The International apple computer users' magazine

Windfall

Volume 2. No. 8 February 1983 £1

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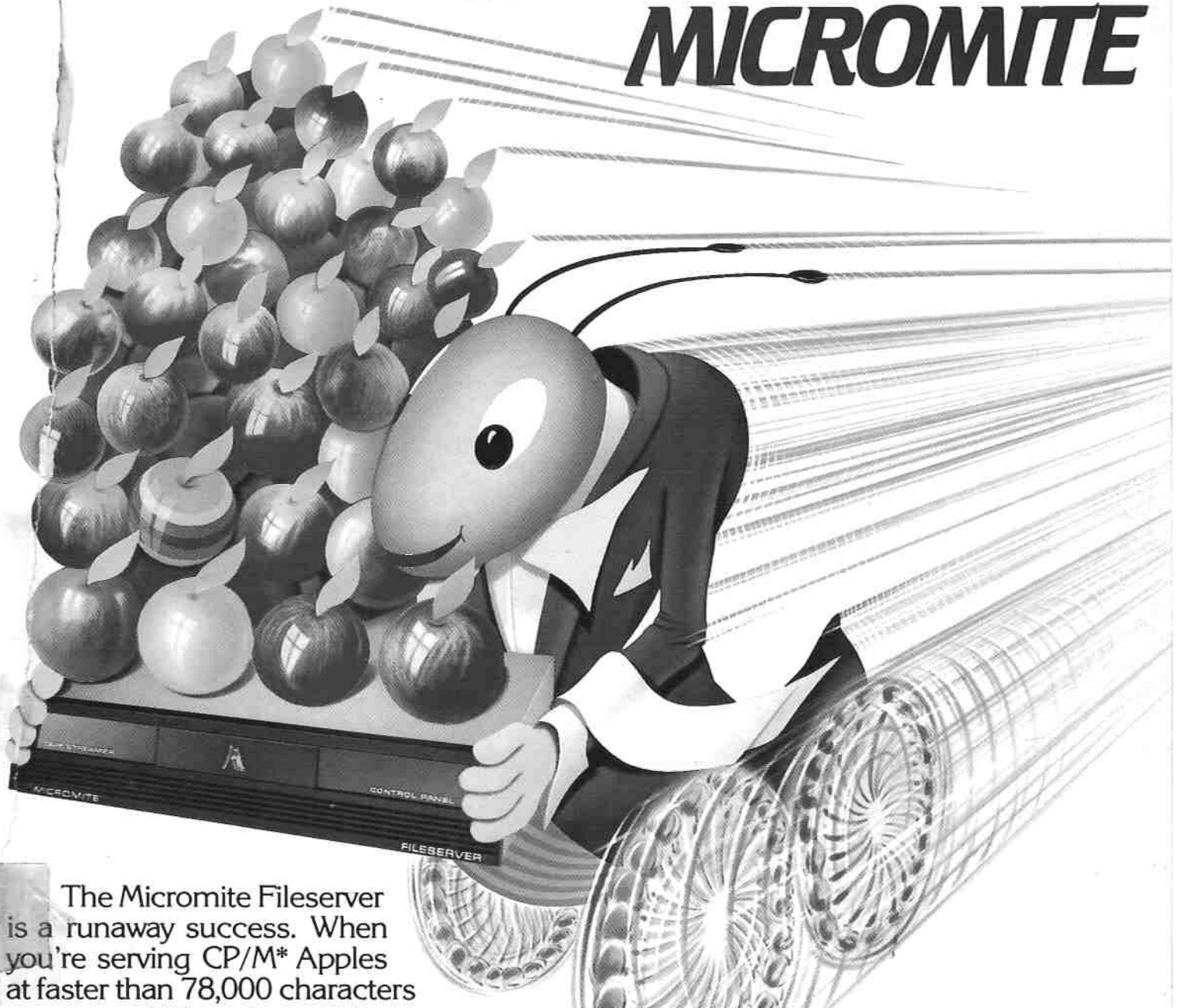

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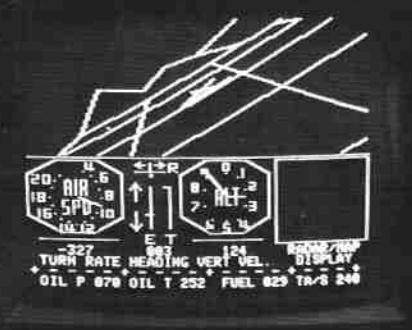

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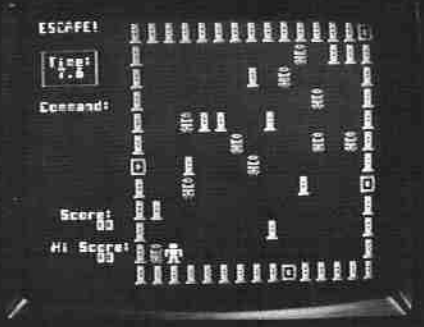

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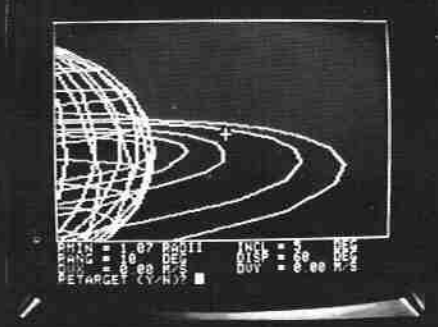

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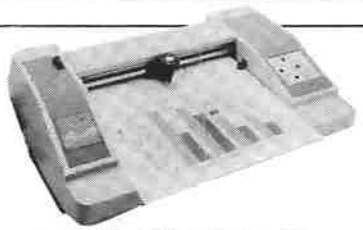

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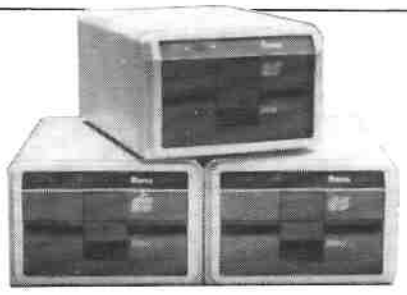

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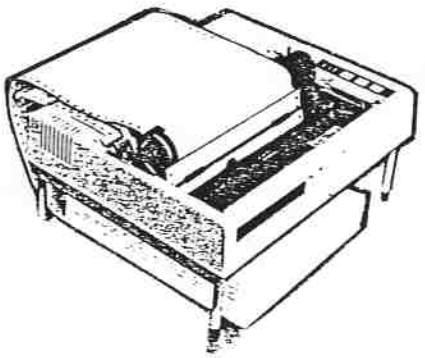

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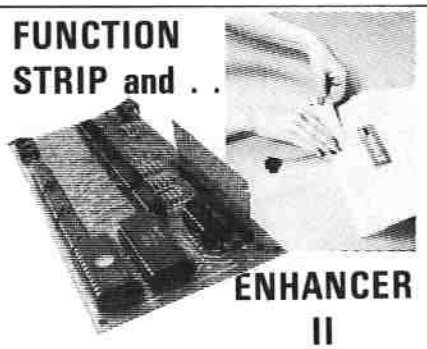

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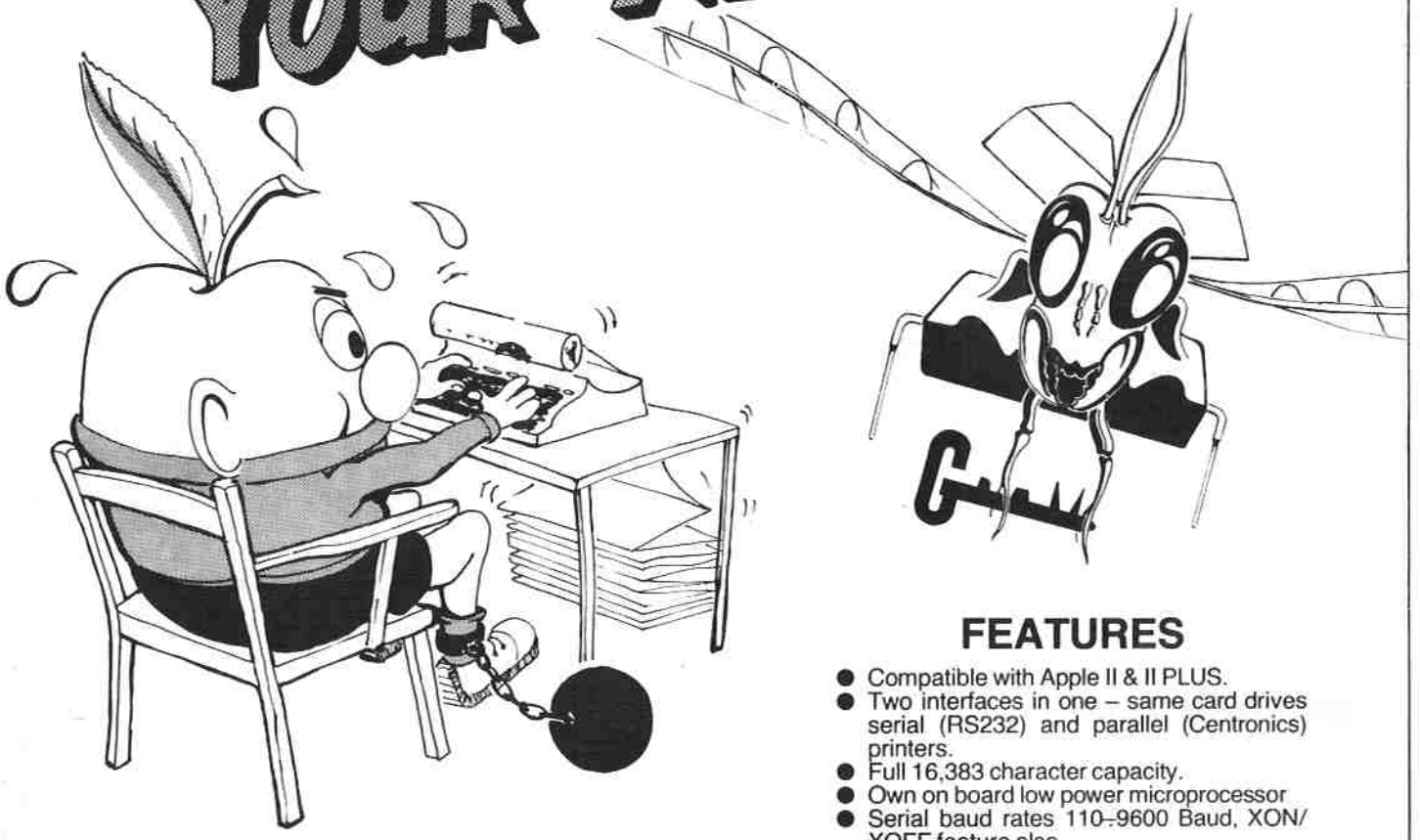

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The IPB–16K is designed to receive data to be printed from the Apple at high speed, save it on the card then send it to the printer at the lower speed required by the printer.

The Apple is now available to continue other processing typically saving 1–20 minutes of otherwise wasted time.

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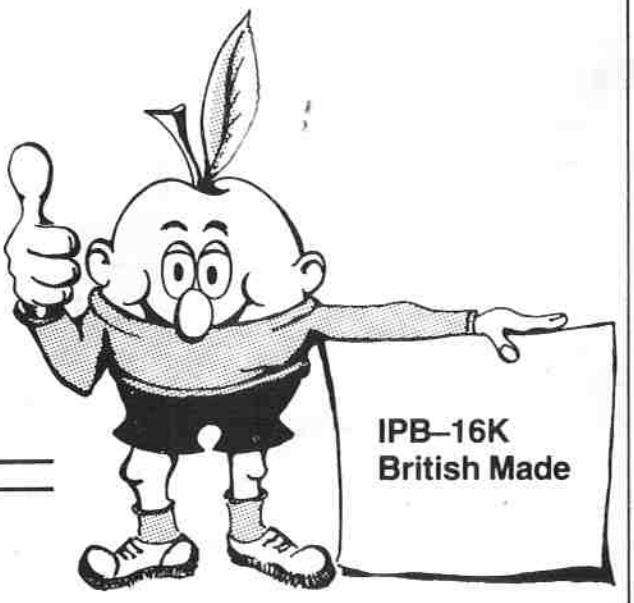

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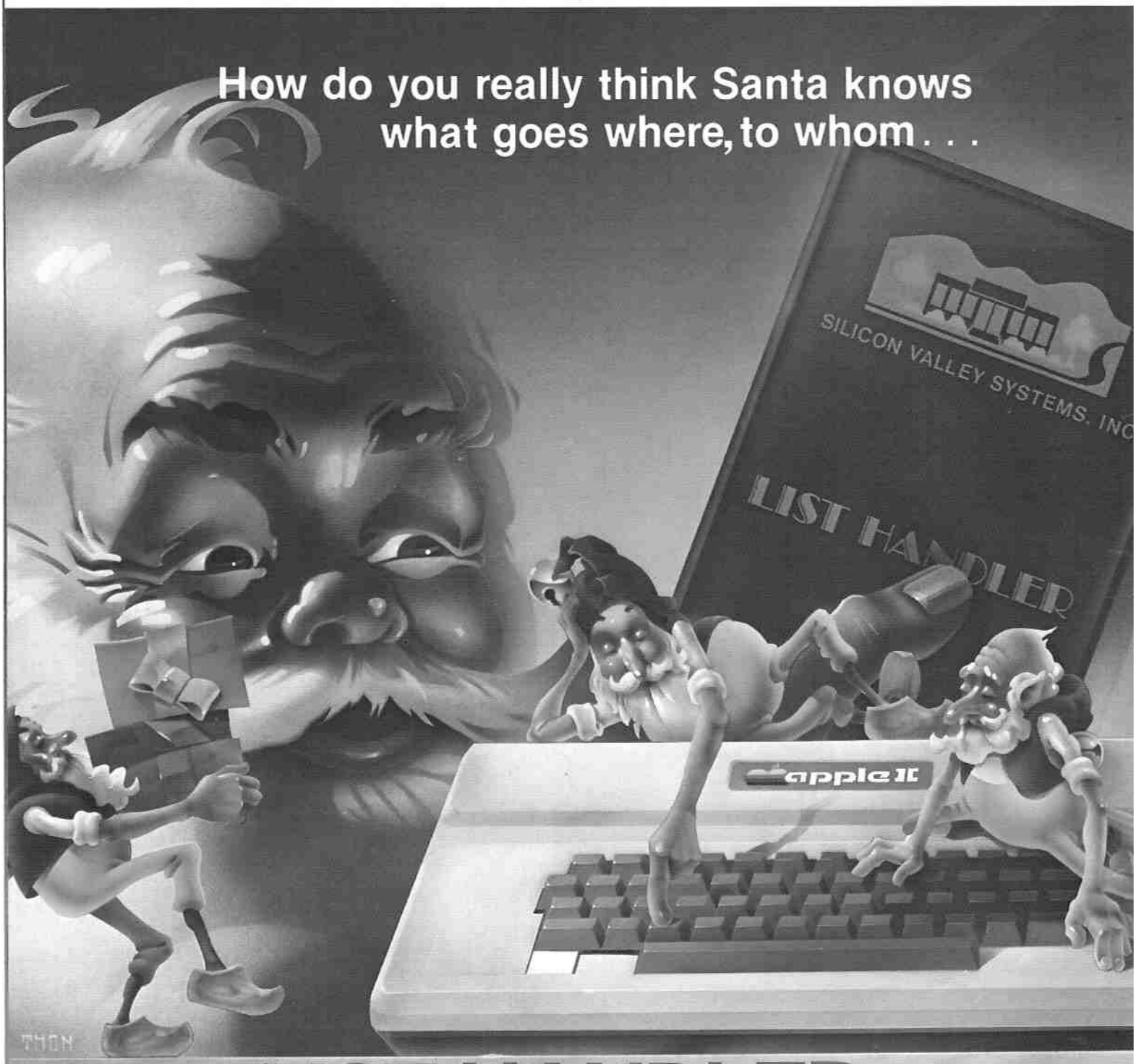

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The List Handler is, **without doubt**, much more than a mailmerge program.

Presto! List Handler turns your Apple® into a quick response file cabinet with room to grow storage space. **With List Handler you can hold up to 3000 records per drive so that 24000 can be kept on-line at the same time with multiple disk drives.**

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The list is endless.

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The Word Handler's many print features are displayed on the screen so I can see at a glance exactly what will be printed. For example: underlining, **bold** super^script, UPPER / lower case. Even / normal justification.

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Let it speak for you.

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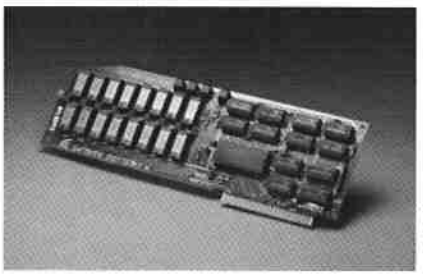
I run out of memory?"

Most people *do* run out of memory with only 18K VisiCalc* workspace. But you can expand your Apple II* to 177K VisiCalc memory! You can also get 80-column display, lower case letters, and hard disk support—all without buying a bigger computer.



The Saturn expansion system for VisiCalc consists of a preboot diskette, one or more plug-in RAM boards, and an optional 80-column display board. You can put the Saturn boards in any slot. And with all that memory, our software lets you save files on more than one diskette.

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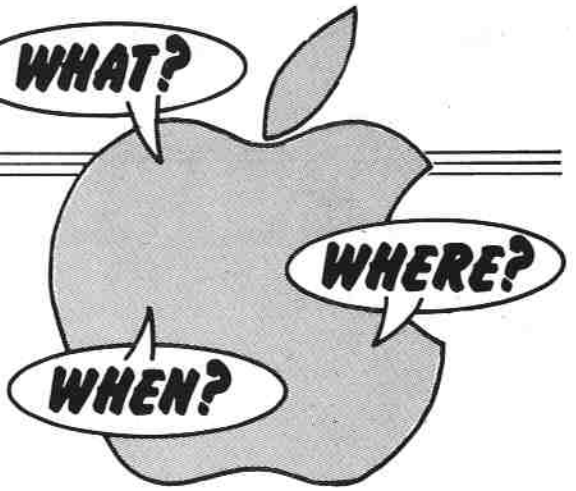
WHAT'S NEWS...

By David Creasey



Best kept secrets of the micro war

ONE of the most remarkable things about Apple's new products – reported on Pages 51 to 53 of this issue – has been the company's success in keeping the wraps on them until the last minute.

The micro industry has been full of rumours about Macintosh, Lisa and the Super E for nearly a year, and the trendy micro press has made a habit of slating Apple's slowness in bringing out a new product to keep the company not just competitive, but alive in the micro market (all this despite the continued sales success of the Apple II and the improving performance of the III).

But no one was able to gain confirmation of what the products were and when they were to be launched. Apple themselves refused to commit anything to paper lest there should be a leak, and although various Beta test sites and privileged dealers were given sneak previews in the months preceding the launch, nothing emerged which would seriously detract from the impact of the launch.

"We wanted to make quite sure that everything was ready and that our dealer and support network was completely prepared for the launch, before going public," said an Apple spokesman.

The first official indication of what was in store came a month before D-Day, when Apple sent out a restricted circulation document to their UK dealers. Even then it didn't tell the full story.

"Apple is soon to make a tremendous leap in personal computing concepts, bringing innovation and ease of use to today's computer user," it said.

"Apple will completely lead the field – we haven't spent literally millions of pounds on research and development for nothing!

"We believe the revision to the Apple II Plus will be in strong demand in preference to the existing successful and competitively-priced Apple II."

British invasion

A MOVE into the American market is proving successful for the British manufacturers of the Ramex 128k RAM card, Vergecourt.

The company started a nationwide advertising campaign in the US last August and is now selling around 400 boards a month there (at $499 a throw) according to managing director John Parvin.

It is also selling well in South Africa and Germany, and Parvin says he expects to have sold 5,000 boards worldwide by May.

Mice are multiplying

A NEW generation of software that lets any micro user work easily with a number of application products at one time has been launched in the United States by Visicorp.

The company claims that Visi-on, which should be available on the Apple in the spring, will become an applications environment standard and will herald a new generation of micros.

Whether it will take the wind out of Apple's sails (and sales) by offering worthy competition to Lisa is difficult to say at this stage. However it incorporates a mouse control similar to Lisa's that can be used as an extension of the user's arm to move the screen cursor.

Multiple applications can be displayed on the screen and worked on simultaneously, such as a spreadsheet, a partial text of a document being developed through word processing and a pie, line or bar graph. The user operates the system with only nine English commands and the mouse control.

By moving the cursor to a particular application window on screen and pressing the select button, that application can be worked on, while any previous application's data is automatically saved and stored ready for later use.

Windows can be framed, expanded, reduced and positioned and separate windows for similar processes and information can be combined to provide summary results.

Visicorp is so pleased with its product that it is planning to modify all its existing applications packages for compatibility with Visi-on. It will also encourage independent software vendors to develop their own applications on licence, and invite equipment manufacturers to licence the product for use with a variety of processors and operating systems.

The company says Visi-on is not an operating system, but designed to run on top of a vendor's operating system, the link between the two being the Visihost software layer. Above this layer is the Visi-on tier which is said to be machine and operating system independent.

48k and three aspirins..

FOR those who always wanted to be doctors, but who had to settle for being mere programmer/Apple users, a new type of educational game from Synergistic Software might appeal.

Microbe: The Anatomical Adventure, combines the best elements of fantasy adventure, arcade action and accurate medical science. It involves a miniaturised submarine injected into the human body – remember the film? – with the task of ridding it of disease and repairing damage to the brain.

If surgery is necessary, the vessel's crew (a captain, navigator, technician and doctor) must perform it.

The captain steers the sub through the veins and arteries of the body, following the advice of the navigator. The technician performs repairs both inside and outside the sub and the doctor must identify any attacking organisms, provide the appropriate treatment, monitor the patient's condition and insure his health.

The game involves strategy and has three different levels, depending on the educational level of the players.

At level one it is a classic adventure, the goal being to explore, overcome obstacles and solve the medical problem.

On the second level players can learn facts about health care, personal safety, anatomy and medicine, while the third level is for science and medical students who must know what drugs to prescribe and what immunity levels, blood pressure and heart rates are healthy or dangerous.

Who knows, perhaps this game is an unwitting prediction of the future – when computers have become so user friendly that they are operated from inside the body!

Dogging those Down Under lookalikes

THERE is little doubt that the new Apple crop will be dogged by the same look-alike competitors who have caused so much trouble to the company's other products throughout the world.

It will be interesting to see just where the first Lisa-lookalike will appear – unless Apple has managed to make aspects of the new machine uncopyable in the same way that a few vital ingredients of Coca Cola have always remained a secret.

Meanwhile in Australia a restraining order has been issued by the Supreme Court of Victoria prohibiting the sale of Apple II copies by Micro Pro Computers of Melbourne.

It is the first action resulting from extensive investigations carried out by Apple Computer Australia – and the company says it will continue to seek out and identify not only stockists of fake Apple machines, but also their sources.

Meaning business

UP to 40 dealers are expected to take stands at the Apple Business Show in Manchester next month. A spokesman for Apple UK says they will be taking the business market by storm this year and as a result the show will be purely business orientated.

Apple's own stand will be at the heart of the show with "a vast array of Apple equipment and software – much of it new", he added. "And we'll be backing it with advertising and promotional events."

The show is open to the public on March 9 and 10 at the Forum Centre in Manchester. Dealer day is the 8th.

Children the winners

ROUND Table wins at Round Table = Apple for charity. That unusual formula derives from the activities of the Hornsey Round Table which, in conjunction with Bromley Computer Centre, recently donated an Apple II to the London Borough of Haringey for use by quadraplegic children.

The borough already has an Apple which handicapped children can control literally by the blinking of an eye, using a pair of glasses with a light source and photocell.

The Hornsey Tablers won a car in a competition organised by another Round Table branch and when they heard that the borough wanted a second Apple they sold the car to pay for one.

Now if only Rolls would . .

APPLE now employs nearly 3,000 people throughout the world – and more than half of them have Apples in their own homes under the company's "loan-to-own" scheme. Most are Apple IIs.

Employees qualify for the free loan of a computer after their first six months at Apple – and they are given the machine after a further year's employment. They also have the option of buying Apple IIIs at about 15 per cent of the retail price.

The scheme was started in the United States soon after Apple was founded, and it has been going in the UK for just over a year. Sixty-two of the British subsidiary's 100 staff now use Apple IIs in their homes.

They all had to pass a computer competency test (after several hours of free training) before being allowed to take the machines home.

Burt Rutan . . "a unique project"

High-flying Apples

LIKE most newcomers to computing, light aircraft designer Burt Rutan bought his first Apple to handle his firm's mailing list. But he soon found it could do much more than just print labels.

Now he has a squadron of them at his HQ in California's Mojave Desert, creating intricate engineering drawings for the planes which he exports to 40 different countries.

He uses nine Apple IIs, each with monitor, two disc drives and printer, plus an Apple Graphics Tablet.

The success he has achieved with his hard-working Apples has led him into a unique project which he says will revolutionise the testing of new aircraft.

He has started producing low-cost, scaled down versions of commercial and military planes which are then put through their paces by test pilots – bypassing conventional wind tunnel tests.

Said Rutan's chief programmer-analyst, Pat Storch: "We've surprised a lot of people. They didn't believe we could design, build and flight-test models for less than the cost of a wind tunnel.

"Testing this way gives us accurate flight data, as well as qualitative data from the pilots that you cannot get from a tunnel."

Running Wildcard

A NEW copy program on the market is living up to its name and literally running wild in terms of sales performances.

Elite Software manufacture the Wildcard package at plants in the UK and the USA (selling it for £99 and $149 respectively) and claim that they can't produce it fast enough.

"We launched it at the Minneapolis Fair last October and sold 300 there," said Mike Hardwick of Elite. "Then at the San Franscisco Apple Fair we sold them at the rate of 300 a day over four days – and in the US we can't keep up with demand.

even though we are manufacturing them at 300 a day.

"We expect to sell tens of thousands of the packages."

He said his company is selling 15 cards a day in Britain. "People aren't buying them for piracy reasons," he told *Windfall.* "They get them primarily because they want to make backups of protected software.

"They are also fed up with having to cope with the various parameters inherent in other copy programs."

Too hot to handle

THE trusty Apple II has always been a victim of the chicken and the egg syndrome.

"It has sold so well because of the extraordinary volume of software available for it," is one line of thought.

"It is such a good machine – and that is why there is so much software written for it," is another way of looking at it.

Both are true.

Which makes a letter published in the January issue of *Personal Computing Today* seem rather strange. It said: "I recently bought an Apple II ... so far I have not come across any good (in fact, hardly any at all) games and educational programs. Could you please offer me a helping hand by adding a software list for the Apple II."

Even stranger was the editor's reply: "We did look at including the Apple computer in our software checklist, along with the Pet. But after seeing the length to which the provisional checklist ran it was decided to drop it in favour of a greater amount of software for a variety of other machines."

We are not sure from that whether PCT felt there was too much or too little Apple software – but thanks anyway for recommending *Windfall* as a solution to the reader's problem.

The other heavy mob

A SMILE for the New Year from Stephen Kear writing in *Accountancy* magazine, who noted that the micro computer industry now ranks alongside crime as Britain's major growth industry.

Now all we need is for someone to produce figures relating to the growth of crime within the micro industry. Statistically that could be a winning combination.

Meanwhile, in the Silicon Valley heartland Apple Inc is reaping an unexpected benefit from the theft of 200 Apple IIIs.

A Cupertino judge has ordered the man identified as the mastermind behind the theft to lecture Apple security officials and employees on how to prevent further thefts of the firm's products.

The man, a former dispatcher for Apple, was sentenced to a year in prison, three years probation and 100 hours of community service work. He was also told to warn his former Apple colleagues about what could happen if they get involved in high technology theft.

The judge noted: "You can get a little wine out of vinegar sometimes."

Academic approach

NEVER mind unusual applications for Apples, we have discovered an unusual use for *Windfalls.*

A lecturer from the University of Manchester Institute of Science and Technology visited Estonia recently and was amazed to discover a copy of *Windfall* in a science laboratory there.

The eastern bloc academics told him they had heard of Apples, and Basic and used *Windfall* to help their students learn English and familiarise themselves with English computer terminology and usage.

Cash in on a modem

HOW would you like to use your Apple to operate your bank account? Lots of Apple users in New York will be doing just that later this year as part of a novel development in electronic banking.

The pioneering Chemical Bank of New York – sixth largest bank in the world – has been conducting a pilot scheme with 3,000 customers who own Ataris. They need a $200 modem and pay a user fee of up to $10 a month.

For this they can link by phone to Chemical's computer centre in New York and pay bills directly to 250 shops that have joined the scheme so far.

This year the network will spread to include those bank customers who also own an Apple, Xerox or IBM Personal Computer.

Plea to professionals

A PLEA for professional data processing people to become involved in the influx of micros into the business environment was made recently by Dave King of Apple UK.

"We are moving very fast into a DP environment – that is where our future lies," he said.

"The Apple isn't a typewriter and to be incorporated efficiently into a business environment it needs someone qualified in software and hardware."

King said that two and a half years ago micros were criticised as being toys. Apples in particular had outgrown that tag, he said. While mainframes tended to benefit the organisation and not the individual, Apples were able to bring the power of the computer to individual business people.

"We complement what is offered by the professional mainframe DP department – we would never hope to compete with them. But the tragedy is that the DP fraternity didn't actually exercise control over the growth of micros in the early days.

"Users need advice and they do get that from the dealer network. However our future lies in the DP department because they have the qualifications to provide effective co-ordination of micro software and hardware."

King was speaking at a one day seminar for businessmen and computer professionals in Leeds, part of a week-long Apple UK roadshow which visited major cities in England and Scotland.

Referring to Apple's new products, due to be released this year, King said that Apple invented the micro industry and will continue to maintain its position as the industry leader.

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Data Star (CP/M) (powerful data entry)	122.00	140.30
D.B. Master (version 3.02)	109.00	125.35
D.B. Master statistics	58.00	66.70
D.B. Master utilities (links with visi's)	58.00	66.70
Desk Top Plan II	110.00	126.50
Graphmagic (bar graphs, pie charts, etc)	52.00	59.80
Mathemagic	52.00	59.80
Multiplan (microsofts superior spreadsheet)	155.00	178.25
PFS Filing system (new improved)	68.00	78.20
PFS Graph	68.00	78.20
PFS Report	53.00	60.95
Supersort (CP/M)	85.00	97.75
The General manager	68.00	78.20
Versaform (form generator in Pascal)	192.00	220.80
Visi + (Visicalc consolidation)	19.45	22.37
Visicalc	105.00	120.75
Visicalc expander (use with 32K/128K cards)	53.00	60.95
Visicalc utilities	34.00	39.10
Visidex	122.00	140.30
Visifile	115.95	133.34
Visiplot	93.00	106.95
Visischedule	144.00	165.60
Visitrend/plot	142.00	163.30
WORD PROCESSING		
Applewriter II	72.00	82.80
Executive Secretary	145.00	166.75
Executive Speller	45.00	51.75
Format 80	195.00	224.25
List Handler	69.00	79.35
Pie Writer (40/80 columns)	85.00	97.75
Sensible Speller (New fast proof reader)	69.00	79.35
Sensible Speller (CP/M)	69.00	79.35
Screenwriter II (70 col w/out 80 col card)	75.00	86.26
SuperText (40/80 columns)	109.00	125.35
Wordstar 3.01 (CP/M) (enhanced features)	135.00	155.25
Word Handler	105.00	120.75
Zardax (40/80 & inc. form letter)	125.00	143.75
PRINTERS		
Epson MX80T-3 (up to 132 col & hi-res)	305.00	350.75
Epson MX80FT-3 (as above & friction drive)	339.00	389.85
Epson MX82FT (very hi-res graphics)	359.00	412.85
Epson MX100FT-3 (100 cps & wide carriage	429.00	493.35
Mannesman Tally MT 120 (160 cps)	365.00	419.75
Nec 8023 (100 cps & prop. spacing)	299.00	343.85
Silentype & interface	159.00	182.85
Smith Corona TP-I (daisy wheel printer)	429.00	493.35
Tec 1500-25 (25 cps daisy wheel)	499.00	573.85
PRINTER INTERFACE CARDS		
Aristocard Parallel	69.00	79.35
Aristocard Serial	75.00	86.25
CPS Multifunction Card (inc real time clock)	119.00	136.85
Digitek Printmaster (BASIC/CPM/PASCAL)	69.00	79.35
Digitek Printmaster III with memory mang	159.00	182.85
Grappler + (Epson/Anadex/Cent/Nec)	98.00	112.70
IPB-16K (Buffer & Serial + par card)	125.00	143.75
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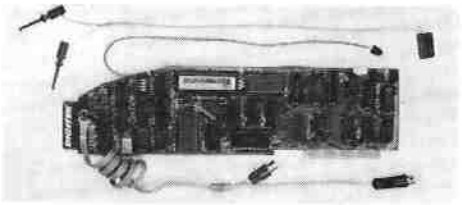

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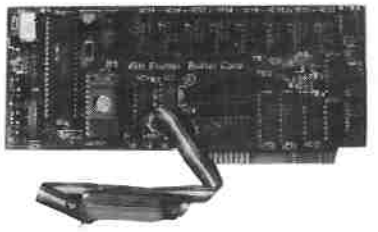

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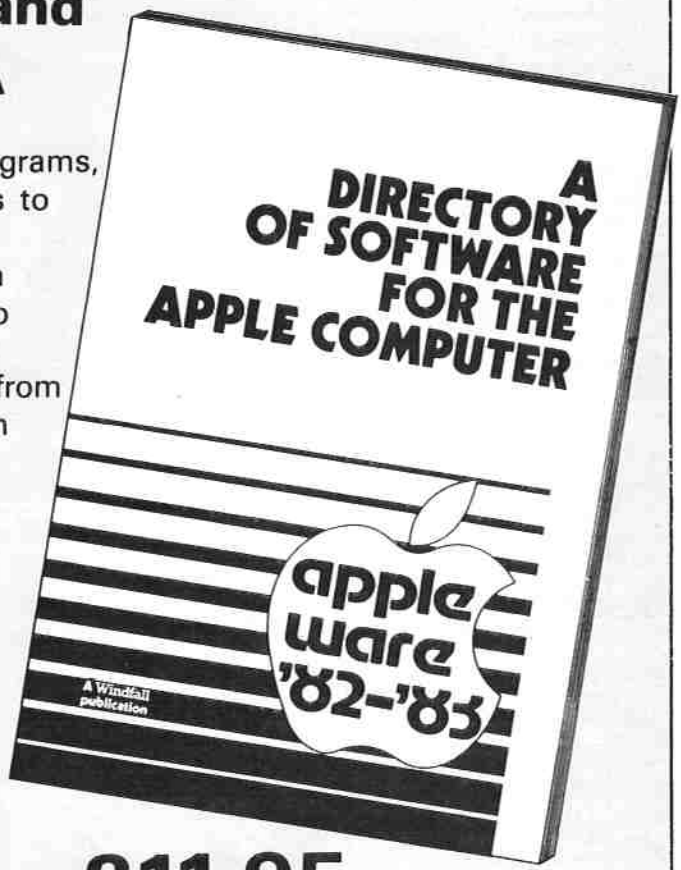

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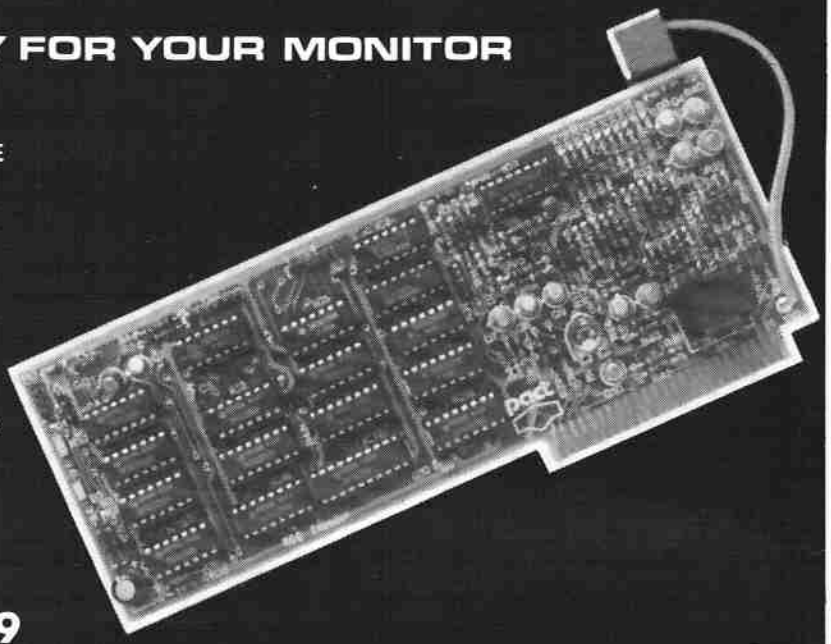

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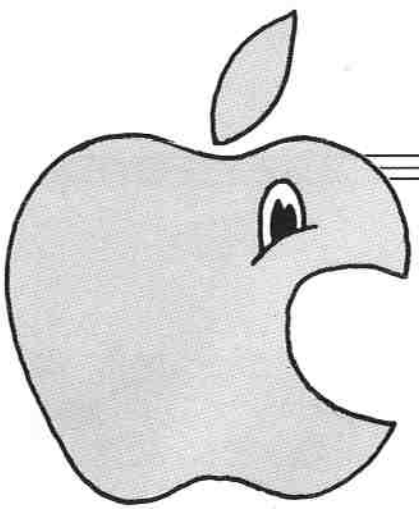

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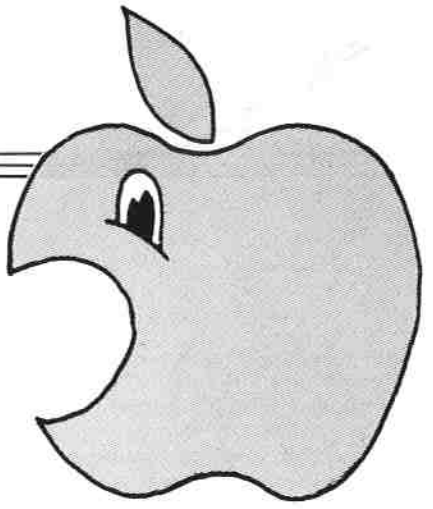

. . . the *Windfall* platform for anyone wishing to agree with, improve, disprove or generally discuss specific articles in Windfall. Write to: Think Tank, Windfall, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

So who's bugging Humpty Dumpty?

CONTINUING the "non-running" saga I started recently, writes **Andrew Oldacre,** you will be pleased to hear (won't you?) that in the Humpty Dumpty program by Max Parrott on Page 42 of the December issue of Windfall another example resides!

I checked several times my typing in of the listing and found all to be OK but on RUNning it I found that after the first brick fell from the wall the little man vanished and the programme "hung".

Investigation showed that the checksum did not agree with that printed (180 less) and that the number of data items was one too many (over the amount required to be "read"). Any suggestions?

In passing, I just know that you will be pleased to hear that in the same issue of Windfall Scram by Michael Hambly exhibits some strange goings on now and again. Just occasionally a "ferocious blob" eats up part of the wall and sometimes pops out of a wall most unexpectedly after the run has started.

