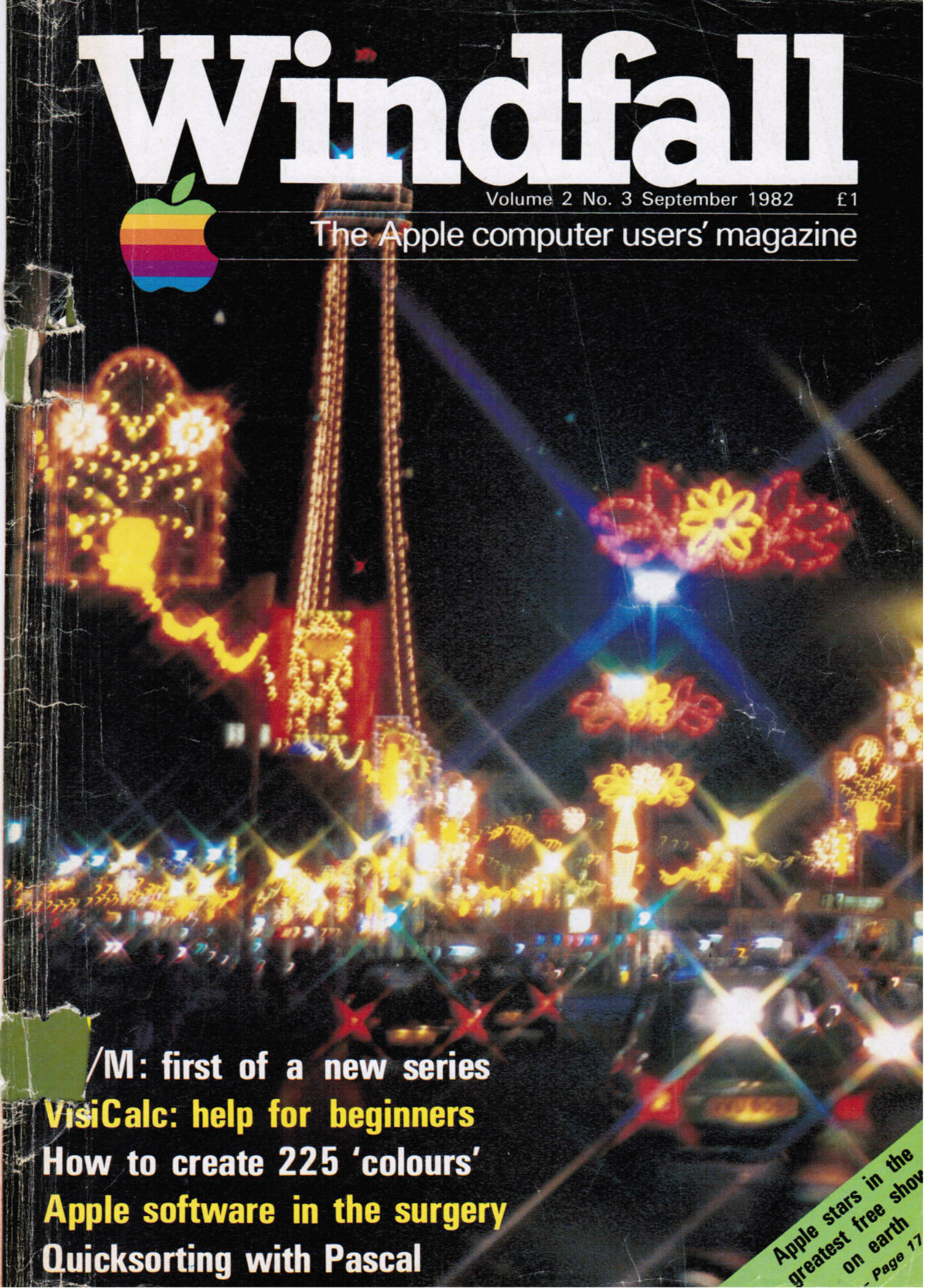
Windfall

Volume 2 No. 3 September 1982 £1

The Apple computer users' magazine



/M: first of a new series

VisiCalc: help for beginners

How to create 225 'colours'

Apple software in the surgery

Quicksorting with Pascal

Apple stars in the greatest free show on earth

Page 17

How to make the RIGHT CHOICE

APPLE *III*

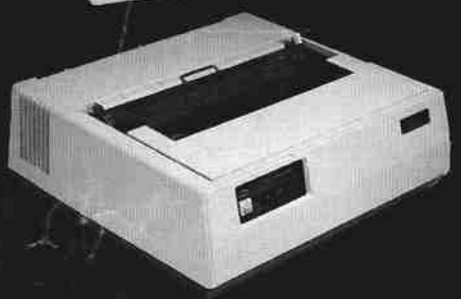
The Computer for serious users, designed for sophisticated business tasks.

+

NEW MEGASTOR *III*

Based on the Megastor][, a capacity of 1.1 Mb is just right for word-processing, financial planning (Visicalc), business accounting, etc. No need for an additional back-up system keeping the installation price in the right range.

+



A PRINTER

Shown is a fast, inexpensive Microline printer, but a word-processing daisy-wheel printer can be used for dual word-processing/accounting clients.

+

VLASAK-ORBIT SYSTEM

Designed exclusively to get the best from Apple computers. Works either integrated or as stand-alone modules. Stock (inventory), Invoicing, Sales Ledger (debtors) Control, Purchase Ledger (creditors) Control, General Ledger: modules can be set up as sophisticated or as simple as you require.

= VLASAK APPLE III SYSTEM

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Bucks HP13 6AG
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DEALERS NATIONWIDE

LISTING

Vol. 2 No. 3 September 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.

LEISURE CENTRES FOR BRAINS

Announcing a new range of Electronic Entertainment from one of today's most advanced computer companies.

1

In HADRON, there are over a dozen enemies from five different classes.
Many of the objects actually rotate as you approach them, creating astonishing 3-D effects. **£19·95**

2

You set out to secure the secrets of the imprisoned Professor Eisenstadt.
The in-depth plot, extensive vocabulary and colorful graphics make Kabul Spy a most intriguing adventure game. **£19·95**

3

Take Theseus' place in the labrynnth and you will travel through 16 different three-dimensional mazes. Armed with a laser sword, you will encounter a myriad of fanciful and frightful creatures. **£19·95**

4

You are the last survivor of your starship crew on a suicide mission.
Your one-man Space Cruiser has only one weapon — a limited quantity of very powerful atomic missiles. **£19·95** *

5

Was the Spider able to destroy the Fly-Fighters, elude the B.S. and repair the damaged web???
Fly back in time with us and join the Alliance.
See how well you do as the Spider-Fighter.
£17·95

6

"There are ten rooms full of chambers and passages and they are all protected by this Drageroo that Grud created.
It has wings and heat sensors and it can't be shot! **£17·95**

7

Enemy forces are advancing from all directions and begin to place Killer satellites in orbit around your station.
And then, look out for the meteors! **£17·95**

8

Sneaker's popularity is based on its seemingly endless variety of challenges.
The game features some of the most animated and colorful characters to ever attempt to stomp you into submission. **£17·95**

9

"As if it wasn't dangerous enough battling the Russians, now it's the Jellyfish too!
We shot them, but they break into smaller pieces and keep coming.
They've got to be nuclear mutants!" **£17·95**

10

Cy-clod (sīklād) ***n.*** A mythical creature apparent in many legends:
in Sirius' legend, the video representation of a game wherein an eyeball fights snakes with bricks. **£17·95**

11

You say you have a sudden urge to play Foosball? Now, you and up to three of your friends can play Foosball at home.
Divide into Grud and Robot teams and bash the ball around the screen. **£17·95** *

12

Dark Forest is a game of strategy which pits you against Trolls, Magicians, Sea Serpents, Specters, Gruds and up to five other players.
You can choose from any of eight levels of difficulty. **£17·95**

1	2	3	4	5	6	7
8	9	10	11	12	13	

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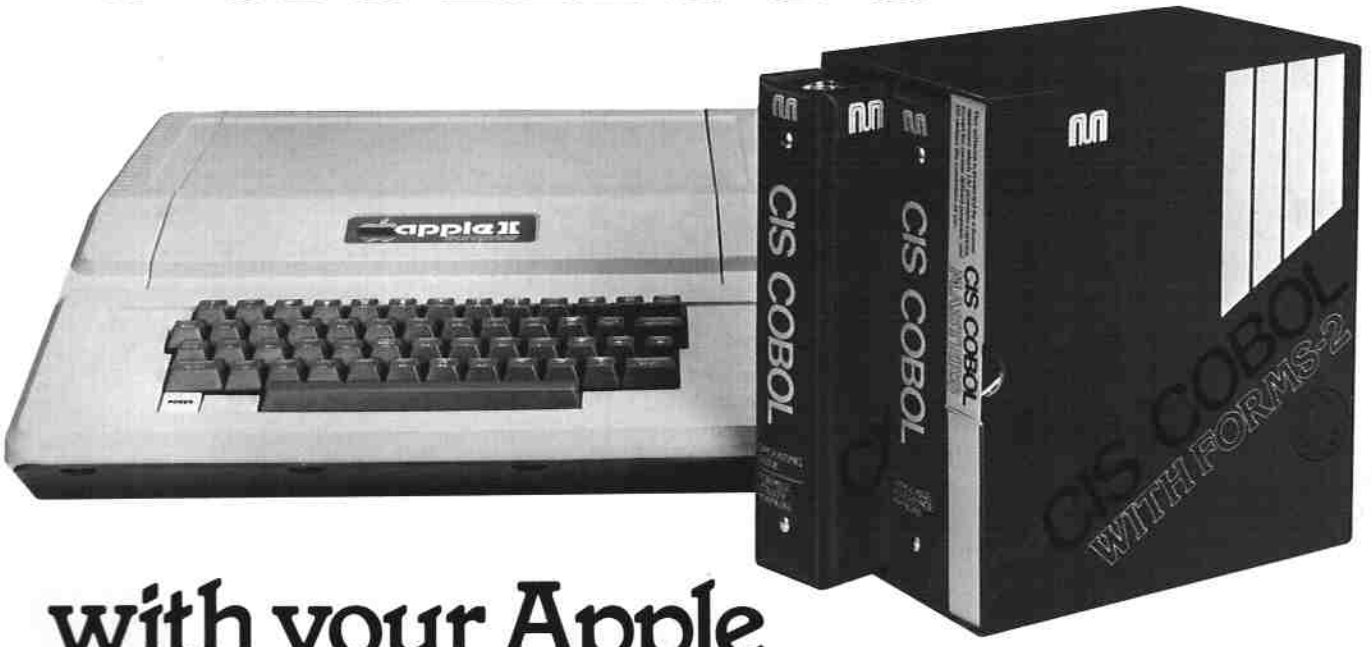
All games require Apple][[with 48K and one Apple disk drive.
Games marked * require games paddle.

13

While you try to make your bombing run, you have to avoid being hit by anti-aircraft fire and fight off enemy aircraft as well. **£17·95**

Start talking business



with your Apple

COBOL is the most effective business language. Apple II is the most friendly business computer. CIS COBOL with FORMS-2 brings together the best features of COBOL and Apple to enable you to deliver the most effective, user-friendly applications.

Business Programmers: Take the COBOL expertise you have acquired on big business mainframes, and use it on Apple II to create friendly applications that will talk directly to your users – where it suits them best, on their own desks.

CIS COBOL's dynamic module loading gives you big application capability and the FORMS-2 source generator lets you build and modify conversational programs from visual screen formats, creating much of the code automatically.

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Over half the Apple II's now being sold are going to business or professional users so demand for quality applications is growing fast, creating big business opportunities for you.

Stability proven by the US Government. CIS COBOL has been tested and approved for two consecutive years by the US General Services Administration as conforming to the ANSI '74 COBOL Standard. Apple II under CP/M is included in CIS COBOL's 1981 GSA Certificate of Validation (at Low-Intermediate Federal Standard plus Indexed I-O and Level 2 Inter-Program Communication).

Get your hands on CIS COBOL at your Apple dealer.

Talk business with him now!

Micro Focus Ltd., David Murray John Tower, Brunel Centre, Swindon, Wilts., SN1 1NB. Phone: (0793) 695891. Telex: 444418 MICROF G

MICRO FOCUS

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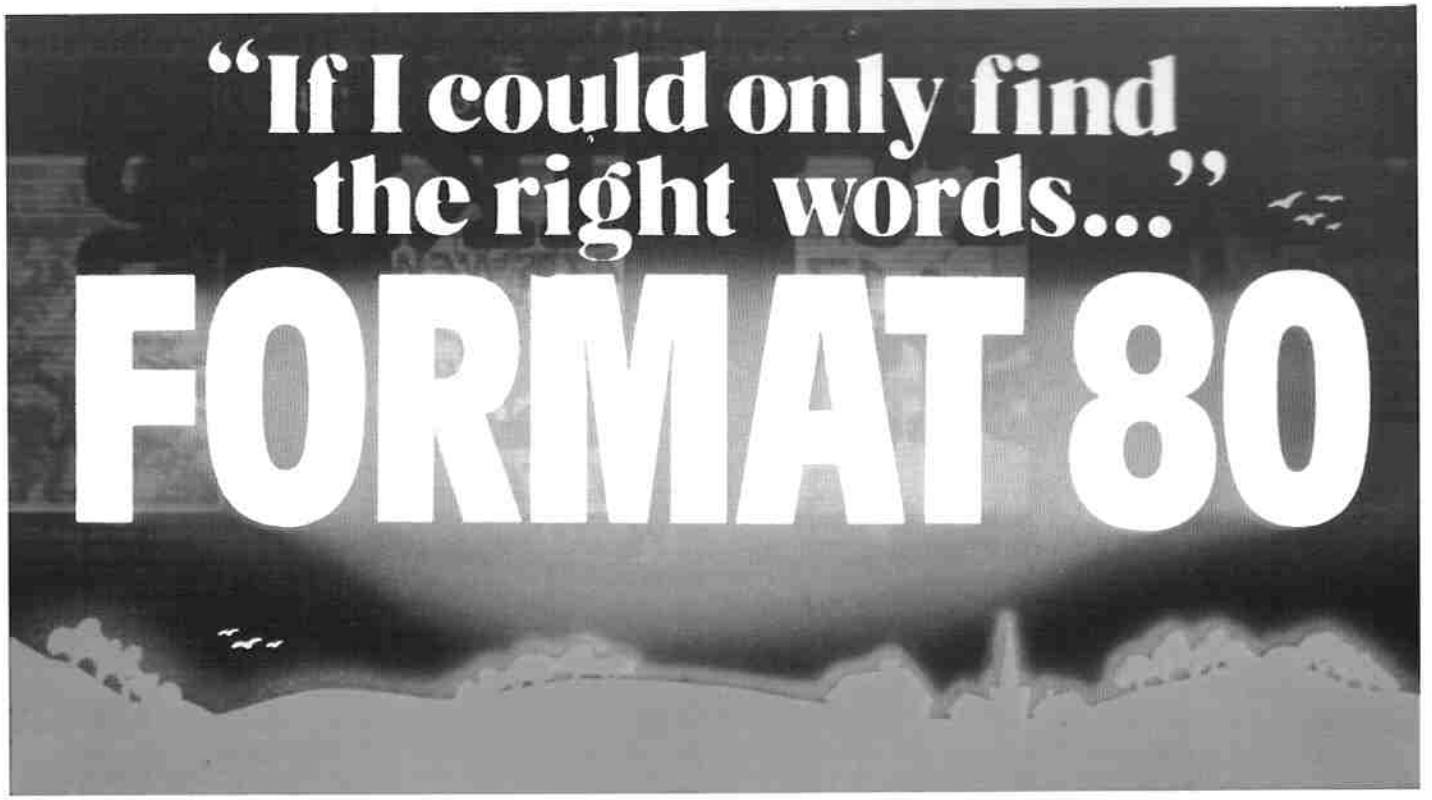


positively the last word in processing

Many people think that because a personal computer does difficult things it must be difficult to operate. Not so. At least not so with the Format-80 professional word processing system.

The Format-80 system lets you and your staff concentrate on doing your work, not on working your computer.

* **EASE OF USE** is the cornerstone of Format-80. Anyone who can use a typewriter keyboard soon feels at home using Format-80 on the Apple II. Example - upper case characters are generated using the shift key - a lot of word processing systems use the ESCape key. Editing commands are introduced using a one keystroke mnemonic command.

* **FEATURES** of entering and editing text make Format-80 the favourite word processing system with office staff. Automatic carriage return insertion (word wrap around) means that they do not have to be concerned with line length; text is automatically adjusted to fit within defined page dimensions.

* **PROFESSIONAL PRESENTATION** of text is enabled using the powerful formatting capabilities of Format-80. Text centreing and justification, coupled with paragraph indentation allow production of high quality work with little effort. Text manipulation commands allow tabulation of columns of figures and easy insertion, location/correction and deletion of text. Whenever text to amended the changes are displayed immediately on the screen - including underlining.

* **PRINTING** of text may be performed on all popular printers. (Telex tapes can be produced directly from an Apple using Format-80). Proportional spacing, emboldening, shadow printing and sub and supercripts are all available on printers which support these functions.

* **COMPREHENSIVE MAIL LIST** facilities allow storage and retrieval of names and addresses which may be printed on adhesive labels or incorporated into documents using standard or specialised paragraphs. Powerful 'logic' commands make it possible to select only those records which match specified criteria.

* **TECHNICAL DETAILS** for the non-technical: Format-80 runs on the Apple II with 48K of memory Apple disk drive and a monitor. An Omnivision or Videx card is also required to provide the 80 character per line display.

* Format-80 is available from most Apple dealers or direct from Personal Computers Limited and costs £300 (ex VAT) - this includes the mail merge facilities as well as a mailing list sorter.

Please send me details of Format-80 and the address of my nearest supplier:

Name .....

Company .....

Address .....

.....

Phone: .....

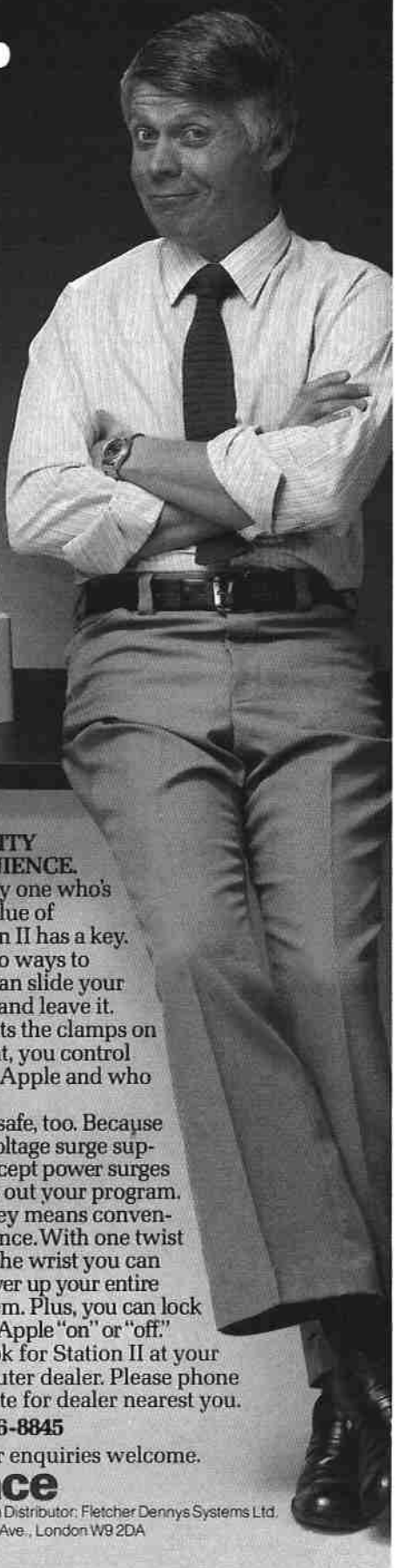
I do/do not own an Apple Personal Computer. .....

Personal Computers Limited

218 & 220/226 Bishopsgate, London EC2M 4JS. Tel. 01-377 1200

PUT ONE OVER ON APPLE II.

Introducing Station II.
The Apple II Support System.

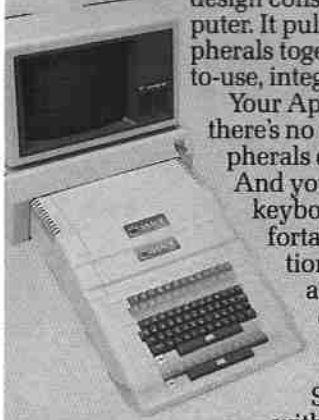


What happens when you put one over on Apple II? You make it better. Because Station II organizes, simplifies, protects, secures and lets you control access to your Apple. In other words, it makes your Apple II your personal computer.

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

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97c Elgin Ave., London W9 2DA

A2·PB1

PINBALL

Experience A2-PB1 PINBALL, the ultimate in arcade simulation. If you're already familiar with other pinball games, discover what a real pinball simulation is all about. 48K Apple II disk.

Features:

- **10 selectable modes of play, including *Easy, Competition, High Speed,* and *Cosmic.***
- **40 user-adjustable parameters: create and save your own custom games.**
- **an instruction card, a hi-score disk label, and a 16-page manual explaining all of the variations available.**

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See your dealer . . . and see what you've been missing!

UPGRADE YOUR APPLE TO TODAY'S STANDARDS

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The Serial Interface has full RS232 protocol and will communicate with any RS232 device. **£75.00**

The Parallel interface is a general purpose printer card which works with virtually all parallel printers. A lead with a 36 pin amphenol plug wired to the Centronics specification is supplied as standard. **£69.00**

2. SATURN SYSTEMS 128K RAM CARD

High powered memory expansion at a low price offering: *extensive software support *simple installation* less power drain than a 16K language card *compatibility with existing software & hardware. Can be used as a pseudo disk. **£359.00**

3. RGB COLOUR CARD

Produces vivid and clear colours in graphics giving the standard Apple Lo-Res and Hi-Res colours. **£89.00**

4. TIME KIT

An amazingly compact card - a Micro-Watch and Electronic Diary. Plugs into the game I/O socket. **£59.00**

5. MICROSOFT SOFTCARD

A Z-80 based hardware/software system. SoftCard greatly increases the capabilities of the Apple by letting you run the CP/M operating system, Microsoft BASIC-80 and other CP/M-based software. **£189.00**

6. CCS CALENDAR/CLOCK MODULE

A true real-time clock implementing full interrrupt facilities. Can be used on a wide variety of applications. **£79.95**

7. KEYPLUS

The Visicalc compatible keypad with all the extra features:- *backward + forward movement arrows *plus and minus keys *space key *escape key which allows cursor movement for easy editing. **£99.00**

8. VIDEX VIDEOTERM 80 COLUMN CARD

Increases Apple II display to a full capacity 80 columns, and, used with VC Expand 80 and any combination of memory expansion boards, 80 column display and memory expansion for Visicalc models can be achieved. **£195.00**

9. ENHANCER II

The Enhancer II features a typeahead buffer. Your keyboard has upper and lower case, and will auto repeat any key held down. A single keystroke can become a word or an entire sentence. Controlled by a powerful microprocessor, Enhancer II allows you to re-map your keyboard or add specialized features. Changing a chip creates a totally different keyboard. **£89.00**

10. COOL STACK

Offers the features of cooling and efficient organization and storage for Apple II. **£69.00**

NEW **SAM RAM**

Pete & Pam's new 16K ram expansion board. **£65.00**

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SCREEN WRITER

A Complete Professional Word Processor for Apple Computers

SCREEN WRITER is a state-of-the-art word processor that gives you the highest control of the written word available for the APPLE Computer.

SCREEN WRITER was designed to give you the power to easily arrange text so that it prints exactly as you want it to appear, no matter what the format. Form letters, legal contracts and other important documents may be reviewed and updated with just a few simple commands. Often used formats may be saved on disc and called up later as the basis for a new document, thus saving word processing time.

SCREEN WRITER is a complete word processing system. All you need is a standard 48K APPLE II/II+ computer system with a DOS 3.3 disc drive and a printer. No expensive "extra" hardware that costs you money and causes problems. It even has features that other micro-computer word processors CAN'T offer; features like printer spooling*, upper/lower case, seventy columns on screen and a software based keyboard buffer. ALL these features are available without the need for additional hardware. SCREEN WRITER is the only word processor that offers all these features without special hardware.

SCREEN WRITER is a professional word processor, yet is simple enough for even a novice to understand. The first time user and the word processing professional can feel equally comfortable with the system in a very short time.

SCREEN WRITER was built to be user friendly. The processing commands are easily learned, and a complete listing of the commands is included in the actual program. A handy user reference card is also included for quick reference to printing and editing procedures.

FEATURES

*GLOBAL SEARCH AND REPLACE. Change whole words and sentences throughout a file, quickly and easily.

*INSERT AND CHANGE MODES. Two editing formats to assure full coverage of your word processing needs. Insert Mode allows you to insert text by moving text forward to make room for it. The Change Mode allows you to write over old text, deleting it at the same time. Switching between edit modes is as easy as one keystroke.

*MACRO CAPABILITIES. Assign commonly used words, phrases or commands to special keys, making your processing more efficient by eliminating the need to type in the same sections of text multiple times.

*SUPPORT OF SPECIAL FUNCTIONS. Special commands allow you to initiate and change values in special printer drivers and BLOAD Hi-Res images for plotting on your printer.

*PROPORTIONAL SPACING. Supports proportional spacing on many printers (NEC, QUME, DIABLO, CENTRONICS).

*TEXT MOVE. Move whole sections of text around with just a few keystrokes.

*GENERATION OF INDICES. Generate up to four tables or indices while you type in your document with a few simple commands.

*PRINTER SPOOLING. Makes your word processing time more productive by allowing you to print and edit at the same time.

*Printer spooling is only available for printers with SSM AIO (Parallel or Serial interface), The APPLE parallel interface card or Epson interface card.

*SUPPORT OF YOUR EXTRA HARDWARE. **SCREEN WRITER** makes full use of your RAM cards and extra disc drives to make word processing quicker and easier.

*HYPHENATION. Make your final copy look better by eliminating unsightly "holes" in your text.

*FORM LETTER CAPABILITIES. Generate form letters from mailing lists you create quickly and easily. Special commands allow conditions to personalise your form letters.

*COMPLETE EDITING AND RUNOFF FUNCTIONS. Centring, boldfacing, underlining, complete formatting and direct interface with your printer.

LARGE FILE SIZE. **SCREEN WRITER** will handle documents up to 65,000 characters or over 50 A4 pages. Plus you can link files together as you want.

*CURSOR MOVEMENT. Movement of the cursor in your text by character, word, line, page or to the beginning or end of the document.

SCREEN WRITER
is available for £73.95

including VAT and postage and packing from:-

Spider Software

98, AVONDALE ROAD, SOUTH CROYDON, SURREY.

Telephone: 01-680 0267 (24 hours a day — 7 days a week)

ACCESS

SIMPLY THE BEST DATA BASE MANAGER AVAILABLE FOR THE APPLE

– SPECIFICATIONS –

I. DATA FIELD TYPES:

* Numeric
* Alpha characters A to Z and special characters
* Alphanumeric fields combining the above field types
* Calculated fields

II. STORAGE METHOD & RETRIEVAL TIMES:

ACCESS uses a powerful IRAM (Indexed Random Access Method) filing system. Records are stored in entry order. The index consists of the first characters of a specified field of each record (the number of characters used is dependent on the record size). Any record can be retrieved in less than 3 seconds if requested by it's index. Indexes may be created from any field (and stored for later use). Up to 8 indexes may be stored on each program disk. Any record on a diskette can be retrieved in less than 23 seconds using various criteria such as OR, AND, Wild Card, global or range searches on a field or number of fields.

III. CAPACITY:

* Up to 1521 characters per record
* Up to 39 fields per record
* Up to 39 characters per field
* Up to 20 calculated fields per record (calculated fields are not stored on disk)
* Up to 39 screen pages per record
* Maximum of 2640 records per diskette (depending on the size of the records)
* Up to 8 screen forms may be saved on each program disk (includes short forms which display only a portion of the record for rapid update/validation)
* Up to 16 defined report formats may be saved on each program disk

IV. SPECIAL FEATURES:

* Title only fields (do not take up valuable data space)
* Word processor style editor (delete/insert characters etc.)
* Hidden fields
* Simple command structure – Commands may be stacked for fast update and retrieval
* Free format screen design – Very easy to use
* Report generator allows additional calculated results, headings, column subtotals, totals etc.
* Logging of updated records
* Automatic or manual update of records
* Sorts may be merged
* A copy program is provided to enable back-up copies of the program and data disks to be made
* Standard DOS 3.3 text files may be produced in either sequential or random access format using any sorted or selected fields
* Deleted records may be un-deleted or purged from the database
* 7 second boot-up of program

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)
5. ACCESS will support most 40 or 80 column upper and lower case hardware modifications
6. Versions of ACCESS will be available to support the SyMBfile 5 megabyte Winchester drive and the SyMBstore 8 megabyte 5 inch floppy system

ACCESS is available for **£199.95** including VAT from all good Apple dealers or direct from:

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Telephone: 01-680 0267 (24 hours a day — 7 days a week)

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Payroll	£375
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COMPUTECH UTILITIES DISK for reliable error checking copying, diskette scan, interpret and patch, etc.	£20
COMPUTECH CHAIN MAIL a mailing merging document processor which may be used with text files, including random files and Applewriter 1.1 binary files.	£45
COMPUTECH GRAPHICS DISK for printing Apple pictures and graphs on Epson and Microline (free with printers purchased from Computech).	£30
COMPUTECH TERMINAL UTILITIES Apple to Apple or Apple to Mainframe.	from £130

ALSO

Visicalc, Applewriter and other Apple Software (Prices on request)

COMPUTECH HARDWARE

DIPLOMAT Video Digitiser - store a frame from a video camera in a fiftieth of a second, process and print images.	£195
DIPLOMAT Parallel Interface	£80
DIPLOMAT High Speed Serial Communications Interface	£85
DIPLOMAT RAM 16 Memory Expansion	£95
DIPLOMAT Clock/Calender	£80
Lower Case Character Generators including Applewriter enhancements	£50
MICROMUX Data Exchange (Max 16 Ports)	from £850
MAXTRIX Printers, Microline and Epson with graphics and up to 200 cps	from £230
Microline Optional Character Generators	£15
DAISY WHEEL Printers, Olympia, Qume, Ricoh, etc.	from under £1000

Prices exclude VAT, Carriage and Packing. Trade enquiries welcome.

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PUTECH SYSTEMS

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TOMORROW

The 5th Personal Computer Word Show this September will be the largest and most exciting microcomputing exhibition ever held in the UK.

There will be over 25,000 square feet of display space in the newest and most prestigious exhibition venue in the country.

It's the only micro computing show to offer literally hundreds of stands covering micros for home, business and educational uses. Previous visitors to the PCW Show will get some idea of the size of this year's event if we tell you that it will be approximately *three times* the size of last year's bash! (Last year's show was, in its turn, twice the size of the year before. Statistically minded persons will calculate that at this rate the PCW Show will cover the face of the planet by the year 1995.)

The 5th Personal Computer World Show

50p

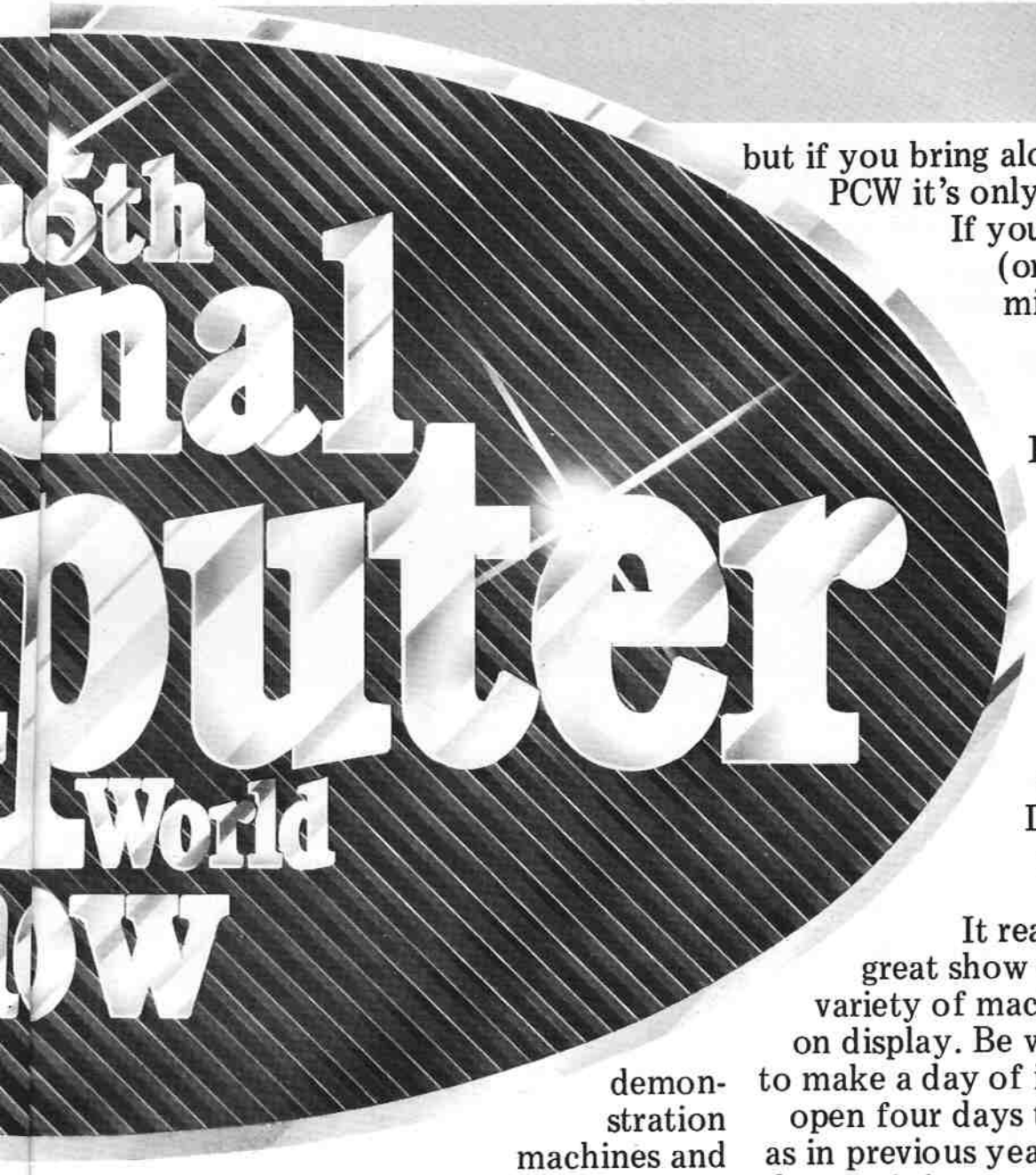
DISCOUNT VOUCHER

This voucher is worth 50p off the price of admission to the PCW Show. Only one voucher valid for each visitor. Not exchangeable for cash.

Features of The 5th Personal Computer World Show will include a Sinclair City and Acorn/BBC Arcade offering the very latest software and add-ons for these popular machines, computer chess competitions as always, and an opportunity for you to challenge a micro to a game of Computer SCRABBLE ®.

