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# apple user

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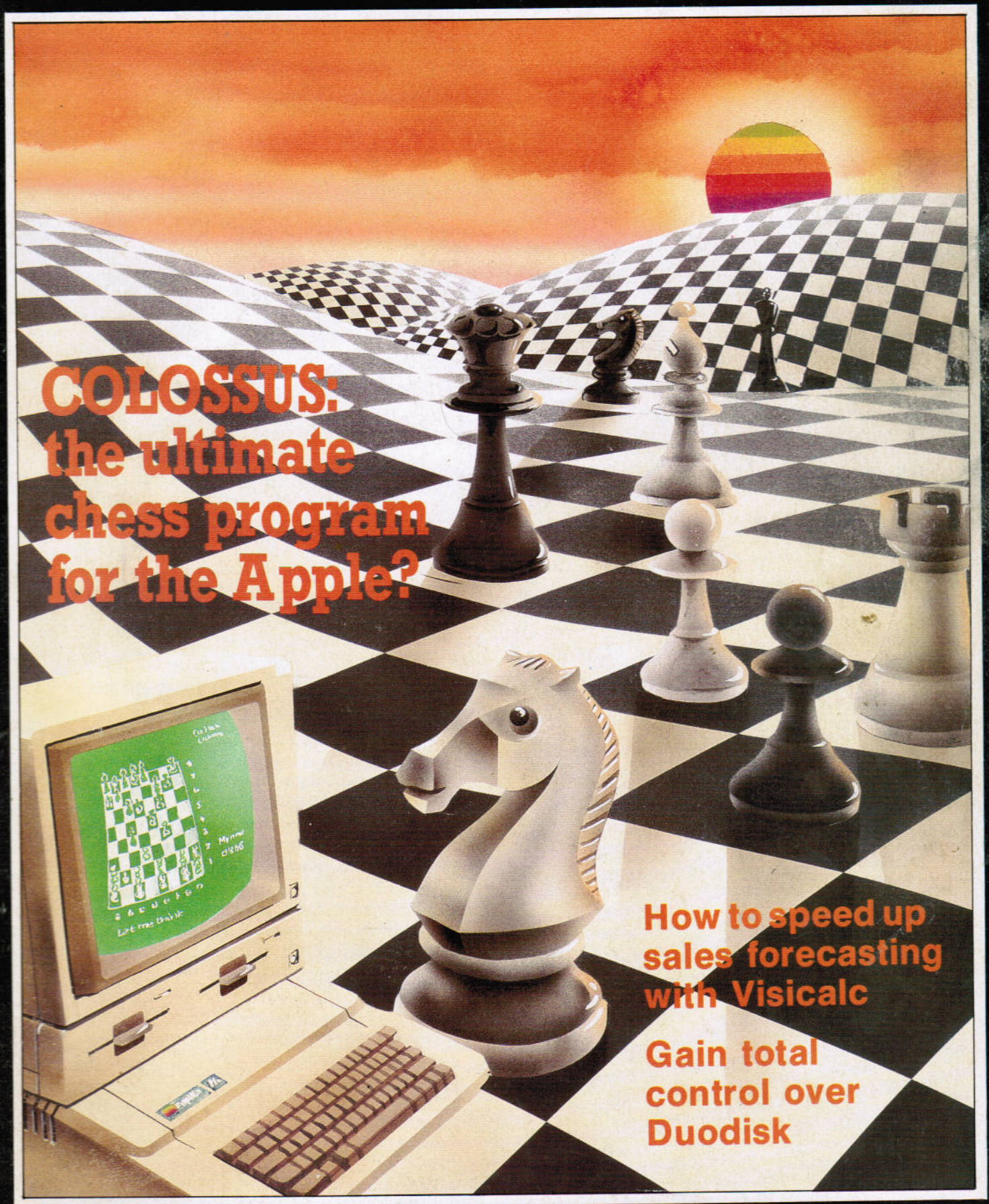

## COLOSSUS: the ultimate chess program for the Apple?

## How to speed up sales forecasting with Visicalc

## Gain total control over Duodisk

Reviews: Lowtext disc controller & NEC drives • Crunch • Lemi Midi interface • Mac+ U