I can see no obvious error in the program, in fact it is a very good one. Mr Hambly is to be congratulated. Incidentally, the two "flat" notes in the rendition of "Greensleeves" can be corrected by substituting the value 150 for the LAST occurrence of the value 156 in the two lines numbered 40240 and 40250. Greetings to all at Windfall and thanks for such a good publication.

Max Parrott replies: You ask for suggestions about the 'non-running' Humpty Dumpty program. My first is that no matter how carefully you have checked your listing, check it again! You do have a typing error!

The program listing on page 42 is correct. It was printed directly from a working version of the program by an Epson.

Here, unfortunately, is one possible problem; the Ø's appear very similar to the O's. The symbols in lines 410, 430, 450, 470 are zeros, those in other lines are O's (lines 20, 60, 70, 80, 110, 120, 130, 220, 440).

However, I do not think that this is where the typing error lies because it seems as if Humpty, the man, and the bricks are correctly drawn and you do not mention any sounds emanating from the Apple.

The number of DATA items and the checksum provided are correct on the printed page so it seems to me that the program is hanging when the routine at 770 (line 150) is CALLed because there is an incorrect instruction there.

Please carefully check line 600. You say that the checksum is 180 less than the given number of 13728, which suggests to me that somewhere you have typed a full stop instead of a comma, missed a comma out completely or reversed two or more items in the DATA list.

If line 600 is correct work backwards looking for a full stop or space or item reversal. Because the checksum is 180 down on the right value I think that you may well have done this more than once. If you cannot find such an error please go into the monitor (CALL-151) and type 302L. You should see the following:

```
302-  AD 30 C0   LDA $C030
305-  88         DEY
306-  D0 05      BNE $030D
308-  CE 01 03-  DEC $0301
30B-  F0 09      BEQ $0316
30D-  CA         DEX
30E-  D0 F5      BNE $0305
310-  AE 00 03   LDX $0300
313-  4C 02 03   JMP $0302
316-  60         RTS
```

The rest of the screen could be filled with anything. If this routine is correct in your version then I don't know where you have gone wrong.

I would have sent you a tape with the program on it but unfortunately you didn't put your address on your letter. If you care to write in with it I will post it to you straight away.

I have played Scram a little but have never noted a blob popping out of the wall unexpectedly, nor eating it. Perhaps you have played it much more than I – or perhaps there is another typing error.

Praise from Brussels

CONGRATULATIONS to Paul Smith for his article about the Apple II DOS and Apple Pascal operating systems, writes **J. Drabbe,** of Brussels. Line 12 (on the right) of the Procedure Print directory (Windfall, March 1982 – page 32):

If (Track <>Ø) and (Sector <>Ø)

seems to be too restrictive. I suggest it should be replaced by

If (Track <>Ø)

Bubble from Budapest

I HAVE found the bubble sort routine published in the January issue of Windfall very useful, writes **Laszlo Koranyi,** from Budapest. We have used it a lot and found that the DIM(<=255) constraint can be a serious limit to its use. Hereby I enclose a listing of a modified bubble sort which is identical to the original one except that it doesn't have this constraint.

It should be used in the same manner, ie, the (string) array is assumed to be the

first one in the program, because no check is made for its name. It can be dimensioned to any number of elements (within the limits of the memory).

I hope this modification will be useful for other *Windfall* readers as well.

- Line 032E refers to the decrement number of bytes and lines 033F and 03BA are double byte decrements.

```
0347 AA          03C3 AB          6B ARYPTR        03DC CHKFLG
0380 CHKSTR      0382 COMPARE     0355 CONTIL      03CB CONTIM
03B7 DECPTR      03E3 END         E3 FLAG          0320 GETNUM
033C ILOOP       03E8 JCOUNT      036F JLOOP         85 JPTR
0371 LOOP        03D9 NODEC       03E6 NUMSTR      03E4 PENULT
038C SAME          FA STRPTR1       FD STRPTR2     0396 SWAP
```

```
      85 JPTR          E3 FLAG          FA STRPTR1       6B ARYPTR
  FD STRPTR2     0320 GETNUM      033C ILOOP       0347 AA
0355 CONTIL      036F JLOOP       0371 LOOP        0380 CHKSTR
0382 COMPARE     038C SAME        0396 SWAP        03B7 DECPTR
03C3 AB          03CB CONTIM      03D9 NODEC       03DC CHKFLG
03E3 END         03E4 PENULT      03E6 NUMSTR      03E8 JCOUNT
```

```
0000              1 ************************
0000              2 *    BUBBLE SORT MGG     *
0000              3 *       14/06/81         *
0000              4 * MODIFIED BY L KORANYI *
0000              5 *       22/10/1982       *
0000              6 *                        *
0000              7 ************************
0000              8 *
----- NEXT OBJECT FILE NAME IS SORTLONG.OBJ
0300              9          ORG  $300
006B             10 ARYPTR   EQU  $6B
0085             11 JPTR     EQU  $85
00E3             12 FLAG     EQU  $E3
00FA             13 STRPTR1  EQU  $FA
00FD             14 STRPTR2  EQU  $FD
0300             15 *
0300 A0 02       16          LDY  #$02
0302 18          17          CLC
0303 B1 6B       18          LDA  (ARYPTR),Y
0305 65 6B       19          ADC  ARYPTR
0307 8D E4 03    20          STA  PENULT
030A C8          21          INY
030B B1 6B       22          LDA  (ARYPTR),Y
030D 65 6C       23          ADC  ARYPTR+1
030F 8D E5 03    24          STA  PENULT+1
0312 38          25          SEC
0313 AD E4 03    26          LDA  PENULT
0316 E9 06       27          SBC  #$06
0318 8D E4 03    28          STA  PENULT
031B B0 03       29          BCS  GETNUM
031D CE E5 03    30          DEC  PENULT+1
0320 C8          31 GETNUM   INY
0321 C8          32          INY
0322 C8          33          INY
0323 B1 6B       34          LDA  (ARYPTR),Y
0325 8D E6 03    35          STA  NUMSTR
0328 88          36          DEY
0329 B1 6B       37          LDA  (ARYPTR),Y
032B 8D E7 03    38          STA  NUMSTR+1
032E 38          39          SEC
032F AD E6 03    40          LDA  NUMSTR
0332 E9 01       41          SBC  #$01
0334 8D E6 03    42          STA  NUMSTR
0337 B0 03       43          BCS  ILOOP
0339 CE E7 03    44          DEC  NUMSTR+1
033C AD E6 03    45 ILOOP    LDA  NUMSTR
033F F0 06       46          BEQ  AA
0341 CE E6 03    47          DEC  NUMSTR
0344 4C 55 03    48          JMP  CONTIL
0347 CE E6 03    49 AA       DEC  NUMSTR
034A CE E7 03    50          DEC  NUMSTR+1
034D AD E7 03    51          LDA  NUMSTR+1
0350 10 03       52          BPL  CONTIL
0352 4C E3 03    53          JMP  END
0355 AD E4 03    54 CONTIL   LDA  NUMSTR
0358 8D E8 03    55          STA  JCOUNT
035B AD E7 03    56          LDA  NUMSTR+1
035E 8D E9 03    57          STA  JCOUNT+1
0361 AD E4 03    58          LDA  PENULT
0364 85 85       59          STA  JPTR
0366 AD E5 03    60          LDA  PENULT+1
0369 85 86       61          STA  JPTR+1
036B A9 00       62          LDA  #$00
036D 85 E3       63          STA  FLAG
036F A0 05       64 JLOOP    LDY  #$05
0371 B1 85       65 LOOP     LDA  (JPTR),Y
0373 99 FA 00    66          STA  STRPTR1,Y
0376 88          67          DEY
0377 10 F8       68          BPL  LOOP
0379 AA          69          TAX
037A E4 FD       70          CPX  STRPTR2
037C 90 02       71          BCC  CHKSTR
037E A6 FD       72          LDX  STRPTR2
0380 A0 00       73 CHKSTR   LDY  #$00
0382 B1 FB       74 COMPARE  LDA  (STRPTR1+1),Y
0384 D1 FE       75          CMP  (STRPTR2+1),Y
0386 90 2F       76          BCC  DECPTR
0388 F0 02       77          BEQ  SAME
038A B0 0A       78          BCS  SWAP
038C C8          79 SAME     INY
038D CA          80          DEX
038E D0 F2       81          BNE  COMPARE
0390 A5 FD       82          LDA  STRPTR2
0392 C5 FA       83          CMP  STRPTR1
0394 B0 21       84          BCS  DECPTR
0396 A0 05       85 SWAP     LDY  #$05
0398 85 E3       86          STA  FLAG
039A A5 FC       87          LDA  STRPTR1+2
039C 91 85       88          STA  (JPTR),Y
039E 88          89          DEY
039F A5 FB       90          LDA  STRPTR1+1
03A1 91 85       91          STA  (JPTR),Y
03A3 88          92          DEY
03A4 A5 FA       93          LDA  STRPTR1
03A6 91 85       94          STA  (JPTR),Y
03A8 88          95          DEY
03A9 A5 FF       96          LDA  STRPTR2+2
03AB 91 85       97          STA  (JPTR),Y
03AD 88          98          DEY
03AE A5 FE       99          LDA  STRPTR2+1
03B0 91 85      100          STA  (JPTR),Y
03B2 88         101          DEY
03B3 A5 FD      102          LDA  STRPTR2
03B5 91 85      103          STA  (JPTR),Y
03B7 AD E9 03   104 DECPTR   LDA  JCOUNT+1
03BA D0 07      105          BNE  AB
03BC AD E8 03   106          LDA  JCOUNT
03BF F0 1B      107          BEQ  CHKFLG
03C1 D0 08      108          BNE  CONTIM
03C3 AD E8 03   109 AB       LDA  JCOUNT
03C6 D0 03      110          BNE  CONTIM
03C8 CE E9 03   111          DEC  JCOUNT+1
03CB CE E8 03   112 CONTIM   DEC  JCOUNT
03CE 38         113          SEC
03CF A5 85      114          LDA  JPTR
03D1 E9 03      115          SBC  #$03
03D3 85 85      116          STA  JPTR
03D5 B0 02      117          BCS  NODEC
03D7 C6 86      118          DEC  JPTR+1
03D9 18         119 NODEC    CLC
03DA 90 93      120          BCC  JLOOP
03DC A5 E3      121 CHKFLG   LDA  FLAG
03DE F0 03      122          BEQ  END
03E0 4C 3C 03   123          JMP  ILOOP
03E3 60         124 END      RTS
03E4            125 *
03E4            126 * DOUBLE BYTE REGISTERS
03E4            127 *
03E4            128 *
03E4            129 PENULT   DS   2
03E6            130 NUMSTR   DS   2
03E8            131 JCOUNT   DS   2

*** SUCCESSFUL ASSEMBLY  NO ERRORS
```

```
*300.3E3

0300- A0 02 18 B1 6B 65 6B 8D
0308- E4 03 C8 B1 6B 65 6C 8D
0310- E5 03 38 AD E4 03 E9 06
0318- 8D E4 03 B0 03 CE E5 03
0320- C8 C8 C8 B1 6B 8D E6 03
0328- 88 B1 6B 8D E7 03 38 AD
0330- E6 03 E9 01 8D E6 03 B0
0338- 03 CE E7 03 AD E6 03 F0
0340- 06 CE E6 03 4C 55 03 CE
0348- E6 03 CE E7 03 AD E7 03
0350- 10 03 4C E3 03 AD E6 03
0358- 8D E8 03 AD E7 03 8D E9
0360- 03 AD E4 03 85 85 AD E5
0368- 03 85 86 A9 00 85 E3 A0
0370- 05 B1 85 99 FA 00 88 10
0378- F8 AA E4 FD 90 02 A6 FD
0380- A0 00 B1 FB D1 FE 90 2F
0388- F0 02 B0 0A C8 CA D0 F2
0390- A5 FD C5 FA B0 21 A0 05
0398- 85 E3 A5 FC 91 85 88 A5
03A0- FB 91 85 88 A5 FA 91 85
03A8- 88 A5 FF 91 85 88 A5 FE
03B0- 91 85 88 A5 FD 91 85 AD
03B8- E9 03 D0 07 AD E8 03 F0
03C0- 1B D0 08 AD E8 03 D0 03
03C8- CE E9 03 CE E8 03 38 A5
03D0- 85 E9 03 85 85 B0 02 C6
03D8- 86 18 90 93 A5 E3 F0 03
03E0- 4C 3C 03 60
```

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"The SCRABBLE program was written by Peter Turcan of Turcan Research Systems Ltd., as part of a PhD research study into word structures and their analysis through 1979-1982".

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This series by SEAN OVEREND takes the lid off assembly language and machine code programming, by describing the purpose and structure of a sophisticated assembler written in Basic.

The assembly process in action

GIVEN the source code, the task of the assembler is firstly to ascertain where in memory the programmer wants the machine code to reside, and then to translate the source code into its byte by byte equivalent.

This may sound simple but the occurrence in operands of symbolic labels before their numeric definitions may make it necessary for the assembler to pass twice through the source code before the task can be completed.

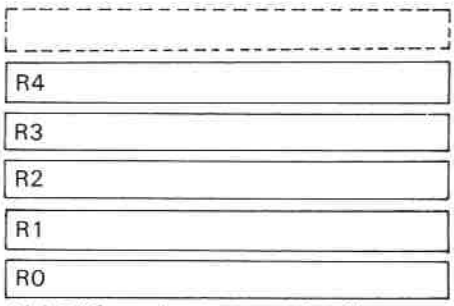
Look at listing 1. Although lines 10 and 20 present no difficulty to the assembler on the first pass, line 30 cannot be fully translated first time round, as SUB1 is not yet defined. It is not until line 60 is reached that it is possible to work out the numeric address of SUB1.

The convention adopted in the author's assembler is that the occurrence of an EQU starts the machine code program. Subsequent EQUs override the last, and a fresh base is then assumed.

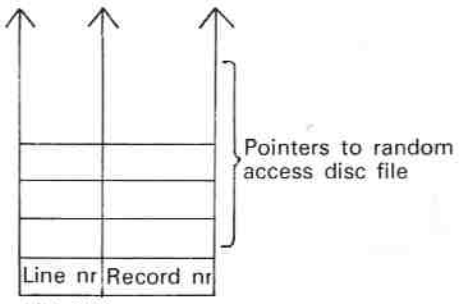
The program thus starts at $302, as defined in line 20, and so the first byte of the machine code program is placed in $0302 – see the assembled hardcopy in listing 2, line 30. Line 30 is translated into three bytes of object code (20 nn nn – where "nn" is yet unknown).

Lines 40 and 50 are 1 byte each (EA EA) making the beginning of line 60, which is assigned to SUB1, $0302 + 5 = $0307.

On the second pass through the source code the assembler will be able to substitute the address $0307 for SUB1 where it appears as the operand of line 30, remembering that the address will be Lo-byte, hi-byte in the object code. It is in the second pass through the source code that tidying-up of this nature is performed.



1(a) RA$ random access disc file



1(b) IX% array

Fundamental structure

From the point of view of assembler design, one must decide how to store the source code and its translation, in both intermediate and final form, bearing in mind that some degree of permanence is essential. A solution is a random access disc file, each record of which contains all the relevant information for one line of source code and its related object code – see fig 1(a).

As the assembly process continues, so each record of the file is progressively completed with the information available at the given time.

In order to give total flexibility for the input and edit facilities, an internal table is kept in RAM of the number of each record in the disc file and of the source code line number to which it refers. This table is

Listing 1

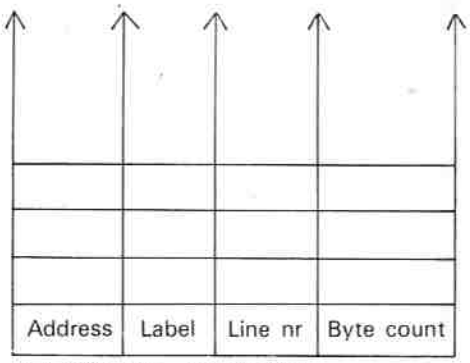
```
10    TEST  EQU   $300       DIRECT LABEL ADDRESS ASSIGNMENT
20    START EQU   $302       DITTO - USED TO LOCATE BASE OF MACHINE CODE PROGRAM - CF THE 'ORG' COMMAND
30          JSR   SUB1       SUB1 IS NOT YET DEFINED - ADDRESS COLLECTED ON SECOND PASS OF ASSEMBLER
40          NOP
50          NOP
60    SUB1  LDA   TEST       TEST IS ALREADY DEFINED IN LINE 10
70          CLC
80          ADC   £$5
90          RTS
```

Listing 2

```
10    0300            TEST  EQU $300          DIRECT LABEL ADDRESS ASSIGNMENT
20    0302            START EQU $302          DITTO - USED TO LOCATE BASE OF MACHINE CODE PROGRAM - CF THE 'ORG' COMMAND
30    0302  20 07 03       JSR SUB1          SUB1 IS NOT YET DEFINED - ADDRESS COLLECTED ON SECOND PASS OF ASSEMBLER
40    0305  EA             NOP
50    0306  EA             NOP
60    0307  AD 00 03  SUB1  LDA TEST          TEST IS ALREADY DEFINED IN LINE 10
70    030A  18             CLC
80    030B  69 05          ADC £$5
90    030D  60             RTS

0   030E
1 0300 TEST 10 0300
2 0302 START 20 0307
3 0307 SUB1 60 030E

TOTAL BYTES 12
```



1(c) LA% array (worktable)

ASSEMBLER LANGUAGE III

constantly sorted into line number order as fresh lines of source code are entered. Figure 1(b) shows this table (the IX% array).

In this manner the disc file records can subsequently be accessed in the correct order during the assembly passes and the sequential listing of source code on either screen or printer is possible.

A further working table is also required to associate each defined label with its numeric address. In order to do this, the table has to have additional entries for each label, its source code line number and the total number of bytes between it and the previous labelled byte.

In the case of an EQU label, its numeric address can be inserted immediately. In all other cases the byte count since the last labelled byte has to be calculated and added to the address of the previous label. This table is shown in figure 1(c) – the LA$ array – and is also sorted into line number order at the conclusion of entry of every labelled line of source code.

The LA$ array is completed in one full pass through the source code, and all final translations occur in the second pass. The information in the table makes the calculation of operands in "relative addressing mode" particularly easy (more on this later in the series).

The two arrays IX% and LA$ can be stored in a further disc file at the end of a session and recreated when required.

Input/editing

My screen lay-out, fig 2, is based on the principle that the combination of keyboard and screen can be used to advantage in an interactive manner. The screen cursor is under total software control and skips from the end of one field to the beginning of the next, when the RETURN key is pressed, blanking out all unwanted characters (such as the "?" left by the INPUT command.)

As each new field is encountered, the bottom of the screen displays the commands available for that field. Screen scrolling is limited to the working area.

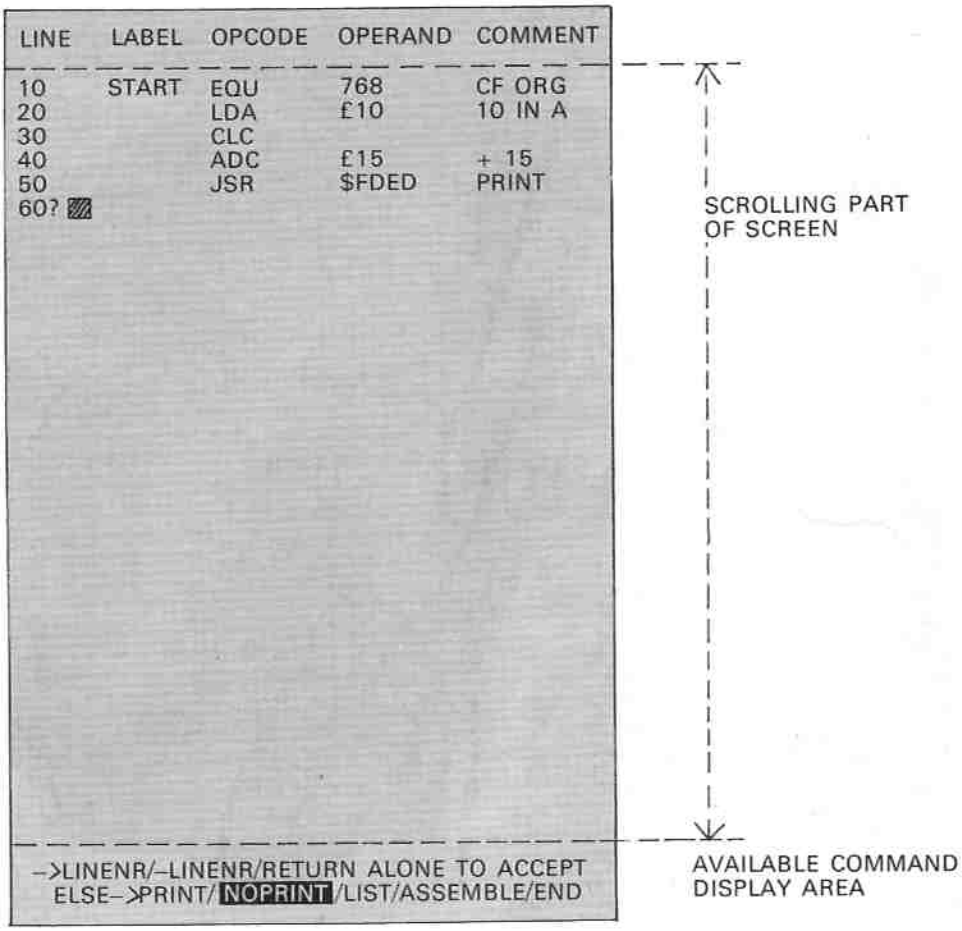
Initial syntax checking

It is important that the assembly language programmer does not leave it to the end of a complete assembly run to discover that he has made a simple error while inputting the source code.

The assembly run takes time and nothing is more frustrating than to be told at the end that an error has been detected, which on inspection turns out to be a simple typing slip.

Many errors can and should be detected by the input software when source code is being entered. The sort of "syntax checking" of source code that can be built in to an assembler at entry time includes:

Labels – duplication, or simple invalidity, such as length.



Opcodes – invalidity, e.g. STZ instead of STY.

Operands – incorrect addressing mode format, or selection of an addressing mode that is not available for the particular assembly language opcode.

Information displays

It also does not help the programmer to discover after assembly that the assembler has selected a machine code opcode that requires a two byte addressing operand, when one (i.e. a "zero-page", address) would have done the job more efficiently.

The author's assembler caters for this firstly by having an optional display of the selected machine code opcode, together with the total bytes for each line, and secondly, by providing a facility to force the assembler to choose a zero-page addressing mode in a situation when it is not obvious on the first pass (achieved by preceding the source code opcode with a "Z"). Where a zero-page address has been previously defined, the "Z" is not required.

Another feature is an optional display of the effect of the current opcode on the status flags of the 6502.

Editing

Individual assemblers use different methods for editing source code. Mine is to provide an automatic line number increment of 10, which can be overridden to interleave or replace lines already created.

Deletion is achieved by typing a negative line number in the line number field. A current line can also be edited, field by field, using a special character "", which backspaces to the previous field and allows overtyping of the previous entry.

The assembled output usually can take two forms. The hard copy is of the type shown in listing 2 – and another disc file containing only the machine-code and the numeric addressing information (the M/C FILE) can also be generated. This disc file is subsequently used with a short loading program to load the code into memory.

● Next month's article gives a further illustration of the assembly process with particular reference to some aspects of the Basic program and to some uses of the assembler itself.

Spread out those lists

It has often irritated me that when printing catalog lists of disc files the titles are all along one side of the paper, wasting over three-quarters of it, and requiring an excessive amount of paper padding out the filing cabinet.

For those with Digitek's Printmaster card and the IDS 440 (and other Paper Tigers no doubt) the listing alongside will enable up to four columnations of listings on 80 character paper – 9½in wide. Other printers driven by this card may require different **CTRL** characters to set print size, line 90.

A word of warning: Should any files have **CTRL A** in their title the 440 will leap into enhanced mode and columnation will be scrolled round the page, probably printing on top of a different list.

Peter Broome

```
10  HOME
20  VTAB 10: HTAB 10: PRINT "DISK CATALOG LISTINGS"
30  PRINT : PRINT : PRINT "WHICH PRINTER SLOT ?": GET PS
40  PRINT : PRINT "INSERT DISK & PRESS RTN": GET R$
50  PRINT "IS THE PAPER ALIGNED ?": GET R$
60  PRINT "WHAT LEFT MARGIN ? (NO.OF SPACES)": INPUT M
70  INPUT "WHAT DISK TITLE ?";DT$
80  PRINT  CHR$ (4);"PR#";PS: REM  PRINTER CONTROL FROM WITHIN DOS
90  PRINT  CHR$ (31)
91  REM  SETS THE IDS 440 TO SMALLEST CHARACTERS
100  PRINT  CHR$ (9);M;"L"; CHR$ (24): REM  SETS PRINTMASTER CARD TO GIVE LEFT
MARGIN
110  PRINT DT$
120 D$ =  CHR$ (4)
130  PRINT D$;"CATALOG"
140  PRINT D$;"PR#0": REM  RETURNS MESSAGES TO SCREEN ONLY
150  PRINT : PRINT "ANY MORE ? Y/N": GET R$: IF R$ = "Y" THEN 40
160  PRINT : PRINT "FINISHED"
```

```
3.3 DOS TOOLKIT          3.3 DOS TOOLKIT          3.3 DOS TOOLKIT

DISK VOLUME 002          DISK VOLUME 002          DISK VOLUME 002

*A 014 HELLO             *A 014 HELLO             *A 014 HELLO
*A 003 EDASM             *A 003 EDASM             *A 003 EDASM
*I 003 INTEDASM          *I 003 INTEDASM          *I 003 INTEDASM
*B 008 EDASM.OBJ         *B 008 EDASM.OBJ         *B 008 EDASM.OBJ
*B 036 ASSM              *B 036 ASSM              *B 036 ASSM
*B 016 EDITOR            *B 016 EDITOR            *B 016 EDITOR
*B 002 ASMIDSTAMP        *B 002 ASMIDSTAMP        *B 002 ASMIDSTAMP
*B 005 RLOAD             *B 005 RLOAD             *B 005 RLOAD
*B 003 RBOOT             *B 003 RBOOT             *B 003 RBOOT
*R 019 APA               *R 019 APA               *R 019 APA
*A 003 LOADAPA           *A 003 LOADAPA           *A 003 LOADAPA
*R 012 HRCG              *R 012 HRCG              *R 012 HRCG
*A 004 LOADHRCG          *A 004 LOADHRCG
```

Neat syntax sifter

Here is a short routine that could save you much time and frustration when trying to remove syntax errors from a new Applesoft program. Just append this routine to your program, set the first line in the program to perform an **ONERR GOTO 63000**, and that's it.

Every time a syntax error is encountered the routine takes over and automatically lists the offending line. In case the syntax error is in a **PRINT** statement, the window width is reduced to 33 characters **(POKE 33,33)**, thus removing the possibility of adding extra spaces to the statement, and reset on exit.

Be sure that you type the lines 63080-63120 exactly as shown, otherwise you can corrupt the program, with unpredictable consequences.

R. Phillips

```
63000 Y =  PEEK (222)
63010  IF Y <  > 16 THEN  END
63020 X =  PEEK (218) +  PEEK (21
    9) * 256
63030 X$ =  STR$ (X)
63040  IF  LEN (X$) < 5 THEN X$ =
    "0" + X$: GOTO 63040
63050  TEXT : HOME
63060  POKE 33,33
63070  VTAB 12: PRINT "?SYNTAX ER
    ROR IN ";X; CHR$ (7)
63080 CURR =  PEEK (121) +  PEEK
    (122) * 256
63090  FOR I = 1 TO 5
63100  POKE CURR + 78 + I, ASC ( MID$
    (X$,I,1))
63110  NEXT I
63120  LIST 00000: END
```

Here are two modifications to the Apple Toolkit EDASM package that I have found very useful.

First to the **EDASM.OBJ** file. Change the command at **$C2A** from **LDA $5F8** to **LDA $B7E9**.

This makes the package run from the slot that originally called it, rather than the boot slot. This allows me to run the package from a RAM128 pseudo-disc, giving much faster assembling and loading of 'multiple-file' programs.

Secondly to the EDITOR file. Change the command at **$1B29** from **JSR $FD1B** to **JSR $XXXX** where **XXXX** is the address of a **KEYIN**-type routine. I use this to jump to a modified monitor which allows me to enter lowercase comments immediately into a source file (only, however, in the **EDIT-LINE** mode).

For saving the two files after modification, the parameters are:-

EDASM.OBJ,A$C00,L$66C
EDITOR,A$11FF,L$E01

J.P. Lewis

Appletips

Loading FID automatically

A GROWING number of Apple users use a 16k RAM card, usually for languages such as Pascal or Integer Basic. The card may also be useful in storing a program "out of sight" until needed, rather like a soft disc.

I tend to swop programs from disc to disc a lot, and therefore use the FID program on the 3.3 Master Disc quite heavily. To avoid repeatedly **BLOAD**ing FID, I have written a M/L routine called by the "&" sign, which automatically loads FID from the language card and runs it.

To set things up, the program "FID routine" must be typed in (it makes a useful boot program) as should the M/L program I have called "Fidpatch". It is typed in through the monitor, and saved by a **"BSAVE FIDPATCH,A$300,150"**.

Your disc should, apart from these two programs, also have a copy of FID.

When run, the Applesoft program loads FID into the language card and **FIDPATCH** into location 768, and sets up the "&" hooks to call it. Anytime after that when FID is needed it will be up and running with a simple "&" from Basic.

Duncan Langford-Allen

```
100  REM  (C) DUNCAN LANGFORD
110  TEXT : HOME : SPEED= 200
120  PRINT "DUNCAN'S FID ROUTINE
125  SPEED= 255:J =  - 16255
130 :
140  REM  WRITE-ENABLE CARD
150 I =  PEEK (J):I =  PEEK (J)
160 :
170  REM  NOW LOAD FID
180 D$ =  CHR$ (4): VTAB 5
190  PRINT "LOADING FID INTO LANG
     UAGE CARD
200  PRINT D$"BLOADFID,A$D000
210 :
220  REM  AND WRITE-PROTECT CARD
230 I =  PEEK (J + 1)
240  PRINT : PRINT "LOADED: NOW L
     OADING FIDPATCH
250 :
260  REM  LOAD THE M/L PATCH
270  PRINT D$"BLOADFIDPATCH
280 :
290  REM  FINALLY, SET UP '&'
300  POKE 1013,76: POKE 1014,0: POKE
     1015,3
310  PRINT : PRINT "DONE.
320  END

*300.331
0300- A9 E2 85 01 A9 00 85 00
0308- A9 1A 85 03 A9 03 85 02
0310- A9 13 85 04 AD 83 C0 A0
0318- 40 B1 00 91 02 88 C0 FF
0320- D0 F7 C6 04 F0 06 C6 01
0328- C6 03 D0 ED AD 82 C0 4C
0330- 03 08
```

Turn for the better

So why does the **SCALE** command in Applesoft rotate the shape defined when drawing concentric squares? A user noted that the first five iterations were OK, then the shape rotated approximately 10 degrees. He did 10 more iterations and it rotated another 10 degrees.

The reason that this happens is tied to the ROT factor. At small scales the only angles that Applesoft can do are 0, 90, 180 and 270 degrees. As the scale increases Applesoft can better approximate the desired angle.

The way to stop the rotation is to put in **ROT=0**

Bugs in Pilot Animation

Bugs have turned up in the Pilot Animation Tools. The system won't boot if there is a Pascal or Pilot-formatted disc in the second drive of the system.

The Maxwell data file on the disc will not work as advertised. He doesn't walk across the screen or wave. The example Maxwell demo in the manual works and can be used to recreate the file as it should be.

When an animation sequence is created it says "Animator file **[file name]** saved.". If the disc is write-protected the file is not saved, although the message is displayed.

Scrabble is the world's most popular word game, involving skill, judgement, knowledge of words and an element of luck. National championships have been organised in several countries and the game has risen to near the level of chess in terms of popularity.

PETER TURCAN, who developed a program for playing Scrabble on the Apple, explains some of the problems he encountered in designing the program and describes the implementation and testing of some of the strategies involved. He also reviews the system and its performance to date. Next month we will be reviewing the commercial end product: Computer Scrabble.

Scrabble on the Apple

THE program consists of two main sections. In the first, the controller handles the human player's moves, the drawing of the board on the VDU screen, the random selection of letters, scoring and all other facilities required to model the game. In the second, the program player selects the computer's move from a given vocabulary.

Unlike other word-games, such as Lexicon, an anagram search using the letters held in hand is of little use unless the words found can be connected to the structure of words on the board. Many words can also be played which use letters already placed on the board. In fact, the only time an anagram search is appropriate is when making the first word, when the board is empty!

Much depends on the structure of words placed; the search system developed considers, in parallel, the information held by the board structure, the programs "rack" of seven letters and the known vocabulary.

The search has the following general capability and will find every move possible given this information:

- A vocabulary of words, of any size, in any language.
- A set of letters held in its rack; any number and any selection.
- Any situation on the board, no matter how complicated.
- Any board size, with any distribution of premium squares.

To make the program independent of the vocabulary size, a window and block-read system was implemented. The window can be of any size that the machine can hold, but typically 256 or 512 words.

The vocabulary is held in separate files, one for each word length, so if there are 2,345 words in the seven letter word file, then four blocks of size 512, followed by one of size 297, are read in.

After each block is read in, it is scanned to find possible plays which can be made. If one found is considered "better" than the best one found so far, then this "better" one is stored as the "best so far". The vocabulary is searched in decreasing order of size under the assumption that a long word would be of more value than a short one.

This was done in case it was necessary, due to time restraints, to stop the search when a word of sufficient value was found. However, in practice the program was sufficiently efficient to search the entire vocabulary (nearly 9,000 words of between two and eight letters) in less than two minutes per move.

Only one word is stored outside of the window (other than those on the board!). Being considered the "best so far", it is stored along with its co-ordinates and score.

The program player used as the basis for future testing and comparison has the following basic strategy (called Player A).

☐ Play the word with the highest score.
☐ If no word can be found, then all seven letters are exchanged with a fresh seven from the pack of remaining letters.

Despite the apparent simplicity of this strategy there are underlying features which make its playing characteristics more complicated than might appear at first sight.

The importance of words which can be extended by a single letter is a major concept in Scrabble. The most common letter used in an extension is S but all allowable extensions are of use. Their value lies in the fact that it is possible to make more than one word in a single move only if words already on the board are extended by one of the letters from the word being placed.

The score for these cross-generated words is added to the score of the placed word; it would seem that the more words that are made, the higher the total score for that move.

The importance of two-letter words in Scrabble (especially obscure ones) is their use when forming a longer word, which needs to make crosswords to fit the prevailing word structure. Fig. 1 shows a striking example of this situation.

It follows from this that words can be formed on the board which were not themselves placed but were entirely or partially cross-generated. As these words lead to high scores their occurrence in the vocabulary significantly affects the performance of the players and the structure on the board.

Fig. 2 shows an example of a very tight game where many crosswords were formed, some up to five letters long. The maximum word length currently held is eight letters, although the program is perfectly capable of finding all words of greater word length up to the maximum of 15 letters.

Consider the word PRELATESS (a female high ranking ecclesiastic!); it could be entirely cross-generated, as the following are all words, being single letter extensions of the preceding one: AT, ATE, LATE, ELATE (puffed up with success), RELATE, PRELATE (a high ranking

Fig 1: The use of single letter extensions. The situation shown occurred between two program players, showing the use of short simple words in "hooking" longer, higher scoring words to the structure. The play proceeded as follows:

Player-1		*Player-2*	
1. ACE	*(10)*	*2. QUELL and LA*	*(28)*
3. ALONG and LAG	*(15)*	*4. WEB and WE*	*(21)*
5. BEET and WEB	*(20)*	*6. AJAR and AT*	*(39)*
7. TAU and QUA	*(21)*		

SCRABBLE

Fig 2: A tight game. With a dictionary containing many obscure two and three letter words, two program players produced the final board structure shown. The words PANTS, FATE, DAK, ONE, JOW and GAD were entirely cross-generated.

ecclesiastic), PRELATES (plural of prelate), and so to PRELATESS! So far, however, the longest recorded entirely cross generated words are of five letters.

Typical extensions made include QUA to QUAD to SQUAD to SQUADS, where the D, S and S respectively are contained in words placed at right angles to QUA. Fig. 2 shows a number of these sequences.

Placing all the seven letters held results in a bonus of 50 points added to the score for that move. These plays are often game winners but are difficult for a human to find. The program, which has no difficulty finding them if one exists in its vocabulary, played one, on average, every two or three games. The record so far is four in the same game.

The main restriction here is the limited number of seven-and eight-letter words known. To place all seven letters, either a seven-letter word must be found and hooked onto the board structure by means of a single letter extension to a placed word, or an eight-letter word can be played using one letter already present on the board.

Fig. 3 shows one of the more spectacular examples of the latter case. The record highest scoring bonus word to date is SQUALID for 110 points.

The ability of Player A was judged on two sources of information.

☐ Observations made while playing human opponents.

☐ A series of 20 games, when the program played both hands, and recording the individual moves, scores and final results.

The program played consistently well and won most games played against interested fellow students. It very rarely "passed", averaged over 20 points per move and often made the board too tight for the human player to see high scoring opportunities. However, it suffered from a few notable shortcomings.

☐ It opened up triple word squares for the opponent (but the program was quick to make use of them if its opponent did not).

☐ It occasionally wasted an S or blank for only one or two extra points when they were better saved.

☐ It was occasionally left with the Q unplayable at the end of the game.

☐ It did not usually finish first, being left with a few unplaced letters.

☐ Although it rarely scored fewer than 10 points in a move, it always made the move rather than the possibly more beneficial choice of exchanging all its letters, especially if it had a rack full of vowels.

The vocabulary held 8,750 words of two to eight letters in length.

As with all measurements and assessments made in experiments involving an element of luck, a sufficiently large sample should be taken to ensure a reasonable degree of confidence in the results. However, there is a vast amount of collectable data from the game Scrabble, each requiring a different size of sample to be confident of the results.

For example, to give an average move score, 20 games (approx. 600 moves) should give an accurate assessment whereas to find the value of selecting the X may require a sample of 100-plus games, or to find the significance of an individual word in the vocabulary may take thousands of games.

The policy adopted was to take a sample large enough to be confident of average scores achieved, but to make what is not more than observations on the significance of strategies, words in the vocabulary, letters held and other interesting but complicated factors which would otherwise require a huge sample of games.

This policy is justifiable as the combination of score analysis and observation can be the basis of the tuning and refinement of the playing strategies.

To implement any strategy within the program, a clear definition of the strategy is needed as well as a method for taking it into account, possibly with relation to other strategies also relevant to a particular play.

For example, a word may waste an S but avoids using a U when the Q is held. Some method of combining the effect of strategies is required; this, combined with any given words score, should give a good indication of its usefulness.

To give values to any strategy, numerical figures must be calculable, as direct comparisons must be made. So for each word found, its usefulness can be assessed by an equation of the form:

VALUE(word) = SCORE + S1 + S2 + S3 . . . + SN

where S1 is the numerical value (positive, negative or zero) for the words usefulness concerning strategy S1. The VALUE is called the PLAY-VALUE (PV) of the word, thus the "best" word can be chosen as the one with the highest PLAY-VALUE found.