From the business angle there's free consultancy with the National Computer Centre and more

THE WORLD!



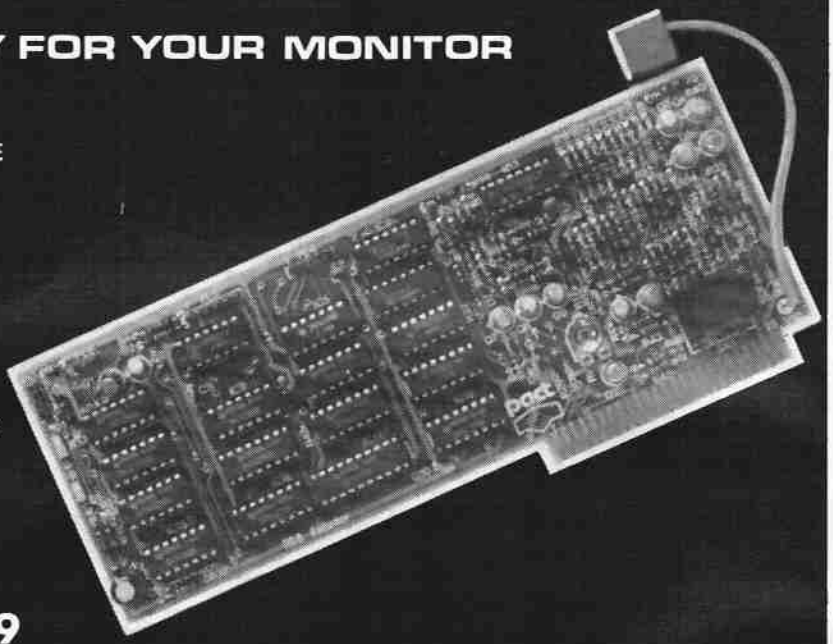
demonstration machines and business software than you could get to see in a year at your own office. But you needn't risk divorce to evaluate them. . . your wife (or husband!) and the kids can be looking at the vast array of home and educational micros in one of the other halls. It's £2.50 to get in but if you bring along a coupon from PCW it's only £2.00 per person. If you're a business user (or potential user) of microcomputers just write with your cheque for £2.00 (payable to the Personal Computer World Show) to Tim Collins, PCW Show, 11 Manchester Square, London W1, enclosing your business card. We'll send you a special 'Fast Lane' ticket to save you the trouble of queuing.

It really is going to be a great show with a tremendous variety of machines and software on display. Be warned, you'll need to make a day of it (remember we're open four days this year, not three as in previous years) so give yourself plenty of time and wear comfortable shoes! See you there. . .

BARBICAN CENTRE, CITY OF LONDON
9–12 September 1982

pact PLUG-IN VERSATILITY FOR APPLE USERS

VERSATILITY FOR YOUR MONITOR



RGB COLOUR INTERFACE

THE HIGHEST QUALITY COLOUR AVAILABLE

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* Alternative hi-intensity colour set
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Load the on-board alterable ROM to suit your particular printer from the disc supplied. Under normal usage the firmware will remain indefinitely. However, should you wish to use your Para-graph + with another printer, simply reload with the appropriate firmware.

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Avoid costly and time consuming system malfunction due to overheating

Apple and fan powered up simultaneously by illuminated switch on front of module

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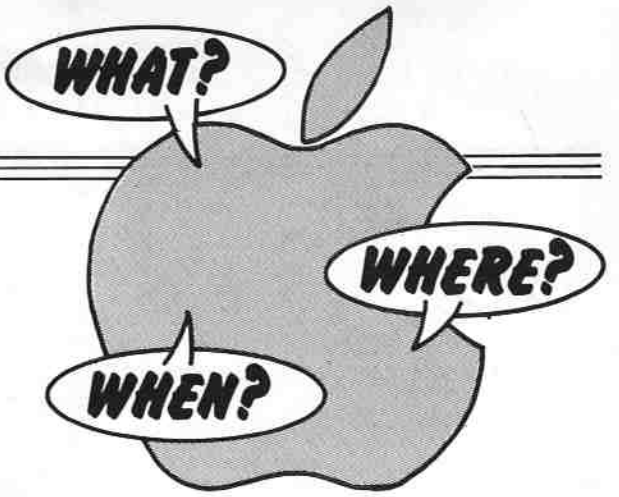
WHAT'S NEWS...



By David Creasey

Apple puts on the biggest free show on earth

WE'VE managed to track down the secret star of the Blackpool Illuminations, that annual fiesta of fantasy that each autumn turns the resort's six miles of promenade into a glittering kaleidoscope of colour and is blatantly billed as "The Greatest Free Show on Earth."

It's a humble Apple II.

The millions of bulbs, miles of wire and dozens of artists, joiners, modellers and electricians that make up the Illuminations are costing Blackpool ratepayers £870,000. But it's an ordinary Apple – retail price £812 – that is playing a leading role in making this year's Golden Jubilee event the most spectacular ever.

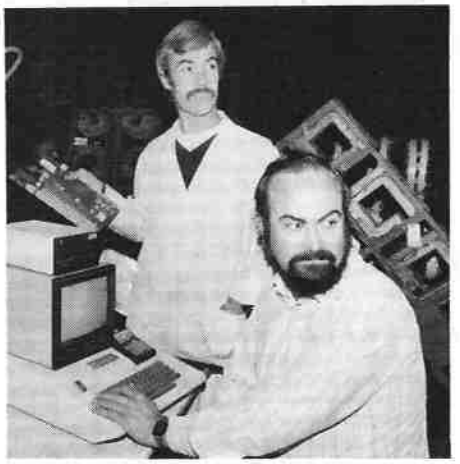
The man who operates the Apple, 30-year-old Roger Eastmead, told us : "I just couldn't do the job without it. Any other way would take far too long."

Roger takes a schedule for a particular flasher, or sequence of lights from the Blackpool organisers, programs the pattern into the Apple, and then transfers it to EPROMs.These boards are then used as display controllers.

One of them controls The Lite Fantastic, a new feature at the Golden Jubilee of the Illuminations. It consists of three 16 foot diameter circular boards carrying hundreds of coloured lamps in a regular grid. The controller operates a changing pattern of light sequences, producing words, animations and effects ranging from one arm bandits to psychedelic lights and people walking.

Another newcomer is a reproduction of some of the famous gambling signs that adorn the Las Vegas skyline in Nevada. Twenty four of these are reproduced, including the Golden Nugget and Stardust, all controlled by Roger's EPROMs.

Six miles of the Blackpool promenade is decorated for the Illuminations throughout this month and October. Old displays are retained with new features added each year, but now instead of the animations being controlled by mechanical means, they're controlled by chip technology. Thirty of Roger's controllers are being used this year.



Roger Eastmead (with beard) and brother Trevor: "Any other way would take far too long."

Pipped!

WE thought that Apples were getting to the core of Britain's nuclear energy problems when we heard that the Atomic Energy Research Establishment at Harwell had taken to them in a big way.

But further investigations revealed that the Apple applications involved "nothing nuclear"; they are simply used for routine commercial and occasionally scientific data.

One over the 8 bit?

THOSE ubiquitous Space Invaders may not be only aliens in your local pub. You – and your foaming pint – may be under observation from unseen sources.

And don't try to steady your nerves with a free scotch from your favourite friendly barmaid. The dreaded Microbar has arrived.

Microbar is a pint-sized microelectronics package which actually monitors each measure of spirit drawn from the optics and each pint pulled. The device is being welcomed by publicans who can loose up to 10 per cent of their turnover through dishonest or incompetent bar staff.

And Microbar is welcomed by some bar staff too because it can add up the cost of those big rounds in a fraction of a second without the barmaid even having to remember the price of the drinks.

The next stage will be to link the system to an Apple to give the pub manager financial data – and presumably cider!

Old fashioned service

IT'S so easy to complain or criticise. But people are not so quick to put pen to paper and sing someone's praises when things go better than they expected. That is certainly not the case with Steve Pattenden, sales executive with Britannia Airways, who wrote to *Windfall* to say how delighted he was with the backup he received from DJ 'Al' Systems, originators of The Last One.

Wrote Steve: "I have no Basic programming experience on the Apple II, so I relied entirely on the manual and prompts, with great success. The programs all worked. But when I progressed to more complex programs I came across a bug.

"I rang the telephone number in the manual, and to my surprise someone was actually on hand to help me. I wrote to them the same day, enclosing trace documentation of the events leading to the discovery of the bug, and by return received a new disc with an amended program free of charge."

And that was not all. "Yesterday", continued Steve, "I received another copy of The Last One, together with a new manual. All had been completely revised. And, again it was free of charge."

He concluded: "I find this sort of

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service very satisfactory and it is a pity some of the American suppliers do not do the same. I can thoroughly recommend this program that writes programs."

When Windfall phoned Steve at Britannia's West End headquarters he revealed how useful The Last One had turned out to be. Apparently he had bought the Apple to help with general administration in the office, and then found that the commercial packages he would need were beyond his budget.

Then he heard about The Last One, and decided to use it to write the programs he needed. "I was most surprised how easy it was," he said. "The program it's just written for me – now the bug has been removed – takes care of our complete financial sales report. Something that took weeks to do manually.

"Quite frankly I've been absolutely astonished – both at the simplicity of The Last One and at the way they came to my help when I needed them."

All of which goes to prove yet again that there's nothing to beat good, old fashioned service.

The dollar doyens

IN the USA, where newspapers love to gossip about the money people earn, they've been cluck-clucking about the miserly salaries paid to the bosses of Apple despite the company's £192.5 million turnover.

The man to set the tongues wagging is Ben Rosen, who brings out a report every year showing how much electronics companies in the USA pay their leaders. According to Rosen the top five men in Apple had to share £390,519. Of this, big boss Mike Markkula pocketed just £103,725.

And while this might appear to be a sum not to be sniffed at – compared to what Britain pays its top people – some of Rosen's other figures shows just how badly off they are at Apple. The top five at rival Tandy shared £1,170,187, and chairman Phil North was rewarded with £358,637.

If your mind is boggling already, wait for the crunch. America's highest paid man in electronics got a salary last year of £1,123,628. He's a man few people have ever heard of – Steven Ross, who runs Warner Communications.

Assuming he clocks in for a normal working week (which is the least one expects him to do) that works out a very handsome £540 an hour.

You see, it's true – there IS a future in electronics. For some!

Joseph O'Keeffe

New man at the top

THE new managing director of Apple's manufacturing operations in Europe is Mr Joseph O'Keeffe, a former general manager of Telectron, the Irish subsidiary of A.T.T. He replaces Alex Wrafter, who resigned in disagreement with the company's Cupertino headquarters.

Mr O'Keeffe has also held senior management positions with General Electric in the United States and its subsidiary company in Ireland, ECCO Limited, and with the Emerson Electric's Irish subsidiary Ridge Tool Ireland.

Apple's two manufacturing facilities in Ireland represent an investment of £10½ million. The main plant at Cork, which was established in 1980, manufactures Apple IIs and IIIs for the European market. The facility at Millstreet contributes electronic keyboards and peripheral equipment.

Further on Forth

WE have been gently chided for referring people to an American group for further information about the Forth language. There is actually a body called Forth Interest Group UK and one of its members, Gil Philby, told us: "It would be nice to let people know that we exist and that we can provide listings for most micros, including the Apple, and tapes for some." Further information from the secretary, K.C. Goldie-Morrison, 15 St Albans Mansions, Kensington Court Place, London W8.

Another enthusiast, Mike Glover of the Leicester Computer Centre, describes Forth as compulsive, but admits that people either hate it or love it, with no middle path.

His company has developed an implementation of Forth and is looking for a limited number of guinea pigs to try it out before releasing it commercially. "We want people interested in helping with development to cough up £25 to cover costs," said Mr Glover, "and we will send them our implementation of Forth together with the documentation. We want them to use it, to kick it around, and to report back on any possible improvements."

The idea is similar to that employed by Apple, which uses Alpha (in-house) and Beta (outsider) test sites for product development and evaluation. Mr Glover described his implementation as "an Appleised" version of Forth, which itself was a language which operated as a series of machine code routines, and which was very quick to work with.

Helping hands

A SPECIAL one day course is being held for technicians amateur or professional who are prepared to make or modify aids and equipment for disabled people.

Roger Jefcoate, a consultant and lecturer on electronic equipment for disabled people, is organising the day in conjunction with Castle Priory College, the Spastics Society's training establishment at Wallingford. The first course of its kind in the UK, its main emphasis will be to familiarise technicians with different types of disability.

Handicapped people will give their views as consumers and there will be lectures and discussions on switches and on adapting micros and other aids. The course, on September 25, is at the Neath Hill Professional Workshop, a centre dedicated to the provision of the correct environment, support staff and special electronic aids needed to help those of high intelligence with severe disability to run their own business. *Tel: 0491 37551.*

Software scenario

VISICORP, the Californian company which has sold more than 500,000 software packages in its Visi range since 1978, is planning a major change of approach in the launch of its second generation programs.

According to Dan Fylstra, the com-

WHAT'S NEWS...

Patrick Lichfield ... setting a new sort of fashion

pany's co-founder, micros (or personal computers as they are referred to in the US) have been used almost as toys in America, and certainly on an experimental basis. However they have now become legitimate tools in companies, he says, and as such pose a big challenge to software designers.

He says user friendliness is now a critical factor, as business micros will increasingly come under the control of users who are indifferent, or even hostile, and who are not prepared to make enthusiastic and substantial efforts to master the hardware.

VisiCorp's aim is to provide a whole system of interlinking software. The products will be easy to use, much more instruction material will be included on disc, and there will be only a few pages of printed guidance – instead of the lengthy instruction manuals currently issued with packages. All the software products will be available at once, so that the user can move instantly from one to another.

It is anticipated that with the second generation software users will be able to carry out word processing, financial planning, statistics and graphics without changing programs or interrupting chains of thought.

VisiCorp will also be extending its marketing practices – which currently involve an elaborate dealer network – to work more closely with the top thousand quoted companies, which it hopes will represent a big additional market. Such companies are large enough to buy hundreds of micros at a time, making this a potentially attractive direct market for the accompanying software.

All the top people . . .

APPLE could well be christened the "top people's micro", thanks to a story which is being featured in showroom displays. World-famous fashion photographer Patrick Lichfield is pictured, not with a bevy of leggy beauties, but with his beloved Apple – in a cornfield!

Reason for the rural setting is that the Earl, among his other talents, is also a highly successful commercial farmer. And it's down on the farm where he finds the most use for his personal Apple.

Farming today is a very exact science (allowing for the vagaries of the English weather) and a micro can help farmers to work out projected yields, herbicide requirements and other important data.

When the agent for the Lichfield estate, a gentleman who rejoices in the name of Major Hasard (really!), first introduced the Apple, its main function was estate accounts. But the setting up of an arable program will soon enable the estate to reap the full benefits.

Doing well

APPLE Inc is still doing rather well – despite intensified competition on world markets and claims that it will fall if it doesn't come up with a new product soon. The company has announced third quarter net profits of $15.2 million (£8.9 million) or 26 cents a share – a 28 per cent increase over figures for a year earlier – and its sales for the period rose by 57 per cent from $90.7 million (£53.35 million) to $142.7 million (£83.94 million).

For the nine months ended June 25 net profit was $42.6 million (£25 million), or 74 cents a share on sales of $407.25 million (£239.5 million) compared with $28.4 million (£16.7 million) or 51 cents on $237.1 million (£139.4 million). These represented profit and growth rates of 50 per cent and 72 per cent respectively.

Apple's strength in distribution and the wide variety of software programs available are largely responsible for its good performance. The company's research and development spending has almost doubled over the past year.

Investing in success

A SECOND generation version of the Silicon Valley phenomenon, where inventive genius joined with venture capital to produce such companies as Apple, could be evolving in Britain, but this time with the emphasis on software development rather than hardware development.

A £10 million venture fund, owned by about 20 institutional investors including Legal and General, Confederation Life Insurance, London and Manchester and the British Council Superannuation, was set up by Alan Patricof Associates last autumn to invest in high technology companies likely to show high growth and profitability. The fund made its first choice only recently – a quarter of a million pounds investment in Systematics International.

APA is very successful in the United States. It was one of the first companies to invest in Apple Inc., and it is clear that it is hoping that Systematics will "do an Apple" for it in the software field. It has bought a 25 per cent share in the £1 million-valued Suffolk company and will bring, in addition, its own expertise in areas of finance, management and international dealings.

Systematics' record is good. The company launched its software for the Apple II late in 1980 and sold 200 packages between October and December of that year. In 1981 it sold 2,500 packages and in the first six months of this year 2,800 packages, mainly in Britain and Ireland. It is currently selling about 450 packages a month.

It specialises in integrated business and accounting packages, most of which use UCSD Pascal, and all of them will be running on CP/M by the end of this month.

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Have wheel, can travel

ONE of the main limitations of the daisywheel printer is the restricted number of characters available on a single printwheel. Some attempts have been made to overcome this by employing two printwheels operating from different ends of the same platen on a single printer.

Now Zygal Dynamics are making available (later this month) a printer that can run a wheel containing 192 complete and part characters which can construct more than 400 different characters. A standard wheel on the Diablo Model 630 ECS will produce the complete international transmission set (Teletext).

The printer, which costs £1,900, interfaces with the Apple through a standard RS232 card. The machine is well suited for technical and mathematical work, where many special characters are required, and when used in word processing it is possible to print standard and italic characters without having to change wheels.

In addition to the 192 character wheel, the ECS can support standard 88, 92 character rows. *Tel: 08692 3361.*

Apple link for Microwriter

MANY people coming face to face with an Apple cannot type, and they find this hampering, particularly if they need to use the machine as a word processor or to handle high volumes of text.

A major innovation in the field of data entry is Microwriter Mk IV, a hand-held microprocessor-based machine that its makers say has an application wherever people use pen and paper.

A user enters words into the machine with the fingers of one hand, using a special alphabet. He can check text on a moving one-line display, edit it if necessary, and produce a hard copy by simply plugging the machine into a printer, an electronic typewriter or an Apple – it interfaces with the Apple using an RS232 card.

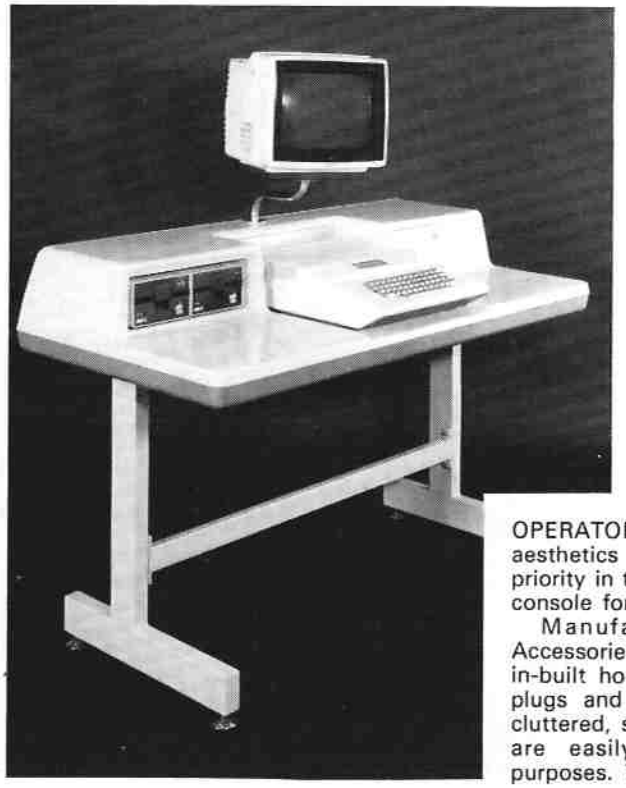
The device is completely portable, running on mains re-chargeable batteries, and is housed in a plastic case measuring 230×117×50mm. It has 8k of memory, a five finger keyboard with a sixth command key, and its 16 character LCD display allows upper or lower case, numerics, punctuation and status symbols.

In fact its software features allow the processing of the full Ascii character set as well as variable length editing controls for insertion, deletion and wiping, text access to the screen by line, paragraph, or document, and variable format settings for tabs, margins and headings.

Microwriter IV comes with a mains charger, a carrying case, cassette lead and an instruction manual, and the whole package costs £495.

The manufacturers, Microwriter of London, say that self-taught it takes a user about half an hour to learn the alphabet and an additional one and a half hours to master the deletion, editing and accessing functions.

Normal handwriting speeds can be achieved after 15 hours of use and eventually a user should be able to achieve speeds double that of normal handwriting. *Tel: 01-831 6801.*



Touch of style

OPERATOR comfort and regard to office aesthetics are said to have been a major priority in the design of this purpose-built console for the Apple II.

Manufactured by Silver Wheel Accessories and selling for £275, it has in-built housing facilities for disc drives, plugs and flex, giving the unit an uncluttered, streamlined look. The unit legs are easily dismantled for transport purposes. *Tel: 0728 723506.*

Graphs like magic

GRAPHMAGIC, a menu driven package which displays arithmetic data in a graphics format quickly and accurately, has been released by I.S.M., the writers of Mathemagic. It can be used independently or will read Mathemagic and VisiCalc files or any file in a different format. Storing on disc of graphs or data is easily achieved, as is dumping to a printer.

Graphmagic costs £69. It gives the user complete freedom of graph and x and y axis titles, and full screen text editing to add text to graphs is easily achieved. Other features include hi-res cursor positioning, full colour capabilities, automatic or user selective x and y axis scaling and overlaying of graphs. *Tel: 01-751 5791.*

Plot replaced

A VERSION of the business graphics package for the Apple III has been developed for the Apple II and is now available from dealers. Apple says it is a replacement for the familiar Apple Plot and is much easier to use.

It is based on a simple command language and allows a user to transform numerical data into a wide variety of easy-to-understand charts and graphs.

Apple II Business Graphics features mathematical and statistical functions. With it one can perform curve fitting and trend line analysis, produce pie charts and horizontal bar graphs, and plot two or more graphs on the same set of axes, thus allowing quick in-depth comparisons.

Any area of a graph can be enlarged for closer study and the user has complete control over all graph parameters. Data from Apple Pascal, DIF format, as well as 13 and 16 sector Basic, Apple Plot and VisiCalc can be loaded, plotted and analysed. Cost: £109.

Inmac's floppy disc storage system

A NEW release in the United States is the portable 13 inch Colour III monitor which is said by its manufacturers, Amdek, to provide an "extremely affordable high-plus resolution graphics display" for the Apple II and III. It features 260×300 line resolution and 80×24 character display capability, with crisp colour.

It is used with the new Digital Video Multiplexer – a four channel multiplexer with three channels multiplexing the existing Apple text, low-res and hi-res graphics, and the fourth allowing the use of an 80 character line video board. The DVM is also colour channel software programmable, allowing the red, blue and green to be turned on or off by Apple II or III software control.

Dust-free discs

MODULAR containers which can stack and latch together to form a dust-free disc storage system have been introduced by Inmac. Each unit in the Floppy Manager system holds 10 discs and features an access tray which automatically flips forward on opening to allow easy retrieval without bending or stressing the disc.

The modules can be stacked horizontally or vertically to fit available workspace, and, as they rotate through 90 degrees, they can also be used in a draw filing system.

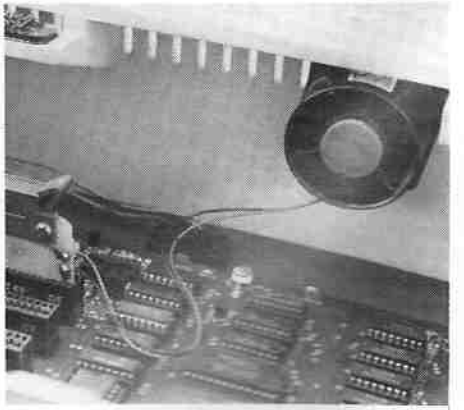
Each module costs £6.10 for the 5¼ inch version or £6.50 for the 8 in version. *Tel: 09285 67551.*

Cool customer

ANOTHER means of keeping the Apple cool is Jetstream, a low-voltage precision cooling fan which fits inside the Apple II case and utilises existing cooling vents on the right hand side of the machine.

The fan is held in place by two screws, and the distributor, Number One Computers, says it can be fitted in less than a minute. It blows air out of the computer and is capable of moving 220 litres a minute.

Power is taken from the Apple's 12 volt rail by plugging in the power card to any slot so the fan module, which has a life of 8,000 hours, operates whenever the Apple is turned on. It costs £29.95. *Tel: 0534 77268.*



The Jetstream in position

Data swapper

A FLOPPY disc system which provides the Apple with over 2 mbytes of memory and enables it to exchange data with large mainframe computers has been designed and built by Eicon Research of Cambridge.

It is a double-density 8 in disc system, the FD8, and it widens the scope of the Apple enormously. It can be used in conjunction with standard 5¼ in drives and with Corvus hard discs, and data is fully interchangeable between these systems.

The discs can be written under CP/M, UCSD Pascal, or DOS 3.3. The system automatically recognises both single and double density discs, and users upgrading from single density do not have to undergo a system conversion.

A key feature of the system is that the FD8 controller does not use an analogue data separator when dealing with double density discs, and therefore doesn't suffer from the drift problems often associated with these systems. Instead it utilises a technique which is completely digital and which gives long term reliability.

The controller is a standard sized interface card which only draws two watts power from the Apple. The system costs £1,950 for a dual drive, double density discs, controller and software.

For an additional £150 a user can buy utility software that allows the FD8 to write files in the same format as those used by IBM and Honeywell or the digital PDP-11 mainframes.

Using this extra software discs produced on the FD8 are indistinguishable from those produced on the larger machine, and are completely interchangeable. *Tel: 0954 81825.*

Organised Apple II

A SUPPORT system designed to secure, protect, organise and simplify the Apple II system is now available in the UK. Its Cupertino designers have considered appearance, accessibility, utility and security, and have produced a unit which pulls the Apple and its peripherals together into an attractive integrated system.

Station II, distributed here by Fletcher Dennys Systems, is a molded plastic shell which safely supports a monitor and two disc drives while allowing access to the inside of the Apple without unstacking. In addition it positions the monitor at the proper angle and distance from the keyboard for maximum viewing comfort and reduced eyestrain.

When the unit is bolted to a desk the Apple can be locked inside using the key provided. The same key is used to power up the entire system.

Station II costs £89. It incorporates three built-in power outlets for the Apple and its peripherals, and has a voltage surge suppressor to prevent corruption of programs and data. Accessories include a fan kit (£49), cable security kit (£39) and disc drive cable extenders. *Tel: 01-286 7374.*

Eicon FD8 . . . links with mainframes

Programs? Take the Mickie

MICKIE, an interactive question and answer program originally developed for medical history taking, is now available on the Apple. The program provides comprehensive, legible and structured records, and built its reputation in hospitals, schools and commerce where it has been used for multiple choice tests, quizzes, questionnaires and computer-aided learning.

The Apple II implementation, developed by Systemics and called Mickie On Apple, costs £50. People with no previous experience of programming, or with neither the inclination nor the aptitude to master languages such as Basic and Pascal, can use Mickie to write programs.

It features a simple, easy to remember format suitable for the novice user who may never have seen a computer before, and who doesn't want to know more than is absolutely necessary about computers and computer languages. *Tel: 01-863 0079.*

Kitten power

A SINGLE drive subsystem comprising an 8 in removable mini Winchester drive, the Lynx DP100, a sophisticated controller and a power supply, is being marketed by X-data under the name of Kitten.

Providing a capacity of 10.6 mbytes formatted store with the DP100's front-loading cartridge, the Kitten effectively gives minicomputer power to the Apple.

Features include sector buffer and interleave, automatic head and cylinder switching, and a controller which can handle up to four drives. The Kitten sells for £3,725. It runs with DOS 3.3 and Pascal.

In the know

ANOTHER business analysis tool for the Apple II is MicroExstat, a data base of company financial information on a set of 5¼ inch discs. Derived from the Exstat database compiled and produced by Extel Statistical Services, the data covers more than 1,600 British and Irish quoted and unquoted companies, including those trading in the Stock Exchange's Unlisted Securities market.

About 30 discs are contained in the package which is updated every month. The service costs £5,500 a year. *Tel: 01-253 3400.*

Travel package

A PACKAGE that controls and simplifies administration and accounting procedures for travel agents is being marketed by Printronic. Designed for small to medium sized single and multi-branch agents, Travelplan provides 17 management reports which enable a user to keep track of past and present clients and bookings, up to date with commitments to suppliers and to make cash flow predictions.

The software costs £500 and the over-

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COMPUCOPIA

all package, which includes an Apple II, printer, monitor, 5¼ in drive and controller, and a 3 mbyte hard disc, comes for just under £4,000.

Optional extras include up to 12 mbyte hard disc, a tape streamer hard disc backup and various other programs including invoicing with carrier returns for £250, which prepares a client's invoice while at the same time preparing airline returns for payment during the following month.

It is possible to run all the software packages on a 5¼ in disc system, although processing times are slower. *Tel: 0291 690214.*

Sophisticated buffer card

AN interface card for the Apple II and III which will help sophisticated users capture data more effectively has been released by Zynar.

The buffered communications card is a serial interface with its own 6502 processor and FIFO buffers, which ends the random loss of characters when collecting data faster than the Apple can cope. Until now this problem could only be solved by extremely tight programming which would extend development times and make software maintenance well nigh impossible.

The new card can be commanded by Basic or Pascal, relieving the need for the designer to write assembly-level drivers. Its use enables Apples to accept rapid data entry from a digital tablet. Other applications include interface to remote databases, control of multiple serial devices, rapid data collection from multiple serial devices, interfacing barcode readers and printer interface.

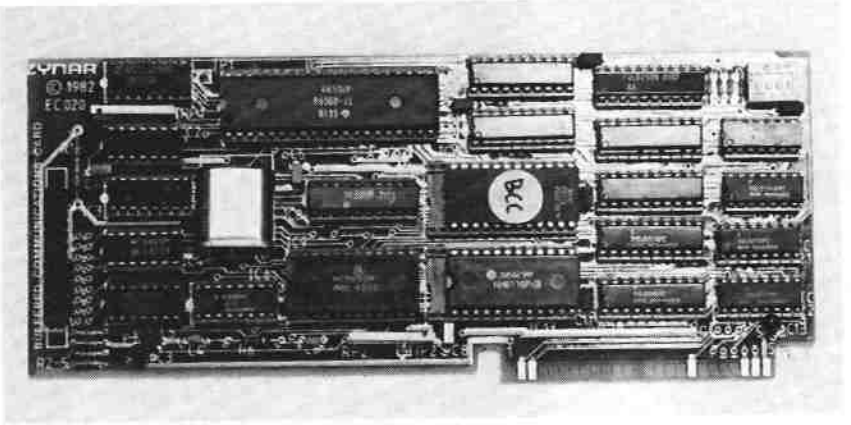
The card also allows a designer to code his own firmware. He may therefore use the resident processor as data cruncher or pre-processor and accomplish data encryption or protocol handling without tying up the Apple's main processor. *Tel: 0895 59831.*

Impressive speed-up

AN Australian disc operating system for the Apple II is available through Pete & Pam Computers. Known as Fast DOS it triples disc access speed without requiring any hardware modification.

Fast DOS is compatible with all DOS/Applesoft programs that access DOS through the standard hooks, including FID and MUFFIN, and it executes all standard DOS commands.

Comparative timings between standard DOS and Fast DOS are impressive – B LOADing Integer Basic from 13 seconds with standard DOS down to three seconds with Fast DOS, cataloging a 12 file disc from two seconds to one second, saving a 10 sector program from 34 seconds down to seven seconds and loading a 100 sector program can be reduced from 24 seconds with standard DOS to seven seconds with Fast DOS. *Tel: 0706 227011.*



The Zynar buffered communications card

Prestel interface

A TELESOFTWARE downloader which allows the Apple II to use the wide range of educational, games and utility software now becoming available via Prestel and other Viewdata services has been introduced by Owl Micro-Communications.

The new program operates in conjunction with the existing Owltel package, which provides a direct interface between the Apple and Prestel, and will be offered as an enhancement option to Owltel or as an upgrade package for existing Owltel users.

The downloader first enters the program selected into a data file, and then converts the stored data to a working program.

Getting organised

AN ENHANCED version of the Information File Organiser from Software Technology for Computers is being marketed by Great Northern Computers.

The original package (now I.F.O. 1) which costs £120, allows the first time user to create a database, enter sample information and print out user-specified reports and labels, all within 30 minutes. The new version, costing £195, does the same, but with far greater capabilities.

It allows an extra 11 characters in a field (giving 36), doubles the number of fields in a record (40), and allows up to 1,600 fields in a file. Optional fields are multi-defined and it features design custom screens, adjustable spacing on labels, summary reports and footnote capabilities. It also allows binary search, block transfer of data and has an auto date feature.

IFO II requires two disc drives and uses DOS 3.3. It works with all printers – the printer can be in any slot – and is fully documented. *Tel: 0532 589980.*

Hi-res graphics processor

A HI-RES graphics processor card for the Apple II has been developed by Digisolve, a new company specialising in display and control systems. The company says that use of the card means that CAD packages can now be written without the memory map problems caused by the Apple's own hi-res mode, giving four times the resolution with two picture buffers.

The card can draw up to one and a half million pixels a second and a hardware vector generator frees the Apple's processor from drawing lines. It has its own 64k of memory to store two 512×512 pictures, and a built-in character generator which can draw in variable size and orientation.

The Digisolve card costs £399. It can be used with assembler, Integer Basic and Applesoft. *Tel: 0977 513141.*

. . . and printer interface

IF you are running, or want to run, one of the popular range of printers with graphics capabilities with your Apple, it would pay to look at Digitek's latest offering, their Printmaster Interface.

It is a parallel interface card which contains ROMs to enable printers to take advantage of the Apple's graphics. It uses very simple commands to dump graphics in inverse print double sized and rotated 90 degrees.

The card, which sells at £79, provides a low cost, reliable unit which will greatly simplify printer use. *Tel: 0403 66550.*

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Paddle scroll works fine with tape

```
1  REM  PADDLE SCROLL
2  FOR I = 741 TO 767: READ N
3  POKE I,N
4  NEXT
5  POKE 43603,229: POKE 43604,2
6  DATA  72, 152, 72, 138, 72, 16
     2, 0, 32, 30, 251, 200, 152,
      170, 202, 208, 253, 136, 20
     8, 249, 104, 170, 104, 168,
     104, 76, 240, 253
7  DEL 1,7
```

UNTIL I joined the discers this paddle scroll utility was among my most used. Apart from long Basic listings I found it very useful when working in the monitor. The utility, as you have it, works fine for non disc operators. The tape user would simply **READ** from the monitor and **CALL 732** from Basic.

It operates by intercepting the monitor's peek at $36-$37 where it would normally find the Cout address **FDFO**. Instead, it gets the address of a delaying routine. This is a two loop delay using the value of PDL(O) from which is a countdown to zero. Once the loops are passed and location 2FD is reached, the Cout monitor routine sends the delayed character to the screen. The SPEED= effect is continuously variable from 2/3 cps. to all ahead full.

