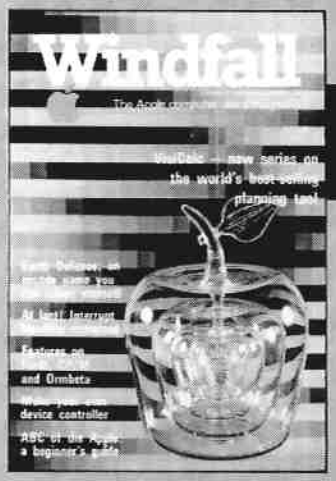

No. 13 July 1982

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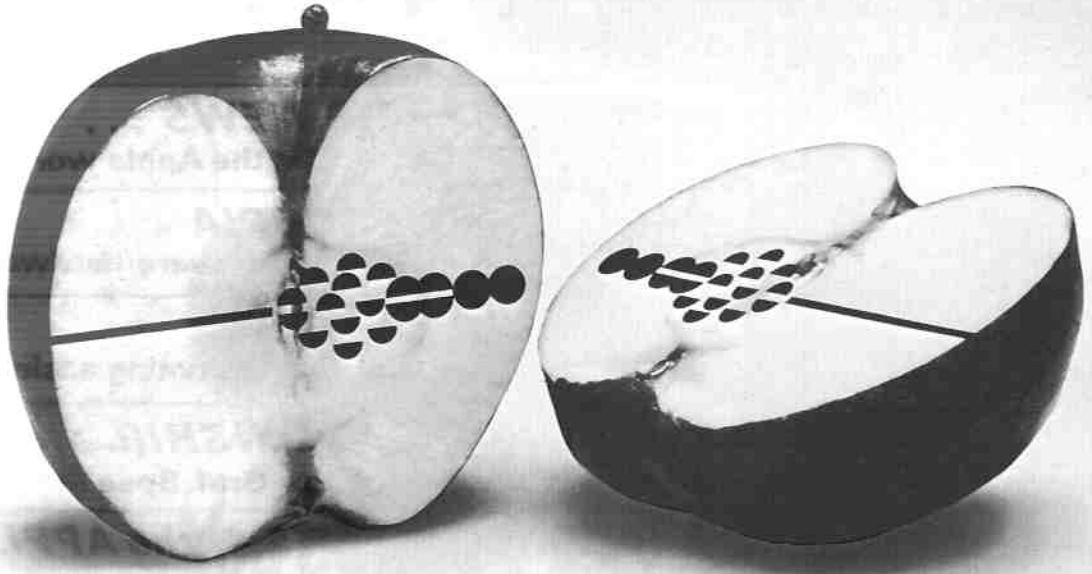
Writing for Windfall: Articles and programs relating to the Apple are welcome. Articles should preferably be typed or computer-printed, using double spacing. Unsolicited manuscripts, discs, etc. should be accompanied by a self-addressed stamped envelope, otherwise their return cannot be guaranteed.

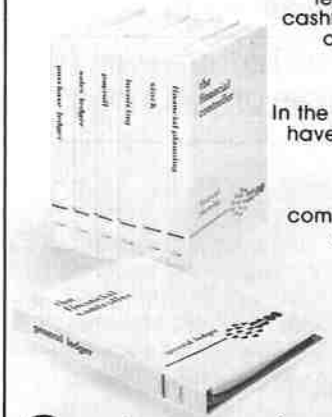
Great minds think alike.



Look inside the top microcomputers on the market and you will find the best business brains in the country. Ours. Because the key to the efficient use of the microcomputer in your business is high quality 'software' — a set of programs which direct and instruct the computers operation. A microcomputer without software is like a car without a driver! And as one of the foremost software organisations in the industry we're amongst the enterprising few whose software packages are compatible with most leading manufacturers models — including the Apple II & III Xerox 820, Phillips P2000, IBM Personal Computer and NEC PC-8000.

It means that whichever of these microcomputers you own, or contemplate purchasing, you have access to the most advanced range of business software currently available — as well as one of the most widely distributed and preferred.

On the financial front for example, there is a definite meeting of minds over the superiority of our software to perform your ledger accounting, payroll, invoicing, cashflow, planning, budgeting and stock control. Word processing, addressing and mailing, job costing and more will be available in the near future.



In the last year alone over 500 companies have invested in our Financial Controller suite of programs and over 2000 packages have been sold in the UK alone — which together with a full complement of Systematics International software is now available at around £250 per package from Currys Micro-C, Beams Business Centres, The Xerox Stores and over 100 of the best microcomputer centres throughout the UK.

Needless to say, the technical excellence of our software is matched by its high commercial quality. All software is supported by comprehensive easy to follow manuals that take you through organising, setting up and using your microcomputer business system — from an International Company with over 10 years experience and hundreds of satisfied customers worldwide. All can be complemented by management and staff training facilities at our computer and business study centre in Suffolk.

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To help you decide whether a microcomputer could help you better manage and control your business, Systematics International have prepared a video tape to put you in the picture!

It shows, the elements of a microcomputer business system, how it can help, how to choose, the benefits to be gained and the pitfalls to avoid.

At only £39.95 plus VAT and carriage, it could save you from making an expensive mistake. And considering the business potential of the right microcomputer it's also a small price to pay for success.

So if you really want to get to grips with your business, pick our brains. Everybody else does!

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Simply the best business software for your microcomputer

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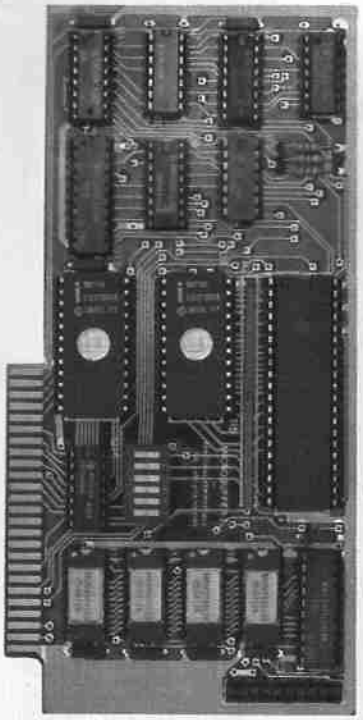
(W1)

HOW TO USE YOUR PRINTER WITHOUT WASTING COMPUTER TIME:

Your computer is capable of sending data at many thousands of characters per second but the fastest Epson can only print 100 characters per second and most daisywheel printers are even slower.
This means your computer is forced to wait for the printer to finish one line before it can send the next. A costly waste of time.

THE NEW MICROBUFFER ACCEPTS DATA AS FAST AS YOUR COMPUTER CAN SEND IT.
Microbuffer stores the data in its own memory buffer and then takes control of the printer. This frees your computer for more productive functions.



INSIDE HELP FOR THE APPLE II ....

The Microbuffer II model is a parallel printer interface card for the Apple II, with a 16K RAM for data buffering.

Compatible with Applesoft, CP/M and Pascal, the Microbuffer II comes with complete print formatting features as well as advanced graphics dump routines for most popular graphics printers.

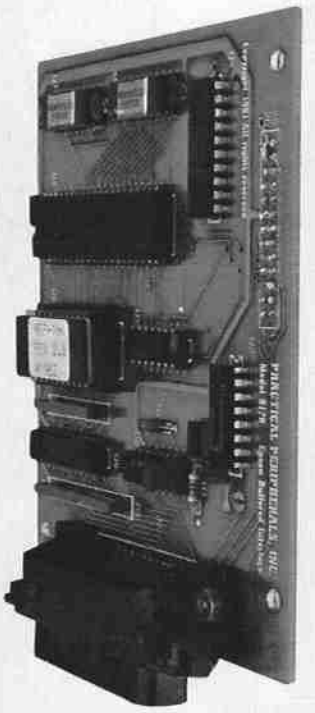
The 16K Microbuffer II costs only £175, the 32K version £199.

....AND FOR THE EPSON

Microbuffer model MBP-16K is a Centronics compatible parallel interface with a 16K RAM buffer.

The MBS-8K is a full-featured RS-232C serial interface with both hardware and software (X-On/X-off) handshaking, baud rates from 300 to 19000, and an 8K RAM buffer.

These models simply plug into the existing interface connector inside the Epson MX-80, MX-80F/T or MX-100 without modification, and compatible with standard Epson cables and printer control software including GRAFTRAX-80.
Either model costs just £99.



SO WHY WASTE ANY MORE TIME?

CALL US NOW FOR YOUR MICROBUFFER AND LET YOUR COMPUTER GET ON WITH SOME REAL COMPUTING.

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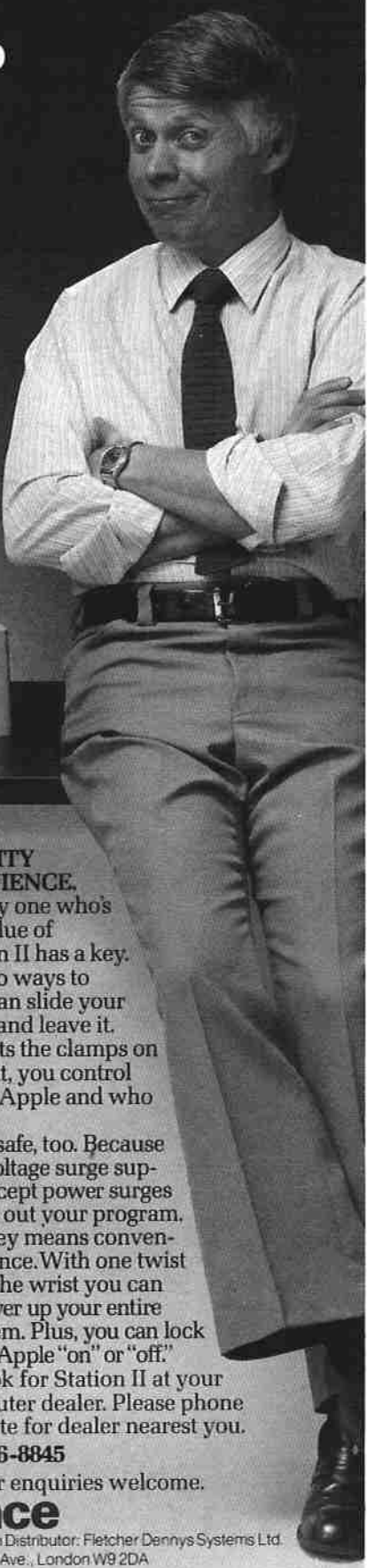
PUT ONE OVER ON A APPLE II.

Introducing Station II.
The Apple II Support System.

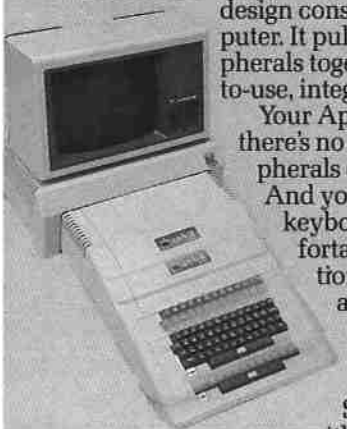


What happens when you put one over on Apple II? You make it better. Because Station II organizes, simplifies, protects, secures and lets you control access to your Apple. In other words, it makes your Apple II your personal computer.

IT'S DESIGNED FOR II-GETHERNESS.

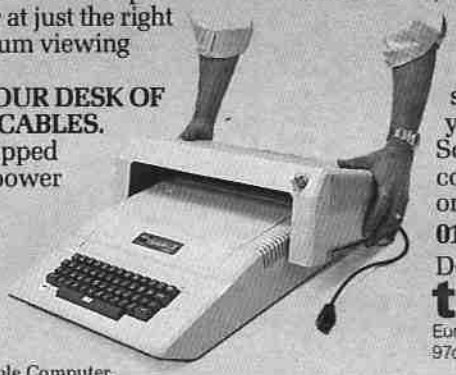
Station II is designed specifically for Apple II by design consultants to Apple Computer. It pulls your Apple and peripherals together into an attractive, easy-to-use, integrated system.

Your Apple is free to slide in and out, so there's no unstacking and restacking peripherals everytime you need to get inside. And you can choose the distance from keyboard to monitor that's most comfortable for you. Station II even positions your monitor at just the right angle for maximum viewing ease.



IT CLEARS YOUR DESK OF CORDS AND CABLES.

Station II is equipped with three built-in power outlets, so the cords and cables that normally clutter your work area are tucked away neatly inside. Now one cord, Station II's own, powers your entire system.



THE KEY IS SECURITY AND CONVENIENCE.

You're not the only one who's discovered the value of Apple II, so Station II has a key. And a lock. And two ways to secure it. Now you can slide your Apple inside, lock it and leave it. Safe and sound. It puts the clamps on theft, and beyond that, you control who gets inside your Apple and who doesn't.

Your programs are safe, too. Because Station II has a line voltage surge suppressor, ready to intercept power surges before they can wipe out your program.

What's more, the key means convenience. With one twist of the wrist you can power up your entire system. Plus, you can lock your Apple "on" or "off."

So look for Station II at your computer dealer. Please phone or write for dealer nearest you.

01-286-8845

Dealer enquiries welcome.

trace

European Distributor: Fletcher Dennys Systems Ltd.
97c Elgin Ave., London W9 2DA

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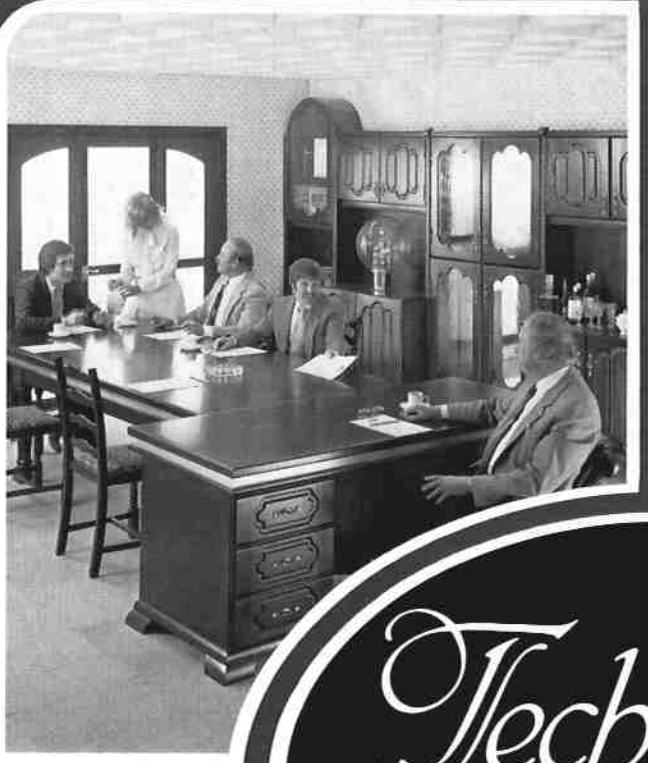
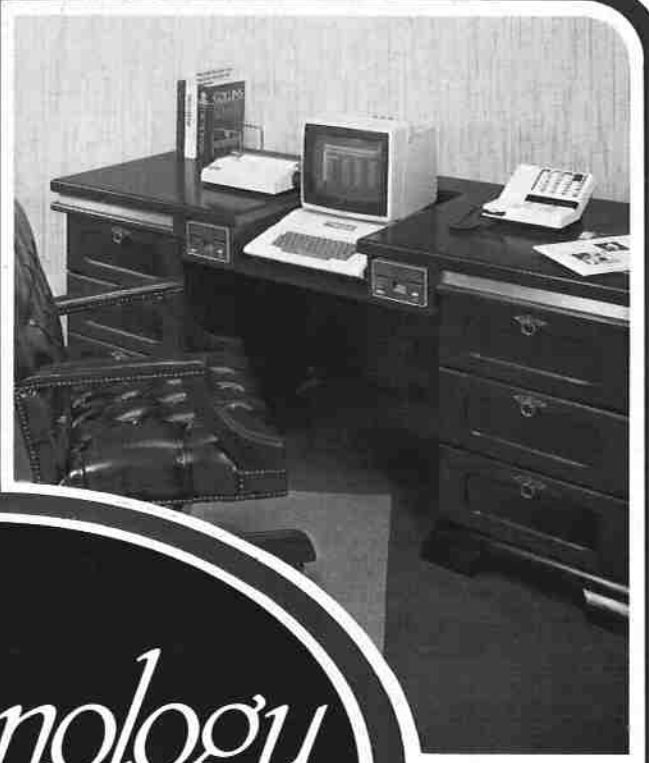
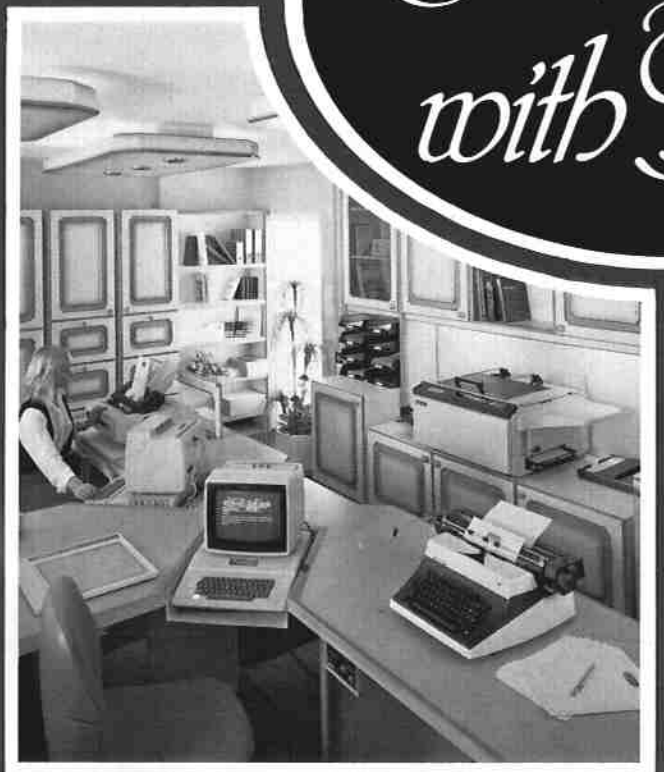




Technology with Taste



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W7/82

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FMS PLUS is the Hard Disk version of FMS and is available on the Apple III Microcomputer.
FMS PLUS has rapidly established itself as the quality Accounting System for Apple Computers.

Consider these features:

- Complete integration of Sales, Purchase and Nominal Ledgers.
- Superb design features that makes FMS look and feel like a manual double entry bookkeeping system.
- Three levels of password security.
- Up to 100 million combinations of Nominal Analysis. (10,000 NL Accounts x 100 Cost Centres x 100 Sub Analysis codes).
- Cost Centre or Departmental Profit and Loss Accounts.
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- Multi Company Option.
- Run Log Control over the operations within FMS PLUS.

Other modules to FMS are currently being developed. These include Stock Control and Sales Invoicing. Windfall, the Apple User's Magazine says *"FMS is the most comprehensive yet straightforward Accounting System yet seen on the Apple"*.

For further information about FMS, business/financial programmes and microcomputers, call Jeremy Hope at RAM.

FMS

RAM COMPUTER SERVICES LTD

15/17 North Parade, Bradford,
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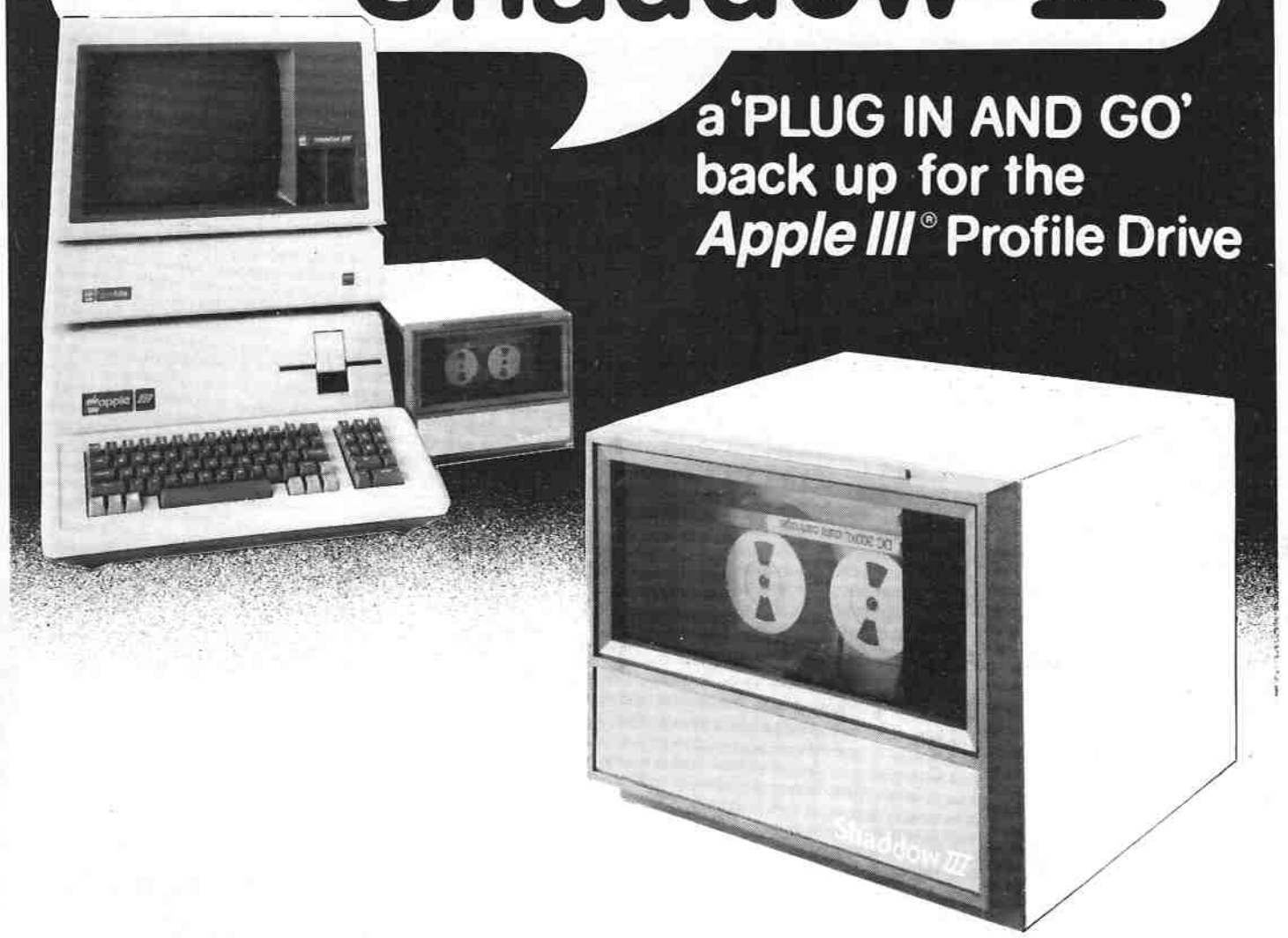
'Me and my Shaddow III'

a 'PLUG IN AND GO' back up for the *Apple III*® Profile Drive



Based on the well known 3M Data Cartridge Drive to ensure quality and performance, and using DC300A Data Cartridges for simplicity and efficiency, the SHADDOW III provides a reliable back-up for the 5 Megabyte Profile Drive.
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Comes with utilities to allow the movement of DOS and the use of Integer together with the ability to store subroutines on the board to be called from a main program. The final utility allows the board or multiple of boards to be used as a fast disk drive
£149.00

128K BOARD
Can be used as above with the additional facility to use the card as a fast disk drive in C/PM and PASCAL in addition to BASIC
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VC EXPAND
Is a utility that can be used with either the above two boards to give additional memory for VISICALC models, up to 146K with the 128 board—and more with additional boards
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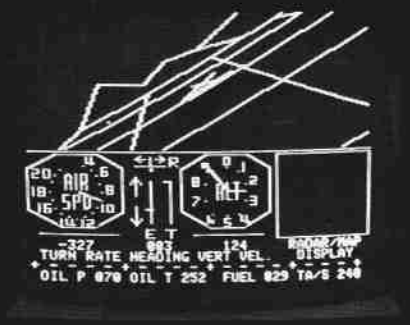

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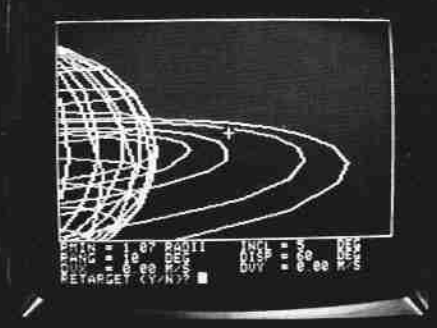

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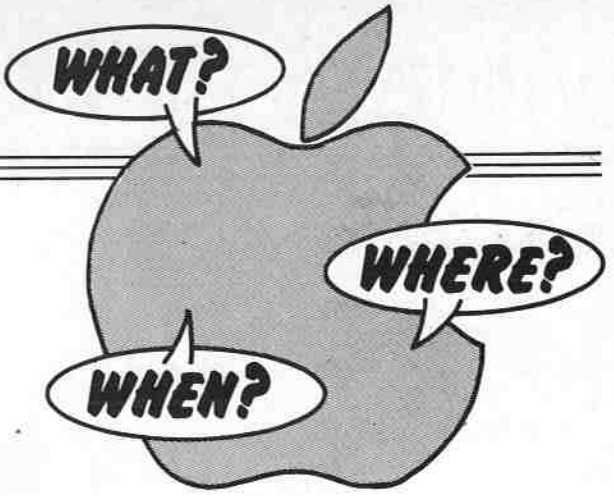


By Derek Meakin

Apple beats as it sweeps as it cleans up . . .

AT long last Apple UK is beginning to show a lot more muscle in its attempt to keep ahead in the marketing field, with TV commercials at prime viewing times, widespread newspaper and magazine advertising and more dynamic promotional work, particularly in the education field.

Either the company has woken up to the fact that in the micro market even a good product needs selling, or else it is responding to twin-pronged attacks from cheap imitators and envious competitors.

Or could it be that it really is in trouble, as was suggested in a recent article n Computer Weekly? The newspaper said there is mounting speculation that all is not well with the company's European operation; Alec Wrafter, director of the Apple plant in Cork has resigned; and sales are running below target for the year.

Apple UK's official response to the article was a categoric no comment (so much so that it is not even prepared to go as far as saying no comment!)

So what is the situation? Apple UK has recently moved into much larger, custom-made premises, which implies confidence. Other indicators however can each be interpreted in two ways.

The company is currently offering discounts in a summer sale – either a move from strength or a panic measure; Keith Hall has just joined the company as sales director from Commodore – and again, depending on one's outlook, that is either very good for Keith or very good for Apple UK; and while CW noted that Apple UK is not achieving sales targets and its sales have "stuck" at around 1,500 Apple IIs a month, other companies regard that as a sales achievement to be envied.

It seems that Apple UK is neither demonstrating a dynamic marketing flair not is it necessarily fighting for its life. Instead it is merely responding to a volatile commercial market.

The company's sales development manager, David King, confirmed this indirectly in his speech at the Apple '82 convention last month.

"We are committed to continuing our growth and to becoming a family name, like Hoover," he said. "If someone wants a vacuum cleaner they ask for a Hoover, and if someone wants a micro computer, we would like to think that they'll ask for an Apple."

"There are currently 425,000 Apples installed throughout the world, with 34,731 in use in the United Kingdom. Three months ago there were 750 companies throughout the world building or designing hardware to complement the Apple II, with 2,500 software companies providing a broad range of specialised applications programs."

That Mr King quoted figures that are three months out of date is probably not a cause for worry about the company's health. As he said, it is in the vast range of software products where the company's fortune and success lies.

Apple UK is now making a concerted effort to develop the quality and reliability of its dealer base through adequate training, support and back-up. This could well be a necessary consolidation if new products planned are as successful as the Apple II.

"We do have a very powerful 16-bit machine which will be available next year," said Mr King, "and with it we have tried a totally new concept, that of breaking down the user interface to take people

→

Always good for a rebate

FIFTY Apple IIs have been installed by Walsall Borough Council to help streamline the complex and lengthy process of assessing rent and rate rebates. The council, which is pioneering a decentralised neighbourhood office concept for local government, was worried about an anticipated 80 per cent increase later this year in people eligible for rebates.

Westwood Computers developed a program for the Apple which uses a dedicated interface device to access existing ICL mainframe records, and which carries out the complicated procedures of the assessment itself and the actual calculation.

The package has cut the waiting time for a decision on rebate entitlements from three months to five minutes – and that's a fast rate by anyone's standards!

WHAT'S NEWS...

off the keyboard as much as possible."

At the lower end of the market Mr King said Apple is developing a home, hobby and small business machine that will cost less than the current price of an Apple II, but which will probably be more powerful. And it also intends to continue introducing Apple-branded peripherals.

Mr King painted a picture of a world in five or ten years time with a micro on every office desk, micro network teaching in many classrooms, micro-controlled utilities for the home and even wheelchairs with built-in computers. It seems clear that he sees Apple at the core of it all.

De-boggler on its way

MINDS boggled by the rapid proliferation of information technology and the associated array of new jargon will welcome the idea behind the Dictionary of Information Technology, due to be released by Macmillan Press in October.

Its editors, Michael Shain and Dennis Longley, acknowledge that even specialists can have problems in relating one field to another, since terminologies are so varied, and set out to give concise definitions of terms used (often in different contexts) within the branches of information technology. We'll let you know how well they succeed in a later issue.

Meanwhile, newcomers to the Apple will find some help on Pages 85 and 87.

Pro-am micro

THE real winner at the 18th hole of a pro-am celebrity golf tournament at Wendover in Buckinghamshire last month turned out to be the Stoke Mandeville Hospital.

Tarace Limited of Wendover sponsored the hole with a gift of a complete Apple system for the hospital. The company also provided a fast and accurate results service for the tournament, using a special program and three Apples, and an autograph service incorporating a graphics tablet which all the celebrities signed before teeing off.

APPLE UK's new director of sales is Keith Hall – who has moved up to Apple after three years as UK sales manager for Commodore. Before that Keith worked for 11 years in Olivetti UK's systems division.

Apples go on holiday

CHILDREN will have a chance to learn and play with micros alongside more conventional holiday pursuits such as canoeing, sailing, riding and swimming at a series of summer camps starting this month.

Dolphin Camps are running five one-week residential courses in the London area, and seven one-week residential sessions in the Lake District.

"Our basic philosophy is to link business and industry with outdoor sport and leisure activities," said organiser Mr Andrew Colin.

The camps are part-funded by the Department of Industry, and at the Mill Hill centre in north London Apple have lent 30 Apple IIs – plus a donation of £1,500.

That's £1 for each of the children expected to attend the Mill Hill courses.

Mr Colin says they should be able to get two or three hours hands-on experience with micros each day. "And that's something that can't be matched by their schools," he added.

They'll be able to choose courses including Basic for beginners, Pascal, building and controlling a robot, and film making.

Eastern promise

APPLES from the East could become a reality in the near future . . . and we are not talking about contentious copycat machines that have been coming out of Taiwan.

Few details are available but it seems that Apple Inc. are to establish a new wholly-owned subsidiary in Japan this month, following the completion of a two year sales contract with Toray Industries Inc. in Tokyo. The subsidiary will initially be called Apple Japanco.

Perhaps it will soon be a case of "When Oriental Eyes are Smiling" to follow on from the success of the Apple plant in Cork which manufactures all the Apples currently sold outside the United States.

Irish version

AND from a Japanese version of the Apple to an Irish version of the Open University.

Apple are donating 75 micros, and Guinness, the Dublin brewers, are putting up £90,000 towards two pilot programs on computing and on agriculture to be transmitted by Ireland's TV organisation, RTE. The programmes are part of the National Institute for Higher Education's plans for technological education.

The Apples will be installed in the country's regional adult educational centres so that when they aren't being used for the TV programmes they can be played with as part of a computer literacy drive.

The 16-bit challenge

A NEW round has started in the increasingly competitive battle for the personal computer market. Digital Equipment (DEC) has entered the fray with the launch of a micro range priced between £2,000 and £5,000. It is thought that these machines could provide a serious chal-

lenge to Apple's leadership of the British market – with Apple being particularly vulnerable because it has yet to market a comparable 16-bit system.

There has been no comment from Apple yet, but perhaps the long-rumoured Apple IV will be their inventive answer.

And while DEC have been creating waves, Apple UK have been busy planting a new Apple orchard. At the end of May the whole company moved about half a mile down the road into new, custom-built premises on the Hemel Hempstead industrial estate. "We needed more office space and bigger warehousing facilities," said a spokesman.

The move has meant the happy demise of the Apple direct-line system — and the 24-line switchboard now in operation (0442-60244) should make Apple employees a lot easier to contact.

Engineers get together

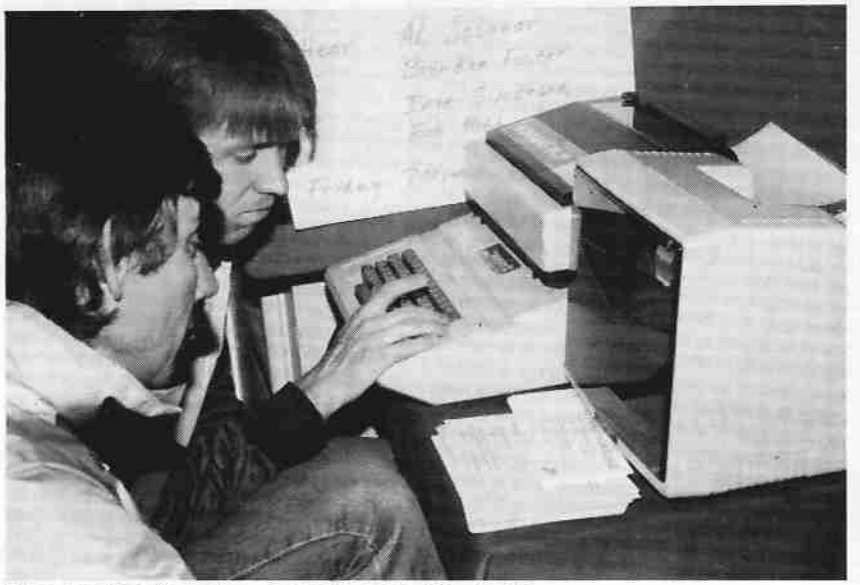
ENGINEERS have been feeling so left out of the main flow of microcomputer exhibitions that they organised a one-day workshop in London to cater specifically for micro applications in engineering. And, naturally, Apples were well in evidence.

"Micro fairs seldom include anything on the engineering dimension and we wanted to fill the gap," said Mr Peter Pugh of the Institution of Mechanical Engineers, which organised the event in conjunction with the Institution of Production Engineers.

"However in retrospect perhaps we should also have included some more generalised applications such as word processing. Engineers and academics still wanted to know what the micro animal could do in other directions."

The workshop featured demonstrations involving micros in gear box and machine tool design, the control of robots and other mechanical devices, structural analysis and naval architecture. It also provided a forum for the exchange of ideas.

"There has been plenty of engineering software written, but little opportunity for interchange," said Mr Pugh. "We have been getting the wheel invented many times as it were, with engineers writing their own programs within a company – and then sitting on them."



One London Marathon entrant gets his Apple computer personal prediction.

Fingerwork before footwork

IT was fingerwork before footwork for many of the competitors in the recent London marathon. The Nike shoe firm borrowed four Apple IIs from Apple UK and invited thousands of runners to key in personal information about their training and race performances to date. In return the Apples, which were run for 10 hours on each of the three days before the race, gave predictions about how long it would take individuals to complete the event.

Overall results haven't been collated, but John Craine, the promotions manager for Nike, says some of the individual predictions were frighteningly accurate.

"My own time was three seconds outside the prediction," he said, "and several others finished within seconds of their estimates. When the system was used at the New York marathon last October Alberto Salazar's world record performance was only 30 seconds outside his time, predicted the day before."

At the Boston marathon this year the West German champion Charlotte Teske was sceptical when the Apple gave her a 2hr 29min prediction. "She'd run faster in Europe, said Mr Craine," and was aiming for 2hr 25min. In the end she finished in 2hr 29min!"

Bargains

CUT-PRICE Apples are available throughout the UK as part of a special summer season offer by Apple UK.

Until the end of this month the company is offering up to 20 per cent discounts on certain items bought through dealers as part of a basic system.

£163 has been knocked off the price of a 48k Apple II and there are reductions on printers, disc drives and selected software, provided they are bought at the same time.

THIS month's pick of the crop for humour is Datalink of Bristol which produces, intermittently, a newsletter for Baud (Bristol Apple Users and Dabblers).

They've written a brief article noting that the computer world has more than its fair share of attractive women, and suggesting that their newsletter could be enhanced by a "Page Three" type pin-up or even a centre-fold spread. And they've headlined the article "Venus de Micro?"

Colourful show

ONE aspect of Apple '82 that made it stand out against the average micro show was that it was such a colourful event.

Of course that had to be expected, because right from their early days Apple scored a resounding lead over most of their competitors by emphasing their hires colour capabilities.

But there's colour and colour, and thanks to the different national standards Apple colour in the UK has never really borne comparison with its American counterpart.

At Apple '82, however, a name we shall be hearing a lot about in the colour monitor world – MicroVitek – decided it would make its mark in a big way, brought in a truckload of its new colour monitors and offered them on free loan to a good cross-section of the exhibitors.

Result? The whole show sparkled with crisp, beautifully defined colour which did much to enhance the many colourful programs – from business graphics to arcade games – that were on display.