The deficiencies in Player A can be roughly divided into three areas – letter control, positioning and the endgame. The following summarises an initial investigation into the theory behind each, and its inclusion in the Scrabble equation.

To save an S or a blank for later use, when it accounts for only one or two points in the current move, a negative value is given for each one used. For example, three points could be deducted from the PV for each S played in a particular word.

PV(word) = SCORE – 3 (number of S's used)

This has the effect of saving the S if another word, scoring a few points less, but not using it has been found.

For example,

PV(STUMP) = SCORE(say, 20) – 3(1) 17
PV(PLUM) = SCORE(say, 18) – 3(0) 18

So PLUM, scoring 18, is played in pre-

From a series of 20 games the following results were obtained:

The average score for a player at the end of the game	= 322.0
The average combined score (both players total) is thus	= 644.0
The average number of moves in a game for the starter	= 15.4
The average number of moves for the second player	= 14.9
The average score for a single move	= 21.3
The highest score for a player at the end of the game	= 404
The highest combined score (both players total)	= 706
The highest individual move score	= 78
The lowest score for a player at the end of a game	= 265
The lowest combined total (both players totals)	= 565
The longest game (in moves)	= 36
The shortest game (in moves)	= 25
The total number of times any player exchanged letters	= 0
The total number of bonus scoring words played (GASOLINE-65, OMITTED-67, NUMERAL-67, STOUTLY-72, ACQUIRES-74, EDGEWAYS-75)	= 6
The average number of triple-word-squares reached	= 5
The average score of words using triple-word squares	= 26.0

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Since Apple brought the power of computing to the desk tops of ordinary people with the Apple II, the world hasn't been the same.

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REVOLUTION.

SCRABBLE

ference to STUMP, scoring 20.

The worst sin of Player A was when holding a Q and a U, to play the U but not include the Q, as a higher scoring word could be made without it. A Q is worth –20 points at the end of the game if it is not played, so it is worth getting rid of! A heavy penalty is therefore imposed if a U is played off in this situation, and a small bonus gained if the Q is played. For example, assume the rack holds: QULAINT

UNLIT scores 23 and QUAINT scores 15.

PV(UNLIT) = 25 – 12 (use of U) = 13

PV(QUAINT) = 15 + 3 (use of Q) = 18

So QUAINT would be played unless another word found scores more than 18 points and it uses neither the U nor the Q.

Positioning is the most complicated of the problems, concerning only the triple word score (TWS) squares in this initial study.

There are three ways of opening up a TWS, defined as follows:

Direct – A word opens up a TWS directly if, by use of one of its letters, a TWS can be reached (e.g. placing a word in column three, starting in row one).

Indirect – A TWS is opened indirectly if a second hook word is required to reach it (e.g. a word placed in column three, row two).

Extension – If a word can be extended, by say ING, onto a TWS, then the TWS has been opened.

There is a considerable problem in working out whether a word does or does not open up a TWS. It depends on a number of factors, including the opening letter or letters, whether the opening is direct, indirect or by extension, and the structure of words around it. For example, a word is harmless, even if it enters say column 1, if there are words already there blocking access to any TWS. In practice, most of the TWS squares were obtained directly so only this case is considered here.

To indicate whether a square can be used to reach a TWS, there are two flags (UP and DOWN, or LEFT and RIGHT) indicating which, if any, TWS squares can be reached directly from it. The flags are set on initialisation and reset on the following conditions:

(a) A letter is placed on the appropriate TWS square

(b) A letter is placed adjacent to this square

(c) A word is placed between this square and the TWS blocking the path to it.

At any one time a square may have 0, 1 or 2 set flags. It follows that a value can be deducted from a word's PV, for each set flag it covers. A value could also be added if a TWS is reached, thus preventing its use by the opponent.

PV(word) = SCORE – 3 (number of TWS flags covered)

PV(word) = SCORE + 3 (for each TWS obtained)

In the closing stages of the game the emphasis changes, from making high scoring words to getting rid of all the letters held. This is to gain the extra points of the opponent's remaining letters. A simple strategy could be to put a small value on each letter placed, and a large value on getting rid of all the letters held when there are none left to refill with (i.e. the game ends). If the pack of remaining letters is empty (or at least nearly empty) then:

(a) Nullify the effect of the previous strategies (except the QU one)

(b) PV(word) = SCORE + 1(number of letters placed) + 10 (if all letters placed)

Fig 3: Bonus scoring words. Placing all seven letters results in a bonus of 50 points. It happened four times in this game; PARODIES (scored 67), RESINATA (62), LAIRIEST (82) and OUTRANGE (70).

In the process of trial and error in refining the devised strategies, more than 100 games were played and observed, both dual program players and with human opponents. One of the most important assessments is, of course, how well the PV system works when two or more special case situations prevail.

When a combination of considerations apply to one given situation, the PV must balance properly to make the right decision. Combining strategies is one of the most difficult situations to deal with successfully in programming games. A variation by just one point to the values given can significantly adjust the playing characteristics of the program. In general, the heuristics which performed best were those in the two clear-cut cases:

- Witholding the U for the Q
- Playing a word which uses all the remaining letters.

In these two cases the alteration to the PV is so dominant as to force its occurrence. The other strategies, although making reasonable decisions in some instances, suffered from some hindering side effects.

The positioning heuristic suffers because of the sheer complexity of deciding whether a word can be used to link to a TWS. It is in the nature of the game for there to be high-scoring areas on the board, where a number of good words can be placed. Sometimes when this area is near one of the edges the program avoids placing one onto the edge but places one within one square of it, which could be extended to a TWS anyway. This implies that a good positioning heuristic would require consideration of the very complex area of indirect openings of TWS squares.

The simple device of adding one for each letter placed in the end game has an undesirable feature. The most easily placed letters are all disposed of quickly (e.g. the A, E or T) but the more difficult letters are left unplayable.

This leads to the conclusion that in the more subtle strategies of play a device less rigid than the Scrabble Equation is required. One recurrent problem was the variance in useability of the letters. This could be partially overcome by ordering the vocabulary so that words using the least playable letters come first, and the most playable letters (including the S) last. This would have the effect, where two words scored the same, of choosing the one with the least playable letters, simply because it was found first. This could be done without any explicit strategy within the program.

The end game is one of the very few areas in Scrabble where a lookahead search is feasible. So if a word cannot be found which uses up all the remaining letters, find the shortest sequence of moves which will. There is of course the confusing factor of the opponent's moves to be considered.

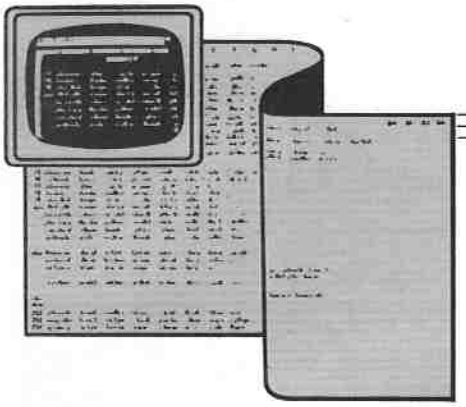
The complete search of all possible moves results in a powerful player, which is difficult to genuinely improve on. Clear cut special case situations can be adequate expressed quantitatively in the form of a Scrabble Equation, but the more subtle areas require a less rigid device.

The problems found in trying to quantify these areas of judgement indicate how complicated the game really is. The power of the program lies in the ability to make two, three or more words in a single move, which has the effect of producing high scores, and using its letters to good advantage. It also makes the board difficult to a human opponent to play. Its current vocabulary is small (9,150 words) compared with that of a good human player.

The current area of research is into the ordering and content of the vocabulary files. It is possible that a simple "find highest scoring word" heuristic, with a minimum of special cases but with a larger more carefully selected vocabulary, would simply overpower a good human player. "Not so good" players are overpowered as it is.

References: Chambers 20th Century Dictionary.

Bibliography: How to Win at Scrabble. Orleans and Jacobson. Publ: Hodder and Stoughton; The Scrabble Book. Hinch. Publ: Pan.



Command that makes all the DIFference

By NICK LEVY
Principal,
Interface Management

BEFORE concluding last month's article on cashflow, let us look at Visicalc's storage command – DIF. It can make a lot of difference to your business modelling efforts as it will enable you to produce models on a 48k Apple, which other Visicalc users would find requires at least 128k. DIF stands for Data Interchange Format, and you will find more about it on page 3-66 of your Visicalc manual (May '81 edition).

As a practical approach to learning DIF, I would suggest that you start by copying the sales forecast Exhibit I. Note that columns F and G, as well as row 16, are calculations. The rest is straightforward data entry. Note also that column G is formatted to /F$ (ie two decimal places), and watch out how you respond to the Visicalc's prompts when you replicate cell G6 from G7 to G14 (should be R followed by N).

Save the model Exhibit I with /SS, under a file named SALES FC1, or any other name that you wish to choose. This model contains specific information that is required for inclusion in other financial statements produced by the Billett company, so let's save such specific information in various DIF files.

The first item of information that we want to transfer from the sales forecast for use in other financial statements is the total quarterly sales figures. Place your cursor on cell B16 and type /S#S (NOT to be followed by RETURN!) Visicalc then asks you for a name for the DIF file. Respond with : S1 DIF or any other name that suits your requirements and press RETURN. (The suffix DIF in the name of the file does not have to be there, but it serves to remind you that this is a special kind of file.)

Visicalc is now prepared to save your file starting from where your cursor is positioned, but first it asks you how far to the lower right hand corner do you want to save the model. Respond by either keying-in or pointing the cursor to F16 and press RETURN.

Respond to the next request by pressing the letter R (for Row), and when you hear your drive whirring you know that you have successfully created a DIF file.

Next move your cursor to cell G6 and again press /S#S (NO RETURN! However if you could not suppress your natural tendency to press RETURN after the second S, press CTRL C – together – and start again). Call that file S2 DIF and now press RETURN. Point the cursor to G14 and press RETURN followed by the letter C (for Column). Again when you hear the drive whirring, this is a sign that you have saved another file in DIF format.

Clear the screen (/CY) and let's carry out a few simple experiments with our two DIF files. Put the cursor anywhere on the screen and type: /S#LS1 DIF RETURN followed by the letter C (for Column). The quarterly sales figures which were saved in a row will now appear on your screen under a single column.

Again position the cursor anywhere on the screen and key-in : /S#LS2 DIF RETURN followed by C. This time the % sales figures which you saved in a DIF file will reappear on your screen.

If you place the cursor over any of these figures you will note from the Entry Line (the very top line on your screen) that all your formulae have disappeared but you are left with the results accurate to ten decimal places.

Now try keying /S#LS2 DIF RETURN RETURN (this time pressing RETURN for a second time instead of C) and the % sales column will appear on your screen in a row instead of under a single column as you originally saved it. Responding with a second RETURN instead of a C or an R acts as an instruction to save or load the DIF file in a row. But you will not be able to turn a row of figures into a column if you saved that row by pressing RETURN twice instead of RETURN followed by R.

Clear the screen (/CY) and copy only the following portion of the Cost Of Goods Sold statement shown as Exhibit II: Rows 1 to 6, row 16, columns A and B from row 7 to row 15.

You cannot calculate the cost of the goods sold unless you enter into this model the quarterly sales (in row 3), and the percentage of sales each product represents (in column C). So proceed by placing the cursor in cell D3 and type: / S#LS1 DIF RETURN R. Next position the cursor in cell C7 and type /S#LS2 DIF RETURN C. The % sales figure should now appear in column C. and you will now be in a position to complete the left portion of Exhibit II.

The figure in cell D7 should be 68% of 30% of the quarterly sales of 70000 (similarly the figure in E10 is 60% of 10% of 8200). To perform this calculation place the cursor on D7 and type: +D3*B7*C7/10000 RETURN. Having entered that formula once, the rest of the entries up to cell H15 can be entered by using the Replicate command.

One way of doing this is to replicate D7 from D8 to D15 and then replicate column D7 . . . D15 from E7 to H7. With practice in replicating, and provided one does not get confused with the 'R' and 'N' responses, it should be possible to complete that portion of the model in less than a minute. The formulae required in rows 17 and 19 should be self evident.

The cost of goods sold calculation will have to be used later in the P&L Account so we need to save row 17 in a DIF file. Place the cursor in cell D17 and type: / S#SC1 DIF RETURN R. C1 DIF is the proposed name for the DIF file, and the last R stands for saving by rows.

Part II of the COGS model (Cost Of Goods Sold), shows how to calculate the weighted average COGS for a whole range of products. As you can see from our particular example (Exhibit II), the production cost of one of the products – HZ14 – is 10% higher than the selling price (fortunately this accounts only for 2% of the sales and is probably carried out to keep some good customers happy.)

	A	B	C	D	E	F	G
1	THE BILLETT CO.PLC. - PROJECTED SALES - 1983.						
2	==========						
3	PRODUCT	1ST.	2ND.	3RD.	4TH.		%
4	CODES:	QTR.	QTR.	QTR.	QTR.	TOTAL	SALES
5	-------	----	----	----	----	-----	-----
6	A534	21000	24600	28500	22500	96600	30.03
7	B862	12600	14760	17100	13500	57960	18.02
8	CN48	10500	12300	14250	11250	48300	15.02
9	DW29	7000	8200	9500	7500	32200	10.01
10	EH85	5600	6560	7600	6000	25760	8.01
11	FP51	3500	4100	4750	3750	16100	5.01
12	GB66	2100	2460	2500	2250	9310	2.89
13	HZ14	1400	1640	1900	1500	6440	2.00
14	MISC	6300	7380	8550	6750	28980	9.01
15	----------						
16	TOTAL	70000	82000	94650	75000	321650	100.00
17	==========						
18	REM: (1)/S#S ROW 16 FROM COL.B TO F (S1)						
19	(2)/S#S COL. G FROM ROW 6 TO 14 (S2)						
20							

Exhibit I

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	COST OF GOODS SOLD CALCULATIONS (COGS)											PART II			
2	==========											HOW TO CALCULATE THE WEIGHTED AVERAGE OF COLUMN 'H':			
3	SALES (FROM DIF FILE) ->			70000	82000	94650	75000	321650				(I.E. THE WEIGHTED AVERAGE OF THE COST OF GOODS			
4	==========											SOLD AS A PERCENTAGE OF THE TOTAL SALES REVENUE).			
5	PRODUCT	% COGS	% SALE	QTR.	QTR.	QTR.	QTR.	TOTAL				COL.H#1			
6	-------	------	------	----	----	----	----	-----				-------			
7	A534	68	30	14296	16746	19330	15317	65689				44668			
8	B862	70	18	8830	10343	11939	9460	40572				28400			
9	CN48	55	15	5781	6772	7817	6194	26565				14611			
10	DW29	69	10	4205	4925	5685	4505	19320				11592			
11	EH85	80	8	4485	5254	6064	4805	20608				16486			
12	FP51	70	5	2453	2873	3316	2628	11270				7889			
13	GB66	55	3	1013	1187	1370	1085	4655				2327			
14	HZ14	110	2	1542	1806	2085	1652	7084				7792			
15	MISCE	75	9	4730	5541	6396	5068	21735				16301			
16	----------											------			
17	TOTAL COST.....			47333	55448	64002	50714	217497				150068			
18	==========										AVERAGE	======			
19	GROSS PROFIT			22667	26552	30648	24286	104153			COGS (%) ->	69.00			
20	==========														
21	REM: (1) /S#L S1 IN B3 (R)					(3) /S#S ROW 17 FROM COL.B TO H									
22	(2) /S#L S2 IN E7 (S)											(C1)			
23															

Exhibit II

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				THE BILLETT CO. PLC SCHEDULE OF FIXED ASSETS AND DEPRECIATION - 1983 -										
2	LOOKUP TABLE:													
3	==========								<- DEPRECIATION EXPENSES->					NEXT
4	USEFUL	SUM OF			USEFUL	SALVAGE	OPENING	1ST.	2ND.	3RD.	4TH.			OPENING
5	LIFE	YEARS			LIFE	VALUE	VALUES	QTR.	QTR.	QTR.	QTR.	TOTAL		VALUES
6	------	------			------	------	------	------	------	------	------	------		------
7	1	1		OFFICE FURNITURE	3	300	698	49	49	49	49	194		494
8	2	3		SALOON CAR	2	0	3200	533	533	533	533	2133		1067
9	3	6		WORKBENCHES	5	500	3930	286	286	286	286	1143		2787
10	4	10		FITTISHING EQUIP.	3	1500	4715	402	402	402	402	1608		3108
11	5	15		PACKAGING EQUIP.	1	100	1430	333	333	333	333	1330		100
12	6	21		OFFICE EQUIP.	2	100	370	45	45	45	45	180		190
13	7	28		DELIVERY TRUCK	2	1000	3600	433	433	433	433	1733		1867
14	8	36		MIXER	5	1200	5000	317	317	317	317	1267		3733
15	9	45		TELEPHONE SYSTEM	5	150	900	63	63	63	63	250		650
16	10	55		COMPUTER	3	2000	17730	0	983	1966	1966	4916		12814
17														
18				TOTAL FIXED ASST		6850	41563	2460	3443	4426	4426	14754		26809
19														
20				REM:S/S# ROW 18 FROM COL. J TO N. (INCLUSIVE)										
21														

Exhibit III

	A	B	C	D	E	F	G	H	I
1									
2	THE BILLETT CO. PLC - 1983 - PROJECTED PROFIT & LOSS ACCOUNT								
3	==========								
4	(A PARTIAL PRESENTATION TO DEMONSTRATE HOW THE P&L A/C CAN BE COMPILED								
5	FROM A SELECTION OF RELEVANT DIF FILES)								
6	QUARTER.....				1ST.	2ND.	3RD.	4TH.	TOTAL
7					----	----	----	----	----
8	SALES (FROM DIF FILE S1).....				70000	82000	94650	75000	321650
9	COGS (FROM DIF FILE C1).....				47333	55448	64002	50714	217497
10	----------								
11	CONTRIBUTIONS.....				22667	26552	30648	24286	104153
12	----------								
13	DEPRECIATION (FROM DIF FILE D1).				2460	3443	4426	4426	14754
14	----------								
15	SUB TOTAL				20207	23110	26223	19860	89399
16	----------								

Exhibit IV

On the other extreme, the production cost of CN48, which accounts for 15% of the annual sales, costs only 55% of its selling price. So what is the average weighted COGS? According to the calculations in column L this average amounts to 69%. The formula in cell L7 is B7*H7/100. Replicate that formula from L8 to L15 and calculate the total of column L in cell L17. Note the formula in cell L19, it reads: @IF(@ISERROR(L17/H17*100),0,L17/H17*100).

Basically the formula is L17/H17*100, but when the model does not contain any data (ie when used as a template awaiting data to be entered) L17/H17 calculates 0/0, and produces an ERROR answer, which does not look good in a model. So what the formula in L19 does is to substitute a 0 in place of the ERROR message. If, however, the formula in L19 contains errors other than those arising from dividing zero by zero, then the substitution will not work and the ERROR message will persist until the mistakes are corrected.

Next we shall look at an equipment schedule and calculate the depreciation on each item of equipment. We shall find the total depreciation and save it in a DIF file ready to be transferred to the P&L A/C.

First we need to select an appropriate depreciation method. The one most widely used in the UK is the straight line method. If you have to depreciate £1,000 over five years you deduct every year 10000/5=£200 from the annual profits. An alternative method popular in the USA is known as Sum-of-the-years method. This enables the company to write off a larger proportion of the cost of an asset during the earlier years of the life of the asset, and a smaller proportion during the later years.

It works as follows. Suppose you want to write off £1,000 over a five year period. First you add up 1+2+3+4+5=15. Then you calculate the depreciation for the first year which would be 1000*5/15=333. The depreciation for the second year would be 1000*4/15=266. On the third year you would depreciate 1000*3/15=200, and so on.

I shall use this method for calculating depreciation, not because it is in any way more scientific than the straight line method, but because it makes a more interesting and challenging excercise in Visicalc.

Copy the first six rows of Exhibit III as well as row 17 and columns A,D,E,F,G,H from row 7 to row 16. Enter 1 in B7 and in B8 enter +A8+B7. Replicate the formula in B8 from B9 to B16 (all Relative). Then enter the following formula in cell I7:

@IF(@AND(G7>=0,H7>=0),H7-G7*F7/(@LOOKUP(F7,A7 . . . A16))/4,0).

What this formula does is to check that the opening values and the salvage values of the equipment are not negative figures (@AND(G7>=0,H7>=0)). If one of these figures happens to be a negative figure then Visicalc will respond with 0. If not the formula calculates the depreciation

cost of the equipment (opening value less salvage value), multiplies that sum by the number of useful life years of the equipment (column F) and divides the results by the sum-of-years.

The LOOKUP command looks at the entry in cell F7, then searches column A for a number equal to the number in L7 and having found that number the formula picks up the figure in the adjacent cell in column B for use as the denominator in the formula.

Having correctly entered the formula in cell I7 replicate it from I8 to I15. (As you can see the computer due to be purchased in 1983 is not due till the middle of the second quarter so the formulae in row 16 have been adjusted accordingly.) Enter +17 in J7,K7 and in L7. Then replicate J7 ... L7 from J8 to J15 (Relative).

If you have managed to get this far with entering the formulae in the model you will have no difficulty in completing the calculations and then saving in DIF format row 18 from column I to column L (inclusive). Call that file D1 DIF. If however you are "stuck" just read on.

The object of this month's article is to learn about DIF, so if you have any difficulties with the formulae in the models presented so far, just copy and save under different file names the three statements shown as Exhibits I, II and III. The main thing is that you should be able to save in DIF format row 16 and column G from Exhit. I, row 17 from Exhit.II and row 18 from Exhit.III. Having created the three DIF files you can now compile a P&L A/C made up of the three DIF files.

Proceed by copying the whole of the first seven rows of Exhibit IV as well as row 16 and colums A,B,C,D up to row 15. Now put your cursor in cell E8 and /S#LS1 DIF RETURN R. Next position the cursor in cell E9 and /S#LC1 DIF RETURN R. Finally position the cursor in cell E13 and /S#LD1 DIF RETURN R.

You should now have a P&L A/C containing three lines each from a different financial statement. This should give you a fairly good idea how and when to use DIF files. If you have a very large model that cannot be contained in the memory of your computer, break it down to smaller statements and use DIF file to transfer key data from one statement to another.

No discourse on DIF would be complete without mentioning that you can use DIF files to transfer Visicalc data for use on other software packages and vice versa. Take, for example, the Visitrend+Visiplot program. If you want to draw graphs from any of your Visicalc models using the above package you will have first to save your model in a DIF file.

In this month's examples we only saved single lines or columns in DIF files, but you can also save whole Visicalc files or blocks from within VC files in DIF format. Try saving VC files in DIF format and then reload them. The results may not appear exactly as you would expect.

None of the figures are wrong, but the entries may require reformatting, and some of the lines would have to be redrawn. In short, you must be prepared to do a bit of cosmetics to your DIF file after you have loaded it. And if you want to have some fun make a DIF saving of a file (with no more than 60 rows) saving it in R (rows). Then reload it in C (Columns) and see how your model looks lying on its side.

We shall now conclude last month's article on cashflow. Exhibit V is the continuation of the model shown on page 56 of the January issue of *Windfall*. Cell B98 is +E83, B99 is +F83 and so on. In other words column B98 to B19 is a copy of row 83 from column E to P.

You will recall from last month's discussion that for a cashflow statement to be of any practical use it should show separately three steams of cashflow: The cashflow from operations, capital cashflows and financial cashflows (eg interest received or paid, Corporation Tax – if any – dividends received or paid etc). Exhibit V only shows the figures for the operational cashflow.

The capital and the financial cashflows can be entered via DIF files in columns C and D respectively. Column F shows the difference between the net cashflow arising from the entries in columns B,C,D, and the minimum desired cash balance re-

→

	A	B	C	D	E	F	G	H
				PART II				
	SCHEDULE OF SHORT TERM BORROWING AND BORROWING COST							
89	MIN.DESIRED BALANCE		7500 <--					
90								
91								
92	EXPECTED CASH BALANCE FROM:							
93							INVEST	BORROW
94		OPERA-	CAPITAL	FINANCIAL		+ OR -	@	@
95	MONTH	TIONS	CASH-	CASH-		DESIRED	9.50	18.00
96			FLOW	FLOW		MINIM.	% P.A.	% P.A.
97	-------	------	------	------		-	------	------
98	JAN	7905	.....	.....		405	3	0
99	FEB	6080	.....	.....		-1015	0	15
100	MAR	5836	.....	.....		-2679	0	40
101	APR	7715	.....	.....		-2465	0	37
102	MAY	17172	.....	.....		7207	57	0
103	JUN	5980	.....	.....		5687	45	0
104	JUL	-5500	.....	.....		-7313	0	110
105	AUG	10895	.....	.....		-3919	0	59
106	SEP	26753	.....	.....		15334	121	0
107	OCT	9614	.....	.....		17449	138	0
108	NOV	3957	.....	.....		13905	110	0
109	DEC	9098	.....	.....		15503	123	0
110	-------	------	------	------		------	------	------
111					TOTAL..		598	261
112	-------	------	------	------		------	------	------
113	NET INTEREST INCOME/EXPENDITURE....					-->	337	0
114	==========							

Exhibit V

	A	B	C	D	E	F	G	H
				PART II				
	SCHEDULE OF SHORT TERM BORROWING AND BORROWING COST							
89	MIN.DESIRED BALANCE		7500 <--					
90								
91								
92	EXPECTED CASH BALANCE FROM:							
93							INVEST	BORROW
94		OPERA-	CAPITAL	FINANCIAL		+ OR -	@	@
95	MONTH	TIONS	CASH-	CASH-		DESIRED	9.50	18.00
96			FLOW	FLOW		MINIM.	% P.A.	% P.A.
97	-------	------	------	------		------	------	------
98	JAN	7905	.....	1000		1405	11	0
99	FEB	6080	.....	.....		-15	0	0
100	MAR	5836	-7500	.....		-9179	0	73
101	APR	7715	.....	-4000		-12965	0	103
102	MAY	17172	.....	6000		2707	21	0
103	JUN	5980	-3500	.....		-2313	0	18
104	JUL	-5500	.....	.....		-15313	0	121
105	AUG	10895	.....	4000		-7919	0	63
106	SEP	26753	-10000	-2500		-1166	0	9
107	OCT	9614	.....	.....		949	8	0
108	NOV	3957	.....	-3000		-5595	0	44
109	DEC	9098	.....	.....		-3997	0	32
110	-------	------	------	------		------	------	------
111					TOTAL..		40	463
112	-------	------	------	------		------	------	------
113	NET INTEREST INCOME/EXPENDITURE....					-->	0	423
114	==========							

Exhibit VI

quired by the company as shown in cell D89.

The model works as follows: Assuming that at the end of January the net cashflow is £7905 (cell B98) this amount is £405 more than the £7,500 desired minimum required by the company to be held in cash (cell F98). So the company can invest the £405 at 9.5% p.a. (cell G95) which will provide a one off income of £3 during the month of January (cell G98).

In February the net cashflow is £6080. Add to this the £405 deposited in January, this still leaves the company £1015 (cell F99) short of the minimum cash requirements of £7,500. So the company, borrows £1,015 at 18% p.a. (cell H95) which for the month of February costs £15 in interest charges, and so on.

By the end of the year, according to Exhibit V, the company made £337 profit (cell G113) out of depositing cash at 9.5% although on five months out of twelve it had to borrow money at 18% (column H).

The reason for this happy state of affairs is that the model does not show any cashflow movements under the capital cashflow column (column C) or the financial cash flow column (column D).

Exhibit VI shows what would be the cashflow situation with capital and fiancial cashflow summaries entered via a DIF file into columns C and D.

The following is a selection of key formulae used in Exhibit V. For a complete listing of the two parts of the model, write to *Windfall* and ask for the January 1983 listing of the operational cashflow model, enclosing a stamped addressed envelope.

F98: @SUM(B98 . . . D98)-D89

F99: @SUM(B99 . . . D99)+F98-D89. Replicate F99 from F100 to F109

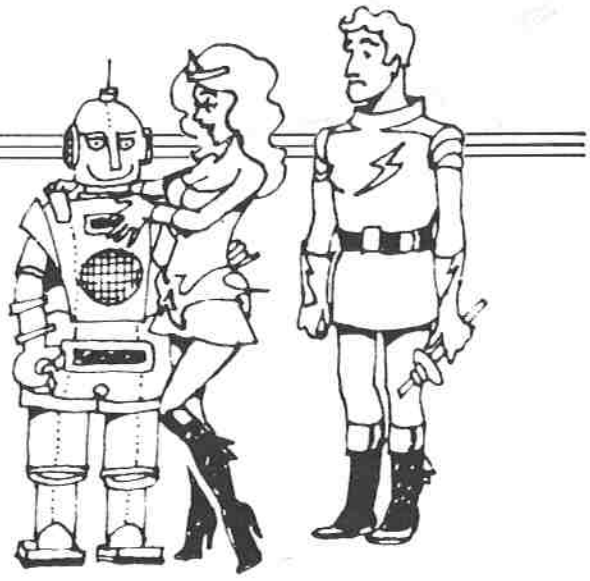
G98: @IF(F98>0,F98*G95/100/12,0). Replicate G98 from G99 to G109

H98: @IF F98<0,@ABS(F98*H95/100/12,0) Replicate H98 from H99 to H109

(Note the use of the function @ABS in the last formula. Without it the figures in column H would appear as negative, ie preceded by a minus.)

Finally, a tip which most Apple users probably are aware of but which is always worth repeating. If, while in the middle of working on a Visicalc model, you accidently hit the RESET key instead of RETURN and you find that the life has gone out of your model, then a minor adjustment to your Apple is required. Switch off, remove the lid and search for a small switch tucked away on the left somewhere under the keyboards between the numbers 6 and 7. Flick the switch over, put back the lid, reconnect the electricity and load Visicalc. If you now press the RESET key you will find it has gone dead while your work remains alive.

The RESET will only function now if pressed together with the CTRL key on the other end of the keyboard. For this you will need two hands – unless you can span your fingers like Liszt, who was reputed to have the largest hands in the business. I wonder how many people can press RESET and CTRL with one hand?



Sorry, no calamares on the road to Nuggyland

WHAT'S the point of going abroad if you're just another tourist carted around in buses surrounded by sweaty mindless oafs in their cloth caps and their cardigans with their transistor radios complaining about the tea – "Oh, they don't make it properly here, do they, not like at home" – and stopping at Majorcan bodegas selling fish and chips and Watneys Red Barrel and calamares and two veg ... So I went on one of Honest Bob's discount World Tours to Rungistan.

For those of you whose knowledge of geography is as bad as mine, Rungistan is in mid-Africa and is distinctly unfriendly to tourists. Consequently, you wake up with the worst headache of your life in a dank jail cell and are due to be shot at sunrise. Not surprisingly, your task is to escape from the cell, cross Rungistan and make it to the border into friendly Nuggyland.

Once you have escaped from your cell, you'll find that the topography of Rungistan is surprisingly varied. It ranges from desert to jungle via snow-covered mountains. You'll encounter the indigenous flora and fauna, as well as some of the inhabitants, some of whom are more civilised than others.

Although the drawings in Escape From Rungistan are less elaborate than many adventure games, this is more than compensated for by the frequent use of musical interludes and the several occasions when animation is used. For example, while you are sat in your cell, a mouse runs across the room and you have to respond quickly before the mouse runs out.

The game can be saved at any point, but only a single saved game is possible. It is saved to the game disc (so you don't need to remove the disc during the game) and can be restored from within the game.

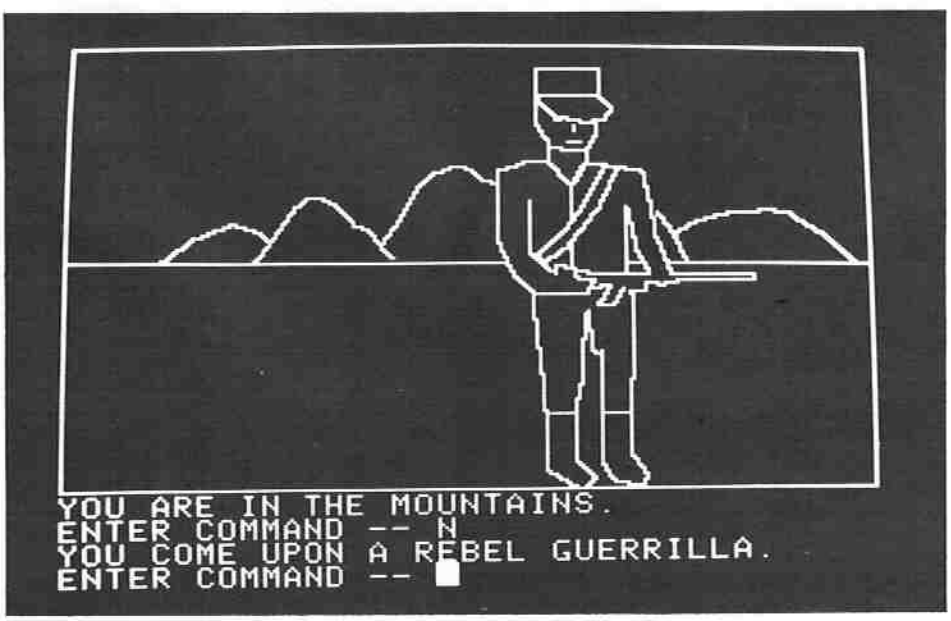
As in all adventure games, there are plenty of dangers and plenty of people ready to kill you if you make a wrong move. If you are stuck at some point and ask nicely for a hint, you *might* get some help but you'll still have to use your imagination and ingenuity, not to mention fast typing and arcade game skills. The ski run is a really nice piece of animation which requires fast reactions if you are to avoid a fatal full of splinters.

Although the musical interludes can be shortened or turned off, I enjoyed playing Spot The Tune. The tunes are appropriate to the graphics they accompany and often make an additional humorous comment. You can probably guess what is played when you meet the rutabega farmer, and if you've played the Olympic Decathlon you'll recognise the anthem at the end of the ski slope.

According to some recent publicity material from Sirius, Escape From Rungistan was "rated the number one adventure for Apple Computers by Softalk magazine". I certainly enjoyed playing the game. It is difficult without being impossible, well-written, well-animated, and funny too! What more can you ask for, apart from your money back from Honest Bob?

Cliff McKnight

Title: Escape From Rungistan.
Author: Bob Blauschild.
Publisher: Sirius Software Inc.
Requirements: Apple II with 48k and one disc drive.



Basic, but not boring

THERE is nothing fantastic about County Fair – no mystery, no futuristic space scenario, dramatic graphics or alien attackers. In fact on first sight it seems remarkably boring. It is just a simple arcade shooting gallery game – but that simplicity might explain why it is so popular.

It is easily assimilated (a five-year-old finds it instantly rewarding) but it doesn't

pall too quickly (I always seem to come back to it after a break) and it provides complete challenge, relaxation and enjoyment in a short space of time. A quick game can be slipped in at the end of a lunchbreak, rather than taking up the whole of the period.

The game requires a 48k Apple with paddles or joystick. On booting you are treated to a fairground theme played as a background to a display of the various targets and their values. Press the games button and you are given in quick succession your supply of bullets across two lines at the bottom of the screen, your pistol, which fires vertically and is aimed by use of the game controller, and four moving lines of targets.

You score points for each target hit, the game ends when you have run out of bullets and the object of the exercise is to score as many points as possible. Your score, plus hi-score, are on constant display.

I thought I was doing well when, after six months I topped the 1,500 mark. However the literature says you have to top 2,000 to be known as a true sharpshooter. High scores are built by repeatedly clearing the screen of targets and thus earning an extra round and a resupply of bullets.

As with the traditional fair shooting gallery the goodies are always at the back, difficult to get at and screened by the front runners. In this case if you manage to shoot a way through the first three rows of targets you have a chance to win bonus supplies of bullets, although you also risk forfeiting some of your own.

The game's appeal derives perhaps from the challenge presented by three features:

- Among the targets are numerous ducks. Instead of following a conveyor-belt motion as with the others, the ducks drop down through the range, unless you shoot them first, and gobble up your supply of bullets. (Very annoying.)
- At the top of the screen in a rectangular enclosure are 10 moving tree targets, which also have to be cleared before you earn an extra round. There are only two small entrances to the enclosure and with insensitive paddles it can be a frustrating business lining up shots.
- Time as well as ammunition supply is a factor. Once you have cleared the non-tree targets you have only a limited period before they reproduce themselves.

And for straightforward pleasure/reward/gratification (not to mention bonus points) if you do manage to clear all the targets you are allowed to use up your surplus bullets in a fast and furious duck shoot before moving to the next round.

It is a particularly good emulation of the game sometimes found in electronic amusement arcades. It can be compared to the space invaders genre and will appeal to those who enjoyed the simple destruction of alien invaders in such programs.

County Fair is long in the tooth but not short on entertainment. It is so simple that it ought to become boring after a while, but it doesn't. It is compulsive.

David Creasey

Title: County Fair
Author: Dan Illowsky
Publisher: Datamost
Requirements: Apple II with 48k, one disc drive, games paddles.