Unfortunately DOS, in order to check for its commands, also intercepts the Cout vector. The way DOS does this is no means simple. It actually exchanges the vectors in $36 and $37 with those of a check routine, the originals (FDFO) indirectly finding themselves in locations $AA53 and $AA54. When DOS is satisfied it swiftly exchanges back allowing the monitor to display the character via FDFO, which is now where it should be in $36-$37. Not for long though! Once Cout is returned DOS swaps back again ready for the next intercept.

This being the case, the paddle scroll intercept is clobbered by DOS and never takes place. All my attempts to place the intercept at $AA53 and $AA54 from within the assembly either don't work at all or cause the dreaded hang!

However I have managed to make it work with DOS. The revised utility requires two direct location changes (POKES), so the whole program is entered from Basic. The two separate **POKES** are to $AA53-$AA54, the program lines are below 10 and self delete. As far as I can make out the utility will remain active and transparent until **RESET** is hit. The only way to reconnect after a warm start is to enter the two **POKES**. – **Barry A. Hallam.**

Missed a bit out? Then use this trick

THERE is a useful trick to insert missing details into a lengthy program line, without actually retyping it.

1. Type **POKE 33, 33** and then **LIST** the line you wish to add to.
2. Press **ESC** and then, by using the normal edit keys, move the cursor to the area where your omission occurs.
3. As Applesoft commands are normally self-spacing, it is possible to insert the following ?:?. Make sure that you move the cursor to the end of the line before pressing **RETURN**. Failure to do so will result in the remaining part of the line being lost.
4. List the line again and you will find that the question marks have changed to print commands.
5. Go back as in 2 and 3 and type over them with the missing text. – **Rupert W. Main.**

Using the hi-res character generator

THE High Resolution Character Generator (HRCG) program included in the DOS Toolkit is a very useful facility for producing alternative character sets, especially lower case letters, for building up pictures and for obtaining text on the graphics screen. It is supplied in relocatable format, so that it may be used with any memory size, always being loaded immediately below **HIMEM**.

If the program is always used on an Apple with the same memory size however, the relocating loader is an unnecessary complication. It is much quicker and more convenient to convert the relocatable program to a normal binary file and to load and run this when required.

The conversion is carried out by loading the relocatable program as usual, using **LOAD HRCG**, then simply saving the relevant area of memory on disc. The start address and length required can be found from the variable ADRS in the **LOAD HRCG** program.

For a 48k Apple, with **HIMEM** equal to 38400 the value of ADRS should be 36351, so the new binary file will be **BSAVE**d with start address (A) and length (L) parameters of 36351 and 2048 (38399-36351). The HRCG can now be used by simply **BLOAD**ing the binary file and **CALL**ing the start address (or the start address +3, to leave off the title).

If any alternative character sets are required they should be loaded with the HRCG program. The A and L parameters for the binary file are altered by 768 bytes for each additional character set. For example, if one additional character set is loaded the A and L values become 35583 (36351-768) and 2816 (2048 +768) respectively. The CALL address remains the same.

Another useful facility is to be able to move the HRCG elsewhere in memory. Since the **LOAD** HRCG program always loads the HRCG immediately below **HIMEM**, this may be achieved by altering **HIMEM** then loading the HRCG, using the relocating loader, and **BSAVE**ing it, as already described.

For instance, to load the HRCG immediately below graphics page 1 you should first set **HIMEM** to 8192, then carry out the procedure as before. This is useful when a Basic program has been shifted to above the graphics page and the HRCG would normally use up valuable program space. – **Keith Williamson.**

Useful for editors

Here is a short HELLO program which I find very useful when editing programs containing lots of **REM** or **PRINT** statements. After the program has been run an & will cause the screen width to be reduced to 33 columns, allowing **PRINT** statements to be edited without leaving gaps in the lines. The screen can be returned to 40 columns by typing **TEXT** or pressing the reset key. The program has the same effect as **POKE 33,33**, but an ampersand is quicker to type. – **Kevin Cowtan, aged 14.**

```
10  TEXT : HOME
20  POKE 1013,76: POKE 1014,128: POKE
     1015,3: REM  SET '&' HOOK
30  POKE 896,169: POKE 897,33: POKE
    898,133: POKE 899,33: REM  ''
    POKE 33,33'
40  POKE 900,96: REM  RETURN TO B
    ASIC
100  PRINT  CHR$ (4);"CATALOG"
```

```
1  DIM N$(35): INPUT "FILE NAME "
     ,N$
2 D$ = "": REM  CTRL D
3  PRINT D$;"OPEN",N$: PRINT D$;"
     WRITE",N$: LIST : PRINT D$;"
     CLOSE",N$: END
```

Accent on integer . . .

AS most Apple users probably know, the renumber program included on the System Master Disc does not work on an Integer program. The above program if included at the beginning of an Integer program will convert it to a text file. If the program is then **EXEC**ed into the computer while Applesoft is in use the program is converted to floating point.

Renumber will now operate on the program as normal. To reconvert to Integer the program should be run to create a new text file which can then be **EXEC**ed back into Integer. To run the actual main program all that is necessary is to remove the first three lines and things are back to normal.

This is a long drawn out exercise, but so is retyping part of a program because there is no more room to type in extra lines needed since the line numbers are all one integer apart. The program is especially useful if stored as a text file since it can be **EXEC**ed into any Integer program. However, as listed, it will not work on Applesoft due to slight changes in syntax. – **Tony Readman.**

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CP/M (Control Program for Microcomputers) is becoming increasingly popular on the Apple. This is particularly true in situations where a microcomputer is bought to supplement existing equipment. There are, however, some pitfalls and misconceptions regarding just how easily programs may be transferred between machines. It is NOT a case of simply taking a disc from one type of machine and placing it in the disc drive of an Apple.

There is a large degree of standardisation in the actual program code and structure of data files, but this standardisation does not extend to the physical format used on the 5¼in discs popular with the Apple and many other micros. The transferring of programs and data has to be done via the I/O ports of the machines involved. This necessitates the use of routines which are not provided on the Apple CP/M Master Disc. There is a dump routine in the manuals, but a familiarity with machine code programs is required to use it.

Having sounded this note of caution, CP/M obviously greatly extends the number of programs available to run on the Apple. CP/M is usually more complicated and less user-friendly than Apple DOS. Good CP/M software, e.g. Wordstar, renders the operating system transparent to the user.

CP/M

Consult COPY and PIP for back-up discs

By PAUL RAYNER

THE CP/M operating system is a very moveable feast. Every implementation is slightly different. However most implementations, including that supplied for the Apple II with the Z80 Softcard, contain two utility programs to help you make back-up copies. These are COPY and PIP.

COPY allows you to dump the entire contents of one disc onto another. Any information previously stored on the second disc will be totally obliterated. Moreover, any errors on the first disc will be faithfully reproduced on the second.

PIP allows you to copy individual files from one disc to another. It is much slower than COPY, but it is also much safer, and therefore to be recommended. PIP stands for 'Peripheral Interchange Program', meaning that it can transfer data from one peripheral (eg. keyboard, disc file, etc), to another (eg. screen, disc file, printer, etc.).

The reason for calling it PIP is lost in the mists of computer antiquity (about 1974). It probably has something to do with the fact that the original developer of CP/M used to work with DEC computers and these used to have a program of the same name. On some micros such as the Cromemco you will find that the name has been changed to XFER, which more clearly identifies its functions.

To make a back-up copy you must first have your original disc and a formatted disc to copy onto. Formatting is a process of electronically dividing up the surface of the disc into sectors in which the data will be stored. All new discs must be formatted before you can use them. If discs have been used before then formatting will erase anything that was previously held on them.

To format a disc you should put your CP/M Master Disc in drive A and the new disc in drive B and then press CTRL C. The computer should respond with what is known as the CP/M prompt, as shown below:

A>

You should then type FORMAT, followed by pressing the RETURN key. The program will ask on which drive is the disc to be formatted. Reply by typing B, followed by RETURN. The FORMAT program will then proceed to format the disc in drive B.

If, by mistake, you had typed A, then it would proceed to reformat your system master – and this is not usually considered a good idea! You can prevent it by ensuring that your disc is write protected by use of a write protect tab. All 5¼in discs come with a small notch about ¼in square cut in the side. If this notch is left open then the disc can be written to. If the notch is covered over then the disc drive will be physically prevented from writing to that disc whatever commands you have typed at the keyboard. The disc suppliers always provide a set of these tabs with each box of discs.

Clearly it is a good plan to have all your master discs protected with write protect tabs. The CP/M Master Disc as supplied to Apple users with the Softcard is a special type with no notch. Thus you can never over-write or re-use this disc.

Note that with 8in discs the procedure works the other way round. These discs have the notch at the bottom. With the tab *on,* you can over-write; with the tab *off,* the disc is protected.

When formatting is complete you should press CTRL C again. This means pressing the C key on the keyboard while also having the CTRL key depressed. This combination has a special meaning to CP/M. It causes the system to stop running the program that it was currently using and perform a 'warm boot'. This latter means to read the operating system off the disc in drive A and store it in memory. You should always press CTRL-C whenever you change a disc.

If you are ever going to use the back-up disc in drive A then you will need a copy of the CP/M operating system stored on it. The operating system will be stored in a special reserved area of the disc. You would not normally be aware of its presence, except that if no operating system is present when you press CTRL-C the whole computer will just stop and 'hang'. It will have obliterated the programs previously in its memory and will be unable to proceed.

On most CP/M computers you would

use the SYSGEN program to copy the operating system from the reserved area of your CP/M Master Disc to the reserved area of your new disc. On the Apple, you use a special option of the COPY program. With the CP/M Master Disc in drive A and your newly formatted disc in drive B, type

COPY B: = A:/S

followed by pressing the RETURN key. The COPY program will then proceed to make the operating system part of the disc in drive B look exactly like the operating system part of the disc in drive A.

To many people this command seems back to front. They would expect COPY A:=B:/S. However, with COPY and PIP, you always put the new disc first and the old one second. The command structure is thus similar to a Basic command where

A = B

means copy the contents of item B into item A.

When the copying operation is complete you should press RETURN and once again you will see the CP/M prompt character on your screen, viz:

A>

Before you can copy your files to the new disc you will need a copy of the PIP program on your new disc. With the CP/M Master still in A and your new disc still in B type

PIP B:=A: PIP.COM

followed by RETURN. The PIP program will then copy itself from Drive A to drive B. You can now copy your files to the new disc. Take the CP/M Master out of A and replace it in A with your new disc and press CTRL-C. Put the disc to be copied from in drive B and type

PIP A:=B:*.*.

followed by RETURN. The PIP program will then copy ALL your files from drive B to drive A. When the operation is complete you should fix a sticky label to the disc and make an appropriate entry in your backup register.

Because PIP is intended as a universal file transfer utility, it has a lot of options and can be used in a number of ways. The examples given above are, however, the simplest ones.

Note that when you are making your back-up discs, you will be using PIP to copy onto discs that already contain files of the same name. The old files will be deleted by PIP and replaced by the new ones.

The only occasion when this may not happen is when your discs are almost full. What happens is that PIP copies over the new version of the file before deleting the old one. It gives the new version a temporary name ending with .$$$ and only gives its correct name when all data has been transferred correctly and the old file deleted. If there is not enough space on the disc to store the new version as well as the old then the process will abort.

You can check how much space is available by using the STAT program and you can free disc space by 'erasing' files. To erase file FRED.DAT you would type

ERA FRED.DAT

followed by RETURN. You should, however, be careful. It is very easy to erase the wrong file. Then you will be able to find out just how good your system of back-up is.

Back-up is like insurance. You never need it until you have a problem, but by then it is too late if your cover is inadequate. Lack of back-up can be just as disastrous as lack of insurance. To completely lose a firm's sales ledger records can be as catastrophic as a warehouse fire. However some thought when setting up your system should ensure that you can cope with all eventualities.

● *This is the first of a regular series of features on CP/M which will be appearing in future issues of Windfall.*

WITH CP/M IN MIND

Two new products from GB for the CP/M user

TML The Missing Link

TML is a communications oriented File Transfer system for use with all CP/M and MP/M regimes.

Ordinarily CP/M File movement is handled by the PIP program. However PIP is very restrictive in the way files can be moved between *different* microcomputers, and usually requires special port drivers to be patched into PIP.

The large number of CP/M based computers, coupled with a wide range of languages and applications, demands an increasing degree of portability and file interchange between those computers.

TML provides this in a simple but most effective way and is currently available for combinations of Apple II, EXIDY SORCEROR, ICL PERSONAL, MICROMATION, ACT SIRIUS I, and RAIR 3/30. Soon to be available on SUPERBRAIN, TRS-80 and other major CP/M computers.
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TURNKEY

TURNKEY is a software concept enabling the Apple II user to communicate with applications *in plain English*, translating information into the form recognised by CP/M.

CP/M has become the most "popular" microcomputer based operating system mainly because it has provided an adequate applications development base. However, CP/M is notorious for its relatively "unfriendly" means of communication, producing obscure coded messages which are often meaningless to the end-user.

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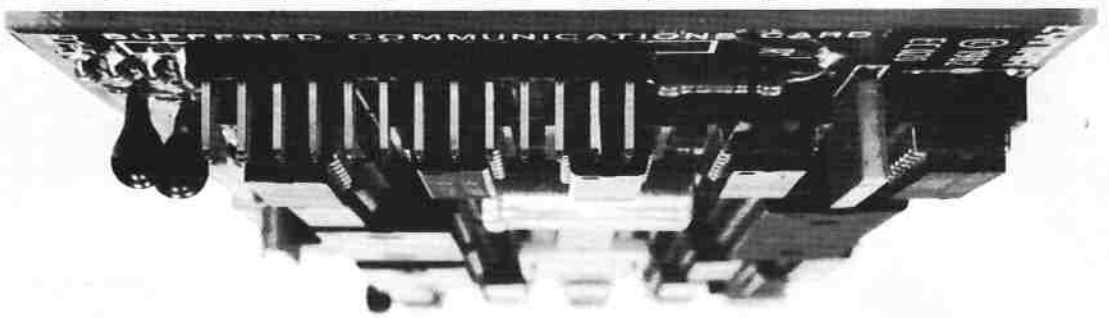

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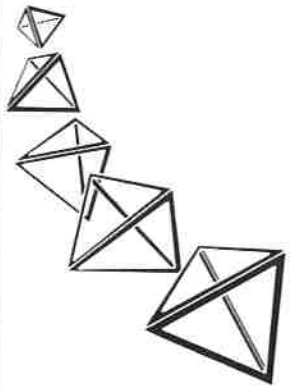

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Align your factors and go on an Odyssey

By CLIFF McKNIGHT

WHAT I would really like to know is: just what is an 'apventure' and how does it differ from an adventure? When I first saw this strange word in the program I thought it was just another spelling mistake. If it is, it is a well-perpetuated one because not only does it appear throughout the program (even in glorious Old English script on the title screen) but also on the front cover of the explanatory booklet. My four-year-old tells me it means APple adVENTURE. And she may be right.

Odyssey is certainly a very good adventure game. When the program is loaded and you have started a new game, as opposed to continuing a saved one, you find yourself on one of the inhabited islands in the mystical Sargalo Sea. You have a few men with you, some gold quadroons (twice the value of doubloons?) and very little else. You can see three cities on the island, each of which has a market where you can buy various items. You can even haggle over the price, but make sure you don't insult the salesman.

Although this first scenario is an adventure in itself where you can meet nice and nasty people and explore all sorts of interesting places which appear as you approach, your real aim is to acquire enough gold, men and equipment to enable you to buy a ship and sail away from the Island.

Once aboard you set sail and cannot return to the original island (the shipwrights' union won't let you.) The scenario changes to a sea adventure with different hazards and a different command set.

As you start trying to explore the other islands you begin to realise what you ought to have bought before you set sail. Also, inappropriate responses can elicit very sarcastic comments from your crew – firing the cannon when there was no enemy elicited the comment: "The native fishermen were very impressed, sir. What next?"

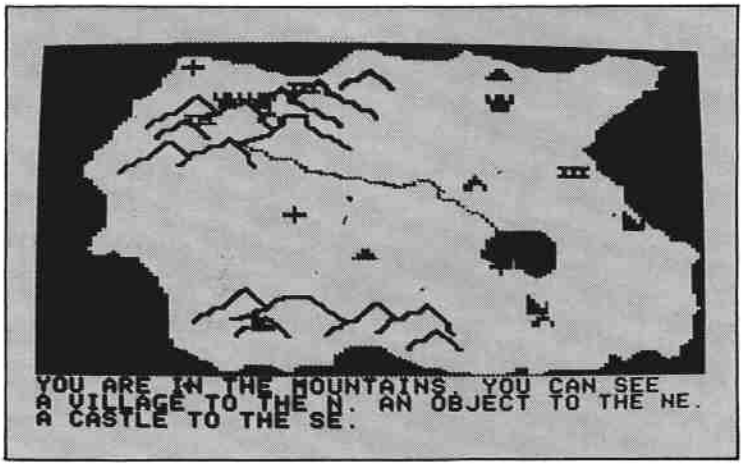
In exploring the islands, you are really searching for the High One's Orb, which could be hidden in the Caverns of Mordril – if you can find them. The entrance to the caverns is guarded by a wizard and you have to work out a way to talk your way past him in order to reach the catacombs beneath.

Once there the scenario changes again (as does the command set) and you have to search for the orb. Again you start to realise why some of the items you might have acquired earlier could have been useful. It wasn't until I got here for the second time that I discovered the function of helmets.

With the orb in your possession, it's back to the ship for a return to the sea adventure. You must now find which island houses the High One's fortress, if you haven't already done so, because with the orb you have the ability to launch an attack on the Caliph of Lapour, an usurper to the throne.

The attack is the final scenario and, like all the earlier ones, you can get wiped out if you are not adequately prepared. You can retreat to the ship again, but items you have used in the attack may well have been used up so you won't have them next time you attack.

A successful attack signals the end of the game and you are given your score (my highest was 57310). You are also told how much gold you won through with, how many men you lost along the way and how many of the realm's in-



Your Odyssey begins on a far from uninhabited island. And not all the natives are friendly.

Odyssey (Synergistic) £18.00
Choplifter (Broderbund) £19.95

Both games were loaned by SBD Software, 15 Jocelyn Road, Richmond TW9 2TY. (tel: 01-948 0461).

habitants you have killed. The final statement is a qualitative remark about your final 'alignment factor'.

Didn't I mention the alignment factor? Well, your party is endowed with certain qualities – strength, wisdom, charisma, speed, experience, dexterity and an alignment factor. The amount of each can be altered by various events in the game, your alignment being varied "as your actions reveal your true nature".

At most points in the game your current rating can be displayed, as can your inventory of possessions. Invalid commands usually cause the current command set to be displayed, but attempting to discover the condition of your party when, for example, two men are trapped under a tree will cause them to be lost. Losing men can be a serious problem because the amount you can carry depends on how many men you have, and losing men may mean you have to dump either gold or goods.

Too many men, on the other hand, can eat up food supplies at an alarming rate which means you cannot explore far without risking losing men through starvation, then having to dump goods, and so on.

Various magic items can be found, won or given by wandering wizards and warlocks (who may help or fight depending on your alignment) and these can be used to improve your party's characteristics if you have sufficient wisdom to use them properly.

As with most adventure games, there is a liberal sprinkling of randomness so that the game may be played many times without too much repetition. Also, since a game may take some time, it is possible to save it and take up where you left off at a later date.

This is useful because after several wipe-outs on the island I got to the point where I was ready to set sail. I therefore saved the game to disc and then continued playing, secure in the knowledge that if I was wiped out at sea I could start from the port again rather than start from scratch. There is also a line number provided where you can GOTO in the event of a program interrupt.

My major criticism of Odyssey is its inconsistency of difficulty. In comparison to the first island, the sea adventure seemed to require less skill and the final assault on the fortress seemed positively easy. It is almost as though the program's author used up all his best ideas at the beginning and it is certainly true that your performance and acquisitions on the first island largely determine your ability to cope with most future hazards.

I've seen an earlier version of this game and some of the changes don't seem to make sense. The worst of these concerns the command to check the Inventory. In the old version, this was always achieved by keying "I". In the new version, it depends where you are. In the great outdoors the command is "I" but in the market the text tells you to use "C" for Check inventory (although keying "I" still results in an inventory listing). However, in the outdoors the command "C" is used to obtain a condition update. Why change things to make them more confusing? Also, it was easier to drive a hard bargain in the old version!

The program uses some nice hi-res graphics, although again these are best in the first island and at sea. The catacombs were disappointing visually. There are also a variety of sounds used which add to the interest and excitement. The accompanying booklet offers a lot of useful information and it is essential to read it thoroughly before embarking on your "apventure". Overall, a highly enjoyable game.

Odyssey requires an Apple II with 48k RAM. The booklet says that the game is on a DOS 3.2 disc, but an addendum slip says the disc is now DOS 3.3 and self-booting.

Beware, Choplifter can make you an addict

By T.N. THOMPSON

CHOPLIFTER, an arcade game from Broderbund Software, is up to their usual standards. It requires a 48k Apple and joysticks, although it can be played, with some difficulty, using paddles. Whether the idea for this game came from the new film 'Who Dares Wins', or from the abortive, calamitous attempt made by our cousins across the pond to rescue the American hostages held in Iran, I wouldn't like to say.

The player is an SAS style helicopter pilot charged with the task of rescuing 64 hostages housed in four buildings. At the start one of the buildings is open and the 16 hostages are running about aimlessly. Until you arrive, that is.

You rescue them by landing the helicopter close to them, allowing them to rush up and jump in. If you land on top of them, as in real life, they have a nasty habit of dying on you. Once aboard you take them back to home base, complete with fluttering Stars and Stripes. They leap out and wave their gratitude profusely. A surprisingly touching part of the game.

Easy isn't it? Except for a couple of minor details, that's all there is to it. The minor details consist of the enemy – a mere one or two thousand of them trying to stop you getting the hostages back. To make matters worse, they're not at all bothered if the hostages get in the way. They're just as happy killing them as killing you.

While your lowly helicopter is only armed with an automatic cannon, the enemy have jet fighters that fire air to air missiles to destroy you in the air, tanks that seem to breed and that will destroy you and the hostages on the ground and, in the later stages of the game, aerial mines that home in on you from all directions.

To start off with your only problems are the tanks, but after you have safely landed the first contingent of hostages the hostile airforce is scrambled. When the second lot have been landed, the kitchen sink comes at you. As 16 is the maximum number your helicopter can carry, the later stages get very hectic.

You can destroy the tanks in great numbers with reasonable ease, but they're always after you. The aerial mines are only a little harder to hit, but they can get you even on your own landing field.

The planes are much more difficult to deal with. In fact, after playing the game for some time the fighters appear to be the most deadly. There doesn't appear to be any restriction on the amount of fuel you use though, so you can spend a lot of time dodging the planes without risking a crash.

The game is mainly about tactics, requiring quick thinking without needing very quick reactions. The hi-res graphics are spectacular. Seeing your helicopter slowly autorotate to the ground, spewing out flames and smoke, is something to behold.

To say that the game is addictive is an understatement. My wife rarely has anything to do with the computer, but once started on this game, I had to fight her to get at the keyboard to write this.

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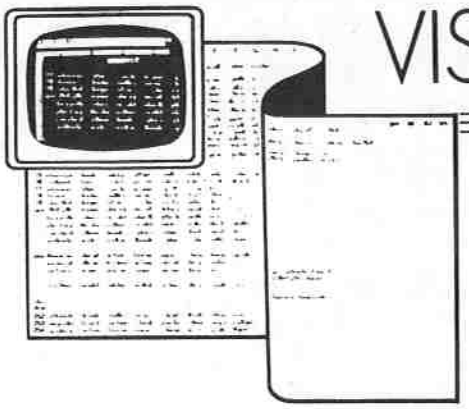


VISICALC

Don't treat DOS like any old boot..

By NICK LEVY
Principal,
Interface Management

IT is said that the popularity of the Apple is primarily due to VisiCalc, but one of the surprising things about this phenomenon is that many exponents only use their Apple to boot the program. They are often not aware of the many other facilities the Apple can offer VisiCalc users.

For instance, I have been surprised to discover how many VisiCalc users are not aware that with each Apple you also get a DOS disc, DOS standing for Disc Operating System. So let's find out how the DOS disc can be used in conjunction with your VisiCalc worksheets.

After booting remove the DOS disc and insert in the same drive one of your VisiCalc data discs – that is one containing VisiCalc worksheets which you have saved – NOT the VisiCalc master program disc. Now type CATALOG and press the RETURN key, and you will see a list of all the files which you have saved on that disc. Didn't you always want to produce a list of all your VisiCalc files held on a disc? An example of such a list is reproduced below.

The number appearing on the left of the title of each of your VisiCalc files indicates how many sectors in the disc are occupied by that particular file. If you multiply that number by 256 you can find out how many characters or digits your file contains. Just in case you want to try and verify these calculations, let me add that any empty cell within the boundaries of your worksheet contains two invisible spaces which are kept "in reserve".

To find out how much space is still left in your data disc, remove it from the drive, put back the DOS disc and type CATALOG. The screen will list all the files in the DOS disc. At this point you might be tempted to try some of the programs on the DOS disc which are for amusement purposes only. Assuming however that you can temporarily overcome this temptation type BRUNFID and press RETURN. (Note that it is not necessary to leave a space between BRUN and FID).

Press No.3 and you are asked to answer two simple questions. For 'source slot' your answer must be 6. For 'drive' your answer must be 1 or 2. Remember to insert your VisiCalc data disc into either drive 1 or 2 before answering the second question. The FID program will now tell you how many sectors on your disc are used and how many are free. This information will help you to decide whether to save your next worksheet on the same disc or on a new one.

Next you want to lock any of your data files so that they cannot be overwritten or deleted. Make a note of the exact spelling of the file you want to lock, and press No.5 in the FID menu. Answer a simple question and press RETURN. If you now use the FID menu to catalog your VisiCalc disc you will find an asterisk on the left of the line containing the name of the file which you have just locked. This file is now protected. When you want to make any changes in this file, or if you want to delete it, you will have first to unlock it using No.4 in the FID menu.

The fact that many users of VisiCalc are not familiar with the Apple's DOS disc must inevitably mean that they are not making back-up copies of their VisiCalc data disc. To make a back-up copy you can use either the COPYA program or the COPY FILES option program (No. 1) under FID. You do not have to initialise your back-up disc if you are going to use the COPYA program on the DOS disc, but you will need an initialised back-up disc if you want to use the copy program which is part of the FID menu.

```
]CATALOG

DISK VOLUME 254

T 133 CASH FLOW ANALYSIS
T 031 RISK ANALYSIS
T 014 ADDITIONAL CAPITAL REQUIREMENT
T 002 RATIO ANALYSIS
T 039 COMPOUND INTEREST TABLES
T 014 DIRECTOR'S SALARIES
T 024 PURCHASES ANALYSIS & FORECAST
T 034 OVERHEAD ALLOCATION & APPORT.
T 037 PERSONAL BUDGET
T 010 COMMISSION CALCULATOR
T 055 OPERATING BUDGET FORECAST
T 015 MORTGAGE CALCULATIONS
T 005 COSA ADJUST.DIF
```

Make a copy of your VisiCalc data disc before attempting the next exercise, which involves renaming a VisiCalc file.

Many VisiCalc users often regret the choice of the first name they gave to a VisiCalc worksheet on a disc. So how can you change the title of a VisiCalc file? There are two ways you can go about it.

You load (/SL) the VisiCalc file the name of which you want to change, and while that file is on your screen and in the computer's memory you wipe that file off from the disc using the /SD command. Following this you immediately save the VisiCalc file kept in the computer's memory (/SS), giving it the new name that you want to use.

Alternatively you can CATALOG your VisiCalc data disc with the DOS disc, as described at the beginning of this article. Then type RENAME followed by the title of the file the name of which you want to change, followed by a comma, followed by the new name (e.g. RENAME ABC,XYZ). Complete the operation by pressing the RETURN key. CATALOG the disc again and see for yourself how the new name has replaced the previous title.

Next we shall look into how you can use VisiCalc in conjunction with the Apple Writer II. Suppose that you write a report using Apple Writer II and you want to incorporate in that report a table produced on VisiCalc. Did you know that Apple Writer II can copy and reproduce that report direct from your VisiCalc data disc? Reproducing tabular information in a report has never been so easy, but in order to enable Apple Writer to reproduce any of your VisiCalc tables, you must first save that table in a Print Format (/PF). You must not confuse the creation of a Print Format file with the commands to print a hard copy of your VisiCalc worksheet.

The creation of a Print Format file is described on page 3-47 of your VisiCalc manual. You start by positioning the cursor at the upper left coordinate from where you want to start reproducing the table. Saving a VisiCalc file in a Print

Format does not automatically save the whole file – you can choose which part you want to save. Having selected your starting point you then type /PF followed by the name you want to give your PF file. Then point the cursor to the lower right coordinate up to where you want to save that table, and press RETURN.

When you save any file in Print Format it is often advisable to add to the name of the file the suffix PF in order to distinguish that file from files saved with the / SS command. If you follow that practice DO NOT use a / to separate the suffix from the name of the file (e.g. TITLE/PF) because when / is used as part of a file name, it confuses the Apple Writer II, instead leave a gap between the title and the suffix (e.g. TITLE PF). Also make sure that the VisiCalc tables that you are going to save in Print Format for use with Apple Writer II are not wider than the page format which you specified for printing with the Apple Writer.

Note that you cannot load on your screen a VisiCalc file saved in Print Format (/PF). The purpose of creating Print Format files is to enable various useful VisiCalc utility programs as well as Apple Writer II to have access and perform certain operations on the VisiCalc files which you have created. Having discovered that Apple Writer II and VisiCalc talk to each other, what would happen if you instruct Apple Writer to accept a VisiCalc worksheet saved with the /SS command? If by any chance you made the mistake of using the Apple Writer II to load a VisiCalc file saved with the /SS command, you will have an unexpected pleasant surprise. The Apple Writer II will produce for your benefit a cell-by-cell display of all the formulae used in the worksheet. You can now look at these formulae on the screen or get them printed. The latter option is not recommended except for small VisiCalc worksheets, because the printing is carried out one cell per line.

Now imagine yourself holding a large printout of one of your worksheets and at the same time checking on the monitor of your Apple the formulae used in that worksheet (reproduced with the aid of the Apple Writer II as described in the previous paragraph). Your attention is drawn to the formula in cell X57. But where exactly is cell X57 in your worksheet? VisiCalc printouts do not unfortunately show row numbers nor the letters used to label the columns. So what can we do about this?

Try the following experiment aimed at showing you how to produce VisiCalc printouts with the rows numbered and the columns lettered.

Load a VisiCalc worksheet which you want to reproduce on a real sheet of paper. Position the cursor anywhere in column A and insert a new column using the command /IC. Move the cursor to cell A1, and type /FL1 followed by RETURN (the 1 should appear one space away on the left hand side of cell A1). Move the cursor to cell A2 and type /FL1 K A1 followed by RETURN (you should have the number 2 appearing exactly below number 1).

Next replicate the formula in cell A2 to the last row of your worksheet. If the last row in your worksheet is, say line 60, then the sequence of key strokes will be as follows: (starting with the cursor in cell A2) /R RETURN A3.A60 RETURN R.

You should now have numbers 1-60 running in parallel with the same numbers shown on the left of your monitor screen in inverse. Next go to cell B1 and insert a new row using the command /IR. Move the cursor to B1 and type the letter A immediately below the letter B appearing in inverse on the top of your screen. If you have difficulties positioning the letter A into the middle of the cell type Q followed by the ESC key, press the space bar three or four times and then type A.

Continue by typing B under the C shown in inverse, type C under the D in inverse and so on till you reach the last column of your worksheet.

Finally move the cursor to A1 and print the whole of the worksheet with the rows numbered and the columns lettered. With such a printout in your hands you will have no problems in pinpointing any cell on your hard copy.

Finally, did you know that you can use your VisiCalc as a word processor? All you have to do is to set the width of your VisiCalc cell to either 40 or 80 (/GC40 RETURN or /GC80 RETURN) according to whether you are working on a 40 column or 80 column VisiCalc, and type away.

You can insert and delete lines, and edit each line with the /E command, print whatever you have typed and always have a copy of your communication stored in a VisiCalc file. Such printouts are ideal for internal memos, but not recommended for formal communication with the outside world.

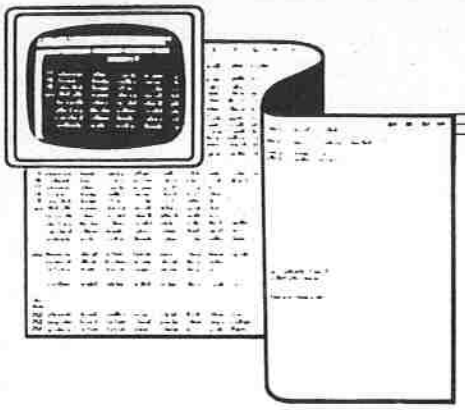
Recalculation makes for a powerful tool

THE VisiCalc worksheet is organised as a grid of columns and rows. The intersecting lines of the columns and rows define thousands of entry positions. At each position you can enter an alphabetic title, a number or a formula to be calculated. Just by "writing" on the worksheet you can set up your own charts, tables and records.

The formatting commands let you individualise the appearance of each entry, row or column. If you wish, for example, you can make your VisiCalc book record look just like your bank statement.

But the power of the VisiCalc program lies in the fact that the computer remembers the formulas and calculations you use in solving a problem. If you change a number you had previously written on the electronic worksheet, all other related numbers on the worksheet change before your eyes as the VisiCalc program automatically recalculates all of the relevant formulas.

Recalculation makes the VisiCalc program a powerful planning and forecasting tool. You can correct mistakes and omissions, and examine various alternatives . . . effortlessly. ***– from the VisiCalc Users' Guide.***



The VisiCalc phenomenon

By PETER BRAMELD

WHEN Personal Software – now VisiCorp – launched the VisiCalc program some years age I am sure it could have not anticipated the impact it would have on the microcomputer world. The reasons for its success are many and varied, as the program allows anybody ranging from a housewife doing domestic accounts to an accountant trying to solve the national debt to supplement their existing skills with the power and flexibility of a computer. Amazingly, this is achieved without the need for any knowledge of computers or programming.

The program is well supported with a series of self-tuition lessons which build on a person's existing expertise and experience of life to create familiarity with the potential of the package.

The Visi family of products has also been expanded to cover a wide range including graph plotting and trend analysis.

Personal Software was the first software house to introduce a standard format for data files, and the use of these data interchange files (DIF files) enables one to pass data from one program to another greatly increasing the potential of data processing.

While the packages are copy protected, the structure of DIF files is described at length enabling those with programming skills to create files which can be processed by VisiCalc and other packages at a later date thus avoiding the need to enter masses of data from the keyboard.

The VisiCalc program, which costs around £120, is now available on a wide range of micros and the user would experience no difficulty when changing machines as the commands are by and large standard.

Like most successful products the program has its imitators which we shall be looking at in future issues, but I would recommend buying the original product.

If you feel you are not getting the best from your computer, or your progress at learning programming is frustratingly slow, the purchase of VisiCalc and accompanying products – all with Visi in the name – will be a rewarding experience.