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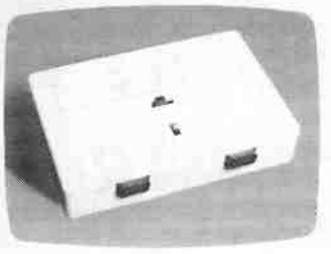
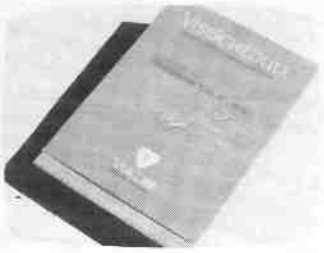


Joyport Price **£35**
Attach 4 Joysticks to your Apple. (Above)



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Epson MX80 F/T1	**£350**
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*Epson MX80 F/T3	**£375**
*Epson MX100 Type 3	**£475**

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The General Manager	**£75**
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*Super Text 40/80	**£105**
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The Image Printer-EPSON	**£34**
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Adventure to Atlantis	**£24**
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* NEW

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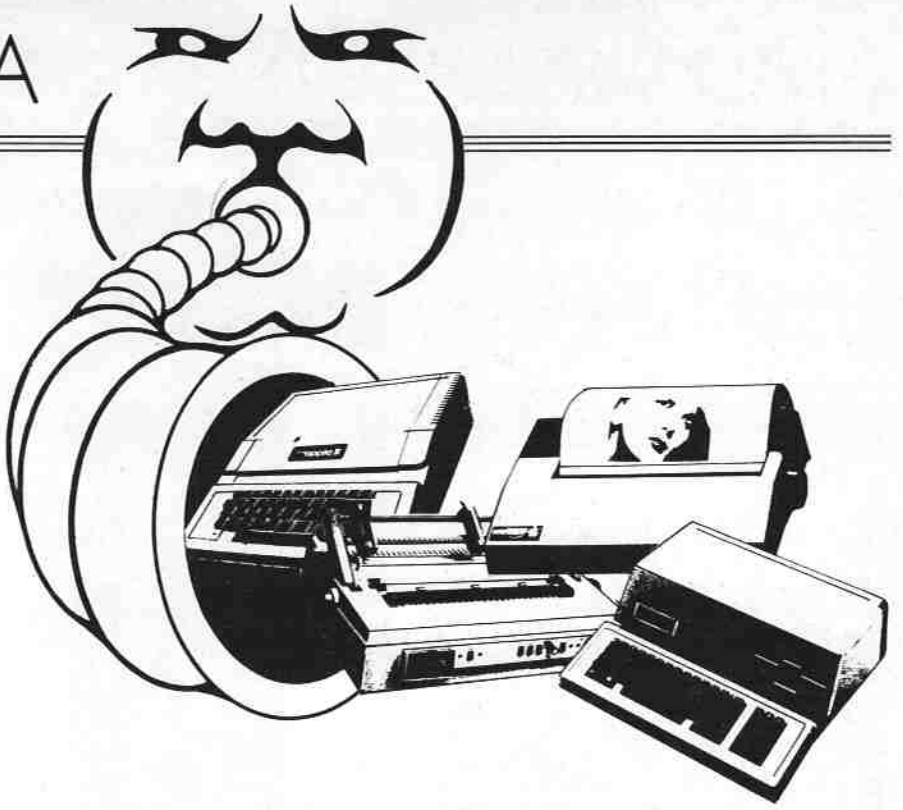


Alternative to mainframe

A PACKAGE that will allow businesses to utilise the reported compatibility of the Apple II with the sophisticated Calcomp 81 plotter comes from Mass Micros.

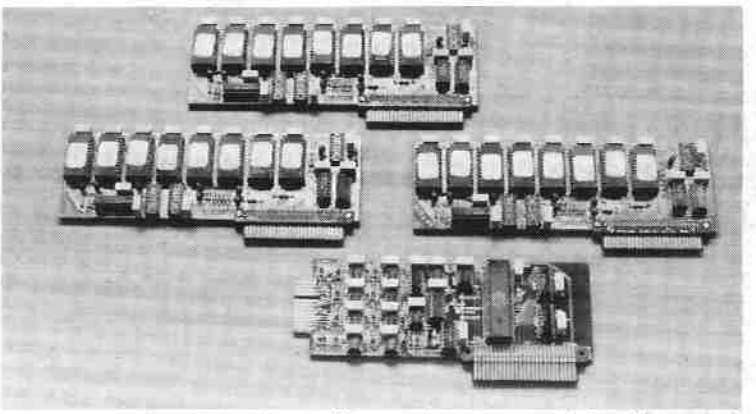
Calplot 81 consists of a database with editing facilities for production of high quality, multicolour plots as hard copy on paper for reports or on transparencies for overhead projection.

The package can handle continuous feed stationery without supervision and comes as a turnkey system that is both prompt and menu-driven.

It can handle scatter diagrams, cumulative or standard line diagrams, histograms, positive-negative histograms and pie charts. Data sets can be edited or the parameters changed to give different plots from the same basic data, and Mass Micros will customise special plots to match individual clients' needs. Planned modifications should enable the new package to interface with the versatile Visicalc program.

MM director Richard Zawadzki points out that though Visicalc's sister program Visiplot will draw excellent screen graphics from Visicalc data, the only hard copy versions available until now have been straight dumps lacking the colour, definition and impact needed for in-house reports, let alone literature intended for clients.

The basic package costs £1,000 with additional customised plots at around £250. MM claims Calplot 81 can be a cost-effective micro-based alternative to running a Calcomp plotter from a mainframe.



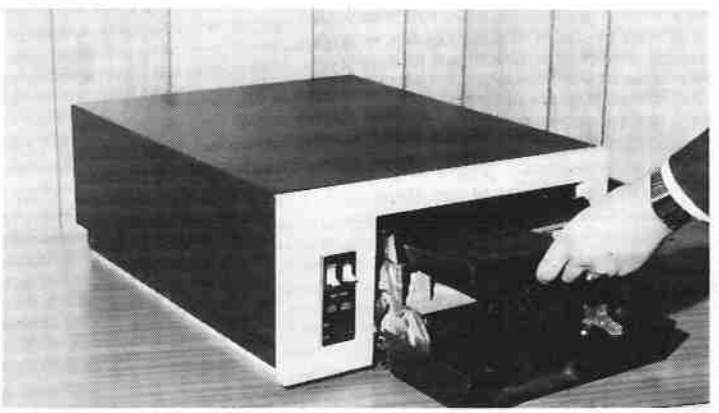
Mercury language and interface cards

Alternative 2

TALKING about the Apple II in the same context as a mainframe computer appears to be a contradiction in terms, yet Channel Island Computer Consultants say that with the use of the Mercury 6502 Disc Operating System the Apple's performance compares in many respects with a mainframe.

Mercury 6502 is a multi-user Apple configuration running up to 15 Apples linked to common disc storage of up to 40 Megabytes. The software simplifies the development of applications through the use of masks, and as it uses full index sequential filing with both multi and single key access, data acquisition is rapid without the need in most cases for time-consuming sort routines. Data and software is stored contiguously on the hard discs.

The system is available on a 16k ROM plug-in language card for £280. Each Apple logging into the system requires an interface card costing a further £100. CICC are the sole UK distributors.



Mercury disc operating system has a massive capacity

Forms on parade

THE preparatory school administration package produced by Deverill Computer Services has been upgraded to run on the Apple III, with a number of advanced facilities. It is suitable for use by public schools with up to 1,500 pupils.

The package, which runs on the Profile hard disc system, is an on-line administration and reporting system catering for all accounting needs of a school bursar.

Because these needs differ between schools, the system is very flexible. It contains records for each pupil and functions to handle the numerous methods of paying fees and recording charges. Up to 2,000 records can be handled on the parent/guardian file, which links in to the pupil file.

A maximum of 120 different fields can be created to handle details of costs – fees, BUPA, riding club, etc – and standing charges and nominal ledger codes. These can be used to create up to 300 different reports, such as outstanding balances, fee analysis, pupil lists by forms, tutors and boarders. The system has been designed to be interactive, with all information instantly to hand.

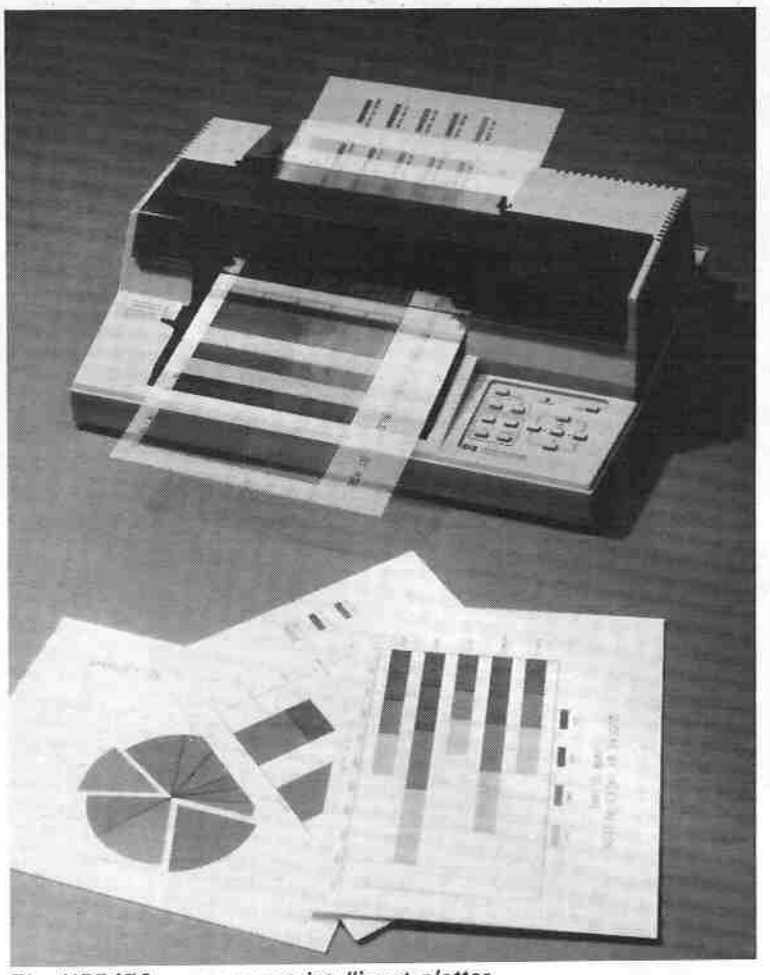
High speed intelligent plotter

MULTICOLOURED plotting on either plain A4 paper or overhead projector transparencies can be achieved with a new plotter from Hewlett Packard being marketed by Datalink. The HP7470 uses two pens and moves both the pens and the paper simultaneously to produce high resolution plots (.025mm resolution). Programs can be halted to insert different coloured pens, and then resumed to produce charts, graphs and other presentation aids with up to 10 different colours and two line widths.

Transparencies can be created with up to seven colours in two line widths. The compact, intelligent plotter can complete complex plots rapidly, moving at a speed of 15 inches per second with the pens down, and 20 inches per second pen up. Features include built-in character generation with a European character set, vector plotting and internal linetypes. The Plotter can also reconfigure or scale graphics and characters to fit within areas, either by condensing, expanding, enlarging or reducing the images or characters.

Communication is further enhanced by the use of more than 40 individual instructions from plot designations to pen commands permanently stored in the 8k ROM and easily accessible from the processor.

Interfacing to the Apple II can be achieved using the Apple Serial Interface or via Hewlett Packard's standard interface, the IEEE-488, which is also available on the Apple. Price is £1,021.



The HP7470 ... compact intelligent plotter offering transparencies in seven colours

Sharing the goodies

A SYSTEM for connecting more than one terminal to the Apple so that different sections of a company department can access a program from different locations has been devised by Saville Audio Visual.

Using just one Apple and a series of extra keyboards and monitors linked via coaxial and twisted pair cables, Apbranch allows any of a number of users to link into the Apple at any one time. A keyboard light indicates when the computer is already in use, and who is the user, access being locked until the user logs off.

Remote consoles can be situated up to 1,000 feet away, allowing input or retrieval to or from any program currently running and complete access to disc memory. Data lockout control ensures that individual consoles retain total independance whenever they are logged on.

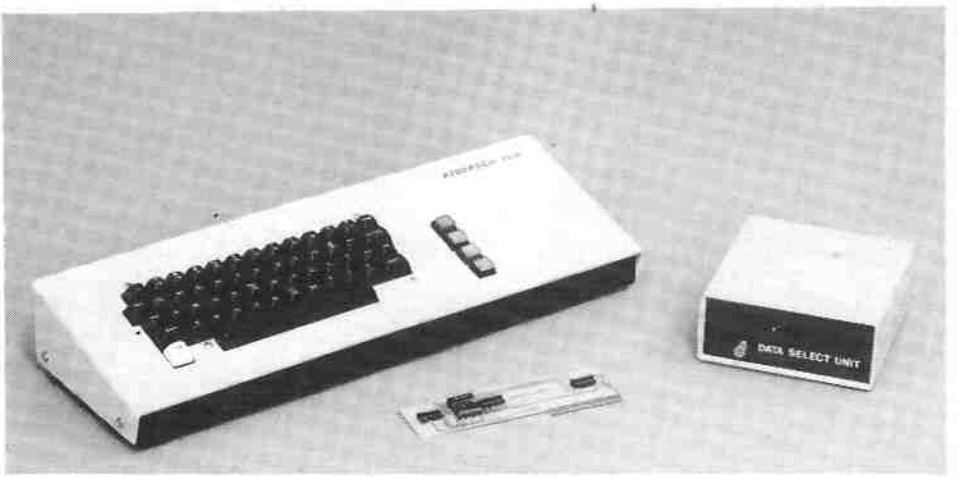
Already in use in the Health Service, the system can be installed to provide a four station hook-up to an Apple II for around £1,600.

Easy as pie

A Californian company has developed a graphics package for the Apple II which is aimed at businessmen who believe a picture is worth a thousand words. PFS Graph will take data and turn it into graphs, bar charts or pie charts.

The program, developed by Software Publishing, is compatible with data collected on Visicalc files, as well as data held on the company's own Personal Filing System. PFS Graph is menu-driven. It can work with the Apple Silentype printer, Epson printers or the Hewlett Packard low cost 7470 plotter – and with the latter can produce colour graphs or transparencies for use in presentations.

PFS Graph is marketed in the UK by Personal Computers.



The new Apbranch remote terminal system

Package for surveyors

CHARTERED quantity surveyors have for many years been using what must be a dreadful system of "cut and shuffle" to produce their bills. This method takes up a considerable amount of time and its practitioners must have been scouring computer journals looking for somebody who has computerised the system.

Relief is at hand. Warner Computer Systems has produced a package based on the requirements of one of its customers, which makes a considerable reduction in the time taken to prepare bills of quantities and is available for an Apple running on hard discs.

The software can be bought for £1,200. Alternatively, Warner will supply a complete system including a Winchester disc drive from Independant Computer Engineering for £6,000. The program will also run on the Apple III with Profile 5Mb disc system.

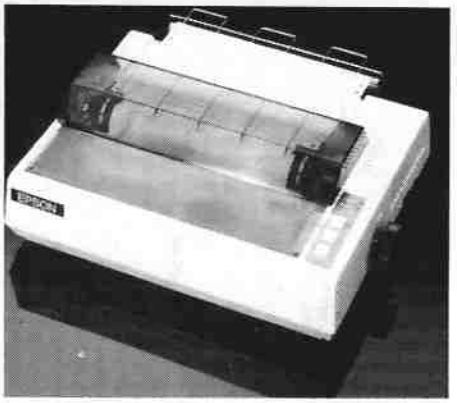
Another package available from Warner is a Project Time and Cost Recording System, recording time and expenses accrued against projects. This package retails at £300.

. . and for management

A NEW database management package on the market offers several facilities not found on similar products. Spider Software describe their Access program as the ultimate in database management for the Apple.

It has an active command stack which allows the input of a list of commands to be executed one after the other, and features a word processor-style screen editor. This allows the insertion and deletion of characters and gives full cursor control over fields and pages of a record.

The retrieval times are impressive. Records stored in random order can be retrieved within three seconds using a primary index. A search for multiple criteria takes a maximum of 23 seconds. The program, which costs just under £200, allows up to 2,800 records on each disc, or up to 1,521 characters and 39 fields for each record.



Epsom MX Type III

New from Epson

A NEW series of printers incorporating high resolution graphics as standard has been launched by Epson. The MX series Type III also feature superscript, subscript, underlining and deletion. Printing rate has gone up to 100 characters a second and the system includes eight software selectable international character sets as well as the standard 96 Ascii characters.

The Epson printer range has already established itself as a favourite with its enlarged and condensed character facility, excellent graphics and friction or tractor paper feed option.

The new series will only serve to enhance Epson's reputation.

Putting on a big show

UP to 24 slide projectors can be run from an Apple fitted with a 16k RAM card, an Apple high speed serial interface card, and a special clock card from Electrosonic.

The whole system, called the ES4024 Multivision Computer, is run by a program called Esclamp, which fully controls a multivision projector show of 24 projectors with one card, and 48 projectors with the addition of another card.

Esclamp, the Electrosonic Computer Language for Multivision Programming, is easy to use. Events are stored as cues which can include two different projector commands and the time to the next cue. The 1,000 cue capacity is sufficient for most audio visual programs, but as extra discs can be loaded rapidly unlimited presentations can be developed.

Programs can be built up in sections, such as 'Ripple', 'Wipeleft' and so on, and combined at execution time to minimise the creation of separate presentations.

Esclamp includes a powerful cue 'looping' facility, and cues can be as close as 20 per second. Although this allows complex animations to be run at the same time as normal cue sequences, other facilities are available for standard animation effects.

The monitor screen displays lamp status, slide tray position, tab status, cue contents, program catalog, program listings and the command syntax. A reduced version of the package is available for education and training applications where the multiplex clock is not required. This will enable 400 cues to be stored and run on a 48k Apple.

Compatible Acclaim

IT would be unfair to call the Acclaim a souped-up Apple II as a lot of thought has gone into providing all the facilities to create a complete commercial microcomputer system, with many similarities to the Apple, and remaining totally compatible with all Apple hardware and software.

Acclaim, designed by Country Computers, is housed in a completely new cabinet which incorporates a 6 or 12Mb

→

THE handling and filing of data printouts is a perennial problem for users, so a new stationery product that looks useful in this sphere, the Samson Databinder, marketed by D N Computer Services, should prove welcome.

The binder opens fully flat edge to edge. It is easy to load and can be filed flat on its spine or stacked flat on any shelf.

COMPUCOPIA

Winchester hard disc drive, a floppy disc drive and an anti-glare screen.

The keyboard has been extended to provide separate numeric key pad, true upper and lower case capability, a shift lock and alpha lock and an auto-repeat on key hold-down as well as a type ahead buffer. The keyboard also has 12 function keys that can be programmed by the operator.

To accommodate the many 80 column word processing packages now on the Apple, Acclaim has a 40/80 column screen switch.

The cost of an Acclaim with 64k of memory and 6Mb of disc storage is £3,995.

Plug in for the right time every time

A TINY card which inserts into the Apple's games socket providing accurate timekeeping using a quartz crystal has been produced by Glanmire Electronics Ltd. Called the Micro-Watch, the tiny automatically rechargable batteries that power it can keep it running for up to a year, whether or not it is fitted inside the Apple, Indeed, we were amazed when we first plugged it in to see the correct time displayed on the monitor.

The Micro-Watch can be used for all applications which require timing down to seconds, and comes with functions for automatic printing of times on invoices and memos, timed messages for hotels, lounges and reception areas with a large font character generator, and an Electronic Diary which can be used to provide an audio or visual warning for events throughout the year.

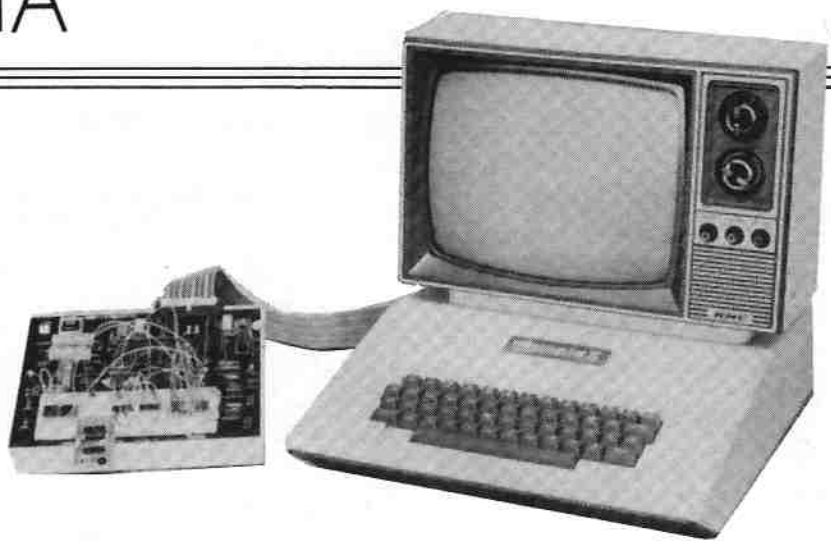
Micro-Watch does not disable the paddle function and can be used as a timer to interface to other programs without wasting I/O slot space.

On reflection . .

DO you suffer from eyestrain after looking at an Apple screen all day? Statiflect-Guard might have the answer in a new device called Tele-Sponge which cuts screen reflections without diminishing definition.

Tele-Sponge has been demonstrated on BBC's Tomorrow's World, showing how up to 90 per cent of light can be diffused by the two-part treatment definition.

The treatment is applied directly to the screen, hardening within 24 hours. It has anti-static properties, and ball-point pen ink and finger marks can easily be removed with a soft cloth.



DIY man's breadboard

BREADBOARDS are essentially naked printed circuit boards with interfaces to computers to enable experiments and circuits to be constructed and tested. Connections are made with hook-up wires and solderless slots into which microchips can be positioned. Programming of the system is generally in machine code, so that individual points can be defined or addressed.

An Apple breadboard has been developed by Group Technology in America, however, which can be used by the less technically minded Apple user, as well as the specialist interface designer. This board can be programmed in Basic, allowing users to design and operate custom interfaces without having to know machine or assembly languages or the internal circuitry of the Apple.

The interface breadboard is fully buffered, enabling a unique scheme to be used to protect the Apple in the event of wiring errors. Eight decoded outputs are available in device addressing mode or in memory addressing mode, and up to 256 I/O (input/output) devices may be addressed. A probe circuit permits detection of logic signals and pulse edges.

Also available to complement the breadboard is a book called Apple Interfacing, which assists the reader in designing custom interfaces using the breadboard. It covers all aspects, including defining device address decoders, synchronising signals and interface ports, and provides diagrams and listings for a number of sample projects. All programming is in Basic.

Voice for the Apple

HERE is a speech synthesiser which comes complete and ready to run, Apple-Vox. The Apple speaker can be connected to the card or alternatively your own or a Mutek extension speaker can be used for added clarity. Volume and pitch can be controlled by preset potentiometers on the Apple-Vox card by simple screwdriver setting.

Apple-Vox is a development of the popular Voxbox system used for the Apple. It holds 64 synthesised phonemes common to human speech in many tongues. Apple-Vox costs £62 including postage for the bare board and manual, and £14 for the extension speaker.

Speedy programming

A SIMPLE to use but sophisticated program development package called PIPS (Personal Instructed Programming System) is being marketed by Micro-Technic. It enables users to develop small applications tailored exactly to their needs, with sophisticated data handling and reporting facilities. Programs are constructed very quickly from responses in English which define the required database, and the record structure can be designed graphically on the screen.

Up to 26 fields can be defined, with a maximum field or record length of 255 characters. Written in Basic, the program can be run in 40 or 80 columns (with the screen being used, through the 80 column card, as a printer).

Data is held with a RAM based index, using key fields for fast access. Records are sorted within the index at the point of entry, so that sorted records can be listed immediately after entry. Sub-fields can be used for sorting subsequent to entry, up to the maximum of 26. A very useful feature is the ability to use all of the Applesoft functions with the data to perform complex calculations on individual fields, or on a selection of fields, rather like the system used with VisiCalc. These calculations can then be used in the reports.

Totals can be producing by field and by line, and moving averages can be calculated. The reporting function is very flexible, allowing complex logical statements to be used field by field. Complex mathematical reports can be produced with ease.

The system costs £235, and requires a 48k Apple with one disc drive.

MC Computers present Pi

— the industrialised Apple II

Pi is a customised version of the acclaimed Apple II Personal Computer for use in harsh industrial environments.

The system comprises a standard 48K Apple Computer, a sealed floppy disc drive, a controller and a mains/dc power unit housed in an industrial enclosure, to protect it from the problems of noise, vibration and dirt. User-definable front panel push buttons provide safe access to the computer. An optional QWERTY keyboard can be plugged into Pi for program development work or modifications.

Another twin unit provides a 5 inch visual display unit and additional disc drive, and the two units are designed to link up for standard 19 inch mounting.

Pi is compatible with the full range of MC Computers' industry standard computer I/O cards for data acquisition and control applications.

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Epson MX80FT-3 as above	335.00	385.25
Epson MX80FTII-3 HI RES Graphics	335.00	385.25
Epson MX82FT-3 As Above	370.00	425.50
Epson MX100FT-3 As Above & wide carriage	455.00	523.25
Integrex CX-80 Colour	720.00	828.00
Tec Starwriter 40cps	990.00	1138.50
Nec 8023 100CPS 80 col. HI RES Graphic	339.00	389.85
Silentype & Interface	159.00	182.85
Seikosha GP-100A 80 col. & Graphics	175.00	201.25
Star DP8480P 80 cps 80 col. F.T.	285.00	327.75
Mannesmann Tally MT 120 160 cps	410.00	471.50
Microline 82A 120CPS 80/132 col	360.00	414.00
PARALLEL INTERFACE CARDS		
Digitek Printmaster (BAS/CPM/PASCAL)	69.00	79.35
CPS Multifunction Card (inc clock)	119.00	136.85
Epson Non graphic	65.00	74.75
Epson Graphic	75.00	86.25
Apple Centronics Card	100.00	115.00
Grappler graphics (Epson/Anadex/Cent/P.tig)	98.00	112.70
Seikosha	69.00	79.35
Star DP 8480 P	65.00	74.75
CX80 Colour Card	80.00	92.00
SERIAL INTERFACE CARDS		
Digitek RS232 (BAS/CPM/PASCAL)	70.00	80.50
CPS Multifunction card (inc clock)	119.00	136.85
U-Micro (13 Baud rates, BAS/CPM/PAS)	90.00	103.50
80 COLUMN CARDS		
Super-R-Terminal	195.00	224.25
U-Term (inc shift mod)	159.00	182.85
Smarterm (very cool running, many features)	212.00	243.80
Videx videoterm	164.00	188.60
Videx Softswitch (40/80)	23.00	26.45
Videx Font editor	23.00	26.45
Videx Switch plate (Hardware 40/80)	12.95	14.89
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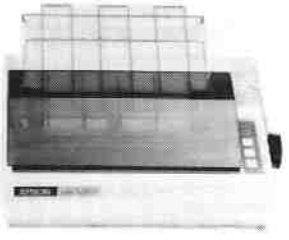
Zenith 12" Green	99.00	113.85
BMC 12" Green	123.00	141.45
Nec 12" Green	135.00	155.25
Eurocolour Card	65.00	74.75
Digitek Colour Card	99.00	113.85
GRAPHIC UTILITIES		
Versawriter	144.95	166.69
Versawriter Expansion software	25.00	28.75
Zoom Grafix	23.95	27.54
Higher Text II	25.00	28.75
3-D Supergraphics	25.00	28.75
E-Z Draw 3.3	31.00	35.65
Artist Designer	33.00	37.95
Pascal Animation	34.00	39.10
Pilot Animation Tools	34.00	39.10
Graphic package A2-3D1 (Sublogic)	39.00	44.85
Graphic Enhancement A2-3D2 (Reg above)	15.95	18.34
Graphic Editor (use with A2-3D1)	18.95	21.79
Saturn Navigator (needs A2-3D1 & A2-3D2)	15.95	18.34
UTILITIES		
Tasc Compiler	84.95	97.69
Expediter II	70.00	80.50
Speed Star	75.00	86.25
Lisa (Assem lang dev system)	55.00	63.25
Lisa (Educational system)	70.00	80.50
Assembly lang. Dev. 6502,Z80 or 8080	75.00	86.25
Locksmith 4.1	63.00	72.45
Super Disk Copy III	20.00	23.00
Back It Up II+	48.00	55.20
The Inspector	35.00	40.25
Dos 3.3 Tool Kit	35.95	41.34
The Directory Manager	26.00	29.90
Quickloader	15.95	18.34
Ace (Applesoft Command Editor)	21.95	25.24
Super Kram	87.00	100.05
Wabash Discs 10 in library case, 2yr warr.	17.50	20.13
SYSTEM EXPANSION		
Z 80 card Inc Software & manual	175.00	201.25
Z 80 card only (U-Micro)	73.00	83.95
16K Ramcard (Ramex)	69.00	79.35
16K Ramcard (U-Micro)	75.00	86.25
16K Ramcard (Microsoft)	79.95	91.94
32K Ramcard (Saturn)	129.00	148.35
128K Ramcard (Saturn)	345.00	396.75
VC Expander (for above)	55.00	63.2
128K Ramcard (Ramex)	280.00	322.0
The Mill 6809 with Pascal speed up	230.00	264.5
E-Z Port (game socket extender)	10.95	12.5
Romplus Card Inc K/B Filter	120.00	138.0
Copy Rom for above	30.00	34.5
Music System (Mountain Computer)	211.00	242.6
Music Machine 9 Voice (Vista)	85.00	97.7
Numeric Keypad (Advanced business tech)	78.00	89.7
Echo II Speech Synthesizer	135.00	155.2
LANGUAGES		
Pascal Language System	220.00	253.0
Apple Pilot	73.00	83.9
Fortran 80 (CPM)	108.00	124.2
Cobol 80 (CPM)	299.00	343.8
Mbasic Compiler (CPM)	195.00	224.2
Lisp Interpreter	68.00	78.2
Forth Development system	78.00	89.7
Forth II	39.00	44.8
BUSINESS SOFTWARE INC MANUAL		
Visicalc 3.3	98.00	112.70
Visidex	98.00	112.70
Visifile	109.95	126.44
Visiplot	85.00	97.75
Visiterm	80.00	92.00
Visitrend/plot	115.00	132.25
Visipac (calc/trend/file)	325.00	373.75
Visicalc utilities	34.00	39.10
Visischedule	192.00	220.80
Visicalc expander (use with Saturn card)	55.00	63.25
Data Factory Ver. 4.0	95.00	109.25
Data Factory Ver. 5.0	160.00	184.00
D.B. Master	110.00	126.50
Desk Top Plan II	99.00	113.85
D.B. Master utilities	58.00	66.70
D.B. Master statistics	58.00	66.70
Mathemagic	55.00	63.25
Access	173.00	198.95
Supersort (CPM)	75.00	86.25
Data Star (CPM)	115.00	132.25
Calcstar (CPM)	85.00	97.75
dBase II (CPM)	380.00	437.00

SPECIAL INTRODUCTORY OFFERS



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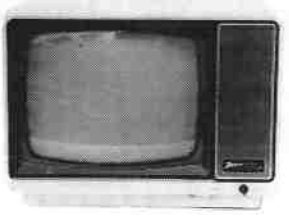

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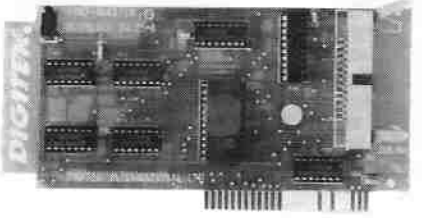

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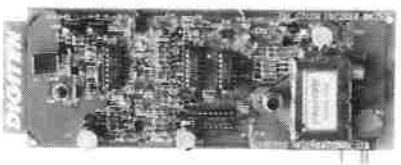

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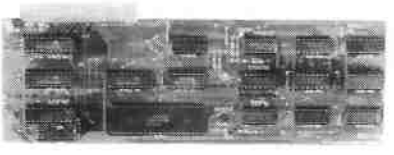

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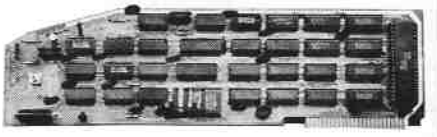

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BOOK REVIEW

● **Mostly BASIC: Applications for your APPLE II, Book 2.** By Howard Barenbon. *(Howard W. Sams and Co., 217pp, £9.05)*

Algebra in the dungeon

By Dr CLIFF McKNIGHT

Senior Lecturer in Psychology
University of London
Goldsmiths' College

ALTHOUGH the publishers make a much broader claim on the back cover of this book, the author's modest claim is that the book is written for the "hobbyist". It contains 32 chapters and a total of 37 complete programs, the chapters being organised into five sections.

Section 1: Educational Programs. The 11 chapters in this section range from a spot-the-odd-word-out game for children to a relativistic mass simulation for physics students. There is a history tester with six different data sets, the test being presented rather nicely as a dungeon game. Three of the data sets concern American history, two concern World War history and one concerns Ancient history (4000 BC – 6 BC). Although only the data sets differ, the complete program is listed six times, once with each data set, so that you don't have to keep referring elsewhere for parts of the program. This section also contains a two-level dungeon game to test algebra competence.

Section 2: Home Applications. The 11 chapters in this section are geared towards home life, so we find programs for a telephone number directory, gas (petrol) usage analysis, water usage analysis, family dental expenses, weekly jogging record and so forth.

Section 3: Money and Investment. The seven chapters in this section give programs for such things as compound interest tables, a stock buying guide – which asks you 15 questions to determine whether a particular stock is worth investing in – and a monthly savings plan.

Section 4: ESP Testing. The two chapters in this section contain a clairvoyance test and a precognition test. The major difference between the two programs is the order of events. For clairvoyance, the program fills an array with symbols and then asks the subject to guess them. For precognition, the guessing precedes the filling of the array. Of course, you could argue that one person's precognition is another person's psychokinesis!

Section 5: A Fantasy Game. The chapter in this section contains a two-level dungeon game called The Dungeon of Danger. It is rather large (needing almost 16k of RAM to run) and I must confess I didn't have time to type in the approximately 580 lines of program. The game is played in text format, without any graphics. There are 37 different monsters to be encountered and ten categories of title bestowed on the basis of your score – from Incompetent Serf to Dungeon Master.

The programs are simply written, and those which I did enter all worked. The program listings are clearly printed, but for some reason there is no clear distinction between Os and zeros. The usual slash through the zero might have increased clarity, particulary since it would then correspond with the Apple typeface.

The programs are almost all simple enough for their operation to be understood, an important point since the author hopes that the book will "stimulate your imagination and aid you in the development of some of your own applications for your home computer."

Certainly there is no explicit attempt to provide "aid" since the notes accompanying the programs tell you how to run them rather than how they operate.

It was presumably the urge to "stimulate" which prompted the author to include such a wide range of programs, and if you *are* going to be stimulated by the ideas then you won't mind the obvious American bias (three sections of American history, state capitals test, Presidents of the U.S. test, etc.). The idea of an algebra test in the form of a dungeon game is certainly stimulating.

However I'm not sure that the book contains £9-worth of stimulating programs. Anyone who has an Apple will probably already have encountered a similar kind of stimulation in the form of the Applesoft Tutorial or the programs on the DOS 3.3 Master Disc, and the author does seem to have put most of his eggs in the breadth (rather than depth) basket. I also found the multiple listing of substantially identical programs to be little more than a waste of paper.

The best I can say, then, is that if you are a "hobbyist" in need of stimulation, you might like to order this book from your library.

Incidentally, I have refrained from exercising professional judgment on the psychology and parapsychology programs on the grounds that the author is not publishing them in the professional literature.

How to beat that 256

In the program published in the May Windfall, "Keep track of your free disc space", M.F. Sheppard almost made it in his attempt to provide a modified DOS which would print the number of free sectors at the end of the **CATALOG** routine. This is such a desirable function, especially when working with long text or program files, which may be damaged by certain software when attempting to file them to discs lacking the necessary space.

Unfortunately the program he devised works in all respects except that it only outputs the true value of free sectors if the result is less than 256. A disc which had 355 free sectors, for example, would be stated to have only 100. That situation requires extra thought on the part of the operator. A DOS 3.3 initialised disc containing a minimal **HELLO** program has 494 sectors available for use.

Fortunately two simple alternative solutions are available. There is an Applesoft routine, resident at $ED20, which converts a 2 byte hexadecimal number at $75/76 into decimal and outputs it to the screen. All that is needed to display the correct number of free sectors in all cases is to alter

```
350  REM  FREESECTOR DOS MOD1 ... SHOWS FREESECTORS AFTER CATALOG
360  FOR N =  - 17815 TO  - 17778: REM    $BA69-$BA8E
370  READ D: POKE N,D: NEXT
380  FOR N =  - 17185 TO  - 17155: REM    $BCDF-$BCFD
390  READ D: POKE N,D: NEXT
440  POKE  - 20947,105: POKE  - 20946,186: REM   $AE2D/E
450  END
460  DATA  162,  0,134, 68, 32,223
470  DATA  188,232, 32,223,188,232,232,232
480  DATA  224,127, 48,242, 32,142,253, 32
490  DATA   66,174,160, 12,185,241,188, 32
500  DATA  237,253,136, 16,247, 76,127,179
510  REM
520  REM     PART2
530  REM
540  DATA  189,255,179,160,  7, 74,144,  6
550  DATA  230, 68,208,  2,198, 68,136, 16
560  DATA  244, 96,197,197,210,198,160,211
570  DATA  210,207,212,195,197,211,160
```

```
PASS1
PASS2
FREE SECTOR ROUTINE VERSION 2.....PAGE 0001

LINE# LOC CODE   LINE

0002 0000
0003 0000        ;ROUTINE TO COUNT FREE SECTORS AND OUTPUT RESULT
0004 0000        ;AFTER CATALOG COMMAND
0005 0000
0006 0000        ;MODIFIED FROM M.F.SHEPPARD, WINDFALL, MAY 1982
0007 0000        ;SO IT WILL OUTPUT CORRECT DEC FROM 2 BYTE HEX.
0008 0000
0009 0000        ;TOTAL NUMBER OF AVAILABLE SECTORS ON A DOS 3.3
0010 0000        ;INITIALISED DISK IS 494 IF HELLO ONLY USES 2
0011 0000
0012 0000        ;USES GAPS IN DOS AT $BA69-$BA95
0013 0000        ;                AND $BCDF-$BCFF
0014 0000
0015 0000        ;SOURCE SAVED AS 'FREESEC SOURCE 2'
0016 0000        ;OBJECT SAVED AS 'FREESEC2 OBJ'
0017 0000
0018 0000        ;ASSEMBLED WITH ASM/65 ASSEMBLER
0019 0000        ;1 MAY 82 BY G.A.M.CROSS
0020 0000
0021 0000        ;TO WORK, THE PROGRAM REQUIRES JUMP ADDRESS AT $AE2C
0022 0000        ;TO BE CHANGED TO $BA69
0023 0000        ;THEN DISKS MAY BE INIT WITH THE MODIFIED DOS
0024 0000
0025 0000        ;THIS ROUTINE MAY CONFLICT WITH BINARY (ASSEMBLER)
0026 0000        ;PROGRAMS WHICH MAKE USE OF THE SAME AREAS OF ZERO
0027 0000        ;PAGE WHICH ARE USED BY THE $ED20 ROUTINE
0028 0000
0030 0000              .OPT GENERATE
0031 0000
0032 0000        LIMIT  = $7F
0033 0000        COUNTL = $75            ;USED BY PRTNUM
0034 0000        COUNTH = $76
0035 0000        PRTNUM = $ED20          ;APPLESOFT HEX>DEC & OUTPUT
0036 0000        CATOUT = $B37F          ;EXIT FROM CATALOG
0037 0000        ADDR   = $B3FF          ;TRACK 3 BIT MAP
0038 0000        CROUT  = $FD8E          ;DOES A CR
0039 0000        COUT   = $FDED          ;OUTPUT ROUTINE
```

```
0040 0000
0041 0000              *=$BA69
0042 BA69
0043 BA69 A200   START  LDX #$00
0044 BA6B 8675         STX COUNTL
0045 BA6D 8676         STX COUNTH
0046 BA6F 20DFBC NXTTRK JSR RDBYTE      ;SECTORS 8-F
0047 BA72 E8           INX
0048 BA73 20DFBC       JSR RDBYTE       ;SECTORS 0-7
0049 BA76 E8           INX
0050 BA77 E8           INX
0051 BA78 E8           INX              ;SKIP UNUSED BYTES
0052 BA79 E07F         CPX #LIMIT
0053 BA7B 30F2         BMI NXTTRK       ;X<LIMIT
0054 BA7D 208EFD       JSR CROUT
0055 BA80 2020ED       JSR PRTNUM       ;PRINTS 2 BYTE HEX AS DECIMAL
0056 BA83 A00C         LDY #$0C
0057 BA85 B9F1BC PRTCH LDA MESG,Y

FREE SECTOR ROUTINE VERSION 2.....PAGE 0002

LINE# LOC CODE   LINE

0058 BA88 0980         ORA #$80         ;ASM/65 DOESN'T SET HIGH BIT
0059 BA8A 20EDFD       JSR COUT         ;OF MESG TEXT ASCI VALUES
0060 BA8D 88           DEY
0061 BA8E 10F5         BPL PRTCH
0062 BA90 4C7FB3       JMP CATOUT
0063 BA93
0064 BA93              *=$BCDF
0065 BCDF
0066 BCDF BDFFB3 RDBYTE LDA ADDR,X      ;MAP BYTE
0067 BCE2 A007         LDY #$07         ;COUNT BITS
0068 BCE4 4A     SHIFT LSR A            ;BIT TO CARRY
0069 BCE5 9006         BCC USED         ;SECTOR IN USE
0070 BCE7 E675         INC COUNTL       ;COUNT A FREE SECTOR
0071 BCE9 D002         BNE USED
0072 BCEB E676         INC COUNTH
0073 BCED 88     USED  DEY
0074 BCEE 10F4         BPL SHIFT        ;FOR NEXT BIT
0075 BCF0 60           RTS
0076 BCF1
0077 BCF1 4545   MESG  .BYT 'EERF SROTCES '
0077 BCF3 5246
0077 BCF5 2053
0077 BCF7 524F
0077 BCF9 5443
0077 BCFB 455320
0078 BCFE
0079 BCFE              .END

ERRORS = 0000 <0000>

SYMBOL TABLE

SYMBOL   VALUE

ADDR   B3FF  CATOUT B37F  COUNTH 0076
COUNTL 0075  COUT   FDED  CROUT  FD8E
LIMIT  007F  MESG   BCF1  NXTTRK BA6F
PRTCH  BA85  PRTNUM ED20  RDBYTE BCDF
SHIFT  BCE4  START  BA69  USED   BCED

END OF ASSEMBLY
```

Sbarrier

three addresses in the originally published Assembler listing: **COUNTL = $75; COUNTH = $76** and **PRTNUM = $ED20.**

However the $ED20 routine makes considerable use of zero page addresses, which may cause conflicts with certain binary programs. That is the case, for example, with the Microact/Programma International ASM/65 Editor-Assembler software.