QUICK SPINS

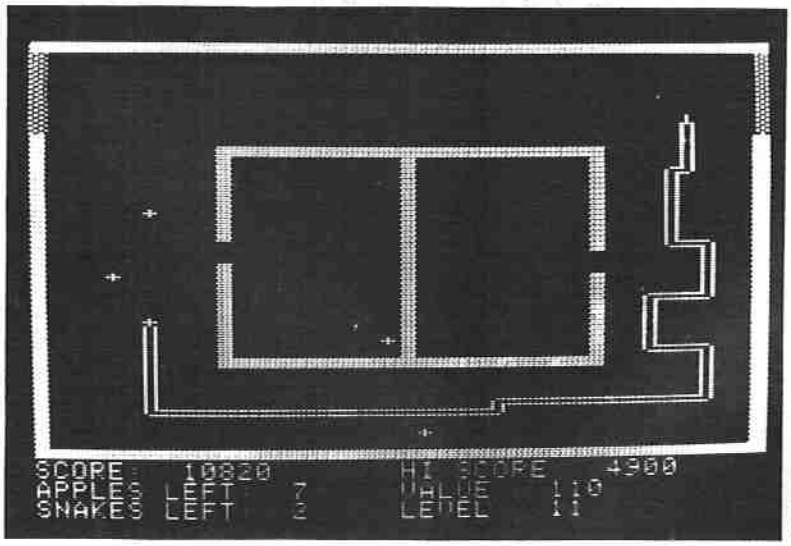
Free Fall. *The goal in this one is a hole in the ground! That is the only place that you'll be safe from deadly showers of needles, guns, bombs and other hazards. You have to manoeuver your man from the top of the screen past the obstacles (most of them lethal to touch), and safely into the holes.* (Sirius Software)

Star Warrior: *In this Starquest you are a star-faring knight, a mercenary with a cause. Armed with nuclear missiles, blaster and power gun, you're on a search and destroy mission against a military dictatorship. Two different scenarios, with play in real time.* (Automated Simulations)

Rescue at Rigel: *You've got 60 minutes – in real time – to free 10 prisoners from a maze-like alien moonbase. You've got limited energy and the aliens are everywhere. Can you get back to the rendezvous point in time?* (Automated Simulations)

Sherwood Forest. *Robin Hood needs your help. He doesn't seem to remember who he is or that he was supposed to marry the beautiful Maid Marion today. It must have been that nasty bump on the head he took while fighting the Sheriff of Nottingham the other day.*

It is up to you to help Robin win the hand of the elusive Maid Marion. After all, he is in your hands – you control his actions by telling him what to do. (Phoenix Software)



Snake Byte in action. Fast reactions are of the essence

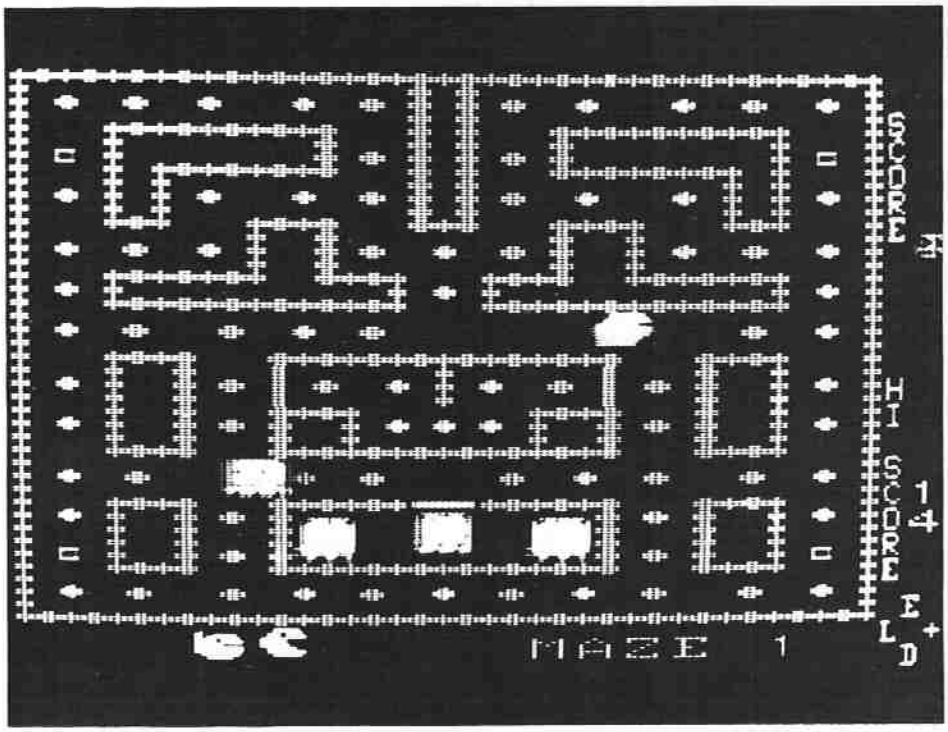
Snake

"WHAT has 48k and is addictive?" Snake Byte from Sirius Software. The game sounds deceptively simple. You control the movement of a snake and your task is to eat apples. The apples only appear one at a time unless you don't eat one in the allotted time, in which case three penalty apples appear. That wouldn't be too bad on its own, but each time you eat an apple you get longer and faster.

You're not allowed to touch the perimeter or yourself, but when you've eaten the last apple a narrow door opens through which you must pass in order to proceed to the next level. You think this sounds simple? Well, once you get off level one, a variety of obstacles appear to make life more difficult. On level two, the obstacle is a bar across the middle half of the screen; on level three a cross shape complicates life, and the obstacles get more complex as the levels increase.

If you think that still sounds easy, you can complicate the game even further by choosing either one or two purple plums. The plums add an extra element of difficulty because they bounce around the

Having a whale of a time, and feeding well . .



Fuzzy . . . but hungry whales are not given to stopping to have their pictures taken

"BETCHA can't play just one game!" is the challenge on the packet of Snack Attack from Datamost. I'm glad I didn't take their bet because I would have lost. It's like sitting at a bar and trying not to eat the crisps.

If you are a Pac Man addict, you'll probably feel the same way about Snack Attack. You control the movement of a whale around a maze, eating gumdrops as you go and avoiding the Gumdrop Guards. Eating one of the four magic stars means that for a few seconds you can eat the guards too, but you'll have to run to catch them. Occasionally an apple appears, and eating that gives extra points, but it only appears for a few seconds.

There are three mazes, and eating all the gumdrops on one moves you onto the next. These three mazes keep reappearing, but each time they do the speed increases, making the game progressively harder. Real pros can start at one of five higher speeds if they want to impress their friends.

Although the game can be played with keyboard, paddles or joystick, I found keyboard felt better than joystick and I couldn't get the hang of using paddles. Each time the disc is booted the set of control keys is changed to help prolong the life of the keyboard.

The gumdrops come in two colours which are indistinguishable on a monochrome display, but since they are only worth either one or two points each (and you have to eat them all to proceed to the next maze), nothing is lost by not having colour.

The big points are scored by eating the guards and the apple. You can tell if you still have the power to eat guards by the presence of a clicking sound, and it's uncanny how the clicking stops just as you catch up with a guard! Various other whirrs, clicks and chomping noises add to the enjoyment.

I gave up smoking 10 years ago, and that was easy compared with having to stop playing Snack Attack in order to use my word processor for this review. Maybe I'll play just one more game . . .

Cliff McKnight

Title: Snack Attack
Author: Dan Illowsky
Publisher: Datamost
Requirements: Apple II with 48k, one disc drive.

Byte can be catching

screen, and contact with the snake's head causes instant death.

The four keys controlling absolute direction of movement and the two controlling relative direction can be specified when the game first boots or at the start of any game. This means that you can choose your favourite keys, or even specify different keys on each game to spread the wear and tear on your keyboard. The game can also be played using an Atari-type joystick connected via a Sirius Joyport, but I haven't tried it in this mode.

Snake Byte has 28 levels, of which I've only seen 14. I say "seen" rather than "reached" because it's an achievement for me to get past level three. My pre-school daughter, on the other hand, has reached level 14 and has a current high score of 19480. In fact, when I wanted to take a photograph of the screen during play, I spent half an hour trying to get up to level three before I called her from her bed.

Although the graphics are simple and the sounds are pretty basic (the best one being the noise which signifies a bonus), Snake Byte is a great game which should keep you busy for a long time. I started with a quote from the instructions, so I might as well finish with one: "Fangs alot, Sirius Software".

Cliff McKnight

Title: Snake Byte
Author: Chuck Sommerville
Publisher: Sirius Software
Requirements: Apple II with 48k, one disc drive.

APPLE'S last significant enhancement to Applesoft was the DOS 3.3 Toolkit, released more than 18 months ago, and since then other companies trying to make inroads into this market have produced a wide range of powerful utilities.

One of them is Structured Basic, written by Patrick Buckland of Island Computers. It combines the ease of use of Applesoft Basic with the features of Pascal, giving more reliable software, faster debugging and more reliable code than Applesoft alone.

Here ROY STRINGER reviews this, one of the most powerful programming tools for the Apple. Essentially a machine code program, it provides 31 new Applesoft commands accompanied by 14 new error messages. Its interpretive nature makes program development much simpler.

Structured Basic..a new lease of life for Applesoft

HAVING the main features of Pascal within an interpreter is a great advantage, particularly to novice programmers who can lose a lot of their enthusiasm by being made to wait while the computer compiles their source code before each test of the program.

Although line numbers are still required with Structured Basic for the purpose of editing, no line references (GOTO:GOSUB:ONERR:GOTO) are required at all. Instead subroutines are called by name with the command 'DO', subroutines themselves being defined with 'PROCEDURE' and 'FINISH' statements, while conditional branches are handled with 'REPEAT . . . . UNTIL', 'WHILE . . . . ENDWHILE' and 'IF . . THEN . . ELSE . . ENDIF' statements and variations thereof.

FOR . . NEXT is still fully implemented. The complexities of Applesoft's 'ONERR GOTO' command are simplified and made more understandable with 'ONERR . . ERRSTART . . ERREND'.

Many of the PEEKs, POKEs and CALLs most commonly used in Applesoft are replaced with simple commands, and a set of completely new development utilities have been included.

Some of the new commands deal with graphics and toggles:

M/C: The same as CALL-151, used to obtain access to the monitor level of the Apple.

LORES: Switches the graphics mode to 40x40 mode without setting all of the other toggles associated with the GR command. Equivalent to POKE–16298,0

HIRES: Similar to LORES but sets high resolution display. Equivalent to POKE–16297,0

FULL: Sets the graphics display mode to all graphics and no text lines. Equivalent to POKE–16302,0

MIXED: Sets mixed text and graphics mode. Equivalent to POKE–16301,0

PAGE (n): This allows you to change between pages one and two of HIRES, LORES or TEXT displays. I have used parentheses to signify that a parameter or expression is necessary for this function.

GRAPHMODE: Tells the Apple to display the currently defined graphics mode, (HIRES or LORES with either FULL or MIXED display in either PAGE1 or PAGE2)

TEXTMODE: Opposite to GRAPH MODE as this switches off the graphics display and sets the text only display.

SCREEN (n): Used to specify the screen to which all VDU output commands will be sent ie, you can display HGR while drawing on HGR2.

FILLWITH (n): Used to fill the current HIRES SCREEN with the colour given in (n).

SUPERIMPOSE: Used to superimpose SCREEN2 onto SCREEN1.

Most of the remaining commands are concerned with flow of control within the program:-

```
REPEAT
      (statements)
UNTIL (logical exp)
```

Here I have used (statements) to represent a list of any Applesoft or structured Basic commands. This routine has obvious origins in Pascal and will continuously execute the (statements) UNTIL the (logical exp)ression is true. When this structure is used within a program the (statements) must be executed at least once before (logical exp)ression is even tested.

```
WHILE (logical exp)
      (statements)
ENDWHILE
```

This structure is very similar to REPEAT UNTIL and also has a very similar counterpart in Pascal. Here though, since the logical test is made before (statements) are executed, if the logical test fails then the (statements) will not be executed at all.

```
IF (logical exp)
THEN
      (statements1)
ELSE
      (statements2)
ENDIF
```

```
IF (logical expl), (log. exp2), . . (log. expN)
CASE
      (statements1)
CASE
      (statements2)
CASE
      (statementsN)
ELSE
      (statements)
ENDIF
```

This is an extension of the IF . . THEN and ON GOTO commands in Basic and the CASE . . OF command in Pascal. Structured Basic takes features from each and uses them to provide two methods of using the IF . . THEN structure.

In the first version the set of (statements) corresponding to the first true (logical exp)ression will be executed leaving all other (statements) unexecuted. If none of the (logical exp)ressions is true then the (statements) after ELSE will be executed instead. The second version is a standard implementation as defined in Pascal.

```
PROCEDURE (procname) (,paraml) (,param2) (,paramN) (;locvarl) (,locvarN)
      (statements)
FINISH
```

These commands are used to define a subroutine within your program. When you call a procedure into use *(see below)* the (statements) within it will be executed and then program flow will return to the next program statement after the position from which the procedure call was made. When procedures are called, every (,param) must be provided with a value otherwise a syntax error will occur.

The (,param)s and the (locvar)s are all locally declared variables which will not affect the values of any variables in use outside of the procedure which use the same variable name. By giving the procedure a name at (procname), calls to the procedure can be made by reference to that name.

This simple change to the method of calling subroutines improves the

→

STRUCTURED BASIC

readability and ease of comprehension of a program listing immeasurably.

```
10 PROCEDURE LINEOFCHAR,L$,L;I
20 ::REPEAT
30 ::::PRINT L$;
40 ::::I=I+1
50 ::UNTIL I=L
60 ::PRINT
70 FINISH

75 L$="FRED": L=99: I=100
80 DO LINEOFCHAR,"-",12
90 PRINT L$,L,I

RUN
------------
FRED    99      100
```

Program 1

If the above lines are typed in as far as RUN then the output you obtain will be as shown. This demonstrates the preservation of variables since the procedure LINEOFCHAR uses L$, L and I for passed parameters and local variables. Note that the first line of code to be executed was line 75 since all previous lines were recognised by Structured Basic as being part of a separate procedure.

The effect of this mechanism is far reaching. It allows you to write programs with almost complete disregard for duplication of variable names (accidental usage of one variable name in two separate parts of a Basic program must rank as one of the most common bugs and is perhaps the most difficult to track down) and it also allows the great advantages of recursive programming to be put to use.

```
10 PROCEDURE FACTORIAL,A
20 ::IF A
30 ::::THEN DO FACTORIAL,A-1
40 :::::::: C=C*A:
50 ::::ELSE C=1 REM C IS GLOBAL
60 ::ENDIF
70 FINISH
```

Program 2

The most useful thing about local variables is that you are able to load prewritten procedures from disc into your program without having to change the variable names used by it.

Structured Basic automatically loads from disc any procedure which it does not already have in memory. This means that Example 1 could have been written as just lines 75 to 90 provided that a file called PROC.LINEOFCHAR was stored on the disc in the system drive (the system drive is determined by the operator or defaults to S6,D1).

If this program were run then Structured Basic would load the procedure from disc, moving the variables currently in memory up to make room as it did so. The procedure would then be used as though it had been there all the time without any interruption to program execution other than the disc reading.

This feature can be put to best advantage by maintaining a library of

```
]RUN

425  REM     THIS PROGRAM DEMONSTRATES MANY OF THE
     FACILITIES OF STRUCTURED BASIC



450  LIST
500  REPEAT
501 : LET LINE = LINE + 1
505 : LET COLUMN = 0
506 : REPEAT
508 :: LET COLUMN = COLUMN + 1
510 :: LET NUMBER =  RND (8) * 1000
520 :: DO NJUST,NUMBER,COLUMN,10
540 : UNTIL COLUMN = 3
550 : PRINT
600  UNTIL LINE = 10
625  LIST 650 -
650  REM  PROGRAM WRITTEN UP TO HERE ONLY
655  REM REST OF PROGRAM LOADED DURING EXECUTION (CTRL-J CTRL-J)


      34.5     965.94    890.989
     556.7     589.11    685.832
     889.2     262.44    450.347
     876.0     569.52    150.280
     648.2     230.39     43.147
     571.4     566.98    834.185
     328.9     634.81     43.512
     681.2     558.48    372.920
     539.8      92.61    903.492
     374.1     338.40    833.449

650  REM  PROGRAM WRITTEN UP TO HERE ONLY
655  REM REST OF PROGRAM LOADED DURING EXECUTION (CTRL-J CTRL-J)


665  PROCEDURE NJUST,N,NP,FW
670  DO MAKENUM,N,NP
675  DO RJUST,FV$,FW
680  FINISH : REM


690  PROCEDURE MAKENUM,N,NP;P
695  IF  NOT  LEN (ZEROS$) THEN ZEROS$ = "000000000": ENDIF
700  IF N THEN FV$ =  STR$ (N + 5 * 10 ^  - (NP + 1))
705  ELSE FV$ = " ": ENDIF
710  IF NP
715 :: THEN
720 :::: DO FINDCH,FV$,"."
725 :::: IF P = 0,P > NP,P < NP
730 ::::: CASE :FV$ = FV$ +  LEFT$ (ZEROS$,NP + 1)
735 ::::: CASE :FV$ =  LEFT$ (FV$, LEN (FV$) - P + NP)
740 ::::: CASE :FV$ = FV$ +  RIGHT$ (ZEROS$,NP - P)
745 :::: ENDIF
750 :: ELSE
755 ::::FV$ =  STR$ ( INT (N))
760  ENDIF
765  FINISH
775  PROCEDURE FINDCH,F$,CH$;I
780  REPEAT
785 ::I = I + 1
790 ::P = ( LEN (F$) - I) * (CH$ =  MID$ (F$,I,1))
795  UNTIL I =  LEN (F$) OR P
800  FINISH : REM


810  PROCEDURE RJUST,F$,FW;I
815  IF  LEN (F$) > FW - 1
820 : THEN F$ =  LEFT$ (F$,FW - 1)
825  ENDIF
830  IF FW - 1 -  LEN (F$) > 0
835  THEN
840 :: FOR I = 1 TO FW - 1 -  LEN (F$)
845 ::: PRINT " ";
850 :: NEXT
855  ENDIF
860  PRINT F$;: PRINT " ";
865  FINISH : REM
```

Program 3

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procedures on a master disc and simply writing your program as though your procedure calls were intrinsic commands. When the program is RUN, all required procedures will be loaded into the program and the program can be saved complete.

This is much less time-consuming than using utilities for merging programs together, since no renumbering is required and no interruption to your programming is inflicted upon you. See Example 3 for an example of a program which did this when I ran it.

DO (procname) (,paraml) (,param2) (,paramN)

This is the main command used to call a procedure as shown in the above examples.

USE (procname) (,paraml) (,param2) (,paramN)

This is the only other command for calling procedures. USE and the rest of the commands covered hereafter are on a pre-release of a new version of Structured Basic due to be released soon.

It has an extension of the disc facilities of the DO command which, when exited, will reset the end of the program pointer back to its position before the procedure was loaded from disc, thus releasing the memory that it USEd for any other disc-based procedures that the program requires during execution.

This makes the chaining of programs unnecessary since a main menu program can download each main routine from disc as and when required releasing it again after use.

STORE (procname)

This allows you to STORE any procedure in the program you are writing onto the disc in the system drive with the filename PROC.(procname). Very useful for updating your library with debugged or modified versions of procedures.

LOCATE (procname)

Tells you the line number at which the procedure (procname) begins. If the (procname) parameter is omitted then a list of all procedures in your program is displayed with linenumbers. If (procname) is not in memory then Structured Basic will attempt to load if from disc in the usual way.

LIST (procl), (proc2)

Lists your program from (procl) to (proc2) inclusive. There are a number of ways to use this command. Either or both of the (proc)s can be omited and either of them may be replaced with a line number.

There are also a number of other little utility commands built into the system.

The most attractive aspect of Structured Basic is its compatibility with Applesoft and DOS 3.3, which means that there are no difficult new systems to learn before you can get your teeth into the language proper. Indeed Applesoft is still the main interpreter while Structured Basic is in operation.

When you have SB active you simply use the Applesoft editor in the normal way, typing in your new commands without any additional "quotes" or ampersands or any other annoying variations.

Structured Basic tokenises your new commands in the normal way, lists them back again when the program is listed and executes them when the program is run. This means that the whole system is completely transparent to the user.

As a guideline to the learning time for Structured Basic I was using it in anger within 45 minutes of opening my first disc, which included time to flick through the manual. If you have been able to understand this article easily then I am sure you will be able to get the package up and running in the same time.

Schools and colleges should jump at the opportunity to teach structured programming without the hassle and expense of Pascal. It is only necessary to give the students a disc and a manual each and they should almost teach themselves, building upon what they already know about Applesoft.

Use of the package should also help software houses cut development time significantly and end up with a user friendly product which can be easily maintained and improved. I understand that run time licences will be offered at about £10 per user which compares with £149 which has to be spent on the Pascal language system (excluding the RAM board) by anyone using a program written in Pascal or Fortran.

I am a firm believer in the "art" of structured programming and have always despaired of the complexities of doing this with a language like Basic. I also feel that schools should not teach students Basic as a first language without also giving them a good understanding of structuring techniques. Perhaps in Structured Basic we have a new definition of the language which will set standards for implementations of Basic on other machines.

Since I received my first copy of Structured Basic I have used it intensively and have done very little work in Applesoft without it being resident. I found a number of bugs in the first version which were a little irritating, such as Structured Basic itself becoming disconnected from the system when calling certain large procedures off disc, and STORE writing procedures to the last accessed drive instead of the system disc. But many of these were cleared up by Island Computers within a few days of my notifying them.

The new version of Structured Basic, which will include a large reference manual, a fully documented library of procedures (some of my own included) and a number of demonstration programs, will retail at around £90 which compares favourably with Apple Pascal, Apple Fortran, Apple Logo and Apple Pilot.

Appletip

Here's a useful routine from one of Apple's technical support people in the States, a WPL program to send out formletters. There are two variables to put into the formletter, (address) and (firstname). The rest is totally tutorial.

```
START   PSX 1
        NY
        PND
        PPR This file is used to print single sheet documents
        PIN      or envelopes - Continue (Y/N)?  =$A
        PCS /$A/N/
        PGO QUIT
        PCS /$A/n/
        PGO QUIT
        PPR
        PIN Use which main document (i.e. formletter)?  =$B
        PPR
        PIN Use which address list  (i.e. maillist )?  =$C
        PPR
        PIN Use a particular address (Y/N)?  =$A
        PCS /$A/Y/
        PGO ADDR
        PCS /$A/y/
        PGO ADDR
```

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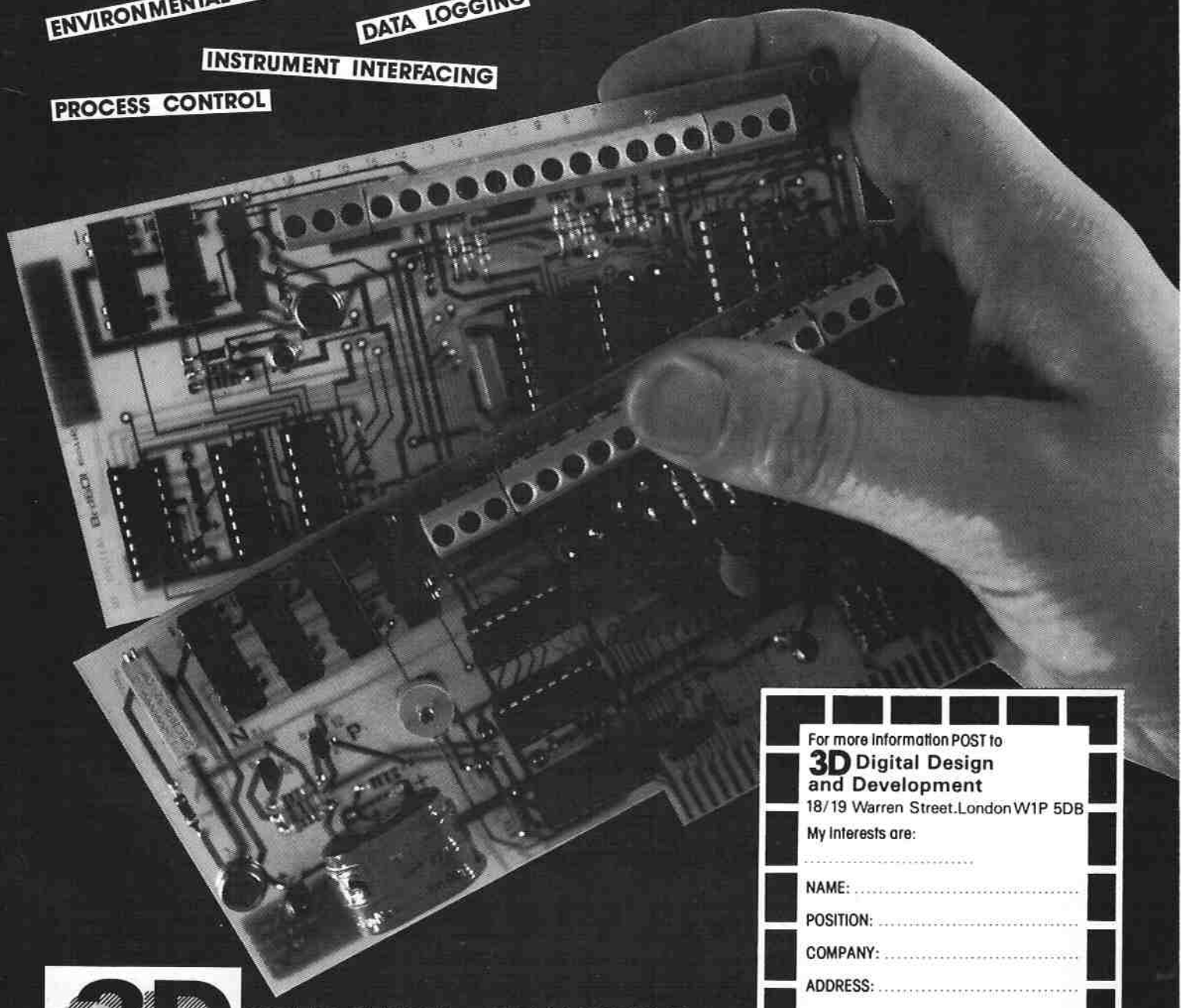

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GRAFORTH

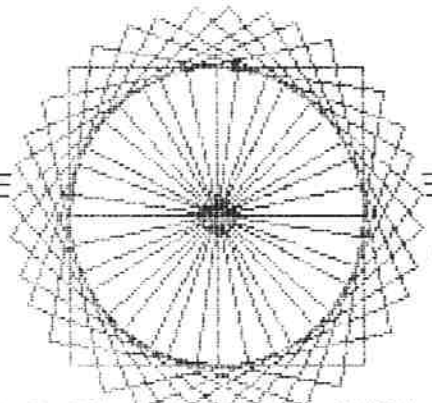


Fig 1

```
Ready 36 0 DO SQUARE 10 TURN LOOP
```

Putting the cart before the horse to good effect

By ROBERT BARR,
University of Manchester

IT is difficult to ignore the name of the author of a software package when it is as well known as that of Paul Lutus. This in turn leads to a sense of anticipation, for he is the author of such pace making packages as the original Applewriter – a simple though amazingly versatile word processing program at a budget price, and Apple World, a 3D graphics package that brought to the microcomputer the facilities for the creation and display of three dimensional images that had previously been available only on mainframes or minis with graphics terminals. This again was sold at a very low price and is still available.

These are only two examples from his prolific output of high quality software tools, which includes versatile assemblers as well as animation packages for games designers. However the microcomputer software market place is maturing fast and products have to offer more and better features at a reasonable price to compete. Paul Lutus has shown himself to be more than capable of keeping up with the pace of change. Applewriter II, for example, though costing twice as much as the original, is such a powerful and versatile word processor that it can compete with products that cost many times its price and includes its own word processing language to allow users to build in any facilities that may have been left out.

So what has all this got to do with GraForth? Well it means that we should expect a very well designed piece of software that offers a new and higher level of performance for its price, it should be superbly documented and it should achieve its objectives with a minimum of fuss.

GraForth certainly lives up to Insoft's claims (see panel) and should not disappoint anyone looking for ALL these capabilities – but there lies the rub. Few users are likely to want the entire package, and most of the individual capabilities of GraForth are available elsewhere.

Two dimensional graphics are largely conventional, though a FILL command allows rectangles to be filled with colour. Turtlegraphics are provided and the Squiral (Fig. 1) was plotted using the command below it. As in the LOGO language shapes can be defined as Forth words and then used in further commands. However all commands in Forth use Reverse Polish or Postfix notation which will be familiar to users of Hewlett Packard calculators or to Forth afficionados. Though I do not find this notation particularly difficult to use I have always had an aversion for it as it seems to put the cart of machine efficiency before the horse of programmer convenience.

The very presence of this notation is likely to dissuade users from using GraForth as a LOGO substitute with young children. While mentioning the

→

The publishers, Insoft, claim that:

GraForth is an embodiment of the Forth language for use on 48k Apple II systems having at least one disc drive. GraForth II is a fully compiled language. No code interpretation is required while a program is running. This makes GraForth II faster than Basic, Pascal or most other Forth versions presently available. Because GraForth II is principally intended for education and game applications, it uses an integer arithmetic system. Included in the GraForth II system are a three-dimensional color graphics capability, text displays of any size and color, and music features.

GraForth II is an excellent medium for instruction in Forth. Although fully compiled, GraForth II allows "immediate-mode" entries to the keyboard for experimentation and training. Error messages are provided during program compilation and running. The GraForth II compiler is very easy to use. Keyboard entries to GraForth II are compiled immediately then executed, so that the user doesn't need to be aware of the compiler. Program source files may be read from disc or memory. A text editor is provided for program development. There are three principal levels for communicating with GraForth II. The first is simply typing at the keyboard directly into GraForth II. The second is to use the provided text editor. Finally, for large projects, a word processor such as Applewriter (or any text editor that creates text files) may be used. Because GraForth II is completely modular, software routines may be developed, tested, then inserted as needed into other programs. GraForth II also allows the use of long English identifying labels (rather than numbers) so that program documentation and maintenance are made easy.

Here is a list of the principal features of GraForth II:

1. Fully compiled into 6502 machine language for maximum speed.

2. Draws three-dimensional colour images at high speed, for animation effects.

3. Displays lowercase text in any size and colour. Text and graphics may be mixed without limitation. The GraForth II system includes applications programs for the creation of 3D colour.

The GraForth II system is designed with human beings in mind. The language prefers words to numbers, and permits experimentation at the keyboard (unlike Pascal) for speedy program development. GraForth II has features not available in any other Apple II language at any price. It costs £50.

GRAFORTH

characteristics of Forth I should add that neither this nor the companion product TransForth are standard implementations of the Forth language as recognised by the Forth interest group.

The character graphics available with GraForth allow the use of user defined character sets and blockmode character display (combining a number of user

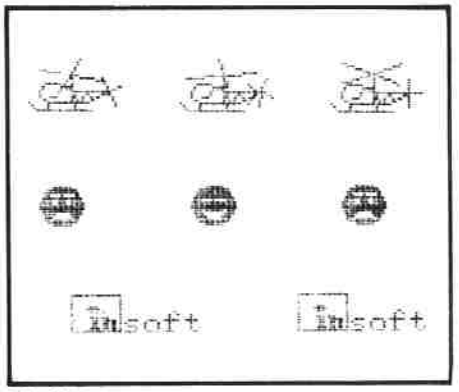


Fig 2

defined characters to produce a picture). Figure 2 shows faces, helicopters and the Insoft logo produced in this way. Character plotting is a good way of achieving powerful animation effects, but again these facilities are available elsewhere. The Applesoft Toolkit, a much underrated package which provides a full assembler, some Basic programming utilities and a character editor, matches many of GraForth's character graphics capabilities at a very reasonable price.

Apple Pilot, a really powerful implementation of an accepted educational language, also provides many of the two dimensional and character graphics capabilities of GraForth as well as a musical editor with similar capabilities to the one in this package. One unusual characteristic of the alternative character

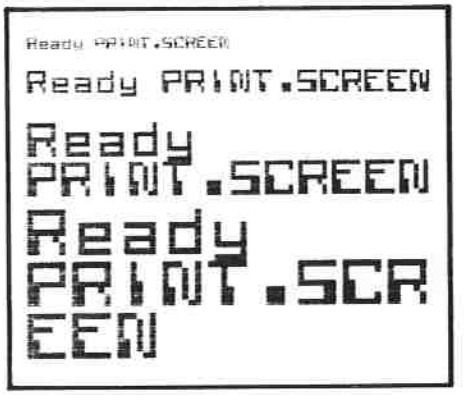


Fig 3

sets used in this package is the option to change the size of lettering, though this facility soon outstrips the limitations of the screen (Fig. 3). Again this facility is unusual, but not unique.

The three dimensional graphics are the usual wire frame style images with no hidden line removal, and the facilities in GraForth compare broadly with those in Apple World. Images can be edited line by line and then displayed, they can be rotated around any of three axes and moved along those axes as well as being scaled. The house (Fig. 4) illustrates these properties, but also shows the limitations of the wire frame technique. Paul Lutus again provides a program for rotating a profile to produce a solid object and illustrates this with his chalice (Fig. 5).

A music facility is better suited to sound effects than anything truly musical, and in addition to the usual ability to play a note of a given pitch for a given duration a voice can be selected to simulate the buildup and fading of a note when played on an instrument such as a piano.

The user manual provided with GraForth is outstanding, it is even more readable and contains more detailed information than the present generation of Apple manuals. That is high praise!

I believe that GraForth is an outstanding product, but one with no very obvious market. It is very fairly priced being advertised at between £50 and £65. But before you rush out and buy it you must consider whether you need all its facilities. I would recommend educational users to

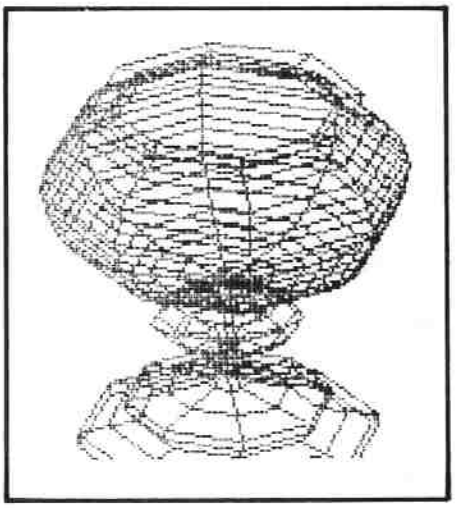


Fig 5

look very closely at Pilot before considering GraForth, because it is a very powerful tutoring system designed for the development of teaching materials and has particular strengths in text display and in dealing with textual responses and it is widely used in education in America. The hobbyist might do better with the Applesoft Toolkit or Apple World, both of which impose far less learning overhead.

The professional games developer is probably fixed up already, though he may well be interested, and Insoft claim to charge no licence fee and are clearly very interested in selling good software – but how many packages will that sell?

The largest potential market must lie with the more sophisticated and advanced hobbyist. GraForth will provide him with many months of challenging and enjoyable work.

First he will have to learn to think backwards to deal with the notation, but if his previous experience has been only in Basic he will be impressed by the wealth of control structures and the ability to define and use new words – a requirement of any serious language. He will soon be writing games programs that match much of the commercially available software and deriving great satisfaction from them.

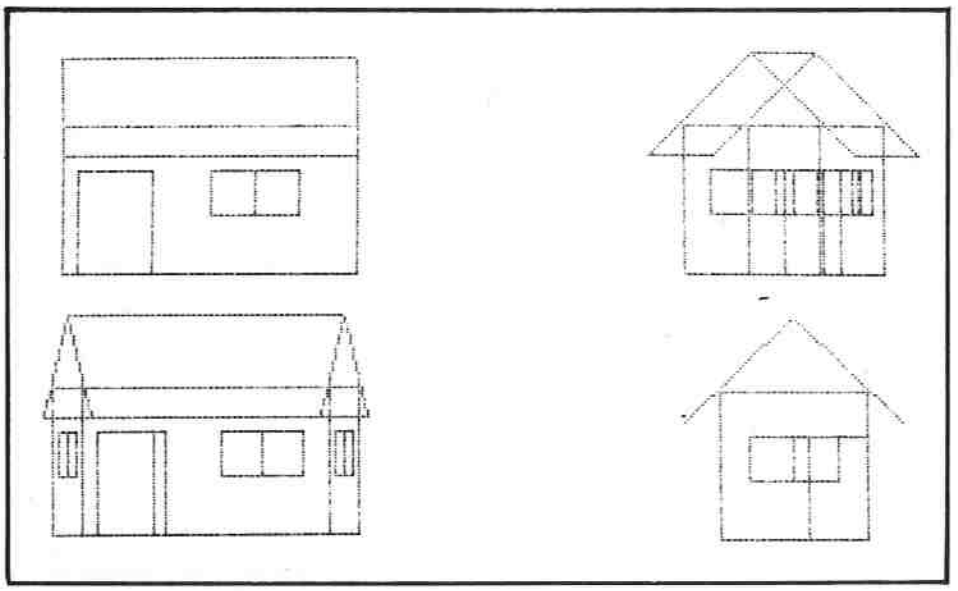
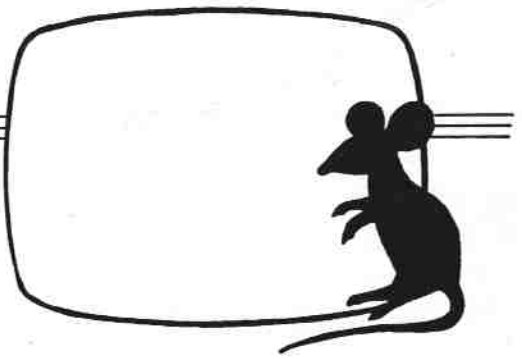


Fig 4



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LISA has arrived. And it's the biggest breakthrough in microcomputing since the first hand-built Apple emerged from a California garage in 1976.

That pioneering machine was the blueprint from which all the hundreds of different micros produced since then have been based.

But now there's Lisa, so revolutionary a concept that it's no exaggeration to say that the future of personal computing has only just begun.

The result of the many millions of dollars and hundreds of man years that Apple has been devoting to research and development is a giant leap forward in making computers far more human.

Lisa is the friendliest micro ever. The average non-user needs only 20 minutes to understand how to get it busily under way doing all the routine office tasks like writing reports, carrying out financial planning, scheduling projects, drawing graphs.

And when the boss is ready to go home it takes it upon itself – without human intervention – to tidy up and put everything it has been working on neatly back into its respective files until work starts again the next day.

The secret of Lisa lies not so much in its processing power but in its phenomenal 2mbyte operating system – which is 200 times larger than the Apple II's.

Not so much its appearance – it's smart and well-designed, but in no way radical in shape – but the magic it can conjure up on its screen.

That screen is the electronic equivalent of an office desktop. As in a well-managed office, at the start of the day it is neat and tidy.

The calculator is vital in the office and it should always be at hand. So it is with

By
DEREK MEAKIN
and
PETER BRAMELD

Lisa. It's there on the left, ready to use at any time, just below the digital clock and calendar.

On the right is a clipboard, on which you can temporarily store anything you are working on. There's also a filing cabinet, in which are folders containing all the jobs you may need to work on.

And at the bottom is a waste basket, where you can throw things away when you no longer need them.

Every need can be accessed by pointing to a little picture symbol on the screen. You do this by using a "mouse" – a square block of plastic that sits on your real desk alongside Lisa. By sliding it in any direction a tiny arrow moves around the screen.

Say you want to start a new job. Go to the filing cabinet and you find that in addition to various folders it contains packs of paper – graph paper, ruled paper, plain paper. Tear off the sheet you need, and get the job under way.

As your day's work progresses you are quite likely to find that your desk is getting rather cluttered. A spreadsheet of financial accounts is partly obscuring your ever-present calculator. Alongside that is part of a mailing list, or a letter that you haven't quite finished.

As in a normal office, you might have to break off a job to do something that has suddenly become more urgent. That's no problem with Lisa. You don't have to put your present job away, find another program disc, boot it . . .

In fact the word program no longer exists as far as Lisa is concerned. Apple researchers say that one of the problems of introducing a computer into the office environment is the language used to describe the different functions. The average office worker, they say, does not understand computer buzzwords. So programs are now simply called "office tools".

The six principal built-in applications are LisaProject (for scheduling jobs), LisaCalc (for financial planning without the complicated coding required by conventional spreadsheets like Visicalc), LisaWrite (for preparing reports and correspondence), LisaList (information management), LisaGraph (for creating business graphics) and LisaDraw (for setting up presentations).