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Volume 6
Number 1
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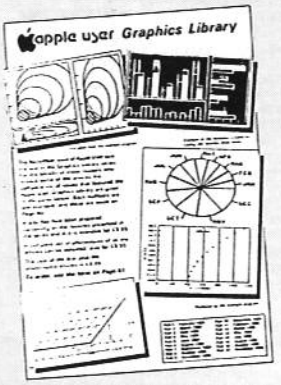


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*Apple User Managing Editor* **Derek Meakin** *Features Editor* **Cliff McKnight** *Technical Editor* **Max Parrott**
*Production Editor* **Peter Glover** *Advertisement Manager* **John Riding** *Design* **Heather Sheldrick**
*News Editor* **Mike Cowley** *Editor-in-Chief Database Publications* **Peter Brameld**

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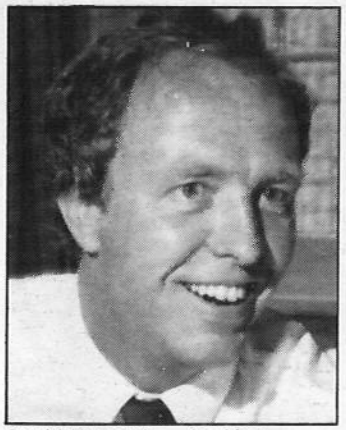


*David Hancock... backing the big Macs*

# Hancock woos the managers

DAVID Hancock has set himself a mammoth task for the remainder of his career as managing director of Apple UK.

His ambition is to get through to the vast majority of managers in British industry and commerce who are still resisting the micro.

And the size of the job can be seen from his estimate that as many as 97 per cent of executives suffer from computer phobia.

In an interview, Hancock said: "I'm convinced of the long-term health of the market for personal computers, though I reckon only about three per cent of managers have woken up to using the power of micros to help their work".

Hancock has high hopes for the new generation of Macintosh computers, including some with really large memories.

"The new 1mbyte Macintosh will be a similar price to the present 512k machine, and this year I expect to see Macintoshes with up to 8mbytes of RAM available", he said.

# Mac switching to UNIX - report

**A SERIES of reports from usually reliable sources in the USA all point to Apple preparing to ditch the Mac operating system.**

These follow on from leaks from within the corporation itself that all is far from well on the Mac front.

Latest "news" from Cupertino is that Apple is to drop its DOS in favour of a specially designed implementation of UNIX.

To support the new DOS, informants claim, there will be brand new CPUs for the Mac. Each will target the machine at a different audience, such as computer aided design.

"If this is true then it will mean the end of the Macintosh as we know it", said one American computer journalist.

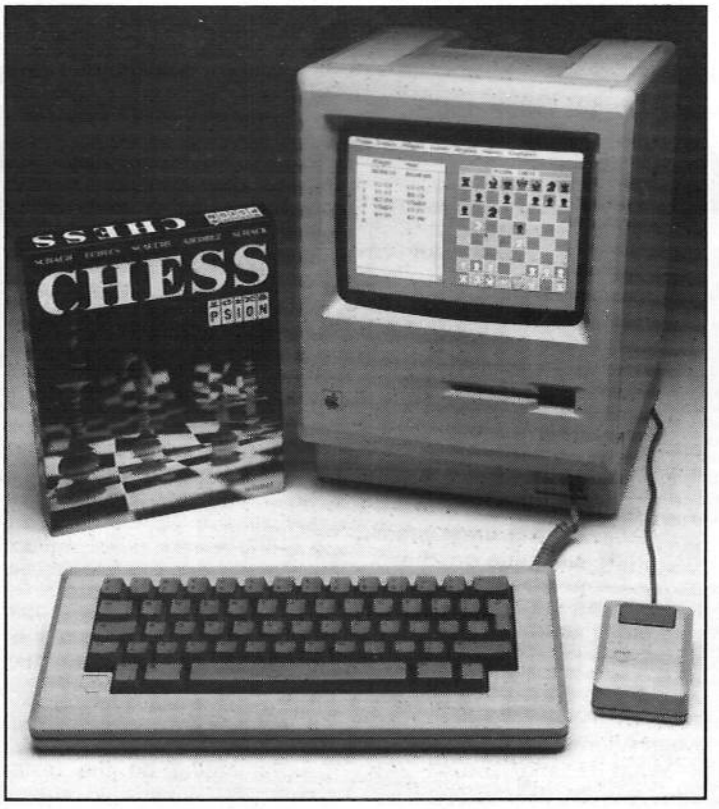
"It is given credibility however by the fact that Apple themselves are known to be renewing their love affair with the Apple II range".