Cutting the cost of costing

MERCHANT bankers Brown Shipley have flourished financially in the City of London and the rest of the world since 1820. Although they have been users of mainframe computers since 1969, much of the work on the final accounts of the group remained as a manual exercise until they decided to look for an alternative to these costly and time-consuming methods of handling certain accountancy operations.

To Mr Bob Carefull, their chief accountant the obvious solution was to install a desk top microcomputer with suitable software to handle certain of the tasks in hand, such as consolidations and budgeting.

After long and obviously careful evaluation of various systems he chose an upgraded 32k Apple II with dot matrix printer and VisiCalc software, all supplied by Microcomputers For Business, a new computer systems company specialising in investigating and packaging compatible hardware and software programs.

"MFB recommended this combination of the Apple II and VisiCalc because the hardware is simple to use and has good back-up facilities. Also with double density dual floppy discs there is plenty of user space. Equally important is that the VisiCalc is flexible enough to handle what we want it to do and a lot more," said Mr Carefull.

Illustrating his point, he explained that although the system is "still being put through its paces" and is essentially used as a hugely sophisticated calculator it is an important and exciting innovation to the office. He added that already they see a good future for the system in the accounts division of the company and for one recently installed in another department.

"Already, the system has reduced time taken to carry out certain jobs", said Mr Carefull.

As an example a costing exercise previously carried out with paper and a small calculator has been reduced from 5½ hours to 25 minutes. It also significantly reduced the possibility of a mistake when number changes are made.

One of the most invaluable uses of the system is for quickly and simply changing the formats of such calculations as Bank of England ratios, which have been subject to frequent changes. However, its main and most common, but just as valuable use is for departmental cost accounts, schedules, accounting reports, budgeting and all consolidations.

Changing formats of any kind, handled by Brown Shipley in the accounts division, is handled by Applewriter which along with VisiCalc is supported by DMS.

Brown Shipley are relatively old timers in the computer business by virtue of the fact that they installed their first Burroughs B500 mainframe 13 years ago and three years ago updated to Burroughs B1985 and B1885 systems.

Mr Carefull views the Apple and VisiCalc as providing a very useful addition to the group's main computers. It provides his department with a new challenge and both he and his team look forward to "really trying it out".

Score wins with strings

APPLE users who went through Jeff Turner's Basic tuition course in Windfall will remember the section which dealt with string handling – the creation of strings of characters and the subsequent inspection of the strings to find embedded characters and so on.

This very useful little game, devised and programmed by Geoff Buckle, will give plenty of practice in using the facilities in the Apple to play around with strings.

Wordscore will print out 10 characters, chosen at random, and the player must assemble words of three characters or more to build up a score. At the end of the game the total score is displayed with a comment on the player's prowess.

Lines 550-850 are used to reset variables and to test whether the words input by the player conform to the rules of the game – the use of blank spaces (630), letters not supplied by the computer (660) and the same letter being used twice (750) are not allowed.

The routine for supplying the random letters starts at line 1110, using the alphabet as a character source. The scoring (lines 860-990) seems to err on the generous side and could be amended by all but the illiterate!

```
100  HOME : REM  CLEAR SCREEN
105  REM  SET UP INITIAL DISPLAY
110 AA$ = "   ********************
     ***************"
120 BB$ = "   *
                  *"
130  PRINT : PRINT : PRINT
140  PRINT AA$
150  PRINT BB$: PRINT BB$
160  PRINT "   *       W O R D  S
      C O R E       *"
170  PRINT BB$
180  PRINT BB$
190  PRINT "   * A GAME DEVISED
     AND PROGRAMMED *"
200  PRINT "   *          BY  GEOFF
      BUCKLE        *"
210  FOR X = 1 TO 8: PRINT BB$: NEXT
     X
220  PRINT "   *    TO CONTINUE P
     RESS ANY KEY    *"
230  PRINT BB$: PRINT BB$: PRINT
     AA$
240  GET CC$: GOTO 250
250  HOME : REM  CLEAR SCREEN
260  DIM A$(12): REM  ARRAY FOR S
     CREEN DISPLAY OF ENTERED WOR
     DS
265  REM  DISPLAY INSTRUCTIONS
270  PRINT
280  PRINT "THIS IS A GAME WHICH
     WILL TEST YOUR"
290  PRINT "ABILITY TO DERIVE WOR
     DS FROM RANDOM"
300  PRINT "LETTERS WHICH WILL BE
      SUPPLIED TO YOU"
310  PRINT "BY THE COMPUTER AND Y
     OUR SCORE WILL"
320  PRINT "BE CHECKED AND POINTS
      AWARDED FOR YOUR"
330  PRINT "SKILL AND KNOWLEDGE.
     PLURALS ARE A FORM"
340  PRINT "OF CHEATING AND SHOUL
     D NOT BE USED."
350  PRINT "UNFORTUNATELY THE COM
     PUTER CANNOT CHECK"
360  PRINT "THAT THE WORDS WHICH
     YOU ENTER ARE"
370  PRINT "GENUINE. SO YOU ARE O
     N YOUR ABSOLUTE"
380  INVERSE : FLASH : HTAB 15: PRINT
     "HONESTY."
390  NORMAL
400  PRINT : PRINT "YOU WILL BE G
     IVEN FIVE POINTS FOR EACH"
410  PRINT "WORD WHICH YOU ENTER
     AND YOU WILL ALSO"
420  PRINT "BE AWARDED A POINT FO
     R EACH LETTER IN"
430  PRINT "THE WORDS WHICH YOU H
     AVE CHOSEN."
440  PRINT "EACH WORD MUST HAVE 3
      OR MORE LETTERS."
450  PRINT "WHEN YOU CAN MAKE UP
     NO MORE WORDS,"
460  PRINT "TYPE 'RETURN' WITHOUT
      MAKING AN ENTRY.
470  PRINT
480  PRINT "WHAT IS YOUR NAME ?"
490  INPUT NAME$
500  HOME
505  REM  RESET VARIABLES AND STR
     INGS
510  FOR A = 1 TO 10
520 A$(A) = ""
530  NEXT A
540 W$ = "":WW$ = "":LL$ = ""
550 U$ = "":UU$ = "":CH$ = ""
560 P$ = "":O$ = "":L$ = ""
570 SC = 0:TS = 0:VV = 12
580  GOSUB 1110: REM  GO FOR LETT
     ERS
590  GOSUB 1440: REM  GO FOR SCRE
     EN DISPLAY
600  INPUT W$: REM  ENTER WORD
610  IF W$ = "" THEN  GOTO 910: REM
      RETURN WITHOUT ENTRY COMPLE
     TES GAME
615  REM  DISQUALIFY FOR WORD NOT
      LONG ENOUGH
620  IF  LEN (W$) < 3 THEN  GOTO
     1410
625  REM  DISQUALIFY FOR USING BL
     ANK SPACES
630  FOR B = 1 TO 10
640  IF  MID$ (W$,B,1) = " " THEN
      GOTO 1400
650  NEXT B
655  REM  DISQUALIFY FOR USING LE
     TTER NOT SUPPLIED BY COMPUTE
     R
660 TT = 0
670  FOR C = 1 TO  LEN (W$)
680 T$ =  MID$ (W$,C,1)
690  FOR D = 1 TO 10
700 TT$ =  MID$ (CH$,D,1)
710  IF T$ = TT$ THEN TT = TT + 1

720  NEXT D
730  NEXT C
740  IF TT <  LEN (W$) THEN  GOTO
     1390
745  REM  DISQUALIFY FOR USING TH
     E SAME LETTER TWICE
750 UU = 0
760  FOR E = 1 TO  LEN (W$)
770 U$ =  MID$ (W$,E,1)
780  FOR F = 1 TO  LEN (W$)
790 UU$ =  MID$ (W$,F,1)
800  IF U$ = UU$ THEN UU = UU + 1
810  NEXT F
820  NEXT E
830  IF UU <  > LEN (W$) THEN  GOTO
     1420
835  REM  TIDY UP THE SCREEN DISP
     LAY
840  IF  LEN (A$(VV)) > 30 THEN V
     V = VV - 1
850 A$(VV) = A$(VV) + " " + W$
855  REM  ROUTINE FOR CALCULATION
      AND DISPLAY OF SCORE AND QU
     ALIFICATION
860  HOME
870 SC = 5 +  LEN (W$)
880 TS = TS + SC
890  GOSUB 1440
900  GOTO 600
910  HOME
920  PRINT : PRINT : PRINT "YOUR
     SCORE IS    ";TS
930  IF TS < 20 THEN O$ = "ILLITE
     RATE"
940  IF TS > 19 AND TS < 40 THEN
     O$ = "NOT VERY GOOD"
950  IF TS > 39 AND TS < 75 THEN
     O$ = "AVERAGE"
960  IF TS > 74 AND TS < 100 THEN
     O$ = "GOOD"
970  IF TS > 99 AND TS < 150 THEN
     O$ = "VERY GOOD"
980  IF TS > 149 THEN O$ = "BRILL
     IANT"
990  PRINT : PRINT "YOUR QUALIFIC
     ATION IS:-  ";O$
995  REM  FIND OUT IF PRINTOUT RE
     QUIRED
1000  PRINT : PRINT "WOULD YOU LI
     KE A PRINT-OUT OF YOUR"
1010  PRINT "EFFORTS TO SHOW THE
     WORLD (Y/N) ?
1020  INPUT ANS$
1030  IF ANS$ = "Y" GOTO 1250
1040  IF ANS$ = "N" GOTO 1060
1050  IF ANS$ <  > "Y" OR ANS$ <
      > "N" THEN  HOME : PRINT ""
     : PRINT "ANSWER THE QUESTION
      PROPERLY PLEASE": GOTO 1000

1051  REM  LAST ENTRY CONTAINS CO
     NTROL/G FOR BLEEP
1055  REM  FIND OUT IF NEW GAME R
     EQUIRED
1060  PRINT : PRINT "DO YOU WISH
     TO PLAY AGAIN (Y/N) ?"
1070  INPUT REP$
1080  IF REP$ = "Y" THEN TS = 0: GOTO
     500
1090  IF REP$ = "N" THEN  END
1100  IF REP$ <  > "Y" OR REP$ <
      > "N" THEN  HOME : PRINT ""
     : PRINT "ANSWER THE QUESTION
      PROPERLY PLEASE": GOTO 1060

1101  REM  LAST ENTRY CONTAINS CO
     NTROL/G FOR BLEEP
1105  REM  SUBROUTINE FOR SUPPLY
     OF LETTERS
1110 NU =  INT (26 *  RND (1)) +
     1
1120 AL$ = "ABCDEFGHHIJKLMNOPORST
     UVWXYZ"
```

Elegant storer of numeric arrays

THE Tasc compiler is rapidly becoming popular among Apple users, mainly for its advantages of minimal code expansion and compatibility with Applesoft Basic.

It also allows a very rapid and elegant method of storing numeric arrays on disc. This method uses the Define Common Block function of the compiler.

Variables or arrays which are defined as common, using the REM ! DEFCOMMON statement, are assigned a block of memory at the start of the program space. This is the key to the method since this block is at a fixed address which does not vary with alterations to the program.

For instance a program beginning at decimal 16384, hex 4000, the normal starting address to avoid Page 1 graphics, may contain an array of 100 floating-point elements defined as COMMON. The block of memory assigned to the array will be from 16384 to 16883, that is, five bytes per element.

To store the array on disc, the area of memory concerned is simply BSAVEd. BLOADing the file will recover the array. The disc file may be used in different programs by defining the same common array in each.

The two programs are included as a simple example of how this method is used. Program 1 fills a 100 element array with 100 random numbers between 0 and 1, and then saves the array on disc as a binary file with the name "ARRAY". Program 2 simply reads the same file back into another array.

Timing program 1, compared with a similar program using a normal DOS sequential file, showed a reduction in time from just over six seconds to 3.5 seconds, ignoring the array assignment. Increasing the array size to 1000 elements showed a much greater speed increase, from 48 seconds to 9.5 seconds.

The increase in speed is due mainly to avoidance of the floating-point to Ascii routine, which is required for every byte in a text file. As long as only numeric data is involved, code conversion is not necessary, since any 8-bit number may be stored in one disc byte.

The method may be easily modified for integer values by defining an integer array and calculating the file length as two bytes per array element.

For the fastest possible disc storage of numeric data, the programmer experienced in the use of the RWTS routine can use it to store the common block in known track/sector locations on the disc. This method has been used to store an 819 element array, which just fills one sector, in rather less than one second (discounting the time taken for the disc drive to reach working speed).

Anybody interested in further details is invited to write to me, enclosing a SAE at 50 Oxford Road, Altrincham, Cheshire WA14 2EB.

Keith Williamson

```
1  REM  !DEFCOMMON A(99)
2  REM  ABOVE IS "ACTIVE REM" FOR
     COMPILER
100 D$ =  CHR$ (4): REM  CTRL-D F
    OR I/O
190  REM
200  REM  ASSIGN ARRAY
210  REM
250  FOR N = 0 TO 99
260 A(N) =  RND (1)
270  NEXT
290  REM
300  REM  SAVE ARRAY TO DISK
310  REM
350  PRINT D$"BSAVE ARRAY,A16384,
    L500"
360  END
```

```
1  REM  !DEFCOMMON B(99)
2  REM  ABOVE IS "ACTIVE REM" FOR
     COMPILER
100 D$ =  CHR$ (4): REM  CTRL-D F
    OR I/O
200  PRINT D$"BLOAD ARRAY"
290  REM
300  REM  ABOVE IS ALL THE CODE R
    EQUIRED
310  REM  TO READ THE BINARY FILE
      INTO
320  REM  ARRAY B(N)
```

GAME

```
1130 L$ =  MID$ (AL$,NU,1)
1140  FOR G = 1 TO  LEN (CH$)
1150  IF L$ =  MID$ (CH$,G,1) THEN
    L$ = ""
1160  NEXT G
1170 CH$ = CH$ + L$
1180  IF  LEN (CH$) < 10 THEN  GOTO
    1110
1190  FOR H = 1 TO 10
1200 W$ =  MID$ (CH$,H,1)
1210 WW$ = W$ + " "
1220 LL$ = LL$ + WW$
1230  NEXT H
1240  RETURN
1245  REM  ROUTINE FOR OPERATING
    PRINTER
1250  REM
1260  HOME
1270  PRINT "SWITCH ON YOUR PRINT
    ER NOW"
1280  PRINT
1290  PRINT "PRESS LETTER 'P' FOL
    LOWED BY 'RETURN'
1300  INPUT P$
1310  IF P$ <  > "P" THEN  GOTO 1
    000
1320  IF P$ = "P" THEN  PR£ 1
1330  HOME
1340  GOSUB 1440
1350  PRINT : PRINT "YOUR QUALIFI
    CATION IS:-  ";0$
1360  PR£ 0
1370  HOME
1380  GOTO 1060
1385  REM  ROUTINE FOR DISPLAY OF
     DISQUALIFICATIONS
1390  PRINT : PRINT "LETTER NOT S
    UPPLIED BY COMPUTER": GOTO 1
    430
1400  PRINT : PRINT "BLANK SPACES
     NOT ALLOWED": GOTO 1430
1410  PRINT : PRINT "MINIMUM THRE
    E LETTERS REQUIRED": GOTO 14
    30
1420  PRINT : PRINT "YOU HAVE USE
    D THE SAME LETTER TWICE.": GOTO
    1430
1430  PRINT "": PRINT "": PRINT "
    YOU ARE DISQUALIFIED FOR CHE
    ATING": GOTO 1060
1431  REM  LAST ENTRY CONTAINS TW
    O CONTROL/GS FOR BLEEP
1435  REM  SUBROUTINE FOR SCREEN
    AND PRINTER DISPLAY
1440  PRINT "NAME OF COMPETITOR:-
     "NAME$
1450  PRINT
1460  PRINT "LETTERS ARE:- ";LL$
1470  PRINT : PRINT "WORDS SUBMIT
    TED:-":
1480  PRINT
1490  PRINT A$(12): PRINT A$(11)
1500  PRINT A$(10): PRINT A$(9): PRINT
    A$(8): PRINT A$(7): PRINT A$
    (6)
1510  PRINT A$(5): PRINT A$(4): PRINT
    A$(3): PRINT A$(2): PRINT A$
    (1)
1520  PRINT : PRINT "YOUR SCORE I
    S:- "TS
1530  PRINT : PRINT
1540  RETURN
```

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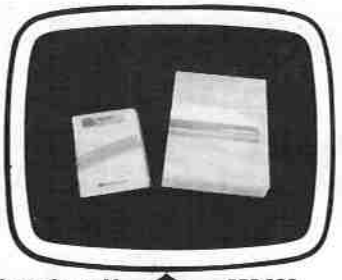

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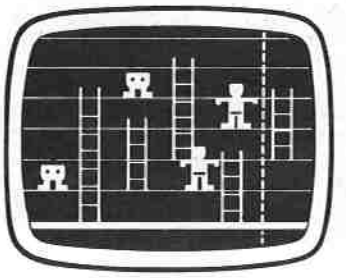

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MED-RES GRAPHICS

How to giv a touch of

This utility gives at least 255 "colours" and a number of medium resolution shapes, including discs. The program is not suitable for ITT 2020.

By ED PEACH

WHILE only four different hi-res colours, plus black and white, are normally available on the Apple, use of the following techniques allow shapes to have all of the low resolution colours plus many more.

There is a price to pay as med-res shapes are limited to a 140*80 resolution, but the big plus is that you can use hi-res as well and mix it without problem with med-res shapes and colours if you use XDRAW and XPLOT.

Before getting into the program details, a little experimenting will help you to get an understanding of how colours are displayed on the screen.

Type CALL–151 RETURN to get into the monitor, then type F3E2G RETURN and the normal hi-res initialisation will take place. If you refer to page 19 of the Apple II reference manual it shows that the first hi-res screen is memory mapped between $2000 and $3FFF. This means if we change a byte in this range a corresponding change will take place on the screen.

Remaining in the monitor try typing 2000:05 RETURN and a small violet line will appear in the top left corner. Repeating the experiment, but replacing the '05' with 0A, 07, 85, 8A and FF yields the following:

05-VIOLET	85-BLUE
0A-GREEN	8A-RED
07-WHITE	FF-WHITE

If these bytes are expressed as the corresponding bit pattern, and compared with a schematic of the dots on a colour TV the reason for these colours can be seen.

MSB	V	B	G	R	V	B	G	R	V	B	G	R	V	B	
0	0		0		0		1		0		1		0		=$0A (green)
1	0		0		0		1		0		1		0		=$8A (red)

Thus the MSB (Most Significant Bit) – bit 7 – switches between the two colours which each bit can represent. However if two adjacent bits are on (i.e. 1) then a white dot results, e.g:

MSB	V	B	G	R	V	B	G	R	V	B	G	R	V	B	
0	0		0		0		1		1		1		1		=$07 (white)

It has probably occurred to you that interesting results might be obtained by stacking different combinations of bytes. The effects that can be obtained in this way are at the core of med-res graphics.

Try for example:

2000:AA

BLK RED BLK RED BLK RED BLK

2400:D5

BLU BLK BLU BLK BLU BLK BLU

and a lilac line results.

Unfortunately as only seven of the eight bits in a byte are plotted on the screen if the same numbers are put in the adjacent bytes $2001 and $2401 a slate colour results. This is because all the bits have been displaced one point to the left. Thus to get the same colour in $2001 plot $D5 and in $2401 plot $AA.

This may be turned into the following rule of thumb. Given a bit pattern for an even byte, the corresponding odd byte may be obtained by rotating bits 0 to 6 one place to the left (preserving bit 7 status).

For speed I have used look-up tables and the even byte patterns are stored at $A11 to $A20, while the corresponding odd byte patterns are in $A21 to $A30. Try substituting different values for these tables. For example, try substituting the values in $A11 and $A21 with $22 and $14 respectively.

The use of only seven out of eight bits not only affects colour patterns but also results in the hi-res screen map being quite complex. Additional complication results from the vertical division of the screen into three major sections, each having eight subsections of eight lines.

The normal procedure for finding a bit address on the screen would be to establish the left hand screen address, then divide the horizontal position by seven to get the byte offset with the remainder giving the bit position within the byte. An excellent reference to this is given in "Practical Microcomputer Programing – The 6502" by Weller.

As may be guessed, this procedure is quite lengthy, for speed med-res uses look-up tables, as follows:

$803-$8C2 LHS LOWBYTE ADDRESS
$8C3-$982 LHS HIGHBYTE ADDRESS
$983-$9C9 HORIZONTAL BYTE POSITION
$9CA-$A10 BIT REMAINDER

These are used in subroutine SCRNPOS which takes X and Y co-ordinates in the range 0-139 and 0-96 respectively. This routine may be used to find the address of any screen position, and thus allow the screen to be altered.

Before altering the data, we need to decide how much needs to be kept. In other words how wide a "paintbrush" is going to be used.

This concept of a brush is used in subroutine FMASK, when called from the line drawing routine DLINE. Here the brush width is used to call up two masking patterns, one to mask a hole in the screen, the other selecting the correct bit sequence for the colour. These masks are then rotated into the correct position with respect to the bit position within the byte.

For example, if the byte associated with the screen were red and we wanted to put in a blue line three bits long, the following bit manipulations would be required:

MSB
1 0 1 0 1 0 1 0 (red)
1 1 1 1 0 0 0 1 mask for hole

This gives a red byte with a hole in it!

1 0 1 0 0 0 0 0

Then if a similar operation is carried out on the blue data:

1 1 0 1 0 1 0 1 (blue)
1 0 0 0 1 1 1 0 Mask for brush

This gives: 1 0 0 0 0 1 0 0, i.e. a small blue blob is obtained. If this is then "OR ed" with the red byte with a hole in it, the result is a red line with a blue blob – well nearly!

In fact the result is:

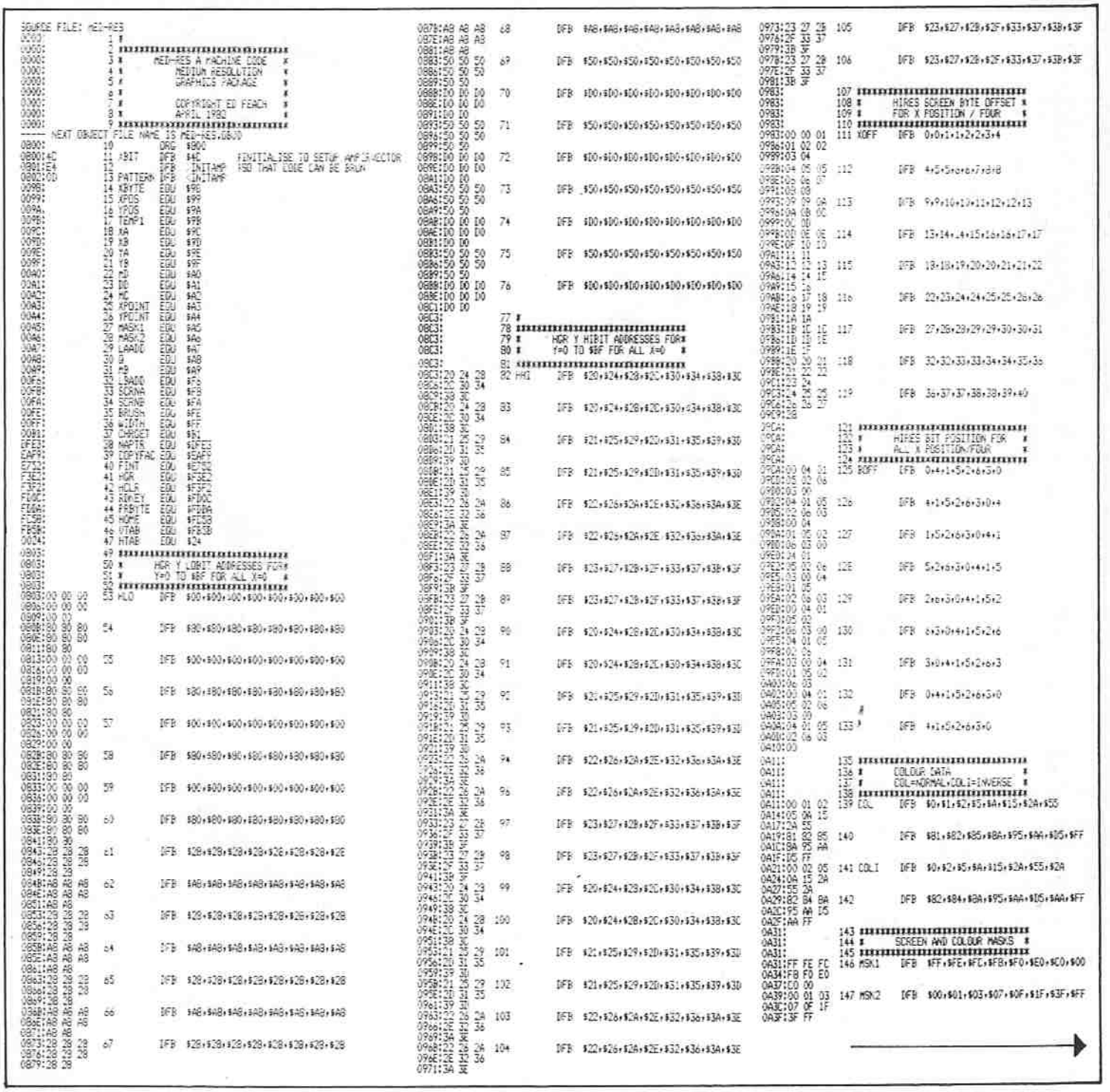
1 0 1 0 0 1 0 0
red blue

This demonstrates one of the problems in manipulating colour data, and why only medium resolution graphics are possible if colours are being mixed together. In fact as a byte represents one fortieth of the screen width, this is fairly acceptable.

To complete this introduction to medium resolution graphics the final routine, FILSCN, leaves you with something to explore once you have typed in the machine code. If you now type $B89G you can examine and tabulate the 256 "colours" which can be obtained. The truly adventurous can obtain more by changing the data in $A11-$A30 – see if you can get a leaded window effect for example.

● *Next month I'll be giving you a routine for drawing a polygon on the screen, which those wargamers among you should be able to adapt to draw hexagons.*

...e your Apple ... the Van Goghs



```
SOURCE FILE: MED-RES
0000:                1 *
0000:                2 ********************************
0000:                3 *     MED-RES A MACHINE CODE   *
0000:                4 *          MEDIUM RESOLUTION   *
0000:                5 *          GRAPHICS PACKAGE    *
0000:                6 *                              *
0000:                7 *          COPYRIGHT ED FEACH  *
0000:                8 *          APRIL 1982          *
0000:                9 ********************************
      NEXT OBJECT FILE NAME IS MED-RES.OBJ0
0800:               10          ORG  $800
0800:4C             11 ABIT     BFB  $4C      INITIALISE TO SETUP AMPER-VECTOR
0801:E4             12          BFB  INITAMP  SO THAT CODE CAN BE RUN
0802:0D             13 PATTERN  BFB  INITAMP
0098:               14 XBYTE    EQU  $98
0099:               15 XPOS     EQU  $99
009A:               16 YPOS     EQU  $9A
009B:               17 TEMP1    EQU  $9B
009C:               18 XA       EQU  $9C
009D:               19 XB       EQU  $9D
009E:               20 YA       EQU  $9E
009F:               21 YB       EQU  $9F
00A0:               22 MD       EQU  $A0
00A1:               23 DD       EQU  $A1
00A2:               24 ME       EQU  $A2
00A3:               25 XPOINT   EQU  $A3
00A4:               26 YPOINT   EQU  $A4
00A5:               27 MASK1    EQU  $A5
00A6:               28 MASK2    EQU  $A6
00A7:               29 LAADD    EQU  $A7
00A8:               30 G        EQU  $A8
00A9:               31 H9       EQU  $A9
00FA:               32 LBADD    EQU  $FA
00FB:               33 SCRNA    EQU  $FB
00FA:               34 SCRNB    EQU  $FA
00FE:               35 BRUSH    EQU  $FE
00FF:               36 WIDTH    EQU  $FF
00B1:               37 CHRSET   EQU  $B1
DFE3:               38 MAPTR    EQU  $DFE3
EAF9:               39 TOPYFAC  EQU  $EAF9
E752:               40 PTNT     EQU  $E752
F3E2:               41 HGR      EQU  $F3E2
F3D8:               42 HGLB     EQU  $F3D8
FD0C:               43 RDKEY    EQU  $FD0C
FDBA:               44 FRBYTE   EQU  $FDBA
FC58:               45 HOME     EQU  $FC58
FB5B:               46 VTAB     EQU  $FB5B
0024:               47 HTAB     EQU  $24
0803:               48 ********************************
0803:               49 *     HGR Y LOBIT ADDRESSES FOR*
0803:               50 *     Y=0 TO $BF FOR ALL X=0   *
0803:               51 ********************************
0803:00 00 00       52 HLO      DFB  $00+$00+$00+$00+$00+$00+$00+$00
0806:00 00 00
0809:00 00
080B:80 80 80       53          DFB  $80+$80+$80+$80+$80+$80+$80+$80
080E:80 80 80
0811:80 80
0813:00 00 00       54          DFB  $00+$00+$00+$00+$00+$00+$00+$00
0816:00 00 00
0819:00 00
081B:80 80 80       55          DFB  $80+$80+$80+$80+$80+$80+$80+$80
081E:80 80 80
0821:80 80
0823:00 00 00       56          DFB  $00+$00+$00+$00+$00+$00+$00+$00
0826:00 00 00
0829:00 00
082B:80 80 80       57          DFB  $80+$80+$80+$80+$80+$80+$80+$80
082E:80 80 80
0831:80 80
0833:00 00 00       58          DFB  $00+$00+$00+$00+$00+$00+$00+$00
0836:00 00 00
0839:00 00
083B:80 80 80       59          DFB  $80+$80+$80+$80+$80+$80+$80+$80
083E:80 80 80
0841:80 80
0843:28 28 28       60          DFB  $28+$28+$28+$28+$28+$28+$28+$28
0846:28 28 28
0849:28 28
084B:A8 A8 A8       61          DFB  $A8+$A8+$A8+$A8+$A8+$A8+$A8+$A8
084E:A8 A8 A8
0851:A8 A8
0853:28 28 28       62          DFB  $28+$28+$28+$28+$28+$28+$28+$28
0856:28 28 28
0859:28 28
085B:A8 A8 A8       63          DFB  $A8+$A8+$A8+$A8+$A8+$A8+$A8+$A8
085E:A8 A8 A8
0861:A8 A8
0863:28 28 28       64          DFB  $28+$28+$28+$28+$28+$28+$28+$28
0866:28 28 28
0869:28 28
086B:A8 A8 A8       65          DFB  $A8+$A8+$A8+$A8+$A8+$A8+$A8+$A8
086E:A8 A8 A8
0871:A8 A8
0873:28 28 28       66          DFB  $28+$28+$28+$28+$28+$28+$28+$28
0876:28 28 28
0879:28 28
087B:A8 A8 A8       67          DFB  $A8+$A8+$A8+$A8+$A8+$A8+$A8+$A8
087E:A8 A8 A8
0881:A8 A8
0883:50 50 50       68          DFB  $50+$50+$50+$50+$50+$50+$50+$50
0886:50 50 50
0889:50 50
088B:D0 D0 D0       69          DFB  $D0+$D0+$D0+$D0+$D0+$D0+$D0+$D0
088E:D0 D0 D0
0891:D0 D0
0893:50 50 50       70          DFB  $50+$50+$50+$50+$50+$50+$50+$50
0896:50 50 50
0899:50 50
089B:D0 D0 D0       71          DFB  $D0+$D0+$D0+$D0+$D0+$D0+$D0+$D0
089E:D0 D0 D0
08A1:D0 D0
08A3:50 50 50       72          DFB  $50+$50+$50+$50+$50+$50+$50+$50
08A6:50 50 50
08A9:50 50
08AB:D0 D0 D0       73          DFB  $D0+$D0+$D0+$D0+$D0+$D0+$D0+$D0
08AE:D0 D0 D0
08B1:D0 D0
08B3:50 50 50       74          DFB  $50+$50+$50+$50+$50+$50+$50+$50
08B6:50 50 50
08B9:50 50
08BB:D0 D0 D0       75          DFB  $D0+$D0+$D0+$D0+$D0+$D0+$D0+$D0
08BE:D0 D0 D0
08C1:D0 D0
08C3:               76 *
08C3:               77 ********************************
08C3:               78 *     HGR Y HIBIT ADDRESSES FOR*
08C3:               79 *     Y=0 TO $BF FOR ALL X=0   *
08C3:               80 ********************************
08C3:               81 *
08C3:20 24 28       82 HHI      DFB  $20+$24+$28+$2C+$30+$34+$38+$3C
08C6:2C 30 34
08C9:38 3C
08CB:20 24 28       83          DFB  $20+$24+$28+$2C+$30+$34+$38+$3C
08CE:2C 30 34
08D1:38 3C
08D3:21 25 29       84          DFB  $21+$25+$29+$2D+$31+$35+$39+$3D
08D6:2D 31 35
08D9:39 3D
08DB:21 25 29       85          DFB  $21+$25+$29+$2D+$31+$35+$39+$3D
08DE:2D 31 35
08E1:39 3D
08E3:22 26 2A       86          DFB  $22+$26+$2A+$2E+$32+$36+$3A+$3E
08E6:2E 32 36
08E9:3A 3E
08EB:22 26 2A       87          DFB  $22+$26+$2A+$2E+$32+$36+$3A+$3E
08EE:2E 32 36
08F1:3A 3E
08F3:23 27 2B       88          DFB  $23+$27+$2B+$2F+$33+$37+$3B+$3F
08F6:2F 33 37
08F9:3B 3F
08FB:23 27 2B       89          DFB  $23+$27+$2B+$2F+$33+$37+$3B+$3F
08FE:2F 33 37
0901:3B 3F
0903:20 24 28       90          DFB  $20+$24+$28+$2C+$30+$34+$38+$3C
0906:2C 30 34
0909:38 3C
090B:20 24 28       91          DFB  $20+$24+$28+$2C+$30+$34+$38+$3C
090E:2C 30 34
0911:38 3C
0913:21 25 29       92          DFB  $21+$25+$29+$2D+$31+$35+$39+$3D
0916:2D 31 35
0919:39 3D
091B:21 25 29       93          DFB  $21+$25+$29+$2D+$31+$35+$39+$3D
091E:2D 31 35
0921:39 3D
0923:22 26 2A       94          DFB  $22+$26+$2A+$2E+$32+$36+$3A+$3E
0926:2E 32 36
0929:3A 3E
092B:22 26 2A       95          DFB  $22+$26+$2A+$2E+$32+$36+$3A+$3E
092E:2E 32 36
0931:3A 3E
0933:23 27 2B       96          DFB  $23+$27+$2B+$2F+$33+$37+$3B+$3F
0936:2F 33 37
0939:3B 3F
093B:23 27 2B       97          DFB  $23+$27+$2B+$2F+$33+$37+$3B+$3F
093E:2F 33 37
0941:3B 3F
0943:20 24 28       98          DFB  $20+$24+$28+$2C+$30+$34+$38+$3C
0946:2C 30 34
0949:38 3C
094B:20 24 28       99          DFB  $20+$24+$28+$2C+$30+$34+$38+$3C
094E:2C 30 34
0951:38 3C
0953:21 25 29       100         DFB  $21+$25+$29+$2D+$31+$35+$39+$3D
0956:2D 31 35
0959:39 3D
095B:21 25 29       101         DFB  $21+$25+$29+$2D+$31+$35+$39+$3D
095E:2D 31 35
0961:39 3D
0963:22 26 2A       102         DFB  $22+$26+$2A+$2E+$32+$36+$3A+$3E
0966:2E 32 36
0969:3A 3E
096B:22 26 2A       103         DFB  $22+$26+$2A+$2E+$32+$36+$3A+$3E
096E:2E 32 36
0971:3A 3E
0973:23 27 2B       104         DFB  $23+$27+$2B+$2F+$33+$37+$3B+$3F
0976:2F 33 37
0979:3B 3F
097B:23 27 2B       105         DFB  $23+$27+$2B+$2F+$33+$37+$3B+$3F
097E:2F 33 37
0981:3B 3F
0983:               106 ********************************
0983:               107 *     HIRES SCREEN BYTE OFFSET *
0983:               108 *     FOR X POSITION / FOUR    *
0983:               109 ********************************
0983:               110 *
0983:00 00 01       111 XOFF    DFB  0+0+1+1+2+2+3+4
0986:01 02 02
0989:03 04
098B:04 05 05       112         DFB  4+5+5+6+6+7+8+8
098E:06 06 07
0991:08 08
0993:09 09 0A       113         DFB  9+9+10+10+11+12+12+13
0996:0A 0B 0C
0999:0C 0D
099B:0D 0E 0E       114         DFB  13+14+14+15+16+16+17+17
099E:0F 10 10
09A1:11 11
09A3:12 12 13       115         DFB  18+18+19+20+20+21+21+22
09A6:14 14 15
09A9:15 16
09AB:16 17 18       116         DFB  22+23+24+24+25+25+26+26
09AE:18 19 19
09B1:1A 1A
09B3:1B 1C 1C       117         DFB  27+28+29+29+29+30+30+31
09B6:1D 1D 1E
09B9:1E 1F
09BB:20 20 21       118         DFB  32+32+33+33+34+34+35+36
09BE:21 22 22
09C1:23 24
09C3:24 25 25       119         DFB  36+37+37+38+38+39+40
09C6:26 26 27
09C9:28
09CA:               120 ********************************
09CA:               121 *     HIRES BIT POSITION FOR   *
09CA:               122 *     ALL X POSITION/FOUR      *
09CA:               123 ********************************
09CA:               124 *
09CA:00 04 01       125 BOFF    DFB  0+4+1+5+2+6+3+0
09CD:05 02 06
09D0:03 00
09D2:04 01 05       126         DFB  4+1+5+2+6+3+0+4
09D5:02 06 03
09D8:00 04
09DA:01 05 02       127         DFB  1+5+2+6+3+0+4+1
09DD:06 03 00
09E0:04 01
09E2:05 02 06       128         DFB  5+2+6+3+0+4+1+5
09E5:03 00 04
09E8:01 05
09EA:02 06 03       129         DFB  2+6+3+0+4+1+5+2
09ED:00 04 01
09F0:05 02
09F2:06 03 00       130         DFB  6+3+0+4+1+5+2+6
09F5:04 01 05
09F8:02 06
09FA:03 00 04       131         DFB  3+0+4+1+5+2+6+3
09FD:01 05 02
0A00:06 03
0A02:00 04 01       132         DFB  0+4+1+5+2+6+3+0
0A05:05 02 06
0A08:03 00
0A0A:04 01 05       133         DFB  4+1+5+2+6+3+0
0A0D:02 06 03
0A10:00
0A11:               134 ********************************
0A11:               135 *     COLOUR DATA              *
0A11:               136 *     COL=NORMAL+COL1=INVERSE  *
0A11:               137 ********************************
0A11:               138 *
0A11:00 01 02       139 COL     DFB  $0+$1+$2+$5+$A+$15+$2A+$55
0A14:05 0A 15
0A17:2A 55
0A19:81 82 85       140         DFB  $81+$82+$85+$8A+$95+$A1+$D5+$FF
0A1C:8A 95 A1
0A1F:D5 FF
0A21:00 02 05       141 COL1    DFB  $0+$2+$5+$A+$15+$2A+$55+$2A
0A24:0A 15 2A
0A27:55 2A
0A29:82 84 8A       142         DFB  $82+$84+$8A+$95+$AA+$D5+$A1+$FF
0A2C:95 AA D5
0A2F:A1 FF
0A31:               143 ********************************
0A31:               144 *     SCREEN AND COLOUR MASKS  *
0A31:               145 ********************************
0A31:FF FE FC       146 MSK1    DFB  $FF+$FE+$FC+$F8+$F0+$E0+$C0+$00
0A34:F8 F0 E0
0A37:C0 00
0A39:00 01 03       147 MSK2    DFB  $00+$01+$03+$07+$0F+$1F+$3F+$FF
0A3C:07 0F 1F
0A3F:3F FF
```