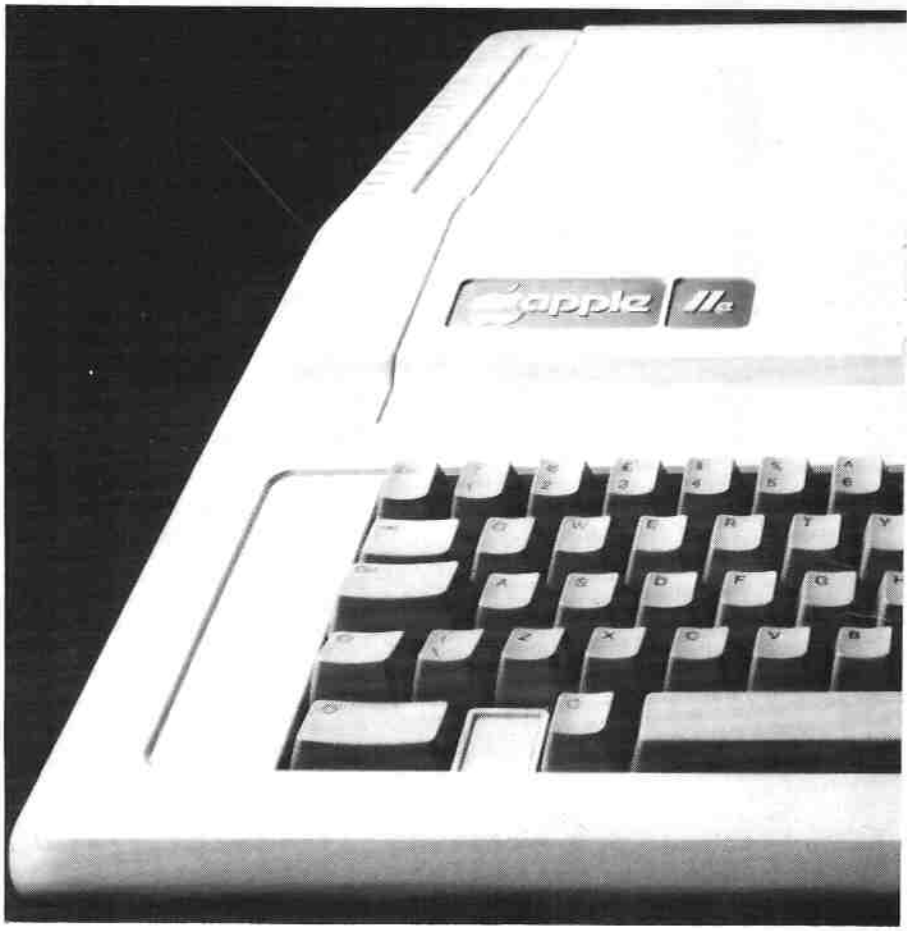
Apple say that using Lisa it is as easy to work with pictures as with words. Complicated drawings can be produced with a wide choice of shadings. Six typestyles can be used for text, in any size you want, and displayed in shadow, outline, italic, bold or underlined.

When you are drawing you can make a ruler materialise alongside the edges of the paper, so you know exactly where your work will be positioned.

Using just the mouse and the keyboard you can design a company letterhead,

LISA

- 16 bit machine using the Motorola 68000 processor.
- 1 mbyte RAM (two ½mbyte boards).
- 32k bit-mapped screen display.
- Two built-in double sided, double density 5¼in disc drives (861k each).
- Built in black and white monitor.
- Mouse pointing device for cursor control.
- Two RS232 serial ports.
- One parallel port.
- Three interface slots.
- 5mbyte Profile hard disc used for operating system software and user data, connected via parallel port.
- 2mbyte software-based operating system incorporating scheduling, financial planning, information management, report and correspondence writing, business graphics and drawing capabilities (can switch between functions at will).
- Convection cooled.
- Package includes sophisticated printer capable of producing mixed graphics and text copy.



complete with logo, type in your letter, add your signature and send it to the printer. Making sure, of course, that you store the letterhead and signature in your filing cabinet for instant use in the future.

Even using the keyboard provided for the UK market you can type letters in other languages, using correctly accented characters. The daisywheel printer that comes with Lisa has a 130-character wheel – the largest currently in production – so it can easily cope with the additional characters.

As Lisa is designed for business use it does not have any colour facility. A black and white monitor and two double-sided disc drives, each with a capacity of 861k, are built in. Also incorporated into the system is the Profile hard disc drive already used with the Apple III. This stores the operating system, which is 2mbytes in size, along with user data.

The keyboard is typist quality with a separate numeric keypad. It has full cursor control keys with auto repeat facility and is detachable from the main computer cabinet, enabling it to be positioned at the user's convenience.

Lisa is a 16-bit computer using the Motorola 68000 processor. It has 1mbyte of RAM, which is shared between the operating system and the user in a similar manner to Apple III. There any similarity between this and any other Apple product ends.

The 1mbyte of RAM is divided between two mother boards, resulting in a modular construction which improves reliability and leads to easy servicing. Convection cooling is used. Clever design of ventilation renders a fan unnecessary.

On board I/O facilities include two RS232 ports and one parallel port. However the Profile utilises the parallel port and the printer requires a card to be placed in one of the three I/O slots.

As Lisa cards offer multi-port facilities the provision of only three slots is not a limitation.

Those greedy for more memory are doomed to be disappointed. At 1mbyte, Lisa's memory is fully expanded.

Your view into the world of Lisa is through a 32k bit-map screen display. This gives a mixed text and graphics facility which has to be seen to be believed.

The standard green, amber or black display of most micros has no place here. If you are writing a letter the area of the screen which represents the piece of paper on which the letter is being written is white and the print is black. Just as if you were using a typewriter.

This rather simple description hardly does it justice. You can almost feel the texture and quality of the paper.

The LisaCalc display looks just like a real life accounts schedule. Because the display is bit-mapped, resolution takes on an entirely new meaning.

Any item on the screen may be changed in size or position, and a multitude of items may be displayed simultaneously. This feature has particular significance when you remember that what you see on the screen is exactly what you get on the printer. Hard copy for once means just what is says.

One revolutionary feature of the Lisa concept is that the use of the keyboard is minimal, except for purposes like word processing and the entering of original data you want Lisa to work with.

For up to 80 per cent of your work with Lisa you don't use the keyboard – you use the mouse. It's about the size of a packet of paper clips. Place your hand on it and move it in any direction you want over the surface of your desk.

This movement controls an arrow on Lisa's screen which is used to select or carry out the operations currently in hand from a variety of options.

When the arrow rests over the required area of the screen a single button on the top of the mouse is pressed, instructing Lisa to carry out the command of your choice. If it requires further clarification it will politely ask you.

And if you do happen to make a mistake at any stage you won't see any of the familiar SYNTAX ERRORs or Applesoft prompts on the screen. Instead Lisa has a variety of symbols available to alert you to the problem – and tell you what to do.

Lisa can still be used as a normal computer, in so far as you can program it yourself, and languages available when the machine is launched in the summer will be Pascal, Basic and Cobol. System monitor and assembler are also incorporated. But there is no CP/M or MP/M capability. Plans are also being made for

The enhanced Apple IIe

Apple IIe

- 64k RAM as standard (language card not required) expandable to 128k.
- Improved typewriter quality keyboard incorporating full cursor control, auto repeat and programmable function keys.
- True upper/lower case display (40 columns) with lockable shift key. (80 columns available with lower cost, simplified 80 column card.)
- Colour system now to European PAL standard (colour card not needed).
- Larger ROM-based operating system incorporating self test routine and keyboard initiated cold boot.
- Ten times improvement in reliability.
- Easier servicing (active components reduced from 127 to 41).
- Improved ventilation and cooling.
- Case screened against radio and TV interference.

IIe...a new life for an old Apple

THE five year old Apple II, which has been breaking new sales records every month despite taunts by jealous rivals that it was getting obsolete – has been given a kiss of life with the arrival of the enhanced Apple IIe.

With an improved keyboard, true upper and lower case screen display, 64k RAM and a built-in European colour system, it makes a worthy flag-carrier to ensure that the Apple II family, with its vast range of add-ons and software, will survive well into the '80s.

Easily the best-selling home and business computer in the world, with well over half a million in use, the Apple II led the way in expandability. More than 60 companies now produce hardware attachments, and an incredible 15,000 applications programs have been developed for the system.

With the IIe Apple have both improved the technology that goes into the machine and lowered the cost of manufacture – factors that will ensure demand is maintained for many years to come.

The most apparent – and most impressive – change is the new keyboard. This is of typewriter quality with regard to the spacing and pitch of the sculptured keys and conforms to ISO standards.

The actual size of the characters identifying each key is very small and offset to the upper left hand corner. This reduction in quality in the clarity of key marking would certainly not be welcomed by a short-sighted, one-finger occasional user, but is unlikely to trouble the average typist.

Full cursor control is available without the use of the ESC key. As with the Apple III, there are two programmable function keys, and TAB and DELETE can also be used as function keys. The keyboard is able to emulate the use of the paddles.

There is a duplicate paddle socket on the rear of the machine which has a standard DB9 connector, as well as internal paddle socket identical to that used in the old Apple II.

A cold boot – the equivalent of switching the machine off and on again –

→

the Apple III and II to be linked to Lisa on an office network.

Floppy disc access time is said to be up to eight times faster than previous Apple floppy drives. However, while it is child's play to switch from one application to another, movement between some of the modules on the machine we used for the Windfall test seemed to be slow compared to the rapid manipulation of data once it was on the screen.

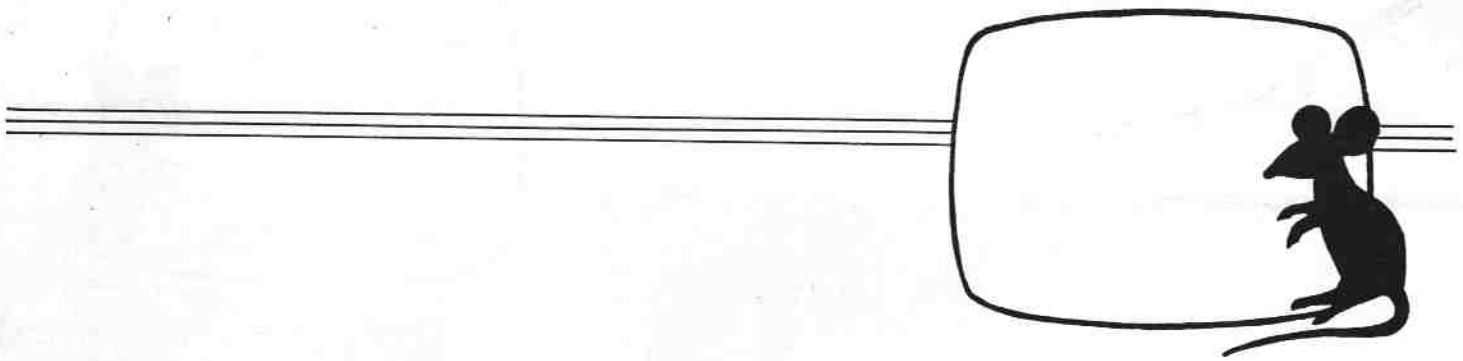
However we were told this was only because of the heavy debugging and fault-tracing equipment temporarily connected to the pre-release machine.

The original Apple II was the product of two man-years of development. The Apple III required 25 man-years. And in Lisa Apple has invested a staggering 200 man-years of development time.

The result is a significant breakthrough in revolutionising the office environment and making advanced computer technology available to the individual.

Lisa is very clearly pointing the way to the office of the future. And while it does a lot today that could never be done before, it will be doing much, much more tomorrow.

Software houses in Britain and the US are already hard at work planning to expand Lisa's capabilities in even more exciting ways. While Lisa already copes admirably with routine office tasks, new and highly specialised applications areas are now being developed, providing companies with even more advanced tools to be accessed by that remarkable mouse.



can be effected by pressing three keys simultaneously. This saves wear and tear on the on/off switch (although this has also been strengthened) and is particularly useful when working with copy-protected software.

The on-board ROM has been increased from 10 to 16k. It now incorporates a self-test routine which is activated in a similar manner to the cold boot by the simultaneous pressing of three keys.

Only RAM is tested, and if a fault is found the user is instructed to "contact your dealer". Well, some help is better than none at all, and there's no doubt your dealer will be pleased to see you.

The size and complexity of the mother board has been considerably reduced. It can easily be removed through the top of the machine, and the number of active components has been reduced from 127 to 41.

The 128 character keyboard has a standard European layout and is completely different from the one designed for the American IIe. There are now two character sets incorporated, one with a £ sign and the other with a hash sign, and the appropriate one is selected by means of a small switch under the machine. There are 21 keyboard variations for different European countries, available by purchasing the appropriate character generator chip.

The built-in colour system is now PAL standard, allowing the computer to provide colour on a normal PAL colour monitor, as well as on a domestic colour TV via a modulator (not supplied). The colour performance is said to be superior to that achieved with present colour cards.

The current consumption of the mother board has been considerably reduced and the power pack has been uprated. These two features, along with improved ventilation, means that the machine is much less prone to overheating. The Apple IIe is claimed to be 10 times more reliable than its predecessor.

A 64k memory is now standard, and this is achieved with only eight ROM chips. This makes a language card redundant, and Pascal and Integer can be run without hardware add-ons.

There are the usual seven interface slots. Adjacent to them is a red light to remind you that the power is on. It is a pity that removal of the lid does not automatically switch off the power. It is still all too easy to remove an interface card without remembering to first switch off – a traumatic experience which a card seldom survives.

The case is now fully screened to prevent radio and TV interference. The cable slots at the rear have been replaced by a metal plate with pull-out panels on which interface sockets can be rigidly mounted.

While it is good that the screen now shows true upper and lower case, it is disappointing to find that an 80-column display does not come as standard.

The new machine is still restricted to a 40 column display. However the mother board now has a large slot right in the middle intended for a very simplified 80 column card which is expected to cost about half the price of cards currently in use on the Apple II.

The simplified 80 column card contains 1k RAM and several other chips. All the rest of the firmware required is already in ROM. The same slot can also be used for a combined 80 column and memory expansion card which will give an 80 column display combined with 127k capacity.

The IIe is aimed firmly at the business market and the documentation provided reflects this. Only one simple tutorial manual, profusely illustrated in colour, comes with the machine, although more technical material is available at extra cost.

Two discs are included. The system master is similar to the one used on the Apple II, but it boots and loads Integer in three seconds instead of 10. There is also an excellent tutorial disc which, with the aid of impressive graphics, shows the way around the keyboard and various other features.

The IIe uses the same disc operating system as the Apple II, and it appears there are no immediate plans to uprate the disc storage facility in any way. The new Duofile and Unifile disc drives for the Apple III, reported in detail in last month's *Windfall*, are not compatible.

However software compatability is said to be very good. Out of 300 Apple II programs tested, 95 per cent worked normally. The other five per cent will require some modification.

Specially designed software already available includes Applewriter IIe and a version of Apple III's highly acclaimed Quickfile. Other software which will fully exploit this much-improved machine is currently being developed.

The Apple IIe has its limitations, lacking a real-time clock, built-in 80 column facility, or any improvement in disc storage, although these could well form the basis for future revisions.

What it does do is provide an up-to-date version of that basic Apple ingredient – reliability.

A key to open people's minds..

APPLE led the hardware revolution of the late '70s. Now, with Lisa, it is pioneering again – spearheading the software revolution of the '80s.

Lisa is designed as a completely new kind of personal computer, intended for the millions of managers, administrators, secretaries and professionals in medium to large organisations worldwide.

Apple forecast they are moving into an untapped market for the personal computer, aimed at the individual who daily creates, transfers, analyses and stores information in all its forms – text, numeric and graphic.

Today's micros require their users to familiarise themselves with computer techniques and adapt to the one-task-at-a-time limitations of the machine. Lisa intends to change all that – to accommodate to the way people deal with typical tasks and manipulate various forms of information.

While Apple III is an evolutionary version of the Apple II, Lisa is revolutionary – the first genuine personal office system.

As Apple UK's managing director Peter Cobb puts it: "We have been redefining the marketplace. Many business people still think of the personal computer as something to play Space Invaders on. We want to change that attitude.

"This is where Lisa comes in, because it makes personal computing so much easier. It is the key that will open people's minds as to what computers can really do."

Sales and marketing director Keith Hall said: "We want the office worker to reach for Lisa just as easily as he now reaches for his calculator or his telephone. It gives us a tremendous opportunity to develop a completely new market."

And Brian Reynolds, who will be responsible for Lisa sales in the UK, added: "This heralds the second wave of micros – a wave that will make personal computing understandable to millions of people.

"We can only do this by creating a system that is incredibly easy to use – in many ways to work as a human works. That is what Lisa does."

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By J.P. LEWIS

Opening files in Pascal

ALTHOUGH most Apple users are by now familiar with the ONERR GOTO and POKE 216,0 instructions that help in the design of crashproof Applesoft programs, the corresponding Pascal techniques have not yet been in the limelight. The program given below is an example of what can be done. The main task is to open a file. As a further chore the program then copies the file to the printer. (Note that this part has not been made crashproof.)

To help you trap errors, Pascal has a "compiler option" facility which allows you to tell the compiler how to behave. In the program the lines (*$I–*) and (*$I+*) send messages to the compiler to switch off (–) and then switch back on (+) the normal I/O error code generator.

As a result the program will not crash if you tell it to do some illegal I/O operation as it passes through the code between the (*$I–*) and the (*$I+*); instead, it will try to do what it is told, and then return a value in a variable called IORESULT to indicate what happened. The IORESULT will be zero for a legal I/O operation, and non-zero otherwise. (The normal error values are given on page 133 of the language reference manual.) It is up to you to make sure that your program can interpret and handle the IORESULT in a suitable way.

Having ensured that the attempt to open the file cannot cause a program crash, the next step is to give the operator a second (third . . .) chance. The neatest way of doing this is to make the routine for opening the file a Boolean function that becomes true if the file was opened safely, and is false if something went wrong. If you do this, your calling program merely needs to REPEAT absolutely nothing whatsoever until the file-opening function becomes TRUE.

```
program getfiledemo;
var
    line:string;
    infile,outfile:file of char;


procedure diskerrormesage(whicherror:integer);
begin
    case whicherror of
        0:Writeln('File opened successfully');
        3:Writeln('Illegal operation for that device');
        7:Writeln('Illegal filename (too long ?)');
        9:Writeln('Volume (Device) not on line');
       10:Writeln('File not found in directory');
       64:Writeln('Device error (unspecified)')
    end
end;


function fileopened:boolean;
var
    filename:string;
begin
    fileopened:=false;
    write('Give me the filename ');
    readln(filename);
    (*$I-*)
    reset(infile,filename);
    if (ioresult<>0) then begin
        filename:=concat(filename,'.text');
        reset(infile,filename)
    end;
    if (ioresult=0) then
        fileopened:=true;
    diskerrormessage(ioresult)
    (*$I+*)
end;


begin (*main program*)
    page(output);
    repeat
        (*nothing*)
    until(fileopened);
    rewrite(outfile,'#6:');
    repeat
        readln(infile,line);
        writeln(outfile,line)
    until (eof(infile));
    close(infile);
    close(outfile)
end.
```

No comment...

AS every good Applesoft programmer knows, you can speed up Applesoft programs by removing all REMs. Conversely, as every good Pascal programmer knows, there is absolutely no point whatsoever in removing comment lines from Pascal programs because the text is totally redundant once the compiler has finished its job.

Here, then, is a program which will remove all comments and blank lines from a Pascal program. There is, in fact, a good reason for using it, though you may not discover it until, like me, you become involved with modifying a program which is extremely well commented and 200 pages long – this wasn't from an Apple by the way.

If you do get handed such a task, you will find that all those wonderful helpful comments waste a huge amount of compiler time purely because the compiler has to read its way through them. Furthermore, if you decide to have the whole program in memory while editing it, the time taken by a simple search-and-replace becomes enormous.

This comment-stripper program, although it uses a slightly complicated method, is almost self-explanatory. The input file is read one character at a time,

PASCAL POINTERS

with a one character delay between reading and copying to the output buffer.

Since the instruction to read is READ rather than READLN, it is necessary to check for the end of each line, and insert an end-of-line token (chosen arbitrarily as chr (2)) into the output buffer. Because of the one character delay, it is easy to check for start-of-comment '(*', then read characters until the pair of end-of-comment markers '*)' appears; following which, it is necessary to read two more characters to go past the end-of-comment.

The line is then written one character at a time (up to, but excluding the end-of-line marker) to the output file. However, if the first non-space character in the line is the end-of-line token, the line is blank, and is not written.

Limitations: The program does no error-checking on I/O, and assumes that a line of your text-file contains no more than 254 characters.

```
program stripper;
var
    NEWLINE:char;
    thischar,lastchar:char;
    infile,outfile:file of char;
    line:array[0..254] of char;
    linelength:integer;

procedure openfiles;
var
    filename:string[15];
begin
    page(output);
    write('File to be read ?');
    readln(filename);
    reset(infile,filename);
    writeln;
    write('File to write to ?');
    readln(filename);
    rewrite(outfile,filename)
end;

procedure blankline;
var
    count:integer;
begin
    for count:=0 to 254 do
        line[count]:=' ';
    linelength:=0
end;

procedure putline;
var
    count:integer;
begin
    count:=0;
    repeat
        count:=count+1
    until (line[count]<>' ');
    if (line[count]=NEWLINE) then
        (*do nothing*)
    else begin
        for count:=1 to linelength-1 do
            write(outfile,line[count]);
        writeln(outfile)
    end;
    blankline
end;

procedure getnextchar(var whichchar:char);
begin
    if not(eoln(infile)) then
        read(infile,whichchar)
    else begin
        readln(infile);
        whichchar:=NEWLINE
    end
end;
procedure killcomment;
begin
    repeat
        lastchar:=thischar;
        getnextchar(thischar);
    until (lastchar='*') and (thischar=')')
end;

begin
    NEWLINE:=chr(2);
    blankline;
    openfiles;
    getnextchar(lastchar);
    repeat
        getnextchar(thischar);
        if (lastchar='(') and (thischar='*')
        then begin
            killcomment;
            getnextchar(lastchar);
            getnextchar(thischar)
        end;
        linelength:=linelength+1;
        line[linelength]:=lastchar;
        if (lastchar=NEWLINE) then
            putline;
        lastchar:=thischar
    until (eof(infile));
    close(infile);
    close(outfile,lock)
end.
```

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The Pert Apple and Visischeduler

This new business series looks at the well-tried and tested management techniques of Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT).

It will also examine some of the related software packages now available for the Apple. Unlike many off-the-shelf packages, these require an in-depth understanding of the technique before spending from £200 upwards on a package.

It is introduced by PETER THOMASON who has been concerned with management application and software for almost 20 years, many as consultant in charge of mainframe applications.

MANAGEMENT science is becoming increasingly important as an aid to solving business problems and applying computers to management.

Network analysis, better known as PERT (Project Evaluation and Review Technique) or CPM (Critical Path Method), is a management technique for planning, scheduling and controlling projects.

Over the years many systems with these special features have been developed, but they all have one thing in common: they use an arrow diagram to show the logical sequence of activities which must occur before a project can be completed.

For small, comparatively simple projects, time schedules can be estimated manually but for projects comprising 100 or more tasks, manual methods are time-consuming and costly.

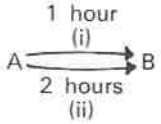
At this point the use of the computer for network analysis becomes economic, and when costs and resources have to be taken into account a computer becomes a neccessity.

Network analysis need not be limited to large scale projects such as missile development, aircraft design, bridge construction, shipbuilding or motorway construction (though these have attracted the most publicity).

It is used increasingly for installing new plant, moving a factory, modifying an existing product, changing a manufacturing process, launching a publicity campaign, controlling subcontract work or maintaining schedules.

Before looking at related packages it is important that any user of Apple CPM/PERT project management technique first has a firm grasp of both technique and applicability. After all, no matter how well intentioned, a software writer or manual writer naturally tends towards his own pet and thus writes in such a way that a reader who is new to the subject tends to naturally accept the writer's point of view.

The fundamental concept in CPM/PERT is shown in the diagram below:



The points A and B denote two positions or states, point A is the beginning, point B the end. To start one job (A-B(i)) the activity or job can begin up to one hour later than (A-B(ii)) and still complete at the same time as the latter. Similarly, if the first job begins at the same time as the second then the first will finish one hour earlier than the second.

The notation below is the convention used:

'A' – Preceeding event
'B' – Succeeding event
(i), (ii) – Uniqueness identifier
1, 2 hours – Duration

The event has a "time of occurrence" or point at which all previous activities are completed. Depending on whether the analysis is calculating earliest or latest times the time of occurrence is:

EPO – Earliest possible occurrence
LPO – Latest possible occurrence

The first step is to assess the time status of every activity, then to use these times to calculate EPO, LPO, and the earliest and latest start and finish times. Thus one adds:

EST – Earliest start time
EFT – Earliest finish time
LST – Latest start time
LFT – Latest finish time
to the list of mnemonics.

Lastly, in time analysis the calculation will determine the degree of latitude allowable for each activity in the example above. The calculation above was 2 hours – 0 hours – Duration (LPO-EPO-DUR'N) and gives 2-0-1=1 hour for A-B(i) and 2-0-2=0 hours for A-B(ii).

This example has a "critical" activity in A-B(ii) since any delay in its start time or increase in its finish time will delay the EPO of 'B'. For instance, if it starts half an hour late then it cannot finish until two and a half hours due to the LFT being the start time plus duration ($\frac{1}{2}+2=2\frac{1}{2}$).

Nevertheless the essential element for resource smoothing has been established, that at least one activity has what is called "float". This is the term used to describe an activity being able to move in time between an "Early" Date and a "Late" Date.

Time analysis works in two separate parts. These are called "forward" and "backward" passes. The forward pass calculates all the earliest times and the backward pass the latest times. The difference between the two less any duration figure is called "Total float".

In the example above a float was found when "working forward", ie from the beginning of the activity series, or network, to the completion point or end. *That* float is called the "early free float". The term "free" refers to the latitude permissible in time which does not affect any other activity time. It can be calculated but is not much used apart from to calculate the EPO and LPO times.

A computer program should work in much the same way as manual calculation:

1. Specify the EPO for the "Beginning" events (there may be more than one).
2. For each activity that begins at the event, set the activity EST to equal the EPO.
3. Add the duration to each EST to find the activity EFT.
4. Find the latest EFT of all activities which finish at an event and set the EPO of that event at this figure.
5. The "Free Early Float" is the difference between the EPO set in '4' above and each activity EFT.

This process is continued until all the EPOs have been set. The latest event set will usually be the "completion" or "finish" event on the network. Now reverse the process and find the latest allowable times. A similar calculation is used to find the latest free float. Finally each activity "total float" is found by TF=LFT-Dur'n-EST.

At this point it is possible to look at resources, but first a few misnamings found in popular literature. "Schedule" refers to an exact positioning of an activity

→

in time. In the CPM sense it should not be confused with time analysis results where simple arithmetic and logic are responsible for certain theoretically possible early and late times.

"Allocation of resources" is the acceptance of a resource usage should a specific time be used. This time could be the results of time analysis, resource analysis or arbitrary time impositions.

"Resource scheduling" refers to the activity being considered by the program together with all other activities as well as overall time constraints and resource availabilities so to produce the "schedule" according to decision rules to be selected according to user decisions and program capabilities.

Now to the practical application of scheduling models. Each model will represent a situation in terms of the activities involved. It will also show the interrelationships between activities.

Time analysis being performed, each model should then be able to reconsider its future schedule in terms of management impositions, resource availabilities etc. Having found the best schedule the program must produce this information in a suitable form.

Neither Microplanner nor Visischeduler for example has a completely flexible output system, although both have comprehensive routines which make this job easy for the new user. In practice probably only longer-term and more advanced users would need more selection and freedom in output specification.

Small projects and businesses could find Visischeduler useful if they have already bought the other Visicorp products.

Visischeduler takes up to 50 jobs (48k Apple) or 160 jobs (64k) and calculates start and finish dates, times for individual jobs of a project and the overall project start and finish times.

The jobs are allowed descriptions and up to nine resources. Only rate-constant resources can be used and in simple mode. One direct cost can also be applied to each job.

A schedule will calculate the resource usage and display, and a resource cost from usage in the form of salary levels for each of the nine types of "skills". Total costs are thus the manpower cost of salary plus direct job costs.

It will handle up to 999 time units which may be days or weeks, up to 24 holidays and dates in the range 1/1/1977 to 31/12/2065.

The Visischedule program treats projects as a series of jobs, each with a name, duration, capital cost, mix of manpower and an associated list of other jobs that must be completed first. The program uses the list of associated jobs to link all jobs together into an overall project.

The program generates four reports:

- The project description report, which contains a summary of the entire project including general description, skills, time and costs.
- The job description report, which gives a detailed listing of each job.
- The tabular report, which can contain a listing of any job parameter. The content and sequence of jobs is user defined.
- The schedule, which contains the time line schedule, the manpower and total costs and a legend explaining the schedule.

The program was tested with 80 column cards and although there was no interference it does not use their 80 column capabilities, which is a shortcoming since viewing resource smoothing is significantly more useful in the 80 column mode.

The DIF format is a standard file format that allows unrelated programs to share data. Thus, a file created by the Visischeduler program can be saved and read by other programs that support DIF. These programs can be written so that the Visischeduler program can be integrated into a broader set of personal computer tools.

Examples in the manual enable users to write their own software and to access Visischeduler data by independent means. Most uses are likely to be for Visicalc, Visifile and Visiplot/trend programs.

Visischeduler considers *one* manpower resource in its resource scheduling process, so only one of the maximum of nine "skill" categories will ever be taken into account during production of a schedule.

There is no provision for changing levels of resource availability for such "skill" regions as overtime availability.

Jobs are split arbitrarily and do not have minimum split or non-split capability.

It is assumed that a job requires the same level of resource for its entire duration. This would imply that many projects having variable resource requirements must be depicted as a number of discrete jobs instead of the single job.

In turn, the size of the network or number of jobs in the project would increase and the very moderate capacity, 50 (48k) or 160 (64k) jobs, would soon be consumed.

It appears odd that any programmer can "lose" the other few hundred jobs which are available to full disc-based Apple PERT/CPM software without concerning himself at the restricted usefulness of his core-based end result.

Written in UCSD Pascal – although not requiring Pascal capabilities in the users' Apple system – Visischeduler is so heavily user-friendly that I wonder if the writers weren't too willing to sacrifice capabilities and capacity in order to please the novice CPM user.

Using two drives, the program disc is in Drive 1 and the project data disc in Drive 2.

The software appears to construct what is know as a "precedence diagram" type of network – one in which the "events" or nodes have the data, the arrows merely being links, job to job.

This can be explored in detail by readers, although the biography given in Visischeduler isn't particularly concerned with precedence diagrams.

Broadly speaking, the program appears to be overlaid with resident housekeeping. It pulls data into core and swaps its program modules, presumably using a designated core area.

This is, of course, quick, but at the expense of the sort of facilities that the average project manager would demand. Even so, despite limitations, the small user may find that no networking and simple fast calculations are precisely what he wants.

When I first read the blurb on the box which arrived I took half a dozen headache tablets and decided to pretend I didn't have to review it.

This was partly due to a background of nearly 20 years mainframe experience with scheduling models, and partly due to what I felt to be very extravagant implied claims – "automatic project scheduling and costing", "the program that makes short work of planning and budgeting projects . . ." etc.

I was still attuned to large company production scheduling, although the principles and facilities used can be programmed for an Apple. So how could I give a straightforward account of Visischeduler at £189?

First its capacity – restricted. Second, its resources and cost capabilities – dare I say crude?

It is a very well presented package, even if limited. The manual is well written and takes the user through a large tutorial, leaving him or her with the reference section.

I would suggest that users be careful before they decide on its usefulness, and the comments at the start of this article should be seriously considered.

Provided that small project networks are used and detailed management controls are not needed, that budgeting can be left at a "manpower plus a single direct cost per job" level and that a larger project can be sensibly processed as a number of discrete projects (unrelated sub-projects), then why pay more?

However while the package has all the basic time analysis facilities,beyond that it is too basic to be useful for many projects.

I hope that the program writers revise their product to give the Apple user more facilities and the option of core-based (fast but restricted) and disc-based (slower but much more capable of facility expansion) selectable processing.

Next month: *Logic, drawing networks and time analysis. Plus a competition to put together a simple time analysis program in Basic. Someone who isn't a programmer but who understands enough about business management could win by specifying the logic in a short article for Windfall.*

patriarch of Constantinople (428-43)
Ne'storian *(adj)*
nĕt *(net) (n)* **1.** an openwork fabric of string, rope, wire, etc; mesh. **2.** a device made of net, used to protect or enclose things or to trap animals. **3.** a thin light mesh, fabric of cotton, nylon or other fibre.

'PLE IBM PC SIRIUS CP/M

Handling interrupts

By PETER GORRY

I WAS always taught that it is impolite to interrupt someone when they are talking. However there are times when you may want to do just that to the Apple. Fortunately, like some people I know, the Apple can carry on after the interruption as if nothing had happened. The object of this article is to explain how to handle interrupts to achieve such a transparent response.

Interrupts are usually generated by a peripheral that needs immediate attention (an exception is the BRK instruction – more of this later). For instance, the Apple could be controlling a process in real time and its actions initiated by interrupts from a timer, or perhaps action is only required for an alarm state – signalled by an interrupt. The advantage of using interrupts is that the Apple is free to be used for any other task in the meantime.

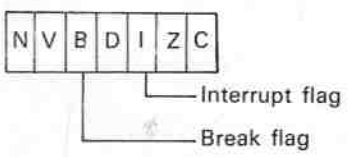
Interrupts are hardware features of the microprocessor and as such have priority over normal software operations. Everyone knows one such interruption, that caused by pressing the RESET key. This however is a drastic sort of interruption and can hardly be called transparent.

The 6502 microprocessor, the heart of the Apple, has two other types of interrupt: IRQ (Interrupt ReQuest) and NMI (Non Maskable Interrupt). These are similar, the only difference being that you can instruct the 6502 to ignore IRQs.

I shall first describe some general features of the 6502 interrupts and then describe how these are applied specifically to the Apple. Before we can deal with an interrupt we need to be aware of the various registers that the 6502 uses in operation. These are

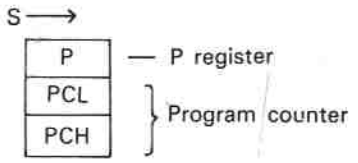
A	Accumulator
X,Y	Index registers
P	Processor status
PC	Program counter
S	Stack pointer

Two bits of the P register will be of special interest



When the 6502 receives an interrupt it first finishes the instruction it is doing and then, if the interrupt is an IRQ, looks to see if the interrupt disable flag is set. If the flag is 1, the interrupt is ignored.

For NMI or an interrupt flag of zero the 6502 automatically sets the interrupt disable flag to prevent other interrupts and stores the program counter and processor status register on the stack. This is necessary to ensure that the 6502 can resume where it left off after dealing with the interrupt.



Stack following interrupt

The next step is to jump to the interrupt handling routine whose start address is stored at $FFFE-FFFF for IRQ or $FFFA-FFFB for NMI. So far everything has been done automatically and we now come to the interrupt handling routine we must supply.

Since you will almost certainly use the accumulator and may use the X,Y registers, it is important to store these first so that their values can be restored just before returning from the interrupt. It is at this point that we must examine how the Apple treats interrupts.

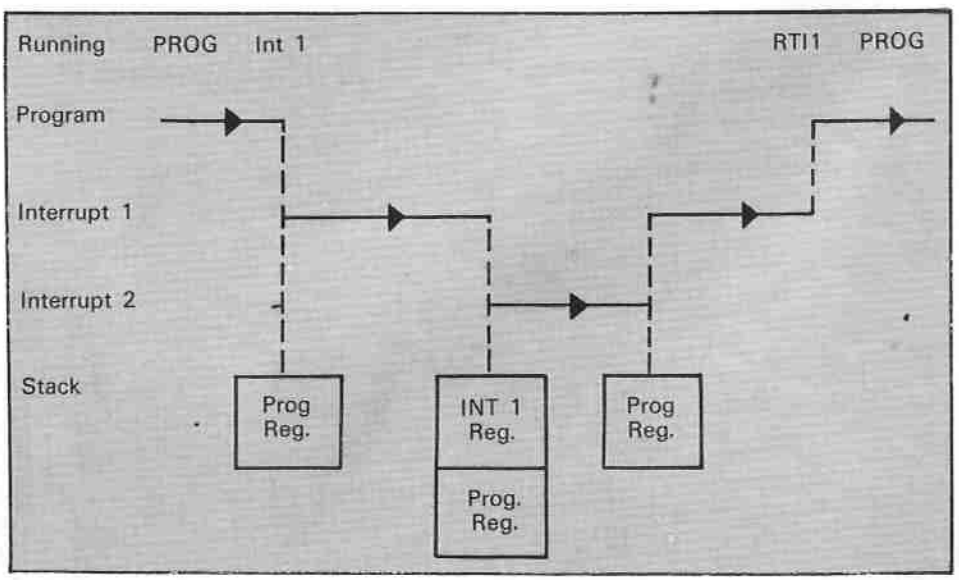
A look in the Apple manual will tell you that the start address for your IRQ routine is stored at $3FE-3FF, while for NMI there is a JMP instruction to your routine required at $3FB-3FD. It is thus clear that you get response "second hand" so to speak.

In the case of NMI this has little effect. If you look at $FFFA-FFFB you will find that it sends the microprocessor straight to $3FB as stated. This is not the case for IRQ. An examination of $FFFE-FFFF shows that the processor is sent into the depths of the monitor first ($FA40 for autostart ROM).

There is a routine here to decide whether the interrupt originated from an IRQ or the BRK instruction. The BRK instruction behaves in a similar manner to the IRQ except that it also sets the B flag of the P register before saving it on the stack. In order to be able to store the A, X and Y registers correctly it is necessary to examine what this routine does:

(i) It first stores the accumulator at $45.
(ii) It puts a copy of P from the stack into the accumulator.
(iii) It shifts this three times to the left to check the B flag.

If the B flag is zero it finally jumps to



Stack contents for multiple interrupts

the IRQ routine whose address is stored at $3FE-3FF, as stated. The important point here is that the accumulator now contains garbage and the value it used to have is already stored at $45. Thus your response to IRQ and NMI must be slightly different. We can now write the beginning and end of an interrupt handling routine:

```
STA $45    Use this line for NMI only
STX $46
STY $47
  .
  .  } Your code
  .
LDA $45
LDX $46
LDY $47
RTI        Automatically restores P and
           PC from stack.
```

$45-47 are the standard locations in the Apple for these registers. As such, they are used by some monitor routines, so this will obviously cause problems if they are overwritten by your program. You can obviate the problem by storing the registers at some other locations or, better still, storing them on the stack:

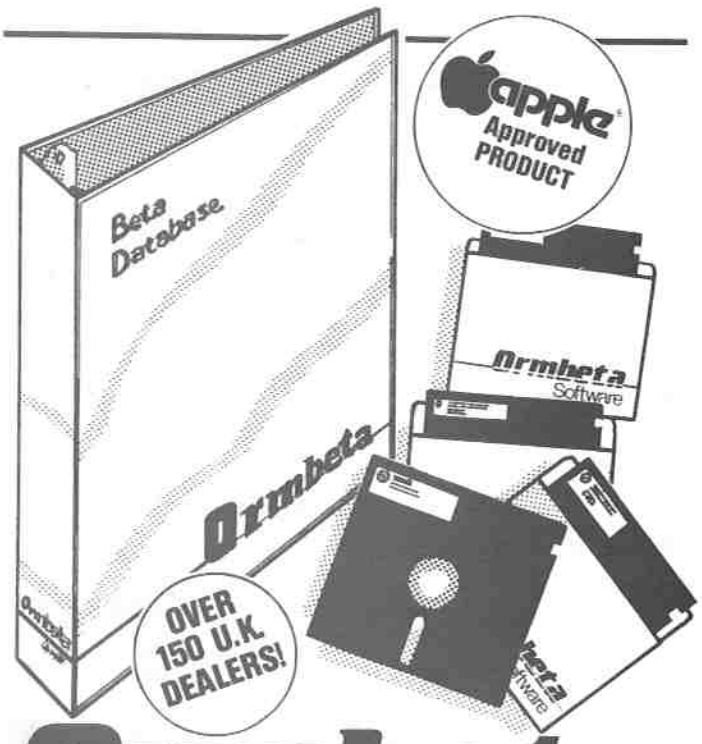
```
LDA $45    Use this line for IRQ only.
PHA        Put accumulator on stack.
TXA        X → A
PHA        Put X on stack.
TYA        Y → A
PHA        Put Y on stack.
  .
  .
  .  } Your code
  .
  .
PLA        Take     from stack.
TAY        A → Y
PLA        Take X from stack.
TAX        A → X
PLA        Take A from stack.
RTI
```

The interrupt disable flag remains set until the RTI instruction is obeyed. This will cause any IRQs that arrive during your interrupt routine to be lost. To avoid this, issue a clear interrupt disable CLI after storing the registers. A further IRQ would now interrupt your interrupt handling routine. If you again store the registers at $45-47 this will overwrite your earlier values, but if you have stored them on the stack everything will be fine.