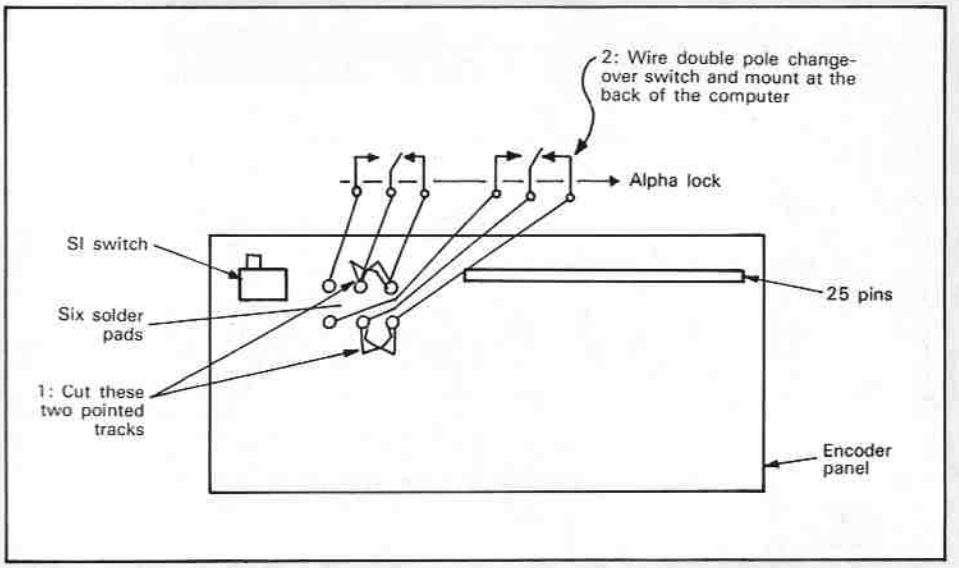
The alternative and even simpler modification to the earlier program is to dispense with the **COUNTH** location altogether and alter the **INC COUNTH** instruction, in section two of the published routine, to **DEC COUNTL**. This simply forces **COUNTL** to remain at $FF (255) when the true number of free sectors exceeds this value.

The modified routine appears advantageous and without conflicts when inserted into the apparently vacant DOS memory areas identified by M.F. Sheppard. Indeed the modified programs are both shortened by one or three bytes respectively. The **TAX** instruction is unnecessary if X is initially loaded instead of A.

As the most convenient way for most readers to load either routine into DOS will be by way of a Basic poking routine, these forms of the modified programs are listed comprehensively as several changes have been made in the **POKE** and **DATA** statements. Either routine can be used to **INIT** new discs. I have also found it most useful to update all my **HELLO** programs, for which the following procedure may be found to be convenient.

Boot the system and **RUN RENUMBER**, from Apple DOS 3.3 System Master. **LOAD FREESECTOR DOS MOD1** or **2**. Change line 450 from **END** to **RETURN**, then type **&H** to put the program on hold. **LOAD** your old **HELLO** program: check it doesn't have any line number conflicts with the subroutine: insert a new line **'GOSUB 350'** at an appropriate point then type **&M** to merge programs and **SAVE** the modified **HELLO** program. The DOS will now be modified each time the disc is booted.

Thanks to M.F. Sheppard for providing the essential operational foundation for this routine. I have found this to be the most universally useful routine I have yet derived from your publication. – **G.A.M. Cross.**



Word processing keyboard for £1

FOR a year I have been using Apples with a correct shift function without needing an adapter. The modification I developed only costs £1 and is ideal for word processing as the keyboard behaves as a true upper/lower case unit. It applies to Rev 7 or onwards computers with the separate keyboard encoder panel and is only worthwhile if you already have means of displaying the lowercase.

To carry out this modification, power down the computer and remove all peripherals. Remove the case and carefully remove the keyboard encoder panel. If you are unsure seek help as this will invalidate your guarantee if still in force.

On the encoder next to the switch S1 locate two rows of three holes. Cut the two tracks as shown on the diagram. Wire the six pads to a double pole changeover switch as shown. Mount the switch at the rear of the Apple case when reassembled.

Check your work, then fit the encoder panel back to the keyboard. Reassemble the computer and power up.

In one position of the switch everything is as before, such as all upper/case and alpha lock. In the other position the keyboard behaves as a true upper/lowercase keyboard with shift key.

The lower case input will only become apparent if using word processors as the Apple monitor converts lower to upper case in the program mode. To alter the monitor to allow you to program in lower case involves replacing the F8 Monitor ROM with an Eprom which has been blown the same as an existing F8 ROM but with location $FD83 changed from $DF to $FF. This allows lower case to be inputted as text during programming.

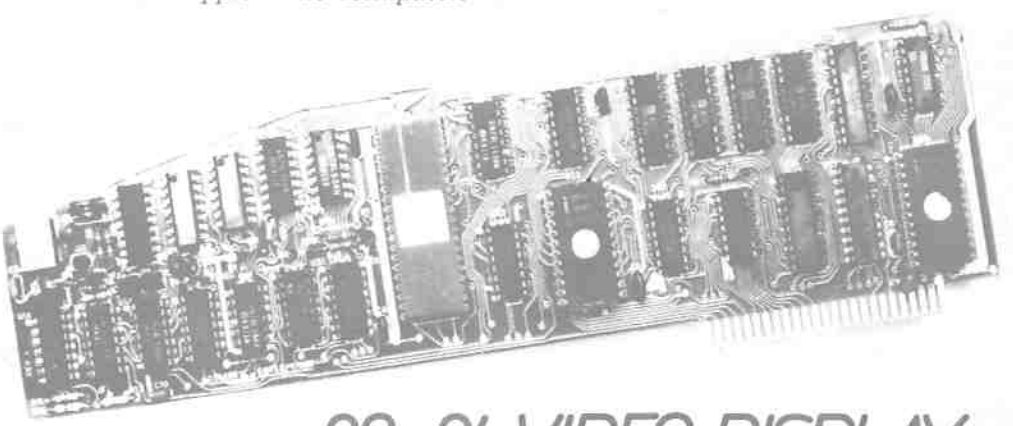
Copy the F8 ROM into RAM, change the location and blow a 2716 Eprom. Use an Eprom adapter socket. This links pins 21 to 24 and 18 to 12 of the Eprom. Pins 21 and 18 are then cut to prevent them being inserted into the motherboard. This matches the 2716 pins connections to the Apple ROM connections. Then use this in place of the old F8 ROM.

Remember that all commands and cursor control have to be in upper case. Several keys are altered. For example, is now **CTRL 0.**

I am sure Windfall readers will find this an extremely valuable modification to their computers. It does save buying an unnecessary keyboard adaptor when the functions are already there. **Stephen H. Alsop, DMS Electronics.**

VISION-80

For the Apple II Microcomputer.



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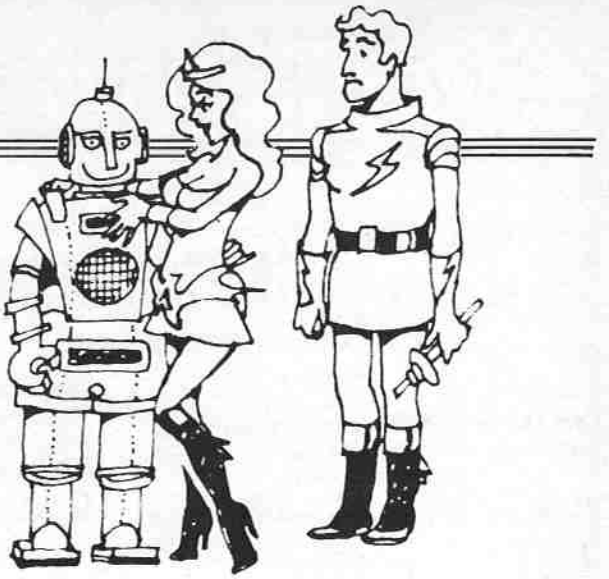


No mirror to the Falklands

By PETER GEE

THE advisability of reviewing, at this time, a game involving searchings and sinkings in the South Atlantic gave pause for thought when Pursuit of the Graf Spee appeared on the monitor. But on reflection it would be difficult to find anything warlike further removed from the Falklands battle than this scenario from the past.

Strategic Simulations' stablemate to Computer Bismarck fights a war where aircraft carriers' planes miss more often than they hit and missiles haven't even been thought of. It is, in fact, a thoroughly gentlemanly and thoughtful morsel of mayhem, and thus to be commended.

One has the option of two players, but I chose the solitaire version, pitting the British fleet against the computer-controlled Nazis. History is largely followed, and the Graf Spee and supply ship Altmark face a massive British fleet led by the carriers Ark Royal and Hermes and other famed names including the Renown, Achilles and Ajax.

As in all these complex offerings, do resist the temptation to bowl straight in without reading the instructions carefully. It may be a daunting task, but it pays dividends. If you boot up and sail straight in the screen presents the Atlantic map without any indication as to where the enemy lurks. Neither does the manual give any secrets away. But look at one of the handy orders summary charts provided and you'll spot them in square 21:23 *(the battle area is broken up into an arbitrarily-numbered latitude-longitude grid)* waiting to pounce on the Allied shipping plying the west coast of Africa.

Even with this help, the task of locating the enemy is no easy one. A few ships could be in one square and still miss each other due to bad weather or blind chance. Radar just doesn't come into it really.

On the chart the British ships' positions are indicated by code letters, and the small white dots show the shipping lanes and the relative amounts of traffic they carry. The Graf Spee and Altmark only show up on the screen when the computer decides they have been spotted, and they vanish promptly if British attempts to shadow or sink them fail.

Each scenario is played by repeating a series of game turns, each of which involves a series of actions. First comes the shadowing phase, and the computer reports if the enemy has been sighted. Probably not, so you move into phase two and give the fleet its orders. And this business is performed much more speedily I found than in the Bismarck game. Every ship can be moved independently, changing direction, speed and purpose. For if you put them into patrol mode each ship can spy out an area normally covered by three – with proportionally more for the aircraft carriers – and so enhance the chances of spotting the enemy.

The weather, of course, plays a large part in this area. The computer takes into account the number of British ships in a square and the weather conditions to determine if German ships have been sighted.

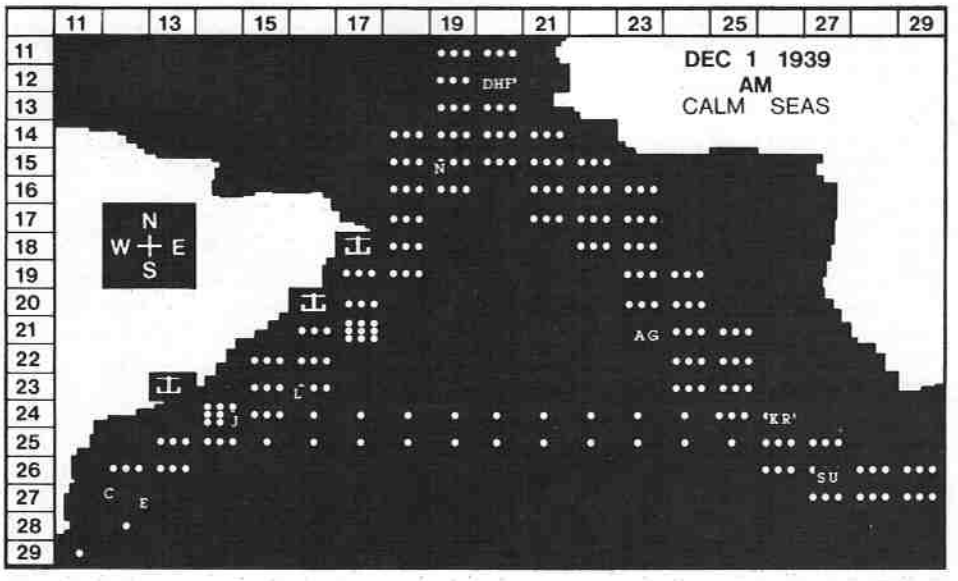
As the game progresses messages will appear on the screen reporting the sinking of such-and-such a ship by the Graf Spee, but not before it sometimes gets off a radio message to alert the British fleet. It pays, in one respect, to spread your goodies far and wide in the hope of intercepting the enemy. It doesn't pay, though, if they are too far and wide and your luckless solo ship faces those mighty broadsides alone. Once I managed to get the Ark Royal within strike range of the Graf Spee, but the resultant air raid was deemed a failure. *(Could the computer have been influenced by the fact that it was both judge and opponent, one wonders?)* Twice Graf Spee came within range of British ships and proceeded to pulverise them with her stern guns. And I still blush when I remember so manouvering that she was able to blast away fore and aft at two luckless destroyers and sink the pair. Doubtless practice will improve that performance.

Handling of weaponry once contact has been established takes up two full pages of the A4 manual, so suffice it to say that the program seems to take everything into account – apart from the state of the gun layer's nerves.

Two scenarios are offered, both setting a time limit on the game. The first runs from December 1 to 25, while the quickie opens on December 13 with the Graf Spee being reported sighted. So you're off to a flying start. One can save a game at any point, but at the end of the day victory is decided by a complex points system involving sinkings, damage inflicted, fuel used, etc.

I like Graf Spee. It generates quite a deal of tension as you sit before a darkened screen after battle has been joined waiting for the first terse messages to tell how goes the day.

And it must be an absolute boon to armchair strategists.



Prerequisites of design

CHRIS CLARKE continues to lay a foundation for a full understanding of micro-computers.

SO far we have looked at a microcomputer in general terms, and have gone over the Apple II in particular, in order to gain some understanding of how a micro functions.

Perplexing though it may be, no attempt has been made to state exactly what a microcomputer is and, as a point of fact, no clear definition is possible.

The more a box of electronic goodies can do, the more the applications are to which it can be put, and therefore the greater the market for it. So in designing a microcomputer as much leeway as possible is given to how to add, attach and plug things on, and to how accessible and useable the memory area is and also what it contains in the way of firmware, i.e., a monitor. Note that the former concerns hardware and the latter software.

The Apple II is widely regarded as the most versatile of the first generation of general purpose microcomputers, and has achieved wide success because of this; also because the "add-ons" were readily available – but that is another story.

As has been pointed out in preceding articles, versatility is a function of design, as is the memory area and other elements, and like any abstract idea, cannot be brought to a fine point, hence the obstacle to providing a concise definition for a microcomputer.

To produce a machine such as the Apple II the uses to which it will be put would be one of the first items considered in designing it. The next would be the contents of the memory map. The pie chart illustration in part 2 of this series may look simple, and probably even artistic, but the memory map of a microcomputer is usually quite complex, is a cornerstone to its functioning, and is of great value to the systems programmer. In a later article we will study the Apple II memory map in depth as it contains many items of interest even to the casual user, though for now we will look at it more impartially.

In designing a microcomputer, a decision is taken whether it will have a firmware monitor – a set of special purpose ROMs – or be run solely by software. Not having a monitor ROM set in the memory area allows more RAM to be packed in and thus gives greater versatility in use. Each software package loaded, however, must contain the necessary operating routines for the computer; for instance, the Apple III with its SOS, or Sophisticated Operating System, as supplied by Apple takes the place of a firmware monitor and has to be loaded, or written into any specialised sortware, before the Apple III can start functioning. Look at the RAM specification for the Apple III though!

Having an in-built monitor means that the necessary routines for maintaining the operation of the computer are always there and the programmer does not particularly have to worry about them – it has a 'housekeeper' in residence (in computerese, internal maintenance of operating data by software routines is referred to as 'housekeeping').

The drawback is that ROMs take up memory area, which for any microprocessor is finite, but for such a machine as the Apple II which was originally intended for the home user, a monitor is a vital necessity. Indeed, when the Apple II was first produced it was at the highest level of sophistication for general purpose microcomputers.

It was great foresight on the part of the designers to allow for such a large area of ROM space – 12k, with 2-8k being the norm, especially as the first monitor produced was of only 8k Integer Basic with its mini-assembler.

This 12k allowed not only for additional ROMs to be used with the integer Basic, such as the Programmer's Aid and the Teksim, but for a full 10k implementation of Floating Point Basic, or Applesoft, the other 2k being taken up by the F8 Controller ROM.

Then inputting and outputting to and from the computer must be catered for, the type and means of external interfacing, and the inherent, or on-board, I/O functions.

The Apple II has, as one of its most well-known features, eight separate and independant data I/O slots for simply plugging in any required interface card, which again is a remarkable feat of design for a garage effort, especially when compared to the single extended motherboard edge-connector type prevalent on other similar microcomputers (thanks for the blank cheque, Steve and Steve).

So much so that in a recent issue of Windfall a case was made out for the Apple II slots to be regarded as an industry bus standard under the title of Applebus.

On-board I/O has the minimum requirements of alphanumeric keyboard input, video display and an audio source. The Apple II has in addition in-built cassette I/O sockets rather than an integral cassette unit, and a connector for hand-held control units – the ubiquitous games I/O socket. This latter is yet again versatility embodied as it may be put to many more uses than for just the games control paddles. In total, the Apple II has 4k allotted in its memory map for all I/O functions.

Thus, having allowed for a set of ROMs to hold the monitor (the monitor is really the software routines contained in the ROMs and not the actual chips) and for data inputting and outputting, the remaining memory space is allotted to useable RAM: 48k for the Apple II.

This is not all available for use by the programmer or user. The monitor, in performing its housekeeping functions, requires some useable memory and consequently some areas within RAM are given over, or allocated, solely for use by the monitor – try doing something at SC050 and see what happens.

In addition, in the RAM area must be information for the screen display and any graphics information if graphics are being used. Also information for the monitor to know what it is being asked to do, such as operating the disc drives, and the requirements of the microprocessor must also be allowed for. In short, the RAM area is not used just for programs.

All this needs to be determined, not just when writing the monitor routines, but also during the design process of the hardware as logic decoding 'links' must be set up for such purposes as, for example, outputting information to the video block, and what the microprocessor does on reset, i.e., the memory location accessed in this event. Allowance must also be made for whatever language is to be implemented – a kilobyte of ROM space may be saved by one extra logic gate or latch.

As may now be assumed, and quite correctly, any piece of "intelligent" hardware must be designed hand-in-hand with the software that it will ultimately carry or utilise. This may seem a fatuous statement but this does in fact entail the greatest effort on the part of the designer or design team, as the prerequisites of the software need to be welded with the capabilities of the hardware, the required LSI chips have to be selected and their inherent functions, quite often involving software, implemented.

From all these considerations, an overall design is produced, primarily in block diagram form and eventually as a working breadboard or prototype, to which any alteration may be made to achieve the desired end result and to bring it as close as possible to the original working notion. This end result, as we are considering it, is then a functional microcomputer ready to be put to use – or into production as the case may be, which for the Apple II is where the success story really starts.

As for what a functional microcomputer is though, all that can be said definitively is that a specific computing environment has been created, and whoever asks what that is is going to be left in total suspense. We can now go on to more specific items of the Apple II: oddments, quirks, and the rest of the works.

To be continued

ERRATUM: Figure 1 in Part 4 of Elements of the Apple, "A functional diagram of the Apple II excluding I/O and monitor ROMs", should have a link from the synchronisation block to the video block.

Courses for profitability

WHILE many people are still suspicious and ignorant of micros, regarding them as the sole province of experts, there are encouraging signs of change. Businessmen in particular are realising that they are vital tools and are trying to find out more about them.

Of major impact is the introduction of micros into schools curriculums – there are 3,000 Apples alone in British schools – which will breed a generation where micros are as familiar as running water. Universities, too, offer formal computer studies.

However it is the business world and its market requirements that determine and shape training, and it is here where short term courses are proliferating.

In the past there was a tendency to give people a computer and let them get on with it. Now there is a range of introductory and specialist courses available for one day to a week.

Some companies prepare custom made in-house training schemes and there are a wide range of do-it-yourself training aids. Many courses are devoted to the Apple and all concentrate on expanding awareness of the micro's potential. The most popular courses are an introduction to micros, Basic, word processing and information management.

"People can get quite a long way with a machine and a manual, but they can also get stuck," says Mr Alan Wood, managing director of Digitus in London. "Our experience is that if people go on a short course they can become productive more quickly, and can also learn some of the nicer features of what they are doing."

Apart from business applications, his company runs familiarisation courses for non-microcomputer professionals.

Many companies offer consultancy services as well as training courses. They dispute strongly the adage that teachers are failed doers, and insist that their training staffs are involved in current software design, development and consultancy work. Most say they'll offer training for almost any machine.

However the director of computing at the University College at Buckingham, Mr Terry Gasking, claims that 90 per cent of courses are either software or hardware orientated. He says the college, which runs short business-oriented courses, is one of the few institutions independent of any software connections, and "there is no pressure on us to present one thing or the other."

The National Computing Centre also promotes the fact that it doesn't sell systems and has no commercial interest or bias. Their courses at the Microsystems Centre in London acknowledge that businessmen are often daunted by the choice of machines available, and prefer to do nothing rather than risk taking the wrong decision.

Starting at £105 for one day, their courses include understanding micros, applications, the computer marketplace, software and software problems and VisiCalc. The centre also offers a modular self-instruction package which includes free access to a computer.

A similar approach is proving successful for Little Genius of London which offers disc based self instruction courses which require no textbooks or manuals. The discs cover Pascal, advanced Applesoft and use of an Apple, and take between 10 and 18 hours study time.

Val Warden, who runs her own consultancy firm, says her aim in training is to open up horizons and make people aware of what packages can do. She concentrates on specialist courses in VisiCalc and also covers functions not covered in basic manuals, such as Micromodeller.

"Our courses have a practical slant," she says. "Anyone can write a bad model, but when students leave us they can write their own models very efficiently." And Ties Computer College in London, which now runs all its practical sessions on the Apple "because of the overwhelming demand," says it usually takes only a few days training to turn an unwilling beginner into an enthusiast.

Courses run by Systematics International in Suffolk emphasise business efficiency and profitability through effective management techniques. The company, which says it fills the middle ground between the businessman and the computer user, dealer or programmer, has also launched a 50 minute video film on understanding microcomputers.

The emphasis in all training is that micros are easy and enjoyable to use. MicroSystems have taken this a step further by offering week-long residential courses in Guernsey that combine training with a holiday.

So there are plenty of learning opportunities available. But at prices ranging from £50 for a do-it-yourself, to £285 for a three-day seminar, are the courses worth it? Businessmen who are worried that they might be left with an expensive toy on their hands would certainly benefit, as with proper training they would be able to get the feel of micros, get over their fears and discover what applications are available.

Many people and firms are still buying in the dark – yet by taking the time to find out what they need and what is available before they buy they could probably save five or ten times the cost of a training course.

Henry Ford revolutionised industry with production line assembly, but the real impact of his car for the common man was felt much later, when society learnt to use the car properly. No matter how refined or powerful the vehicle, the first step is to learn how to drive it. It is the same with the microcomputer.

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THE SECOND APPLE MEDICAL FORUM

The second Apple Medical Forum one day meeting will take place as three parallel sessions covering General Practice, Hospitals,and Administration with speakers in the morning and demonstrations and discussions in the afternoon.

To be held at
Middlesex Hospital Medical School Cleveland Street, London, W1P 6DB on Friday 24th September 1982

The object of the meeting is to allow all people working with or interested in Apple microcomputers used in medical applications to meet, discuss and learn what is going on in the medical field.

If interested, please fill in the form provided and return it to Dr D G Jameson, Physics Dept, Middlesex Hospital Medical School, Cleveland Street, London W1P 6DB, by 1 September 1982, with your remittance.

Overnight accommodation is available in the adjacent student hostel.

Any person interested in giving a demonstration should contact the organisers.

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apple '82
® 1st National Apple User Convention

Busy, informative but most of all, friendly

LAST month's Apple '82 was such an outstanding success that plans are already being drawn up for Apple '83. And it will be much bigger and much more ambitious in order to satisfy the needs and interests of the rapidly-growing number of Apple users.

People flocked in their thousands to the Fulcrum Centre in Slough for the first-ever national Apple exhibition and convention.

They enjoyed themselves immensely, despite the tropical heatwave which blanketed Britain that weekend and sent the temperature into the eighties.

They learnt a lot about new ways of making the most of their Apple from the many expert speakers who took part in the convention, held simultaneously in two lecture theatres.

They found much to excite their curiosity in the comprehensive exhibition, where an impressive number of new products made their first public appearance.

But what was most important for companies selling their wares at Apple '82 was that people were prepared to take out their wallets and buy the products on display.

For one of the best things about Apple '82 was the quality of the visitors, and it was this aspect perhaps that made it stand out in comparison with conventional computer shows.

They were, in the main, dedicated Apple users, enthusiastic about what they saw, knowledgable in their questions, and in their discussions with the technical experts manning the stands very often contributing as much as they learned.

They came from all walks of life – teachers, scientists, technicians and from the world of business. And there were many visitors from overseas, not only from Continental Europe and Scandinavia but from much further afield – Africa, the Middle East, the Far East, Australia and the United States.

But all of them displayed an obvious, genuine interest in the Apple. And it was that, as the exhibitors said as they were packing up at the end of the show, that had helped to create such a close, family atmosphere.

Yet many of the exhibitors confessed that before the show opened they had doubts about its success. One who openly admitted his fears was Rodney Cox, a director of Symbiotics.

"I felt we took a risk participating because we didn't know whether many people would bother coming", he said. "And being your first show, it must have been a risk for Windfall too, if it had been a flop it would have been very embarrassing all round."

But what had been the result for Symbiotics? A delighted Mr Cox said his stand covered its costs between 11am and 3pm on the first day – and the show generated hundreds of thousands of pounds worth of business for the company.

"This year we have been to Computer Fair, the Hanover Fair in Germany, the Brussels Compec and the Wembley Microshow," he said. "And we did more business on the first day of Apple '82 than we did at the other shows combined." He attributed the company's success to having the right product, the right price and the right show, and added:

"I thought at first that Slough was the wrong place to hold it, but perhaps it isn't. People had to make an effort to get here and those that did come were serious users.

"We actually closed our office and brought all our staff here," he said. "We had 15 people on our stand and wished we had had 30."

Stephen Pearce of MicroVitek said he was worried about the show being held over a weekend, but by the end had been well satisfied with the steady flow of "good quality" visitors.

"We actually took quite a few cheques over the three days, which is unusual," he said. "You don't expect to actually take money or cash, you just take orders – but we have had both at Apple '82 and I think most of the inquiries we received will come to fruition. People have wanted to talk to us – rather than just visit the stand."

And Paul Madden of Silicon Express said 30 of the 35 MicroVitek colour monitors they'd displayed around the show had been sold.

Roy Stringer of U-Microcomputers commented: "This was definitely the best exhibition we have attended for a long

Young and old, businessmen and addicts of the micro art . . . they all thronged Apple '82

– that was Apple '82

time, because it brought together just the type of people we are looking for." He said it was difficult to quantify the firm's success, but said there had been tremendous interest from dealers and outside groups.

"We are very pleased with the show. It was well organised, not too big, and has been very friendly," he added.

"An amazing reaction," enthused Tony Leeper of Ram Computers. "So many visitors have been to our stand to find out more about our new program, Medic, especially from overseas – Hongkong, Kenya, Iceland, Norway, Greece, Switzerland, Singapore.

"Thanks to one enquiry that came out of the blue today I'm going out to Belgium on Monday to set it up in the medical department of Antwerp University. That's results for you!"

On The Last One stand, Peter Warburton said he had already sold a lot of the programs and had received many more enquiries. "What has particully impressed me," he said, is that most of the people who have been coming on the stand to talk to us are just the kind of people we have been trying to get through to."

There were 59 commercial stands and about 40 new products were on display. There was a lot of interest in such varied products as Robocom's versatile graphics tool, Bit-Stick, the National Computing Centre's cut-price modem, MC Computers' Pi – a customised Apple for use in harsh industrial environments – and ICI Petrochemicals and Dyson Instruments Rexagan system, which links Apples to scientific instruments and engineering processes.

The Last One was on display at last at the Electronics Experts stand, and visitors were able to experiment with MicroFocus CisCobol on the Microcal stand. Ferrari Software were showing the GraphMagic package, which provides graphic interpretaion of numeric data.

There were many more: Eicon's new version of their 8in floppy disc drive, ICE's WDS200 series 5¼in Winchester, Hal Computers new Amlyn 8 megabyte floppy drive, Extel's Micro Exstat database of company financial information, Data and Control Equipment's TelexBox I – a telex interface – and Owl's new communications packages.

GB Computers showed three printers being run simultaneously on one Apple, using their Microbuffer II and Print Buffer cards, and both GB and Country Computers demonstrated the Acclaim microcomputer – billed as a commercial alternative to the Apple.

Software Rental Bank said they were delighted with the exhibition, and another company which has recently turned its attention to the Apple market, Moore Paragon, said the show had created valuable contacts in the dealer market. A spokesman said: "We took a gamble and it certainly paid off."

The Windfall stand did a roaring trade, and staff enjoyed meeting subscribers and discussing the magazine, the Apple and the Show. Many people came determined to bargain for cut-price T shirts or back numbers, and one group from Malaya wanted to know whether our Apple necklaces, selling for a princely £2.99, had genuine gold inlays and chains!

Two visitors from Apple UK and Apple Europe respectively were surprised to find that Windfall is completely independent of Apple. One also said that the first she had heard of Apple '82 was when members of the public started phoning Apple the day it opened to ask about the show!

All in all it was a memorable Apple '82. Windfall made many new friends among the exhibitors, speakers and visitors and looks forward to seeing them all again – together with the thousands of new users who will be joining the Apple family – when we all meet next year . . . at Apple '83.

Feast of sophisticated technology

By DAVID CHADWICK

SPEAKERS at the Apple '82 convention provided a whole range of sessions on a wide number of subjects, all factual and educational, and some also thoroughly entertaining.

The highlight for me, and with no disrespect to the other speakers, was the performance put on for music lovers by Dr David Ellis.

Given a brief sampling of the pleasures of using the Apple as part of a musical instrument, I had been waiting for nearly a year for the full-blooded performance, with Apples linked to Alpha Syntauris, Soundchasers and mixers, building up into a feast of surprisingly rich sounds.

If this was only the infant stage of computer-assisted music, I can't wait for adolescence and maturity. Well over 100 people waited till mid-evening for the start of the session, some watching the setting up, a performance reminiscent of the construction of complicated electronic sets for today's pop groups, and were well rewarded for their patience.

The convention was arranged to cover as wide a range of Apple related subjects as possible and to minimise the conflict of overlapping interests. Generally technical enthusiasts were not torn between two concurrently running presentations, and those with commercial interests had ample time to cover all their topics, too.

Main aim of the convention was to interest delegates in different aspects of their subjects. In the commercial presentation given by David Jarman, of Jarman Systems, visitors were asked to look at the correct use and interpretation of commercial systems rather than just an overview of what they are able to provide, which is already understood by most users.

Peter Bailey of Robacom, demonstrating his Bit-Stick, was more concerned with the practical aids to graphics rather than an in-depth software attack on the more technical aspects of programming graphics. Incidentally, the Bit-Stick really looks as if it could be used to open up quite a few new areas in graphics applications. It was fascinating to watch.

Commercial Apple users were also treated to a comprehensive introduction to Cobol, showing some of the reasons why this language should be considered as a professional development tool for Apple users.

An insight into the realm of computing in a medical environment was given by Dr Gordon Jameson, who works in the Medical Teaching Hospital at Middlesex Hospital, and Dr Simon Harrison, who is a GP in Bishop's Lydiard in Somerset. And Dr Anne Thompson, from Hammersmith Hospital, showed a very moving piece of film taken in their paediatric department, of an Apple being used to assist in the treatment of breathing difficulties in pre-

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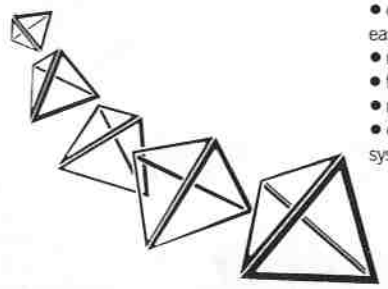

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mature babies. This "amateur" film, in the best tradition of electronic news gathering, brought the atmosphere of the theatre vividly to life.

I was unfortunate in not being able to see all of the presentations. I missed Mike Gardner of Owl Communications, assisted by Hugh Nicklin of Catel and Roger Sinden of Mike Dennis Associates bringing to light the most recent developments in communications, and Dr Austin Tate of Edinburgh University expounding on Pascal.

Having sat with Austin on the software panel, I can only conclude that that particular session must bave been characterised by his own forceful style, and the interest that was contained was evidenced by the numbers of delegates who stayed behind at the end of question time at each session to continue the discussions. Mike Gurr of MG Associates concluded his talk on databases surrounded by a number of visitors requesting more advice.

A comment made halfway through the event that the talks in a number of cases didn't quite reach the depth that some delegates would have liked must be answered by the fact that all grades of users were present, from beginner to expert, and the time available was not conducive to in-depth analyses at all times.

David Sutton, who looked at management training, I have known for some time, having seen some of his work at other seminars. The impressions I gained from speaking to attendees after the session confirmed my view that he maintained his standard for providing useful insights into his field of expertise.

I must thank all of the people who sat in on the hardware and software panels. Stephen Alsop of DMS Electronics, and Geoff Reiss of Construction Programming Services all helped settle a number of vexing problems in the hardware section, and the software panel was highlighted by the fact that Mike Hardwick of Elite Software and Lawrence Payne of Computech were not always in complete accord with the other members of the panel – Roy Stringer of U-Microcomputers, Geoff Reiss again and Austin Tate. A lot of useful points were discussed and argued about.

Dr Gavin Kenny was "volunteered" after seeing him give a lively presentation on computer assisted learning at the Medical Forum at Middlesex Hospital, and he gave sterling service, speaking both at the convention and at the education forum which preceded it.

Our thanks go to all of the speakers for the effort that they put into their presentations, and for their tremendous support over the whole weekend.

Running consecutively with the convention was a demonstration of some aspects of communications on the Apple, and no one can have failed to miss seeing Derek Turner surrounded by his mound of radio equipment using the Apple to communicate as a radio teletype. This is an area which is receiving more interest as the techniques and possibilities become more widely known.

The National Computing Centre demonstrated their new modem, which for a modest price will enable Apple users to link in to Prestel systems, accessing Basic software which can subsequently be used on the Apple. Kex showed us the type of professional databases which ought to be run from a central source, and Owl Communications displayed methods of communicating with IBM mainframes. Basug linked a couple of Apple computers together, a feat which in spite of its apparent ease seems to elude most amateur (and sometimes professional) users.

Visitors from all over the UK, plus many from as far away as Australia, Malaysia, Iceland, Africa and Norway confirmed that it had been a worthwhile and enjoyable weekend.

Finally, thanks to the Fulcrum Centre staff, who were absolutely marvellous in the cheerful assistance they gave to all concerned in the event, especially to ourselves and the stand holders. Apple '83 is already being planned, and the fact that it will probably be in the Fulcrum Centre again is due in no small part to their efforts.

You may also have seen a couple of busy bodies hurtling around installing colour monitors everywhere at the drop of a hat. Silicon Express, with their Microvitec monitor, not only covered most of the exhibition area with their excellent monitors, but on more than one occasion helped at very short notice to colour speakers' presentations. Their enthusiasm and assistance was most appreciated.

And I must not forget Powerhouse Electronics who provided the means for displaying screen data to a size visible to all, and Apple UK, who kindly loaned a number of Apple systems for the duration of the convention.

A real Olympic performance

AN Apple keyboard has never had as much continual bashing as happened during the national finals of the Apple Olympics, when for well over two hours five determined contestants took it in turn in the ten "athletic" events that make up the decathlon.

Selection of the finalists had been based on points they had scored under less arduous conditions, and at Apple '82, sitting under a spotlight on a stage with the screen display projected on a giant monitor, none of them managed to achieve their previous figures.

Even so, the results were outstanding. The winner, 18-year-old John Chappell from Poole, clocked up a magnificent 8,855 points, only three points ahead of 17-year-old Andy Champion.

Their achievement can be measured against the 8,618 points scored in the real-world 1976 Olympics at Montreal by Bruce Jenner, on whose world-record performance the points system on Microsoft's Olympic Decatholon disc had been based.

In third place came David Johnston from Newport, Mon., who at 13 was the youngest of the contestants. He scored 8,487.

Other finalists were Kieran Emmett (19) of Liverpool,. with 7,930 points, and Andrew Nixon (17) of Harrogate, with 7,223 points.

At the close of the marathon session the three winners were presented with gold, silver and bronze medals – specially designed by Toye, Kenning and Spencer, the Queen's jewellers – by Windfall's managing editor, Derek Meakin.

Youngest competitor David Johnston came in third

Now take a lightning tour..