Asked about the possible consequences of Apple dropping the Mac DOS, one UK expert replied: "Firstly it would mean an end to a colour Macintosh.

"Then all the existing programs in the pipeline for the current Mac DOS may as well be scrapped.

"And you could literally say goodbye to sales of the existing Macs".

Contacted by *Apple User,* a spokesman for the company said: "We have certainly not heard anything about this – and we would be very surprised if it was true".




# French award for Mac chess

A TOP French software award has gone to Psion's Chess program thanks to its Macintosh version.

The company has won the prestigious *"Le meilleur logiciel d'echec"* award which is sponsored jointly by Tilt Microloisirs magazine and the Canal Plus television station.

At a Paris ceremony Psion's export and marketing manager David Frodsham received the trophy – a gold disc – on behalf of the company.

"The Macintosh version is the only bilingual chess program available, so naturally this gave it an edge", a company spokesman told *Apple User.*

It is the second major award to be won by Psion Chess. The program picked up the world microcomputer chess championship title in 1984.

# Wozniak buys $5m Apple shares

A REPORT in the authoritative San Francisco Examiner has revealed that Steve Wozniak, co-founder of Apple, has bought his way back into the corporation.

Writer John Markoff has dug up the fact that Wozniak, who left Apple to work on remote control devices, has sunk $5 million into company shares.

And he has taken an option to purchase a further $15 million worth of stock. "It's not an investment, it's just because it's right", Wozniak is quoted. "I'm very excited about Apple".

Word has had it for some time that Wozniak wanted back, but not in any executive capacity.

# Christmas spending spree

**APPLE UK went on a half a million pound spending spree in London and the South East before Christmas.**

**The money was spent on promoting the business aspects of its Apple II and Macintosh machines – with £270,000 allocated to a one minute television commercial alone. Two of the scenes from it are shown above.**

**Advertisements in the major national newspapers used up the remainder.**

**Produced by Lewin and Watson and created by BBDO in the UK, the commercial had its premiere here before Apple International took it over for European screenings. In the run up to Christmas it was repeated 15 times.**

**The international arm ran a major print campaign in business publications such as the Financial Times, Newsweek, Time, the Economist, Fortune, Business Week, the International Herald Tribune and the Wall Street Journal.**

# Big New Year boost for the Apple II

**ON the eve of the annual shareholders meeting, when several impressive new products are due to be unveiled, Apple appears to have got its act together again and things are jumping in Silicon Valley, reports Jim Mangles*.**

Sales of the Apple II are reputed to be running at about 50,000 a month, with the IIe outselling the IIc in the ratio of two or three to one.

There will be a new Apple II using the 16 bit CPU announced in the New Year and it is apparent that since Steve Jobs left, the company's attitude to the Apple II has become much more positive and we can look forward to a long life for this magnificent machine.

Interestingly, third party add-on cards have now become available for it which enable it to outperform the IBM-PC in almost every respect. Two or three mbyte RAM configurations are now quite common, giving users of AppleWorks up to two mbytes or more of workspace – three times more than that available to those power users who think that 1-2-3 on the IBM is the way to go. And all for half the price of Big Blue!

Recently in San Jose a public competition was organised between Andrew Williams, author of "What If?" and "Lotus 1-2-3 From A to Z", who had worked exclusively with Symphony for over a year, and Charles Rubin, author of AppleWorks and "The Endless Apple".

Williams was equipped with a 640k IBM-PC running Symphony and Rubin had a 128k Apple IIe souped up with an Applied Engineering RAMworks 512k expansion card and AppleWorks.

Both were given the task of generating the same sales report from the same data and both were given the same time – 30 minutes – to complete the work.