MED-RES GRAPHICS

```
0A41:                 149 ;*********************************
0A41:                 150 ;*      SUBROUTINE SCRNPOS       *
0A41:                 151 ;*      TAKES X AND Y COORDINATES*
0A41:                 152 ;*      AND RETURNS SCREEN A AND *
0A41:                 153 ;*      B POSITIONS IN :-        *
0A41:                 154 ;*      SCRNA,SCRNA+1            *
0A41:                 155 ;*      SCRNB,SCRNB+1            *
0A41:                 156 ;*      PLUS XBYTE AND XBIT      *
0A41:                 157 ;*      OFFSETS                  *
0A41:                 158 ;*********************************
0A41:A5 9A            159 SCRNPOS LDA  YPOS       ;GET Y COORD (Y=2*YPOS)
0A43:C9 60            160         CMP  #96
0A45:90 04            161         BLT  YOK
0A47:68               162         PLA              ;POP
0A48:68               163         PLA
0A49:18               164         CLC
0A4A:60               165         RTS
0A4B:18               166 YOK     CLC
0A4C:0A               167         ASLA             ;MULT BY TWO MAINLY FOR 2ND LINE DATA
0A4D:AB               168         TAY
0A4E:B9 03 08         169         LDA  HLO,Y       ;GET LHS SCREEN LOBIT
0A51:85 A7            170         STA  LAADD       ;SAVE IT
0A53:B9 C3 08         171         LDA  HHI,Y       ;GET LHS HIBIT
0A56:85 A8            172         STA  LAADD+1     ;SAVE IT
0A58:C8               173         INY              ;GET NEXT ROW
0A59:B9 03 08         174         LDA  HLO,Y       ;AND REPEAT
0A5C:85 F6            175         STA  LBADD
0A5E:B9 C3 08         176         LDA  HHI,Y
0A61:85 F7            177         STA  LBADD+1
0A63:A9 00            178         LDA  #$00        ;INITIALISE
0A65:85 98            179         STA  TEMP1
0A67:A5 99            180 XSCRN   LDA  XPOS        ;GET HORIZONTAL POSITION (X=2*XPOS)
0A69:C9 80            181         CMP  #140
0A6B:90 06            182         BLT  XOK
0A6D:38               183         SEC
0A6E:E9 8C            184         SBC  #140
0A70:85 99            185         STA  XPOS
0A72:4C 67 0A         186         JMP  XSCRN
0A75:18               187 XOK     CLC
0A76:4A               188         LSRA             ;DIVIDE BY TWO (SAVES STORAGE)
0A77:A8               189         TAY              ;SAVE RESULT
0A78:26 98            190         ROL  TEMP1       ;AND REMAINDER
0A7A:B9 CA 09         191         LDA  BOFF,Y      ;GET BIT OFFSET
0A7D:18               192         CLC
0A7E:65 98            193         ADC  TEMP1       ;ADD BIT REMAINDER
0A80:8D 00 08         194         STA  XBIT        ;SAVE RESULT
0A83:C9 07            195         CMP  #7          ;DOES XBYTE NEED INCREASE
0A85:90 07            196         BLT  SMALLB      ;NO
0A87:38               197         SEC              ;YES!
0A88:E9 07            198         SBC  #7          ;CORRECT BIT POSITION
0A8A:8D 00 08         199         STA  XBIT
0A8D:38               200         SEC              ;AND BYTE (SUBTLY THOUGH!)
0A8E:B9 83 09         201 SMALLB  LDA  XOFF,Y      ;GET BYTE OFFSET
0A91:69 00            202 XSCREEN ADC  #$00        ;ADDS 1 IF CARRY SET
0A93:85 98            203         STA  XBYTE       ;AND SAVE RESULT
0A95:A5 A7            204         LDA  LAADD       ;GET LHS BYTE
0A97:18               205         CLC
0A98:65 98            206         ADC  XBYTE       ;ADD OFFSET
0A9A:85 F8            207         STA  SCRNA       ;AND GET SCREEN POSITION
0A9C:A5 A8            208         LDA  LAADD+1     ;INCLUDING HIBITS
0A9E:69 20            209         ADC  #$00
0AA0:85 F9            210         STA  SCRNA+1     ;SAVE IT
0AA2:A5 F6            211         LDA  LBADD       ;REPEAT FOR NEXT ROW
0AA4:18               212         CLC
0AA5:65 98            213         ADC  XBYTE
0AA7:85 FA            214         STA  SCRNB
0AA9:A5 F7            215         LDA  LBADD+1
0AAB:69 00            216         ADC  #$00
0AAD:85 FB            217         STA  SCRNB+1
0AAF:60               218         RTS              ;ALL DONE
0AB0:                 220 ;*********************************
0AB0:                 221 ;*      SUBROUTINE DLINE         *
0AB0:                 222 ;*      DRAW A LINE 2BITS DEEP ON*
0AB0:                 223 ;*      SCREEN                   *
0AB0:                 224 ;*      ENTRY XPOS,YPOS,WIDTH AND*
0AB0:                 225 ;*      PATTERN                  *
0AB0:                 226 ;*      X=XPOS*2,Y=YPOS*2        *
0AB0:                 227 ;*      WIDTH=BIT WIDTH          *
0AB0:                 228 ;*********************************
0AB0:20 41 0A         229 DLINE   JSR  SCRNPOS     ;GET SCREEN ADDRESSES
0AB3:AE FF            230         LDX  WIDTH       ;DIVIDE BY TWO
0AB5:4A               231         LSRA             ;TO BE CONSISTENT WITH XPOS
0AB6:18               232         CLC
0AB7:65 99            233         ADC  XPOS        ;FIND RHS POSITION
0AB9:C9 8C            234         CMP  #140        ;IS IT ON SCREEN
0ABB:90 0E            235         BLT  BITMASK     ;YES
0ABD:38               236         SEC              ;NO
0ABE:E9 8C            237         SBC  #140        ;SO MAKE IT
0AC0:18               238         CLC
0AC1:2A               239         ROLA             ;MULT BY TWO
0AC2:85 98            240         STA  TEMP1
0AC4:A5 FF            241         LDA  WIDTH       ;BY ALTERING WIDTH
0AC6:38               242         SEC
0AC7:E5 98            243         SBC  TEMP1
0AC9:95 FF            244         STA  WIDTH       ;AND STORE IT
0ACB:A0 00            245 BITMASK LDY  #$00        ;INITIALISE
0ACD:20 54 0B         246         JSR  FMASK       ;GET MASKING BITS
0AD0:F1 F8            247         LDA  (SCRNA),Y   ;GET 1ST SCREEN POSITION
0AD2:25 A5            248         AND  MASK1       ;MAKE A HOLE
0AD4:91 F8            249         STA  (SCRNA),Y   ;AND SAVE IT
0AD6:B1 FA            250         LDA  (SCRNB),Y   ;REPEAT FOR NEXT ROW
0AD8:25 A5            251         AND  MASK1
0ADA:91 FA            252         STA  (SCRNB),Y
0ADC:A5 9B            253         LDA  XBYTE       ;GET BYTE POSITION
0ADE:29 01            254         AND  #$01        ;ODD OR EVEN?
0AE0:18               255         CLC
0AE1:4A               256         LSRA             ;MOVE BIT0->CARRY
0AE2:90 25            257         BCC  EVEN        ;CARRY CLEAR IF EVEN
0AE4:AD 02 08         258         LDA  PATTERN
0AE7:18               259         CLC
0AE8:48               260         PHA              ;LOAD AND SAVE PATTERN
0AE9:29 0F            261         AND  #$0F        ;GET LOBITS
0AEB:AA               262         TAX              ;USE AS OFFSET
0AEC:BD 21 0A         263         LDA  COLI,X      ;GET INVERSE PATTERN
0AEF:25 A6            264         AND  MASK2       ;MASK OUT UNWANTED BITS
0AF1:11 F8            265         ORA  (SCRNA),Y   ;MERGE WITH SCREEN
0AF3:91 F8            266         STA  (SCRNA),Y   ;AND DISPLAY
0AF5:68               267         PLA              ;GET BACK PATTERN
0AF6:29 F0            268         AND  #$F0        ;GET HIBITS
0AF8:4A               269         LSRA             ;AND MOVE INTO POSITION
0AF9:4A               270         LSRA
0AFA:4A               271         LSRA
0AFB:4A               272         LSRA
0AFC:18               273         CLC
0AFD:AA               274         TAX              ;PUT AS OFFSET
0AFE:BD 21 0A         275         LDA  COLI,X      ;GET INVERTED PATTERN
0B01:25 A6            276         AND  MASK2       ;MASK OUT UNWANTED BITS
0B03:11 FA            277         ORA  (SCRNB),Y   ;MERGE WITH 2ND ROW
0B05:91 FA            278         STA  (SCRNB),Y   ;AND DISPLAY
0B07:4C 2C 0B         279         JMP  TEST        ;LINE COMPLETE
0B0A:AD 02 08         280 EVEN    LDA  PATTERN     ;GET PATTERN
0B0D:48               281         PHA              ;SAVE IT
0B0E:29 0F            282         AND  #$0F        ;GET LOBITS
0B10:AA               283         TAX              ;USE AS COUNTER
0B11:BD 11 0A         284         LDA  COL,X       ;GET PATTERN
0B14:25 A6            285         AND  MASK2       ;MASK IT
0B16:11 F8            286         ORA  (SCRNA),Y   ;MERGE
0B18:91 F8            287         STA  (SCRNA),Y   ;AND SHOW
0B1A:68               288         PLA              ;GET BACK PATTERN
0B1B:29 F0            289         AND  #$F0        ;GET HIBITS
0B1D:4A               290         LSRA
0B1E:4A               291         LSRA
0B1F:4A               292         LSRA
0B20:4A               293         LSRA             ;AND POSITION
0B21:18               294         CLC
0B22:AA               295         TAX              ;USE AS OFFSET
0B23:BD 11 0A         296         LDA  COL,X       ;GET NEXT ROW
0B26:25 A6            297         AND  MASK2       ;MASK
0B28:11 FA            298         ORA  (SCRNB),Y   ;MERGE
0B2A:91 FA            299         STA  (SCRNB),Y   ;SHOW
0B2C:A5 FF            300 TEST    LDA  WIDTH       ;GET LINE WIDTH
0B2E:38               301         SEC
0B2F:E5 FE            302         SBC  BRUSH       ;HOW MUCH WAS DRAWN
0B31:85 FF            303         STA  WIDTH       ;HOW MUCH LEFT
0B33:C9 01            304         CMP  #$01        ;ALL DONE
0B35:90 1C            305         BLT  DONE        ;YES
0B37:AD 00 08         306         LDA  XBIT        ;GET PRESENT BIT POSITION
0B3A:18               307         CLC
0B3B:65 FE            308         ADC  BRUSH       ;UPDATE
0B3D:8D 00 08         309         STA  XBIT        ;STORE IT
0B40:C9 07            310         CMP  #$7         ;UPDATE BYTE?
0B42:90 0C            311         BLT  SMAGIN      ;NO NEED
0B44:38               312         SEC
0B45:E9 07            313         SBC  #$7         ;YES SO UPDATE BIT
0B47:8D 00 08         314         STA  XBIT
0B4A:38               315         SEC
0B4B:A5 98            316         LDA  XBYTE
0B4D:20 91 0A         317         JSR  XSCREEN     ;AND BYTE
0B50:4C D8 0A         318 SMAGIN  JMP  BITMASK     ;DO AGAIN
0B53:60               319 DONE    RTS              ;FINISHED
0B54:                 321 ;*********************************
0B54:                 322 ;*      SUBROUTINE FMASK         *
0B54:                 323 ;*      GETS BRUSH WIDTH AND SETS*
0B54:                 324 ;*      MASKS FOR SCREEN AND THE *
0B54:                 325 ;*      COLOUR PATTERNS          *
0B54:                 326 ;*********************************
0B54:A5 FF            327 FMASK   LDA  WIDTH       ;GET REMAINING WIDTH
0B56:85 FE            328         STA  BRUSH       ;FIRST GUESS & DEFAULT VALUE
0B58:18               329         CLC
0B59:6D 00 08         330         ADC  XBIT        ;ADD BIT POSITION
0B5C:C9 07            331         CMP  #$7         ;NOT TOO BIG?
0B5E:90 08            332         BLT  BSMALL      ;NO
0B60:A9 07            333         LDA  #$7
0B62:ED 00 08         334         SBC  XBIT
0B65:C5 FF            335         CMP  WIDTH       ;USE BIGGEST VALUE
0B67:B0 02            336         BGE  BSMALL      ;FOR BRUSH
0B69:85 FE            337         STA  BRUSH
0B6B:A6 FE            338 BSMALL  LDX  BRUSH       ;USE AS OFFSET
```

```
0B6D:BD 31 0A  339         LDA  MSK1,X    ;GET MASKS
0370:85 A5     340         STA  MASK1
0B72:BD 3F 0A  341         LDA  MSK2,X
0B75:85 A6     342         STA  MASK2
0B77:AE 00 08  343         LDX  XBIT      ;GET BIT POSITION
0B7A:E0 00     344 POUT    CPX  #$00
0B7C:F0 0A     345         BEQ  PIONE
0B7E:18        346         CLC             ;AND ROLL INTO PLACE
0B7F:26 A6     347         ROL  MASK2     ;MOVE MASKS
0B81:38        348         SEC             ;BIT BY BIT
0B82:26 A5     349         ROL  MASK1
0B84:CA        350         DEX
0B85:4C 7A 0B  351         JMP  POUT
0B88:60        352 PIONE   RTS

0B89:          354 ********************************
0B89:          355 *      SUBROUTINE FILSCN       *
0B89:          356 *      FILLS SCREEN WITH PATTERN*
0B89:          357 *      CORRESPONDING TO NUMBER  *
0B89:          358 *      INPUT TO KEYBOARD        *
0B89:          359 *      TO TERMINATE INPUT Z     *
0B89:          360 ********************************
0B89:20 E2 F3  361         JSR  HGR
0B8C:20 58 FC  362         JSR  HOME      ;SET GRAPHICS AND CLEAR TEXT
0B8F:20 0E 0C  363         JSR  COMMENT
0B92:4C CA 0B  364         JMP  START     ;INITIALISE
0B95:A9 00     365 FILL    LDA  #$00
0B97:85 24     366         STA  HTAB      ;SET HTAB
0B99:A9 16     367         LDA  #22       ;SET VTAB
0B9B:20 5B FB  368         JSR  VTAB
0B9E:AD 02 08  369         LDA  PATTERN
0BA1:20 DA FD  370         JSR  PRBYTE
0BA4:A9 00     371 FILSCN  LDA  #$00
0BA6:85 9A     372         STA  YPOS      ;INITIALISE
0BA8:A9 8C     373 XLOOP   LDA  #140
0BAA:85 FF     374         STA  WIDTH     ;SET WIDTH
0BAC:A9 00     375         LDA  #$00
0BAE:85 99     376         STA  XPOS
0BB0:20 B0 0A  377         JSR  DLINE
0BB3:A9 8C     378         LDA  #140
0BB5:85 FF     379         STA  WIDTH
0BB7:A9 46     380         LDA  #70
0BB9:85 99     381         STA  XPOS
0BBB:20 B0 0A  382         JSR  DLINE
0BBE:A5 9A     383         LDA  YPOS
0BC0:18        384         CLC
0BC1:69 01     385         ADC  #$1       ;INCREASE Y
0BC3:85 9A     386         STA  YPOS
0BC5:C9 60     387         CMP  #96
0BC7:90 D-     388         BLT  XLOOP     ;CARRY ON UNTIL DONE
0BC9:60        389         RTS             ;END OF SUBROUTINE FILSCN
0BCA:20 0C FD  390 START   JSR  RDKEY
0BCD:C9 C1     391         CMP  #$C1
0BCF:90 0C     392         BLT  NOALPH
0BD1:C9 C7     393         CMP  #$C7
0BD3:B0 32     394         BGE  ESCRN
0BD5:38        395         SEC
0BD6:E9 B7     396         SBC  #$B7
0BD8:85 9B     397         STA  TEMP1
0BDA:4C DF 0B  398         JMP  NOAND
0BDD:29 0F     399 NOALPH  AND  #$0F      ;MASK HIBIT
0BDF:0A        400 NOAND   ASLA
0BE0:0A        401         ASLA
0BE1:0A        402         ASLA
0BE2:0A        403         ASLA
0BE3:85 9B     404         STA  TEMP1
0BE5:20 0C FD  405         JSR  RDKEY
0BE8:C9 C1     406         CMP  #$C1
0BEA:90 0A     407         BLT  NALPH
0BEC:C9 C7     408         CMP  #$C7
0BEE:B0 17     409         BGE  ESCRN
0BF0:38        410         SEC
0BF1:E9 B7     411         SBC  #$B7
0BF3:4C F9 0B  412         JMP  NAND
0BF6:18        413 NALPH   CLC
0BF7:29 0F     414         AND  #$0F
0BF9:05 9B     415 NAND    ORA  TEMP1
0BFB:8D 02 08  416         STA  PATTERN
0BFE:20 F2 F3  417         JSR  HCLR      ;CLEAR SCREEN
0C01:20 95 0B  418         JSR  FILL
0C04:4C CA 0B  419         JMP  START
0C07:AD 51 C0  420 ESCRN   LDA  $C051     ;TEXT
0C0A:20 58 FC  421         JSR  HOME
0C0D:60        422         RTS
0C0E:A9 17     423 COMMENT LDA  #23
0C10:20 5B FB  424         JSR  VTAB
0C13:A9 00     425         LDA  #$00
0C15:85 24     426         STA  HTAB
0C17:AA        427         TAX
0C18:BD 24 0C  428 PRLOOP  LDA  STR,X
0C1B:F0 06     429         BEQ  PRDONE
0C1D:20 F0 FD  430         JSR  $FDF0     ;PRINT A CHARACTER
0C20:E8        431         INX
0C21:D0 F5     432         BNE  PRLOOP
0C23:60        433 PRDONE  RTS
0C24:D4 D9 D0  434 STR     ASC             "TYPE A HEX PAIR 00-FF,Z TO END"
0C27:C5 A0 C1
0C2A:A0 C8 C5
0C2D:D8 A0 D0
0C30:C1 D9 D2
0C33:A0 B0 B0
0C36:AD C6 C6
0C39:AC DA A0
0C3C:D4 CF A0
0C3F:C5 CE C4
0C42:00        435 DUMMY   DFB  $0
```

Close-up of Snapshot

By DAVE STEVENS

SNAPSHOT is a system designed specifically for backing up those rather expensive software packages which, when corrupted, are not easy to replace by normal methods. The Snapshot package consists of a plug-in card which fits into any slot and a disc of software. You are able to back up Snapshot software using the standard COPYA from the System Master disc.

Snapshot does have some problems in that it cannot back up a disc that re-addresses the disc after the initial boot-up and anything that uses the language card during execution because the Snapshot software resides in the language card. Initially it was specified that the system required either an Apple language card or the Microsoft language card. However the manufacturer, Dark Star Systems, has since said that it will work with the Ramex and Computerstop cards, although the latter requires a modified Snapshot.

The instruction booklet gives a few pointers on how to interface to your particular language card. While on the subject of language cards I have found that some software backed up by Snapshot requires a language card to run the back up, whereas the original did not. However I understand that this is being corrected by Dark Star.

The use of the system is basically very simple, and the installation of the Snapshot card is reasonably well documented, though I think that perhaps a drawing or photograph of the card installed in an Apple would go a long way to prevent any confusion during installation. The system is menu driven and selection of function is done by using the ESCAPE and RETURN keys as prompted by the Snapshot program.

The menu options are self-explanatory and include boot disc to be backed-up, set video mode during operation, set video mode during boot, dump Snapshot in memory to disc, convert Snapshot disc to a back-up disc, load Snapshot on disc to memory, resume execution of Snapshot in memory, exit to monitor, exit to Basic, copy a Snapshot disc.

Correct use of this menu will allow you to not only back up your disc but also to do things like 1) halt execution of your existing program and save it complete with current variables using Snapshot. 2) Boot some other software, maybe for reference purposes. 3) Using Snapshot load the original program and resume exactly from the place you left off when you activated Snapshot.

Snapshot also, on exit to monitor, gives step and trace facilities. I understand that a mark 2 card is in the pipeline and that the control buttons (although the games paddles can at present be used) are to be made more accessable by bringing them outside the Apple. While I have tried to emphasise Snapshot's limitations I like the card and the system. It can be used to copy anything, within the limitations stated.

Dark Star made several enhancements to Snapshot during the course of my review, and says it is willing to upgrade the package for registered users.

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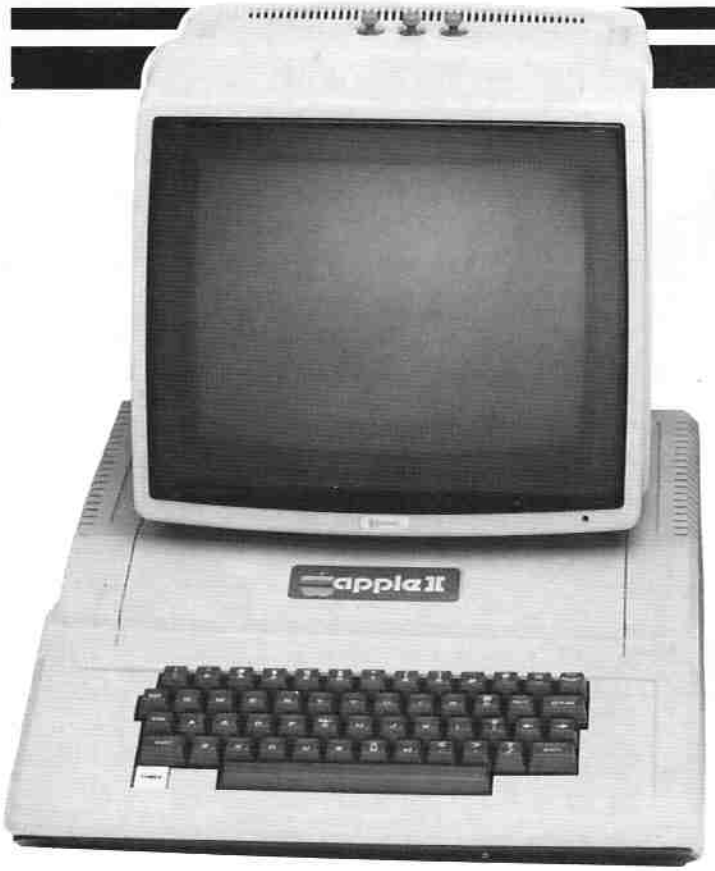

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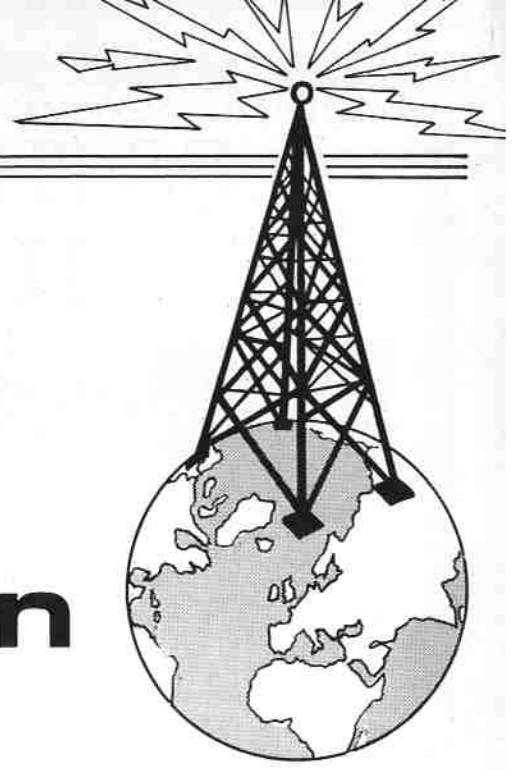
MORSE CODE Part II



Communication aspects

By SEAN OVEREND

LAST month I described the educational and programmatic aspects of a morse code trainer for a 48k Apple which is programmed both in Basic and in machine code. This article concludes by considering some of the potential uses of the decoding section of the program.

In its present form the translation mode could be used as it is in order to enable a person, such as a disabled radio amateur or anyone else capable of transmitting morse code, to communicate with others who do not understand morse code.

In certain circumstances substitute devices could be made to replace the choice of the "O" and "P" keys, providing input to the subroutine entry points in some other manner. All that is further required in such a case is something to measure time which will have to be POKEd into [CT].

The next logical development stage is to use the recognition subroutine to unravel morse code sent from a distant source. To this end a decoder would be necessary to identify a dot as a "dot" and a dash as a "dash", otherwise the requirements are as in the previous paragraph.

In the absence of a predetermined transmission speed some form of synchronisation signal would have to precede the message to be translated, and some software created at the reception end to adjust the parameters of the recognition routine during reception of the synchronisation message.

In essence, however, this software is sufficiently advanced for radio wave communication between computer and computer via morse code – or, indeed, using any other code with corresponding alteration of the look-up tables – to be a reality.

The author holds a UK amateur radio transmitting licence and would be happy to hear from any other radio amateur who owns or has access to an Apple II computer in order to be able to put the development here envisaged to practical test over progressively larger distances.

SUMMARY

This training package enables a user to acquire the techniques both of recognising morse code sounds generated by the computer and also of transmitting morse code himself. In the former case there are comprehensive facilities for varying speed, pitch, type of presentation and user-response times, together with fully automatic assessment. In the latter case, the "O" and "P" keys of the computer operate as an electronic morse key, sounding dots and dashes, which are fully decoded on the screen into plain language, with appropriate gaps between letters and words. Again, there is a wide variety of pitches and transmission speeds selectable by the user.

The Basic program is the driver of the package, providing the interface with the user and automatically loading the machine code routines (for note production and decoding) into memory from a binary disc file called BCODER.