By KEITH LANDER

HAVING delved a little into the history and philosophy of the Forth language I'd like to devote this month's article to an overview of its major structural features. But first I would ask you to keep an open mind as you read what follows.

Forth is a somewhat unusual language that often seems to violate fundamental programming concepts. Consequently one's first reaction to it tends to be one of complete scepticism, and the only effective way of dispelling this impression is to sit in front of your Apple and go Forth. Be warned, though, that few programmers who start programming in Forth ever return to the language they left behind.

Earlier I mentioned that the boundaries between major Forth components (compiler, editor, etc.) are not as distinct as for their counterparts in more conventional languages. This is largely due to the fact that Forth is structured around a unifying concept called the "dictionary".

The dictionary is composed of items called words, where "words" is the Forth term used to denote program operations. Each word consists of two parts called the "word name" and "word definition" respectively.

Names can be up to 31 characters in length, and there are no restrictions on the characters that can appear in them. The definition part determines the function performed by the word, and in a typical Forth system the dictionary created at load time contains about 150 words. Between a third and one half of these have definitions written in machine code, while the remainder are written in what is known as "threaded code".

All Forth programs are composed exclusively from dictionary words, and the act of executing a Forth program involves executing the definitions of the component words. The machine code definitions are executed under processor control, whereas the threaded code routines are executed by a threaded code interpreter.

Threaded code is what the Forth compiler generates. It is more compact than machine code, albeit slower. However, the interpreter is usually very small – of the order of 100 bytes of code – and consequently very fast.

A typical interpreter for the Apple II might incur an overhead of 20-30 microseconds per threaded code operation. This means that it takes the interpreter about that much time to move from one operation to the next. This is vastly superior to Basic, and much better than Pascal P-code.

You can obtain an estimate of interpreter overhead by, for example, timing the execution of a null loop – a loop that does nothing between iterations – over a large number of steps. If you do this in Basic using a FOR statement that runs from 1 to 32000 you'll find that it takes about 42 seconds. The equivalent Pascal loop runs for about 19 seconds, and written in Metacraft's Forth it takes a mere 3.5 seconds.

The act of programming consists of defining new dictionary words in terms of existing ones. An application program is, therefore, simply an extension of the dictionary, and the basic Forth vocabulary is actually a component of all applications.

One application that is always a part of a development system is the editor. It is typically implemented as a set of some 20-30 words which are loaded into the dictionary from disc when required.

Extending the editor amounts to little more than defining new editor words in terms of existing editor and other words.

This approach can be applied to all Forth components, including the compiler itself. In fact, very little of the system code lies outside the dictionary, which means that almost all of the code is accessible to the programmer.

All Forth systems contain two interpreters. One of these, which has already been mentioned, is known as the threaded code, or address interpreter, and is responsible for executing Forth pseudo-code.

The other, known as the text interpreter, is responsible for accepting and interpreting characters from an input source. When Forth is loaded the input source is assumed to be the terminal, from which lines of up to 80 characters terminated by a return character are accepted.

Each line is assumed to consist of a sequence of zero or more word names separated by one or more spaces. The definitions belonging to these words are executed one after the other, after which the interpreter signals its readiness to accept further input by displaying a message (usually 'OK').

Suppose you were to type the following:-

2 RETURN

Forth would process the '2', respond with OK, and request more input on the next line, so that your dialogue would appear as:

2 OK

The character '2' is actually the name of a word in many Forth systems, and execution of its definition causes the binary value for the digit 2 to be placed on top of what is known as the "parameter stack".

A stack, for those readers who have never seen the word used in this context before, is the name of a powerful data structure often used in certain classes of algorithm.

The best way of imagining a stack is as a pile of numbers. Initially the pile is empty, and new numbers, as they arrive, are put on top of the pile so that the pile gets bigger and bigger. Items can be removed from the top of the pile, and the order of the top two or three items can be changed.

Suppose now you were to type the following:-

8 RETURN

Again Forth would process the '8' and respond with OK. This time however, the processing would be slightly different. Forth would search through its dictionary for a word with the name '8' and fail to find one. Before giving up it would try to interpret the word you typed (in this case '8') as a number. If it succeeded, it would put the binary value on top of stack (abbreviated to TOS from here on).

At this point there would be two values on the stack. You could obtain the product of these and output the result by submitting two more words, namely:

***** **.** RETURN

The word '*' (pronounced 'star') is the Forth multiply operator. It takes its two operands from TOS and puts their arithmetic product back there. Next the word '.' (pronounced 'dot') removes the TOS item (in this case the product of 2 and 8) and, after converting it to external form, displays it on the screen followed by a single space.

Of course, the whole sequence of operations could have been typed in at once, and the answer obtained directly, as follows:-

2 8 * . RETURN **16 OK**

Note that RETURN only signals end of

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input, and does not cause a newline to be output. No doubt this may look a little strange compared with the equivalent Basic command:-

PRINT 2*8 RETURN
16

The reason for this is that most languages employ 'infix notation' for the specification of arithmetic expressions, whereas Forth uses what is known as in the trade as 'postfix notation'. These two terms refer to the position of the arithmetic operator in relation to its operand(s).

Postfix notation, once you become accustomed to it, is just as easy to read as infix notation and, unlike infix notation, doesn't require parentheses or operator precedence rules to resolve ambiguities.

Consider the following infix expression:

1+2*3

If treated as (1+2)*3 this has the value 9, whereas 1+(2*3) has the value 7. If * has a higher precedence than +, as it does in most programming languages, then the parentheses are necessary if the desired result is to be 9.

Whichever result is required it is possible to write a postfix expression, without parentheses, that evaluates to it. This is because postfix expressions are evaluated strictly from left to right according to the following simple rule. Whenever an operator is encountered it is applied to its operand(s) which immediately precede it, and the result put in the expression in place of both operator and operand(s). This process continues until the only remaining value is the required answer.

Thus the postfix equivalent of (1+2)*3, which is 1 2 + 3 *, is evaluated as:

1 2 + 3 *
= 3 3 *
= 9

and the postfix equivalent of 1+(2*3), which is 1 2 3 * +, is evaluated as:

1 2 3 * +
= 1 6 +
= 7

The foregoing discussion shows how Forth can be used in 'calculator' mode, just like Basic. Used in this mode there are many words in the dictionary which can be used by the programmer to evaluate expressions, and it is simplicity itself to add more. Suppose, for example, you wanted to evaluate the polynomial expression:

$4x^2+3x-1$

for different values of x. The Forth definition of a word F(X)= which outputs the value of the expression for a value of x which it expects to find on TOS is:

: F(X)= DUP 4 * 3 + * 1- . ;

Note that this definition exploits the fact that the polynomial may be factorised as:

x(4x+3)-1

The : which starts the definition is the name of a standard Forth word whose execution causes compile mode to be entered and a new dictionary entry to be created whose name is, in this case, F(X)=.

The sequence of words following F(X)= up to the semicolon is converted to threaded code by the Forth compiler, and assigned to the definition of the new word. The ; causes compile mode to be left and calculator mode (the text interpreter, in fact) to be reinstated.

If F(X)= is now submitted as input to the text interpreter, the effect will be to execute its threaded code definition under control of the address interpreter. For example, typing:

3 F(X)= RETURN

would cause the polynomial to be evaluated for x=3 as follows:

First 3 is put on TOS and control passed to the address interpreter to execute F(X)=. The first word in F(X)= is DUP which causes the TOS item to be duplicated, in this case the 3. The next four words replace the duplicate 3 with the value of **4x+3** for x=3. Next the * multiplies the remaining two stack items to leave the value of **$4x^2+3x$**, and then the word 1- decrements this value by 1 to leave the value of the complete polynomial. Finally, dot outputs the result 44. Omitting the RETURN, the screen would look like:

3 F(X)=44 OK

Although the definition of F(X)= may look a little unusual, just consider the Basic/Pascal equivalents. In both languages an input command is required to obtain the value of x, and in neither case can the function be invoked by name from the keyboard, as it can in Forth. Instead a program run command is necessary in order to obtain the value of the polynomial for each x value.

More program structure would be required to set the program up to handle multiple activations of the polynomial, which all adds to the development cost.

This may seem a bit trivial, but it should nevertheless convey a feeling for the sort of thing that leads to short development times for Forth programs.

"Each Forth word is always designed to perform one simple atomic function."

Another factor contributing to the speed and ease of development of Forth programs is the length of word definitions. It is unusual, even bad style, to create definitions which are more than two or three lines long. This is perhaps difficult to imagine if you are used to programming in Basic or Pascal, but nonetheless true.

Each Forth word is always designed to perform one simple atomic function. Design of application programs proceeds from the design of the top level word, via a factorisation process, down to the primitive bottom level words.

Testing then proceeds bottom-up from these primitives to the top level word. The fact that each word definition is short, and that all words normally communicate via the stack, makes for very easy testing. There is seldom any need to build test programs (which themselves have to be tested!).

So far I have only talked about definitions composed out of simple expressions. Forth, of course, supports the usual set of alternative and iterative constructs necessary for the development of good structured programs. First the alternative construct. This takes one of the forms:

```
condition IF true-action
          ELSE false-action
          THEN . . .
```

or

condition IF true-action THEN . . .

IF expects to find a value 'condition' on TOS. If this is non-zero, then the words comprising the true-action are executed, otherwise those comprising the false-action are performed. Whichever branch is chosen, processing continues with the words following THEN.

For example, if you want to divide two numbers only if the divisor is non-zero, the following phrase will do:

```
?DUP  IF  /
      ELSE ." ZERO DIVISOR"
           QUIT
      THEN . . . .
```

Here / expects the divisor on TOS and the dividend below it. ?DUP is like DUP except that it only makes a copy if TOS is non-zero. The word ." outputs the following string up to ", and QUIT terminates the current computation.

There are two forms of conditional loop control:

```
BEGIN
   routine
   condition
UNTIL . . .
```

and:

```
BEGIN
   condition
WHILE
   routine
REPEAT . . .
```

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In both cases 'routine' denotes the sequence of words to be repeatedly executed subject to the TOS value 'condition'. The BEGIN-UNTIL construct requires the controlled routine to be executed at least once, and termination to occur when condition is non-zero. The WHILE-REPEAT construct requires its controlled routine to be executed zero or more times as long as condition is non-zero.

Two trivial examples of the use of these constructs are:

```
: NO BEGIN
       DUP . 1- DUP
       0<
   UNTIL ;

: N1  BEGIN
       DUP 0>
   WHILE
       DUP . 1-
   REPEAT ;
```

In these examples the words 0< and 0> test the TOS value for less than and greater than zero respectively. If the relation holds the value is replaced by a non-zero result, otherwise by zero. Calling N0 with TOS equal to 10 causes the values 10, 9, 8, ... ,1, 0 to be output, while N1 would output all but the final zero for the same input.

Finally, Forth provides a conventional iterative-DO construct of the form:

end+1 start DO routine LOOP . .

Here 'start' and 'end+1' are the initial and final values of the loop index, and they are assumed to be on TOS when DO is executed. The routine is executed:

end-start+1

times and, each time round the loop, the index is incremented by 1. There is a more general version of DO-LOOP available, but it is not described here.

As an example of the use of DO-LOOP one might define a word SQ to output a table of squares of the first N integers, where N is the value on TOS when SQ is called:-

```
: SQ 1+ 1
     DO CR
        I
        I I * .
     LOOP ;
```

Here 1+ increments TOS, and CR outputs a newline character. The word I always returns the current value of the enclosing loop index.

The effect of calling SQ with 5 on TOS is:

```
5 SQ RETURN
1 1
2 4
3 9
4 16
5 25 OK
```

These then are the basic Forth constructs for controlling program behaviour. There are more of course, and the programmer can choose to create his own according to any special requirements he might have. How this is done is, unfortunately, beyond the scope of this article.

In order to convey some impression of how Forth can be extended however, I will show you how a word CONSTANT may be added to the dictionary. CONSTANT allows the programmer to define named single length (16-bit) constants in the dictionary. First the definition:

```
: CONSTANT
     CREATE
        HERE ! 2 ALLOT
     DOES> @ ;
```

Suppose CONSTANT is called as follows:-

3 CONSTANT X RETURN

First CREATE establishes a new dictionary entry whose name is X. Then HERE places the address of the next free dictionary location on TOS, and ! stores the 3 in the two bytes following this location.

Finally, 2 ALLOT assigns these two locations to the definition of X and DOES> sets the definition pointer for X pointing at the word following the DOES>, in this case @. Suppose you were now to type:

X RETURN

Two things would happen. First the address of the two bytes containing the 3 assigned to X would be put on TOS, and next the word(s) following the DOES> will be executed. In our example this means that @ will be executed, which causes the value stored at the address on TOS to be loaded on TOS in place of the address, and then ; is called, thus terminating the execution of X. The net effect is to put the value of the constant X on TOS.

Confused? If so, don't worry. Such things require a certain amount of mental readjustment before they become clear. A lightning tour of Forth, such as this article provides, is intended to be no more than an incentive to find out more. And there is more, much much more!

If you haven't been put off you can find out more by reading Leo Brodie's excellent introduction called 'Starting Forth', published in 1981 by Prentice Hall. The Forth Interest Group publishes a bi-monthly journal which contains a wealth of useful information for the Forth programmer, and it also organises discussions on the language standard. You can write for information to:

Forth Interest Group, PO Box 1105, San Carlos CA 94070, USA.

Apple has paper taped

THE Apple has been used by Standard Telephones and Cables (STC) in Belfast to automate an industrial control system which was previously managed by punched paper tape. The system, designed by the Wolfson Signal Processing Unit of Queen's University in Belfast, is flexible enough to become a substitute for most tape equipment anywhere.

STC make exchange equipment for Britain's public telephone network. Previously the punched tape was used to control semi-automatic wiring machines. These are used to instruct operators on how to wire more than 400 different types of equipment, the largest of which can be three feet long, and 1½ feet wide, containing up to 2,800 one inch high pins all of them individually wired.

The machines tell the operator exactly where to position the wire, and which of eight different types of wire to use.

Mr William Chambers, the manufacturing engineering manager, said: "Because the tape equipment was very inefficient the paper kept breaking and, with thousands of tapes in use, it was possible for an operator to accidentally get one wrong.

"The Wolfson Signal Processing Unit, when asked to assist, came up with a prototype within 12 weeks – incredibly fast – and it still forms the heart of the system today".

Operators now run an electronic pen across their individual code on arrival at work. The Apple responds with 'Hello' and the operator's name on the display unit which is attached to each wiring machine. A bar code is also attached to each piece of equipment to be wired. About 10 seconds after receiving the code the computer has found the instructions and using the display tells the operator to proceed.

Since its installation nine months ago, 64 operators have been linked into the system. One, Mrs Mary Allen, said: "You don't lose concentration and time through having to fit new tapes. It makes the work much smoother". Although they are still evaluating the system, STC expect higher productivity because delays have been cut out.

Their engineers have developed the system further to enable instant checks to be made on the status of the equipment through the wiring process. Mr Chambers believes that it is unique to have such a small, low cost computer doing such a big job.

"This, plus its compatibility with virtually any punched tape setup, opens up the possibility of automating control systems so far thought to be economically out of reach of computers", he said.

THIS is the first of a regular series of articles on how to make the most of the tremendous power of VisiCalc – the most popular of all business programs which is claimed to have helped sell more Apples than any other piece of software. Its author is an experienced lecturer who runs courses on financial modelling for planning and analysis, all based on the Apple.

Making the most of VisiCalc's capabilities

By NICK LEVY
Principal,
Interface Management

IF YOU are the kind of person who aspires to solve business problems in your own particular way, then you must have discovered by now that VisiCalc was made for you.

But have you been getting the best out of your VisiCalc? Most probably not. Just consider how many of the 30 VisiCalc functions beginning with @ you have incorporated in your work-sheets. Two? Perhaps three? Admittedly, a third of these 30 functions would not have business applications, but the likelihood is nevertheless that so far you have been using your VisiCalc only in a rather elementary and crude way.

In a way this is to be expected, considering how very time consuming it is to plough systematically through the 180-plus pages of the manual (especially when you get that elated feeling that you can use VisiCalc after just going through Lesson One). Besides, who had heard of @IF, @INT, @TRUE, @LOOKUP, @CHOOSE and all that Boolean being used in business calculations? So why bother? (@IF incidentally has nothing to do with analysing "What If..." propositions.)

As you might have gathered by now this article, and the ones to follow, will deal with the 16 sector version of VisiCalc (the 13 sector version does not contain those Boolean functions). If you are already using the 16 sector version for business and commercial applications but you have only a 48k Apple, sooner or later you will probably need to increase the capacity of your computer to at least 64k.

If this sounds like sales talk let me assure you that I am not trying to sell you anything to fill those empty slots in your Apple. The only reason why I suggest that you should consider increasing the memory capacity of your Apple is because the 16 sector VisiCalc program disc occupies almost two thirds of the memory in your computer – 30k out of the 48k memory. So you are not left with enough space for developing VisiCalc worksheets for serious business applications.

We shall start the series by examining a model for a personal financial budget (exhibit I) Do not concern yourself too much with the actual financial consequences of the exercise. In spite of its title, the main object of this model is to show how to work with VisiCalc, not to analyse personal financial circumstances. So what can this model teach us about VisiCalc?

● Note that the model is divided into two areas: (a) The area between columns C and L, from the top of the page to row 50. This is the data collection area. It contains only planning values and does not contain any cell with computed values (that is, cells with formulae).

(b) The whole of columns A and B as well as columns C to L below row 50. This area contains computed values only – all the sub-totals, grand totals, subtractions, percentages, etc., arising from the planning values.

By separating these two areas you are less likely to make the fatal mistake (to which VisiCalc is so vulnerable) of entering data in a cell which contains computed values.

Aggregating all the results in one area provides you with a summary sheet. Now try to split the screen either vertically or horizontally (/WH or /WV - see manual pages 2-29). Move the planning values onto one screen and the computed values onto the other.

Next, try changing some of the planning values (that's what "What if..." is all about). After you have made a few changes, press the ! twice and see the results updated. In case you wonder why you have to enter !, just read on.

Use the ';' key to jump between the two screens. Enter the /WS command if you wish to synchronise the two windows, /WU if you do not want them to move in synchronisation and /W1 when you want to return to one window.

● You will note that the total and the percentage columns (columns A and B) are on the left hand side of the model and not on the right as one would perhaps normally expect them to be.

The main reason for adopting this layout is because it makes it easy to add more columns to the right of the last existing column in the model. And provided that you change cell A5 to

```
@SUM(E5...P5)
```

– replicated, of course, down column A – then any value that is going to be inserted anywhere between column M and P will be automatically added to the total in column A.

When you adopt this kind of layout don't forget the particular need for your work sheet to be updated by keying ! twice. (Look up the manual on page 3-75: "A common Instance of . . .")

You could, of course, keep the total column in the right, and insert new columns between August and the totals. If your current work sheets are like this then (a) leave a blank column between the last data entry column and the totals and (b) make sure that the @SUM in your total column also includes the blank column. In this way the total column will always update itself automatically every time you put new columns between the blank column and the rest of the work sheet.

● To save yourself time, I trust that you are working on your models in the manual mode (i.e. /GRM) – see pages 3-26 of your manual. If you are not in the manual mode, then every time you make an entry VisiCalc automatically updates all the calculations in the sheet. This can be time consuming when your work sheet is very large and you have to make several alterations and additions.

● You may be wondering about the expression TRUE which appears in cell A64. This is a mathematical VisiCalc value, not just a label. So why was it necessary to insert it there?

As every accountant knows, the difference between the total income and the total expenditure in a cash flow statement must be equal to the balance carried forward at the end period. In our particular example, we must make sure that cell A61 = L64.

	A	B	C	D	E	F	G	H	I	J	K	L
1	A PERSONAL FINANCIAL BUDGET				JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
2	==========				-----	-----	-----	-----	-----	-----	-----	-----
3	TOTALS	%	INCOME									
4	------	---	--------									
5	2709.60	96.30	EARNINGS		451.60	451.60	451.60	451.60	451.60	451.60	.....	.....
6	104.00	3.70	CHILD BENEFITS		16.00	16.00	20.00	16.00	20.00	16.00	.....	.....
7	0.00	0.00	INTEREST RECEI'D		.....	.....	.....	.....	.....	.....	.....	.....
8	0.00	0.00	DIVIDENDS		.....	.....	.....	.....	.....	.....	.....	.....
9	0.00	0.00	OTHER INCOME		.....	.....	.....	.....	.....	.....	.....	.....
10	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
11	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
12	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
13	==========		==========		==========	==========	==========	==========	==========	==========	==========	==========
14			OUTGOINGS:									
15			----------									
16			(A) REGULAR BILLS									
17			-----------------									
18	612.00	20.69	MORTGAGE		102.00	102.00	102.00	102.00	102.00	102.00	.....	.....
19	104.00	3.52	RATES		26.00			26.00	26.00	26.00	.....	.....
20	90.00	3.04	GAS		15.00	15.00	15.00	15.00	15.00	15.00	.....	.....
21	42.00	1.42	ELECTRICITY		7.00	7.00	7.00	7.00	7.00	7.00	.....	.....
22	120.00	4.06	INT'ST ON LOAN		20.00	20.00	20.00	20.00	20.00	20.00	.....	.....
23	60.00	2.03	TELEPHONE		10.00	10.00	10.00	10.00	10.00	10.00	.....	.....
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27	38.00	1.28	CAR TAX					38.00				
28	54.00	1.83	TV RENTAL		9.00	9.00	9.00	9.00	9.00	9.00	.....	.....
29	36.00	1.22	TV LICENCE		6.00	6.00	6.00	6.00	6.00	6.00	.....	.....
30	15.00	0.51	SPORTS CLUB				15.00					
31	15.00	0.51	AA/RAC CLUB						15.00			
32	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
33	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
34	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
35												
36			(B) HOUSEKEEPING									
37	1185.00	40.06	&LUNCHES		180.00	180.00	225.00	180.00	240.00	180.00	.....	.....
38	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
39												
40			(C)IRREG. PAY'MTS									
41			-----------------									
42	90.00	3.04	CAR&HOUSE REPAIRS		15.00	15.00	15.00	15.00	15.00	15.00	.....	.....
43	30.00	1.01	HOUSEHOLD EQUIP.		5.00	5.00	5.00	5.00	5.00	5.00	.....	.....
44	102.00	3.45	HOLIDAY SAVINGS		17.00	17.00	17.00	17.00	17.00	17.00	.....	.....
45	110.00	3.72	PRESENTS			10.00		25.00	25.00	50.00		
46	90.00	3.04	CLOTHES		15.00	15.00	15.00	15.00	15.00	15.00	.....	.....
47	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
48	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
49	0.00	0.00	.....		.....	.....	.....	.....	.....	.....	.....	.....
50	==========		==========		==========	==========	==========	==========	==========	==========	==========	==========
51			EXPEN.SUB TOTALS:									
52			-----------------									
53	1351.00	45.67	REG.BILLS		195.00	169.00	184.00	258.00	255.00	290.00	0.00	0.00
54	1185.00	40.06	H/KEEP & LUNCHES		180.00	180.00	225.00	180.00	240.00	180.00	0.00	0.00
55	422.00	14.27	IRREG. PAY'MTS		52.00	62.00	52.00	77.00	77.00	102.00	0.00	0.00
56	==========		==========		==========	==========	==========	==========	==========	==========	==========	==========
57												
58	2813.60	100.00	TOTAL INCOME		467.60	467.60	471.60	467.60	471.60	467.60	0.00	0.00
59	2958.00	100.00	TOTAL SPENDING		427.00	411.00	461.00	515.00	572.00	572.00	0.00	0.00
60	----------		----------		----------	----------	----------	----------	----------	----------	----------	----------
61	-144.40		NET FOR MONTH		40.60	56.60	10.60	-47.40	-100.40	-104.40	0.00	0.00
62												
63			BALANCE B/F			40.60	97.20	107.80	60.40	-40.00	-144.40	-144.40
64	TRUE		BALANCE C/F		40.60	97.20	107.80	60.40	-40.00	-144.40	-144.40	-144.40
65	=====	~~~~~~	WARN.SIGNAL IF									
66	ALWAYS END-UP BY		BAL.C/F<	25.00					********	********	********	********
67	PRESSING '!' 2X		(LESS THAN	~~~)								
68	==========		==========		==========	==========	==========	==========	==========	==========	==========	==========

Exhibit 1

Now you wouldn't normally be able to notice this by just looking at the statement, so that's where VisiCalc's @TRUE function coupled with an @IF function comes to the rescue by providing a cross reference check. The formula in cell A64 can be entered by using the following key strokes:

```
@ IF (A61 = L64,@TRUE,@FALSE)
```

In plain language, the formula reads as follows: IF cell A61 is equal to cell L64 then enter TRUE. If not, enter FALSE. (See your manual pages 3-80 starting with the paragraph: "@IF takes three arguments. . .").

● Did you have problems in entering the months in row 1 and the % sign in cell B3? And did you have difficulties in creating a gap between column B and the entries in column C? If so, look up your manual pages 2-8 starting with the paragraph which begins with: "In order to begin a. . .".

Now if, instead of holding the shift key down and at the same time typing an inverted comma, you press Q and ESC in succession, you will achieve exactly the same effect but with less effort and concentration. Why not try this neat little trick on an empty cell in your work sheet and feel the difference?

● The formula in cell E58 reads [@sum(E4... E13)]. Note that cell E13 consists of = = = =. Assuming that was no mistake, why was cell E13 included in the sum total?

The reason is that if at some later time you find it necessary to insert a new row in the position where row 13 is now, or another row above row 5 (see your manual pages 2-53: "The insert and delete commands"), then you will not have to change the @SUM formulae in row 58.

If on the other hand your @SUM formulae in row 58 add up only the figures from row 5 to row 12, then inserting a row above line 5 or below line 12 will require revising the @SUM formulae for the whole of row 58.

● The **** in row 66 are not for decora-

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	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	TOTAL	%
EARNINGS	451.60	451.60	451.60	451.60	451.60	451.60			2709.60	96.30
CHILD BENEFITS	16.00	16.00	20.00	16.00	20.00	16.00			104.00	3.70
INTEREST RECEI'D									0.00	0.00
DIVIDENDS									0.00	0.00
OTHER INCOME									0.00	0.00
TOTAL INCOME	467.60	467.60	471.60	467.60	471.60	467.60	0.00	0.00	2813.60	96.30
MORTGAGE	102.00	102.00	102.00	102.00	102.00	102.00			612.00	20.69
RATES	26.00			26.00	26.00	26.00			104.00	3.52
GAS	15.00	15.00	15.00	15.00	15.00	15.00			90.00	3.04
ELECTRICITY	7.00	7.00	7.00	7.00	7.00	7.00			42.00	1.42
INT'ST ON LOAN	20.00	20.00	20.00	20.00	20.00	20.00			120.00	4.06
TELEPHONE	10.00	10.00	10.00	10.00	10.00	10.00			60.00	2.03
WATER RATES				25.00					25.00	0.85
HOUSE INSURANCE					45.00				45.00	1.52
CAR INSURANCE						95.00			95.00	3.21
CAR TAX				38.00					38.00	1.28
TV RENTAL	9.00	9.00	9.00	9.00	9.00	9.00			54.00	1.83
TV LICENCE	6.00	6.00	6.00	6.00	6.00	6.00			36.00	1.22
SPORTS CLUB			15.00						15.00	0.51
AA/RAC CLUB					15.00				15.00	0.51
TOTAL REG.BILLS	195.00	169.00	184.00	258.00	255.00	290.00	0.00	0.00	1351.00	45.67
" HOUSE KEEPING	180.00	180.00	225.00	180.00	240.00	180.00			1185.00	40.06
CAR&HOUSE REPAIRS	15.00	15.00	15.00	15.00	15.00	15.00			90.00	3.04
HOUSEHOLD EQUIP.	5.00	5.00	5.00	5.00	5.00	5.00			30.00	1.01
HOLIDAY SAVINGS	17.00	17.00	17.00	17.00	17.00	17.00			102.00	3.45
PRESENTS		10.00		25.00	25.00	50.00			110.00	3.72
CLOTHES	15.00	15.00	15.00	15.00	15.00	15.00			90.00	3.04
TOTAL IRRE.PAYMTS	52.00	62.00	52.00	77.00	77.00	102.00	0.00	0.00	422.00	14.27
TOTAL SPENDING	427.00	411.00	461.00	515.00	572.00	572.00	0.00	0.00	2958.00	100.00
NET FOR MONTH	40.60	56.60	10.60	-47.40	-100.40	-104.40	0.00	0.00	-144.40	
BALANCE B/F		40.60	97.20	107.80	60.40	-40.00	-144.40	-144.40		
BALANCE C/F	40.60	97.20	107.80	60.40	-40.00	-144.40	-144.40	-144.40	TRUE	

Exhibit II

tive purposes. They provide a warning signal that the balance carried forward during the months May, June and August is less than 25.00 (see cell D66). If you change the figure in cell D66 to, say, –150.00 (and press !! for the work sheet to be up dated) you will find that all the asterisks have disappeared (none of the Balance B/F figures is less than –150.00). Change it to 100.00 and see asterisks appearing under every month except March.

To make use of this signalling facility, go to cell E66 and first enter /F*. You have now turned cell E66 into graphic format. This means that instead of displaying numbers the cell will display as many asterisks as the number entered, limited only by the width of the cell.

Then you enter the following formula in cell E66:

```
@ IF (E64 > D66,0,8)
```

which in plain language means: If the figure in cell E64 is larger than the figure in cell D66 then enter 0 in E66. If not, enter 8. But as cell E66 is in a graphic format, it will either display nil asterisks (a blank) or eight asterisks.

● As an extra precaution to ensure that all the values in the work sheet have been manipulated correctly, and in order also to expand our understanding of VisiCalc, a check is made in cell B64 to see if cell B58=cell B59. If there are any unwarranted calculations, one or the other of the two cells will not be equal to 100.00.

The surprising thing about such a check is to discover that these two cells can hardly ever be equal to each other. Cell B58 is, in effect, equal to 99.999-9999999, while cell B59 is equal to 99.9999999988. VisiCalc will therefore not accept that the two cells are identical.

So what we have to do is first to round up the figures in these two cells (to, say, two decimal places) and then check if the rounded up figures are perfectly identical.

It's because of the rounding up that the formula hidden in the apparantly blank cell B64, looks so formidable:

```
@ IF ((@ INT (B58 * 10000) / 1
00) = (@ INT (B59 * 10000) /
100),0, @FALSE)
```

If at this point you start wondering how long you could make a VisiCalc formula, the answer is more than 120 characters.

Rounding up is covered in pages 3-81 of the VisiCalc manual. Working with any computer requires knowledge of rounding up so we shall come back to this topic later. In the meantime don't be surprised if, as a result of not rounding up, you get a VisiCalc column showing a total of, say, 1200.45 when you can see at a glance that the second place after the decimal point could not possibly be anything else but an even number.

● The final appearance of most VisiCalc work sheets contains a lot of "cosmetics" which you don't really need to insert till the computations have been completed. Experienced VisiCalc users will probably start developing their work-sheets without leaving gaps between rows of figures. This makes manipulating the work sheet much easier.

Only after completing all the calculations will they start moving the rows and columns around (with the /M command) and insert new columns and rows which will be used for underlining and for entering labels to describe the various columns.

If you have to develop your own model for a personal financial budget, then as an experienced user of VisiCalc your first draft would probably look like exhibit II. You could be satisfied leaving it at that, but if you had to pass it on for other people to use or work on, then the final version would probably look more like exhibit I.

This advice is, of course, not applicable to when you copy from a printed work sheet but is most useful to apply when you develop your own work sheets.

Next month we shall deal with matrices – those blocks from which larger work sheets are made and following that we shall cover some of the useful utility programmes which exist to make life with VisiCalc easier.

For those who find it too time consuming to reproduce the model, a VisiCalc data disc will be available soon which will contain the work sheets that will be examined in this series of articles.

● *If you would like a copy of the formula printout for the work sheet shown in Exhibit 1, send a stamped addressed envelope to: Windfall, Europa House, Hazel Grove, Stockport SK7 5NT.*

EIGHTY column VisiCalc on the Apple II is now available in Britain. First copies of a new program, VC-Expand/80, arrived at Heathrow Airport at 8am on the last day of Apple '82 and were rushed to Slough, where they went on display on the Pete & Pam stand and were quickly snapped up. The program offers Apple II VisiCalc users the 80 column facility that is standard on the Apple III, except that letters are restricted to upper case.

The normal VisiCalc program provides for four columns of nine characters each on an Apple II, and use of the VC-Expand/80 at the same time doubles the capacity.

This gives a much larger window and enables a user to keep two or three columns with descriptions permanently on the screen, together with another five or six columns of data.

However there are some minor problems. You cannot use VC-Expand/80 without a Videx Videoterm 80 column card, as no other 80 column card is compatible. And in turn you can't use Applewriter II with the Videx Videoterm 80 column because they aren't compatible either – which is a pity.

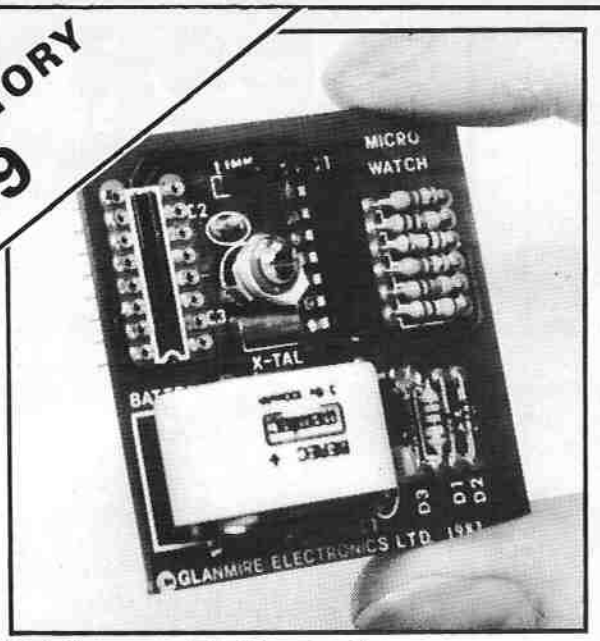
Note also that with the ordinary VisiCalc program when an entry in any cell is covered by the cursor it can still be seen in inverse, but this isn't the case with the 80 column disc and Videoterm card. With the latter the cursor must be moved before the entry can be seen.

This problem can be overcome by installing a special chip on the card interface.

Buying the 80 column disc, the interface card and the chip represents an additional investment of about £300. However for the serious user this is well worthwhile – as the size of the Apple II screen has been a major limitation with the VisiCalc program.

● *VC-Expand/80 is available from Pete and Pam Computers.*

SPECIAL INTRODUCTORY £59



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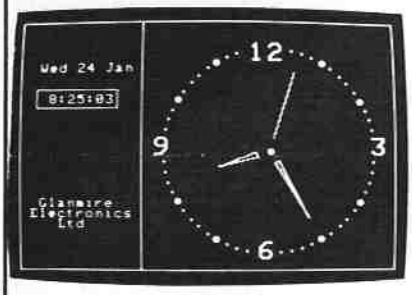
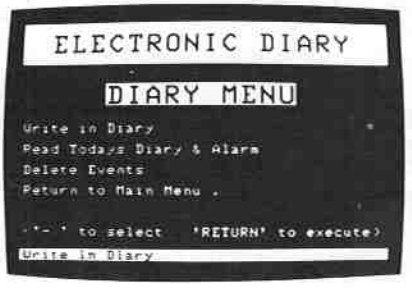


◀ Clock Display



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Amazingly compact card, only one IC using the latest CMOS technology.

Accurate time keeping ensured by Quartz Crystal.

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Automatically adjusts for number of days in a month.

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Fully protected against incorrect insertion into the game I/O socket.

Easy to program - no PR#or IN# commands, just a simple CALL.

High quality 'plated through hole' PCB with solder mask on both sides.

The Electronic Diary

Enables immediate and practical usage of micro-watch

Easy to use, menu driven system.

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Six different formats for Analog, Digital and Day/Date displays.

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Sample Applesoft programs to aid user programming.

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Basically, it's a matter of method

By PAUL RAYNER

CP/M Is probably the most widely used computer operating system in the world. It is the standard operating system on approximately 150 different makes of microcomputer and is available, in one form or another, on at least another 50 including the Apple II and (soon) the Apple III.

It allows the user to write and run his programs in a great number of languages – Basic, Cobol, Fortran, Pascal, Assembler etc. Of these, Basic is by far the most common. There are many different versions of Basic –SBasic, ZBasic, Micropolis Basic, Cromemco 16k Basic etc, but in spite of this variety, two Basics dominate the scene – MBasic from Microsoft and CBasic from Digital Research.

Users of Microsoft's Z-80 Softcard which provides CP/M on the Apple II get MBasic included in the price. Many other makes of microcomputer, such as the SuperBrain, provide MBasic at no extra cost. There are, however, sound reasons why such users should be prepared to pay extra to gain access to a second dialect of Basic. One of the most important is that a large number of software packages are written in CBasic and the user requires a copy of the language in order to run these packages legally.

MBasic is very similar to the Applesoft Basic provided as standard on the Apple II. It does, of course, offer more facilities but like Applesoft it is interpretive. This means that the source statements are converted into executable machine code as the program is RUN. This is a tremendous boon to anyone writing software since coding errors can be immediately rectified and the program restarted.

CBasic, on the other hand, is a compiled Basic. The user must first write his program in source form, using an editor (such as the CP/M ED utility) or a word processing program. This source program is then compiled by means of the CBAS2 compiler into intermediate code, which can then be executed under the supervision of the CRUN2 program. If any bugs are discovered then the source program must be corrected and the procedure repeated. The whole process is similar to that required with Pascal.

Clearly, developing programs in CBasic is a more tedious process. In spite of this, serious systems houses developing packaged programs usually prefer CBasic.

Obviously, the compiled CBasic will execute faster than the interpretive MBasic. This can be important if, for example, the program is designed to sort 500 invoices. Furthermore CBasic program packages can be supplied in intermediate code form. This provides a simple but effective protection against software piracy. CBasic also makes more efficient use of main memory. The compiled code takes less space than the source statements and consequently larger programs can be run. This is particularly the case where programs are well documented.

With MBasic all REMarks are part of the program and must be held in memory. With CBasic they are only part of the source program. CBasic therefore allows for – and even encourages – fuller program documentation. Another aid to clarity which is a feature of CBasic is the fact that line numbers are not required for every line of code. Instead, line numbers are only necessary for those statements which are referenced by GOTOs or GOSUBs.

CBasic provides another facility called INCLUDE. This allows sections of code which are repeated in several different programs to be written as a separate and distinct sub-routine, and included with the remainder of the program during compilation. This feature is particularly useful in commercial applications where the same files may be accessed by several programs. The programmer can write his file access routines as separate subroutines and test them before inclusion in the programs.

MBasic has an ostensibly similar feature called MERGE, but the flexibility with line numbers allowed by CBasic makes the INCLUDE facility much more useful.

Both MBasic and CBasic now have companion programs which produce completely compiled code. This is code which is completely executable and requires no run-time module. The MBasic compiler is called Bascom while the CBasic equivalent is called CB80. Unfortunately, both compilers require changes to the source code, although those needed to convert from CBasic to CB80 are very minor.