It is thus possible to return transparently from layers of interrupts very easily.

The final problem is what if several different devices can generate interrupts, how do you know which to service? This is usually dealt with by having a polling subroutine as the first part of your routine (after saving the registers). This must either be capable of interrogating each device in turn to find out which one issued the interrupt, or the devices should set an associated memory location when they generate the interrupt. The polling routine then checks each location in turn to find out which device was responsible.

I hope this article has shown that handling interrupts really isn't difficult at all and that they needn't be a cause of irritation to you or the Apple.



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Franciscus Sylvius (died 1672), German anatomist. sym. *abbrev for.* **1.** symbol. **2.** *chem.* symmetrical. **3.** symphony. **4.** symptom.

sym·biosis *(n)* **1.** living together in harmony of two organisms of different kinds *esp* to their mutual benefit.

sym·biotic *(adj)* — symbiotic computer systems manufacturers of **symbnet** *(n)* **sym·bfile** *(n) (see over).*

Chips put the fish in their place

By JEFF BARRINGER

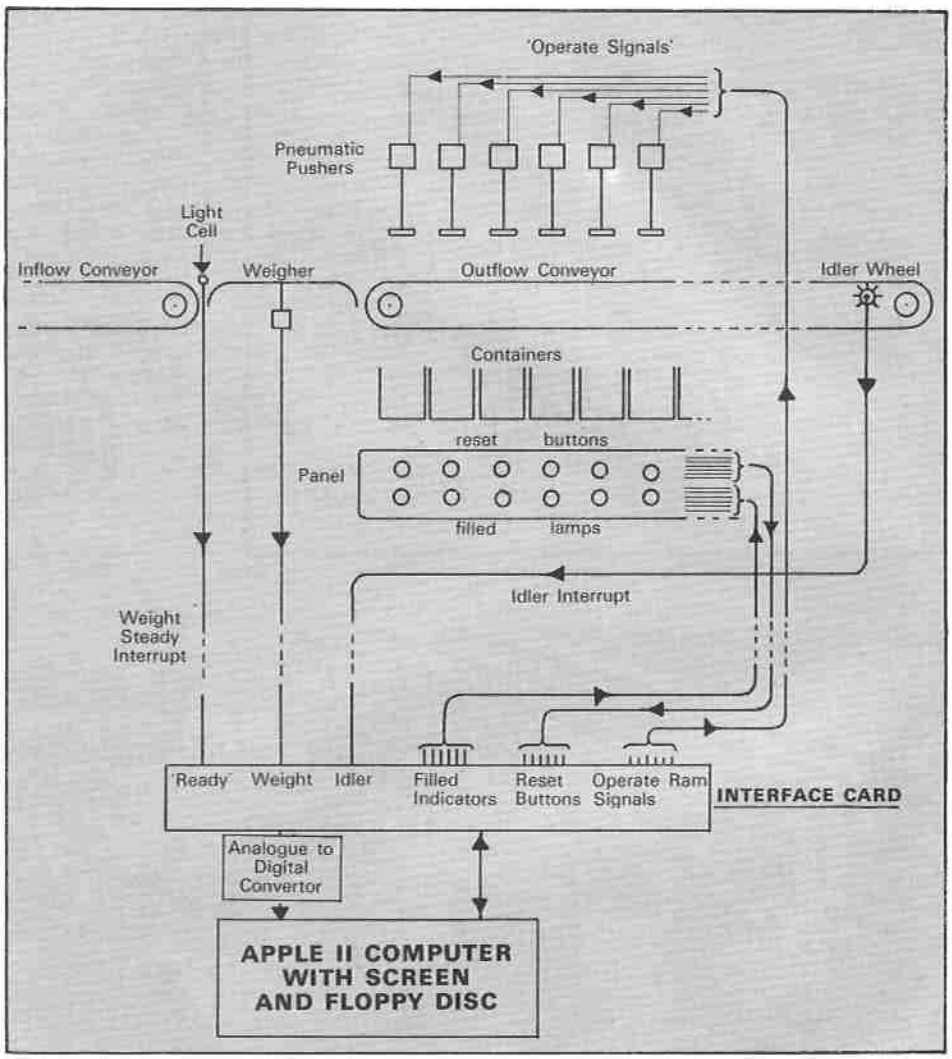
WHEN you visit a supermarket or freezer centre do you buy vegetables, meat or fish in "minimum weight" bags? If you do, you've no doubt caught on to the trick of taking a few bags to a convenient scale, weighing them to find the heaviest, and then buying that one.

As the manufacturer is obliged to supply goods packaged to the declared minimum weight there will inevitably be a certain amount of overweight. As each bag or box of produce is the same price then clearly if you can find an overweight one you will get more for your money and the vendor will lose slightly as he is paid a fixed price per unit by the supermarket.

An Apple is now being used to minimise such losses for the fish, meat or vegetable packer by controlling an In-Line Weight Grading System which weighs and grades each piece of produce as it passes through the machine and allocates it to a specific bag or box. It keeps cumulative totals and aims to achieve the precise minimum weight for that bag or box. Should an item take a container "over the limit," it is passed to one of 12 other bags being filled simultaneously, or else recycled through the system to try again.

The system *(see diagram)* consists of a delivery conveyor, in-line weigher, feed out conveyor, up to 13 containers, and the Apple sub-system. The latter comprises an Apple II 48k processor, screen, floppy disc drive, high speed analogue-to-digital converter and interfacing to ready lamps, reset buttons, and "boppers". The number of graded product containers has been reduced for simplicity.

The delivery conveyor moves a product onto the weigher piecemeal, and the process is monitored by a light sensor cell. An interrupt is generated to the Apple and then a machine code subroutine digitises the weight of the piece via the analogue-to-digital converter. This value is scaled to grammes and passed to a sophisticated algorithm in Basic which determines the container into which the product should be placed. The algorithm takes into account the statistical spread of pieces, chooses "penultimate" pieces which may be placed into a container but leave the container with a good chance statistically of being filled precisely next time, and "jackpot" pieces which will just fill a container. Once chosen, the destination of a piece is tagged in a machine code shift register along with all the other pieces on the conveyor at the same time.



System schematic

The shift register is clocked by pulses generated from the idler on the conveyor, and the pulses move pointers within the shift register until a given piece reaches its destination. At this point the Apple operates the appropriate pneumatic "bopper" to push the product into its target container. If it's a "jackpot" piece, a lamp flashes to alert the operator who removes the bag and pushes a reset button to indicate that an empty container is now in place. The Apple acknowledges this, switching off the lamp indicator.

The system, from Best Inspection of Newbury, reduces wastage and improves efficiency through faster grading. It is currently installed in a frozen fish factory in Scotland in an environment where the temperature varies from sub-zero centigrade upwards, humidity is very high with constant condensation and all equipment is kept clean by hosing down with water. Unprotected metal at the plant rusts within days and so extensive use is made of stainless steel. The Apple is housed in a hose-proof cabinet with a transparent door so that the display can be seen.

Another feature of the program is a simulator module which can generate a prediction of how the system would operate with any particular commodity.

A slight modification to the operating program allows the system to be used as a grader. In this mode, produce of similar weight within defined limits can be graded into containers instead of making the weight of each container the only criteria, as with the Makeweight System.

Jeff Barringer is director of Xcalibur Computers

symb/net. *(n) (see fig 1)* **1.** speedy long range, local area network system, capable of ranges to 9km. utilises fibre optic cable and semi conductor laser to transmit data; **symbnet** enables user to link various microcomputers supported by **symbfile** *(see below)* **2.** compatible with DOS,PASCAL,CP/M; transfer rate 50 k**HZ**, transmission power 800 micro W cable, fire retardant P.V.C. grade 32. signal insensitive to electrical noise, ∴ cannot be corrupted; system nucleus **symbfile** *(see below).*

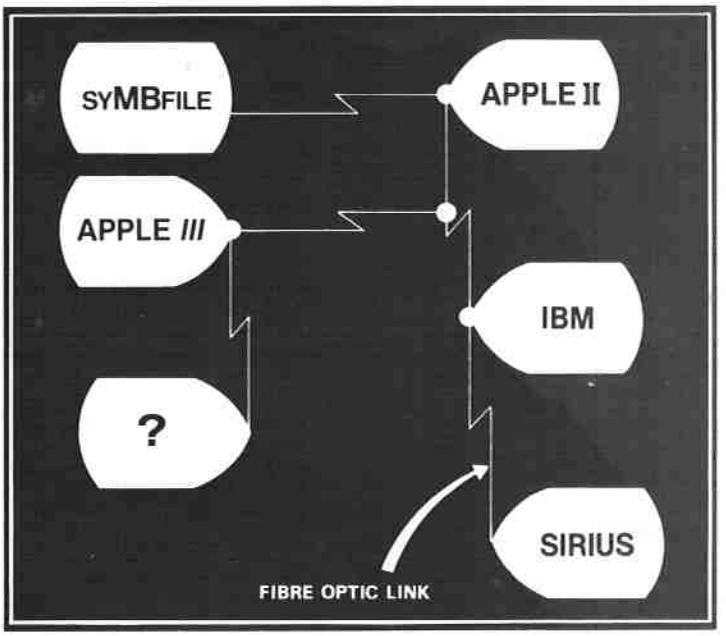


fig 1 **symb/net.**

symb/file *(n) (see fig II)* **1.** high capacity, high quality, $5\frac{1}{4}''$ Winchester sub-system, compatible with most microcomputers including APPLE II, ///, IBM PC, and SIRIUS. Other features include **2.** a cold booting facility **3.** one year's full warranty. Also available on **symbfile** top quality software including database, word processing and accounting packages. **4.** capacities range from 3-84 megabytes; average speed of access 90ms, 32 sectors per track; rotational speed 3600 (rpm) **5.** used at the centre of network system — **symbnet** (*see above*).

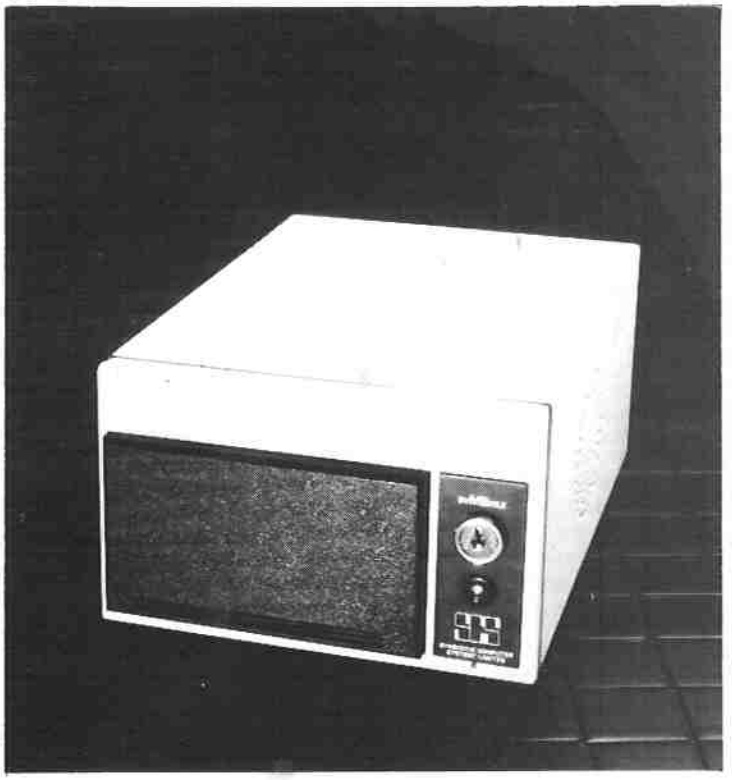


fig II **symb/file**

Date-stamping DOS helps your memory along

by G.J. FLANAGAN

WHEN programs are stored on disc it occasionally becomes difficult to establish which of a number of versions is the latest copy. While a good memory (human) may get round this problem it is also possible by a slight modification of DOS to insert the current day's date automatically alongside any program saved to disc.

The steps needed to let the system insert a date are:

☐ Provide the computer with the correct date.

☐ Modify Apple DOS to insert date as the last characters of the line in the catalog.

☐ Do a further modification to Apple DOS so that when a program name is searched for, the date is omitted.

All of these modifications can be carried out by fairly trivial alterations to DOS together with the insertion of a patch into one of DOS's empty spaces. Having done this then any future discs initialised using the modified version of DOS will automatically include this feature.

The easiest way of obtaining the current date is to run a program which asks the user to type the correct date whenever the disc is booted. If a copy of this data is stored within DOS itself then that date is there until the machine is switched off. The easiest way of achieving this is to create a small Basic program such as the one listed here which stores the date in eight locations within DOS.

Some of the vacant locations within DOS (obtained from Beneath Apple DOS by D.M. World and Pieter Lechner), are as follows:-

$BA69 to $BA95
$BCDF to $BCFF

Since the correct patch, together with the date, would fit comfortably within the 33 (decimal) locations between $BCDF and $BCFF these locations were chosen for both the small machine code program required and the eight locations storing the current date.

After some searching of DOS it was found that if a patch was added at $A069 at this point the file name buffer had just been cleared and the current program's name was written into the buffer. By adding a small program which copies the eight data locations from where they were stored at $BDF7 upwards into the DOS file buffer, which goes from $AA75 to $AA92, then as DOS continues the resultant data will be written into the file name on the disc.

The final patch was to the "find" routines which matched the current name with the names in the catalogue. These routines start at $B1C9 and at $B203 one finds the string length to compare to find whether a full match has been made.

Since normal DOS contains $1E, to allow for not matching the date found, this location should be changed to $16. To perform these changes to the current DOS in memory Program 2, which is simply a series of pokes, could be used. Any new disc initialised with this version of DOS in the machine then automatically uses the date stamping routines. In order to get the current date in to the machine then the Hello program should be Program 1. For those wishing to use a menu driven catalogue or an automatic program start then line 55 should be changed in program 1 to: 55 PRINT CHR$ (13); CHR$ (4); "RUN OLD STARTPROG".

A second way of modification can be carried out on existing discs. This involves a procedure similar to the "Master update" procedure where the DOS on the disc is rewritten with the modifications included. This requires a much longer machine code program which will access the first three tracks of the user DOS.

For a standard DOS 3.3 system these programs are available on receipt of an initialised DOS 3.3 disc together with a handling charge of £5. (Send to Rosslyn, 14 Station Road, Benton, Newcastle upon Tyne NE12 9NQ.)

With these modifications made to DOS 3.3 whenever a *new* program is saved to a disc the date will be added at the right hand side.

When modifying an older version of a program the date will only be changed if the old version is first deleted and then a new version saved, otherwise the old date will be left in the catalogue.

Programs such as FID, which make use of their own buffer areas, will not be affected by these modifications, but the date will not be added to files transferred using FID.

Your own programs which load and save text files and binary files using the standard DOS routines will automatically add the current day's date.

Remember therefore always to include as the Hello program Program 1. Otherwise the date area will be uninitialised and odd characters will appear in place of the date.

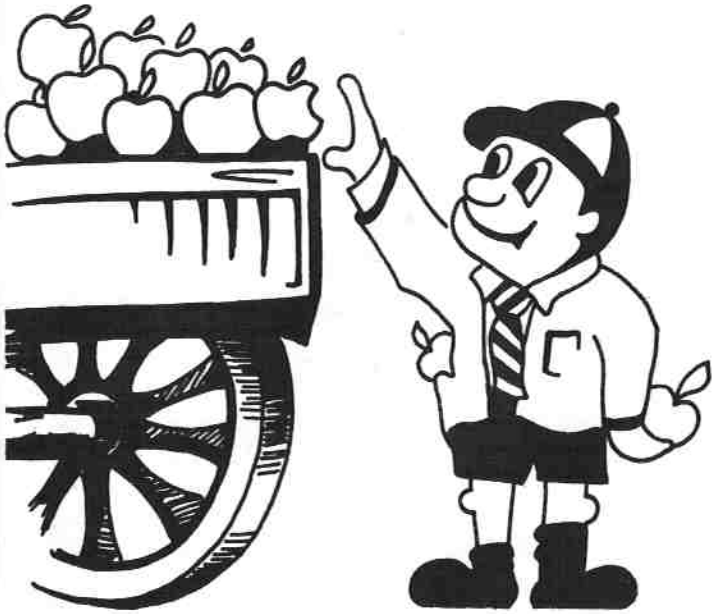
Program 1

```
10  TEXT : HOME : VTAB 10: HTAB 9
    : PRINT "PLEASE TYPE DATE: D
    D/MM/YY"
15 DM$ = ""
20  VTAB 10: HTAB 27: GOSUB 60: GOSUB
    60: PRINT "/";:DM$ = DM$ + "
    /": GOSUB 60: GOSUB 60: PRINT
    "/";:DM$ = DM$ + "/": GOSUB
    60: GOSUB 60
30  IF  LEN (DM$) <  > 8 THEN 10
40  FOR I = 1 TO 8: POKE 48375 +
    I, ASC ( MID$ (DM$,I,1))
50  NEXT
55  NEW
60  GET D$: PRINT D$;: IF D$ < "0
    " THEN  POP : GOTO 10
63  IF D$ > "9" THEN  POP : GOTO
    10
65 DM$ = DM$ + D$: RETURN
```

Program 2

```
10  TEXT : HOME : VTAB 10: HTAB 5
    : PRINT "DATE STAMP DOS MODI
    FIER"
20  VTAB 12: PRINT "NOW MODIFYING
     DOS IN MEMORY. ANY DISK": PRINT
    : PRINT "INITIALISED WILL NO
    W PERFORM AUTOMATIC"
30  PRINT : PRINT "DATE STAMPING"

40  POKE 45571,22: REM   LENGTH O
    F PROGRAMME NAME
50  POKE 41065,76: POKE 41066,223
    : POKE 41067,188: REM  INSER
    T PATCH INTO NAME BUFFER CLE
    AR ROUTINE
60 P = 48351
70  READ D: POKE P,D:
80 P = P + 1: IF D <  > 160 THEN
    70
90  PRINT : PRINT "THE DOS IN MEM
    ORY HAS BEEN MODIFIED": END
100  DATA  162,8,189,247,188,9,12
    8,157
110  DATA  138,170,202,208,245,17
    2,95
120  DATA  170,76,108,160
```



Applecart

Monthly review of
Apple in education

Reducing teacher prompts to a minimum

By MICHAEL HAMBLY

THERE is a lot to be said for interfering as little as possible with a child and his Apple. Many adults and teachers new to micros unconsciously assume a direct involvement in a game or program where their "teaching" is secondary to their own activity – and where the child quickly steps aside to allow the adult to direct matters. A gentle prompt in the background is often all the encouragement and help a child needs.

Board Game is graded to cater for first and second year primary children, but it will appeal to older children (and even those adult enthusiasts mentioned above) who relish the interaction with a computer.

It is a long program, but I have explained what I have done and where, and given a short routine which enables a prospective user to assess the value of the game before committing himself to a lengthy typing session. The game tasks can also be altered to suit individual requirements and syllabuses.

The game can be played by one to four people. After asking for the number of players the computer arranges the playing order (an unnecessary luxury perhaps). Each player is then asked for their Ladybird reading level (1-6) and their maths level (1-10).

A 10x8 board is drawn using low resolution graphics and each player plotted at the starting square (top left). The first to reach the last square bottom right (lines 500-1160) is the winner. The players take turns with the computer giving the moves (2000-2170), asking the player to press RETURN, and generating a random number between 1 and 6. It either displays this like a dice or sounds the appropriate number of bleeps (3000-3250).

The player must enter the answer – an incorrect response leads to a penalty (4000-4030). These variations make it necessary for the player to concentrate, and movement whether forwards or backwards is covered by lines 5000-5160. Sixty of the 80 squares require tasks to be done, but this number can be changed if required (1200-1240).

Three different tasks are covered at present, and this number can be changed at lines 140 and 2120. Line 2120 is responsible for sending the program to the appropriate task subroutine. Although there are only three different tasks at present I have set TASKS = 5 (line 140) so that tasks can be given in the ratio 3:1:1 (line 2120) to give greater emphasis on the first task which is spelling.

The tasks are:

Spelling (lines 10000-10150)

An array WD$( ) is filled with all the Ladybird keywords from reading levels 1 to 6 (50000-50130). When a player encounters this task they are given a few seconds to view a word (how long depends on reading level) before being asked to type it in.

Maths (11000-11230)

An addition or subtraction sum: For maths level 1 addition sum will add up to no more than 7. For level 10 no more than 70. (See line 11000 to change this.) Subtraction sums have a similar grading and a test is made (11100) to make sure the answer will always be positive.

Guess number (12000-12120)

Computer generates a number and allows a certain number of guesses, e.g. Maths level 1 – number between 1 and 10 – guesses allowed 4. Maths level 10 – number between 1 and 100 – guesses allowed 7.

Hopefully this will encourage children to discover for themselves how to do a binary search! In this routine there is no penalty for not getting the number, but if the number is guessed correctly the player gets an extra turn.

ANSWER$ is used as a flag to penalise wrong answers in a spelling or maths question. ANSWER$ = "CORRECT" is set at line 2010. However if on return from a task routine

→

ANSWER$="WRONG" a backward penalty move is generated (2130).

To make each task recognisable before it is given, and to make the game a little more interesting, a little jingle is played before each task. The music for these is contained in lines 50140-50330. More could be done along these lines, such as having a jingle for correct answer and a drone for wrong.

During the program delays are necessary to allow players to read messages, I've done this in two ways:

1. Subroutine 62000 – delay until return is pressed.

2. Subroutine 63000 – delay depending on the value of PAUSE which always returns with a value of 1000.

As this is such a long program here is a suggestion for the minimum entry requirements for program to function.

This cuts down the program by half but is sufficient to see if you find it useful.

100-570 (But change 140 to . . 140 TASKS = 1)
670-3000 (but leave out line 760)
3200-10150
50000-63100

When you have the program fully up and running more tasks can be added by changing lines 140 and 2120 and adding the appropriate subroutines at 13000, 14000 etc.

To encourage children to aim for higher levels during play, points are also awarded for each correct answer to a task, e.g. line 10110 (higher points for higher levels). At the end of the game the points are displayed so that a child who lost on the board might win on points. Hopefully this will prevent too much arguing between children of different abilities. Points can be seen during the game by pressing CTRL-C, and that is the function of line 760. Points so far will be displayed and an option given to leave the game.

The PRINT statements in lines 4000, 4020, 10120 and 12100 also include some CTRL-G's to draw attention to the message when it is printed.

```
10  REM  COPYRIGHT(C) M HAMBLY
20  REM        AUGUST 1982
30 :
70 :
80  REM    *** INITIALISATION AND
     READING DATA ***
90 :
100  TEXT : HOME : VTAB 10
110  PRINT "PREPARE FOR THE GAME
     ....."
130 ST = 1:PAUSE = 1000
140 TASKS = 5
150  DIM BOARD(79)
160  DEF  FN X(X) = 2 + (X -  INT
     (X / 10) * 10) * 4: DEF  FN
     Y(Y) =  INT (Y / 10) * 5
170  FOR I = 768 TO 786
180  READ X: POKE I,X
190  NEXT
200  DATA     173,48,192,136,208,
     4,198,7,240,8,202,208,246,16
     6,6,76,0,3,96
210  GOSUB 50000: REM  *** READ W
     ORDS FOR SPELLING ***
497 :
498  REM  *** DETAILS ABOUT PLAYE
     RS AND ARRANGE PLAYING ORDER
      ***
499 :
500  INPUT "HOW MANY TO PLAY (1-4
     ) ? ";PLAYERS
510  IF PLAYERS < 1 OR PLAYERS >
     4 THEN  PRINT "ONLY 1 TO 4 P
     LAYERS ALOWED ": GOSUB 63000
     : GOTO 500
520  PRINT : PRINT
530  FOR I = 1 TO PLAYERS
540  PRINT "NUMBER "I" YOUR NAME
     PLEASE ";
550  INPUT PN$(I)
560 PP(I) =  RND (1)
570  NEXT
580  FOR I = 1 TO PLAYERS - 1
590  IF PP(I) > PP(I + 1) THEN 62
     0
600 TEMP$ = PN$(I):PN$(I) = PN$(I
     + 1):PN$(I + 1) = TEMP$
610 TEMP = PP(I):PP(I) = PP(I + 1
    ):PP(I + 1) = TEMP:FLAG = 1
620  NEXT
630  PRINT
640  IF FLAG = 1 THEN FLAG = 0: GOTO
     580
650  PRINT "THE ORDER I HAVE PICK
     ED FOR YOU TO PLAY IN IS :-"
660  PRINT
670  FOR I = 1 TO PLAYERS
680  PRINT "NUMBER "I" IS "PN$(I)

690  INPUT "LADYBIRD READING LEVE
     L PLEASE (1-6) ";RLEVEL(I)
700  IF RLEVEL(I) < 1 OR RLEVEL(I
     ) > 6 THEN  PRINT "PLEASE GI
     VE A NUMBER BETWEEN 1 AND 6
     ": PRINT : GOSUB 63000: GOTO
     690
710  INPUT "NOW YOUR MATHS LEVEL
     (1-10) ";MLEVEL(I)
720  IF MLEVEL(I) < 1 OR MLEVEL(I
     ) > 10 THEN  PRINT "PLEASE G
     IVE A NUMBER BETWEEN 1 AND 1
     0": PRINT : GOSUB 63000: GOTO
     710
730  PRINT
740  NEXT
750  POKE 34,20: HOME
760  ONERR  GOTO 40000
997 :
998  REM  *** GRAPHING GAME BOARD
      ***
999 :
1000  GR : COLOR= 3
1010  FOR Y = 4 TO 40 STEP 5
1020  HLIN 0,39 AT Y
1030  NEXT Y
1040  FOR X = 0 TO 36 STEP 4
1050  VLIN 0,39 AT X
1060  NEXT X
1097 :
1098  REM    *** PLAYERS STARTING
      PLACES AND NOTES TO PLAY WH
     EN MOVING (PM(I)) ***
1099 :
1100 PY(1) = 0:PC(1) = 12:PM(1) =
     232
1110 PY(2) = 2:PC(2) = 1:PM(2) =
     184
1120 PY(3) = 1:PC(3) = 2:PM(3) =
     208
1130 PY(4) = 3:PC(4) = 9:PM(4) =
     172
1140  FOR I = 1 TO PLAYERS
1150  COLOR= PC(I): PLOT  FN X(PN
     OW(I)), FN Y(PNOW(I)) + PY(I
     )
1160  NEXT I
1197 :
1198  REM  ** SQUARES FOR TASK **

1199 :
1200  FOR I = 1 TO 60
1210 RBOX =  INT ( RND (1) * 80)
1220  IF BOARD(RBOX) <  > 0 THEN
     1210
1230 BOARD(RBOX) =  INT ( RND (1)
      * TASKS + 1)
1240  NEXT I
1995 :
1996 :
1997  REM  *** RUN GAME ***
1998 :
1999 :
2000  FOR I = 1 TO PLAYERS
2010 ANSWER$ = "CORRECT"
2020  PRINT : PRINT
2030  PRINT PN$(I)"'S MOVE .... P
     RESS RETURN"
2040  INPUT KB$
2050 DICE =  INT ( RND (1) * 6 +
     1)
2060  GOSUB 3000: REM   ** DICE R
     OUTINE **
2070  PRINT : PRINT "WELL "PN$(I)
     " HOW MANY MOVES ";
2080  INPUT MOVES$
2090 MOVES =  VAL (MOVES$)
2100  IF MOVES = 0 THEN  PRINT "S
     ORRY I DIDN'T CATCH THAT ": GOTO
     2070
2110  IF MOVES <  > DICE THEN  GOSUB
     4000: GOTO 2130: REM     **
     PENALTY SUBROUTINE (FOLLOWED
      BY MOVE) **
2120  GOSUB 5000: REM     ** MOVE
      PLAYER **
2130  ON BOARD(PNOW(I)) GOSUB 100
     00,10000,10000,11000,12000
2140  IF ANSWER$ = "WRONG" THEN  GOSUB
     4010
2150  IF PNOW(I) = 79 THEN  GOTO
     30000: REM  ** THE WINNER **

2160  NEXT
2170  GOTO 2000
2997 :
2998  REM  ** DICE ROUTINE **
2999 :
3000 WHICHDICE =  INT ( RND (1) *
     2 + 1)
3010  GOSUB 63000: HOME : POKE 33
     ,8: POKE 32,32: PRINT
3020  ON WHICHCHOICE GOSUB 3100,3
     200
3030  GOSUB 63000
3040  POKE 32,0: POKE 33,40: HOME

3050  RETURN
3097 :
```

```
3098  REM  ** DISPLAY DICE **
3099 :
3100  ON DICE GOSUB 3120,3130,314
     0,3150,3160,3170
3105  GOSUB 63000
3110  RETURN
3120  PRINT : PRINT " *": PRINT :
      RETURN
3130  PRINT "*": PRINT "  *": RETURN

3140  PRINT "*": PRINT " *": PRINT
     "  *": RETURN
3150  PRINT "* *": PRINT : PRINT
     "* *": RETURN
3160  PRINT "* *": PRINT " *": PRINT
     "* *": RETURN
3170  PRINT "* *": PRINT "* *": PRINT
     "* *": RETURN
3197 :
3198  REM  ** BLEEP DICE **
3199 :
3200  PRINT : PRINT "COUNT": GOSUB
     63000
3210  FOR J = 1 TO DICE
3220  POKE 6,255: POKE 7,255: CALL
     768
10080  HOME
10090  PRINT "NOW "PN$(I)" TYPE W
     ORD"
10100  INPUT ANSWER$
10110  IF ANSWER$ = WD$ THEN  PRINT
      "GOOD "PN$(I): GOSUB 63000:P
     TS(I) = PTS(I) + RLEVEL(I) *
     15: RETURN
10120  PRINT : PRINT "SORRY "PN$(
     I)" THAT WAS WRONG": PRINT "
3230  FOR M = 1 TO 400: NEXT
3240  NEXT
3250  RETURN
3997 :
3998  REM     ** PENALTY SUBROUTIN
     E (FOLLOWED BY MOVE) **
3999 :
4000  PRINT "WRONG "PN$(I)" ... W
     RONG "
4010 PENALTY =  INT ( RND (1) * 4
      + 1):DICE =  - PENALTY
4020  PRINT "YOU GO BACK "PENALTY
     " PLACES"
4030 PAUSE = 2000: GOSUB 63000
4997 :
4998  REM   *** MOVE PLAYER ***

4999 :
5000 PNOW(I) = POLD(I) + DICE
5010  IF PNOW(I) < 0 THEN PNOW(I)
      = 0
5020  IF PNOW(I) > 79 THEN PNOW(I
     ) = POLD(I): PRINT "SORRY MU
     ST BE EXACT NUMBER TO WIN"
5030  IF POLD(I) > PNOW(I) THEN S
     T =  - 1
5040 FLAG = 0
5050  FOR J = POLD(I) TO PNOW(I) STEP
      ST
5060  COLOR= PC(I): PLOT  FN X(J)
     , FN Y(J) + PY(I)
5070  PLOT  FN X(J), FN Y(J) + PY
     (I)
5080  IF FLAG = 1 THEN  POKE 6,PM
     (I): POKE 7,100: CALL 768
5090  COLOR= 0: PLOT  FN X(J), FN
     Y(J) + PY(I)
5100 FLAG = 1
5110  NEXT
5120  COLOR= 0: PLOT  FN X(POLD(I
     )), FN Y(POLD(I)) + PY(I)
5130  COLOR= PC(I): PLOT  FN X(PN
     OW(I)), FN Y(PNOW(I)) + PY(I
     )
5140 POLD(I) = PNOW(I)
5150 ST = 1
5160  RETURN
9997 :
9998  REM   ** TEST LADYBIRD KEY
     WORDS ROUTINE ***
9999 :
10000  FOR MUSIC = 1 TO 7
10010  POKE 6,NR(MUSIC): POKE 7,1
     00: CALL 768
10020  NEXT
10030 WD$ = WD$( INT ( RND (1) *
     NWDS(RLEVEL(I)) + 1)): REM
        ** CHOOSE WORD FROM EASI
     EST UP TO LEVEL **
10040  PRINT : PRINT "A FEW SECON
     DS TO VIEW WORD"
10050  GOSUB 63000
10060  PRINT : PRINT  SPC( 12)WD$

10070 PAUSE = (8 - RLEVEL(I)) * 4
     00: GOSUB 63000
     NOW LOOK AND REMEMBER .... "
     WD$
10130 ANSWER$ = "WRONG"
10140  GOSUB 62000
10150  RETURN
10997 :
10998  REM  *** SUMS ROUTINE ***
10999 :
11000  HOME :HIGH = 7 * MLEVEL(I)

11010  FOR MUSIC = 1 TO 26: POKE
      6,MN(MUSIC): POKE 7,ML(MUSIC
     ) * 16: CALL 768: NEXT
11020 X =  INT ( RND (1) * HIGH)
11030 Y =  INT ( RND (1) * HIGH)
11040 SUM =  INT (2 *  RND (1)) +
     1
11050 FLAG = 1
11060  ON SUM GOSUB 11100,11170
11070  IF FLAG = 0 THEN 11020
11080  IF ANSWER$ <  > "WRONG" THEN
     PTS(I) = PTS(I) - 10 * MLEVE
     L(I)
11090  GOSUB 62000: RETURN
11100  IF X < Y THEN FLAG = 0: RETURN

11110  PRINT "   "X" - "Y" = ";
11120  INPUT ANS
11130  IF ANS = X - Y THEN  PRINT
     "WELL DONE": RETURN
11140  PRINT : PRINT "SORRY WRONG
      ANSWER, THE CORRECT ANSWER
      IS:-      ";
11150  PRINT "   "X" - "Y" = "X -
     Y
11160 ANSWER$ = "WRONG": RETURN
11170  IF X + Y > HIGH THEN FLAG =
     0: RETURN
11180  PRINT "   "X" + "Y" = ";
11190  INPUT ANS
11200  IF ANS = X + Y THEN  PRINT
     "CORRECT  ": RETURN
11210  PRINT : PRINT "SORRY WRONG
      ANSWER, THE CORRECT ANSWER
      IS:-      ";
11220  PRINT "   "X" + "Y" = "X +
     Y
11230 ANSWER$ = "WRONG": RETURN
11997 :
11998  REM  *** GUESS COMPUTER'S
     NUMBER ***
11999 :
12000 TP = 0:HIGH = 10 * MLEVEL(I
     ):NUM =  INT ( RND (1) * HIG
     H + 1)
12010  FOR MUSIC = 1 TO 14: POKE
      6,GM(MUSIC): POKE 7,GL(MUSIC
     ) * 11: CALL 768: NEXT
12020  PRINT : PRINT "I HAVE A NU
     MBER BETWEEN 1 AND "HIGH
12030 TP = TP + 1
12040  INPUT "YOUR GUESS ";GUESS
12050  IF GUESS < 1 OR GUESS > HI
     GH THEN  PRINT " NUMBER IS B
     ETWEEN 1 AND "HIGH: GOTO 120
     40
12060  IF GUESS = NUM THEN : PRINT
      "GOOD ... NUMBER GUESSED IN
      "TP" TURNS": PRINT "YOU GET
      AN EXTRA 50":PTS(I) = PTS(I
     ) + 20 * MLEVEL(I):I = I - 1
     : GOSUB 62000: RETURN
12070  IF GUESS < NUM THEN  PRINT
     "TOO LOW ": GOTO 12090
12080  PRINT "TOO HIGH"
12090  IF TP < 3 +  INT ((MLEVEL(
     I) + 4) / 3) THEN  PRINT "TR
     Y AGAIN": GOTO 12030
12100  PRINT "   BAD GUESSER "
12110  GOSUB 62000
12120  RETURN
30000  TEXT : HOME
30010  FOR J = 200 TO  - 200 STEP
      - 5: POKE 6, ABS (J): POKE
     7,4: CALL 768
30020  PRINT " ***** YOU WIN %%%%
     % "PN$(I);
30030  NEXT
30040  PRINT : PRINT
30050  FOR I = 1 TO PLAYERS
30060 POLD(I) = 0:PNOW(I) = 0
30070  NEXT
30080  PRINT : GOSUB 62000
30090  GOTO 40000
40000  TEXT : HOME : VTAB 5
40010  PRINT "  POINTS SCORE FOR
     THIS GAME ....."
40020  PRINT : PRINT
40030  FOR I = 1 TO PLAYERS
40040  PRINT
40050  PRINT "POINTS FOR "PN$(I),
     PTS(I)
40060  NEXT
40070  PRINT : PRINT
40080  INPUT "DO YOU WANT TO CONT
     INUE PLAYING ? ";KB$
40090  IF  LEFT$ (KB$,1) = "N" THEN
      END
40100  PRINT : PRINT "YOUR POINTS
      TOTAL WILL BE ADDED TO "
40110  FOR I = 0 TO 79
40120 BOARD(I) = 0
40130  NEXT
40140  PRINT : GOSUB 62000
40150  GR : POKE 34,20
40160  GOTO 1000
49970 :
49980  REM  ** FILL ARRAY WITH LA
     DYBIRD KEY WORDS **
49990 :
50000 LEVEL = 0: DIM WD$(230)
50010 K = K + 1
50020  READ WD$(K)
50030  IF WD$(K) = "END LEVEL" THEN
      LEVEL = LEVEL + 1:K = K - 1:
     NWDS(LEVEL) = K
50040  IF WD$(K) <  > "999" THEN
     50010
50050  DATA     JANE,AND,PETER,LI
     KE,THE,DOG,TREES,SHOP,IS,IN,
     HERE,BALL,HAS,TOYS,END LEVEL
50060  DATA    YOU,WANT,WE,ARE,CAN
     ,FISH,FUN,THIS,FAT,SOME,WATE
     R,LOOK,HE,IT,FOR,INTO,THEY,S
     AYS,COME,SWEETS,HAVE,TO,JUMP
     ,YES,GO,NO,HOME,END LEVEL
50070  DATA  PLAY,UP,AT,DOWN,ON,B
     OAT,SEE,GET,ME,CAKE,PLEASE,S
     TATION,TRAIN,WITH,RABBITS,ON
     E,THAT,MAN,HELP,MUMMY,DADDY,
     CAR,GOOD,POLICE,AN,APPLE,GIV
     E,FLOWERS,RED,BOYS,WAS,BUS,G
     IRLS,SCHOOL,TEA,BED,END LEVE
     L
50080  DATA   MAKE,SHE,LET,WILL,D
     RAW,US,HOUSE,CHILDREN,BE,OFF
     ,THERE,THEN,THINGS,PUTS,WORK
     ,AWAY,HIS,FIRE,BIG,KEEP,LITT
     LE,MY,TWO,HER,FARM,HORSE,THA
     N,COWS,MILK,HIM,WHAT,DO,CAT
     ,ALL,SEA,GAME,READ,DANGER,NO
     T,STOP,END LEVEL
50090  DATA   WALK,HILL,BY,WHERE,
     NOW,THEM,PIGS,OF,TALK,ABOUT,
     TOP,EAT,SUN,GOING,SIT,AFTERN
     OON,SAID,SO,RUN,AFTER,FULL,O
     UT,MUST,BUT,CHAIR,ASKS,HAD,O
     UR,FROM,STREET,SOON,AS,WINDO
     W,MORE
50100  DATA WHO,OTHER,WHICH,BAG,A
     GAIN,TAKES,BROTHER,MEN,SISTE
     R,KNOW,HOW,SAW,END LEVEL
50110  DATA  FRIENDS,THEIR,DAY,NE
     XT,TOM,TELL,IF,LIVE,TIME,WHE
     N,HOT,VERY,MUCH,HAT,ROUND,BE
     EN,BEFORE,WET,DON'T,TODAY,YO
     UR,THREE,DOES,BIRDS,FLY,OWN,
     MOTHER,FATHER,PAM
50120  DATA    DOOR,BEST,BOB,FIND
```

Demo disc is ACE value

AN interesting educational package which arrived from ACE (Aids Communications and Electronics), contained a demo disc with samples of nine different programs showing how the Apple can be used in the education of the physically and mentally handicapped. Each program highlights a particular aspect of the Apple's capabilities.