The would-be user must first enter the Basic program and save it on disc. He then has to create the BCODER disc file. To do this, enter the MONITOR and then place the machine code contained in the assembly language listing from line 340, starting at $8EF8 (decimal 36600), until the end of the assembled listing. Once this is done, type:-

BSAVE BCODER,A$8EF8,L404

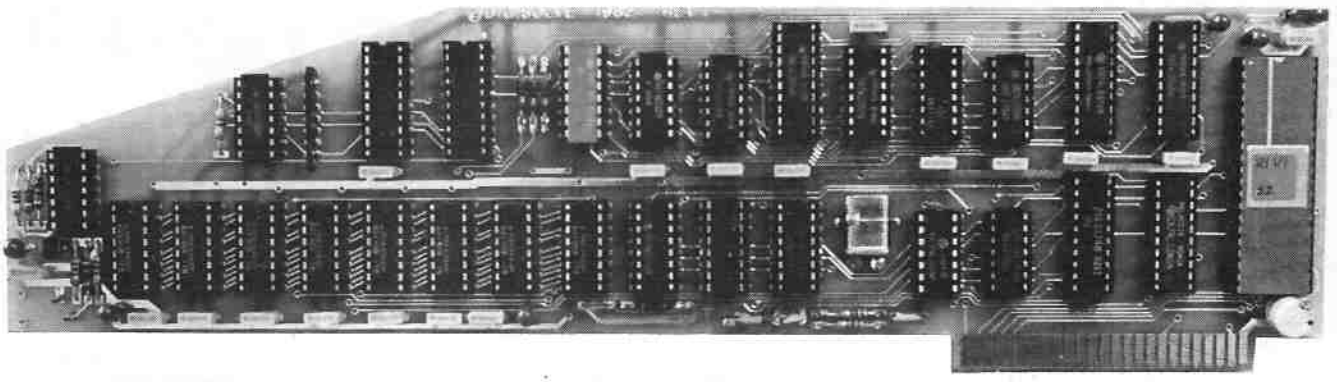
Finally, return to Applesoft and protect the machine code memory area by typing HIMEM:36500 and RUN the Basic program, using whatever name it was saved under.

```
10  REM  MORSE CODE TRANSLATION A
    ND TEST
12  REM COPYRIGHT FEB 1982
14  REM SEAN OVEREND
20  HOME : PRINT : PRINT "SETTING
    UP DATA "
30 SS = 4:SG = 4
40 TR = 3:I1 = 4:I2 = 10
50 PH = 100:DA = 120:DT = 40:PL =
    100:PW = 200:IL = 5
60  PRINT  CHR$ (4);"BLOAD BCODER
    "
70  CALL 36727: REM INITIALISE
80  GOTO 220
90  REM DASH SUBROUTINE
100  POKE 249,PH: POKE 250,DA: CALL
    36762: GOSUB 210
110  RETURN
120  REM DOT SUBROUTINE
130  POKE 249,PH: POKE 250,DT: CALL
    36762: GOSUB 210
140  RETURN
150  REM PAUSE BETWEEN LETTERS
160  FOR P = 1 TO PL: NEXT P
170  RETURN
180  REM PAUSE BETWEEN WORDS
190  FOR I = 1 TO PW: NEXT I: RETURN

200  REM INTER LETTER COMPONENT G
    AP
210  FOR Q = 1 TO IL: NEXT Q: RETURN

220  DATA 1,2,3,2,1,1,1,3,2,1,2,1
    ,3
230  DATA 2,1,1,3,1,3,1,1,2,1,3
240  DATA 2,2,1,3,1,1,1,1,3,1,1,3
250  DATA 1,2,2,2,3,2,1,2,3
260  DATA 1,2,1,1,3,2,2,3,2,1,3
270  DATA 2,2,2,3,1,2,2,1,3,2,2,1
    ,2,3
280  DATA 1,2,1,3,1,1,1,3,2,3,1,1
    ,2,3,
290  DATA 1,1,1,2,3,1,2,2,3,2,1,1
    ,2,3
300  DATA  2,1,2,2,3,2,2,1,1,3
310  DATA 2,2,2,2,2,3,1,2,2,2,2,3
    ,1,1,2,2,2,3,1,1,1,2,2,3,1,1
    ,1,1,2,3
320  DATA 1,1,1,1,1,3,2,1,1,1,1,3
    ,2,2,1,1,1,3,2,2,2,1,1,3,2,2
    ,2,2,1,3
```

MORSE CODE

```
330  DIM A(25,4)
340  FOR I = 0 TO 25
350  FOR J = 0 TO 4
360  READ A(I,J)
370  IF A(I,J) = 3 THEN 390
380  NEXT J
390  NEXT I
400  DIM N(9,5)
410  DIM PU(5,7)
420  FOR I = 0 TO 9: FOR J = 0 TO
     5
430  READ N(I,J): IF N(I,J) = 3 THEN
     450
440  NEXT J
450  NEXT I
460  DATA 63,1,1,2,2,1,1,3
470  DATA 46,1,2,1,2,1,2,3
480  DATA 44,2,2,1,1,2,2,3
490  DATA 47,2,1,1,2,1,3
500  DATA 61,2,1,1,1,2,3
510  DATA 43,1,2,1,2,1,3
520  FOR I = 0 TO 5: FOR J = 0 TO
     7
530  READ PU(I,J): IF PU(I,J) = 3
      THEN 550
540  NEXT J
550  DATA  UNLIMITED
560  DATA   28 W/P/M,20 W/P/M,15
     W/P/M,12 W/P/M,10 W/P/M,9 W/
     P/M,7.5 W/P/M,6.7 W/P/M,6 W/
     P/M
570  FOR I = 0 TO 9: READ SP$(I):
      NEXT I
580 L1$ = " GAPS ARE ":C1$ = "COD
     E SPEED "
590  DATA  15 W/P/M,13 W/P/M,11 W
     /P/M,10 W/P/M,9 W/P/M,8 W/P/
     M,7 W/P/M,6 W/P/M,5 W/P/M
600  FOR I = 1 TO 9: READ TR$(I):
      NEXT I
610 C2$ = "TRANSLATION SPEED ":L2
     $ = " ILCG=":L3$ = " IWG="
620  GOTO 890
630  HOME : PRINT "TAP ANY KEY TO
      BREAK OFF": PRINT : PRINT C
     1$;SP$(SS);: IF SG <  > SS THEN
      PRINT L1$;SP$(SG)
640  FOR I = 0 TO 25
650 Y =  PEEK (49152): IF Y >  =
     128 THEN 900
660  VTAB 10: HTAB 19
670  PRINT  CHR$ (193 + I)
680  FOR J = 0 TO 4
690  ON A(I,J) GOSUB 130,100,150
700  IF A(I,J) = 3 THEN 720
710  NEXT J
720  NEXT I
730  FOR I = 0 TO 9
740 Y =  PEEK (49152): IF Y >  =
     128 THEN 900
750  VTAB 10: HTAB 19
760  PRINT  CHR$ (48 + I)
770  FOR J = 0 TO 5
780  ON N(I,J) GOSUB 130,100,150
790  IF N(I,J) = 3 THEN 810
800  NEXT J
810  NEXT I
820  FOR I = 0 TO 5
830 Y =  PEEK (49152): IF Y >  =
     128 THEN 900
840  VTAB 10: HTAB 19
850  PRINT  CHR$ (PU(I,0))
860  FOR J = 1 TO 7: ON PU(I,J) GOSUB
     130,100,160: IF PU(I,J) = 3 THEN
     880
870  NEXT J
880  NEXT I
890  FOR I = 6 TO 9: POKE I,0: NEXT
     I: FOR I = 25 TO 31: POKE I,
     0: NEXT I
900  HOME : PRINT : PRINT : PRINT
910  PRINT "SELECT FROM:-": PRINT
920  PRINT "1. MESSAGE MODE (CODE
      OUTPUT)"
925  PRINT
930  PRINT "2. TRANSLATOR MODE (C
     ODE INPUT)"
935  PRINT
940  PRINT "3. TUTOR MODE (CODE T
     O CHARACTERS)"
945  PRINT
950  PRINT "4. DEMONSTRATION MODE
      (SIMULTANEOUS)
955  PRINT
960  PRINT "5. ALTERATION OF SPEE
     D OR PITCH"
965  PRINT
970  PRINT "6. EXIT"
975  PRINT
980  PRINT : PRINT "TYPE 1-6 ";: GET
     M$: PRINT M$:M =  VAL (M$)
990  IF M < 1 OR M > 6 THEN  PRINT
      CHR$ (135);: GOTO 980
1000  ON M GOTO 1030,2330,1440,63
     0,2430,1020
1010  GOTO 890
1020  END
1030  HOME : PRINT : PRINT "IS ME
     SSAGE STORED ON THIS DISC? Y
     /N";: GET A$: PRINT A$
1031  IF A$ <  > "Y" THEN DI = 0:
      GOTO 1039
1032 DI = 1: INPUT "TYPE MESSAGE
     NAME ";N$
1033  PRINT  CHR$ (4);"OPEN";N$: PRINT
      CHR$ (4);"READ ";N$: INPUT
     M$: PRINT  CHR$ (4);"CLOSE "
     ;N$
1034  GOTO 1045
1039  PRINT : PRINT "TYPE MESSAGE
      TO BE CODED "
1040  PRINT : PRINT : INPUT M$: IF
     M$ = "" THEN 890
1045  PRINT C1$;SP$(SS);: IF SG <
     > SS THEN  PRINT L1$;SP$(SG
     )
1050  PRINT : PRINT : PRINT "TYPE
      AT THE SAME TIME? Y/N ";: GET
     Y$: PRINT Y$
1060 SC = 0:TP = 0: IF Y$ = "" THEN
     1080
1070  IF  LEFT$ (Y$,1) = "Y" THEN
     TP = 1:B$ = ""
1080 L =  LEN (M$):SL = L
1090  FOR I = 1 TO L
1100 A$ =  MID$ (M$,I,1)
1110  IF TP = 0 THEN  PRINT A$;: GOTO
     1170
1120  IF I = 1 THEN 1170
1130 Y =  PEEK (49152)
1135  IF SG = 0 THEN 1140
1137  IF Y < 128 THEN 1150
1140  GET C$: IF C$ = B$ AND B$ <
     > " " THEN SC = SC + 1: PRINT
     B$;: GOTO 1170
1150  IF B$ = " " THEN SL = SL -
     1: PRINT B$;: GOTO 1170
1160  FLASH : PRINT B$;: NORMAL
1170  IF A$ = " " THEN  FOR P = 1
     TO PW: NEXT P: GOTO 1330
1180  IF  ASC (A$) < 48 OR  ASC (
     A$) > 57 THEN 1230
1190  FOR J = 0 TO 5
1200  ON N( ASC (A$) - 48,J) GOSUB
     130,100,160
1210  IF N( ASC (A$) - 48,J) = 3 THEN
     1330
1220  NEXT J
1230  IF  ASC (A$) < 65 OR  ASC (
     A$) > 90 THEN 1280
1240  FOR J = 0 TO 4
1250  ON A( ASC (A$) - 65,J) GOSUB
     130,100,160
1260  IF A( ASC (A$) - 65,J) = 3 THEN
     1330
1270  NEXT J
1280 X =  ASC (A$): FOR J = 0 TO
     5
1290  IF X <  > PU(J,0) THEN 1320
1300  FOR K = 1 TO 7: ON PU(J,K) GOSUB
     130,100,160: IF PU(J,K) = 3 THEN
     1330
1310  NEXT K
1320  NEXT J
1330 B$ = A$
1340  NEXT I
1350  IF  NOT IF THEN 1420
1360  GET C$: IF C$ = B$ AND B$ <
     > " " THEN SC = SC + 1: PRINT
     B$: GOTO 1390
1370  IF B$ = " " THEN SL = SL -
     1: GOTO 1390
1380  FLASH : PRINT B$: NORMAL
1390 PC =  INT (SC / SL * 100)
1400  PRINT : PRINT "YOU SCORED "
     SC" OUT OF "SL" OR "PC"%"
1410  PRINT : PRINT "PRESS ANY KE
     Y ": GET A$
1420  PRINT : PRINT : PRINT
1421  IF DI = 0 THEN 1425
1422  PRINT "DELETE THIS MESSAGE?
      Y/N ";: GET A$: PRINT A$
1423  IF A$ = "Y" THEN  PRINT  CHR$
     (4);"DELETE ";N$
1424  GOTO 1430
1425  PRINT "SAVE THIS MESSAGE ON
      DISC? Y/N ";: GET A$: PRINT
     A$
1426  IF A$ <  > "Y" THEN 1430
1427  INPUT "TYPE MESSAGE NAME ";
     N$
1428  PRINT  CHR$ (4);"OPEN";N$: PRINT
      CHR$ (4);"WRITE";N$: PRINT
     M$: PRINT  CHR$ (4);"CLOSE";
     N$
1430  GOTO 890
1440  REM TEST
1450  HOME : PRINT : PRINT : PRINT

1460  PRINT "1","A-E"
1470  PRINT "2","F-J"
1480  PRINT "3","K-O"
1490  PRINT "4","P-T"
1500  PRINT "5","U-Z"
1510  PRINT "6","A-M"
1520  PRINT "7","N-Z"
1530  PRINT "8","ALL LETTERS"
1540  PRINT "9","0-4"
1550  PRINT "10","5-9"
1560  PRINT "11","ALL NUMBERS"
1570  PRINT "12","ALL LETTERS AND
      NUMBERS"
1580  PRINT "13","?.,/-+"
1590  PRINT "14","THE LOT"
1600  PRINT : PRINT "USE THE RETU
     RN KEY AFTER ANSWERING THE N
     EXT TWO QUESTIONS:-"
1610  PRINT : INPUT "CHOOSE ONE O
     F THE ABOVE ";A$:A =  VAL (A
     $)
1620  IF A < 1 OR A > 14 THEN  PRINT
      CHR$ (135): GOTO 1610
1630  PRINT : PRINT : PRINT "PLEA
     SE ENTER THE TIME ALLOWED FO
     R EACH"
1640  PRINT "QUESTION. THE RANGE
     IS FROM 1-VERY FAST"
1650  PRINT "TO 10 OR MORE - VERY
      SLOW": PRINT
1660  INPUT "WHAT IS YOUR DELAY F
     IGURE? ";TT
```

512 × 512 GRAPHICS FOR APPLE II



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MORSE CODE

```
1670 TT =  INT (TT): IF TT < 1 THEN
     PRINT  CHR$ (135);: GOTO 16
     60
1680 SC = 0:T = 0:Z = 1
1690  HOME
1700  ON A GOTO 1720,1730,1750,17
     70,1790,1810,1850,1870,1890,
     1910,1930,1970,2000
1710  REM A-E
1720 J = 0:I = 5: GOSUB 2290: GOTO
     2050
1730  REM F-J
1740 J = 5:I = 5: GOSUB 2290: GOTO
     2050
1750  REM K-O
1760 J = 10:I = 5: GOSUB 2290: GOTO
     2050
1770  REM P-T
1780 J = 15:I = 5: GOSUB 2290: GOTO
     2050
1790  REM U-Z
1800 J = 20:I = 6: GOSUB 2290: GOTO
     2050
1810  REM A-M
1820 J = 0:I = 13: GOSUB 2290: GOTO
     2050
1830  REM N-Z
1840 J = 13:I = 12: GOSUB 2290: GOTO
     2050
1850  REM ALL LETTERS
1860 J = 0:I = 26: GOSUB 2290: GOTO
     2050
1870  REM 0-4
1880 J = 0:I = 5: GOSUB 2310: GOTO
     2050
1890  REM 5-9
1900 J = 5:I = 5: GOSUB 2310: GOTO
     2050
1910  REM ALL NUMBERS
1920 J = 0:I = 10: GOSUB 2310: GOTO
     2050
1930  REM LETTERS/NUMBERS
1940 J = 0:I = 36: GOSUB 2200
1950  IF K < 26 THEN  GOSUB 2230:
     B$ =  CHR$ (K + 65): GOTO 20
     50
1960 K = K - 26: GOSUB 2280:B$ =
      CHR$ (K + 48): GOTO 2050
1970  REM PUNCTUATION
1980 J = 0:I = 6: GOSUB 2200
1990  FOR J = 0 TO 7: ON PU(K,J) GOSUB
     130,100,160: NEXT J:B$ =  CHR$
     (PU(K,0)): GOTO 2050
2000  REM  THE LOT
2010 J = 0:I = 42: GOSUB 2200
2020  IF K < 26 THEN 1950
2030  IF K < 36 THEN 1960
2040 K = K - 36: GOTO 1990
2050  PRINT "TYPE THE CHARACTER

     OR & FOR SCORE
                    OR * FOR MEN
     U
        OR ^ FOR REPEAT": PRINT :
      PRINT C1$;SP$(SS): PRINT
2060  FOR I = 1 TO 50 * IT
2070 Y =  PEEK (49152)
2080  IF Y > 128 THEN  GET A$: PRINT
     A$: GOTO 2110
2090  NEXT I
2100 A$ = "%"
2110  IF A$ = "&" AND T > 0 THEN
     PGE =  INT ((SC / T) * 100):
      PRINT SC;" OUT OF ";T;" ("P
     GE;"%) - TAP ANY KEY";: GET
     A$: GOTO 1690
2120  IF A$ = "&" THEN  PRINT "T<
     O TAP ANY KEY ";: GET A$: GOTO
     1690
2130  IF A$ = "*" THEN 890
2140 T = T + 1
2150 Z = 1: IF A$ = "^" THEN Z =
     0: GOTO 1690
2160  IF A$ = B$ THEN SC = SC + 1

2170  IF A$ <  > B$ THEN  PRINT :
      PRINT : PRINT  CHR$ (135);"
     WRONG - "B$" - TAP ANY KEY":
      GET A$
2180  IF A$ = "&" OR A$ = "*" OR
     A$ = "^" THEN 2110
2190  GOTO 1690
2200  REM RANDOM SUBROUTINE
2210 K =  INT ( RND (Z) * I) + J
2220  RETURN
2230  REM SOUND SUBROUTINE FOR LE
     TTERS
2240  FOR J = 0 TO 4
2250  ON A(K,J) GOSUB 130,100,160

2260  NEXT J: RETURN
2270  REM SOUND SUBROUTINE FOR NU
     MBERS
2280  FOR J = 0 TO 5: ON N(K,J) GOSUB
     130,100,160: NEXT J: RETURN

2290  REM COMPOSITE FOR LETTERS
2300  GOSUB 2200: GOSUB 2230:B$ =
      CHR$ (K + 65): RETURN
2310  REM COMPOSITE SUB FOR NUMBE
     RS
2320  GOSUB 2200: GOSUB 2280:B$ =
      CHR$ (K + 48): RETURN
2330  REM SEND
2340  HOME : PRINT : PRINT : PRINT
     "DOT=0 DASH=P EXIT=RETURN $=
     GAP CHANGE": PRINT "USE THE
     REPEAT KEY FOR MULTIPLE ENTR
     IES": PRINT : PRINT : PRINT

2350  PRINT C2$;TR$(TR);L2$;I1;L3
     $;I2: PRINT : PRINT
2360 Y =  PEEK (49152): IF Y >  =
     129 THEN CT = CT - (256 *  INT
     (CT / 256)): GET A$: GOTO 23
     80
2370 CT = CT + 1: GOTO 2360
2380  IF A$ = "0" THEN  POKE 29,C
     T:CT = 0: CALL 36805: GOTO 2
     360: REM DOT
2390  IF A$ = "P" THEN  POKE 29,C
     T:CT = 0: CALL 36811: GOTO 2
     360: REM DASH
2400  IF A$ =  CHR$ (13) THEN CT =
     0: GOTO 890
2410  IF A$ = "$" THEN CT = 0: GOTO
     2820
2420  GOTO 2360
2430  REM SPEED/NOTE ALTERATION
2440  HOME : PRINT : PRINT
2450  PRINT "SUB-SELECTION:-": PRINT

2460  PRINT "1. ALTER SPEED OF CO
     DE SENT BY COMPUTER"
2470  PRINT "2. ALTER AUTOMATIC T
     RANSLATION SPEED"
2480  PRINT "3. ALTER PITCH OF NO
     TE"
2490  PRINT "4. MENU - EXIT"
2500  PRINT : PRINT "CHOOSE 1-4 "
     ;: GET A$: PRINT A$:A =  VAL
     (A$)
2510  IF A < 1 OR A > 4 THEN  PRINT
      CHR$ (135);: GOTO 2500
2520  ON A GOTO 2550,2740,2690,25
     40
2530  GOTO 2440
2540  GOTO 890
2550  REM SPEED OF CODE OUTPUT
2560  PRINT : PRINT "CURRENT:-": PRINT
     : PRINT C1$;SP$(SS);L1$;SP$(
     SG)
2570  PRINT : PRINT "CHOOSE BETWE
     EN1 (28WPM) AND 9 (6WPM) ";:
      GET A$: PRINT A$:A =  VAL (
     A$)
2580  IF A < 1 OR A > 9 THEN  PRINT
      CHR$ (135);: GOTO 2570
2590 SS = A:SG = A
2600 A = 9 * A:DT = A:PL =  INT (
     2.5 * A):DA = 3 * A:PW = 5 *
     A:IL =  INT (A / 8) + 1
2610  GOSUB 100: GOSUB 130: GOSUB
     100
2620  PRINT SP(SS);" WANT A DIFFE
     RENT GAP? ";: GET A$: PRINT
     A$
2630  IF A$ <  > "Y" THEN 2680
2634  PRINT
2635  PRINT "UNLIMITED GAP (MESSA
     GE MODE) =0 ELSE "
2640  PRINT "CHOOSE GAP BETWEEN 1
      (28WPM) - 9 (6WPM) ";: GET
     A$: PRINT A$:A =  VAL (A$)
2650  IF A < 00 OR A > 9 THEN  PRINT
      CHR$ (135): GOTO 2640
2660 SG = A
2670 A = 9 * A:PL =  INT (2.5 * A
     ):PW = 5 * A
2680  GOTO 2440
2690  REM PITCH
2700  PRINT : PRINT "ENTER NUMBER
      BETWEEN 1(HIGH) AND 9(LOW)
     ";: GET A$: PRINT A$:A =  VAL
     (A$)
2710  IF A < 1 OR A > 9 THEN  PRINT
      CHR$ (135);: GOTO 2750
2720 PH = A * 12: POKE 251,PH
2730  GOSUB 100: GOSUB 130: GOSUB
     100: GOTO 2440
2740  REM RECOGNITION SPEED ALTER
     ATION
2750  PRINT : PRINT "CHOOSE NUMBE
     R FROM 1(FAST TO 9(SLOW) ";:
      GET A$: PRINT A$:A =  VAL (
     A$)
2760  IF A < 1 OR A > 9 THEN  PRINT
      CHR$ (135) GOTO 2750
2770 TR = A
2780 A =  INT (A / 9 * 6.5) + 2
2790 I1 = A:I2 =  INT (2.5 * A):D
     1 = 10 * A:D2 = 30 * A
2800  POKE 252,D1: POKE 253,D2: POKE
     254,I1: POKE 255,I2
2810  GOTO 2330
2820  REM ILCG AND LG ALTERATION
2830  PRINT : PRINT : IF I1 = 0 THEN
     I1 = 4
2840  PRINT : PRINT "PRESENT VALU
     E OF ILCG IS ";I1
2850  PRINT : PRINT : PRINT "ENTE
     R NEW VALUE FOR INTER-LETTER
      COMPONENT GAP (1-255) ";: INPUT
     I1
2860 I1 =  INT (I1): IF I1 < 1 OR
     I1 > 255 THEN  PRINT  CHR$ (
     135);: GOTO 2850
2870  IF I2 = 0 THEN I2 = 10
2880  PRINT : PRINT "PRESENT VALU
     E OF IWG IS ";I2
2890  PRINT : PRINT "ENTER NEW VA
     LUE FOR INTER-WORD GAP ";: INPUT
     I2
2900 I2 =  INT (I2): IF I2 < 1 OR
     I2 > 255 THEN  PRINT  CHR$ (
     135);: GOTO 2890
2910  POKE 254,I1: POKE 255,I2
2920  GOTO 2330
```

● *The machine code listing to complete this article will be in next month's Windfall.*

Push buttons to ease MCQs

By STEPHEN KELLY

MULTIPLE choice questionnaires (MCQs) are popular in schools, colleges and universities. I have been using an Apple computer in my medical practice to administer a questionnaire to patients. The patients initially used the Y and N keys on the keyboard, but it was easy to make mistakes, and I worried about how hard some people were pressing the keys.

This article describes a simple gadget making use of the game I/O connector. An example is also give of a simple MCQ that I have used with my children.

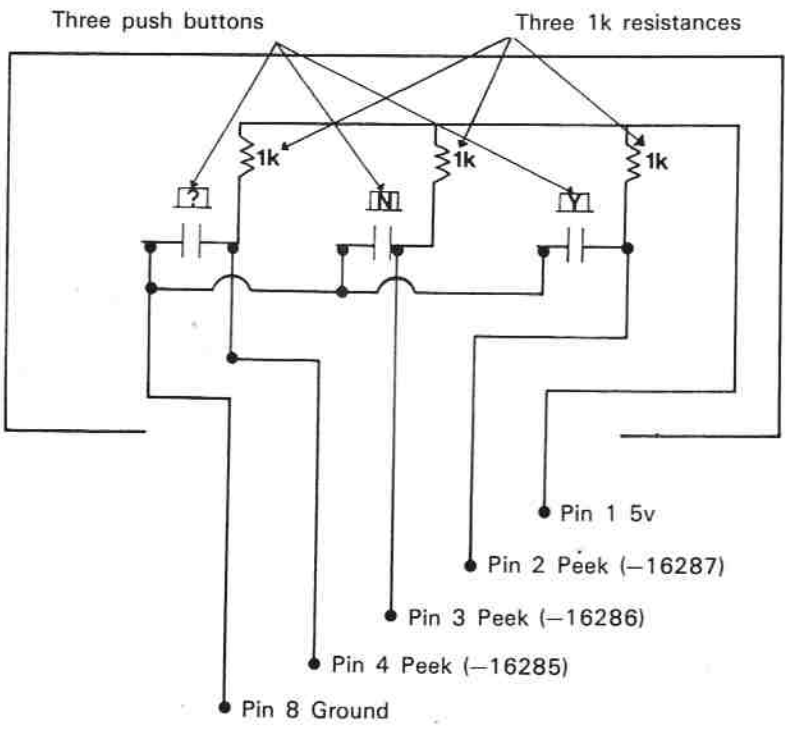
The various parts needed were bought from Tandy – a blue plastic box (6cm by 11cm by 3cm), 16 pin plug for the I/O connector, ribbon cable, three 1k resistors, and three on/off buttons. The latter were mounted by drilling holes in the plastic box and then connected to the 16 pin plug as shown in the diagram.

The games locations are connected through the resistors to 5V (pin 1) so that when they are not pressed the games button inputs are high (> greater than 127). When one button is pressed contact is made to ground (pin 8) and the location falls (< less than 128).

The program listing demonstrates five questions about capital cities. The questions and correct answers are stored as DATA statements (lines 250-290). These are read into the arrays Q$(T) and A$(T). T is the total number of questions. A loop is used to display the instructions (lines 580-620).

The I/O locations are peeked until one of the buttons has been pressed (lines 630-690). When one of the buttons has been pressed the answer is displayed on the screen and stored in the array AN$(T). A check is made to ensure that the button is released before the next question is displayed (lines 750-775). When all the questions have been displayed and answered a summary of those answered correctly is given (lines 800-end).

I have been using the box described for more than a year with a more complicated program to try to assess the different risk factors in pregnancy. More than 100 patients have used the system with no problems. Modifications may make it useful for wider applications.




```
10  REM  MULTIPLE CHOICE TEST
20  REM  DEMONSTRATION PROGRAM
30  REM  BY STEPHEN KELLY
40  REM  NEEDS SPECIAL BOX
50  REM  SEE CIRCUIT DIAGRAM
100  REM  T IS NUMBER OF QUESTION
     S
110  REM  Q$(T) IS QUESTION
120  REM  A$(T) IS CORRECT ANSWER

130  REM  AN$(T) IS ANSWER GIVEN
140  REM  FIVE QUESTIONS IN EXAMP
     LE
200 T = 5
210  DIM Q$(T),A$(T),AN$(T)
220  REM  QUESTIONS AND ANSWERS A
     RE ENTERED INTO PROGRAMS AS
     DATA STATEMENTS
250  DATA   LONDON IS THE CAPITAL
      OF ENGLAND,Y
260  DATA   SWANSEA IS THE CAPITA
     L OF WALES,N
270  DATA   PARIS IS THE CAPITAL
     OF FRANCE,Y
280  DATA   ROME IS THE CAPITAL O
     F ITALY,Y
290  DATA   PERTH IS THE CAPITAL
     OF AUSTRALIA,N
390  REM   LOOP TO READ QUESTIONS
      AND ANSWERS
400  FOR I = 1 TO T
410  READ Q$(I),A$(I)
420  NEXT I
500  REM   LOOP TO DISPLAY QUESTI
     ONS
510  REM   THEN PEEK GAMES BUTTON
     S
520  REM   UNTIL ONE IS PRESSED
530  REM   ANSWER STORED AS AN$(I
     )
550  HOME
580  FOR I = 1 TO T
590  PRINT "PLEASE ANSWER THE QUE
     STIONS"
600  PRINT : PRINT "BY PRESSING T
     HE YES OR NO BUTTON"
610  PRINT : PRINT "ON THE BLUE B
     OX"
615  PRINT : PRINT "IF YOU DO NOT
      KNOW PRESS THE '?' BUTTON"
620  VTAB 12: PRINT Q$(I)
630  IF  PEEK ( - 16287) < 128 THEN
      PRINT "YES":AN$(I) = "Y": GOTO
     700
680  IF  PEEK ( - 16286) < 128 THEN
      PRINT "NO":AN$(I) = "N": GOTO
     700
680  IF  PEEK ( - 16285) < 128 THEN
      PRINT "?":AN$(I) = "?" GOTO
     700
690  GOTO 630
699  REM  PAUSE LOOP
700  FOR Z = 1 TO 500: NEXT Z
740  REM  CHECK BUTTON BEEN RELEA
     SED
750  IF  PEEK ( - 16287) > 127 THEN
      GOTO 760
755  GOTO 750
760  IF  PEEK ( - 16286) > 127 THEN
      GOTO 770
765  GOTO 760
770  IF  PEEK ( - 16285) > 127 THEN
      GOTO 780
775  GOTO 770
780  HOME
790  NEXT I
798  REM  A$(I) AND AN$(I) COMPAR
     ED
799  REM  TO SHOW CORRECT ANSWERS

800  HOME
810  PRINT "THE ANSWERS THAT YOU
     GAVE CORRECTLY WERE "
820  PRINT : PRINT
830  FOR I = 1 TO T
840  IF AN$(I) = A$(I) THEN  PRINT
     Q$(I)
850  NEXT I
860  PRINT : PRINT "WELL DONE"
870  END
```

Direct memory access to the Apple

By Dr JOHN LITTLER
University of Bristol

IN last month's article the use of interrupts for transferring data rapidly in and out of the Apple was discussed in detail. The maximum rate at which data can be transferred is limited by the time taken to respond to the interrupt signal, plus the time taken to run the interrupt service routine. Even the simple routine given may take 60 microseconds, limiting the data transfer rate to about 15k transfers per second.

However the natural maximum rate of transfer of data to the Apple memory is determined by the processor clock and the width of the data bus, and is one mbyte/sec.; of course this is the speed at which the CPU chip reads and stores data. The Apple CPU actually uses only 500 nanoseconds out of each cycle, the first half cycle being used to read data out onto the screen and to refresh the dynamic memory by a process which is itself a type of direct memory access (DMA).

There are several possible applications for very fast data transfer. One is to read a digitised TV image directly into memory in real time. A 280 pixel line must be stored in under 60 microseconds, giving a rate of five bits/microsecond, or just a little slower than the maximum DMA rate. Another is to use the Apple as a transient recorder to collect data from an analog signal at up to one byte per microsecond, in order to study rapidly changing signals. The Apple can then be used as a digital storage scope with the added advantage that the data collected can be processed and displayed in appropriate ways.

A third is to use DMA to allow a coprocessor to use the same memory. This is a very old technique (it was used on a DEC machine called the LINC 8 in the late '60s) which is used in the Apple to allow Z80 or 6809 processor cards to take over from the 6502 in order to run programs more suited to them. The 68000 and 8086 cards probably behave similarly but the Microspeed AMD 9511 card does not access main memory, and so does not use the DMA system.

A fourth application is to provide higher resolution output on a screen. The basic requirement of any DMA device is that it must provide address, data and control signals independently of the CPU, i.e. it must itself temporarily replace the normal memory control function of the CPU (see Fig 1).

There are in general five ways of carrying out DMA transfers with a processor such as the 6502. One is to use the first memory half-cycle, temporarily suppressing the read-out of pictures or text to the screen. If the alternative counters which provide the correct addresses for a screen display are still to be useful, and this is essential if the normal refreshing of the RAM is to be maintained, the sequence of memory locations into which the DMA data will be transferred will be the same as the sequence of the screen memory locations. This is very inconvenient for all applications except for the capturing of television pictures, but this technique has been used successfully to couple a television camera to the Apple. The CPU speed is unaffected by the DMA operation (see Fig 2).

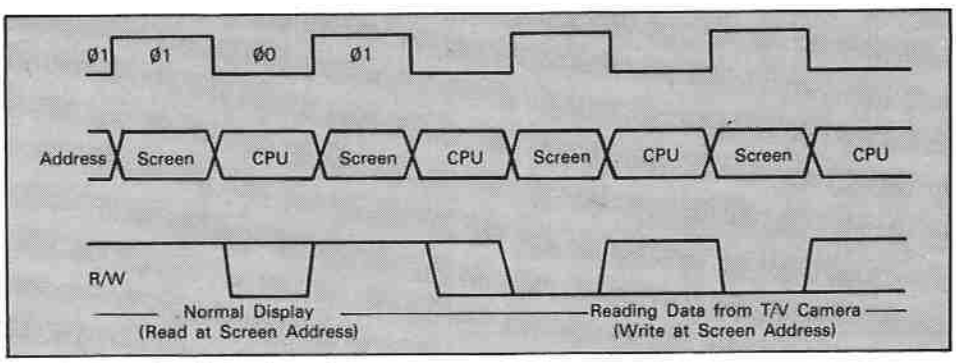


Fig. 2. Transfer of data into the screen memory from a synchronously scanned TV camera.

The second technique, illustrated in Fig 3, is to lengthen the processor clock signals by extra units of 0.5 microseconds to allow extra transfers to and from the memory. This is a very satisfactory technique if the necessary circuitry has been built into the clock generators at the design stage; special clock generators are available but not used with the Apple.

The processor can be subjected to an extended phase 1 or phase 0 time during which the DMA address and data can be multiplexed onto the memory buses, in place of the normal processor phase 0 transfers. Whichever phase the processor is stopped in, the DMA transfers can replace or be alternated with memory refresh cycles.

There are, however, several problems with this method. There must be a considerable reorganisation of the circuit, if the memory refresh is too long delayed the RAM may lose data, if the refresh is linked with the display on the screen (as in the Apple) the display will be disturbed, and the maximum data rate is limited by the requirement that the processor cannot be stopped for longer than about 5-10 microseconds, or it may lose data from its own internal dynamic memory stores.

Although the 6502 documentation is not very specific about it, this processor, like the 6800 from which it was derived, cannot run slower than a certain speed without losing data. The problem is met with the 6809 (the Mill) processor card, where the 6809 program has to include pauses in which it does not access the memory, in order to allow the 6502 to proceed by a cycle and refresh its own stores.

The third technique is that actually used by the Mill, which pulls down the DMA line provided on the interface (Fig

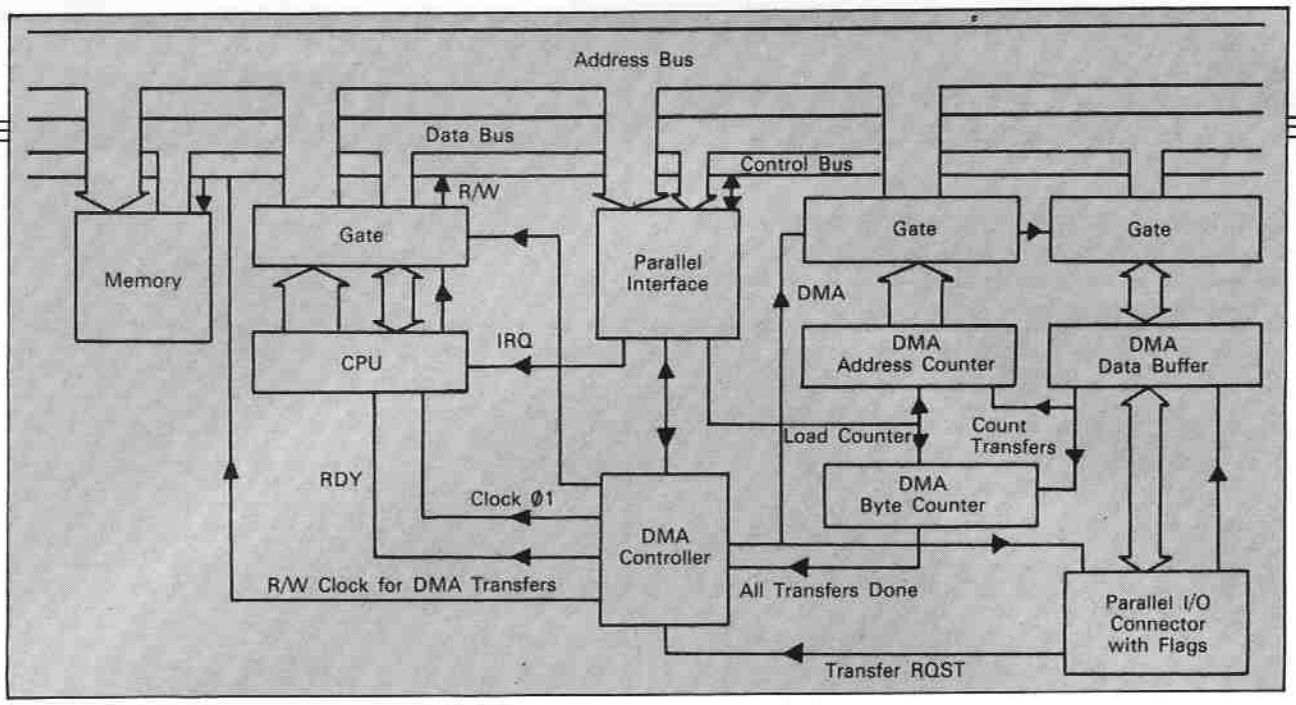


FIG. 1. Main components of a generalised DMA interface. The DMA controller is set up by the parallel interface. It connects the bus to the CPU when not in DMA state, and to the DMA address and data buffers when a DMA transfer is occurring. The byte counter checks how many DMA transfers have been completed, and defines the length of the block of data transferred. The rate of transfer is controlled by the flag handshake at the parallel I/O connector.

4). If this is done at the correct time, i.e. while 01 is high, the processor is suspended in phase one time for extra units of 1.0 microseconds while the memory is seeing a phase 0 clock. As the DMA line also turns off the processor address buffers and sets the data buffer into the read direction this leaves the bus free to be driven by the circuits on the Mill card, which can also control the read/write line.

Any peripheral which uses DMA must synchronise its request correctly with the clock cycles, and then must provide addresses and read or write data at the correct moments, and it may also need to provide signals (e.g. by standard parallel interface) to indicate to the main program when a transfer is complete.

It may also be necessary to turn on and off the DMA interface, and it may also be necessary to set up the addresses of the block of memory to be used by program via a parallel interface. All these facilities are provided in a DMA controller chip such as the MC6844, but it is designed for use with the 6800 microprocessors and is not completely compatible with the 6502.