Both MBasic and CBasic provide some special features within the main body of the program. One CBasic feature which is particularly useful is dynamic array allocation. This allows the program to define the size of an array with variables which may change from run to run. This is useful in a situation where, for example, a two dimensional array could contain 200 by 100 elements or 100 by 200 elements or 200 by 200 elements, depending on the circumstances when the program is run.

With CBasic the size of the array would be defined at run-time. MBasic would require the array to be set up as the maximum (200 by 200 in the example above). This problem becomes more critical when using the Bascom compiler, for each blank array element is duly compiled and written to disc. Thus a simple sort program with, for example, a mere 5k of code but using an array occupying 36k of main memory to hold the data would require 41k of disc space to hold the run-time program. An equivalent CBasic or CB80 program would require only 5 or 6k of disc space.

Which Basic is more suitable will depend on the user's requirements. The end-user who wishes to write a few one-off programs will find MBasic quick and convenient. A software house, however, which wants to develop a suite of programs for resale will opt for CBasic because it makes more efficient use of memory and has better documentation facilities.

Neither CBasic nor MBasic is very expensive. You would expect to pay from £75 to £100 for CBasic and from £150 to £250 for MBasic. The Bascom compiler would cost approximately £300 on top of the cost of MBasic, but systems houses using it to develop packages for resale should also pay a substantial licence fee. CB80 costs a straight £400 or so.

Both Basics, whether the standard versions or the fully compiled versions, are first-class programming tools designed for developing efficient business programs.

Paul Rayner is managing director of Great Northern Computer Services Ltd.

Experiment to find your ideal system

By DAVID CHADWICK

THERE is always a great deal of pleasure to be had in using software which is well written, easy to use, and promises more than you could possibly require for the job in hand.

I have enjoyed using Ormbeta's range of software, and have been delighted that not so limited needs have always been met, while the program still has much in hand.

Most of the software Ormskirk Computer Services market is based around the Ormbeta Database Package, which consists of a series of four discs containing a wide range of facilities from sort routines to word processing. The system is Pascal based, runs on 40 and 80 column screens and is available for 5¼ and 8in floppy and hard disc systems, on both the Apple II and Apple III.

Using this series of file handling routines Ormskirk has developed a number of front end routines to cater for individual markets such as estate agents, club management and garage stock control, and have now marketed a very flexible series of accounting packages.

Two systems used have demonstrated the versatility of the system – the estate agents package, and the sales ledger/invoicing system. The former allows the user to create substantial files of properties and applicants using the databases, and permits the merging of both files using selected criteria, which when linked with the text processing routines enable standard letters to be sent to applicants listing properties meeting their requirements.

Creation of both property and applicant files is straightforward. Up to 32 different fields can be used, with a maximum of 512 bytes or 1 block per record. The usual character types are permitted, with the addition of a number of other useful types including table fields.

Up to 50 constants can be stored with the databases, recording such information as tax rates or subscriptions. This is useful when standard rates have to be amended, enabling them to be updated once only.

Data fields are catered for, using either the American or the British format, and long numbers up to + or – 99999999.99 can be entered.

Calculated and percentage values enable formulae of up to five elements to be entered to give addition, subtraction, multiplication and division and, of course, percentages. These accept data from the constant, long number and number fields, and do not take up any room in the data files.

The grouped item fields enable three items to be grouped together to form a new item – such as grouping a name from title, initials and surnames. A non-space consuming character can also be specified to separate the grouped items.

The table fields are extremely useful. Separate files are constructed which relate to the codes within the field. When data is entered keying in a numeric code will cause the table to be assessed, printing out the code field, which could contain anything from property types to discount rates in an invoice.

The use of the tables is enhanced further by the creation of a small subroutine which matches property types for house searches. Therefore, when individual properties are listed as flat, bungalow, semi-detached house, cottage and so on, a series of links can be created using the tables to ensure that an applicant selecting a house will receive details on bungalows, semis, cottages and mansions, ignoring flats and houseboats.

A number of fields can be designated key fields (primary and secondary field) to assist in fast sorts and searches as the system can be used interactively for customers who want immediate screen-displayed information.

The estate agents package was chosen carefully for a particular requirement after an investigation of other systems available. The criteria for selection were a compromise between what the client needed and what the computer can reasonably be asked to do. The clients needs were paramount, but the sellers and buyers needs also had to be considered. It is in the best interests of the buyer to have the maximum amount of space allotted to describe the wonderful properties of his house.

The buyer needs to have a reasonable list of properties which come closest to his particular requirements, and not just in price alone. The computer, coming way down the list, is asked to store a large amount of information for the buyer, and then to enable the seller to do complex searches on the data to produce a list of properties with sufficient information extracted to stimulate the interest of the buyer.

Of the two other types of packages investigated, on the Apple and other computers, one type held bare information on properties, allowed limited searches to be made for one applicant at a time, and produced a very dry list of property with insufficient information to enable a choice to be made between one house and another. The second type produced a large amount of information on each property, produced during an overnight run, at vast expense of paper and computer storage space.

The Ormbeta package produced an excellent compromise, using the flexible reporting format. I was able to configure a property description which, besides containing the property address, price, rates and viewing details, contained 300 characters of description contained in a neat 5x132 character block.

Lists of properties, headed and tailed by an individually addressed letter, produced a neat document to send to enquirers. Using a 5in floppy disc system it was possible to merge two discs of data, one containing 200 properties and one 400 applicants. This did a selected sort on price, house type and a number of selected areas, and was left totally unattended until the run finished or the paper ran out.

This was achieved using the default

→

Appletip

A problem encountered when using a drive head cleaning disc is how to keep the drive running for the required time of 30 seconds. If the Apple does not recognise a valid disc in the drive it stops running after only a few seconds, so repeated attempts are needed to give the full running time.

One way round this problem is to use the disc drive start/stop address directly. These addresses are mapped into the I/O RAM space and are, for slot 6:

	HEX	DEC
To start drive	C0E9	49375
To stop drive	C0E8	49374
To select drive 1	C0EA	49376
To select drive 2	C0EB	49377

To carry out each operation, all that is necessary is to read the address concerned. The quickest way is from the monitor, thus from Basic:

CALL–151 to enter monitor, then
*C0EA to select drive 1
*C0E9 to start the drive
*C0E8 to stop the drive
Similarly for drive 2.

system. As it was based on a very flexible database, unlimited search criteria can be used. Reporting can be interactively defined or stored as formats within the system. The text editor can also be used to produce a whole series of letters, reports and whatever else using data stored in the files.

As is so often the case with software suppliers, the manuals supporting the system are of limited assistance. Although capable of being used as a reference manual by the practised user, newcomers will find it extremely hard to get into the system if they rely on the manual alone. Far better at the moment that they should create a couple of small files and play around with the system, investigating the options, before they commit their main job to disc.

The Ormbeta Database can be manipulated quite easily to modify files which have been created. A current file is loaded and amendments and alterations can be made to that file and stored as the new file. So many databases available require new files to be created from scratch. One word of warning here, however. If the original file contains a substantial table file and the same tables need to be used with the new file, do remember to transfer those to the new disc as well. Most of the time that I spent in making slight modifications to the data file were taken up by keying in the tables again.

All accounting packages are, essentially, systems to manipulate a number of files, customer accounts and transaction files being the main ones, incorporating an element of mathematics and producing reports which can take the form of invoices, statements, analysis reports and so on.

Standard accounting packages provide fairly rigid patterns of operation, and permit little scope for the definition of invoices and reports to suit particular customers requirements. The scope of the Ormbeta Database has enabled a sales ledger and invoicing package to be set up which can cater for the most complex invoice and ledger requirements of the most demanding user.

Using the Database and a simple utility included with the ledger packages, users can define very flexible invoices and statement layouts interactively on the screen.

Customer and transaction files can be set up with the same constraints (32 fields) to incorporate any user defined field, as long as this includes customer account codes to link with similar transaction fields, to merge the two files.

The word processor can then be used to create standard letters which will extract data from the customer account files, looking perhaps at the account age analysis fields, picking out overdue accounts to be sent reminders, with the amounts outstanding embedded in the text.

The Ormbeta range now includes purchase and nominal or general ledgers. Codes within each ledger can relate transactions to the general ledger for automatic updating, and the latest developments have enabled the ledgers to become totally integrated, with a facility for extracting the relevant data from each file to produce final accounts and profit and loss statements. The capability is there.

The Ormbeta packages are not for the user who wants a package handed to him on a plate. That would be a waste of the facilities. While the packages are available in default 'load and go' format, it would pay the user to experiment with the package a bit, to learn his way round the system, to find out how different utilities operate, and then to redefine his requirements to create a relevant, flexible system to cover all his needs.

Fill up your crossword like magic

By GLYN DAVIES

CROSSWORD Magic? "Just the job", I thought reaching for the Telegraph, discarded earlier with an 'if at first you don't succeed, blow it'. "Now what shall I do with the £10 prize?"

Sadly, Crossword Magic doesn't solve crosswords willy nilly. You may first ask then, what use is any crossword program that doesn't? Well, the short answer is, surprisingly useful. The two disc package contains one player disc, one maker disc and two A4 size instruction sheets. The system will boot from either disc, depending on intentions. The maker disc is the workhorse of the two, and from this the puzzles are created.

An initial menu appears from which, obviously, an initial puzzle must be begun, and the program is menu-driven where possible, eliminating dreary, superfluous keystrokes – software authors take note! In create mode you can specify a particular puzzle size to maximum of 20 squares, or let the program size the puzzle automatically. I favoured the latter where you just key the answers in and they appear within the grid – like magic.

The grid expands to accommodate inputs, providing the word fits. If not, it is stored in memory for future recall and use. CONTROL X deletes the last entry, and CONTROL R relocates the last entry. The benefit of relocation is not readily apparent to the uninitiated, but soon becomes a powerful tool during puzzle construction, both for presentation and word manipulation. When completed, the clues can be entered – up to 98 characters per clue, which is adequate. At any point during creation the puzzle can be saved, incomplete, for further work later.

To 'play' a completed puzzle, the player disc is booted and the play option selected, whereupon the puzzles resident on the disc are duly listed to the screen. The display uses the hi-res pages, and in both upper and lower case, make it extremely pleasing to the eye. Choice made, the first clue is displayed below the blank grid, a flashing cursor denoting the spaces allocated for the answer.

The cursor can be moved anywhere within the grid, the clues changing appropriately, thus enabling one to skip through the entire puzzle, completing the easiest answers first.

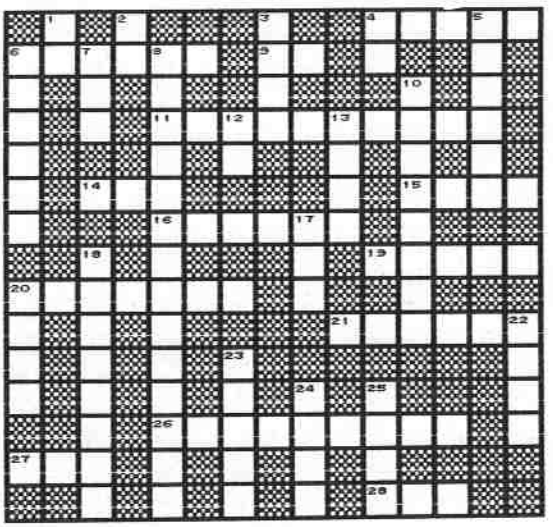
A particularly useful feature is the facility to "turn off" the grid outline, leaving only the spaces appropriate to the answers. This greatly enhances readability, especially part way through. Upon completion the answers are scored and the clues may be reviewed. My score was high, which is not surprising as I wrote the clues!

A disc initialisation routine is incorporated within the program to allow puzzle storage discs to be created, each one holding 20 crosswords. Puzzles may also be transferred between discs. Hard copy puzzles can be dumped to a printer, the range of printers catered for being quite comprehensive – from say, the Silentype up to the Anadex, Paper Tiger, etc. It is worthy of note, however, that only printers with a graphics capability can be used.

There would seem at first, to be few uses for such a program as this, but further consideration suggests otherwise. Foremost, obviously, are the tremendous educational possibilities on a kind of question and answer basis, but requiring deeper thought. Crosswords are reknowned for edification and improvment of spelling, and few would argue that subject matter necessitating a further degree of thought sinks in better.

Puzzles could be set with any theme in mind, and this would thus appear to be an invaluable addition to any educational establishment's software library. Aside from schools and the like, one envisages crossword compilers everywhere using this as a substantial aid in their toils. Periodicals which don't normally incorporate crosswords for whatever reasons could think again, considering the ease with which they can now be constructed.

In conclusion, an excellent program, written with much foresight and at £29 a 'steal'. Crossword Magic is very aptly titled and highly recommended. System requirements: Apple II plus 48k DOS. 3.3.



ACROSS CLUES

4. CIRCLE ON DISK
6. TEXT WINDOW UPWARD MOVEMENT
9. GOES WITH "THEN"
11. A PUZZLE IN WHICH WORDS FIT INTO A PATTERN OF NUMBERED SQUARES
14. RANDOM ACCESS MEMORY
15. INPUT OR OUTPUT CHANNEL
16. A QUESTION OR PROBLEM DESIGNED FOR TESTING INGENUITY
19. DETAILED GRAPHICS
20. A DEVICE USED TO MARK LETTERING ON PAPER
21. THE LAST NAME OF A NOTED FRENCH SCIENTIST
26. APPLE BASIC
27. SMALLEST AMOUNT OF INFORMATION A COMPUTER CAN HOLD
28. AN ACRONYM FOR DISK OPERATING SYSTEM

DOWN CLUES

1. AN ACRONYM FOR INTEGRATED CIRCUIT
2. IN/OUT TERM
3. EIGHT ---- TO A BYTE
4. IC MANUFACTURER IN TEXAS
5. BLINKS ON SCREEN
6. SEGMENT OF DISK TRACK
7. READ ONLY MEMORY
8. CREATOR OF CROSSWORD MAGIC
10. DRAWINGS AND ILLUSTRATIONS
12. POWER UP
13. HARD OR SOFT ----
17. LIGHT EMITTING DIODE
18. MEDIA FOR STORING SOFTWARE
20. PROGRAMMABLE READ ONLY MEMORY
22. RUNOUT BASIC PROGRAM
23. A RED FRUIT OR COMPUTER
24. WORDS, LETTERS AND NUMBERS
25. BRING INTO MEMORY

Specially for the professionals

WE have discussed at length in earlier editions of Windfall the different means available for accessing databases and other main computer systems. What we have not, so far, looked at is the type of facility available on the systems when we logged on.

Why should the average Apple user want to spend extra money to enable him to tap into other computers when the software currently available for the Apple is usually adequate for his needs?

The vast databases of Prestel and other viewdata systems provide a useful service for a lot of small businesses where information can be obtained on a bewildering variety of subjects.

What is lacking, however, is a service geared to specific needs of particular sectors of the market. Prestel is fine if you want to know the latest news, book a hotel, or learn about the latest products offered by company X. But to warrant the purchase of a system to access Prestel, the average user requires far more specific benefits.

To encourage rather more than spasmodic usage, an information system must provide a large amount of relevant data for a particular market segment. It is to this end that Kex have launched a system, based initially on the Apple, to keep various professional bodies totally up to date with current developments.

Imagine an accountant's practice, where decisions regarding tax laws have to be made frequently for clients. Every time a financial case comes before a court a legal decision is made, and perhaps a legal precedent is established which influences the result of subsequent actions.

To keep up with the constant amendments of procedures and decisions, a publishing industry is kept busy sending out revisions to the standard legal tomes. Much time is spent up-dating the volumes, reading and inserting many pages of fresh text.

Kex have consigned the legal statements on up to 70 topics, from capital gains tax to more obscure tax laws, onto disc, giving Apple users access to an up-to-date database of legal precedents.

This database is constantly being revised by specialist authors, and updated discs can be mailed to users. In addition it is being made available on the Enterprise Systems Group computer and updates can be carried out via a communication link over the telephone.

Because of their current involvement and expertise with taxation requirements, Kex intend to follow this project with further professional databases on subjects varying from pharmaceutical products and software licensing to employment law and many other areas of interest to the professional user.

Once the database is accessed, searches can be made in the system for key words located in pages of text. Once the word has been found, the accompanying page of information is displayed. This means that an accountant will be able to search for all information concerning, say, ground rents, and peruse all the latest information relating to that subject.

The constant updating of tax laws alone is a boon for accountants, who just do not have the time to initiate complex searches into the current state of the law. With this system, the most up-to-date thinking on any of a large number of points can be accessed and checked immediately and, as a consequence, can give their clients a more thorough interpretation of the law.

Imagine, therefore, the benefits which must accrue to other professional fields once they have access to the most up-to-date reports. Pharmaceutical dispensation is one area where care is needed to ensure that current legislation regarding drugs is strictly adhered to. Company law and criminal law are also subject to the changing whims of the legal profession, and require constant clarification and commentary for correct interpretation.

APPLETIPSTER

THERE is money to be made in computers – but what are the odds on money being made using computers to bet on races? If computer technology offers us the chance of a futuristic space age in our own time, then what chance does it offer for a rags-to-riches lucky break? Can a programmer or analyst develop the perfect system for gambling, and winning on horses?

Frankoform, a company registered in London last year, believes it has done just that, and is hoping to make a tidy sum by marketing as well as using the system, Courseplan 2000.

Two hundred people were asked to participate in the plan *(put your money away, subscriptions closed on June 21)* by investing £1,000 each with Frankoform. The money will be staked on horse races using the Courseplan system over a specified 10 week period, at the end of which investors will be required to purchase the software for £1000 or 35 per cent of any profit made, whichever is the lesser figure.

Mr John Clement of Frankoform says it took 10 years to perfect the system, and when it was tested last year it gave a 403.58 per cent return on £1000 over 10 weeks.

The snag is, of course, that there is no guarantee of success, and an investor could lose all his money. Mr Clement admits this, but says the system is built to withstand 12 consecutive losses and still leave a stake for the next run.

"It is a delicate and speculative subject and we've gone to great pains to establish our credibility and integrity," he said. "We believe we have a unique and very effective system that will produce a profit."

The system itself is run on an Apple II. The program takes into account the number of days since a horse last raced, official starting prices and the ratings of jockeys engaged. It analyses weight, past performances and course and distance claims of each horse and allocates points "in relation to the criteria of logic and statistics." The program then lists the name of a horse and the amount to be staked on it.

Asked why he didn't keep the system to himself to make money if it was so successful, Mr Clement said: "Everyone asks me that. Possibly I have a bit of a vendetta in mind. It gives me a kick to feel that I have produced a powerful weapon which if handled by the right people in the right way will produce a very handsome return for them and get some of my own back on the bookies."

Frankoform is charging 10 per cent of the initial investment (which will give them £20,000 if fully subscribed) and will also charge 10 per cent on any profits (which if based on last year's figures could bring in a further £80,000). And that isn't taking into account the proceeds from the sale of the system software.

On the other side the investors (who will probably be micro buffs) are guaranteed only that they'll receive the Courseplan 200 software and documentation for future use. As far as their money is concerned, it seems that they'll be doing what countless form-followers and punters have done through the ages – having a flutter on the whims of chance, albeit dressed up in the trappings of modern computer technology

One of the strengths of the Apple is its peripheral slots, which allow a variety of different devices to be connected to it. The simplest of these is a user port, which can be used to sense and control the environment. This article describes a simple and yet powerful user port that is easy to make and install. Some ideas for its use are also given.

Powerful port to control your environment

By R.A. Sparkes

AN electric light switch can be *up* or *down*. An electromagnetic relay can be *on* or *off*. A valve can be *open* or *closed*. These are all examples of digital devices. The Apple microcomputer uses digital electronics to carry out all of its many different functions, so it is possible for the Apple to control digital devices also. It can switch lamps, relays, motors, valves, etc, on or off.

However the power needed to switch a motor is different from that needed for a relay or a lamp, and the Apple will not be able to supply much power anyway. Therefore there must be some interface between the microcomputer and the device being switched to convert the power to the correct levels.

Similarly the Apple can be used to detect whether any particular digital device is in its *on* or its *off* state. Here the switching voltages involved will be dependent upon the devices, so an interface must be used to change the voltage levels of the device to the levels acceptable to the Apple.

The digital interface described here will do these jobs and a great number of others besides. It is based upon the popular (and therefore cheap) 6522 Versatile Interface Adapter, or VIA. This device provides the Apple with 16 input/output lines, two timers and four control lines. It has a particular address and can be PEEKed or POKEd just like any other addressable memory location.

In this instance we have chosen the addresses 49344 to 49359 for the VIA (COCO in hexadecimal). One way of doing this would be to use the device select line of peripheral slot 4, but in practice this does not seem to work, possibly because the Apple is too quick for the VIA.

Instead we use a simple two-chip address decoder which responds only to the chosen addresses. Figure 1 gives the circuit diagram for this decoder.

To enable it to respond to its 16 addresses, the VIA is connected directly to the lower four lines of the address bus (A0 to A3). Also connected are the eight lines of the data bus (D0 to D7), the RESET line, the CLOCK line, the interrupt request line (IRQ), the read/write line (R/W), the +5 V power line and GROUND.

The circuit diagram is given in Figure 2. The numbers refer to the peripheral slot of the Apple II or to the pin numbers of the VIA. The whole circuit is built onto a hobby card, which can then go into any of the slots.

The 22 lines from the VIA are brought out through the back of the Apple to a connection board which contains the additional circuitry to protect the VIA from wrong connections. Eight of the lines (PA0 to PA7) are designated as inputs, and eight (PB0 to PB7) as outputs.

Inputs

The input terminals can be 2mm or 4mm sockets, or screw or spring-loaded terminals. Each is connected to an input line through an op amp circuit, which protects the VIA and alters the voltage level of the input device to an acceptable level. Figure 3 shows one of these op amp circuits. Since this uses the LM324 device, which has four op amps on one chip, it is not expensive.

If an input terminal is connected to a voltage greater than about 2.5 volts the interface interprets this as a high (or on) level. If the voltage is less it is interpreted a low (or off) level. Alternatively, if the input terminal is connected to ground through a resistor greater than about 1 kilohm it is reckoned to be high – otherwise it is low. This allows thermistors, photocells and similar devices to be used as environmental sensors.

The op amp contains a small amount of positive feedback to prevent oscillations if

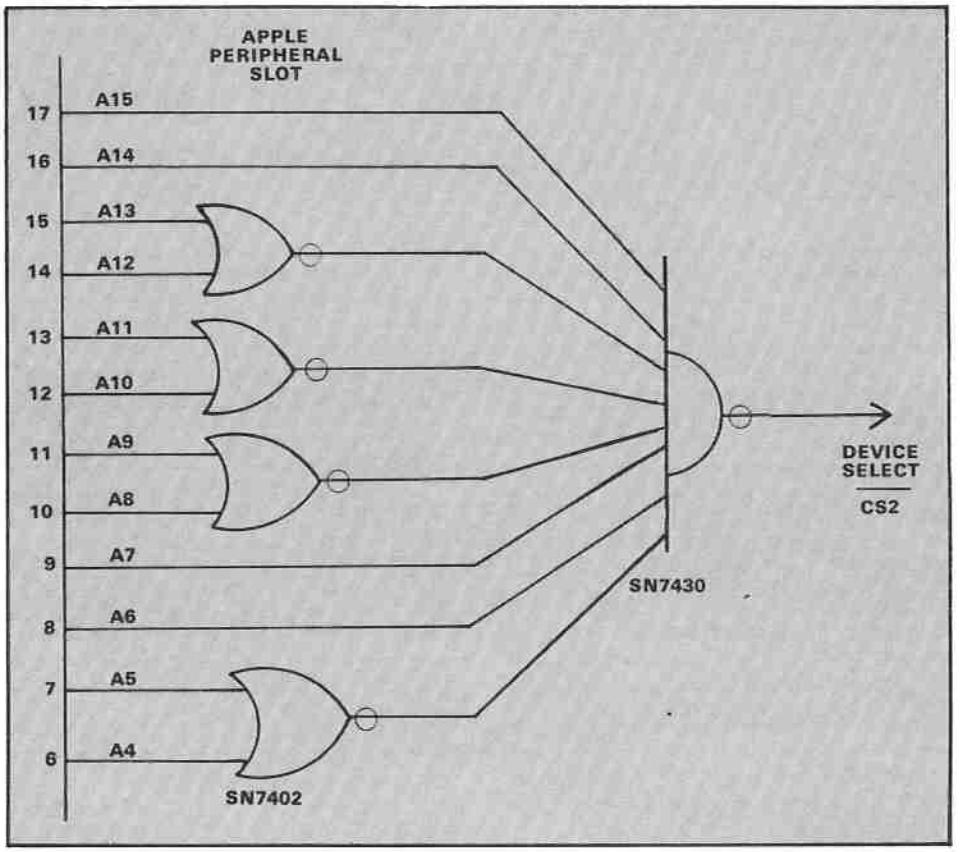


Figure 1

the resistance of such devices changes rather too slowly.

The Basic statement:

X = PEEK(49345)

will set the value of X to some integer between 0 and 255, depending upon which bits of the input port are high and which are low. In binary these extremes are the numbers 0000 0000 (corresponding to all eight input lines being low) and 1111 1111 (corresponding to all eight input lines being high). To determine which lines are high and which are low, the decimal number must be 'decoded' into its equivalent 'bits' using this table.

line number	*bit value*	*X*
7	1000 0000	128
6	0100 0000	64
5	0010 0000	32
4	0001 0000	16
3	0000 1000	8
2	0000 0100	4
1	0000 0010	2
0	0000 0001	1

If more than one line is high, the X value will be a combination of the corresponding numbers above. Thus if the X value is 48, this means that lines 4 and 5 are high and the others are low. Similarly if X = PEEK(49345) yields the value 3, this means that the lines 0 and 1 are high and the others are low. Routines can be written in Basic to inspect the value in X to find out which lines are high or low.

Outputs

The outputs are connected to eight Darlington drivers, which drive a set of LED indicators, as well as providing current for components such as relays, lamps or motors. Figure 4 shows how these different devices are driven by this output buffer.

In order to control the environment the microcomputer can switch each of the eight output lines high or low, by writing a 1 or a 0 into the corresponding bit positions of the B-register (address 49344). This "writing" is achieved with the POKE statement, so the statement:

POKE 49344,0 (in binary: 0000 0000) sends all lines low.

POKE 49344,63 (0011 1111) sends lines 0 to 5 high and lines 6 and 7 low.

POKE 40000,127 (0111 1111) sends lines 0 to 6 high and line 7 low.

POKE 40000,255 (1111 1111) sends all lines high.

In order to tell the B-register that it is for output, data direction register-B (address 49346) must be set high. Likewise, to tell the A-register that it is for input, its data direction register (address

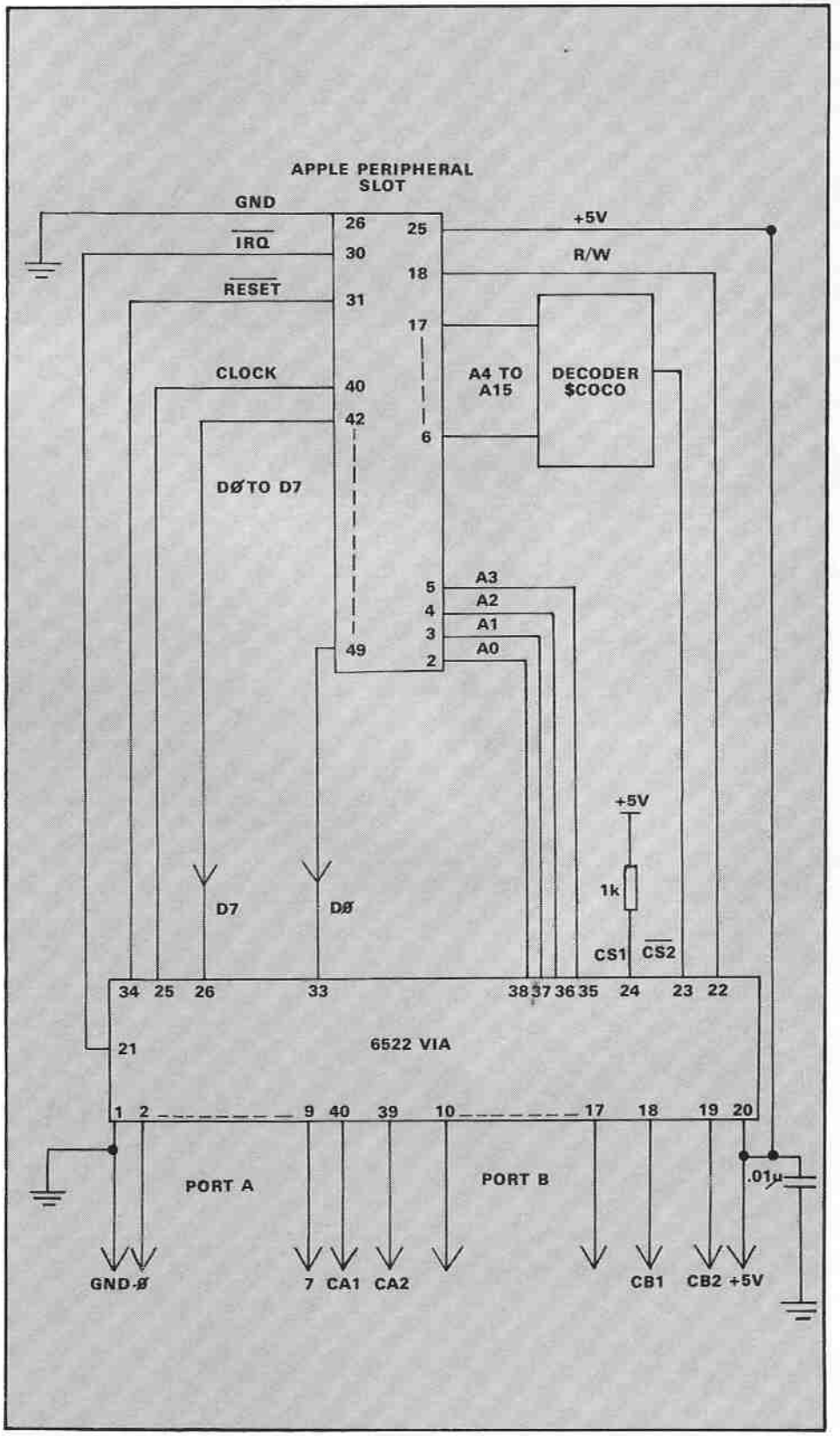


Figure 2

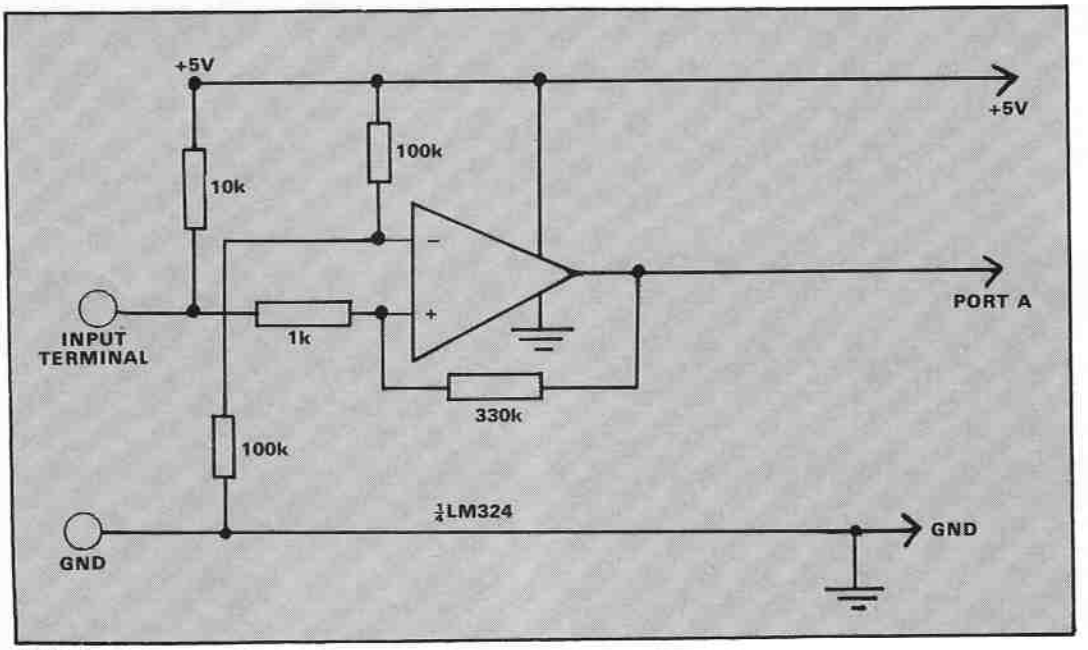


Figure 3

49347) must be cleared to 0. Thus, the two statements:

POKE 49346,255:POKE 49347,0

occur in all programs where these registers are used in this way.

● **This article continues next month with three listings showing the port's versatility.**

COMPONENTS

Plug-in double-sided card for Apple II peripheral slot.
Verospeed components: Apple printed circuit board
Apple Computers: Apple 'Hobby' card

The following must be cut to the correct size:-
R.S. Components: Double-sided edge plug stripboard (434-122).

The following components are obtainable from R.S. Components:
Darlington driver array (307-109)
LM324 quad op.amp. (307-884)
SN7402 quad 2-input NOR (305-513)
SN7430 8-input NAND (305-563)
RA 53 bead thermistor (151-114)

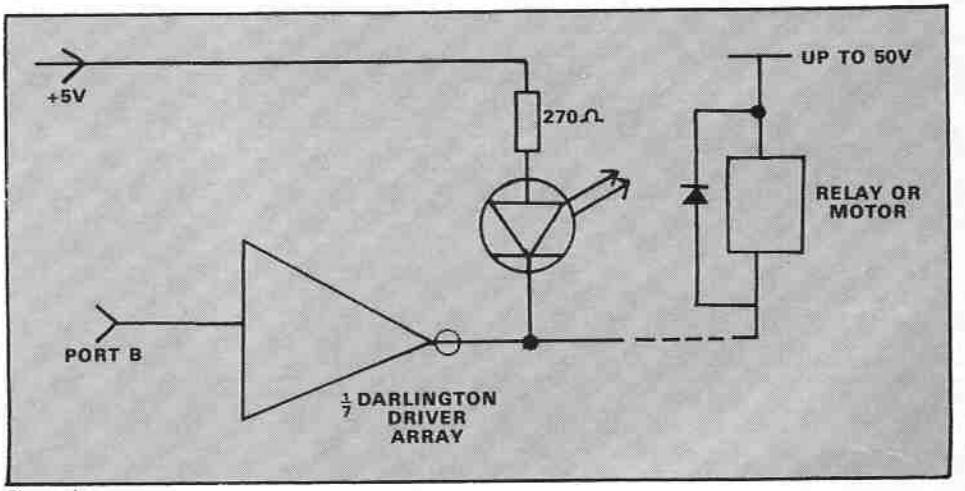


Figure 4

ORP12 light dependent resistor (305-620)
Red LED (586-475)
Terminal block (screw) (423-166)
Terminal block (spring) 'quick connect' (423-576)
Sub-miniature 5 V relay (348-526)
Low profile sockets (40 way) (401-986)
Low profile sockets (14 way) (401-790)

The 6522 VIA can be obtained from any of the suppliers advertising in electronic and computer magazines.

Appletips

Frequently, in card games especially, an array is 'shuffled' by selecting a random number, checking to see if it has already been used, if it hasn't then using it, and if it has then selecting another random number.

A quicker way to shuffle is to fill the array with the possible values, then shuffle it. By way of an example, in October's issue of Windfall the Letter Puzzle on Page 18 is noticeably faster if lines 1370-1500 are substitued by:

```
1370 B0 =  - 16287: REM  LOCATION
     FOR GAMES BUTTON
1375  REM  NOW FILL THE ARRAY
1380  FOR I = 1 TO 16:L%(I) = I -
     1: NEXT
1385  REM  NOW SHUFFLE IT
1390  FOR I = 16 TO 2 STEP  - 1:R
     =  INT (16 *  RND ( PEEK (B
     0) + 1) + 1):T = L%(I)
1400 L%(I) = L%(R):L%(R) = T: NEXT

1405  REM  NOW FILL THE OTHER ARR
     AYS
1410  FOR V = 1 TO 4: FOR H = 1 TO
     4
1420 CH%(V,H) = L%(4 * (V - 1) +
     H): IF CH%(V,H) = 15 THEN X =
     V:Y = H
1430  NEXT : NEXT
```

Note the use of **B0** in line 1390. This obviates the necessity to input a number to re-seed **RND** so that lines 1300-1360 of Letter Puzzle become redundant.

Max Parrott

MONITOR CHECK

Dr G.A. MANSON, of the Department of Applied and Computational Mathematics, Sheffield University, spotlights a fault in the Apple's plotting routines.

WITH most TV monitors the Apple produces half intensity dots at certain points on the screen. This occurs with colours 5, 6 and 7 and is apparent in both black and white and colour. The only system known to the author in which this does not occur is an Apple with Sony TV and special Sony colour card.

To assess whether this problem occurs with your system try Program 1, which produces three half intensity dots and then changes them to full intensity. If the dots remained unchanged then your system has no problems and you need read no further. To see how annoying this problem is run Programs 2 and 3. The problem in plotting the point X, Y only occurs in a limited number of situations, namely:

(i) HCOLOR = 5, X odd and X+1 divisible by 7.
(ii) HCOLOR = 6, X even and X+1 divisible by 7.
(iii) HCOLOR = 7 and X+1 divisible by 7.

Program 1.

```
10  HOME : TEXT : HGR
20  HCOLOR= 5
30  HPLOT 13,100
40  HCOLOR= 6
50  HPLOT 48,100
60  HCOLOR= 7
70  HPLOT 96,100 TO 97,100
80  VTAB 21: PRINT "WATCH THE LEF
    T HAND DOT"
90  PRINT "AND PRESS THE 'SPACE B
    AR'": GET A$
100 HCOLOR= 4: REM  BLACK
110 HPLOT 16,100: REM  SHOULD BE
     NO CHANGE
115 HOME
120 VTAB 21: PRINT "NOW WATCH TH
    E NEXT DOT"
130 PRINT "AND PRESS THE 'SPACE
    BAR'": GET A$
140 HPLOT 52,100: REM  AGAIN THE
    RE SHOULD BE NO CHANGE SINCE
     PLOTTING IN BLACK
145 HOME
150 VTAB 21: PRINT "NOW WATCH TH
    E LAST DOT"
160 PRINT "AND PRESS THE 'SPACE
    BAR'": GET A$
170 HPLOT 100,100: REM  THERE SH
    OULD BE NO CHANGE SINCE PLOT
    TING IN BLACK
180 END
```

Program 2.

```
10  HOME : TEXT : HGR
20  HCOLOR= 5
30  HPLOT 13,1 TO 13,150
40  HPLOT 17,50 TO 17,150
50  HCOLOR= 6
60  HPLOT 48,1 TO 48,150
70  HPLOT 52,50 TO 52,150
80  HCOLOR= 7
90  HPLOT 96,1 TO 96,150
100  HPLOT 97,1 TO 97,150
110  HPLOT 101,50 TO 101,150
120  HPLOT 102,50 TO 102,150
130  END
```

Program 3.

```
10  HOME : TEXT : HGR
20  HCOLOR= 6
30  HPLOT 48,0 TO 244,0 TO 244,10
     0 TO 48,100 TO 48,0
40  HPLOT 52,20 TO 230,20 TO 230,
     80 TO 52,80 TO 52,20
50  END
```

Normally the remedy is to set HCOLOR = 4 (i.e., black) and then to plot the point X+1, Y in black. Thus Program 2 can be corrected by adding the lines:

```
35  HCOLOR= 4: HPLOT 14,1 TO 14,1
     50: HCOLOR= 5
65  HCOLOR= 4: HPLOT 49,1 TO 49,1
     50: HCOLOR= 6
105  HCOLOR= 4: HPLOT 98,1 TO 98,
     150: HCOLOR= 7
```

The remedy for Program 3 is similar. Add the lines:

```
42  HCOLOR= 4: HPLOT 245,0 TO 245
    ,100
44  HPLOT 49,0 TO 49,100
46  HPLOT 231,20 TO 231,80
```

Note that if HCOLOR = 7 is used in program 3 instead of HCOLOR = 6 then the given correction produces two small black dots at 49,0 and 49,100. This can be corrected by changing line 44 to:

```
44  HPLOT 49,1 TO 49,99
```

This problem is caused by a fault in the Apple's plotting routines. Since this can be corrected in Basic then the machine code routines could also be corrected. Let's hope that Apple will correct this most annoying fault.