Wordpictures is a spelling test with a difference. A picture is displayed on the hi-res screen and as the objects in the picture are named by the user they are erased from the picture. The aim is to clear the screen.

The disc contained three sample pictures – in the Town, Shapes, and Transport. If the user pauses for more than about 30 seconds the program makes a suggestion about what can be seen and the user can then copy the word.

House and Garden is the opposite of Wordpictures. The aim is to draw a house and garden starting from a few lines of the house. The user is asked what is missing, and if a valid word is entered the corresponding detail is added to the picture.

Spelling test is a more direct approach in which a word is displayed for a short time and then erased and the user then types the word. There are three levels of difficulty which correspond to the amount of time the word is displayed.

Multiplication test is straightforward drill in the multiplication tables.

Mountain Climbing is a slightly different approach to maths knowledge. The user chooses from addition, subtraction, multiplication and division, and also selects one of the three levels of difficulty. The program uses low-res colour to draw a series of steps and each correct answer advances a little person to the next step.

Number recognition/counting is designed to familiarise the severely handicapped with numbers and the number keys and to practise counting. There is a choice of range of numbers, whether the numbers are displayed large or small or absent and whether they are delayed. There is also a choice of objects for counting as well as whether they are displayed in a straight line or randomly on the screen.

Flowerpower needs colour since it involves drawing the various sections of a flower in different colours. If the user is "drawing", the program gives the name of the colour to be used and the user enters this name. A section of the flower is then drawn in this colour. Alternatively, the program will draw the flower, naming the colours en route.

Etcha Sketcha allows a severely handicapped person to draw on the hi-res screen using only two paddle buttons. The picture can also be printed out if a Silentype or Epson MX80FT is connected through slot 1.

Mac is an acronym for "microcomputer aided communication." It allows the user to build up words and sentences using only a single paddle button to select letters from a target board.

With the disc comes a set of program notes. These not only describe each program but also suggest how some of them might be modified by a Basic programmer. Although the program authors retain copyright, the programs are not protected in any way and the notes give express permission to adapt them for use by handicapped people.

There were a few problems with some of the programs. For example, if you enter "gate" in House and Garden, the program draws a garden gate. If you then enter "gate" again, you are told that there are no more gates. However if you now enter "gates" the program draws a pair of gates across the driveway!

The quality of the numbers displayed in Mountain Climbing were the worst I have seen. I tried them out on several adults as well as a few children and everybody had trouble deciphering them. Also, the delay in number recognition was far too short to enable the objects to be counted before the number appeared. If this is intentional, I'm afraid I can't see any point in having a delay. I would also want to argue with the statement that Flowerpower tests colour recognition.

Having said that, I must say that some of the programs are really very good. For example, Etcha Sketcha makes line drawing very easy with a little practice and only requires the amount of movement necessary to press the two paddle buttons. Similarly, although the instructions stress that Mac is only suitable for demonstration purposes, it is a very powerful demonstration and could easily be modified to include print routines. I also find Wordpictures and House and Garden interesting approaches to spelling.

The ACE programs are distributed by the Neath Hill Professional Workshop, 1 Fletcher Mews, Neath Hill, Milton Keynes, Bucks. As a demonstration aimed at people unfamiliar with the Apple capabilities, I found the demo disc – price £7.50 – very good on the whole. It would also represent amazing value if you are working with the handicapped and can program in Basic.

Incidentally, if you do modify the programs the workshop would love to know. As the notes say, "your adaptation may be just what someone else needs."

Cliff McKnight

```
     S,DOLL'S,DOLLS,MOLLY,MR,GREE
     N,BABY,LOVES,EVERY,FOUR,GARD
     EN,MRS,MARY,EGGS,GRANDMOTHER
     ,GRANDFATHER,BECAUSE,OLD,GAV
     E,ANN,TEACHER,END LEVEL
50130  DATA  999
50140  REM   ** MUSIC FOR SPELLIN
     G ROUTINE **
50150  FOR I = 1 TO 7
50160  READ NR(I)
50170  NEXT
50180  DATA    232,184,156,116,15
     6,184,232
50190  REM  ** MUSIC FOR MATHS RO
     UTINE **
50200  DIM MN(26),ML(26)
50210  FOR I = 1 TO 26
50220  READ MN(I),ML(I)
50230  NEXT
50240  DATA 208,3,184,3,172,3,156
     ,3,140,3,172,3,140,6,156,3,1
     84,3,156,6,172,3,208,3,172,6
     ,208,3,184,3,172,3,156,3,140
     ,3,172,3,140,3,104,3,116,3,1
     40,3,172,3,156,3,140,12
50250 :
50260  REM  ** MUSIC FOR GUESS RO
     UTINE **
50270 :
50280  DIM GM(14),GL(14)
50290  FOR I = 1 TO 14
50300  READ GM(I),GL(I)
50310  NEXT
50320  DATA 78,3,86,3,92,6,116,6,
     116,6,156,6,116,6,116,6,92,6
     ,116,6,92,6,78,6,86,6,92,6
50330  RETURN
61990 :
62000  INPUT "*** PRESS RETURN TO
     CONTINUE ***";KB$: PRINT
62010  HOME
62020  RETURN
62970 :
62980  REM   ***** DELAY ROUTINE
     *****
62990 :
63000  FOR TIME = 1 TO PAUSE: NEXT

63050 PAUSE = 1000
63100  RETURN
```

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Extending stock control operation with the Apple II

WE own an Apple II with two disc drives which we use for business purposes, and the software we are using is the Systematics Financial Controller programs on Pascal.

We wish to extend the computer operation for stock control and, at the moment, Systematics feel that two to three thousand is the maximum number of items their program can handle.

I am wondering if you can advise of any stock control program for the Apple II which, coupled with a hard disc drive, can handle stock control of ten to fifteen thousand items.

Any assistance or names of companies whom we could contact would be very useful. Meantime, congratulations on your magazine which we find very helpful for both business and personal use. – **E.H. Brooks, Douglas, Isle of Man.**

● Possible solutions are Omnis, which has recently been updated and has a hard disc version, and Orbit whose authors claim that the number of items is limited only by the disc capacity.

There is a free Apple publication called "Apple Applications Index" which is obtainable from your dealer or direct from Apple. This lists some of the available programs. A more detailed review of software available is in the Appleware directory (see Page 21).

Ensure when choosing the package that it is compatible with your hard disc operating system and can fully exploit the large amount of storage available. Always try out the package before making your final choice.

Most dealers are happy to allow you to do this, as it leads to satisfied customers in the end. We would be interested to hear the outcome of your quest, if only to pass on your experiences to other readers. – **Peter Brameld.**

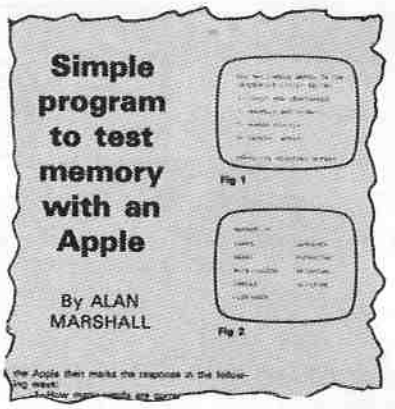
Shiftless Lazer

IS anyone using a Lazer Systems Keyboard Plus with Applewriter I? If so, have you managed to get the shift key to produce uppercase characters? The Applewriter patch supplied with the adaptor is faulty, as is the copy of the listing in the manual.

I've tried contacting Stack Computers in Bootle who supplied the adaptor, but they don't seem interested enough even to answer my letter.

I've also tried writing direct to Lazer in California, but it doesn't look as if they are going to reply either.

Can anyone help me by fixing the patch, please? I'm no machine code programmer, so I don't even know where to start looking to attempt to fix it myself. – **Bob Mould, Bracknell, Berks.**



I HAVE been working on the program on pages 71/2 of your September issue (Applecart – by Alan Marshall) but I have come up against a problem in that when I run Program 2 it stops part way through with the message "break in 310".

I have checked the program entry for this line and have played around with some alternative character entries in case there was a misprint, but all to no avail.

I have limited experience in programming and would appreciate it if you could solve this problem for me. – **R.H. Shorer, Halifax, Yorks.**

● It is difficult to answer a query about a program without being on the spot, but I suspect that I know what has happened. Program 1 on page 71 creates a text file with length and name supplied by the user. Program 2 attempts to read the file but assumes that there are 80 entries (and incidentally that the names of the files agree with those within the program).

There are three ways of solving the problem (if this is the problem):

☐ Use Program 1 to create exactly 80 entries.

☐ Let Program 1 write the number of entries as the first entry on the text file. This is easily accomplished by inserting the line

125 PRINT ENTRIES

Now let Program 2 read this number before reading the words. Insert line

295 INPUT ENTRIES

and change line 300 to

300 FOR I = 1 TO ENTRIES

☐ A text file created by the original Program 1 could be read by the original Program 2 using the ONERR GOTO to terminate the reading of the file. In Program 2 insert the line

275 ONERR GOTO 1000

and insert lines

1000 PRINT: PRINT CHR$(4) "CLOSE"
1010 POKE 216,0 : GOTO 340

Line 330 is now redundant and can be deleted.

What happens is that the file is read and when the program finds no more data to input, instead of crashing with the BREAK message it goes to 1000 which closes the file, clears the ONERR construction with the POKE 216,0 and resumes execution at line 340. – **Max Parrott.**

Matter of Protocol

THE answer to Howard Carter's CP/M query (Windfall, December '82) lies in the Microsoft software manual, Volume I, section headed "Support of non-standard peripherals and I/O software," which gives all the details of software protocols required to correctly interface most non-standard peripherals.

He could perhaps try altering his software so that it can be accepted in Slot 3.

As Apple commercial software expects

an external terminal in Slot 3 I must assume that Mr Carter has some custom software that has been incorrectly interfaced to the Apple. I suggest he looks to altering this piece of custom software so that it follows standard Apple protocols. Then there would be no problem with interfacing the Apple. – **Terry Thompson, Manchester.**

Refreshing

I HAVE received my first copy of Windfall magazine. May I take this opportunity to compliment you on a first class production. Having only recently acquired an Apple II computer, it is totally refreshing to be able to relate to the magazine for ideas, future software sources and the inclusion of programs – **Margaret A. Clapperton, Whissendine, Oakham.**

One too many

IT was with some pleasure that I tried Allan Dubost's December Appletip. The required effect was not forthcoming, however, until I deleted an unnecessary linefeed (line 210).

Overall, the ideas presented by this simple program, and the way in which they were produced, were refreshing. By contrast, it seems somehow depressing to see Appletips frequently repeated. This month again saw the familiar one about garbage collection. – **M. Green, Plymouth.**

● Point taken, but some tips are worth repeating for the benefit of new users (and readers) as well as for existing readers who have improved their level of competence and therefore their comprehension.

Appletips are eagerly consumed by our readers and it is at times difficult to satisfy their appetites.

Sorting subroutines

I HAVE been looking for a machine code sorting subroutine to incorporate into Applesoft programs which I have written for our Apple II which runs under DOS, using 8in discs.

There appears to be something which may be suitable listed in the Appleware '82-'83 book. It is called Amper-sort/merge (A-S/M) and is distributed by S and H Software, USA. Could you please therefore send me their address and also, if you can, tell me whether or not you think this program would fit the bill? If not, have you any other suggestions? **Elizabeth Enstone, Kent.**

● S and H Software's address is: Box 5, Manvel, ND 58256, USA. You don't say whether you want to sort strings or numbers or both, nor whether the data to be sorted resides only on disc or can possibly all be in memory. Therefore it is difficult to advise on the suitability of this or any other utility on the market.

Your best bet is to chat over the problem with a reputable dealer. Remember that if only numbers are to be sorted Basic alone can provide the speed if the right algorithm is chosen. The choice will be between Quicksort and Shellsort depending on the total number of items.

An Applesoft version of Quicksort by J.P. Lewis and an enhanced version of Mike Glover's machine code bubble sort *(Windfall, January '82)* by Lazlo Koranyi are in this issue. Perhaps you could use these to your advantage. – **Max Parrott.**

Selling programs

I HAVE written a program for Apple II Europlus. I have been considering to send it for publication, and thought Windfall was the appropriate magazine because it is especially for Apple.

It is a space war program called "Space Shoot". It has sound, plus shape table which is loaded from disc, with recorded hits. I was wondering if there would be any money in it, as it is copyright. Needless to say, I would send all the relevant data – **Master D.S. Briggs, Southend-on-Sea.**

● We would certainly be interested in having a look at your program. If it is suitable for publication there will indeed be some money coming your way.

When considering a program for publication we look at the following points:

☐ Does it work, and has it been fully debugged? This may seem obvious, but many of the programs we receive do not behave quite as their authors intended.

☐ How user-friendly is the program. If things go wrong it is possible to protect the user from bewilderment by use of such features as "ONERR GOTO" which will tell the person using the program what they are doing wrong.

This is particularly important as many of our readers are first-time users and have little experience of the many catastrophes that can occur when running complex programs.

☐ We only have a limited amount of space in which to publish your contribution, so a nice, neat layout can be very helpful.

Lastly, don't forget those REM statements. For a reader to get the most from a program it is important that he knows how the program works. If you are sending discs through the post always protect them from bending by use of a stiff piece of card. We look forward to receiving your masterpiece in due course. – **Peter Brameld.**

Making most of big discs

WE use an eight inch disc unit to store a large number of small files which cannot be stored as a data base system.

The directory track on the disc becomes full prior to the storage capacity of the disc, thus defeating the advantage of an eight relative to a five inch disc unit.

Can you advise if there is a simple method of increasing the number of tracks used for directory from one to, say, two or three? – **V.F. Cox, Llewellin's Machine Co., Bristol.**

● Increasing the number of files which can be created on an 8in disc is not simply a matter of making available a larger number of tracks on which to store file names.

As well as the actual file names there is a list called the Volume Table of Contents (VTOC) which contains a map of where the data is located on the disc.

This list would also require modification if the number of files was to be increased.

I cannot tell from your letter why you need so many files. Have you fully exploited the use of random access files (Page 82 to 89 of the DOS manual), or is it that this type of file is too slow?

When you buy an 8in disc system it is usually operated from a modified DOS control card. The firmwear held on this card along with a modified disc operating system is what dictates the number of files, maximum file length etc.

Unfortunately there is no standard 8in disc operating system for the Apple and the actual features available are varied from one system to another.

It does not sound as if your system is particularly flexible, and I suggest you approach your dealer and ask him to look at the possibility of changing it for you.

If you require any further information as to what is available by way of 8in disc operating systems I suggest you contact a specialist supplier such as Eicon Research (0954-81825) or any other appropriate advertiser within the magazine. – **Peter Brameld.**

COMPUCOPIA

Interface gives instant graphics

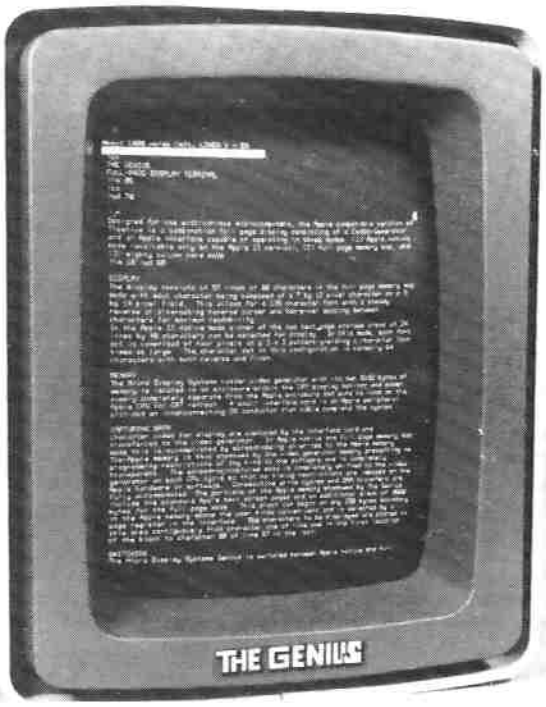
A PLOTTER interface program, PIK, which allows the graphics produced by either the Apple II or III to be reproduced directly onto the Strobe 100 Plotter, has been introduced by Business and Professional Software.

The user can perform curve fitting and trend line analysis, produce multicolour exploded pie charts, vertical and horizontal bar charts, or scattergrams – dot patterns in various shapes.

Existing Visicalc data files can be used to automatically display the quantitative data in the user's choice of formats. The resulting graphs can then be simply directed to the plotter.

The software allows all Apple business graphics to be drawn to the full 150 points per inch resolution of the Strobe 100 which accommodates standard A4 paper, transparency film for overhead projections, or high quality materials for reproduction as colour prints or 35mm slides.

Two discs included in the package contain drivers for all popular printers and a manual details how to install each driver on the business graphics disc. The PIK kit for both the Apple II and III costs £86.25 from Data Efficiency. *Tel: 0442-60155.*



Enhanced word processing from the Genius

All the news on one page

THE first full-page, hi-res, black and white display for the Apple II is The Genius from Micro Display Systems of Minnesota.

It displays 57 lines of 80 characters with fully formed descenders, and enhances word processing, software development, financial analysis and data entry applications.

The display unit interfaces to the Apple through the installation of a single printed circuit board. It has 8k memory.

Features include an expanded Ascii character set (128 characters) with both reverse video and flashing characters available. Factory options include a variety of international character sets.

CP/M and Pascal-based software is compatible with the display, as is Wordstar and the Executive Secretary packages. Other packages are being modified to utilise the full-page capabilities.

The unit can also be operated in the Apple II native mode, displaying 24 lines by 40 characters and enabling it to be used with unmodified software packages.

The Genius is 41cm high, 33cm wide and 43cm deep. It costs from $1,795. *Tel: (0101) 612-437 2233.*

All-Apple network

A LOW-COST, entry level local computer network which supports both Apple II and III is available from Zynar.

ELF is based on the Cluster/One network already installed in over 450 locations worldwide. Apples are linked together and share common resources such as hard disc storage and printer facilities. Each Apple on the network is either a user work station or a network server station.

Examples of a server include the Network File Server, which manages access to shared mass-storage discs, and the File Transfer Server, which enables users to exchange files between networks both locally and remotely.

ELF consists of a mini Winchester hard disc drive with a choice of 5mbyte or 10mbyte formatted capacity; Network File Server software which supports both the DOS Basic and UCSD Pascal operating environments; an interface card and a clock card for the Network File Server station; and Network interface cards for the Apple II and III work stations and server stations.

Options include a CP/M operating system to run with the Network File Server software as well as an in-house Viewdata system and electronic mail system. Several communication facilities are also available including telex, file

→

transfer between networks and dial-in capabilities from remote Apples.

ELF can easily be upgraded at low cost to a full Cluster/One network with the addition of a 40mbyte disc and extra network software.

All software which runs on ELF can be transported to Cluster/One, and the mini Winchester can be used for extra storage.

ELF costs £5,500 (for a basic 3-Apple, 5mbyte system) or £6,600 (for a 5-Apple 10mbyte system.)

Teeing up for club admin

A SERIES of specialist software modules each taking care of an aspect, or linked aspects, of golf club management and administration has been released by Twig Systems.

The company says its Twig Golf Administrator package is a combination of modern controls for general management and the specialist capabilities peculiar to golf.

It was inspired by the prospect of changes in the British system of handicapping to be made this year, and is said to cater for these regulations as well as automatic billings and subscription renewals, membership, handicap and results listing, documented histories of members' playing achievements, hole-by-hole leader boards for competitions, individual performance averages on a hole-by-hole basis, members records and direct mailing. The package runs on an Apple III.

Modules include Stocktwig (to monitor bar stocks), Managetwig (for budgeting and forecasting), Paytwig (catering for wage and salary calculations), Clubtwig (membership listings and details, and invoicing) and Tigertwig (records details of individuals' rounds, with performance analysis). There are also competition, handicap and scoring capabilities.

The whole system costs £1,842.50, although modules can be bought separately. *Tel: 0296-623965.*

Apple III systems

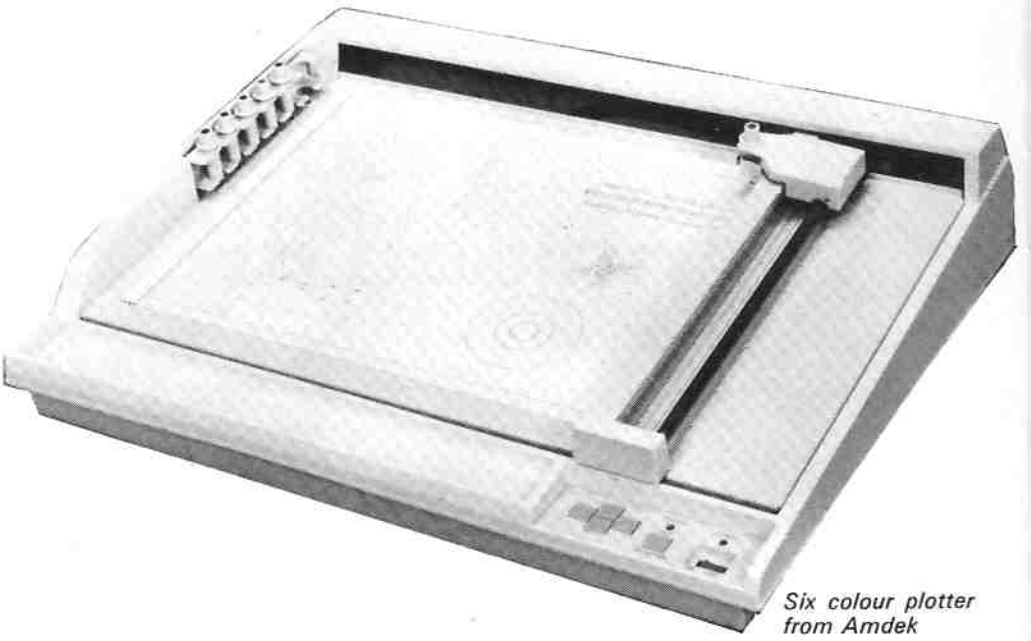
MORE than 120 software packages for the Apple III are now available in the UK. Among them are the Accsys Sales Ledger and Purchase Ledger from Microtechnic.

Both systems will run stand-alone or as part of an integrated business system incorporating stock control, purchase/sales order processing, and general ledger, and both require an Apple III and a 132 column printer.

Additional disc drives or a hard disc are needed if integration with other modules is required. Both modules cater for up to 5,000 accounts and the number of transactions is limited only by disc storage capacity.

Reports printing can be interrupted and resumed later, transactions can be batched or processed immediately, there is an audit trail report with on screen enquiry option, mailing labels capability and automatic housekeeping routines are executed whenever the keyboard is inactive.

The systems produce all common ledger reports and cost £250 per module. *Tel: 0642-221501.*



Six colour plotter from Amdek

More program space

A SERIES of memory boards for the Apple includes a 16k RAM board, a 32k RAM board and a 16k board which is user upgradable to 32k.

The AP-32 from MPC Peripherals and distributed by Computer Applied Technology is supplied with software to relocate DOS and Integer, thus allowing over 46k Basic program space, and has six LEDs to indicate board status.

In common with the other two boards its features include RAM selected/RAM write-enabled and a switch selectable 2716 monitor socket. The boards are slot independent (subject to software requirements) and are compatible with the Apple language card and all existing programs that operate with it.

The monitor socket on the boards is designed to allow custom monitor routines such as an interrupt drive I/O, getting default input from a custom keyboard, putting default output to an 80 column card. An EPROM version of Apple's old monitor can also be utilised from this socket.

The 32k board costs £107.65, the 16/32k board £90.60 and the 16k board £73.55. *Tel: 0262-73036.*

Six colour plotter

A SIX colour plotter introduced by Amdek is compatible with most personal computers including Apples and features high pen speed, automatic pen retrieval and .002in resolution for fast, accurate plots.

The microprocessor-intelligent Amplot II receives Ascii commands and built-in software permits additional one alpha character commands. Eight-bit parallel and RS-232-C operation is standard.

Effective plotting range is 10in x 14in and six fibre tip pens are provided for plotting on ordinary paper or film. Chart hold-downs and a dust cover are also available. Price is $1290. *Tel: 0101 (312) 364-1180.*

Property package

ESY, from Prodata, is an accounting system for estate agents supplied in three modules – Accounts, Property Manager

and branches. The former is a comprehensive estate agent's accounting system.

Each can be used independently in practices having only one branch, while multi-branched businesses can operate them at a central administration office.

The modules are written in Pascal and run on an Apple III with monitor, using a Profile hard disc and a 132 column printer. Features include the rapid recording of all expenses chargeable to properties and payments received.

Expenses can be automatically analysed into up to 10 different types and management reports analysing expenditure produced at any time, including a list of all expenses incurred to date on any property, a detailed monthly report for any branch and a monthly summary of all expenditure on any chosen expense.

Prodata say the system was developed with the help of leading estate agents and says that it can easily be mastered by average clerical personnel. *Tel: 0928-35110.*

Binary answer

COPY-protected software presents the user of non-standard disc formats with two major problems.

Firstly, if the user cannot copy a program from one 5¼in floppy to another he can scarcely transfer the original program to a hard disc drive.

Secondly, even if he could, it would be a major undertaking to alter the software so that on booting from the "new" environment it continued to recognise the existence of a non-standard DOS.

Elite Software is marketing a hardware copying device, the Wildcard, as a possible solution. It converts protected software into standard binary files which can readily be transferred.

Also, because the files are accessible, the primary entry points of DOS can be located and modified. If necessary it is possible to completely replace DOS. The card costs £99. *Tel: 01-572 0453.*

AN emergency power backup unit, the heavy duty EPU 1000, has been added to the Microguard range of constant voltage units. It is designed to maintain a stabilised voltage and reduce the effect of fluctuating mains transients to all equipment operating from an AC mains supply.

It keeps an Apple going when the power fails, fades or surges. The 1,000 watt output unit, connected between the Apple and the power supply, switches to battery power when required.

It can also be used as a remote power unit where there are no mains available. Price: £1,295. *Tel: 0905-21541.*

Share a Winchester

VOLUME production of the ICE Multiplexor started last month.

The unit is an intelligent microprocessor controlled device for the Apple II which allows multiple users to share a Winchester subsystem and printer.

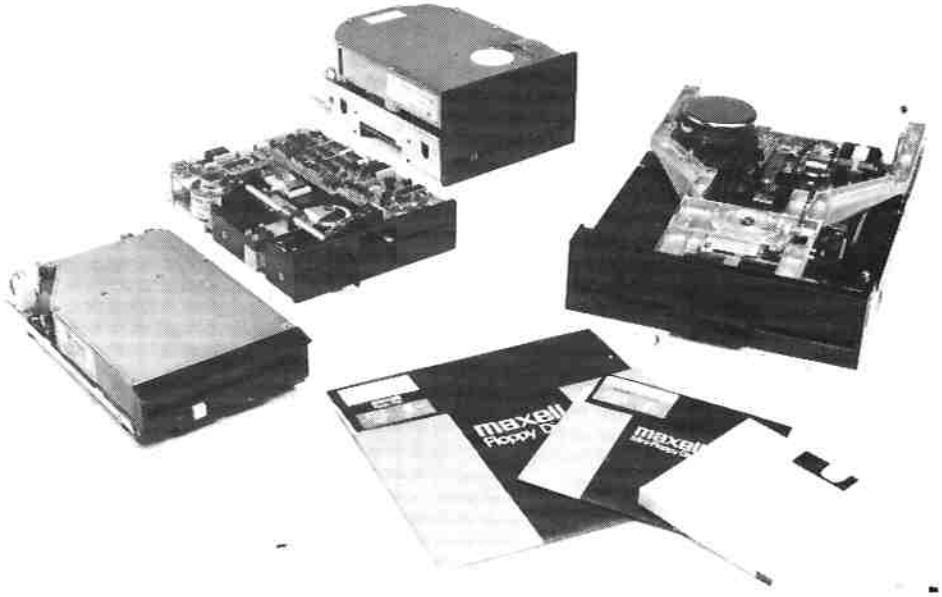
It is a free standing unit containing power supply, a Z80A processor control card with 64k dynamic RAM, and between one and eight multiplexor channel cards, each of which supports eight users.

The system can be configured for between eight and 64 users in increments of eight.

Use of the Rodime RO208 40mbyte Winchester disc drive allows up to 80mbytes of formatted storage.

ICE claims its multiplexor has a data transfer rate of 200k a second, which is fast enough to eliminate most of the contention problems experienced with a network approach.

The unit costs £620 and the interface kit for each Apple is £100. *Tel: 07842-47271.*



Storage

A USEFUL innovation from Pete and Pam is "Stilts" – legs for the Epson MX80 printer which raise it enough to provide up to 3 in of space for paper storage.

The stilts slot easily into each of four holes in the base of the printer and provide a sturdy support. They are made of colour-matched polypropolene with protective plastic feet and the set costs £5.95. *Tel: 0706-227011*

A REMOVABLE 5¼in Winchester hard disc cartridge forms the basis for a new product from Rohan Memories and Peripherals.

The SS10R has a capacity of 10mbytes removable, formatted storage and costs £2,395. The system incorporates two SyQuest Technology half-height drives in a package only slightly larger than a standard Apple floppy disc drive.

At the top end of the new range is the SS15R which provides 10mbyte fixed and 5mbyte removable formatted capacity, and which the distributors claim provides an integrated solution to the problem of hard disc backup. It costs £2,600.

All the systems are provided with integral controllers, power supplies and host adaptors for the Apple II and III. *Tel: 020488-6977.*

COMPUCOPIA

Fibre optics interfaces

A SECOND UK company is marketing fibre optics products for the Apple. U-Electro Optics has developed fibre optics interfaces that offer either single duplex channels or eight duplex channels and standard lengths of 10 metres or 25 metres.

Each interface occupies a single Apple slot and can be used for Apple to Apple or Apple to other device communications. Maximum cable lengths of 400 metres or 2km are possible dependent on type of cable.

With fibre optics links computers can be sighted without restriction in factory environments. Cabling can be laid in existing ducting alongside mains cables if necessary and no shielding is required because the components are immune to electrical interference.

Other products include fibre optics line drivers and digital fibre optics evaluation kits. *Tel: 0925-54117.*

PACE enhancements

ENHANCEMENTS to the Apple II version of PACE estimating software have been made by High Technology Software of Oklahoma. The package, a flexible general purpose estimating product for use in almost any industry, has been made Corvus hard-disc compatible.

This increases the maximum number of estimates that can be stored from 100 on floppy disc to 500 with the Corvus.

The package can now store and retrieve information regarding the component make-up of up to 2,000 items as well as information on individual components that make up the estimate item. The floppy version stores information on 400 components.

PACE, which costs $395, is also available for the Apple III. *Tel: 0101 (405) 478 2105.*

Code generator

AUTOCODE I is an automatic programming system for CP/M microcomputers which generates programs executed directly by the dBase II system.

With the package the user enters directly to the screen an image of the document to be used in maintaining files.

Autocode I requests interactive responses to set parameters for the system, such as key fields, variable ranges, menu and sub-menu creation and report formats, before producing programs to run under dBase II without further effort.

Manufacturers Stemmos say that a user with no programming experience and no knowledge of dBase II can produce programs within a few hours.

Users with a working knowledge of dBase II can link up their own processing files in the menus, producing complex systems generated in code already optimised by the system. Automatic documentation for each application is provided.

The package is available from Pete and Pam for £120. *Tel: 0706-227011.*

Fast central data file

A RECENT entry into the networking arena is the Fileserver from Micromite. Designed for use with CP/M based machines, the system incorporates a high capacity, high speed central data file.

It can be shared by numerous micros, with none of them tied up acting as a controller station, and features a file lock facility. This ensures that only one user can access a particular file at any one time.

The 10mbyte unit costs £4,250, while the top of the range 40mbyte model with 2mbyte tape streamer back-up costs £6,450.

Interface cards for each Apple on the network cost £150. *Tel: 0703-24071.*

Pascal aids to editing

A PACKAGE of Pascal programming aids is available from JEL Computer Services. The Units 1 Library is a set of three Pascal units which provide keyboard entry and editing of data with full character by character validation.

The programmer has control over the width and position on the screen of the input/edit field and, for numerical data, can specify the range of values which will be accepted.

When handling string data the programmer can specify those characters which may be entered.

The left and right arrow keys are implemented to give true editing facilities. The cursor can be stepped forwards or backwards over the data already entered to allow individual characters to be changed.

Each disc is supplied with comprehensive manual and demonstration program. Price: £20. *Tel: 0472-693742.*

Diary with a difference

IT is hardly a pocket diary, although the Digital Diary, which requires a 48k Apple II with twin drives and optional printer, does generate comprehensive print-outs to provide an up-to-date "take away" copy for the businessman on the move.

The package, from C.P. Software, is described as a complete desktop time manager. Its features include a one year appointment diary on call at any time, a separate "page" for each day, automatic diary entries for regular events, advance warning of important events coming up, and a 'things to do' file in priority order.

Jobs left undone are automatically highlighted, you can add, delete or change entries and security features allow you to keep you diary to yourself.

Digital Diary costs £28.50. *Tel: 0273-564500.*

CORP update

THE CORP program generator has been up-dated and modified by manufacturers Dynatech Microsoftware.

The package contains a disc of sample programs to illustrate precisely how the generator works and improvements have been made to the instruction manual.

The new package costs £249 and includes a master disc, demo tutorial, two utility discs and a diagnostic disc. All items are available separately. *Tel: 0481-45934.*

128k bubble

RELIABLE non-volatile memory storage in a hostile environment is provided by a 128k bubble memory module. Plug-compatible with Apple, the XBUB1 unit may be used either to replace a floppy disc or in conjunction with a disc to hold files that are frequently accessed for programs or data.

Manufacturers Xcalibur say the bubble memory unit is very reliable, immune to heat, dust, grease and grit, and executes DOS read or write three times faster than disc. It is supplied with utility software and a two year warranty for below £500. *Tel: 0604 21051-4.*

Developer

The DEVELOPER is a powerful program development aid for programmers writing in APPLESOFT.

DEVELOPER speeds up the program development cycle by providing facilities to make rapid local and global changes to program text. DEVELOPER consists of 4 modules, each of which is accessed by typing the ampersan '&' followed by a single command letter and a line number or string of characters. DEVELOPER is designed to operate either on its own or in conjunction with the RENUMBER utility present on the DOS 3.3 SYSTEM MASTER or the APPLESOFT PROGRAMMER'S ASSISTANT supplied with the DOS 3.3 TOOL KIT. Once installed DEVELOPER is completely transparent and does not interfere with DOS or APPLESOFT.

The 4 modules that comprise DEVELOPER are:

* A Line Editor offering rapid cursor moves, insert and delete.
* A Global Editor allowing all lines containing a specified string to be listed and an optional string substituted for it.
* A Lister with forward and reverse list, single step and suspend list.
* A System Variable Dump displaying much useful information on memory status.

SYSTEM REQUIREMENTS DEVELOPER requires a 48K APPLE II+ with APPLESOFT in ROM or language card and at least one DISK II running under DOS 3.3.