The above two methods effectively cause the 6502 processor to hesitate and, as indicated, the DMA cannot continue indefinitely. If however the 6502 can be stopped tidily without loss of internal data, the DMA transfers can proceed at full memory speed. This is the fourth method. Unlike the 6800, the 6502 has no "halt" line to stop it tidily at the end of an instruction, but it does have a RDY line, designed to allow it to wait for slow peripheral memories to respond to a read request. This can be held low as long as necessary, provided that the clock phase 0 still reaches the processor to retain its internal memory intact while waiting.

However the address and read/write line drivers from the processor are still enabled, and this means that the external DMA device cannot control these lines, though the data lines are held in the correct state (read). It is however possible to make two small modifications to the circuitry to allow the DMA line to turn off these buffers while still allowing the clock to reach the processor. These are as follow. They can be done non-destructively by mounting the chips referred to on headers:

Remove connection to pin 9 of C14 and drive it instead from H5 pin 4. Remove connection to pin 2 of B11 and drive it instead from B11 pin 1. (On the 2020 pin 5 of A11 should be driven from pin 6 of H4, and 2 of F1 should be driven from pin 1 of F1.)

There is a spare connector (pin 35) in the I/O slot. If the modification is to be selectable by the card, pin 2 of B11 could be driven by the pin 35 line and the card could link it to DMA (e.g. for standard operation as when the Mill is in use), and hold it to +5v. with a resistor otherwise. The modifications to C14 are purely to transfer a line to the opposite side of a non-inverting buffer, and have no effect in normal operation.

With this modification the DMA interface can halt the processor indefinitely by driving low first RDY, and then, after allowing time for the CPU to reach a read cycle, DMA (Fig 5). The interface can then transfer data on every phase 0 cycle of the memory, i.e. at full memory rate without interfering with refresh or display, and without corrupting the data in the halted CPU. The CPU will restart when RDY becomes high, expecting to see the data it has requested, so the DMA line must be released first.

The fifth method is to use some form of double-ported memory, i.e. a memory area which can be read or written effectively independently and simultaneously along two sets of data and address lines. Thus the CPU must see it as normal memory, accessible at all normal times, while the external data highway must also see it operating at its own speed. No problems then arise about halting the CPU. This is, of course, not possible with the standard on-board RAM, but it would be possible to use a memory expansion card in this way, especially if constructed of static RAM, so that the half-cycles currently used for refresh operations would be available for the DMA transfers, even while the main Apple memory is being refreshed normally.

At present I know of no expansion boards which can operate in this manner, but the design of such a board would not be difficult, and would give the advantage of providing, if necessary, a much larger memory area or a much faster memory which could be read a block at a time by the CPU as normal memory.

If only a small amount of dual ported RAM were needed it would be possible to fit a 2k x 8 chip in the address slot C800-CFFF (the spare I/O ROM area) or in place of a 2k x 8 ROM on a modified integer card, but in view of the falling costs of memory any development would probably be better to aim at producing a minimum of 16k of memory. At DMA speeds even that is filled very quickly, though fortunately most sources of data which operate at high speed only do so for short periods of time – and anyway if the quantity of data is too large the Apple will not have time to process it afterwards!

For output a similar technique can be used. For example the Videoterm 80-column board employs 2kbytes of static RAM which it pages into a 512 byte space starting at $CC00, which can be loaded by the processor during the normal phase 0 time, and which is accessed by the display controller chip (MC6845) at phase 1 time. The processor can write to the display controller chip itself instead of to the memory, so that its internal control registers can be set up or read (Fig 6).

If more advanced graphics display controller chips are used such as the EF9365,

→

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which give colour graphics, vector generation, etc., it is necessary to use a totally separate memory driven directly by the controller chip. The chip is only seen by the processor as a device at addresses in the normal I/O slot area. With these chips it is not usually helpful to be able to read the local memory, since it contains a bit map of the area, including up to 96kbytes if the display is in colour, and not, as in the Videoterm, a table of the Ascii values of the characters being displayed.

We are however here beginning to depart from the region of true DMA systems and considering the possibility of adding special front-end memory to the Apple, for either input or output. Such memory is of course not generally available as extra program or data space when not in use for data transfer, and it is limited in speed only by the technology of the memory chips and the organisation that is used.

For the temporary storage of up to 4k words of data an attractive solution is to use fast static RAM together with the Signetics 8X60 controller. This provides all the circuitry necessary for the memory to behave as a FIFO (First In, First Out) store at up to 8 mhz, though of course transfer of data between the FIFO and the main Apple memory, probably via a standard parallel interface, will limit the average data rate.

Not unexpectedly, the cost of asynchronous data transfer hardware increases progressively as the potential data rate increases. We have considered a range from simple interrupts needing little more than a switch to external stores which cost more than the Apple itself. However it is worth noting that all the above techniques which allow us to add further memory are likely to decrease in cost, and increase in importance, as the cost of memory and special controller chips falls. Indeed, since writing the first draft of this article I have seen a colour graphics board costing under £400, which apparently is driven via a standard parallel interface, and includes 192kbytes of RAM controlled by an extra microprocessor.

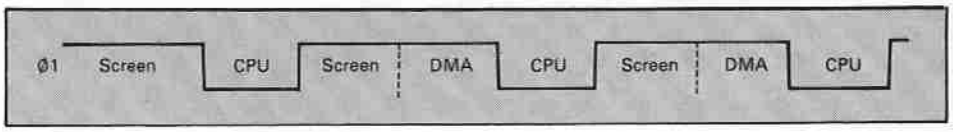

Fig. 3. Transfer by extension of 01 processor cycle.

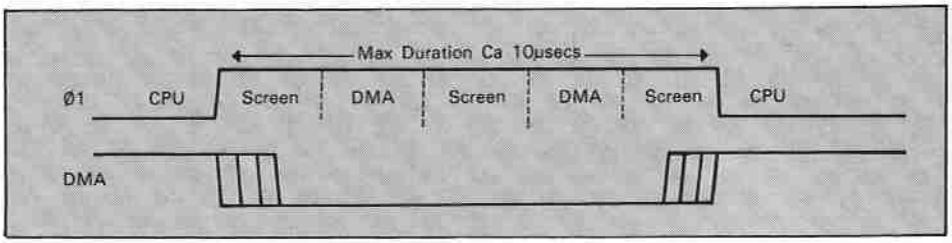

Fig. 4. Transfer by brief disconnection of the CPU during 00 time.

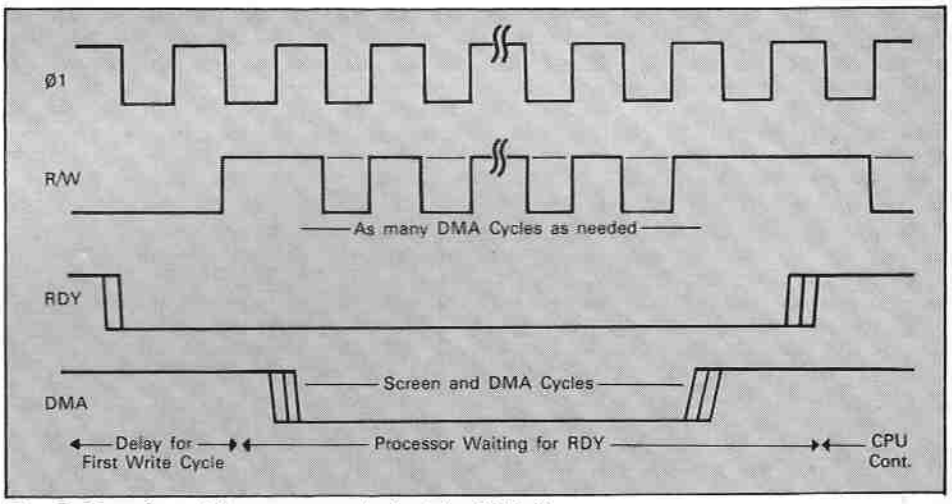

Fig. 5. Transfer while processor halted by RDY line.

There has been no discussion of software in this article for the simple reason that there are no general techniques; the only thing to remember is that the memory areas which are involved in DMA must be treated with respect by any programs running.

Processing of incoming data cannot start until the whole of a block is transferred, nor should a further incoming block be placed in the buffer area until the previous one has been processed. Outgoing transfers can of course occur at any time, so for operations such as high resolution graphics display, the only software problems involve writing the right patterns into the buffer areas, and not over-writing them with program or data.

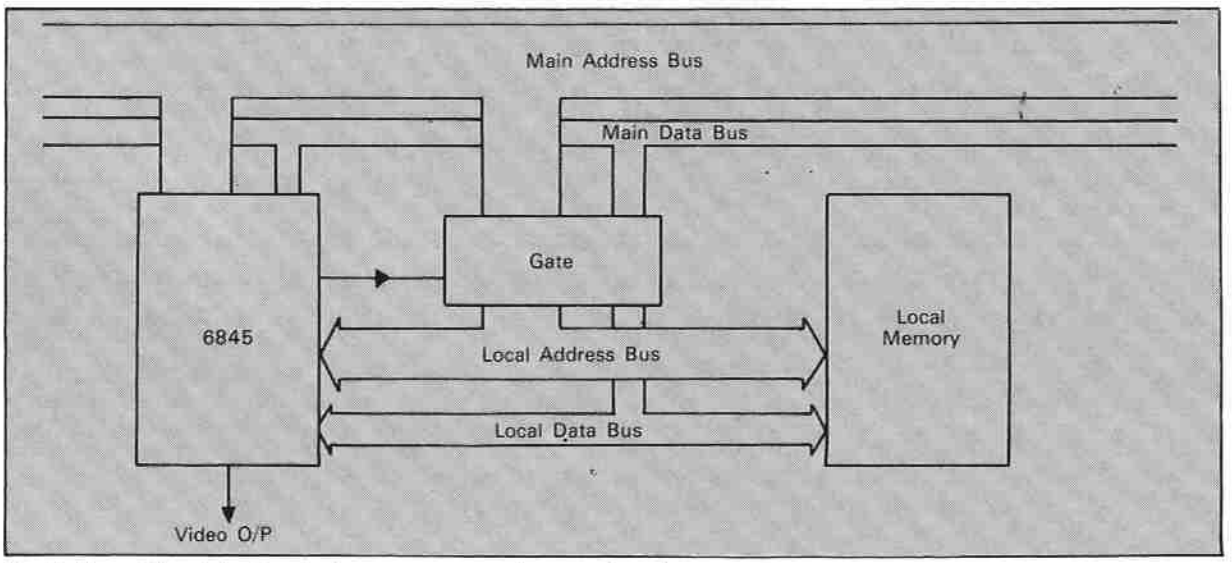

Fig. 6. Use of local dual ported memory, operating at twice the speed of the main memory, with the 6845 display controller.

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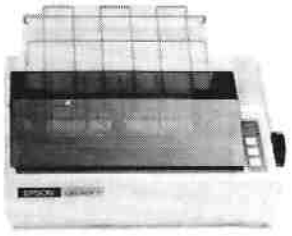

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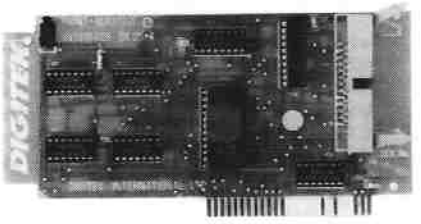

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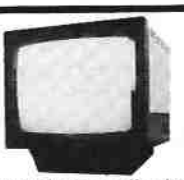

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Handy Bag of Tricks

By T.N. THOMPSON

HAVE you ever spent the whole day updating your stock control package, your mailing list, or your accounts, got to the stage of running the main program only to find at the end of the day that something has gone wrong? For some reason you can't access the data disc, or can't find the data, or worse still, you can't find the main program on disc? Your VisiCalc data vanished into thin air?

I used to have a full head of hair until that day. "Don't you back it up?" Of course I do. Every day. There was still a day's work down the drain. Sad. A missing bit in the disc VTOC can make the whole disc unreadable to DOS. The data was still there, and I could get at it by other means, but it took nearly another day, even with a good knowledge of DOS, to get it all back. All that work for the sake of a bit.

If only I'd had Bag of Tricks, a new suite of programs from Don Worth and Pieter Lechner, the authors of Beneath Apple DOS. For a simple job like that it will recover all the readable data, reconstruct VTOC and the CATALOG track, and recover any deleted files for you automatically in a matter of seconds. And this is only a minor part of the package.

It comes on a heavily protected disc, together with a 150 page user manual. The suite allows access to any unprotected disc in order to manipulate the data at all levels from disc "nibble" to whole disc. It consists of four programs, Trax, Init, Zap and Fixcat. All perform separate tasks, and are, except for Zap, menu driven from boot.

Trax works in all formats and has two levels. The first should be easily understood by any user. With it you can find the tracks and sectors that have been damaged in some way. This information is used with Init to help recover the data. The second level is for the experienced programmer, being a "nibble editor". It allows editing of disc information at the raw "nibble" level. At this level you may be able to find out why the track has crashed, correct the errors, and write it back to disc – but it's really for the expert.

Init works in Apple DOS, Pascal and CP/M formats and will initialise a range of tracks, or the whole disc, optionally changing the disc volume number and preserving any readable data it finds in the sectors. In effect, it will rebuild the sector around that data, thereby recovering lost data. It doesn't end there though. With Init you can specify the order in which the sectors are arranged on the track. I know it doesn't sound dramatic, but it means the speed of loading programs from disc can be increased by an amazing 40 per cent. That means it takes only about half the time to load the language card and get your program running.

Fixcat is the program I mentioned at the start of this review. It will completely reconstruct the Apple DOS catalog track for you automatically. It will, optionally, scan the whole disc for lost files and recover them. A friend went from complete despair at the loss of all his VisiCalc data files to complete joy in the 90 seconds or so it took to recover all the files but one from a full disc, and that one had been deleted by him and overwritten before the disc crashed.

I've left Zap until last, trying to think of a way to compress a whole book into this short review. With 67 high level commands, which can be formed into macros, available to Zap, it can only be described as a new programming language, devoted to operating on disc data at the byte level. Zap has more commands, in fact, than the 6502 instruction set. With it you can operate at the track and sector byte level, or call up your disc files and work at byte level inside them. The discs can be Pascal, or CP/M as well as 13 or 16 sector Apple DOS.

If there's anything you want to do with a disc Zap will do it – swap files between any formats, compare sectors and files, patch any of the DOSs, recover the unused sectors in files, set the disc to boot without DOS. The list is endless, and while all this is going on any changes you make are being logged on a printer in case something goes wrong. It can do all these things and anything else you care to program.

Coupled with the Trax "nibble" editor, Zap is in a different league to other disc utilities. It appears similar to "Inspector", but, compared to these, the only thing "Inspector" has going is that it's co-resident. From then on, it's lost.

The manual is well written, as a tutorial, such that I was able to recover a crashed disc within five minutes of opening the manual and booting the disc. There are many well thought out examples in the text which cover most problems and should be easily understood by the non-technical user. All the programs in the suite are treated the same in the manual. The last third is devoted to a large section covering the more advanced aspects of the programs. There are a number of references to "Beneath Apple DOS" throughout the book and, although not essential, any prospective buyer would find the book an investment, explaining as it does the technical details of disc storage.

For the non-technical user Init and Fixcat are worth every penny of the cost of this insurance. For the technical user, there is the added bonus of Trax and Zap. Though even now I can hear the eternal optimists saying to themselves "It couldn't happen to me. I'm too careful about back up!" Fine, save the £20 it costs to buy, but when the unthinkable happens to you, write to me and say "Sorry". For the rest, it really is a once only insurance premium you can't miss.

G-WHIZ

By JOHN WEBSTER

LET me draw the attention of any readers who are fixed wing pilots to a remarkable Apple program I have recently discovered called G-WHIZ, produced by Michael Falter International who I understand were greatly involved in the production of The Last One.

Its subtlety might not be appreciated by non-pilots but if you are a pilot, just listen to what this thing can do for you.

All you do is to put the $5\frac{1}{4}$in disc into your Apple and it self-loads without using a DOS disc. Then it asks you to fill in your take-off airfield and all way points, which it already has programmed in its own memory. Then it asks you to input the weather conditions, magnetic variation for your proposed route and fuel on board and hourly consumption.

Now comes the quite remarkable part. When you ask it to do so, it prints out a flight plan which shows the magnetic track from each way point to the next. It also shows the actual heading to allow for wind drift, your ground speed, your flight time for each leg, the aggregate flight time and the fuel consumed. It also contains all the NDB and VOR frequences, so that for all practical purposes it condenses into about a 45 second printout the sort of information that normally would take a private pilot about an hour to construct and calculate.

Pilots will know that one of the major stumbling blocks about any form of flight planning is that it has to be done at the last minute after the met. report has been obtained. The next amazing thing is that you can reduce that time even more dramatically. What you do is to feed in all the details of your program the night or even the week before you intend to make the flight. Then as soon as you obtain your met. report on the actual day and usually about two hours before you are due to take off, instead of a frenetic last minute calculation of all these headings and flight times, etc., you merely bomb the information in, which takes about 30 seconds, and within 45 seconds you have the whole plan printed out ready to depart.

At the moment the program contains virtually every airfield in the UK plus as far as I can find out, every NDB and VOR. You can add extra beacons and airfields right across the continent if you so desire and it takes about 30 seconds to put each one in. After that it keeps them in memory so that once input they are there for ever.

As a private pilot making occasional flights, I have found the most tedious and stressful part of the operation is not merely preparing the flight at the last minute, but actually knowing that it all has to be rechecked in case any mistakes have been made. Anybody with an Apple who is also a private pilot can now forget about all those problems and merely rely on new technology. What I have suggested to Michael Falter International is that the next phase is for them to get a little hand held computer that can be attached to the aircraft controls and actually fly the thing for us.

Thank you Apple for creating a marvellous tool. Thank you Michael Falter for giving it a practical application to pilots that I think is a signpost for the future. I do not believe it will be long before that type of program leads to micro computers in airports so that pilots can obtain this sort of printout at short notice. Many pilot flights necessitate changes in plans right at the last moment and this is absolutely the ideal solution. Congratulations to Michael Falter, who I'm told is himself a private pilot.

I understand he is about to market the product at somewhere around £260, but I came across it in a completely different context and have happily forked out that amount.

THE G-WHIZ COMPUTERISED FLIGHT PLANNING SYSTEM

FOR CAPTAIN : J.WEBSTER DATE : 17/6/82

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55Hi	200/15	+ 8° W	125	50	10.7	4 H 40 M

FROM	TO	FREQ	CO(M)	HDG(M)	D/S	LEG	FUEL	TIME	ETA	ATA
NOTTINGHAM	COVENTRY		196	196	210	76	4	20		
COVENTRY	STAVERTON		214	212	210	58	4	21		
STAVERTON	BRISTOL FILTON(BATE)		206	205	150	37	4	29		
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CARDIFF	BRECON/VOR/116.2		081	079	139	20	2	9		
BRECON/VOR/116.2	SLEAP		007	005	140	69	5	30		
SLEAP	WHITEGATES/NDB/360.5		045	043	170	22	2	9		
WHITEGATES/NDB/360.5	LIVERPOOL		325	319	133	13	1	6		

266 NM 22 2 H 6 M

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25000	225/20	+ 8° W	125	35	10.7	3 H 16 M

FROM	TO	FREQ	CO(M)	HDG(M)	D/S	LEG	FUEL	TIME	ETA	ATA
LIVERPOOL	WHITEGATES/NDB/360.5		145	154	125	13	1	6		
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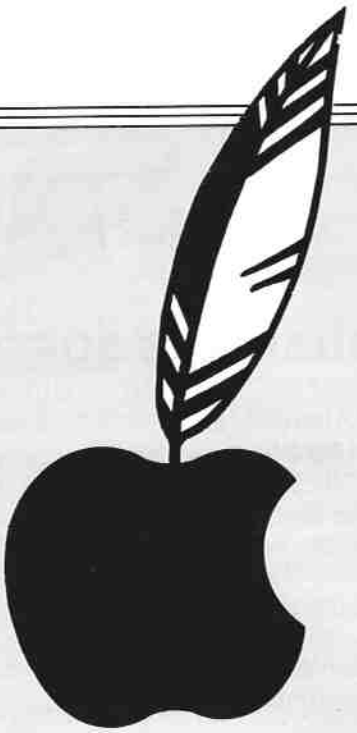


How to give CTRL-C the KO

IS there any way of knocking out CTRL-C apart from the ON ERR statement?

How do machine code programs such as FID trap errors?

Thank you for an excellent machine-dependant magazine, although a few more listings would be nice to see. – **P.J. Colmer, Fordingbridge, Hampshire.**

● Yes, there is a way of knocking out the effect of CTRL-C. The idea is to trap this value ($83) obtained from the keyboard and to pass some other innocuous value (we have used $D) to the monitor and the interpreter. The following short routine will do the trick.

```
10 FOR I = 768 TO 788: READ A: POKE
   I, A:NEXT
15 CALL 768
20 DATA 169,11,133,56,169,3,133,57,
   76,234,3,32,27,253,201,131,208,2,
   169,13,96
```

Or, if you prefer, enter the following hexadecimal values via the monitor:

```
$300: A9 B 85 38 A9 3 85 39 4C EA 3
20 1B FD C9 83 DO 2 A9 D 60
```

return to Basic and CALL 768 to initialise the routine.

In answer to your second question, errors are trapped in differing ways. Errors of input are essentially ignored by the program and other errors such as I/O errors are specific to the task in hand. These may be handled in a variety of ways. A popular approach is to use the routines already existing in the interpreter and DOS. If you want information on the addresses etc of these it is well worth reading "Beneath Apple DOS" by Don Worth and Peter Lechner and "What's Where in the Apple?" by William F. Luebbert.

Compiler problems

BOTH PETER Brameld's article (Windfall, June 1982) and the subsequent letter from C.A.G. Webster were of great interest to me, since I use the Tasc compiler almost daily. My general impressions are similar to Peter Brameld's. I have had no problems at all in compiling a large number of programs, some using unusual routines such as direct use of RWTS as well as all the normal Applesoft functions.

I have investigated C.A.G. Webster's first problem, and it does appear to be a genuine fault. The problem occurs because the COMMON block is used to pass the string pointer, not the string itself. If the string variable has been assigned directly within the program, for instance:-

10 A$ = "FRED BLOGGS"

and not subsequently altered, then this pointer will refer to the location within the program which contains the string. When a second program is BRUN, and uses the REM! USECOMMON statement, the string pointer now refers to the same location in the new program, which is probably completely different. The result, as Mr Webster found, is garbage.

Unfortunately I cannot suggest a simple solution. It is necessary to force the string to be stored outside the program area. One possible solution is to declare all the strings to be passed by making them up from sub-strings, for instance:-

10 A$ = "FRED" + "BLOGGS"

Perhaps another reader could suggest a simpler remedy?

As regards Mr Webster's second bug, my copy of the Applesoft Basic manual states that XPLOT is a reserved word which is not at present implemented in Applesoft. My Tasc compiler treats PLOT quite correctly. As expected, XPLOT will not even compile. – **Keith Williamson, Altrincham, Cheshire.**

Active in Croydon

YOUR readers may like an update regarding the Croydon Apple User Group. Having now passed through its formative period, it meets monthly at the address below and caters for serious or programming users of Apple systems.

Meetings are at 7pm for 7.30pm on the second Monday of the month, excepting August. They alternate between informal discussions and illustrated talks. Further details from myself on 01-777 5478. – **Paul Vernon, hon sec., 60 Hawkhurst Way, West Wickham, Kent.**

Key indexed files

CAN you help me please? I want to set up a list of about 2500 records in a random access file, but I need to be able to search on three or four separate keys. I find that searching on the record number, as per the DOS manual, is perfectly OK, but the manual quite overlooks the fact that one may not know what record number is required.

If I want to pick all records starting with a "W" or which contain the number "8", this takes for ever, because I have to read all of each and every record (I agree this is not the case if I need the first letter of the record, but more often than not this is not the case).

Is there any way in which I can create a key indexed file, so I can search on keys rather than read the entire file. (The records are 35 characters long.)

Keep up the good work at Windfall. I've been an Apple freak for only six months, but I've learnt a tremendous amount from your pages. – **Frank Lewis, Sevenoaks, Kent.**

● There are many ways of searching and sorting indexed files, all of which are too lengthy to explain here. The problem is not restricted to any one language; rather the approach to take is to find good algorithms and then implement them in your chosen language. Pascal would

probably be the best choice for this program. We recommend your reading one of the following books which you should be able to get via your local library. The selection here is a small one taken from many possible titles.

☐ Vol. 3 of 'The Art of Computer Programming' by D.E. Knuth entitled 'Sorting and Searching', Addison-Wesley 1975, ISBN 0-201-03803-X.

☐ 'A Structured Programming Approach to Data', by D. Coleman, Macmillan Press Ltd. 1978, ISBN 0-333-21943-0 (paperback).

☐ 'Data-Structures and Programming', by M.C. Harrison, Scott, Foreman and Co. 1973, ISBN 0-673-05964-2.

☐ 'Algorithms + Data Structures = Programs', by N. Wirth, Prentice-Hall Inc. 1976, ISBN 0-13-022418-9.

Another book which you may well already have and which contains a good but brief overview is 'Programming the 6502' by Rodney Zaks.

Graphics gremlins

I HAVE just completed working through Robert Benyon's excellent series of articles on high resolution graphics. I think I have successfully implemented the routines as both sample programs work. However I believe I have found a few minor discrepancies between the text and the listings as follows:

In the area clearing routine (52000), the listing for it (Feb, p41) does not include a call on the INIT routine (50200) as stated. However, if routine 52000 is used to clear both plotting and histogram areas the call on 50200 should be omitted for the same reasons as given by Robert Benyon for the multi-area INIT (51100) in the March issue, p28. After clearing the area, either 50200 or 53000 as appropriate should be called to redraw the area.

In the routine to plot a symbol (50700), the coding will result in nothing plotted if SY is not in the range 1 to 4. This contradicts the assertion (Feb, p41) that, if SY = 0, a square symbol will be plotted. Given the high standard of error checking elsewhere, I suggest SY is checked for being in range.

When drawing the histogram area (53000), BG = 1 is valid though the test states erroneously that BG is checked for being "greater than 1" (Mar, p29).

I hope that Robert Benyon will be encouraged to contribute further routines for graphics. This series has been one of the best in a generally excellent magazine. – **Maurice Farlie, Balham.**

I HAVE just received a set of back copies of Windfall and I am wondering if there are now any regrets about the advertisement on the back cover of issue No. 1 July 1981.

I hope it is not a case of GIGO? – **J.P. Rauch, Lagos.**

Disabled disabler

I have just discovered a problem with Stephen Alsop's treatment of a 2716. The modification he suggests to make it replace an Apple ROM does, in fact, remove the disabling mechanism (via pin 18) of the 2716; consequently, if you are using a 16K RAMcard it is possible for two sets of F8 addresses to come into conflict on the address bus, with the ROM usually being victorious.

As a result of this, Pascal and Fortran will not run if you have a 2716 pretending to be a ROM unless you are using the "official" Apple language card and you have made the appropriate cut and jump indicated on the board for exactly this purpose. Alternatively, you could use a DIL to lead the pin 18 signal through an inverter, but this is letting things get a bit messy. – **L.P. Lewis, Abingdon School, Abingdon, Oxon.**

Done out of 24

AS a regular reader of Windfall I do not wish to make a complaint, merely point out a misdemeanour in the July 1982 edition. On page 87, you have a useful article, ABC of the Apple. However it was written k – Kilo – 1000. Having just taken O level computer studies I learnt that K = 1024, making 64K = 64 x 1024.

I trust this is not taken as a criticism, as I find Windfall the most helpful and interesting of computer magazines, especially this month's article on VisiCalc. – **Helen Coxen, Chester.**

Interactive training

I WOULD like to contact any Apple owners who have had experience with educational software, particularly in conjunction with the interactive training of children with dyslexia.

I have seen passing mention in Apple Computer's official advertising but that is as far as I have got so far. – **Peter Trinder, South Bramble, Sunning Avenue, Sunningdale, Berkshire SL5 9PW.**

Bleep

A letter in the June Windfall incorrectly stated that Joy Healey was with Systematics. She is in fact, a director of a completely different company, Systemics. We apologise to both companies for this unfortunate error. Systemics are based at Harrow, Middlesex, and Systematics International operate from Haverhill, Suffork.

SOFTWARE FOR THE SURGERY

By Dr PAUL SHELDON

"AN Apple a day helps the practice to pay" is the novel motto adopted by a medical practice on the outskirts of the city of Bradford. The doctors at the Idle Medical Centre realised that the boom in microcomputers could be a boon for the modern general practitioner. Time needlessly spent in repetitious paperwork and filing could, by means of a computer, be better spent in actually treating and preventing sickness.

For several years the doctors at their Idle surgery had been seeking ways to enable their practice to function more efficiently both as a treating and teaching centre. Despite the name of the clinic, the doctors were far from idle when it came to thinking of new ways to do this.

An age/sex register was started and various methods of issuing prescriptions to patients on long-term drug therapy were tried – and found wanting. It also seemed that a compact practice of 10,000 patients within a radius of two miles would be an ideal source of research material for trainee doctors – if only the source could be tapped.

"We are an average-sized practice, and like most, a lot of our time is taken up with routine paperwork, writing out prescriptions and wading through notes," explained Dr Peter Rennie, one of the partners.

"It gradually occurred to me, having seen microcomputers at exhibitions demonstrating their use in medicine, that general practice would be ideally suited to use them. This is because general practice depends heavily on paperwork, accurate filing and the inter-connection of seemingly unrelated factors. I was sure that a computer was the answer – provided we had the correct software."

The software was the snag. The partners looked at other systems and all had problems. For instance, one small system was offered on a take-it-or-leave-it basis and almost all the basic information had to be coded. While this did not matter in the case of addresses and diseases where the code-information could be readily available on a chart nearby, it seemed a major problem when a patient's records had to be consulted in order to find his code number so that a prescription could be issued.

What was wanted was a system that could on the one hand store all the important information about the patients in the practice and yet on the other hand be so easy to operate that any of the receptionists could work it with little or no training. A tall order!

It soon became apparent that systems which listed information onto the small $5\frac{1}{4}$in floppy discs would not be the answer. "I did not want the staff to have to keep changing discs," pointed out Dr Rennie. "It would be so easy for them to be mishandled and the information on them ruined."

So it was that in August 1981 Dr Rennie and I approached Ram Computers of Bradford to see what they had to offer. We were lucky insofar as Ram were themselves researching this market and were actively looking for an interested practice to work with.

Of necessity the planning stage was a long one because, in order to be right, the system had to be foolproof. Above all it had to be suitable for use by people who knew nothing about computers and cared little about FOR . . NEXT loops and GOTOs!

Because of its capacity and speed Ram recommended the 128k Apple III together with Apple's 5 mbyte hard disc, Profile. The program that was written to run on this set-up is called Medic and is now fully operational.

The type of information that is stored in the Apple III for each patient includes his name, address, date of birth, telephone number, sex, marital status, occupation, up to three 'high risk-factors' (such as allergies or dangerous occupations), any number of diseases (under which heading come vaccinations, smears and other items) and up to eight repeat prescription items.

Of these the address, high risk factors and diseases are coded – but only on input. They are always printed out in full.

"Although Medic was written as we wanted, it is not idiosyncratic to the Idle Medical Centre," explains Dr Rennie. "We realised that for a GP software package to be of interest to a wide selection of doctors it must be adaptable to any type of practice. With this in mind Medic has been written to include a number of features which can be varied so that any practice can adjust it to suit their own particular interests."

Take the Disease file for instance. This contains many vacant codes. If a doctor should wish, say, to record whether a patient smoked or was participating in a clinical trial he could easily enter in this information. It is interesting that whatever order things are entered into the Disease file, they are always printed out in chronological order of occurrence.

It is difficult to summarise all that the machine will do because it is still early days and so far the practice has not been able to take full advantage of all the facilities. But the repeat prescription program is working very well and very hard.

On typing in a patient's name the program recalls his prescription record which shows his current medication and the last six dates on which items were issued. If he has not had an item within the previous 25 days then a prescription for this will be produced. This is written by the computer on the special FP10 paper which is provided by the local Family Practioner Committee.

If a patient requests an item within the 25 day period one can still be produced after the operator uses a special override code. When an item is written out for the fifth time the computer reminds the operator that the patient should make an appointment to see the doctor next time. On the sixth occasion a sterner warning is given.

Each time a prescription is issued the computer prints a revised version of the patient's prescription record on the prescription counterfoil. This details all the prescriptions written since the last time the patient saw the doctor. This can then be filed and the previous one discarded.

It is hardly necessary to mention that printouts of all patients, prescriptions and

disease records can be obtained whenever necessary, but a vital key of the machine as a research tool is its search facility.

The user can set parameters for the machine to check. These include age, sex, occupation, any four diseases and any two drugs and ask for either a positive, negative or an either/or search. This needs explaining and it is easiest to do so by means of an example.

If the user inputs two diseases such as gastric ulcer and carcinoma of stomach he can request the machine produce a list of patients who have had gastric ulcer *and* carcinoma of stomach or neither gastric ulcer *nor* carcinoma of stomach or thirdly, either gastric ulcer or carcinoma of stomach.

This facility is also of use when a list of patients due to be recalled for vaccinations is needed. In all these requests the machine will either produce a simple list of names or write the patients a standard or specially composed letter, advising them to make an appointment to see the doctor.

Any disease or other event, such as a cervical cytology test, which is input may be entered in the machine's automatic calendar. This facility reminds the user at the beginning of each day of anything of a regular nature that needs to be done.

This may vary from recalling patients for tests through filling claim forms to sending invoices to factories and suppliers. When reminding the user about claim forms, it will produce a list of patients who have had that claimable item since the last list was produced.

The financial implications of this are already proving very apparent and have resulted in considerable savings.

For example a practice gets paid for every vaccination given or cervical smear taken so, if it can pick out those patients who are due for such things and send them a letter to remind them, hopefully its claimable items will increase. Of course, the patient will get a better – and a safer service as well.

The most onerous part of setting up the system is actually completing the data base. This involves summarising the patient's notes and entering them onto the hard disc. The practice solved this problem by employing two nurses who, being professionally qualified, were able to carry out this task. The Family Practitioner Committee reimburses the practice for 70 per cent of the wages so the overall cost is small.

Summing up, Dr Rennie says: "The repeat prescription facility has not only saved us a lot of time but it also acts as a safety measure to prevent over-prescribing. The patient record printouts are useful in a number of ways. One is that we always have up-to-date information readily available in an easy-to-read form so that a doctor who is new can see at a glance what the salient points of the history are without having to wade through mountains of illegible notes.

"Apple III and Medic have certainly proved to be of great value to our practice. We have been able to cut down on unnecessary work and therefore provide a better service to our patients."

**Dr Sheldon is a general practitioner at the Idle Health Centre, near Bradford, Yorkshire.*

Paddle a picture

THIS program makes good use of the Apple II's graphics. Using the standard Apple paddles you will be able to create pictures on the high resolution screen. The actual paddles are used to control a large part of the program.