ORMBETA SOFTWARE

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EARTH DEFENCE

EARTH Defence was written by Sandy Nelson, a schoolboy from Edinburgh. It is useful in demonstrating the methods of building up complex action games on the Apple, using shape tables and hi-res graphics. There are one or two very minor limitations to the program, mainly concerned with responses to commands, which we think could be improved upon.

Rather than ask Sandy to do this, we suggest that the user would benefit more by loading the program and experimenting himself. This way a greater understanding of the methods used will be achieved.

The program uses a shape table and two sound routines which are poked in using data statements. The shape table is loaded in from disc.

Line 1660 is there to set up the variable table used by Applesoft in the right order, i.e. the most frequently referenced variables are stored at the top of the table so that Applesoft will not have to scan so far during a run.

The program is $2EE0 bytes long, and if it were loaded normally then it would encroach upon the hi-res screen. To avoid this, the program must be loaded just above the hi-res screen and the shape table is placed where the program would normally be. To do this a short program of two lines must be used to change the beginning of program pointer and to load Earth Defence.

The error flag is switched on so that if a CTRL-C is typed then a jump will be made to the end of the game routine at line 990. If either emitter is hit more than twice they will be re-drawn, to avoid a ragged appearance. In lines 690, 2780 and 3770 the maximum value of G can be changed to 2, 4 or 6 to vary the extent of the explosion.

At the end of the program there are two animation routines which are very similar. The reason for there being two is that the programmer may wish to add small pieces of animation peculiar to each type of ship. If there was one amalgamated routine then the number of branches might make the routine too slow if extra sequences were added.

Program to load Earth Defence:

```
10  POKE 104,64: POKE 103,01
15  POKE 24576,0
20  PRINT  CHR$ (4);"RUN EARTH DE
    FENCE"
```

Dump of shape table:

```
0801- 09 00 14 00 33 00 7F
0808- 00 92 00 BF 00 D9 00 DF
0810- 00 F8 00 00 01 29 E4 3F
0818- 1E 36 0E 2D 0C 2C 2D 24
0820- 24 36 36 36 36 24 24 3F
0828- 3F 1F 3F 3F 24 24 36 36
0830- 36 36 06 00 24 24 24 3C
0838- 3F 3F 3F 2D 2D 2D 2D 2D
0840- 2D 2D 3F 3F 3F 1E 36 36
0848- 36 36 36 36 3E 3F 3F 3F
0850- 2D 2D 2D 2D 2D 2D 2D 3F
0858- 3F 3F 27 24 24 2C 18 3F
0860- 3F 3F 3F 3F 3F 3F 24 36
0868- 36 24 2D 2D 2D 2D 2D 2D
0870- 2D 2D 2D 2D 2D 2D 2D 2D
0878- 24 36 36 24 3F 3F 07 00
0880- 49 E1 3C E4 CA 1C 1E 1E
0888- 37 1E 0E 2E 0E 0E 05 60
0890- 25 06 00 29 27 1C 17 3E
0898- 35 0E 05 20 2D 3F 3F 3F
08A0- 2D 2C 36 36 36 ED 23 24
08A8- 24 24 24 34 36 26 1F 1C
08B0- 97 92 0A 0C 05 28 25 64
08B8- 0C 95 92 1A 1C 1C 24 00
08C0- 2D 3D 3C E0 17 17 2E 2D
08C8- 3F 3F 35 35 2D 2C 27 2D
08D0- 2D 3F 3F 3F 3F 3F 2D 2D
08D8- 05 00 24 34 36 36 06 00
08E0- 24 07 30 20 05 A8 F6 2E
08E8- 15 1F 07 B8 4E 0E 0E 0E
08F0- 1F 1F 08 18 1E 27 07 70
08F8- 00 24 3F 3C 37 2E 35 2D
0900- 05 00 24 24 37 37 37 35
0908- 2D 04 00 00
*
```

```
100  GOSUB 1650
110  GOSUB 1230
120  ONERR  GOTO 990
130 DU% = 2501:FR% = 2515:HI = 0:
     A% = HI:B% = A%:E = 1.02406:
     Q = 2.03998
140  ROT= 1: SCALE= 1: HGR
150  GOSUB 300
160 F% =  PDL (1) / E + 15:K% =  PDL
     (0) / Q + 7
170  ON G% GOSUB 460,500,540,580
180  IF (N% - (O% - 1) < 2 OR N% +
     (O% - 1) > 277) OR (P% - (Y%
      + 4) < 3 OR P% + Y% > 156) THEN
      HCOLOR= 0: DRAW Z AT N%,P%:
      DRAW 2 AT F%,K%: GOTO 150
190  HCOLOR= 3: DRAW Z AT N%,P%: DRAW
     2 AT F%,K%
200  IF  PEEK ( - 16286) > 127 THEN
      GOSUB 600
210 L = L + 1
220  HTAB 7: PRINT L;: HTAB 21: PRINT
     A%;: HTAB 33: PRINT HI;
230  POKE 768,93: POKE 769,2: CALL
     770
240 J% =  INT (56 *  RND (1)) + 2
     : IF J% < S% THEN  GOSUB 830

250  IF J% > 58 - S% THEN  GOSUB
     910
260  IF  PEEK ( - 16286) > 127 THEN
      GOSUB 600
270  IF (N% - 4 < 2 OR N% + 10 >
     277) OR (P% - (Y% + 4) < 3 OR
     P% + Y% > 156) THEN  HCOLOR=
     0: DRAW Z AT N%,P%: DRAW 2 AT
     F%,K%: GOTO 150
280  HCOLOR= 0: DRAW Z AT N%,P%: DRAW
     2 AT F%,K%
290  GOTO 160
300 O% =  INT ( RND (1) * 15) + S
     %:Y% =  INT ( RND (1) * 15) +
     S%:G% =  INT ( RND (1) * 4) +
     1
310  ON G% GOSUB 440,480,520,560
320  HCOLOR= 3
330  IF FG% = 10 THEN  GOTO 2040
```

```
340  IF B% = 10 THEN  RETURN
350  FOR T = 1 TO 30:X% =  INT ( RND
     (1) * 270) + 5:Y% =  INT ( RND
     (1) * 100) + 1: HPLOT X%,Y%
360  NEXT
370 B% = 10
380  HCOLOR= 3: HPLOT 0,150 TO 5,
     150 TO 5,147 TO 10,147 TO 20
     ,140: HPLOT 20,140 TO 14,147
      TO 14,155 TO 0,155
390  HPLOT 0,150 TO 0,155: HPLOT
     279,150 TO 279,155
400  HPLOT 0,159 TO 279,159
410  HPLOT 279,150 TO 274,150 TO
     274,147 TO 269,147 TO 279,14
     0: HPLOT 259,140 TO 265,147 TO
     265,155 TO 279,155
420  HPLOT 8,150 TO 12,150 TO 12,
     154 TO 8,154 TO 8,150
430  RETURN
440 N% =  INT (40 *  RND (1)) + 1
     :P% =  INT (30 *  RND (1)) +
     1
450  RETURN
460 N% = N% + O%:P% = P% + Y%
470  RETURN
480 N% =  INT (40 *  RND (1)) + 2
     39:P% =  INT (30 *  RND (1))
      + 1
490  RETURN
500 N% = N% - O%:P% = P% + Y%
510  RETURN
520 N% =  INT (40 *  RND (1)) + 2
     39:P% =  INT (30 *  RND (1))
      + 129
530  RETURN
540 N% = N% - O%:P% = P% - Y%
550  RETURN
560 N% =  INT (40 *  RND (1)) + 1
     :P% =  INT (30 *  RND (1)) +
     129
570  RETURN
580 N% = N% + O%:P% = P% - Y%
590  RETURN
600  HCOLOR= 3
610  HPLOT 20,139 TO F%,K%: HPLOT
     259,139 TO F%,K%
620  IF (F% - 10 < N% AND F% + 10
      > N%) AND (P% + 2 < K% + 7 AND
     P% - 2 > K% - 8) THEN 670
630  POKE DU%,10: POKE FR%,83
640  CALL 2500
650  HCOLOR= 0: HPLOT 20,139 TO F
     %,K%: HPLOT 259,139 TO F%,K%

660  RETURN
670  HCOLOR= 0: HPLOT 20,139 TO F
     %,K%: HPLOT 259,139 TO F%,K%

680  HCOLOR= 3
690  FOR G = 1 TO 4
700  FOR V = 1 TO 9
710  SCALE= V: ROT= 0
720  DRAW 3 AT N%,P%
730 M = 2 * V + 30
740  POKE 768,M: POKE 769,4: CALL
     770
750  POKE 768,113: POKE 769,3: CALL
     770
760  NEXT V
770  IF G = 1 OR G = 3 OR G = 5 THEN
      HCOLOR= 0: NEXT G
780  HCOLOR= 3: NEXT G
790  SCALE= 1
800 A% = A% + 1
810  IF A% = 5 THEN 1010
820  HCOLOR= 0: HPLOT 20,139 TO F
     %,K%: HPLOT 259,139 TO F%,K%
     : DRAW 2 AT N%,P%: DRAW 2 AT
     F%,K%: HCOLOR= 3: GOTO 150
830 H =  INT (20 *  RND (1)) + 1:
     I =  INT (10 *  RND (1)) + 1
     49
840  IF (H > 4 AND H < 18) AND (I
      > 145 AND I < 156) THEN L =
     L + 15:HI = HI + 1:M = M + 1
850  IF M > 2 THEN M = 0: GOSUB 3
     80
860  IF HI > ((1 / S%) * 10) + 5 THEN
     FG% = 10
870  HCOLOR= 3: HPLOT N%,P% TO H,
     I
880  HCOLOR= 0: HPLOT N%,P% TO H,
     I
890  POKE DU%,3: POKE FR%,180: CALL
     2500
900  RETURN
910 H =  INT (20 *  RND (1)) + 25
     0:I =  INT (10 *  RND (1)) +
     149
920  IF (H > 296 AND H < 275) AND
     (I > 145 AND I < 156) THEN L
      = L + 15:HI = HI + 1:U = U +
     1
930  IF U > 2 THEN U = 0: GOSUB 3
     80
940  IF HI > ((1 / S%) * 10) + 5 THEN
     FG% = 10
950  HCOLOR= 3: HPLOT N%,P% TO H,
     I
960  HCOLOR= 0: HPLOT N%,P% TO H,
     I
970  POKE DU%,3: POKE FR%,170: CALL
     2500
980  RETURN
990  IF  PEEK (222) = 77 THEN 160

1000  IF  PEEK (222) = 53 THEN 16
     0
1010  TEXT : HOME : SPEED= 255
1020  VTAB 8: PRINT "IT TOOK YOU
     "L;" TIME UNITS TO ACCOMPLIS
     H  THIS UNIQUE FEAT!"
1030  IF HI = 1 THEN  PRINT : PRINT
     "AND THE FIGHTERS SCORED ";H
     I" DIRECT HIT.(HA HA!)": GOTO
     1050
1040  PRINT : PRINT "AND THE FIGH
     TERS SCORED "HI;" DIRECT HIT
     S.(HA HA!)"
1050  PRINT : PRINT "WOULD YOU LI
     KE ANOTHER SHOT?"
1060  PRINT : PRINT "TYPE 'Y' OR
     'N'"
1070  INVERSE
1080  VTAB 2: HTAB 2: PRINT "++++
     ++++++++++++++++++++++++++++
     +++++++"
1090  VTAB 4: HTAB 2: PRINT "+": VTAB
     4: HTAB 40: PRINT "+": VTAB
     3: HTAB 2: PRINT "+": VTAB 3
     : HTAB 40: PRINT "+": VTAB 5
     : HTAB 2: PRINT "+": VTAB 5:
      HTAB 40: PRINT "+"
1100  VTAB 6: HTAB 2: PRINT "++++
     ++++++++++++++++++++++++++++
     +++++++"

1110  NORMAL
1120 K$ = "YOU HAVE SUCCESSFULLY
     SHOT DOWN "
1130 F$ =  STR$ (A%):K$ = K$ + F$

1140  IF A% = 1 THEN H$ = " ANDRO
     ID FIGHTER.....": GOTO 1170
1150  SPEED= 230
1160 H$ = " ANDROID FIGHTERS...."

1170 K$ = K$ + H$
1180  VTAB 4: HTAB 4: PRINT  LEFT$
     (K$,35);:K$ =  MID$ (K$,2) +
      LEFT$ (K$,1)
1190 G% =  PEEK ( - 16384): POKE
      - 16368,0
1200  IF G% = 89 THEN L = 0: VTAB
     15: RUN 1500
1210  IF G% = 78 THEN  SPEED= 255
     : HOME : POKE 103,1: POKE 10
     4,8: END
1220  GOTO 1180
1230  TEXT : HOME : PRINT : INVERSE

1240  PRINT "++++++++++++++++++++
     ++++++++++++++++++++"
1250  PRINT "+"; SPC( 37)"+"
1260  PRINT "+"; SPC( 12)"EARTH D
     EFENCE"; SPC( 12)"+"
1270  PRINT "+"; SPC( 37)"+"
1280  PRINT "++++++++++++++++++++
     ++++++++++++++++++++"

1290  NORMAL
1300  PRINT : PRINT "THIS IS A VE
     RY THRILLING GAME"; SPC( 11)
     ;"WRITTEN BY:-"
1310  PRINT
1320  INVERSE : HTAB 13: PRINT "S
     ANDY NELSON": NORMAL
1330  PRINT : PRINT "YOU ARE THE
     GUNNERY OFFICER OF AN EARTH"

1340  PRINT "DEFENCE STATION.YOU
     MUST TRY TO SHOOT "
1350  PRINT "DOWN THE FIVE DEADLY
      ANDROID FIGHTERS "
1360  PRINT "WHICH CIRCLE THE ARE
     A RELENTLESSLY."
1370  PRINT : PRINT
1380  PRINT "PRESS ANY KEY TO CON
     TINUE"
1390  GET R$
1400  POKE 34,6
1410  HOME : PRINT : PRINT "WHEN
     YOU ARE READY YOUR BATTLE DI
     SPLAY"
1420  PRINT "WILL APPEAR.MOVE YOU
     R SIGHTS BY TURNING"
1430  PRINT "THE PADDLES.(PADDLE(
     0)MOVES YOUR SIGHTS VERTICAL
     LY AND PADDLE(1) MOVES YOUR"
     ; SPC( 5)"SIGHTS HORIZONTALL
     Y.TO FIRE YOUR"
1440  PRINT "XANTIC RE-STRUCTION
     DESTABILIZED ZENON "
1450  PRINT "EMITTERS  PRESS BUTT
     ON(1),"
1460  PRINT "EVERY TIME A FIGHTER
      SCORES A DIRECT"
1470  PRINT "HIT YOUR TIME WILL G
     O UP BY 20 UNITS."
1480  PRINT "THERE ARE TWO VERSIO
     NS,1 IS A TIE "
1490  PRINT "FIGHTER AND 2 IS A S
     AUCER."
1500  PRINT : PRINT "WHICH VERSIO
     N WOULD YOU LIKE (1/2)? ";
1510  GET R$: IF  ASC (R$) < 49 OR
      ASC (R$) > 50 THEN 1510
1520  IF  ASC (R$) = 49 THEN Z =
     1:LK = 9
1530  IF  ASC (R$) = 50 THEN Z =
     5:LK = 8
1540  PRINT : PRINT
1550  PRINT "PLEASE ENTER YOUR SK
     ILL RATING(0-9) ";
1560  GET R$: IF  ASC (R$) < 48 OR
      ASC (R$) > 57 THEN 1560
1570 A% =  ASC (R$):S% = A% - 47
1580  PRINT : PRINT : PRINT "PRES
     S ANY KEY TO START TO PLAY "
     ;
1590  GET R$
1600  HOME
1610  POKE 35,24: POKE 34,21: HOME
1620  PRINT  SPC( 3)"-*TIME*-"; SPC(
     5)"-*SCORE*-"; SPC( 4)"-*HIT
     S*-"
1630  SPEED= 255: GOTO 120
1640 LD =  FRE (0)
1650  GR : COLOR= 15: HOME
1660 F% = 0:K% = F%:G% = K%:J% =
     G%:O% = J%:Y% = O%:P% = Y%:N
     % = P%
```

```
1670  FOR T = 1 TO 18
1680  READ A%,B%,C%
1690  VLIN A%,B% AT C%
1700  NEXT
1710  FOR T = 1 TO 24
1720  READ A%,B%,C%
1730  HLIN A%,B% AT C%
1740  NEXT
1750  FOR T = 1 TO 8
1760  READ A%,B%
1770  PLOT A%,B%
1780  NEXT
1790  DATA  5,11,8,5,11,14,5,11,1
      8,  5,11,20,5,7,23,5,11,27,5
      ,11,31,5,11,35,15,21,2,16,20
      ,6,15,21,8,15,21,8,15,21,14,
      15,21,19,15,21,25,15,21,29,1
      5,21,31,15,21,36
1800  DATA  8,12,11,8,11,8,8,12,5
      ,14,18,5,14,18,8,20,23,5,20,
      23,8,25,29,5,31,35,8,2,5,15,
      2,5,21,8,12,15,8,12,21,8,11,
      18,14,17,15,14,16,18,19,23,1
      5,19,23,21,19,22,18,31,34,15
      ,31,34,21,36,39,15,36,39,21,
      36,38,18
1810  DATA   23,11,23,10,22,9,28,
      19,26,17,27,18,34,16,34,20
1820  FOR O = 770 TO 792
1830  READ A%
1840  POKE O,A%
1850  NEXT O
1860  PRINT  CHR$ (4)"BLOAD EARTH
      SHAPE,A$801"
1870  FOR T = 2500 TO 2521
1880  READ A%
1890  POKE T,A%
1900  NEXT
1910  POKE 232,1: POKE 233,8
1920  DATA   173,48,192,136,208,5
      ,206,1,3,240,9,202,208,245,1
      74,0,3,76,2,3,96,0,0
1930  DATA  160,10,162,0,138,24,2
      33,1,208,252,141,48,192,232,
      224,128,208,242,136,208,237,
      96
1940  COLOR= 0
1950  FOR A = 5 TO 21
1960  HLIN 2,39 AT A
1970  POKE 768,78: POKE 769,2: CALL
      770
1980  POKE 768,73: POKE 769,3: CALL
      770
1990  FOR T = 1 TO 45: NEXT T
2000  NEXT A
2010  FOR T = 1 TO 800: NEXT T
2020  POKE  - 16303,0: HOME
2030  RETURN
2040  IF Z = 1 THEN 3120
2050  SCALE= 1: HCOLOR= 0: DRAW Z
      AT N%,P%:N% = 100:P% = 0: DRAW
      2 AT F%,K%
2060 J% = 153
2070  FOR P = 10 TO J% STEP 3
2080  HCOLOR= 3: DRAW Z AT N%,P: HPLOT
      N% - 2,P + 3 TO N% + 2,P + 3
       TO N%,P + 10 TO N% - 2,P +
      3
2090  POKE FR%,P: POKE DU%,1: CALL
      2500
2100  POKE 768,120: POKE 769,2: CALL
      770
2110  HCOLOR= 0: DRAW Z AT N%,P: HPLOT
      N% - 2,P + 3 TO N% + 2,P + 3
       TO N%,P + 10 TO N% - 2,P +
      3
2120  NEXT P
2130  HCOLOR= 3
2140  DRAW Z AT 100,J%
2150  HPLOT 95,153 TO 94,158: HPLOT
      105,153 TO 106,158
2160  FOR T = 1 TO 200: NEXT
2170 X = 105:Y = 152
2180  FOR T = 1 TO 7
2190  HPLOT X,Y TO X + 2,Y
2200 X = X + 2:Y = Y + 1
2210  POKE FR%,100: POKE DU%,1: CALL
      2500
2220  FOR D = 1 TO 200: NEXT
2230  NEXT
2240 X% = 105:J% = 145
2250  FOR T = 1 TO 8
2260 X% = X% + 2:J% = J% + 1
2270  HCOLOR= 3: DRAW 7 AT X%,J%
2280  POKE 768,70: POKE 769,3: CALL
      770
2290  POKE 768,60: POKE 769,4: CALL
      770
2300  HCOLOR= 0: DRAW 7 AT X%,J%
2310  NEXT
2320 J% = 153
2330  FOR X = 120 TO 250 STEP 2
2340  HCOLOR= 3: DRAW 7 AT X,J%
2350  POKE 768,70: POKE 769,3: CALL
      770
2360  POKE 768,60: POKE 769,4: CALL
      770
2370  HCOLOR= 0: DRAW 7 AT X,J%
2380  NEXT X
2390  HCOLOR= 3: DRAW 7 AT X,J%
2400 X = 265:Y = 154
2410  FOR T = 1 TO 12
2420  HCOLOR= 3: HPLOT 265,147 TO
      X,Y
2430  POKE 768,80: POKE 769,2: CALL
      770
2440  POKE 768,60: POKE 769,4: CALL
      770
2450  FOR D = 1 TO 200: NEXT
2460  HCOLOR= 0: HPLOT 265,147 TO
      X,Y
2470 X = X - 1:Y = Y - 0.5
2480  NEXT
2490  HCOLOR= 3: HPLOT 265,147 TO
      X - 1,Y - 1.5
2500  HCOLOR= 0: HPLOT 265,155 TO
      279,155
2510  HCOLOR= 3: HPLOT 265,158 TO
      279,158
2520  HPLOT 279,158 TO 279,154
2530 J% = 153
2540  FOR X = 250 TO 268 STEP 2
2550  HCOLOR= 3: DRAW 7 AT X,J%
2560  POKE 768,70: POKE 769,3: CALL
      770
2570  POKE 768,60: POKE 769,4: CALL
      770
2580  HCOLOR= 0: DRAW 7 AT X,J%
2590  NEXT
2600  HCOLOR= 3: DRAW 7 AT X,J%
2610  HCOLOR= 0:X = 121:Y = 159
2620  FOR T = 1 TO 8
2630  HPLOT X,Y TO X - 2,Y
2640 X = X - 2:Y = Y - 1
2650  POKE FR%,80: POKE DU%,1: CALL
      2500
2660  FOR D = 1 TO 200: NEXT
2670  NEXT
2680  HCOLOR= 3: HPLOT 121,159 TO
      119,159
2690  HCOLOR= 0: HPLOT 95,153 TO
      94,158: HPLOT 105,153 TO 106
      ,158
2700  FOR Y = J% TO 10 STEP  3
2710  HCOLOR= 3: DRAW Z AT N%,Y: HPLOT
      N% - 2,Y + 3 TO N% + 2,Y + 3
       TO N%,Y + 10 TO N% - 2,Y +
      3
2720  POKE FR%,Y: POKE DU%,1: CALL
      2500
2730  HCOLOR= 0: DRAW Z AT N%,Y: HPLOT
      N% - 2,Y + 3 TO N% + 2,Y + 3
       TO N%,Y + 10 TO N% - 2,Y +
      3
2740  IF Y > 140 AND Y < 146 THEN
       HCOLOR= 3: HPLOT 95,159 TO
      110,159
2750  NEXT
2760  HCOLOR= 3
2770  FOR T = 1 TO 500: NEXT
2780  FOR G = 1 TO 6
2790 F% = 6 + 2.5 * G
2800  FOR V = 1 TO F%
2810  SCALE= V: ROT= 0
2820  DRAW LK AT 275,155:M = 2 *
      V + 30
2830  POKE 768,(S * 2) + 70: POKE
      769,2: CALL 770
2840  POKE 768,104: POKE 769,3: CALL
      770
2850  POKE FR%,M: POKE DU%,4: CALL
      2500
2860  POKE 768,M - 20: POKE 769,3
      : CALL 770
2870  NEXT V
2880  IF G = 1 OR G = 3 OR G = 5 THEN
       HCOLOR= 0: NEXT G
2890  HCOLOR= 3: NEXT G
2900  POKE 34,0: POKE 35,24: HOME
      : VTAB 22
2910 B$ =  STR$ (HI)
2920 L$ =  CHR$ (160) +  CHR$ (16
      0):K$ = L$ + L$:L$ = K$ + L$

2930 A$ = "YOUR BASE WAS HIT " +
      B$ + " TIMES AND YOUR" + L$ +
      "EMITTERS WERE KNOCKED OUT,
      ALLOWING AN  ANDROID FIGHTER
       TO LAND AND PLACE AN" + K$ +
      "EXPLOSIVE CHARGE...."
2940  FOR T = 1 TO  LEN (A$)
2950  PRINT  MID$ (A$,T,1);
2960  POKE 768,50: POKE 769,3: CALL
      770
2970  POKE 768,60: POKE 769,2: CALL
      770
2980  POKE 768,40: POKE 769,2: CALL
      770
2990  NEXT
3000  FOR T = 1 TO 1000: NEXT : HOME
      : VTAB 22
3010 A$ = "THUS LEAVING THE EARTH
       OPEN TO INVASION"
3020  FLASH : HTAB 2
3030  FOR T = 1 TO 39
3040  PRINT  MID$ (A$,T,1);
3050  POKE 768,40: POKE 769,3: CALL
      770: POKE 768,30: POKE 769,4
      : CALL 770
3060  NEXT
3070  NORMAL : FOR T = 1 TO 50: POKE
      768,60: POKE 769,2: CALL 770

3080  POKE 768,60 - T: POKE 769,2
      : CALL 770
3090  POKE 768,60 + T: POKE 769,2
      : CALL 770
3100  NEXT : GOTO 1010
3110  HCOLOR= 3: DRAW 7 AT X,J%
3120  SCALE= 1: HCOLOR= 0: DRAW Z
       AT N%,P%:N% = 100: DRAW 2 AT
      F%,K%
3130 J% = 153
3140  FOR P = 10 TO J% STEP 3
3150  HCOLOR= 3: DRAW Z AT N%,P: HPLOT
      N% - 2,P + 3 TO N% + 2,P + 3
       TO N%,P + 10 TO N% - 2,P +
      3
3160  POKE 768,P: POKE 769,3: CALL
      770
3170  HCOLOR= 0: DRAW Z AT N%,P: HPLOT
      N% - 2,P + 3 TO N% + 2,P + 3
       TO N%,P + 10 TO N% - 2,P +
      3
3180  NEXT P
3190  HCOLOR= 3
3200  DRAW Z AT 100,J%
3210  HPLOT N%,P TO 105,148
3220 X% = 105:Y% = 158: FOR S = 1
       TO 11
3230  HCOLOR= 3: HPLOT 105,148 TO
      X%,Y%
3240  FOR T = 1 TO 200: NEXT T
3250  HCOLOR= 0: HPLOT 105,148 TO
      X%,Y%
3260 X% = X% + 1:Y% = Y% - 1
```

```
3270  POKE 768,120: POKE 769,2: CALL
    770
3280  POKE 768,114: POKE 769,3: CALL
    770
3290  POKE 768,130: POKE 769,4: CALL
    770
3300  NEXT
3310  HCOLOR= 3: HPLOT 105,148 TO
    X%,Y%: FOR T = 1 TO 300: NEXT
    T
3320  FOR X = 110 TO 250 STEP 2
3330  HCOLOR= 3: DRAW 7 AT X,J%
3340  POKE 768,70: POKE 769,3: CALL
    770
3350  POKE 768,60: POKE 769,4: CALL
    770
3360  HCOLOR= 0: DRAW 7 AT X,J%
3370  NEXT X
3380  HCOLOR= 3: DRAW 7 AT 250,J%

3390 X = 265:Y = 154
3400  FOR T = 1 TO 12
3410  HCOLOR= 3: HPLOT 265,147 TO
    X,Y
3420  POKE 768,80: POKE 769,2: CALL
    770
3430  POKE 768,60: POKE 769,4: CALL
    770
3440  FOR D = 1 TO 200: NEXT
3450  HCOLOR= 0: HPLOT 265,147 TO
    X,Y
3460 X = X - 1:Y = Y - 0.5
3470  NEXT
3480  HCOLOR= 3: HPLOT 265,147 TO
    X - 1,Y - 1.5
3490  HCOLOR= 0: HPLOT 265,155 TO
    279,155
3500  HCOLOR= 3: HPLOT 265,158 TO
    279,158
3510  HPLOT 279,158 TO 279,154
3520 J% = 153
3530  FOR X = 250 TO 268 STEP 2
3540  HCOLOR= 3: DRAW 7 AT X,J%
3550  POKE 768,70: POKE 769,3: CALL
    770
3560  POKE 768,60: POKE 769,4: CALL
    770
3570  HCOLOR= 0: DRAW 7 AT X,J%
3580  NEXT
3590  HCOLOR= 3: DRAW 7 AT X,J%
3600 X% = 116:Y% = 147: FOR S = 1
    TO 11
3610  HCOLOR= 3: HPLOT 105,148 TO
    X%,Y%
3620  FOR T = 1 TO 200: NEXT T
3630  HCOLOR= 0: HPLOT 105,148 TO
    X%,Y%
3640 X% = X% - 1:Y% = Y% + 1
3650  POKE 768,90: POKE 769,2: CALL
    770
3660  POKE 768,140: POKE 769,4: CALL
    770
3670  NEXT
3680  HCOLOR= 3: HPLOT 105,148 TO
    105,157: HCOLOR= 0: HPLOT N%
    ,P% TO 105,148
3690  FOR T = 1 TO 300: NEXT T
3700  FOR Y = J% TO 10 STEP  - 3
3710  HCOLOR= 3: DRAW Z AT N%,Y: HPLOT
    N% - 2,Y + 3 TO N% + 2,Y + 3
    TO N%,Y + 10 TO N% - 2,Y +
    3
3720  POKE 768,Y: POKE 769,3: CALL
    770
3730  HCOLOR= 0: DRAW Z AT N%,Y: HPLOT
    N% - 2,Y + 3 TO N% + 2,Y + 3
    TO N%,Y + 10 TO N% - 2,Y +
    3
3740  IF Y > 140 AND Y < 146 THEN
    HCOLOR= 3: HPLOT 95,159 TO
    110,159
3750  NEXT
3760  HCOLOR= 3
3770  FOR G = 1 TO 6
3780 F% = 6 + 2.5 * G
3790  FOR V = 1 TO F%
3800  SCALE= V: ROT= 0
3810  DRAW LK AT 275,155:M = 2 *
    V + 30
3820  POKE 768,(S * 2) + 70: POKE
    769,2: CALL 770
3830  POKE 768,104: POKE 769,3: CALL
    770
3840  POKE 768,M: POKE 769,4: CALL
    770
3850  POKE 768,M - 20: POKE 769,3
    : CALL 770
3860  NEXT V
3870  IF G = 1 OR G = 3 OR G = 5 THEN
    HCOLOR= 0: NEXT G
3880  HCOLOR= 3: NEXT G
3890  POKE 34,0: POKE 35,24: HOME
    : VTAB 22
3900 L$ =  CHR$ (160) +  CHR$ (16
    0):K$ = L$ + L$:L$ = L$ + L$
    + L$
3910 B$ =  STR$ (HI)
3920 A$ = "YOUR BASE WAS HIT " +
    B$ + " TIMES AND YOUR" + L$ +
    "EMITTERS WERE KNOCKED OUT,
    ALLOWING AN  ANDROID FIGHTER
    TO LAND AND PLACE AN" + K$ +
    "EXPLOSIVE CHARGE...."
3930  FOR T = 1 TO  LEN (A$)
3940  PRINT  MID$ (A$,T,1);
3950  POKE 768,50: POKE 769,3: CALL
    770
3960  POKE 768,60: POKE 769,2: CALL
    770
3970  POKE 768,40: POKE 769,2: CALL
    770
3980  NEXT
3990  FOR T = 1 TO 1000: NEXT : HOME
    : VTAB 22
4000 A$ = "THUS LEAVING THE EARTH
    OPEN TO INVASION"
4010  FLASH : HTAB 2
4020  FOR T = 1 TO 39
4030  PRINT  MID$ (A$,T,1);
4040  POKE 768,40: POKE 769,3: CALL
    770: POKE 768,30: POKE 769,4
    : CALL 770
4050  NEXT
4060  NORMAL : FOR T = 1 TO 50: POKE
    768,60: POKE 769,2: CALL 770

4070  POKE 768,60 - T: POKE 769,2
    : CALL 770
4080  POKE 768,60 + T: POKE 769,2
    : CALL 770
4090  NEXT : GOTO 1010
```

An Apple in your pocket..

A bus inspector uses the portable terminal to log passenger statistics.

MAKING public transport pay, or reducing the amount of subsidy required to make such a system feasible, means that the services provided must match as closely as possible the public's requirements.

At a simple level the amount of revenue and the number of passengers carried by a bus must indicate how popular that particular route is at any given time. If, however, the bus is on a busy commuter route most passengers will have some form of concessionary pass which they merely show to the driver when they board. At the other extreme, shoppers' buses will have many customers, alighting for short trips, and all paying by cash.

Some form of analysis of passengers is required and Greatef Manchester Transport has introduced a system, provided by Mektronic Consultants, which enables bus inspectors to move among the passengers recording details of passenger numbers and how they have paid on a portable computer using a bar code scanner. On return to the depot they download the information to a central computer which analyses the results.

At the moment the data is fed into Greater Manchester Transport's mainframe computer. But Mektronic have now developed the system to run on the Apple.

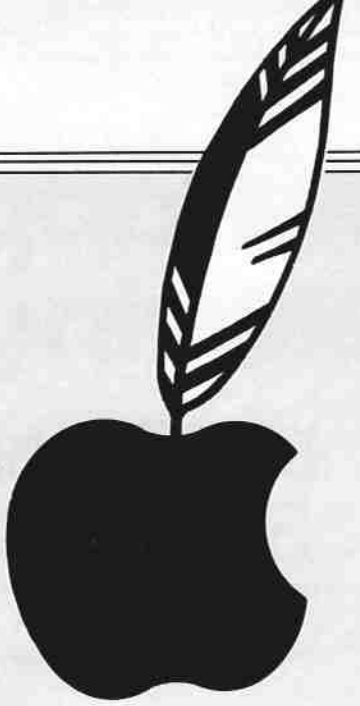
It is based on a portable terminal produced by MSI, acknowledged leader in such devices, most of which have been used in the traditional mainframe market for checking stock, etc, in supermarkets.

Mektronic, however, are more interested in their potential in conjunction with microcomputers, and Greater Manchester Transport, with 80 systems in use, is one of their first major customers.

The system, called Portapple, consists of the MSI portable terminal, a serial interface card developed by Mektronic, a bar code scanner, and software and manuals, plus a starter pack of barcoded labels. The terminal can store up to 32k of data which can be input through bar code scanner or keyboard.

The terminal can display 11 characters, and errors are signalled by a long bleep and a displayed error code. Communication is in eight-bit Ascii or five bit binary, and data can be transmitted at rates between 300 and 2400 baud.

So venture gamely on, creature addicts, help is at hand



I HAVE noticed several letters in recent issues of Windfall concerning the problems people have been having with Creature Venture. My colleagues and I have finally solved the initial game (yes there is a further game when you have found the first portion of treasure.)

If anybody would like an occasional hint or suggestion perhaps they could give me a ring at home any evening after 6pm on 061-226 2179. The game is well worth the effort to solve! – **Bob Penrose, Manchester.**

★ ★ ★

IF David Watson – or any other reader – still requires assistance with Creature Venture (Windfall, Page 76, June) he could ring me after 6pm any night on 0783 367140 and I'll give him a clue to help solve the game.

Incidentally, have you read your mail in the vicinity of the shed? – **Martin Paddon, West Boldon, Tyne & Wear.**

Mains mean danger

I WOULD like to reply to the query from M.R. Kitt in the April issue regarding the use of the mains cycle to provide timing for games. There are no AC signals of any kind available on the Apple side of the power supply. This then means that either you get into the Apple power supply to retrieve the required signals or manufacture some interface component from the mains supply to the Apple.

I think that apart from any other constraints the primary concern would be one of safety in bringing the mains supply any closer to the Apple than it already is. While I agree that adequate isolation can most likely be achieved I would not recommend or advise, especially in a home environment, anyone to attempt to connect the Apple to any mains source other than the power supply provided.

The mains cycle is of the order 20 milliseconds for one complete cycle, which by computer standards is a long time, and I would have thought that software timing for games was possible. This not being the case then a simple interrupt generator giving fixed period interrupts should not be too difficult to achieve.

Another possibility is to use one of the available clock systems for timing. It should also be possible to derive some kind of timing signal from the Apple hardware, though I advise anyone not experienced in the workings of the internal gubbins to tread very carefully there.

In respect of the collision counter usage, I think the easiest way to demonstrate its use is to run the small program below where I think the usage will become self evident.

The value assigned to CC in line 100 may of course be used as any normal variable would. – **Dave Stevens, Woodley, Stockport.**

```
10  HOME
20  GOSUB 500
30  HCOLOR= 3
40  ROT= 1: SCALE= 1
50  HGR
60  POKE 232,0: POKE 233,96: REM
     -POINT TO SHAPE TABLE
70  DRAW 1 AT 100,100: REM -DRAW
     STATIC SHAPE
80  DRAW 1 AT  PDL (0), PDL (1): REM
     -DRAW MOVEABLE SHAPE
90  VTAB 22
100 CC =  PEEK (234): REM :LOOK A
    T COLLISION COUNTER
105  PRINT CC: REM -DISPLAY COLLI
    SION COUNTER
110  GOTO 50
500  REM     SQUARE GENERATE
510 A = 24576
520  READ B
530  IF B = 999 THEN  RETURN
540  POKE A,B
550 A = A + 1
560  GOTO 520
570  DATA  1,0,4,0,32,36,36,44,54
    ,54,54,37,36,36,44,54
580  DATA  54,54,37,36,36,44,54,5
    4,54,0,0,120,12,0,120,120,12
    0
590  DATA  120,999
```

Micromodeller medicine

OTHER readers of Windfall who use the Micromodeller.program may be interested in two small problems which, thanks to Janette Butler of Intelligence (UK), have been overcome.