£19.95 + VAT

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$$\begin{pmatrix} 1 & 5 & 2 \\ 1 & 1 & 7 \\ 0 & -3 & 4 \end{pmatrix}^{-1} = \begin{pmatrix} -25 & 26 & -33 \\ 4 & -4 & 5 \\ 3 & -3 & 4 \end{pmatrix}$$

$$\begin{vmatrix} 1 & 5 & 2 \\ 1 & 1 & 7 \\ 0 & -3 & 4 \end{vmatrix} = -1$$

The routines include:–
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(also calculates DET).
OPERATIONS
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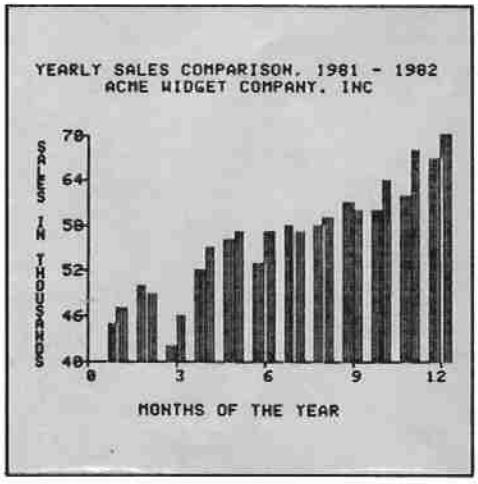

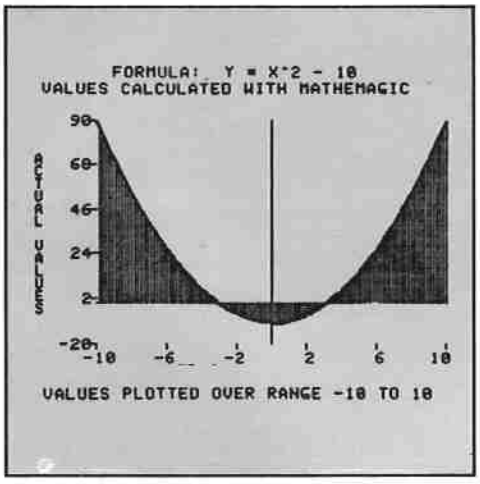

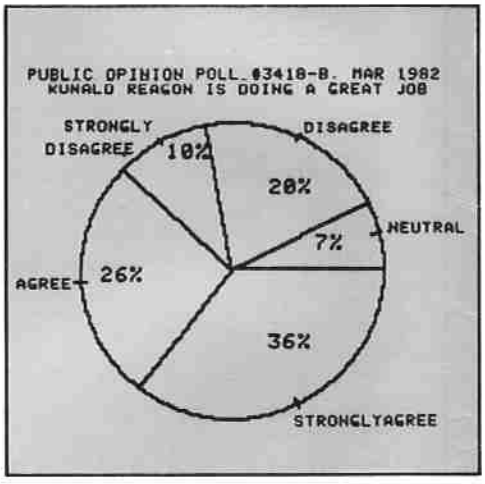

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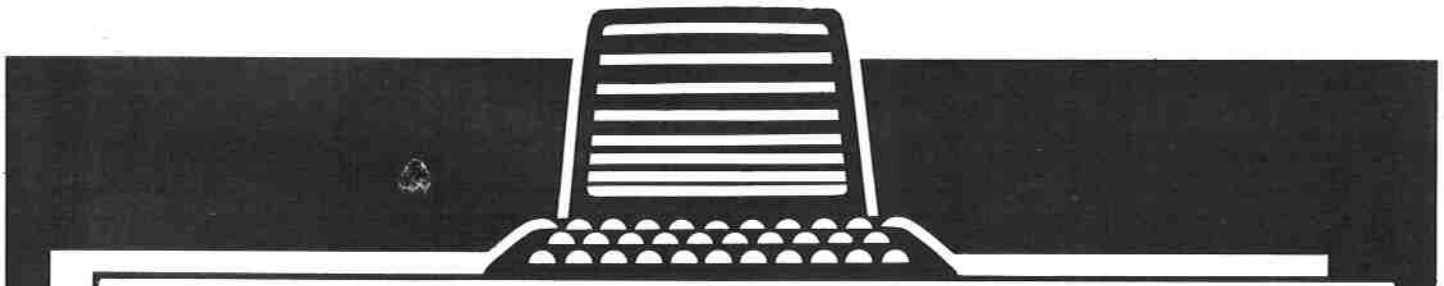

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```
]LIST

10 BIG = 10: DIM A(BIG): FOR K =
     1 TO BIG:A(K) =  RND (0.413)
     : NEXT : FOR J = 1 TO BIG -
     1: FOR K = 1 TO BIG - J: IF
     A(K) < A(K + 1) THEN TEMP =
     A(K):A(K) = A(K + 1):A(K + 1
     ) = TEMP
20   NEXT : NEXT : FOR K = 1 TO BI
     G: PRINT A(K): NEXT
```

Obscure Applesoft . .

```
PRETTY PRINT

10  BIG = 10
    DIM A(BIG)
    FOR K = 1 TO BIG
        A(K) = RND (0.413)
    NEXT
    FOR J = 1 TO BIG - 1
        FOR K = 1 TO BIG - J
            IF A(K) < A(K + 1) THEN
                TEMP = A(K)
                A(K) = A(K + 1)
                A(K + 1) = TEMP
20      NEXT
    NEXT
    FOR K = 1 TO BIG
        PRINT A(K) ;
    NEXT
```

. . clearer when formatted

All is revealed in formatted Applesoft

By J.P. LEWIS

EXAMINE THE two-line Basic program above and see how long it takes you to decide what it is supposed to do; then have a look at the same program as reformatted on the right. I think you will agree that it is rather easier to comprehend.

It is unfortunate that the Applesoft program written for maximum speed also tends to be written with minimum clarity. Since I am frequently called upon to debug such Applesoft programs, I have written a utility to make my task easier by reformatting the listings in the style shown above.

The program itself is rather long (11 pages of EDASM text) so this article is not going to reproduce it. Instead it will attempt to give you some idea of its design and structure, and the problems it raised, so that you may write your own version if you want to.

The first step is a rough specification of the requirements, as follows:

1. The program should be similar to the LIST command in use, syntax and speed.

2. The program should not interfere with the current Applesoft program in memory (or vice versa).

3. Format: Line numbers should be right-justified; commands should be split one to a line; contents of FOR . . . NEXT loop should be indented; consequences of IF . . THENs should be indented; subroutines/END/STOP/REM/ should be emphasised; optionally print key-words in lowercase.

The next stage is to sketch in details and relevant ideas. The paragraph numbers correspond roughly to step 1 above.

1. Use CTRL-P and CTRL-L to trigger the listing. This allows for simple interception of the KEYIN routine (e.g. Mike Glover's Screendump, Windfall, Oct 81). Note that the first thing the program should do is disable its own calling routine.

Allowing that all the usual "LIST" parameters are acceptable, use GETLN1($FD6F) to get a parameter line and GDBUFS($D539) to prepare it for interpretation by LINGET($DAOC), FNDLIN($D61A) which will find which bit of the actual memory you want to examine.

Judicious use of CHARGOT($B7) will do any error-trapping for illegal syntax here. Don't forget to check that the listing doesn't end before it begins.

After each line processed, examine the keyboard for a CTRL-C to exit or space-bar to singlestep.

2. Get the program into memory by BRUNning, and have the first bit of it set HIMEM and the KSWL($38-$39) pointer.

3. Use a 256 byte buffer to build up a line; reserve the first five bytes for the line number.

Have a tab-count variable, initially set to the seventh byte of the buffer.

Have a buffer-pointer variable, initially set to the tab-count value.

Have a pointer moving through memory, pointing at the current byte to be copied, or decoded, to the buffer.

Whenever the memory pointer hits a ":" or EOL (end of line for which Applesoft uses a zero) or if the buffered line reaches the limit of the output device, use COUT to output the buffer; then clear the buffer and reset the buffer-pointer.

If the last output was caused by an

→

This article outlines a method of improving the readability of Applesoft listings by modifying their format. Space limitations prevent a full listing of the machine code routine described, but sufficient information is given to guide the reader in the construction of his own program. The reference to lower case letters is normally only applicable to printer output unless you have installed a lower case chip in your Apple.

For those unfamiliar with machine code programming, a brief explanation of some of the phraseology used is necessary: The numbers preceded by a $ and containing letters as well as numbers (eg $B7) are in hexadecimal form and refer to locations in the Apple's memory. The nearly understandable words in capitals, e.g. EOL (end of line) and GET CHAIR, relate to machine code subroutines and are roughly the equivalent of REM statements in Basic, as they convey some clue to what function the subroutine performs.

Anyone wishing to experiment with machine code might first consult the Apple Reference Manual. (Don't be scared of it – you can't do any damage to your machine, but if you are playing about in the monitor, do remove any discs from the drives.) Also of interest is Mike Glover's "Introduction to Machine Code" (Windfall August, 81 - February 82).

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EOL (you will need a flag), then do the next line, ie check that you haven't gone as far as required, check that CTRL-C and space aren't being pressed, decode the next two bytes as a five-digit line number, then (or otherwise) carry on as above.

Every time you hit a FOR, add four (say) to the TAB-COUNTER.

Every time you hit a NEXT, subtract four from the TAB-COUNTER.

Every time you hit an IF, add four to the TAB-COUNTER, and get ready to put in a fake ":" (ie newline) after the next THEN.

After STOP, RETURN, END, REM, put in an extra blank line.

Step three of the process is "problems arising."

How do you decode Applesoft tokens? Use the Applesoft list of reserved words, stored in DCI form (last byte has bit 7 set) at $DODO. Use a lookup table, referenced by the value of the token, to tell you where the word starts.

How do you get lowercase? Set a flag at the start to show that it is wanted (this explains the CTRL-L option) and add 32 ($20) to each letter of a keyword before putting it into the buffer.

How do you handle lines like IF . . . THEN 100? Check if the thing immediately after the THEN is a digit; if so, take a dummy step back and slip a GOTO token to the decoder.

What about IF . . . GOTO 10? Messier, but similar. Set a flag on hitting an IF, which must be cleared at the next THEN. If the flag is set the next time you hit a GOTO, step back and slip in a THEN.

What if TAB-COUNTER becomes greater than the available line-width? Check it every time you empty the buffer, and do an orderly exit with a message if it gets too big.

How do you get the indentation correct on:

(a) NEXT X,Y,Z,Q? After the NEXT, count how many commas appear (this needs another variable location) before the next ":" or EOL.

(b) Multiple IFs on a line? Keep a count of the number of IFs in the line (another variable), and detab that many times at EOL.

(c) More NEXTs than FORs (legal, but nasty)? Have a counter increment for each FOR and decrement for each NEXT. Complain and reset it (and the TAB-COUNTER) if it goes negative.

(d) More FORs than NEXTs? No solution without a lot of syntax checking.

How do you handle COLONS inside quotes? Keep a count of the quotes in the line. If it is odd, a colon is genuine; if it is even, a colon is a command separator. Remember to reset this counter at each EOL.

Where do I find all the necessary zero-page locations to use as flags and counters? In the $EO to $EA region reserved for the hi-res work; and a few more near $FF.

At this point, feeling that I have a clear idea of all the problems, my usual next step is to write out the program in a Pascal-like way, eg:

```
procedure doasection;
begin
   repeat
      get next character;
      decode character
   until (':' or EOL or buffer too long);
   output buffer;
   if (EOL) then begin
      set eolflag;
      clear quoteflag;
      count back if-tabs
   end
end.
```

With this design pattern laid out clearly, it becomes quite easy to translate the problem into assembler virtually on a line by line basis. This avoids long, convoluted pieces of code and makes it very easy to slot in any changes at a later date.

I don't have room to present the entire "pseudo-Pascal" program so I will finish up with a few extracts from the final assembler program (see left.)

I hope that this article will be sufficiently useful to help you develop your own formatter. If, however, you don't have the time to write your own program, you may like to know that the one I wrote for myself is now being marketed under the name of Pretty Print, by Rocon.

```
   The routine to get the next character from the program into the
6502 accumulator.  This is self-modifying code, similar to
Applesoft's own GETCHAR.

  GETC    LDA $FFFF      ;GETC+1,GETC+2 are set at the start of the
          INC GETC+1     ;run to the start location of your listing.
          BNE GETOUT
          INC GETC+2
  GETOUT  RTS

      The main driving loop:
      ======================

  NEWLINE JSR QUIT       ;the routine for CTRL-C or space.
          JSR GETC
  TEST1   CMP #$0        ;TEST1+1, TEST2+1 are set at the start
          BNE ENTRY1     ;of the program to the 'pointer to next line'
          JSR GETC       ;of the line number after the one you
  TEST2   CMP #$0        ;want to end on, or 0,0 for the whole thing.
          BNE ENTRY2
          JMP TIDYOUT    ;a routine to leave the program neatly.

      The entry for handling a command line section.
      ==============================================

  ENTRY1  JSR GETC       ;to bypass the hibyte of 'pointer to next line'
  ENTRY2  JSR CLEARBUF   ;set output buffer to 256 spaces.
          JSR LINENO     ;convert next two bytes to ASCII line number
          JMP DOSECT1
  DOSECTN JSR CLEARBUF   ;normal entry
  DOSECT1 .....etc..     ;entry to avoid wiping out the line number
                         ;we've just put into the buffer.


      The output subroutine
      =====================

  ENDSECT LDX #0
  PUTC    LDA BUFFER,X
          BEQ CRLF       ;End of buffer is signalled by 0.
          JSR COUT
          INX
          JMP PUTC
  CRLF    JSR CROUT
          LDA COLFLG     ;this is 0 for a true Applesoft EOL, and
          BNE DOSECTN    ;non-zero for a command separating colon.
          LDA #0         ;We must have a new Applesoft line,
          STA QUOTFLG    ;so clear quote count, and
  CLRIFS  LDA IFFLAG     ;reverse the tabs caused by IF's.
          BEQ NEWLINE
          JSR DECTAB     ;decrease the TAB-COUNTER by 4
          JMP CLRIFS
```

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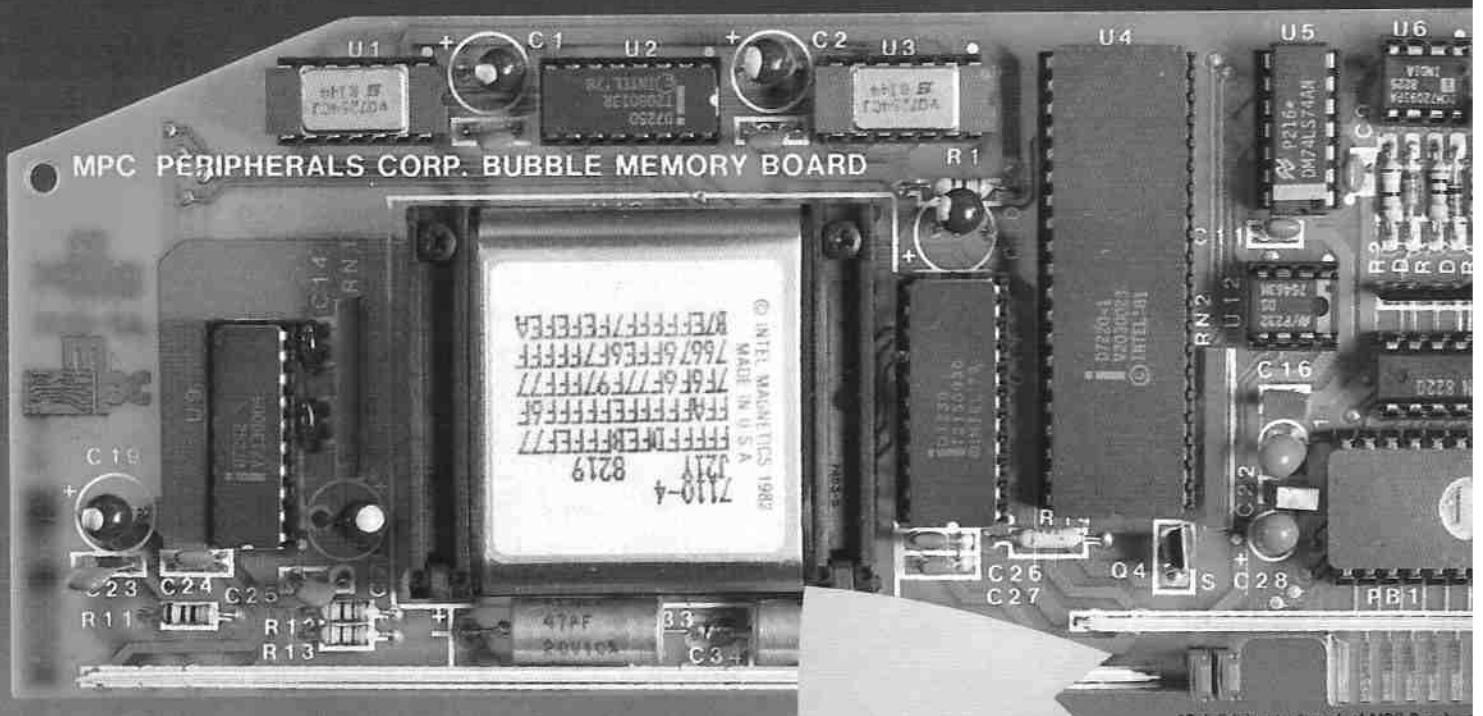

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PRODUCT DESCRIPTION: The PROM-IT EPROM Programmer is the answer for those uses who own an APPLE and need to program EPROMs. EPROMs can be used for creating custom character generators, custom system monitors (for the MPC AP-16 or MPC AP-32), for custom driver software, or applications outside of the APPLE such as EPROMs for other microcomputer or prototype systems. The PROM-IT comes with all personality modules. Retail Price **£73.55**

AP-SIO Serial Input/Output Card for the Apple II

SPECIFICATIONS:
- Crystal controlled baud rates switch selectable from 50 to 19.2K.
- Uses industry standard 6850 ACIA.
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- On-board firmware with switch selectable serial driver options.
- Serial communication protocol jumper block for various handshaking configurations.

PRODUCT DESCRIPTION: The MPC AP-SIO is an asynchronous serial input/output interface card for the APPLE II Computer. The driver firmware follows APPLE's peripheral convention to insure plug-in compatibility with all present and future operating systems. Switch selectable firmware options include auto LF/no LF, delay/no delay after carriage return, half/full duplex, and lower to upper case conversion/no conversion. The Serial Communication Protocol jumper block eliminates non-standard cables and jumpered circuit boards. Considering all features of the AP-SIO it is the most versatile and compatible serial interface on the market today. Retail Price **£73.55**

AP-80 Apple II Parallel Printer Card

SPECIFICATIONS:
- Assembled and tested.
- Fully compatible with: All Apple software, graphics dump routines, Epson, Okidata and Centronics.
- Defaults to 80 column/printer only.
- Eliminates the need for CTRL-18ON.

PRODUCT DESCRIPTION: The MPC AP-80 is a parallel printer card for the APPLE II Computer. It is designed to be compatible with ALL existing software and accepts all standard APPLE parallel control codes. It is configured to operate Centronics compatible printers such as Epson, Okidata, IDS etc. The jumper block can be easily modified to operate any parallel printer. Default values have been present in software so that on power-up the AP-80 defaults to 80 column width, output to printer only. These defaults can be modified at any time using APPLE's CTRL-1 convention. The AP-80 is supplied with a Centronics configured jumper block, 4 foot cable and connector. Retail Price **£50.85**

AP-32 32K Memory Board for APPLE II

SPECIFICATIONS:
- 32K 4116 200NS Prime RAM
- Supplied with software to relocate DOS and Integer in the AP-32 allowing over 46K basic program space
- Six LEDS to indicate board status
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- Switch selectable 2716 monitor socket
- Operates in any slot (subject to software requirements)
- Fully compatible with the Apple language card.

PRODUCT DESCRIPTION: The MPC AP-32 is a 32K RAM expansion board for the APPLE II computer. It is designed to be compatible with all existing programs that operate with the Language Card including APPLE PASCAL and FORTRAN, CP/M, DOS 3.3 (enables use of both INTEGER and APPLESOFT BASIC), VISICALC, LISA 2.0, or any other application requiring additional data space. With a 48K APPLE and the MPC AP-32, you have 80K bytes of storage available. The monitor socket is designed to allow custom monitor routines such as an interrupt driven I/O, getting default input from a custom keyboard, putting default output to an 80 column card, etc. An EPROM version of APPLE's old monitor can also be utilised from this socket.

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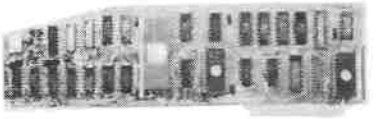

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Micro Planner review – Games review (Computer Bismark, Battle of Waterlook, Raster Blaster) – Letter square puzzle – Machine code techniques. Part III (dumping screens to printers) – Bulletin boards and personal computer database systems – Teletype terminal program – Crash course in Basic, Part II – Consumer's guide to Apple Music, Part II – Apple user profile: SEGAS, Part II – Apples in South African schools – Programs for primary schools. PLUS two pages of Compucopia and four Appletips.

November 1981
First review of the new Apple III – Games review (Temple of Apshai, Hellfire Warrior, Apple Panic) – Hayden Compiler review – BCPL, a fast language for the Apple – Psychological assessment by the Apple – Beneath Apple DOS book review – New software from the USA – Crash course in Basic, Part III – The role of speech synthesisers in schools – Historical review of computer literacy – Apple user profile: clothing manufacturing. PLUS three pages of Compucopia and six Appletips.

December 1981
Regain Step/Trace in Autostart Apples – Games listings (Apple Casino, Avoid, Calendar) – Games review (German Whist, Wizardry, Galactic Attack, Pool 1.5,) – Sinta Shape Manager review – Machine code techniques, Part IV (sorting arrays) – A/D converter review – Colour systems – Financial Controller review – Wordstar review – Crash course in Basic, Part IV – Debugging the Fortran Compiler – Care of discs – Electronic atlas – Pascal explored. PLUS four pages of Compucopia and seven Appletips.

January 1982
Apple scoop on Tomorrow's World – 1982: The Year of the Apple? – Games review (Wizardry) – Simultaneous equations without tears – Boosting machine code technique – Program Writer/Reporter review – Crash course in Basic, Part V – Machine code techniques. Part V (flagged bubble sorts) – Apple graphics, Part I (Apple's memory map) – Orbit accounting system review – Cost effective terminal computer – Moving hi-res graphics. PLUS four pages of Compucopia and seven Appletips.

February 1982
Games review (Olympic Decathlon, Dragons Eye) – CP/M: passport to exciting new world – Pascal file conversion program – Machine code techniques, Part VI (EVALuate a new function) – Crash course in Basic, Part VI – Elements of the Apple, Part I – Apple Graphics, Part II (high resolution graph drawing) – Making programs more user friendly – Getting round the memory map muddle – Apple user profile: Sea Fish Authority. PLUS three pages of Compucopia and seven Appletips.

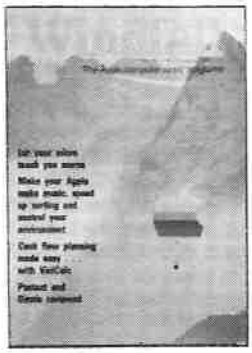
March 1982
Games review (Crush, Crumble and Chomp) – Apple Medical Forum – Data Factory review – Apple Graphics, Part III (displaying histograms) – Printing an annotated DOS disc directory – Crash course in Basic, Part 7 – Start training for the Apple Olympics – Elements of the Apple, Part II – Payroll package for the Apple III – Six educational programs reviewed – DOS 3.3 to 3.2 software switch – Workshop/Wordstar tuition course reviewed. PLUS three pages of Compucopia and four Appletips.

April 1982
Apple speeds the news – Games review (Castle Wolfenstein, Threshold, President Elect) – DOS Toolkit problems – Linking Apples to IBM – Home-grown boards boom – Micro-Finesse review – Basketball match analysis – Elements of the Apple, Part III – FMS accounting system review – DOS disc directory, Part II – Apple graphics, Part IV (3D animation graphics) – Apple 82 Education Forum – A structured approach to teaching. PLUS four pages of Compucopia and five Appletips.

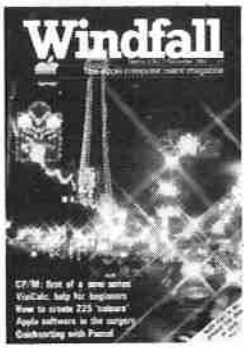
May 1982
A case for Applebus as a new international standard – Games review – Flight Simulator – Hi-res Planet Plotting – Microspeed review – Mathemagic review – Update on Printers (special 16-page printer section) – The Stationery Revolution – Understanding Microcomputers (Part IV) – Simulations Enhance Classroom Work – Computers in Business Education Studies – Speedy Way to Handle Histograms. PLUS four pages of Compucopia and four Appletips.

June 1982
New ways of linking Apples to the outside world – Introduction to Forth, Part I – Games review (The Prisoner, Pinball) – Apples in Medicine – Tasc Compiler review – Micros in process control – Building pictures with machine code – High-speed Apple links to mainframes – Wildport cards review – The Last One and CORP program generators reviewed – Book review (Apple II User's Guide) – Teacher's Toolkit and suite of primary school programs reviewed. PLUS four pages of Compucopia and six Appletips.

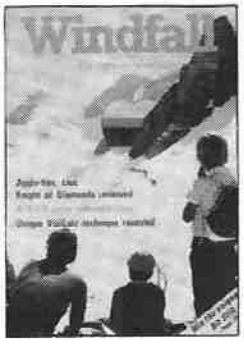
July 1982
Games review (Pursuit of the Graf Spee) – Elements of the Apple, Part IV – Apple '82 reviewed – Introduction to Forth, Part II – Making the most of VisiCalc's capabilities – CBasic and MBasic analysed – Ormbeta database reviewed – Crossword Magic reviewed – Make your own user port, Part I – Earth Defence game and listing – Asynchronous data transfer, Part I – School application of Cesil – Computers as an aid to concentration – PLUS four pages of Compucopia and three Appletips.



August 1982
Games review (Bandits, Suicide, Swashbuckler, Fly Wars) – Instruction file editor – Teach yourself Morse, Part I – VisiCalc section – Pastext II review – Asynchronous data transfer, Part II – Omnis review – A melody from your micro – Summary of 10 utilities – Make your own user port, Part II – Mah Jong – Number sorting – Elements of the Apple, Part V – Guidelines for buying a school Apple – Educational programs reviewed – PLUS four pages of Compucopia and two Appletips.

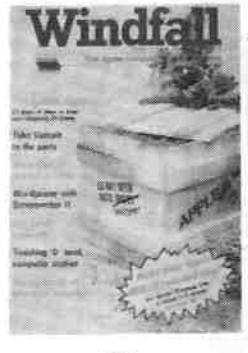


September 1982
Use of CP/M COPY and PIP programs – Games review (Odyssey, Choplifter) – DOS aid to VisiCalc – The VisiCalc phenomenon – Wordscore game (listing) – Tasc compiler review – Med-res graphics, Part I – Snapshot review – Learning Morse, Part II – Button for multiple choice testing – Asynchronous data transfer, Part III – Bag of Tricks review – G-WHIZ review – Medic review – Sorting with Pascal – Memory test program (listing). PLUS four pages of Compucopia and six Appletips.



October 1982
Games reviews Knight of Diamonds (the second wizardry scenario) and Pig Pen – Think Tank (with listings) – Med-res graphics, Part II (filling in shapes) – Lisa assembler language review – Magic of VisiCalc – VisiCalc Business Forecasting Model review – Cross reference listing program – Apple-vox speech synthesiser review – Morse Code, Part III – Computerised flash card for schools – French Verb program review. PLUS four pages of Compucopia and seven Appletips.

November 1982
A beginner's guide to PEEKs and POKEs, Part I – Games review (Galactic Wars, Night Mission Pinball, Raster Blaster, David's Midnight Magic and three Quick Spins) – Think Tank (with listings) – Three 80 column cards evaluated – VisiCalc: Brush up your algebra – Bit Stik graphic system reviewed – Pitfalls in producing educational software – Treasure Islands educational game reviewed – Med-res graphics, Part III (Ampersand routine). PLUS four pages of Compucopia and six Appletips.



December 1982
Think Tank – Doing the impossible in Pascal (listing) – Interactive editor-assembler, Part I – Take Visicalc to the Christmas party – Games reviews (Space Kadet, Crazy Mazy, Mars Cars, Star Maze, Deadline, Musicomp, Electric Duet, Time Zone) and listings (Humpty Dumpty, Christmas Card, Scram) – reviews of 'O' Level Aids, Tic Tac Show and Screenwriter II – Beginners guide to PEEKs and POKEs, part II – Z80 cards compared – PLUS four pages of Compucopia and six Appletips.

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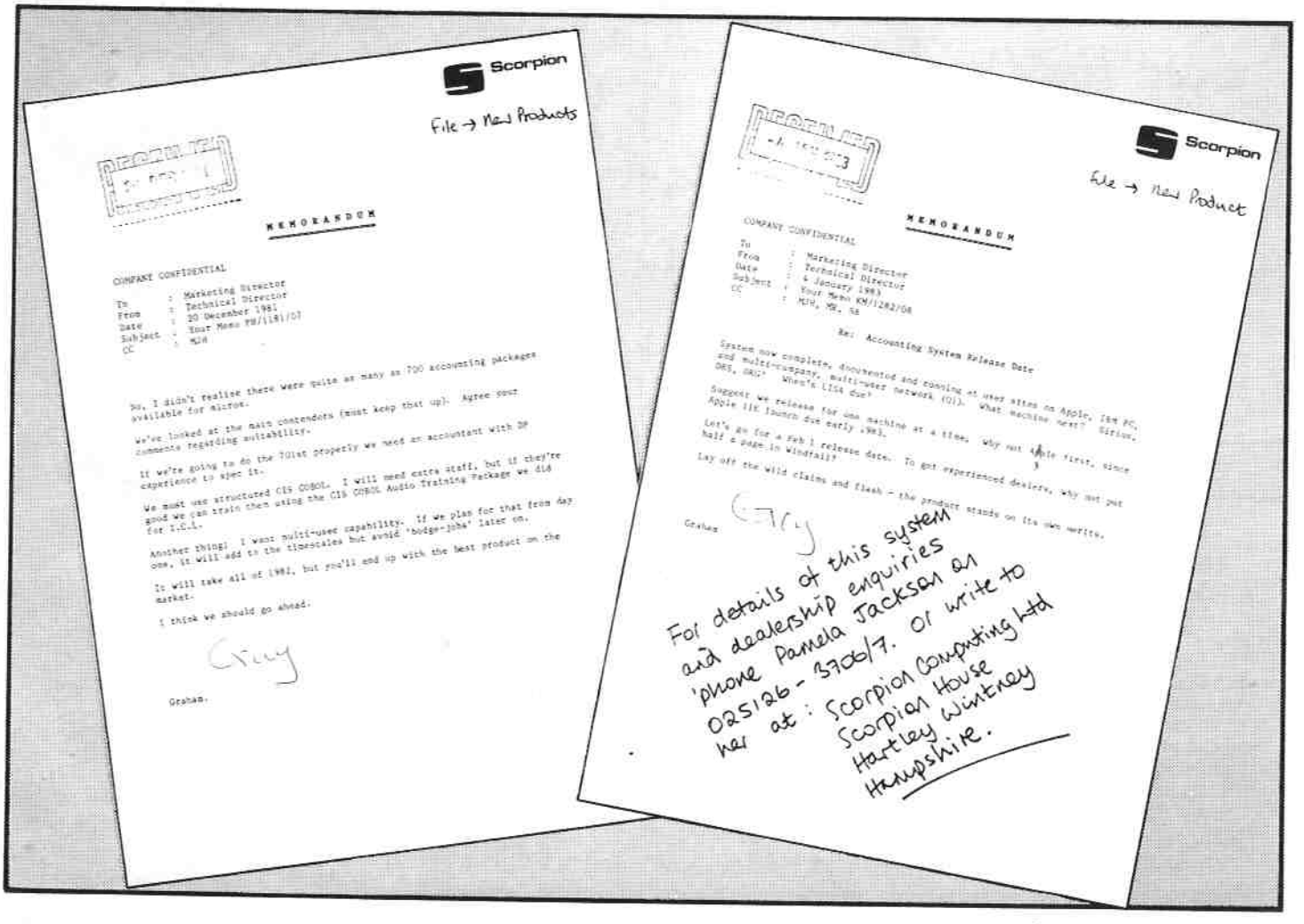

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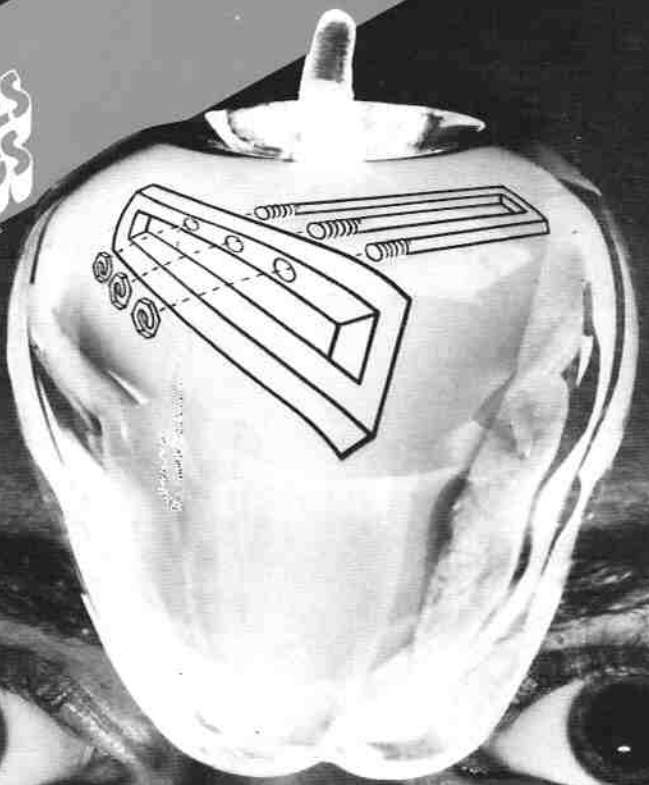

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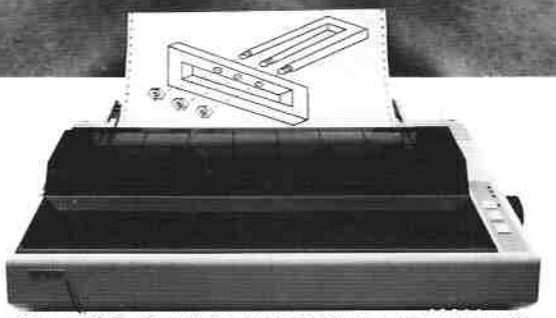

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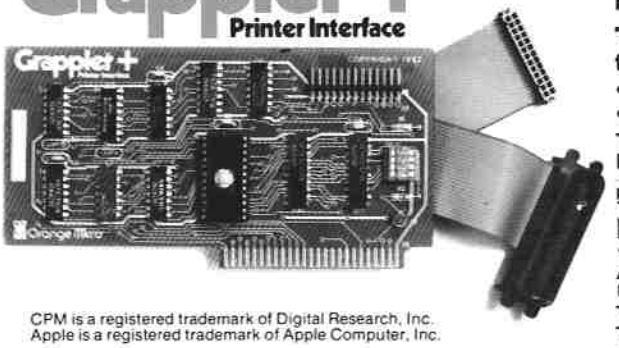

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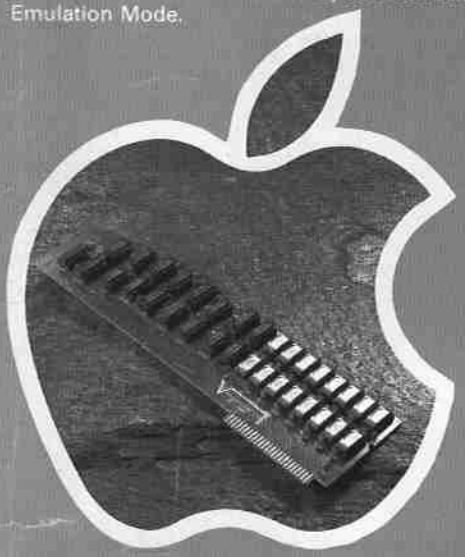
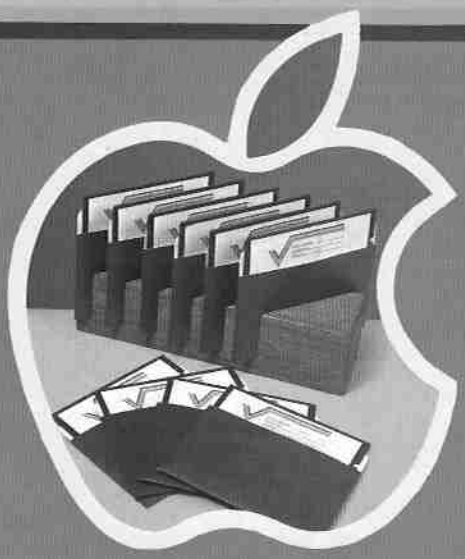
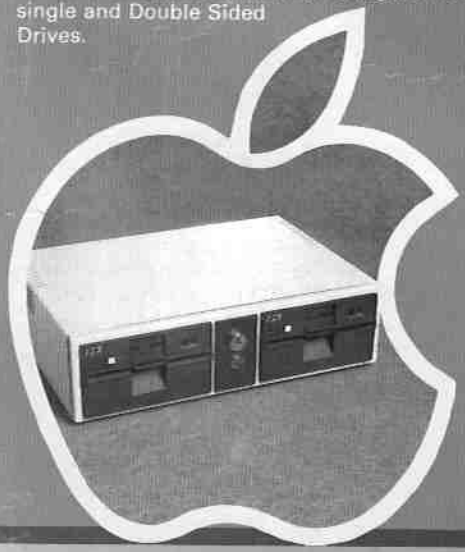
Ramex 128
- ★ 128 Memory Expansion Board using latest 64K Ram chips.
- ★ Supplied complete with Disk Emulation and Memory Management System for Apple DOS 3.3.
- ★ Memory Management System uses up to two existing 16K cards in your computer configuration.
- ★ Integer/Applesoft firmware cards fully supported.
- ★ The Vergecourt Super Expander Software package allows the Ramex 128 to display *VISICALC WITH 136K* of memory.
- ★ Access times can be increased by as much as 300% in Disk Emulation Mode.

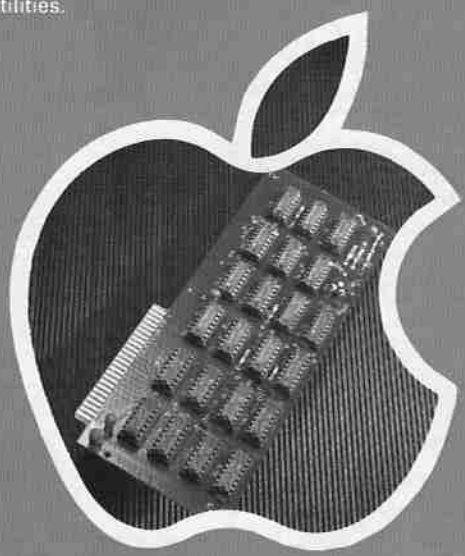




Software
- ★ Super Expander — using 128K Ram Board expands Visicalc to 136K usable memory
- ★ Expander — using 2 × 16K Ram Boards expands Visicalc to 50K usable memory
- ★ Consolidator — to consolidate your Visicalc worksheets
- ★ Manager — for relocation of DOS onto a second 16K Ram Board
- ★ Locksmith — bit copier to take back-ups of your vital programs.
- ★ Inspector — selection of necessary utilities.
- ★ Watson — the Inspectors assistant with additional utilities.

Disk Drives for Apple II
- ★ Three versions of this product currently available in either two, three or four pack configurations.
- ★ Capacity of 622K, 933K and 1244K bytes.
- ★ Maximum file sizes have therefore been increased to 311K bytes.
- ★ Integral switch made Power supply unit for much improved reliability.
- ★ Interface Board and Cable assembly included.
- ★ Formatted for IBM 3470 in 76 tracks.
  Conversion capability between Shugart, Teac and Pertec single and Double Sided Drives.





Ramex 16
- ★ The first 16K Expansion Board for the Apple to incorporate on-board Ram re-fresh.
- ★ Language card capability to run Pascal, Integer, 56K CP/M etc.
- ★ DOS Relocation capability using 'The Manager' software by Vergecourt leaves approximately 45K of Motherboard Ram available.
- ★ Over 7000 sold worldwide and available through all major Apple dealers.
- ★ Easy installation as no strap and header chip need to be connected.
- ★ Multiple boards can be used dependant upon application.

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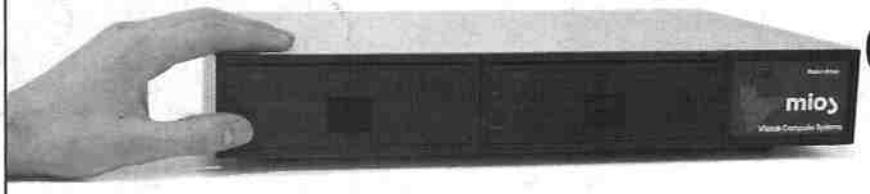
Apple][	**Pascal 1.1**
Apple ///	**SOS 1.1**



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