When you have the program running and need to refer to the menu this can be achieved by pressing the button on the controller. After the menu has been displayed you are faced with seven options: SAVE , LOAD, COLOR, RUBOUT, DELETE, NEW, EXIT.

The first two are to do with the saving and loading of pictures that you would have created. The COLOR function will allow parts of the picture to be different colours or shades. The RUBOUT function will remove lines or dots by the use of the paddles.

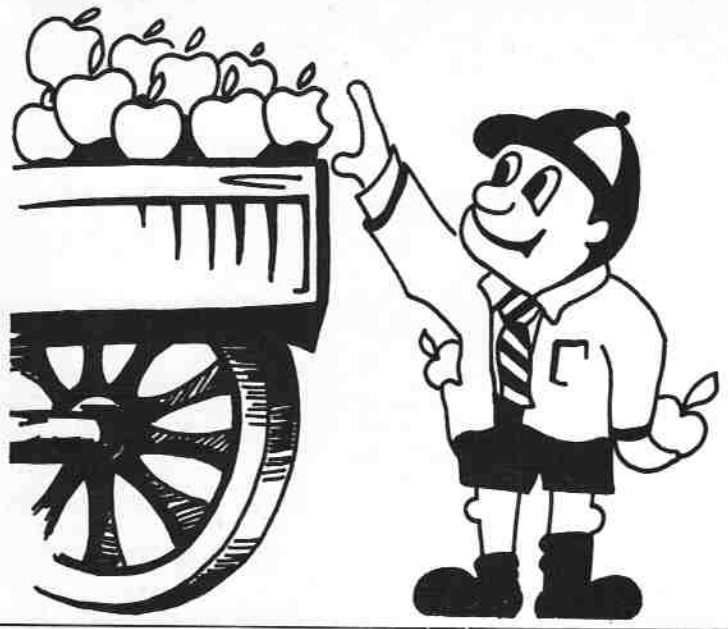
Really all the EXIT function does is to clear the program from memory while the NEW function clears the screen ready for a new picture. The DELETE function enables you to wipe old or maybe ruined pictures from the disc.

The program has been written so as to save and load pictures using a standard 5¼ in disc. About seven pictures as well as the program can be stored on one disc. This is due to the fact that each hi-res screen that is saved on disc uses 8k of memory, or 34 tracks.

```
1  HOME : GOSUB 1000
5  POKE  - 16304,0: HOME
6  HGR
7  HCOLOR= Z
10  GOSUB 60
20  HPLOT X,Y
30  GOSUB 60
40  HPLOT  TO X,Y
50  GOTO 30
60 X =  PDL (1) / .914
65  IF  PEEK ( - 16286) > 127 THEN
     90
66  IF  PEEK ( - 16287) > 127 THEN
     90
70  LET Y =  PDL (0) / 1.6
80  RETURN
90  POKE  - 16301,0
91  POKE 35,21
92  POKE 34,21
94  POKE 33,39
95  HOME
100  INVERSE : PRINT "SAVE LOAD C
     OLOR RUBOUT DELETE NEW EXIT"
     ;: GET A$
101  IF A$ = "S" THEN 500
102  IF A$ = "L" THEN 600
103  IF A$ = "E" THEN  NORMAL : HOME
     : TEXT : NEW
104  IF A$ = "R" THEN  HOME : LET
     Z = 4: GOTO 7
105  IF A$ = "N" THEN  GOTO 5
106  IF A$ = "D" THEN 700
130  PRINT "SHADE CHANGE OF 1 2 3
      5 6   ";: GET Z
140  HOME : POKE  - 16304,0: GOTO
     7
500  REM  SAVE HI-RES PIC
520  INPUT "NAME FOR PICTURE   ";
     A$
530  PRINT  CHR$ (4);"BSAVE "A$",
     A8192,A8192"
540  GOTO 140
600  REM  LOAD HI-RES PIC
620  INPUT "NAME OF PICTURE   ";A
     $
630  HGR
640  PRINT  CHR$ (4);"BLOAD "A$",
     A8192"
650  GOTO 91
700  REM  DELETE HI-RES PIC
710  INPUT "NAME OF PICTURE   ";A
     $
720  PRINT  CHR$ (4)"DELETE "A$"
730  GOTO 91
1000  FOR S = 1 TO 4: PRINT : NEXT
     : PRINT  TAB( 10): FLASH : PRINT
     "ELECTRONIC SCRIBBLE PAD": NORMA

1005  PRINT : PRINT
1010  PRINT : PRINT : PRINT "THIS
      PROGRAM WILL ALLOW YOU TO C
     REATE A PICTURE USING THE HI
     GH RESOLUTION GRAPH-ICS."
1020  PRINT "IF THE CONTROLLER BU
     TTON IS PRESSED THE SCREEN W
     ILL GO BLANK.":
1025  PRINT "TO DISPLAY THE MAIN
     MENU PRESS THE BUTTON AGAIN.
     "
1030  FOR R = 1 TO 5000
1035  IF  PEEK ( - 16287) > 127 THEN
      IF  PEEK ( - 16286) > 127 THEN
      GOTO 10000
1040  IF  PEEK ( - 16286) > 127 THEN
     5
1050  IF  PEEK ( - 16287) > 127 THEN
     5
1060  NEXT
10000  TEXT
10010  PRINT  TAB( 10): FLASH : PRINT
     "PADDLES NOT PLUGGED IN": NORMAL

10015 : FOR S = 1 TO 10
10020 : FOR A = 1 TO 100:X =  PEEK
     ( - 16336): NEXT
10030 : NEXT
10040  HOME : POKE 35,0: POKE 34,
     0: POKE 32,0: POKE 33,0
```



Applecart

Monthly review of
Apple in education

Why not sort out your pupils with Pascal

By J.P. LEWIS

BEING the master in charge of school computers is often good fun. There are times, however, when it can make life rather hard and lead to late nights/early mornings, particularly when other members of staff suddenly realise what clever things a computer can do . . . if "someone" can program it.

The last problem that someone had to handle started as follows: "Take 107 boys, let them choose any three out of a possible seven subjects (e.g. German, geography, etc.), arrange a timetable for them which consists of three parallel 'blocks' containing four geography sets, two German sets, two music sets, etc., etc. And don't let any of the sets get too big. Could you have it done by next week, or tomorrow if possible?"

There were two reasons why Pascal was the best language to use for a quick solution. First, its convenient handling of sets (try writing a Basic routine to find all the boys doing history and Russian and art). Secondly, the potentially high speed of sorting. This article is intended to give you some idea of how to take near-maximum advantage of the latter.

Of the many ways of getting a computer to do a sort, the Quicksort is probably the fastest (unless, surprisingly, the data is almost in order to start with). Unfortunately, the Quicksort is also one of the hardest to understand from a verbal description. So if you really want to get a feel for how it works get about 10 pieces of paper, write a number on each, arrange them into a neat line, then read on.

The essence of a Quicksort is that on one pass through any list of data, you should re-arrange it to form two smaller lists; one containing items which are all less than a picked reference value (called the pivot), the other containing items which are all greater than, or equal to the pivot. At this point you push one side out of the way for a while, and Quicksort the other side . . . and so on.

Anyone who has by now said "self-recursion" is absolutely right. The only problem now is to produce an algorithm to do the re-arranging. Pascal can take care of the self-recursion all by itself.

The algorithm works as follows, so get back to those 10 pieces of paper. Assume you want to sort the numbers smallest to the left, largest to the right:

(1) Point your right hand at the far right piece and your left at the far left piece.
(2) Look at the number on a piece of paper near the middle of the line – this is going to be the pivot value.
(3) Move your right hand in until you come to the first number which is smaller than, or equal to, the pivot (it may even be the pivot).
(4) Move your left hand in until you come to the first number which is larger than, or equal to, the pivot.
(5) Swap over the two pieces of paper you are pointing to, and move your hands one step further on.
(6) Go back to step (3) unless your hands have just crossed. In which case . . .
(7) Look at the line of papers. You should note that everything to the left is less than the pivot value, and everything to the right is greater. (Note that on your last move you may have found that both hands were pointing at the pivot; in which case, step (5) will not have taken much effort).
(8) Put the left hand section to one side and Quicksort the right hand side, unless there is only one piece of paper on the right, in which case it is sorted, so go back to the left hand side and GOTO 1 . . .

I don't advise you to try the full recursion. Unlike the computer, you will probably not find it easy to remember which bits have been pushed onto the heap, and how far down they are supposed to be.

The routine to do this task in Pascal follows. You will note that it contains a rather esoteric data

→

```
Oprogram SORTSETS;
(*=============*)
uses APPLESTUFF;
type
    OPTIONS=set of CHAR;
    BLOCKS=set of (G1,G2,G3,H1,H2,H3,J1,J2,J3,L1,L2,L3,
                   N1,N2,N3,R1,R2,R3,T1,T2,T3,U1,U2,U3);
    BOY=record
        NAME:integer
        (*NAME:string[20]*);
        HISOPTIONS:OPTIONS;
        HISBLOCKS:BLOCKS
    end;
    BOYLIST=array[1..500] of BOY;
var
    NOOFBOYS,COUNT:integer;
    LISTOFBOYS:BOYLIST;


procedure OUTPUT;
(*=============*)
var
    COUNT:integer;
begin
    for COUNT:=1 to NOOFBOYS do
        if ((COUNT mod 8)=0) then
            writeln('  '.LISTOFBOYS[COUNT].NAME)
        else
            write(LISTOFBOYS[COUNT].NAME:5)
end;


procedure QUICKSORT(OLDLOW,OLDHIGH:integer;var TIDIER:BOYLIST);
(*=============================================================*)
var
    NEWLOW,NEWHIGH:integer;
    PIVOTBOY,TEMPBOY:BOY;
begin
    NEWLOW:=OLDLOW;
    NEWHIGH:=OLDHIGH;
    PIVOTBOY:=TIDIER[(OLDLOW + OLDHIGH) div 2];
    while (NEWLOW <= NEWHIGH) do begin
        while (TIDIER[NEWLOW].NAME < PIVOTBOY.NAME) do
            NEWLOW:=NEWLOW+1;
        while (TIDIER[NEWHIGH].NAME > PIVOTBOY.NAME) do
            NEWHIGH:=NEWHIGH-1;
        if (NEWLOW<=NEWHIGH) then begin
            TEMPBOY:= TIDIER[NEWLOW];
            TIDIER[NEWLOW]:=TIDIER[NEWHIGH];
            TIDIER[NEWHIGH]:=TEMPBOY;
            NEWLOW:=NEWLOW+1;
            NEWHIGH:=NEWHIGH-1
        end
    end;
    if (NEWLOW < OLDHIGH) then
       QUICKSORT(NEWLOW,OLDHIGH,TIDIER);
    if (OLDLOW < NEWHIGH) then
       QUICKSORT(OLDLOW,NEWHIGH,TIDIER)
end;


begin (* MAIN PROGRAM *)
(*====================*)
    write('How many items ? ');
    readln(NOOFBOYS);
    writeln('Preparing data');
    randomize;
    for COUNT:=1 to NOOFBOYS do
        LISTOFBOYS[COUNT].NAME:=RANDOM mod NOOFBOYS;
    writeln(chr(7),'Sorting');
    QUICKSORT(1,NOOFBOYS,LISTOFBOYS);
    writeln(chr(7),'Finished');
    OUTPUT
end.
```

IN all aspects of teaching, whether in schools c colleges, there are some subjects which student and staff would rather not have to know about. It i in these areas that the microcomputer can come t the rescue and bring in the interest which is re quired. Of course there are many commercia software packages available, some of which ar indeed very good, and which are reviewed withi the pages of *Windfall.*

However it is a great pity if such a versatil machine as the Apple is used only to run com mercial software, because there are so man possible areas of any syllabus which could b greatly assisted by the right program and it is onl the individual teacher who really knows th educational needs of his/her class. What I hope t show by this article is how even a simple program written only in Basic, with never a POKE in sigh can make a very useful and entertainin educational routine.

Some time ago I was given the task of lecturin in ergonomics in part of the biology course run college, and as one of the practical sessions w attempted to determine fatigue by means memory assessment.

Conventionally this would involve presentatio of a list of words or symbols, and then after a pre determined time requesting recall of this dat Such a test was just begging to be computerise

To begin I made a short program to store lists words as a sequential text file (program 1). This truly very simple and use of the Append commanc could be included if required for future file enlarge ment. The words have been stored as four differe categories.

In order to test the student's memory for th words, the four categories are presented as show in Fig 1. On pressing the required category numb the file of words is then automatically loaded fro the disc into a string array. The student is the asked on the VDU for the number of words r quired and the time for which the words should b displayed. Use of the random number generatin capability then selects the words from the strin array and the use of a delay loop determines th dwell time on the screen. The words must then b input via the keyboard with prompting from th VDU. Fig 2 shows an example of nine words presented on the screen, which, for the purpose this article only, was also output to a printer.

Having supplied the correct number of word

structure. In fact, the only thing the routine is sorting is integers, but I have left in the original record definition to show how flexible the Quicksort can be. (If you use this printout to work through the task with little bits of paper, by the way, you will notice it is very slightly different from the algorithm above.)

The following test times (to the nearest 0.1 seconds) were taken with the program in two different forms. First as it stands, secondly with the record replaced by a simple integer.

No. of items	*50*	*200*	*500*
RECORDS	1.6	8.3	23.4
INTEGERS	0.7	4.0	10.0

As a final comparison, my 107 boys (with names, sets of three choices, and sets of three blocks) started in groups of about six alphabetically, and ended up in a single alphabetical list in 4.45 seconds. This compares very favourably with a machine code bubble sort published a few months ago, even though the code is so much more readable and the routine machine-independent.

The obvious enhancement of this routine is to pass it a flag on entry telling it which of several fields it is to sort with, such as name, tutor's initials, etc. This is quite easy if you restrict yourself to just one type of field, but I have yet to come up with a single, neat routine which will sort strings, chars, numbers or whatever else you throw at it. Any ideas?

Simple program to test memory with an Apple

By ALAN MARSHALL

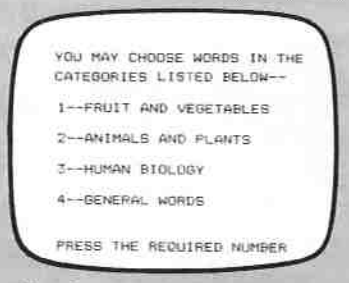


Fig 1

Fig 2

the Apple then marks the response in the following ways:

1. How many words are correct.
2. How many words correct and in the correct order.
3. How many words are correct as judged by the first three letters only.

Fig 3 shows how I was marked on my memory (since I was looking at the printout, the errors were deliberate!). Fig 4 is included to show the different categories of words and the marking or the errors.

The method by which the information is recalled, presented and assessed is shown in program 2. Note that there is a small routine which prevents the same word appearing twice in any list. This program has been found to have lots of other uses, for example with medical and technical secretaries where use of the appropriate word files can improve their typing and memory for technical words.

To summarise – even simple programs can aid teaching and I hope the one presented here may be useful to some people.

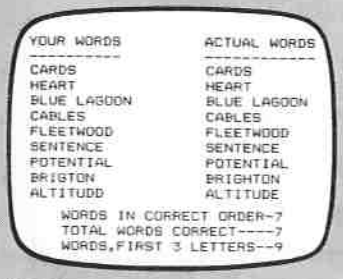


Fig 3

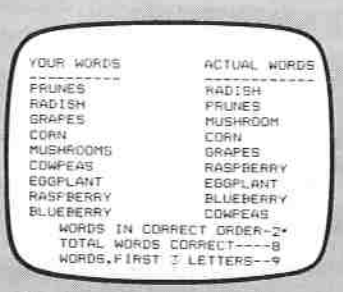


Fig 4

Program 1

```
10  HOME : VTAB 10: PRINT "WORD S
    TORE PROGRAMME"
20  FOR X = 1 TO 1000: NEXT
30  HOME
35  INPUT "SUPPLY CATEGORY NAME "
    ;A$
37  PRINT : PRINT
38  INPUT "SUPPLY NUMBER OF WORDS
     TO STORE";E
40  PRINT : PRINT "SUPPLY ";E;" W
    ORDS"
50  DIM B$(E)
55  FOR I = 1 TO E
60  PRINT "SUPPLY WORD NUMBER  ";
    I
70  INPUT B$(I)
80  NEXT
90  PRINT : PRINT : PRINT "ALL WO
    RDS SUPPLIED"
100 D$ =  CHR$ (4)
110  PRINT D$;"OPEN";A$
120  PRINT D$;"WRITE";A$
130  FOR I = 1 TO E
140  PRINT B$(I)
150  NEXT
160  PRINT D$;"CLOSE";A$
170  HOME
180  PRINT : PRINT "ALL WORDS STO
    RED"
190  PRINT D$;"CATALOG"
```

Program 2

```
10  HOME
15  VTAB 10
20  PRINT "*****      ERGONOMICS E
    XPERIMENTS     *****"
30  PRINT : PRINT : PRINT  TAB( 5
    )"WORD REMEMBERING ROUTINE"
35  HTAB 5
40  PRINT "-----------------------
    --"
45  PRINT : PRINT : PRINT
50  PRINT : PRINT : PRINT "PRESS
    KEY TO  CONTINUE"
60  GET A$          '
70  HOME
80  PRINT "THIS EXPERIMENT TO BE
    DONE AS DIRECTED"
90  PRINT : PRINT "BY THE LAB. MA
    NUAL"
95  PRINT : PRINT : PRINT "FOLLOW
     THE DIRECTIONS CAREFULLY"
100  PRINT : PRINT : PRINT "SUPPL
    Y THE NAME OF YOUR SUBJECT"
102  INPUT B$
103  HOME : PRINT "HELLO  ";B$
110  PRINT : PRINT : PRINT "YOU M
    AY CHOOSE WORDS IN THE CATEG
    ORIES"
120  PRINT : PRINT "LISTED BELOW-
    -"
```

Applecart

```
130  PRINT : PRINT "1--FRUIT AND
     VEGETABLES"
140  PRINT : PRINT "2--ANIMALS AN
     D PLANTS"
150  PRINT : PRINT "3--HUMAN BIOL
     OGY"
160  PRINT : PRINT "4--GENERAL WO
     RDS"
170  PRINT : PRINT : INVERSE : PRINT
     "PRESS THE REQUIRED NUMBER":
      NORMAL
180  GET B
190  IF B = 1 THEN C$ = "FRUIT"
200  IF B = 2 THEN C$ = "ANIMALS"
210  IF B = 3 THEN C$ = "HUMAN"
220  IF B = 4 THEN C$ = "GENERAL"

230  IF B > 4 THEN 170
240  HOME
250  PRINT : PRINT "YOU HAVE CHOS
     EN ";C$
260  PRINT : PRINT : PRINT "THIS
     DATA NOW BEING LOADED"
270  DIM E$(80)
280  PRINT  CHR$ (4);"OPEN";C$
290  PRINT  CHR$ (4);"READ";C$
300  FOR I = 1 TO 80
310  INPUT E$(I)
320  NEXT
330  PRINT  CHR$ (4);"CLOSE";C$
340  HOME : PRINT "ALL DATA NOW R
     ETRIEVED ON "
350  PRINT : PRINT C$
360  PRINT : PRINT : PRINT : PRINT
     "PLEASE SUPPLY THE TIME IN S
     ECONDS"
370  PRINT : PRINT "FOR WHICH YOU
      WISH NAMES TO BE DISPLAYED"

380  PRINT : PRINT : INPUT "TIME?
     -- ";E
390 T =  INT (E * 1000)
400  PRINT : PRINT "HOW MANY WORD
     S DO YOU WISH DISPLAYED"
410  PRINT : PRINT : PRINT "ANY W
     HOLE NUMBER LESS THAN TEN"
420  PRINT : INPUT "NUMBER -";F
425 X =  INT (( RND (1) * 9) + 1)

430  FOR H = 1 TO F
440 G(H) =  INT (( RND (X) * 80) +
     .5)
441  IF G(H) = 0 THEN G(H) = 1
442  FOR I = 0 TO H - 1
445  IF G(H) = G(I) THEN  GOTO 43
     0
450  NEXT : NEXT
455  REM :ABOVE ROUTINE STOPS DUP
     LICATION
460  HOME : VTAB 5: FOR I = 1 TO
     F
```

```
470  PRINT  TAB( 10)E$(G(I))
472 X$(I) = E$(G(I))
475  PRINT
480  NEXT
490  FOR Q = 1 TO T: NEXT
500  HOME : PRINT "YOU HAVE SEEN
     THE--";F"-- WORDS"
510  PRINT : PRINT "NOW TYPE EACH
      ONE, IN ORDER IF POSSIBLE"
520  PRINT : PRINT "PRESS <RETURN
     > AFTER EACH WORD"
530  PRINT
540  FOR I = 1 TO F
550  PRINT "SUPPLY WORD--";I
555  HTAB 15: INPUT Y$(I)
560  NEXT
570  HOME
580  PRINT "YOUR WORDS"; TAB( 20)
     "ACTUAL WORDS"
585  PRINT "----------"; TAB( 20)
     "----------"
590  PRINT
600  FOR I = 1 TO F
610  PRINT Y$(I); TAB( 20)X$(I)
620  NEXT
622 N = 0: REM  NUMBER IN CORRECT
      ORDER
623 N1 = 0: REM  TOTAL NUMBER COR
     RECT
624 N2 = 0: REM  CHECK SPELLING
630  FOR I = 1 TO F
640  IF Y$(I) = X$(I) THEN N = N +
     1
645  NEXT
660  FOR I = 1 TO F
670  FOR H = 1 TO F
680  IF X$(I) = Y$(H) THEN N1 = N
     1 + 1
685  IF  LEFT$ (X$(I),3) =  LEFT$
     (Y$(H),3) THEN N2 = N2 + 1
690  NEXT : NEXT
695  PRINT : PRINT
700  PRINT "WORDS IN CORRECT ORDE
     R-";N
702  PRINT "TOTAL WORDS CORRECT--
     --";N1
704  PRINT "WORDS,FIRST 3 LETTERS
     --";N2
720  PRINT : PRINT "YOU MAY DO TH
     E FOLLOWING---"
730  PRINT "1--NEW CATEGORY OR SU
     BJECT"
740  PRINT "2--REPEAT WITH NEXT W
     ORDS/TIME"
745  INVERSE
750  PRINT : PRINT "PRESS REQUIRE
     D KEY": NORMAL
760  GET NUMBER
770  HOME
780  ON NUMBER GOTO 900,360
900  CLEAR :X =  FRE (0): GOTO 70
```

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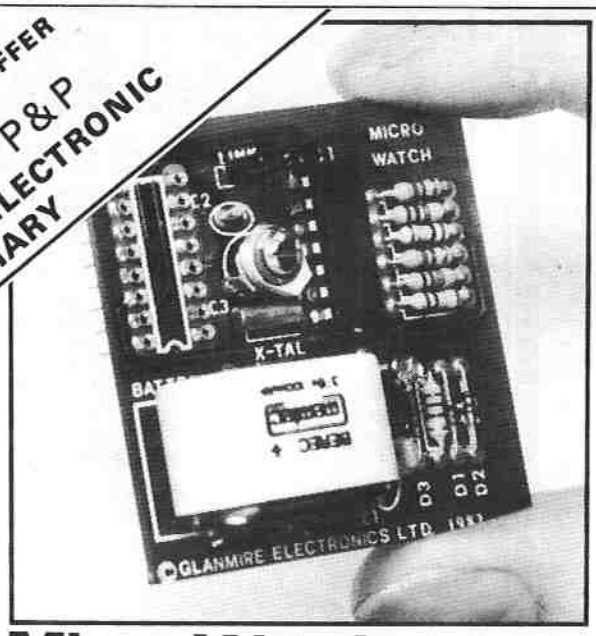

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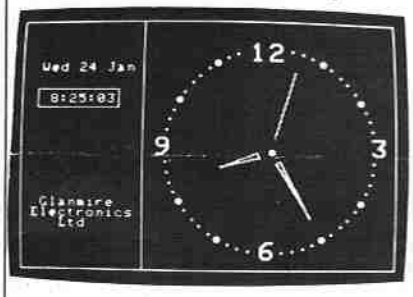

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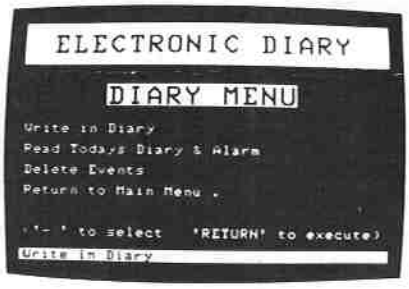

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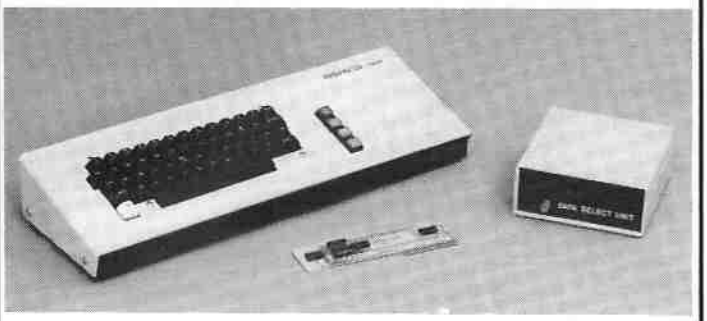

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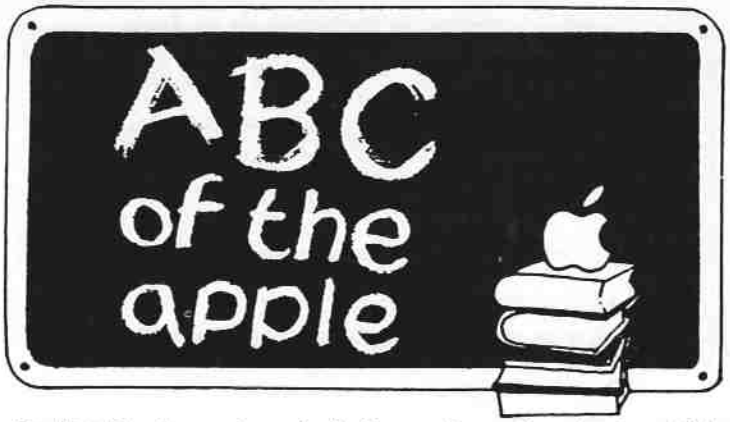

Applesoft. A version of Basic used on the Apple which contains numbers stored in floating point notation.

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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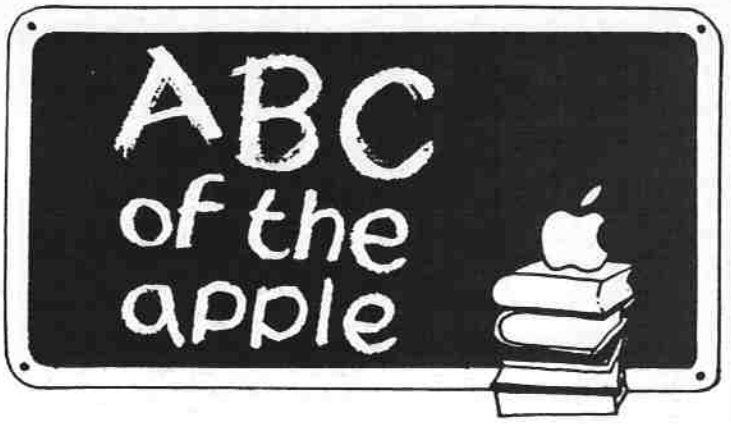

Interface. A device for linking one finite component with another, such as a printer interface to link a printer to an Apple.

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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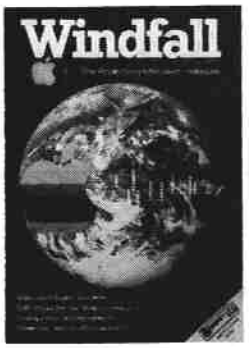

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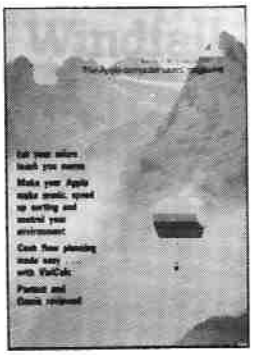

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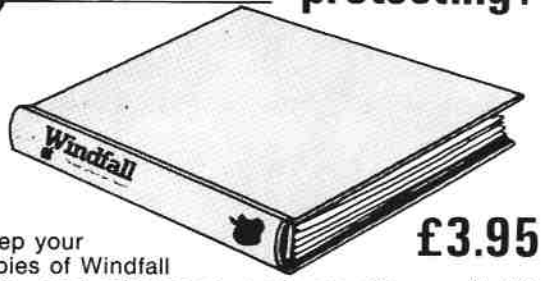

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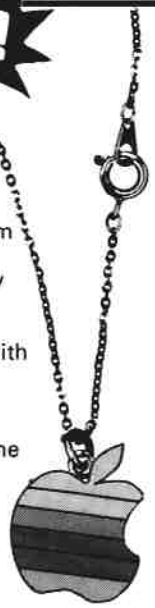

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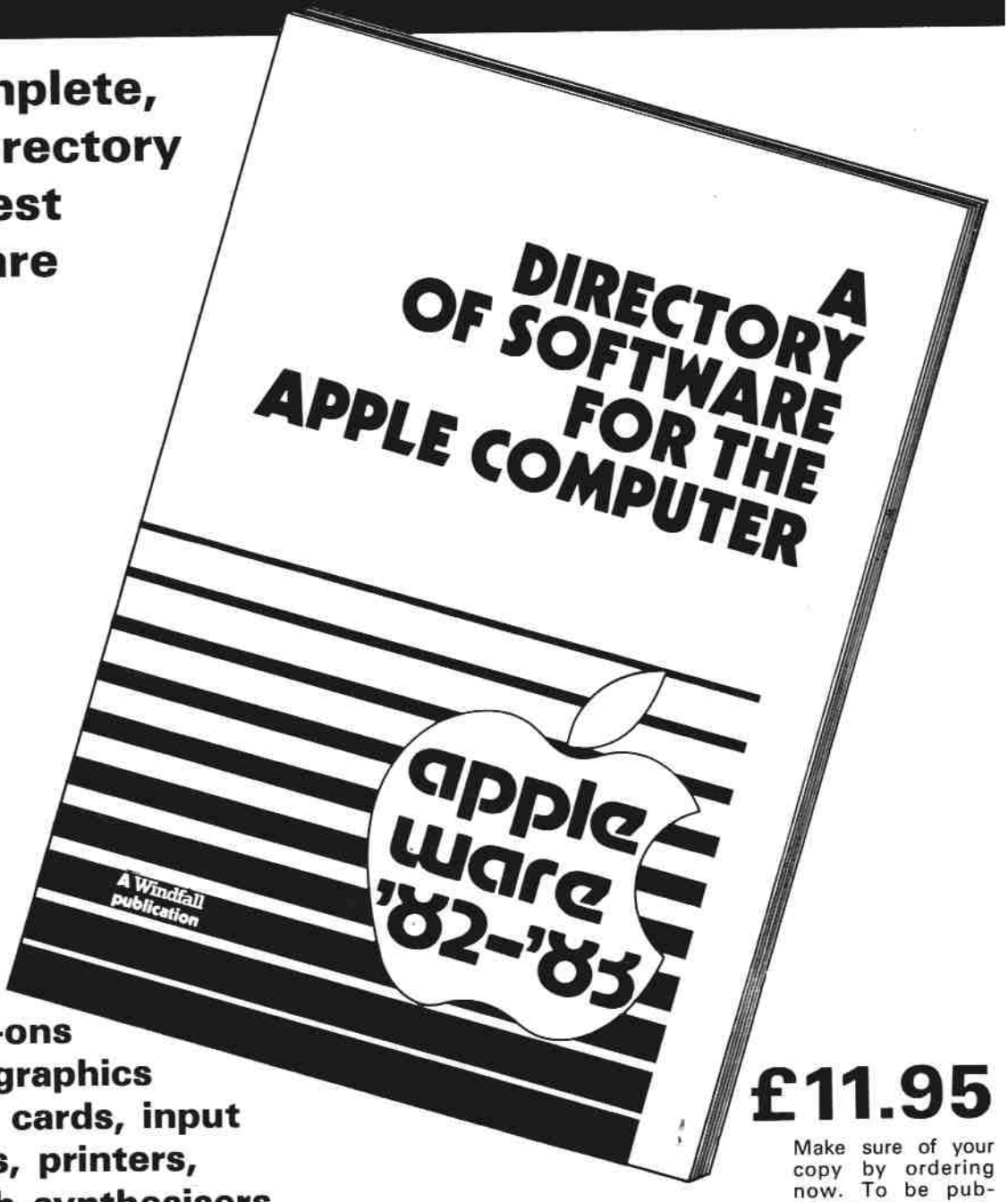

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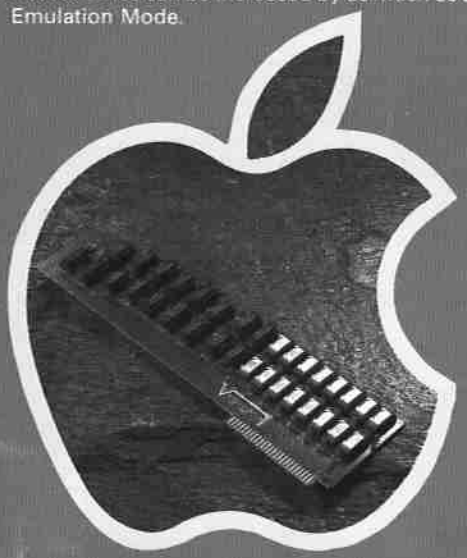

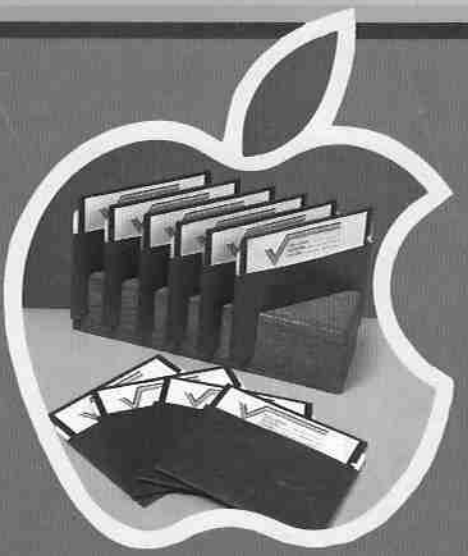

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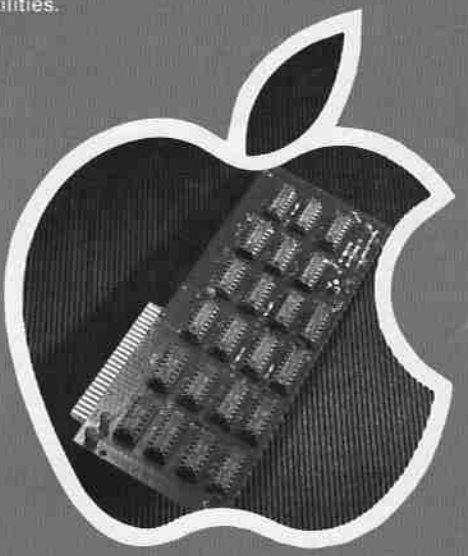

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