The first problem concerns rows which are not named in a logic file but are used for lines like subtotals. In large models in particular garbage names can adhere to these rows, causing string overflows and other crashes. The simple solution is to name all rows used, even if the name is a space.

The second problem was discovered when trying to use a logic file which simply consisted of the logic that "column 14 equalled the first 13 columns." It didn't work properly. What was required was a message as to how big (i.e., rows) the matrix was.

The simple insertion of Row 137 =" before the columnar logic line provided the answer. – **Harold Binley, Deputy Chief Accountant, Bristol United Press, Bristol.**

Taken to Tasc

I READ with some interest Peter Brameld's eulogy on the Tasc compiler (Windfall No. 12, June 1982). Though the author says, "I feel this is one of the best pieces of software I have ever used", I fear that he cannot have used it very thoroughly.

The version I purchased about eight weeks ago has at least one major bug and one minor one.

The major bug is that, despite supposedly being able to make special provision to preserve strings while chaining from one program to another, the feature does not work. In my own case this has involved major changes to a large suite of programs in order that copies of string data could be "hidden" from the runtime system and preserved while chaining.

The minor bug is that the compiler treats both PLOT and XPLOT as XPLOT. – **C.A.G. Webster, Assistant Director (Resources), Teeside Polytechnic.**

● **Peter Brameld replies:** The review encompassed the practical experiences of

two other users in addition to my own, but with a product as complex as this we could not possibly cover every permutation of usage. If Mr Webster would like to give us an annotated example of the problem he encountered we can publish it and await the response of other readers.

With regard to my enthusiasm for the package, I still feel that when compared with similar products, this compiler is, at present, the best available. There is a new version of the Hayden Compiler (DOS 3.3) now available, which I hope to look at in the future.

Educational programs

I READ with interest the article by Cliff and Denise McKnight in the Applecart section of June's Windfall and noted their reservations concerning the educational programs they were reviewing.

I would like to draw their and other readers' attention to programs from Kingfisher Software which I believe they would find better suited to their requirements.

We too have realised the importance of guidance for first time users in interacting with the computer, and include an optional short training session for novices in all programs (with plenty of emphasis on when to press RETURN!)

We also recognise the need for teachers or parents to meet children's individual needs and have allowed as much flexibility as possible in difficulty levels, vocabulary, speed of operation etc, all of which is carefully described in the detailed documentation which accompanies every program. – **Mrs R.E. Lewis, Kingfisher Computer Services, Keynsham, Bristol.**

● Windfall is always happy to receive copies of new software for review purposes. We look forward to trying out Kingfisher's educational programs.

Interest in South Africa

WINDFALL has evoked quite wide interest in the Apple user group of which I am a member. If you would care to send me some extra cards for placing a subscription I shall distribute them among members.

I am interested in the applications of the computer in medicine. The contribution on this subject in the March issue was of great interest.

We have a medical interest group in Johannesburg and would like very much to establish contact with any similar group or groups in the UK. I would be much obliged if you could give me contact addresses. – **F. Gillespie, Marshalltown, South Africa.**

● Any readers wishing to contact Mr Gillespie can write to him at PO Box 62171, Marshalltown 2107, South Africa.

Interest in gubbins

I AM an Apple user with an interest in the gubbins of the machine as well as writing software. I have been intrigued by the diagnostics disc which my supplier flashes whenever my Apple, and those of my friends, falls over (not often, thankfully).

They don't seem to be able to provide me with a copy, though, and I would like to have a little more control over my computer. Is there a similar disc of software available on the commercial market, and, if so, who sells it? **Tony Ward, Croydon.**

● You might try SBD Software of Richmond who sell a disc called 'Brain Surgeon' which might give you what you want.

Interest in interfaces

WINDFALL, and all other computer magazines seems to stop short of information on applications. There's plenty about how Apple programs work, but nothing about how DIY types can find meters, gauges, etc. to feed analogue signals into A/D interfaces. I think it is assumed that people with micros are in two types, idiots who want to play games or use an expensive typewriter and physicists, technologists and BSc. Eng. sorts of people.

May I introduce you to the growing mass of people who build their own house/workshop/farmbuilding and know a bit about many skills and techniques but insufficient about the hardware of control systems.

Can Windfall explain what is wired to what beyond the A/D-D/A interface? There seems to be a danger that the quality of the data processing will be far higher than that of the data itself – **Peter Arnold, Alderney**

● Perhaps Windfall's new series of articles on interrupt handing, which starts on the next page, will be more to Mr Arnold's liking.

Satisfied subscriber

I AM a recent subscriber to Windfall and I just received my first issue. I am very impressed with the quality and the contents of your magazine.

I would like to order all back issues as well as three binders to hold them and all future issues. – **Garo Sirinian, Hacienda Heights, California, USA.**

● This is typical of letters Windfall is receiving from new subscribers in the USA.

Listings available

AS a user of an Apple II in the education field I am very impressed with the articles and particularly the Apple tips which appear in Windfall.

*From recent issues I have found the graphics subroutines by Robert J. Beynon to be especially useful in my work. Unfortunately I have been unable to get the histogram subroutines to work properly. I suspect that this may be due to the printing of the program in the magazine which is not always very clear – for example, BN and BH and * and † are difficult to differentiate between. Is it possible to obtain a listing of these subroutines?*

Also, I wonder if you could help me with the following problem. We have the Appleplot software for our computer but we cannot obtain a printout of the graphs on our IDS 445 Paper Tiger printer. Has any reader solved this problem? – **Roy D. Boylan, principal teacher of mathematics, Buckie High School, Banffshire.**

● We are getting complete listings of Robert Beynon's software, and will send a copy to anyone who writes in asking for one, enclosing a stamped addressed envelope. Regarding the Appleplot software, this has also been done.

It's not rude to interrupt

By Dr JOHN LITTLER
University of Bristol

MANY computer programs fall into two categories, those for which the data needed by the program is fed in with it and those which request data whenever the process is ready for it.

The first corresponds to the old-fashioned concept of batch processing, where data is set up as a stack of cards or in a named file. In Apple Basic this relates to the use of DATA statements, or the requesting of data from a disc file previously prepared.

The second corresponds to the interactive use of a computer, typified by the INPUT statement in Basic, which prompts the operator to take a decision and provide data which may have been chosen in the light of the computer's previous output.

There is, however, a further method of operation, which is to make the computer receptive to input at any time, whether or not it immediately needs the information. Similarly, instead of having to wait before proceeding until a device such as a printer has completed a print, it may be possible to start off a printer operation but then to return to the program before the printing is complete.

This type of asynchronous data transfer, where input and output can be at any convenient speed, can be very efficient, since the computer is not doing anything useful while waiting for the operator to type or the printer to form feed, etc., but it is not apparently possible in many high level programming languages.

Typically in Basic it is not possible to pass on from an INPUT statement until the input is done, and it is not possible even to type in the next command in advance. It is equally difficult to have more than once source of input or destination for output specified at the same time.

However these are not inherent limitations of the 6502 microprocessor but of the software, and it is possible to use asynchronous data transfer techniques provided that appropriate machine-code and hardware provisions can be made for them.

Such techniques are, of course, widely used in the operating systems of large machines, where it is important that input and output are carried out with the minimum load on the CPU, and where a wide variety of inputs may be simultaneously demanding attention. They are absolutely essential in any system involving communications, where unexpected data may be received at any time from remote terminals or other computers.

The other area of use is in the control of equipment which may need a rapid real time response either because if data is not collected it will be lost, or because alarm conditions need action immediately.

All systems to do this have one feature in common – they must suspend the operation of the current program while the new condition is dealt with, after which the original program can be resumed, if desired, without any disturbance other than that it has obviously been slightly delayed.

This is very like the operation of CTRL-C followed by CONT in Basic, by which the operator can interrupt a Basic program, examine values, etc. as required, and then allow it to continue. The CTRL-C operation is, however, rather limited in capability. It is only available from the console keyboard and not even over a remote terminal, and can only occur at one point in each Basic instruction.

A Basic instruction cannot itself be stopped once it has started (try to break into a WAIT which never becomes true, and note the need for RETURN if the instruction is INPUT), and there is no facility for operation in other than immediate mode, since a RUN will destroy the information about the line number at which CTRL-C was detected, and may well corrupt data values anyway.

The interrupt facility provides a more satisfactory answer to this problem, but the information available in the manuals is rather sparse. The only references in the Apple reference manual are on Page 108 (Table 33) which specifies that pins 29 and 30 of the peripheral connector are NMI and IRQ respectively, and in Table 14 (Page 15) where the use of locations $3FB to $3FF are described.

In the table of machine code commands (Appendix A) the instruction CLI has no description given, though its opposite (SEI) is described briefly. Finally and most importantly, there is the listing of the monitor, from which clues can be obtained as to the correct way of using it.

Clearly Apple is not encouraging the user to meddle in this area. The system itself does not use interrupts, though I gather that the Apple III does use them. This may result in it being less easy for the user to gain control of the interrupt in the Apple III, but we shall no doubt find out eventually what is happening there.

As Basic (or for that matter Pascal or Forth) have no facilities for handling interrupts, we have to write machine code to handle them, and it is worth noting that writing machine code routines is rather more difficult and error-prone than writing Basic routines.

There is an additional problem. Routines written to service time-dependent interrupts can often not be operated slowly or stepwise. This makes it very much more difficult to locate and fix their machine code bugs. Indeed machine code debugging aids may well not function correctly or at all on interrupt routines since they may use the same monitor code.

If you have not been totally discouraged by these comments it is now time to explain the operation of an interrupt. The 6502 processor has two input pins labelled NMI and IRQ and these are connected to the appropriate pins on the peripheral slot. Normally these lines are held in a high (inactive) state since they are each connected to +5 v. through a 1k ohm resistor. Once in each machine code instruction the processor checks that they are still high and inactive.

If however a "low" voltage is seen on the IRQ pin or a transition from high to low has occurred on the NMI pin, the processor, instead of carrying out the next instruction in sequence, carries out a special routine. It first stores the address of the next instruction (which was in the internal register called the Program counter) on the stack, followed by the processor status register P.

It then fetches an address from the special location FFFA and FFFB (NMI) or FFFE and FFFF (IRQ) puts it in the program counter, and then fetches and executes the instruction it finds at that address. Both IRQ and NMI act in the same general way, as also does the reset line which is connected to the reset button. The differences are that each has a different special pair of locations (RESET uses FFFC and FFFD), and that there is a priority order between them.

RESET will override NMI, and NMI will override IRQ, while IRQ can be disabled (masked) by the operation of SEI (set interrupt disable) or enabled by CLI (clear interrupt disable).

If a maskable interrupt (IRQ) occurs the processor additionally sets the interrupt disable bit in the status register P *after* the old value has been stored in the stack, so that no further IRQ interrupts can occur until the first has been dealt with. No such protection is available in the NMI line, but of course it has to go high and then low again before a second NMI will be recognised.

It should also be noticed that the

the Apple!

BREAK command (BRK) in the 6502 uses the same hardware location as the IRQ function, so these have to be sorted out from each other in the monitor.

Now all these hardware locations ("vectors") are in ROM, so we still cannot do very much with them, but an examination of the monitor code tells us what is possible.

The simplest is the NMI operation, where the processor is directed to start a program in location $03FB. This should contain a JMP to wherever your machine code to handle the NMI is stored.

IRQ is more complicated since it must first decide that the operation is not BRK. In the process of doing this the monitor stores the old value of the accumulator at ACC ($45), and alters the value in the accumulator. It does an indirect jump to the address stored at $03FE and $03FF, so the user's code must start at the address specified there.

We have nearly got to the place where we can write some code (the interrupt service routine) to carry out the asynchronous transfer we are interested in, but first we must make sure that at the end of it we can return safely to the original program.

The restoration of the status and program counter is easy; a special instruction (RTI) is provided. There is no problem here provided that the interrupt service routine has not inadvertently altered the value of the stack pointer, such as by doing a PUSH without a corresponding PULL.

However in order to do anything useful within the routine some register space must be cleared and subsequently the values restored, and in any case if it is an IRQ routine we must recover the value of the accumulator from ACC.

It might be thought that the routine SAVE and RESTORE in the monitor would be useful for clearing space, but these are a snare and a delusion since they are specifically written for the debug software to use and use special RAM locations. The correct way to do this is to use the stack.

In a IRQ routine there must be a LDA $45 to get the old accumulator value. If this is done at the beginning the registers can be saved as follows and all left clear for use:

```
PHA          save old accumulator
TXA  }
PHA  }       save old X if space needed
TYA  }
PHA  }       save old Y if space needed
```

The reverse sequence should occur at the end of the routine:

```
PLA  }
TAY  }       if Y was saved recover it
PLA  }
TAX  }       if X was saved recover it
PLA          get accumulator back
RTI          final return.
```

The advantage of handling the accumulator value in this way is to avoid trouble if a break command is encountered. The above code will avoid disrupting the program that was interrupted, but will not actually do anything useful.

However a very simple instruction, such as INC $300 (or any other convenient location), could be included and it would then be possible to keep a count of each time the interrupt line is pulled low, in a location which could be examined from Basic (by a Y = PEEK 768). This could for example be the basis of a simple elapsed time clock, if the signal pulling the line low were derived from a crystal oscillator.

The programming of more complicated operations however needs extra care, since one can never know exactly what is happening when the interrupt occurs. In particular the following precautions are needed:

(a) Always ensure the interrupt leaves the stack as it finds it.

(b) Never call subroutine or use sections of code which can also be used by the main program unless you can be absolutely sure they are re-entrant. If it is not, and the main program is using it when it is interrupted, and it has stored data in a temporary RAM location, that data will be overwritten when the IRQ routine uses it.

Most monitor routines (especially I/O routines) are not re-entrant and so should not be used. Do not try to make an interrupt routine write to the screen or read the keyboard using COUT, KEYIN, etc. It may work apparently correctly for a time, but the random nature of interrupts ensures that sooner or later it will not, and an obscure, unreproducable bug will appear.

(c) Any time-dependent code in the interrupted program will be delayed and possibly disrupted. Basic should not have any such code (unless you are unusually sensitive about the pitch of the "bell") but DOS does. The data transfer to and from the disc must occur at a speed compatible with the disc rotation rate, and delays cause I/O errors, and possibly corrupted discs. So do not allow interrupts to occur during DOS operations.

(d) Any machine code routines must be protected from being overwritten by Basic, etc.

From this description it can be seen that in order to service the interrupt the user needs to have in memory a machine code service routine, and the vector at the top of Page 3 must point to it.

In addition, since the Apple normally operates with the interrupt-enable bit off there must be an initiating routine which includes a CLI command which can be called from the main program to turn on the system, and a routine including SEI, RTS reached by a CALL from Basic, and these two routines must be used to turn off interrupt while any disc transfer takes place. The initiating routine might well also set up the vector and prime any interfaces to generate interrupts.

Many of the common interface cards have the capability of generating interrupts on the IRQ line, though often it is necessary to give close attention to the details of the card. For example, the AIO card which has both parallel (6821) and serial (6850) interface chips needs a soldered link completing before it is connected to the IRQ line.

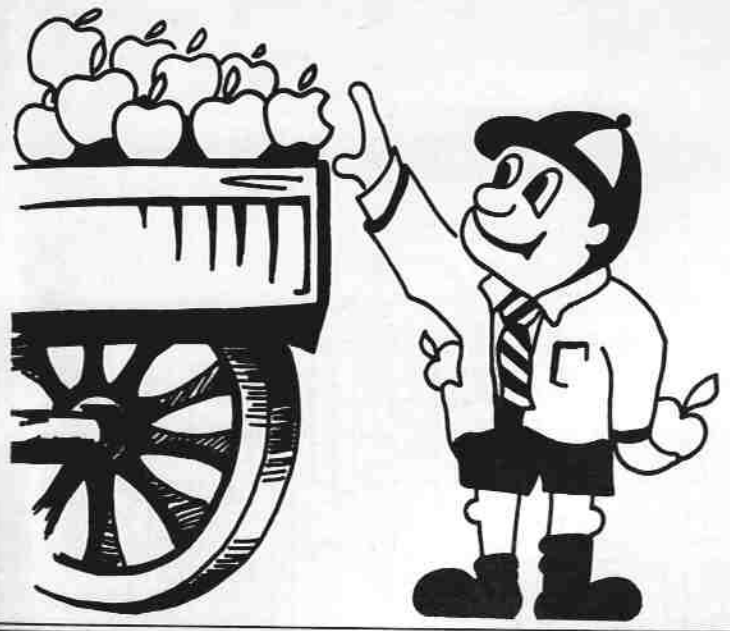
As the interface chip IRQ line is not buffered it is not capable of pulling the IRQ line low because of the small value of the pull-up resistor provided internally on the Apple main board.

The interface chips only have 1 TTL load capability but the line needs a driver which can sink 5 mA. A single transistor can be wired across the link to provide the necessary current gain.

Furthermore these two chips do not actually generate interrupts until their control registers are set up correctly to enable them. This is a common feature and enables several different sources to generate interrupts at different times under software control.

Clearly for an interrupt to occur it must be enabled both at the interface chip and at the processor, and also the external event must be detected by the interface chip. Therefore the inititating routine is also a good place to include the necessary code to set up the interface chips in whatever mode they are being used. But if you are testing an interface do it first, by direct programming without any interrupts, before you try to handle them!

● *Next month Dr Littler will explain in more detail how to go about setting up an asynchronous data transfer using interrupt routines, and will include appropriate listings.*



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Monthly review of Apple in education

Useful school application of Cesil

By Dr D.A. NORTH

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SINCE microcomputers were first introduced into classrooms there has been a need for an implementation of the Cesil language for the teaching of computer studies up to 'O' level. Ideally this implementation would conform closely with the ICL-CES textbook version as this series of textbooks is used by many schools and because in the past many schools have been using ICL mainframes via telephone links. It should also be suitable for pupils to use directly by keying in their own programs from coding sheets (see Fig. 1 for example). This latter point becomes absolutely essential when large classes are involved.

To date the only version of Cesil written for the Apple that I have come across has been one produced by Eugene Evans, published in the Liverpool Software Gazette No. 5* in response to an earlier article by Dave Straker. These two articles between them provide a useful insight into the language itself, and I recommend anyone wishing to gain a further understanding of Cesil to read them.

The implementation produced by Mr Evans, written in Basic, while perfectly acceptable in its own right, appears to have several shortcomings with regard to its use in a classroom situation. After using the program for a short time I found these shortcomings became more apparent, so I set about modifying it to suit my own needs. The alterations, ranging from minor syntax changes to major redesign of program sections, have resulted in an implementation of Cesil which bears little resemblance to the original, but which I find is much more suitable for classroom situations and for direct use by the pupils.

I will therefore devote the rest of this article to a description of the program, its operation principles and its use.

The program is written in Applesoft Basic, using DOS 3.3 and a 48k Apple. It is approximately 10k in length (of which some 3k is taken up by integral REM statements – hopefully enabling easy modification where necessary). The program is command mode driven, i.e. the screen prompt requests an actual command to be typed in.

On switching on a turnkey system brings the program up and running immediately – the first screen of information (Fig. 2) showing a summary of the acceptable commands and requesting one. If the user's command is not recognised it is rejected (politely) and another command requested. Three consecutive wrong commands automatically returns the screen to the format shown in Fig. 2 to show details of acceptable commands. The acceptable commands and their effects are:-

1. LOAD RTN first checks that no Cesil program is already in memory, then requests a program title. Once this is entered the screen changes to a format looking very similar to the standard Cesil coding sheet, enabling the program to be typed in directly one line at a time. A crash-proofing routine here prevents over-running onto the next column, or backspacing beyond the column being entered. Another subroutine allows skipping up or down one line for editing purposes.

A typical example of the screen showing a partially entered programme is shown in Fig. 3. On reaching the bottom line the screen scrolls up one line at a time, thus allowing continued program entry to a maximum of 100 lines. Program entry can be terminated by ESC at any time, by * if no data is required, or by % if data is to be entered. The latter method allows data entry which must finally be terminated by an *. These methods are obvious, I hope, on comparison with an accurate

→

* *Copies of Liverpool Software Gazette No. 5 are available, Price £1.25, from Database Publications, Europa House, 68 Chester Road, Stockport SK7 5NY.*

reading of a standard Cesil coding sheet.

2. LIST RTN will cause any Cesil program in memory to be listed one screenful at a time (RTN giving the next 'page'), the last page showing any data that is present. Here also an editing feature is included to skip up the currently shown page for editing using '<' or '>' for up or down one line at a time.

3. LISTP RTN will list the currently shown program and data from start to finish in one operation directly on a printer for hard copy.

4. RUN RTN will do the following using the screen for output:-

a. Clear the screen
b. Print the programme title
c. Run the programme
d. Print a 'finished' message
e. Return to the "next command" prompt.

5. RUNP RTN will mimic the above but using the printer as the output device.

6. CLEAR RTN will clear any Cesil program currently in memory. This is necessary before any further programs are typed in.

7. SAVE EG RTN will cause the current Cesil program to be saved on disc as a text file named (in this case) EG. The name under which the program is saved does not therefore have to be the same as the original program title.

8. CAT RTN will catalogue the disc currently in use.

9. LOAD EG RTN will first check that no Cesil program is resident in memory then load the named Cesil program from disc into memory.

10. OP RTN will list the set of operations (or statements as they are often called) that are allowed in Cesil programs, along with a summary of their effects. This summary is necessarily brief but is a useful 'memory jogger'.

11. RTN will act as a "help" command and return the screen to its original format showing the acceptable commands.

12. BASIC RTN will return the machine to Basic language.

I have deliberately omitted commands such as "delete" to protect both the pupil's programs and the Cesil disc itself, although any of these can readily be removed via Basic.

After using the version of Cesil described here for a while I then decided to include another utility command. This is the<ESC>command, which will cancel almost any process at any time and return the machine to the 'next command' prompt. This latest addition has proved most useful in recovering from a variety of infinite loops and similar "program hangers".

Future developments of Cesil should include a graphical option to enable "dry runs" or programs on the screen showing the contents of any memory locations in use and the accumulator and, hopefully, a machine code compiler to demonstrate the true speed of a language which is really very closely related to machine code.

These developments should be available by the autumn, time permitting . . . unless of course someone else wants to have a go!

I would like to point out that although Cesil appears to be a dying language in the opinion of some examining bodies, I feel that it is worthy of a permanent place, even if only to provide an introduction to the otherwise incomprehensible world of machine code programming. This particular evil is probably here to stay, and from a pupil's point of view one definitely needs a "preparatory buffer" before embarking on a study of machine code. It is here that Cesil comes into its own.

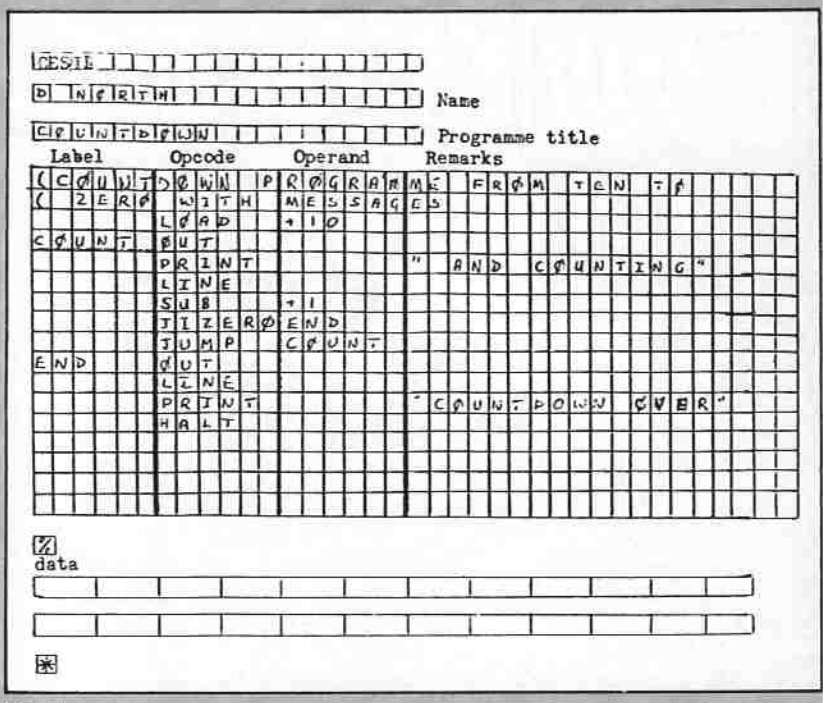

Fig 1

```
        CESIL COMPILER
        --------------
  THE FOLLOWING COMMANDS ARE AVAILBLE

 DIRECT COMMANDS
 ---------------

 LOAD       (TO LOAD FROM KEYBOARD)
 RUN        (TO RUN CURRENT PROGRAMME)
 LIST       (TO LIST CURRENT PROGRAMME)
 CLEAR      (CLEARS CURRENT PROGRAMME)
 ?          (GIVES CESIL INSTRUCTIONS)
 ESC        (ESCAPES & RETURNS TO C> PROMPT

 COMMANDS AFFECTING DISCS
 ------------------------

 CAT                    (CATALOGS A DISC)
 LOAD <PROG NAME>       (LOADS NAMED PROG)
 SAVE <PROG NAME>       (SAVES CURRENT PROG.)


 NEXT COMMAND PLEASE
 C>
```

Fig 2

```
        LABEL  :OPCODE:OPRAND:     REMARKS        :
        =======:======:======:====================:
        ( COUNTDOWN PROGRAMME
        (
               :LOAD  :+10   :
        COUNT  :OUT   :       :
               :PRINT :       :" AND COUNTING"
               :SUB   :+1     :
               :LINE  :       :
               :JIZERO:END    :
               :JUMP  :COUNT  :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
               :      :       :                    :
        USE '<' OR '>' TO EDIT
```

Fig 3

```
0  ONERR  GOTO 9000
10  GOTO 7005
20  REM ******MEMORY LOCATING SUB
    ROUTINE*****
22  REM  A$ HERE IS FIRST CHAR. O
    F OPERAND
25  IF A$ = "" THEN 666: REM  ERR
    OR
30  IF  ASC (A$) < 65 OR  ASC (A$
    ) > 90 THEN 667: REM  ERROR
35  FOR I = 1 TO N
40  IF M$(I) = OPD$(PC) THEN  RETURN
45  NEXT I
48  IF B$ = "STO" THEN I = I + 1:
    RETURN
50  GOTO 668: REM  ERROR
100 J$ = "": REM ***INPUT SUBROUT
    INE****
105  GET A$
106  IF A$ =  CHR$ (27) THEN 810:
    REM  ESCAPE
110  IF A$ = ">" THEN 190: REM  D
    OWN ONE LINE
115  IF A$ = "<" AND  PEEK (37) =
    2 THEN 105
120  IF A$ = "<" THEN PC = PC - 1
    : VTAB ( PEEK (37)): RETURN
    : REM   UP CURSOR
125  IF A$ <  >  CHR$ (13) THEN 1
    40
130  FOR I = 1 TO (L -  LEN (J$))
    : PRINT " ";: NEXT I
135  RETURN
140  IF A$ =  CHR$ (8) THEN 170 REM
     BACK ARROW
145  IF  LEFT$ (J$,1) = "(" THEN
    L = 38: REM   REMARK CAN USE
    WHOLE LINE
150  IF  LEN (J$) = L THEN 105 REM
     RESTRICT LENGTH
155  PRINT A$;
160 J$ = J$ + A$
165  GOTO 105
170  IF J$ = "" THEN 105
175  IF  LEN (J$) = 1 THEN J$ = "
    ": GOTO 185
180 J$ =  LEFT$ (J$,( LEN (J$) -
    1))
185  HTAB ( PEEK (36)): GOTO 105:
    REM  BACK CURSOR
190  PRINT
195  IF  PEEK (37) = 22 THEN  HTAB
    (1): GOTO 1580: REM   BOTTOM
    OF PAGE
200 PC = PC + 1
205  RETURN
210  REM **** RUNNER ROUTINE ****
    *
215  CALL  - 936:DP = 1:PC = 0: REM
     CLEAR SCREEN, SET DATA & PR
    OG COUNTER
220  PRINT PROG$;"                <P
    ROGRAMME RUN>"
222 N = 0: REM  NO NAMED MEMORIES
    (YET)
225  PRINT
230  REM ******ROUTE INSTRUCTION*
    ****
235 PC = PC + 1
240 V = 0: REM  OPERAND TYPE
245  IF  PEEK ( - 16384) > 127 THEN
     GET A$: IF A$ =  CHR$ (27) THEN
    810: REM   ESCAPE
250  IF  LEFT$ (L$(PC),1) = "(" THEN
    235
255 B$ =  LEFT$ (ST$(PC),3):A$ =
     LEFT$ (OPD$(PC),1)
260  IF A$ = "+" OR A$ = "-" THEN
    V = 1:VO =  VAL (OPD$(PC)): GOTO
    265: REM  VALUE IN OPERAND
265  IF B$ = "NOP" THEN 235
270  IF B$ = "HAL" THEN  PRINT : PRINT
    : PRINT "    <END OF RUN>": GOTO
    810
275  IF B$ = "LIN" THEN  PRINT : GOTO
    235
280  IF ST$(PC) = "IN" THEN 365
285  IF B$ = "OUT" THEN 390
290  IF B$ = "PRI" THEN 620
295  IF B$ = "STO" THEN 430
300  IF B$ = "LOA" THEN 410
305  IF B$ = "ADD" THEN 455
310  IF B$ = "SUB" THEN 480
315  IF B$ = "MUL" THEN 505
320  IF B$ = "DIV" THEN 530
325  IF B$ = "JUM" THEN 565
330  IF B$ = "JIN" THEN 558
335  IF B$ = "JIZ" THEN 562
340  IF B$ = "RES" THEN DP = 1: GOTO
    235
345  GOTO 695: REM  ERROR
355  REM ******FOLLOW INSTRUCTION
    *****
360  REM ********IN******
365  IF DP > ED THEN 670
370 AC = D(DP)
375 DP = DP + 1: IF DP > 40 THEN
    1445
380  GOTO 235
385  REM ****OUT*****
390  IF AC < 0 THEN  PRINT  TAB(
     PEEK (36) + 9 -  INT ( LOG
    ( ABS (AC)) / 2.30258509))AC
    ;: GOTO 235
395  IF B$ = "STO" THEN 435
400  PRINT  TAB(  PEEK (36) + 10 -
     INT ( LOG (AC) / 2.30258509
    ))AC;: GOTO 235
405  REM ********LOAD********
410  IF V THEN AC = VO: GOTO 235
415  GOSUB 25
420 AC = M(I)
425  GOTO 235
430  REM ********STORE**********
435  GOSUB 25: REM  CHECK IF MEM
    EXISTS
436  IF I > N THEN N = I:M$(I) =
    OPD$(PC): REM  NEW MEMORY
440 M(I) = AC
445  GOTO 235
450  REM **********ADD***********
455  IF V THEN AC = AC + VO: GOTO
    235
460  GOSUB 25
465 AC = AC + M(I)
470  GOTO 235
475  REM *****SUBTRACT******
480  IF V THEN AC = AC - VO: GOTO
    235
485  GOSUB 25
490 AC = AC - M(I)
495  GOTO 235
500  REM ****MULTPLY*****
505  IF VO THEN AC = AC * VO: GOTO
    235
510  GOSUB 25
515 AC = AC * M(I)
520  GOTO 235
525  REM ***DIVIDE******
530  IF V AND  NOT VO THEN 675
535  IF VO THEN AC = AC / VO: GOTO
    235
540  GOSUB 25
545  IF M(I) = 0 THEN 675
550 AC =  INT (AC / M(I))
555  GOTO 235
557  REM  ********JIN********
558  IF AC < 0 THEN 565
559  GOTO 235
560  REM ******** JIZ ******
562  IF AC <  > 0 THEN 235
564  REM ******* JUMP ******
565  FOR I = 1 TO EP
570  IF L$(I) = OPD$(PC) THEN 590
575  NEXT I
580  GOTO 680
590 PC = I
595  GOTO 240
600  REM ****JUMP IF NEG******
605  IF AC < 0 THEN 560
610  GOTO 235
615  REM ******PRINT*******
620  IF  LEFT$ (RE$(PC),1) =  CHR$
     (34) AND  RIGHT$ (RE$(PC),1)
     =  CHR$ (34) THEN 635
625  GOTO 690: REM ERROR
635 I =  LEN (RE$(PC)) - 2
640  PRINT  MID$ (RE$(PC),2,I);
645  GOTO 235
665  REM ***** ERROR MESSAGES ***
    ****
666  PRINT : PRINT "*** MISSING O
    PERAND, LINE "PC" ***": POP
    : GOTO 810
667  PRINT : PRINT "*** ILLEGAL O
    PERAND, LINE "PC" ***": POP
    : GOTO 810
668  PRINT : PRINT "*** MEMORY ";
    OPD$(PC);" (LINE ";PC;") NOT
     FOUND ***": POP : GOTO 810
670  PRINT : PRINT "*** PROGRAMME
     REQUIRES MORE DATA***": GOTO
    810
675  PRINT : PRINT "*** DIVISION
    BY ZERO ERROR ***": GOTO 810
680  PRINT : PRINT "*** LABEL '"O
    PD$(PC)"' NOT FOUND ***": GOTO
    810
685  PRINT : PRINT "*** PROGRAMME
     ALREADY PRESENT ***": GOTO
    810
690  PRINT : PRINT " " *  *  * MI
    S SIN GQUOT AT I ON MARKS,LI
    NE"PC" *  *  * ":GOTO810
695  PRINT : PRINT "***ILLEGAL ST
    ATEMENT, LINE "PC" ***": GOTO
    810
800  REM ****COMMAND ACCEPT ROUTI
    NE ********
805  REM *****RESET SCREEN ETC **
    *
810  POKE 34,0: POKE 35,24: REM
    FULL SCREEN
815  SPEED= 255
820  CALL  - 958: PRINT
825  REM *** GET COMMAND *****
830  PRINT
832  PRINT "NEXT COMMAND PLEASE"
835  INPUT "C>";T$
840  IF T$ = "CLEAR" THEN 8005
845  IF T$ = "LOAD" THEN 1005
850  IF T$ = "RUN" THEN 215
855  IF T$ = "RUNP" THEN  PRINT D
    $"PR#1": GOTO 215
860  IF T$ = "LIST" THEN 1505
865  IF T$ = "LISTP" THEN 1805
870  IF T$ = "CAT" THEN 4005
875  IF T$ = "END" THEN  END
880  IF T$ = "?" THEN 7025
885  IF T$ = "OP" THEN 5005
890  IF  LEFT$ (T$,5) = "LOAD " THEN
    3005
895  IF  LEFT$ (T$,5) = "SAVE " THEN
    2009
896  IF T$ = "SAVE" THEN 2001
897  IF T$ = "GRUN" THEN  PRINT D
    $"RUN SCREEN"
900  INVERSE : PRINT : PRINT "COM
    MAND NOT RECOGNISED";: NORMAL
905 WR = WR + 1: REM  WRONG(AGAIN
    )
910  IF WR >  = 3 THEN 7025
915  GOTO 810
1000  REM ****** LOAD ROUTINE ***
    ******
1005  IF EP THEN 685: REM  PROG A
    LREADY PRESENT
1006  HOME : PRINT "PLEASE TYPE T
    HE TITLE OF YOUR PROGRAMME "
    ;: INPUT PROG$
1010  CALL  - 936
1015  VTAB (1): HTAB (1)
1020  PRINT "LABEL :OPCODE:OP'AND
    '       REMARKS"
1025  PRINT "======:======:======
    :================:"
1030  FOR I = 1 TO 20
1035  PRINT "      :      :
    :                :"
1040  NEXT I
1045  PRINT : PRINT "USE < OR'>'T
    O EDIT";
1050  POKE 35,23
1055  POKE 34,2: VTAB (3): HTAB (
    1)
1060  IF T$ = "LIST" THEN  RETURN
1065 PC = 0:N = 0
1070 PC = PC + 1
1075 L = 6: REM  MAX LENGTH OF LA
    BEL ETC
1080  REM **** GET LABEL ********
1085  HTAB (1): GOSUB 100
1090  IF A$ = "<" OR A$ = ">" THEN
    1085
1095 L$(PC) = J$
1100  IF  LEFT$ (J$,1) = "(" THEN
    PRINT : GOTO 1070
```

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```
1105  IF J$ = "%" THEN EP = PC: GOTO
      1235: REM  END OF PROG, DATA
      TO FOLLOW
1110  IF J$ = "*" THEN EP = PC: GOTO
      810: REM     END OF PROG, NO
      DATA
1115  REM **** GET STATEMENT ****
1120  HTAB (8): GOSUB 100
1125  IF A$ = "<" OR A$ = ">" THEN
      1085: REM  EDIT
1130  IF J$ = "" THEN J$ = "NOP"
1135 ST$(PC) = J$
1140  REM **** GET OPERAND ******

1145  HTAB (15): GOSUB 100: REM
      GET OPERAND
1150  IF A$ = "<" OR A$ = ">" THEN
      1085
1155 OPD$(PC) = J$
1175  REM ***** GET REMARK ******

1180 L = 18: REM   MAX LENGTH OF
      REMARK
1185  HTAB (22): GOSUB 100: REM
      GET REMARK
1190  IF A$ = "<" OR A$ = ">" THEN
      1085
1195 RE$(PC) = J$
1200  PRINT
1210  GOTO 1070
1215  PRINT : PRINT
1220  PRINT "NO MORE MEMORY LEFT"
1225  GOTO 810
1230  REM ******DATA INPUT ROUTIN
      E *******
1235  POKE 35,24
1240  CALL  - 958
1245  PRINT
1250  PRINT "DATA ";
1255  FOR DP = 1 TO 50
1260  INPUT A$
1265  IF A$ = "*" THEN ED = DP -
      1: GOTO 810
1270  IF  NOT  VAL (A$) AND A$ <
      > "0" THEN  PRINT "NOT ACCE
      PTED": GOTO 3060
1275 D(DP) =  VAL (A$)
1280  NEXT DP
1285  FOR I = 1 TO 20: PRINT : NEXT
      I
1290  GOTO 3060
1500  REM ****LIST ROUTINE****
1505  IF L$(1) = "" AND ST$(1) =
      "" THEN  PRINT : PRINT "NO P
      ROGRAMME IN MEMORY": GOTO 81
      0
1510  GOSUB 1010: REM  SET SCREEN
1515 PG = 0
1520 PG = PG + 1: REM  PAGE NUMBE
      R
1525  IF PG > 5 THEN  PRINT "NO M
      ORE PAGES AVAILABLE": GOTO 8
      10
1530  FOR PC = (PG - 1) * 20 + 1 TO
      PG * 20: REM  LIST ONE PAGE
1535  PRINT L$(PC);
1540  IF L$(PC) = "%" THEN  PRINT
      " (DATA ON NEXT PAGE)";
1545  HTAB (8): PRINT ST$(PC);
1550  HTAB (15): PRINT OPD$(PC);
1555  HTAB (22): PRINT RE$(PC)
1560  NEXT PC
1570  VTAB (24)
1575  PRINT "'<'OR'>'TO EDIT,<RET
      URN> FOR NEXT PAGE";
1580  VTAB (23): HTAB (1): REM  P
      OSITION CURSOR
1585  GET A$: REM  WHAT NEXT ?
1590  IF A$ =  CHR$ (27) THEN 810
      : REM   ESCAPE
1595  IF A$ =  CHR$ (13) AND L$(E
      P) = "%" AND PC >  = EP THEN
      1625: REM  LAST PAGE, DATA N
      EXT
1600  IF A$ =  CHR$ (13) THEN  PRINT
      : GOTO 1520
1605  IF A$ <  > "<" THEN 1585: REM
       ANSWER NO GOOD,GET ANOTHER
1610  HTAB (1): CALL  - 958
1615 PC = PC - 1
1620  VTAB (22): GOTO 1075
1625  REM ******DATA LIST ROUTINE
      *******
1630  POKE 34,0: REM  TOP MARGIN
      SCROLL
1635  PRINT "     DATA"
1640 J$ = ""
1645 PG = 0
1650 PG = PG + 1
1655  IF PG > 2 THEN 1685
1660  FOR I = (PG - 1) * 20 + 1 TO
      PG * 20
1665  PRINT "     ";D(I)
1670  IF I > 39 THEN  PRINT "END
      OF DATA": GOTO 1685
1675  NEXT I
1680  PRINT
1685  REM  *****WHAT NEXT ? ****
1690  GET A$
1695  IF A$ =  CHR$ (13) THEN 1650
1700  IF A$ =  CHR$ (27) THEN 810
      : REM  ESCAPE
1705  IF A$ = "<" THEN 1715: REM
      CHANGE DATA
1710  GOTO 1690
1715  VTAB (23): HTAB (1): CALL  -
      958
1720 I = PG * 20: REM  SET I
1725  VTAB (21): HTAB (6): REM  P
      OSN CURSOR
1730 J$ = ""
1732  REM  ****** DATA EDITING **
      ********
1735  GET A$
1740  IF  VAL (A$) OR A$ = "0" OR
      A$ = "-" THEN  PRINT A$;:J$ =
      J$ + A$: GOTO 1735
1745  IF A$ = "<" AND I = (PG - 1
      ) * 20 + 1 THEN 1735
1750  IF A$ = "<" THEN  VTAB ( PEEK
      (37)):I = I - 1: GOTO 1735
1755  IF A$ = ">" THEN 1770
1758  IF A$ <  >  CHR$ (13) THEN
      1735
1760 D(I) =  VAL (J$): REM  NEW D
      ATA VALUE
1762  CALL  - 868
1765  GOTO 1735
1770  IF I = PG * 20 THEN  HTAB (
      1): VTAB (23): GOTO 1685
1775 I = I + 1: VTAB ( PEEK (37) +
      2):: HTAB (6):: GOTO 1730
1800  REM ****** LIST ON PRINTER
      ******
1805  PRINT D$"PR£1"
1806  PRINT : PRINT : PRINT : PRINT
      PROG$
1810  FOR I = 1 TO EP
1820  PRINT L$(I),ST$(I),OPD$(I),
      RE$(I)
1825  IF L$(I) = "%" THEN 1850
1830  NEXT I
1850  PRINT : PRINT "DATA  ";
1860  FOR I = 1 TO ED
1870  PRINT D(I)", ";
1880  NEXT I
1890  PRINT : PRINT D$"PR£0": GOTO
      810
2000  REM ****SAVE ON DISC*******
2001  HOME : PRINT "THE PROGRAMME
      TITLE IS"
2002  PRINT : PRINT "     "PROG$
2003  PRINT : PRINT "PRESS <RTN>
      TO SAVE THE PROGRAMME, OR
      TYPE A NEW NAME HERE"
2004  PRINT : INPUT "     ";A$
2005  IF A$ = "" THEN 2010
2006 PROG$ = A$: GOTO 2001
2009 PROG$ =  RIGHT$ (T$,( LEN (T
      $) - 5))
2010  INVERSE : PRINT : PRINT  TAB(
      14)"WRITING "PROG$: NORMAL
2012  PRINT D$;"OPEN";PROG$
2015  PRINT D$;"DELETE";PROG$
2020  PRINT D$;"OPEN";PROG$
2025  PRINT D$;"WRITE";PROG$
2030  FOR X = 1 TO 100
2035  PRINT L$(X)
2040  IF L$(X) = "%" THEN 2060
2045  IF L$(X) = "*" THEN 2080
2050  PRINT ST$(X): PRINT OPD$(X)
      : PRINT RE$(X)
2051  IF  LEFT$ (RE$(X),1) =  CHR$
      (34) THEN  PRINT "1": GOTO 2
      053
2052  PRINT "0"
2053  IF  RIGHT$ (RE$(X),1) =  CHR$
      (34) THEN  PRINT "1": GOTO 2
      055
2054  PRINT "0"
2055  NEXT X
2060  PRINT ED
2065  FOR X = 1 TO ED
2070  PRINT D(X)
2075  NEXT X
2080  PRINT D$;"CLOSE";PROG$
2082  PRINT : PRINT "  FINISHED"
2085  GOTO 810
3000  REM ******LOAD FROM DISC***
3005  POKE 34,0
3010  CALL  - 936
3015 PROG$ =  RIGHT$ (T$,( LEN (T
      $) - 5))
3020  VTAB (10): PRINT "    LOADI
      NG PROGRAMME"
3025  PRINT : HTAB (8): INVERSE :
      PRINT PROG$: NORMAL
3030  PRINT D$;"OPEN";PROG$
3035  PRINT D$;"READ";PROG$
3040  FOR X = 1 TO 100
3045  INPUT L$(X)
3050  IF L$(X) = "%" THEN EP = X:
      GOTO 3070
3055  IF L$(X) = "*" THEN EP = X:
      GOTO 3090
3060  INPUT ST$(X): INPUT OPD$(X)
      : INPUT RE$(X)
3061  INPUT S: INPUT F
3062  IF S THEN RE$(X) =  CHR$ (3
      4) + RE$(X)
3063  IF F THEN RE$(X) = RE$(X) +
      CHR$ (34)
3065  NEXT X
3070  INPUT ED
3075  FOR X = 1 TO ED
3080  INPUT D(X)
3085  NEXT X
3090  PRINT D$;"CLOSE";PROG$
3095  VTAB (10): PRINT "
3100  VTAB (14): PRINT  TAB( 8)"D
      ONE"
3105  GOTO 810
4000  REM ****CATALOG A DISC*****
      **
4005  POKE 34,0
4010  CALL  - 936
4025  PRINT D$;"CATALOG,D";X
4030  GOTO 810
5000  REM *****INSTRUCTION SET **
      ****
5005  CALL  - 936
5010  INVERSE : PRINT "******* SU
      MMARY OF CESIL OPCODES******
      *": NORMAL
5015  PRINT "OPCODE.              E
      FFECTS"
5020  PRINT "=======              =
      ======="
5025  PRINT "NOP.....NO OPERATION"
5030  PRINT "IN......READS NEXT D
      ATA ITEM FROM LIST"
5035  PRINT "OUT.....PRINTS ACCUM
      ULATOR VALUE"
5040  PRINT "LOAD....LOADS ACCUMU
      LATOR"
5045  PRINT "STORE...COPIES ACCUM
      ULATOR INTO MEMORY"
5050  PRINT "ADD.....ADDS VALUE T
      O ACCUMULATOR"
5055  PRINT "SUB.....SUBTRACTS VA
      LUE FROM ACCUMULATOR";
5060  PRINT "MULT....MULTIPLIES A
      CCUMULATOR BY VALUE"
5065  PRINT "DIV.....DIVIDES ACCU
      MULATOR BY VALUE."
5070  PRINT "JUMP....JUMPS TO LAB
      EL"
5075  PRINT "JIZERO..JUMPS TO LAB
      EL ONLY IF ACC' = 0"
5080  PRINT "JINEG...JUMPS TO LAB
      EL ONLY IF ACC' < 0"
5085  PRINT "PRINT...PRINTS THE R
      EMARK FOUND ON THE
        SAME PROGRAM LINE"
5090  PRINT "LINE....CAUSES NEXT
      OUTPUT ON NEW LINE"
5095  PRINT "HALT....CAUSES PROGR
      AM EXECUTION TO STOP";
```

→

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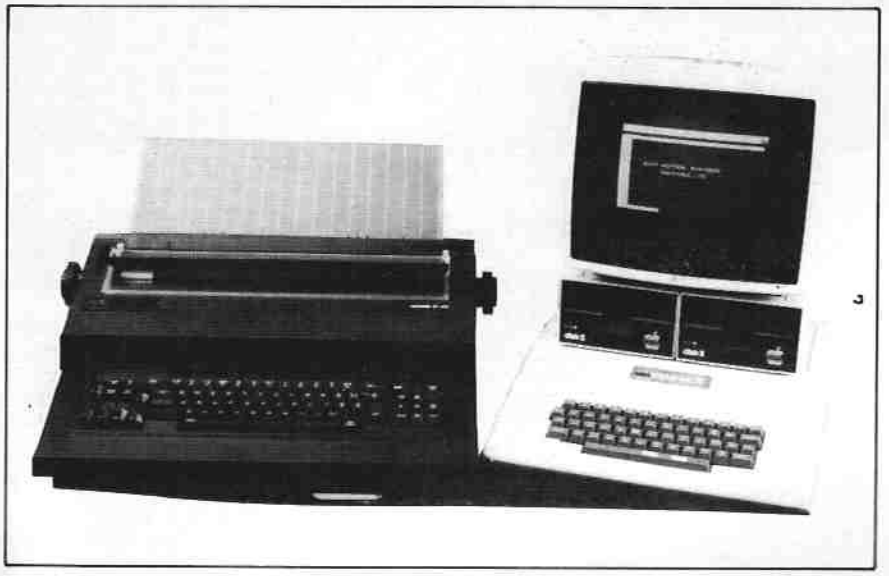

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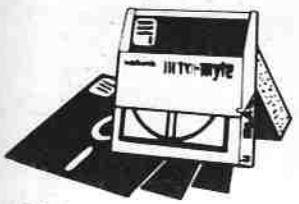

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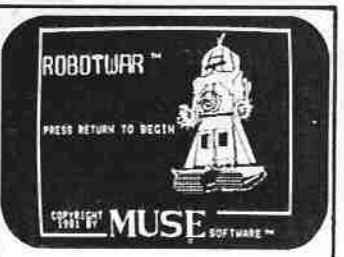

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AS more and more Apple computers are used in the home, for educational use or as games playing machines, it is inevitable that younger children will want to use them. Here is the story of one such child.

Computer aid to concentration

By JEFF TURNER

MICHAEL has had two years experience of microcomputers, starting with the Tandy TRS-80 and working through the Commodore Pet, Sharp MZ-80K to the Apple II. And Michael is only five years old.

His first experience on a micro was playing a game, a very good way to introduce a child to such a complex machine. The controls were kept very simple, using only SPACE and RETURN, so that the manipulations required to operate the program were at a minimum level.

He has now reached the stage where he can operate matrix maze games, word copying programs, number guessing programs and games such as Raster Blaster and Falcons. Even though the games themselves are quite tricky he can achieve a respectable score (sometimes even beating me!).

One of the reasons for Michael's appreciation of the Apple II is that he is allowed to use the computer with only the minimum of supervision. This not only increases his self-confidence, with the responsibility for the proper use of the computer resting on his shoulders, but it has allowed him to have more time on the computer. The system he uses is an Apple II with two discs and a 12in green monitor.

Having previously used other micros, and my electric typewriter, Michael is conversant with the QWERTY style of keyboard and understands that the RETURN key is needed to make the computer respond.

He had not used discs before using the Apple but soon realised that he could change programs very easily and the programs would load quickly. After having a short lecture on the use of discs I gingerly watched as he attempted his first system boot-up. Amazingly, he got it right first time. This taught me not to underestimate the speed with which young children can learn when they really put their minds to it.

While allowing Michael to operate the system on his own I am always near at hand to aid his attempts at answering questions and coping with new situations. (The keyboard operation is under Michael's control – the mental work is shared.)

My aim in allowing Michael to use the Apple is to help him, and hopefully his brother David, to become computer literate. I do not try to push Michael beyond his capabilities, rather to expand on his ability to manipulate the keyboard, test his reading skill and numeracy.

Why does he prefer the Apple II? It has many advantages when used as a teaching aid for younger children, some of which contribute to Michael's liking of the machine.

The ability to create high resolution shapes on the screen is probably the major benefit. Manipulation of graphics ensures that the concentration of the child is held as long as possible. Michael will concentrate on the screen for up to seven or eight minutes at a time, quite a high degree of concentration for a five year old.

Boredom is a killer, so I try to use a range of graphics in a program, moving men, animals, etc., and this keeps Michael's attention right through. Sometimes he will work with one program for half an hour before becoming bored with it. Usually when this happens he is rewarded with a game-playing session of five to ten minutes.

Alternating between the use of paddles and the use of keyboard also helps to prevent a "keyboard block". When using the other computers Michael would lose interest in the computer because he had to stay with keyboard operation at all times. If this had continued he would have reached a stage where he would not want to use any computer, regardless of the appeal of the programs.

Because the games paddles are easy to operate, one hand turning the paddle and one hand operating the button, the length of time using the computer has increased dramatically. One of the benefits of this mode of operation is that the software does not have to be virtually automatic and Michael has a reasonable amount of program control.

I should mention at this point that I am an exponent of games playing. The child is not only developing physical skills and coordination skills, but is developing an awareness of interactions, role playing and concentration. I believe that the concentration that Michael shows when reading his school books has been aided by his use of the computer.

Now that Michael has been introduced to Pilot and colour he wants to spend even more time with the Apple.

Using colour recognition in counting programmes has opened up a new dimension for him.

```
5100  INVERSE : PRINT "**********
      **********************************
      **";: NORMAL
5105  GOTO 810
6000  REM *****LIST ON PRINTER***
      **
6005  PR£ 1: PRINT : PRINT : PRINT

6010  PRINT PROG$;"  <PROGRAMME L
      IST>"
6015  FOR X = 1 TO 100
6020  PRINT L$(X),ST$(X),OPD$(X),
      RE$(X)
6025  IF L$(X) = "%" THEN 6040
6030  IF L$(X) = "*" THEN 6065
6035  NEXT X
6040  PRINT "DATA ";
6045  FOR X = 1 TO ED
6050  PRINT D(X);
6055  PRINT ",";
6060  NEXT X
6065  PR£ 0: GOTO 810
7000  REM   *** INITIALIZATION  *
      **
7005  DIM L$(100): DIM D(40): DIM
      ST$(100): DIM RE$(100): DIM
      OPD$(100)
7010  POKE 34,0: POKE 35,24: REM
      FULL SCREEN
7015  DIM M(50): DIM M$(50):D$ =
      CHR$ (4)
7020  REM ******** COMMANDS *****
      ****
7025  HOME : HTAB (12): INVERSE :
      PRINT "CESIL COMPILER": NORMAL

7030  FOR I = 1 TO 500: NEXT I
7035  PRINT "THE FOLLOWING COMMAN
      DS ARE AVAILABLE"
7040  FOR I = 1 TO 200: NEXT I
7045  SPEED= 200: PRINT : PRINT "
      DIRECT COMMANDS"
7050  PRINT "----------------"
7055  PRINT : PRINT "LOAD     (TO
      LOAD FROM KEYBOARD)
7060  PRINT "RUN      (TO RUN CURR
      ENT PROGRAMME)"
7065  PRINT "LIST     (TO LIST CUR
      RENT PROGRAMME)"
7070  PRINT "CLEAR    (CLEARS CURR
      ENT PROGRAMME)
7075  PRINT "OP       (GIVES SUMMA
      RY OF OPCODES)"
7080  PRINT "?        (GIVES OPERA
      TING INSTRUCTIONS"
7085  PRINT "<ESC>    (ESCAPES & R
      ETURN TO C> PROMPT";
7090  PRINT
7095  PRINT : PRINT "COMMANDS AFF
      ECTING DISCS"
7100  PRINT "----------------------
      ----"
7105  PRINT
7110  PRINT "CAT
      (CATALOG A DISC)
7115  PRINT "LOAD <PROG NAME>
      (LOADS NAMED PROG."
7120  PRINT "SAVE <PROG NAME>
      (SAVE CURRENT PROG"
7125 WR = 0: REM  RESEST 'WRONGS'

7130  GOTO 810
8000  REM ***** CLEAR ROUTINE ***
      ****
8005  CALL  - 936: VTAB (10): HTAB
      (5)
8010  PRINT "CLEARING EXISTING PR
      OGRAMME"
8015 A$ = ""
8020  FOR X = 1 TO 100
8025 L$OP"
1135 ST$(PC) = J$
```

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II. STORAGE METHOD & RETRIEVAL TIMES:

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* Up to 39 characters per field
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* up to 39 screen pages per record
* Maximum of 2800 records per diskette (depending on the size of the records)
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V. SYSTEM REQUIREMENTS:

1. Apple II Plus 48K
2. 1 or 2 disk drives (2 recommended)
3. DOS 3.3 Disk Operating System
4. ACCESS supports most makes of printers (special control characters may be sent to the printer as required)
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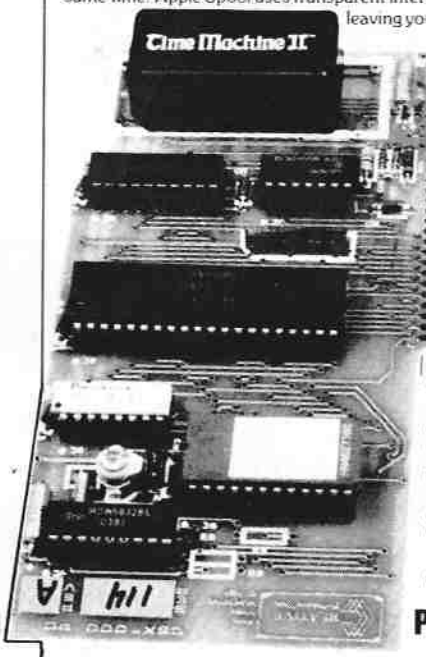

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ABC of the apple

Applesoft. A version of Basic used on the Apple which contains numbers stored in floating point notation.
Application. Software developed for the Apple to do a specific task.
A/D Converter. A device (interface card or chip) which is used to convert analog signals into digital format.
Acoustic Coupler. Links the Apple to standard telephones to enable a communications link to be set up over the public network.
Asynchronous. Transporting data in and out of the Apple in one direction at a time.
Boolean. A method of handling logic statements, popular on computers.
Boot. Loading operating systems and software into an Apple, from scratch.
Byte. Assemblage of 8 bits to form a basic storage area, sufficiently large to contain meaningful information – instructions, numbers and characters.
Bit. Basic means of storing electronic data in binary format (on/off).
Basic. Beginners All Purpose Symbolic Instruction Code – the most popular method of entering instructions to operate a computer. A high level computer language, with most commands in recognisable English.
Bug. An error in a software program, or a fault in a computer.
CAL. Computer Assisted Learning – a method of teaching subjects using the computer.
Chips. A common term used to describe the small black composite objects which contain even smaller silicon 'chips' (used in the correct sense), linked via wires of minute dimensions to the terminal legs.
CP/M. An operating system used on microcomputers which use a Z80 microprocessor.
Configure. Design and set up a system containing elements of hardware and/or software.
Colour Card. An interface card which when plugged into an I/O port in the Apple enables colour to be output onto a colour monitor or standard colour TV.
Compiler. A utility which converts a high level language program, which needs to be interpreted every time it is run, into a machine code program, which runs faster, needing less or no interpretation.
Cursor. A flashing marker on a screen, indicating where the next item of input data will appear.
Data. Information stored in numerical or text format, used as transients in programs, for calculations or information storage.
Database. A large body of stored data, supported by utilities for editing, sorting, entering new data and so on.
Disc. A magnetic storage device, either hard or flexible (floppy), which can store data or programs in digital format.
Disc Drive. A unit which contains a reading and writing head for loading data onto a disc, or reading data from a disc. The drive also contains the motor for rotating the discs. Hard discs, because of their greater volume, are usually housed in sealed units. Flexible discs are easily swapped.
Dump. Transfer amounts of data (such as the 8 Kbytes required to store a picture), straight onto a peripheral, like a printer or disc, with little ceremony or reformatting.
DOS. Disc Operating System. A series of routines which need to be loaded into the Apple to enable it to initialise, save to and read from disc, plus numerous other associated refinements.
Execute. To carry out an operation in a program, or 'run' a program. *(Also may be done to the operator after pressing RESET with a disc running!)*
Hardware. Generic term for all manufactured computer equipment.

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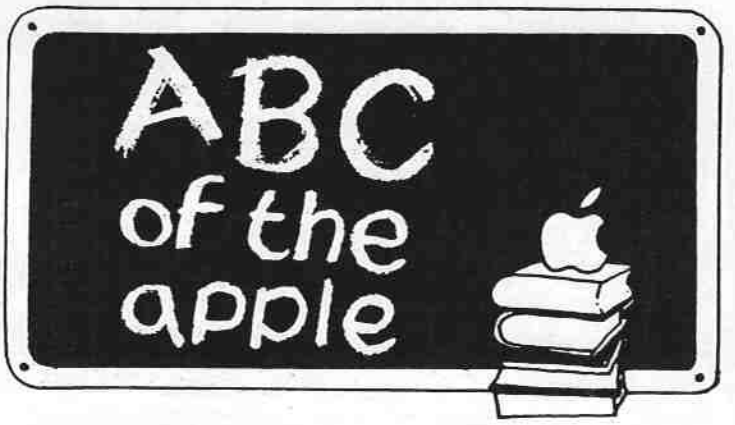


Interface. A device for linking one finite component with another, such as a printer interface to link a printer to an Apple.

Interactive. An operation which produces an immediate result.

Hi-res. A shortened term for high-resolution graphics.

Hard copy. A dumping of data or a program held in the Apple onto a printer.

Interpreter. A program, such as Basic, which needs to be translated by the computer into machine code each time it is run.

Integer Basic. A form of Basic (the earliest Apple version) which stores its numbers in integer format (no decimals). Useful even now for higher accuracy and speed in long calculations.

I/O Port. Interface cards are connected to the Apple by placing them in one of the eight long slots at the back of the Apple. These are the Input/Output Ports.

K. Kilo – 1000 – a convenient notation for describing volume. 64k represents 64000 bytes.

Microprocessor. The Basic 'chip' which controls the memory, data transfer and other functions of the microcomputer. The Apple uses a 6502 'processor'.

Mainframe. A very large computer, capable of handling many jobs at any one time and many terminals. They cost a lot of money.

Machine Code. A language which is directly understandable by the Apple computer. High level languages have to be converted to machine code, either by compiling or interpreting, before they can be used.

Mother Board. The large printed circuit board (PCB) in the Apple, which holds all of the chips, the processor and the input/output ports.

Macros. A series of instructions which can be linked together to be operated by one or two key strokes, or instructions.

Paddles. External devices which when connected to the games socket in the Apple can be used to provide variable input of data values for games and graphics routines.

Pascal. A high level language, much in vogue at the moment, which needs compiling to run. Pascal is a structured language which, once compiled, runs faster than Applesoft Basic.

Program. A series of instructions connected in a logical format to enable the Apple to complete a task.

RAM. Random Access Memory. A 48k Apple has 24 2k RAM chips installed on the mother board. Bytes can be accessed within RAM by direct addressing methods (an index points directly to the byte required) very quickly.

ROM. Read Only Memory. A number of standard and custom designed programs can be stored on a ROM, where they are only available for reading data. Programs can only be 'burned' into the ROM chip with specialised 'burners'.

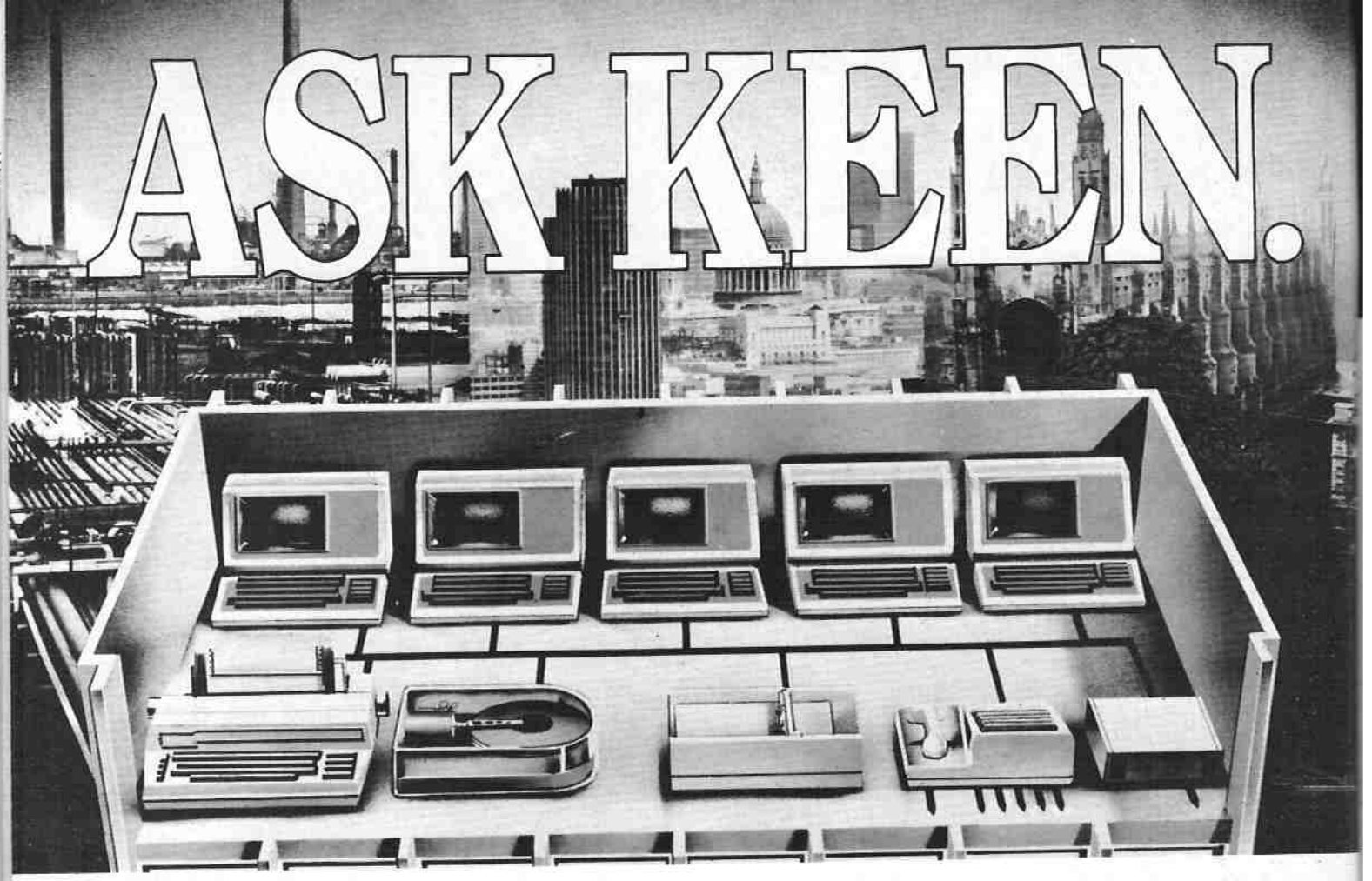
Sequential Access. Accessing memory in a linear as opposed to a random fashion. Cassettes are restricted to very slow sequential access. indexed Sequential Access is, however, a very efficient merging of both methods, using pointers to link records once accessed.

Software. Generic term for programs and digitised information, which is used to command the hardware.

Utilities. Programs which have been developed to make life easier for those writing software. These include editors, compilers, character generators and so on. Some can be incorporated into programs to improve their running.

Visual Display Unit. Any screen which is used to display the current operating status of a microcomputer.

Z80 Card. A very popular alternative microprocessor to the Apple's 6502, which uses the CP/M operating system. The Z80 processor mounted on an interface card enables the Apple to run CP/M and CP/M based programs.



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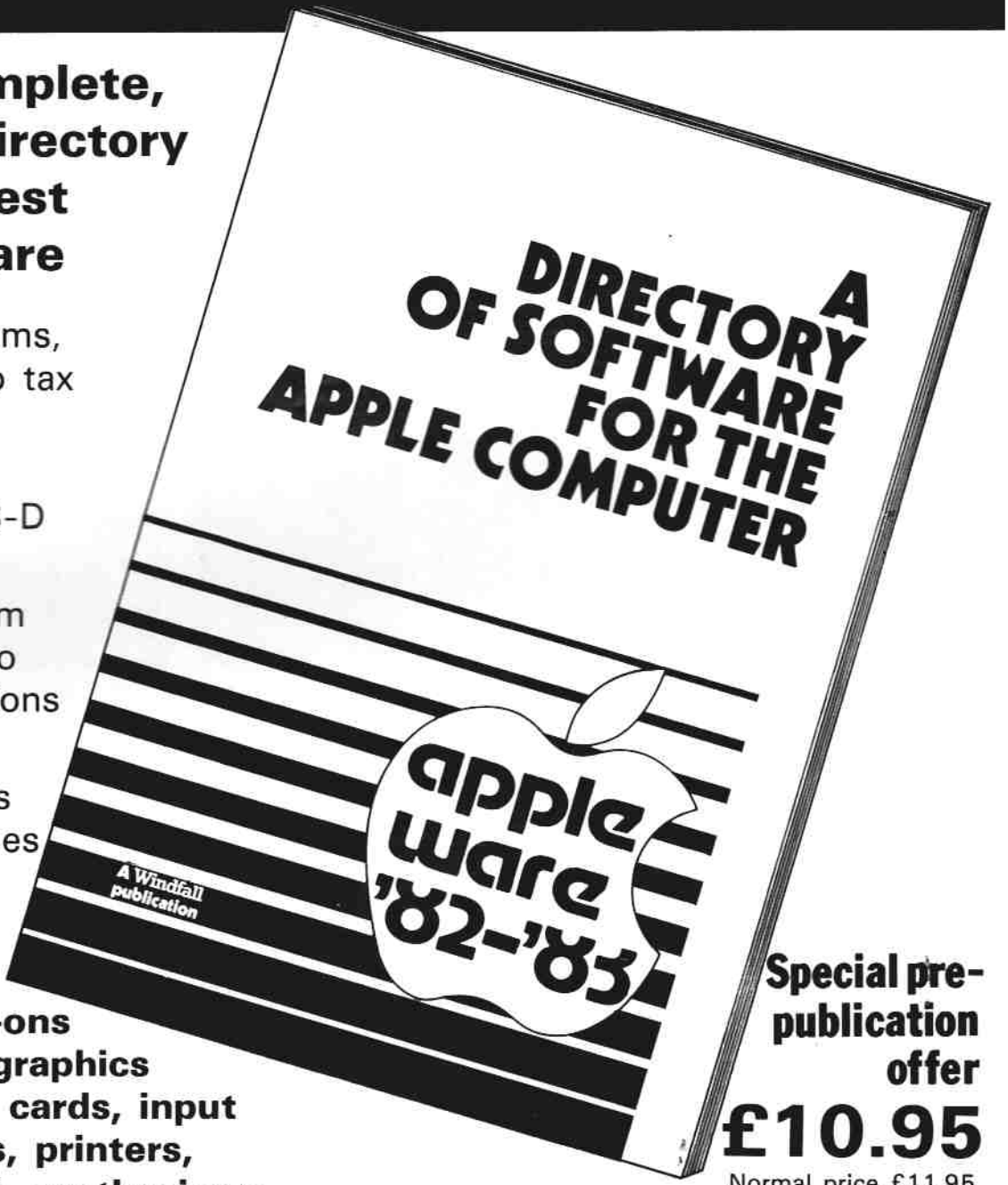

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Consumers' guide to Apple music, Part I – Games review (Starmines, Creature Venture, Hi-res Soccer) – Ski-run game (listing) – Speed restrictions with variables – Non-linear curve fitting – Machine code techniques, Part II (text insertion) – Crash course in Basic, Part I – Dot matrix printer review – Apples in networks (modems, Prestel) – CAL explosion coming – Computer games for physically handicapped – Apple user profile: SEGAS. PLUS three pages of Compucopia and five Appletips.

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Micro Planner review – Games review (Computer Bismark, Battle of Waterlook, Raster Blaster) – Letter square puzzle – Machine code techniques, Part III (dumping screens to printers) – Bulletin boards and personal computer database systems – Teletype terminal program – Crash course in Basic, Part II – Consumer's guide to Apple Music, Part II – Apple user profile: SEGAS, Part II – Apples in South African schools – Programs for primary schools. PLUS two pages of Compucopia and four Appletips.

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First review of the new Apple III – Games review (Temple of Apshai, Hellfire Warrior, Apple Panic) – Hayden Compiler review – BCPL, a fast language for the Apple – Psychological assessment by the Apple – Beneath Apple DOS book review – New software from the USA – Crash course in Basic, Part III – The role of speech synthesisers in schools – Historical review of computer literacy – Apple user profile: clothing manufacturing. PLUS three pages of Compucopia and six Appletips.

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Regain Step/Trace in Autostart Apples – Games listings (Apple Casino, Avoid, Calendar) – Games review (German Whist, Wizardry, Galactic Attack, Pool 1.5,) – Sinta Shape Manager review – Machine code techniques, Part IV (sorting arrays) – A/D converter review – Colour systems – Financial Controller review – Wordstar review – Crash course in Basic, Part IV – Debugging the Fortran Compiler – Care of discs – Electronic atlas – Pascal explored. PLUS four pages of Compucopia and seven Appletips.

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Games review (Olympic Decathlon, Dragons Eye) – CP/M: passport to exciting new world – Pascal file conversion program – Machine code techniques, Part VI (EVALuate a new function) – Crash course in Basic, Part VI – Elements of the Apple, Part I – Apple Graphics, Part II (high resolution graph drawing) – Making programs more user friendly – Getting round the memory map muddle – Apple user profile: Sea Fish Authority. PLUS three pages of Compucopia and seven Appletips.

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Games review (Crush, Crumble and Chomp) – Apple Medical Forum – Data Factory review – Apple Graphics, Part III (displaying histograms) – Printing an annotated DOS disc directory – Crash course in Basic, Part 7 – Start training for the Apple Olympics – Elements of the Apple, Part II – Payroll package for the Apple III – Six educational programs reviewed – DOS 3.3 to 3.2 software switch – Workshop/Wordstar tuition course reviewed. PLUS three pages of Compucopia and four Appletips.

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Apple speeds the news – Games review (Castle Wolfenstein, Threshold, President Elect) – DOS Toolkit problems – Linking Apples to IBM – Home-grown boards boom – Micro-Finesse review – Basketball match analysis – Elements of the Apple, Part III – FMS accounting system review – DOS disc directory, Part II – Apple graphics, Part IV (3D animation graphics) – Apple '82 Education Forum – A structured approach to teaching. PLUS four pages of Compucopia and five Appletips.

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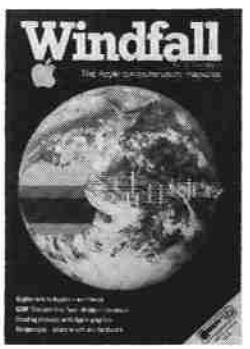

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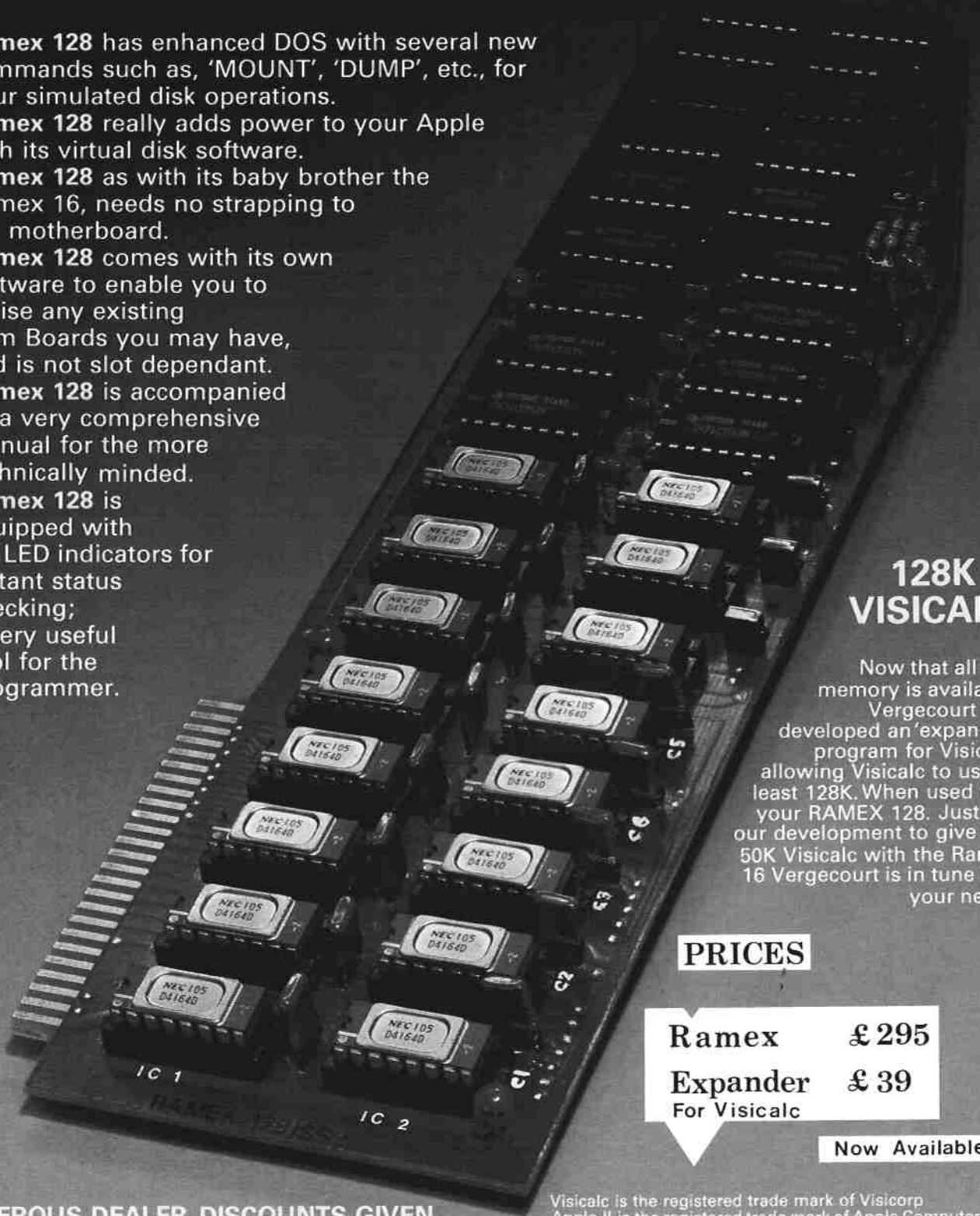

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