As it turned out it was no contest. Rubin and the Apple were finished well ahead of time, and Williams and the IBM were so far behind that they could not finish in the available time.

Commenting on the result afterwards, Rubin said it was the logical result of the nature of the two machines – the IBM, for all its vaunted power, is complex, hard to use, and full of pitfalls, whereas the Apple with Appleworks is designed for simplicity and function and is highly disaster-proof.

There are going to be two new Macs next year.

The first, codenamed Rocky, will be announced at the annual meeting and is already out in the hands of selected third party developers in Silicon Valley for beta testing.

What I have to say about Rocky is guaranteed to be 99 per cent correct, unless Apple go to extraordinary lengths just to make a liar out of me. Remember you read it here first!

The second, codenamed Jonathan, will not be released until August or September.

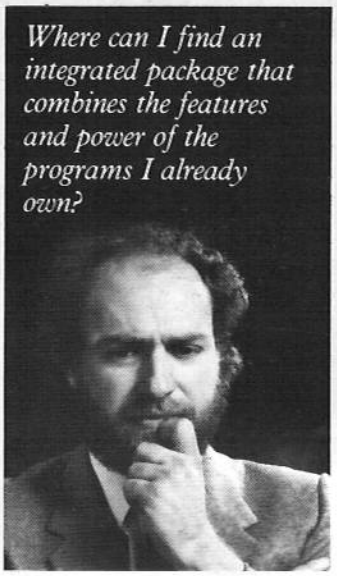
Details about this second machine are necessarily not so firm as is the case with Rocky.

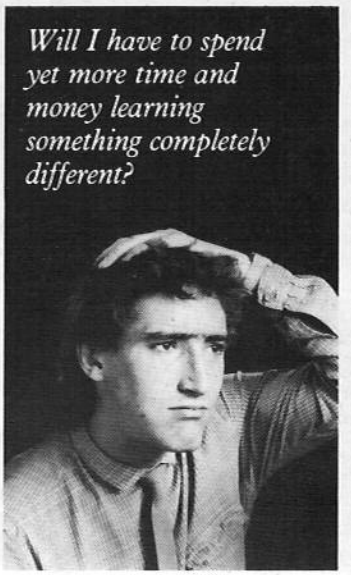
Rocky will come in a box that looks like the present Mac. The screen will not be changed either. The principle changes are:

- 1 mbyte RAM, with the capability of future expansion.
- 128 kbyte ROM, including the new Hierarchical File System

** Jim Mangles is owner of consultants Ewart Microsystems.*

# If only there were an alternative to integrated software!






You've probably considered the benefits of buying a program that does several different jobs from one disk. After all, most computer users need to switch from one task to another several times a day. And repeatedly closing down your current program, booting a different disk and then trying to find where you left off wastes valuable time and disrupts your flow of work.

Integrated software would be the obvious solution if it weren't for the fact that one Apple II* user is likely to have very different needs from another.

The remarkable Snapshot Shuttle™ is an inexpensive device that gives you a simple alternative to worrying about the drawbacks of integration. It lets you keep up to four different programs in memory at any one time.

You want to combine the best word-processor with the fastest spreadsheet, a versatile comms package and Hitch Hikers Guide to the Galaxy?** Fine. With the Shuttle you're free to choose.

You can switch rapidly between your programs with just the flip of a switch, and each one resumes running exactly where it was interrupted. No fuss, no waiting. The Shuttle even works happily with integrated software!

You already know everything you need to know to use the Shuttle. There are no new commands for you to memorize and no piles of impenetrable documentation to wade through. And because it uses the interrupt-and-resume power of the Snapshot card, the Shuttle gives you access to a whole new world of great, easy-to-use utilities that will enhance your Apple at home and in the office.

Ask your local Apple dealer to demonstrate the power of the Shuttle for you, or write or call us for more information.

**PRICES (ex VAT)**
Shuttle software and Snapshot card ..... £115.00
+ 1 other Snapshot software pack ..... £130.00
+ 2 other Snapshot software packs ..... £140.00
+ 3 other Snapshot software packs ..... £150.00
(Snapshot software packs are available separately at £20.00)

**SYSTEM REQUIREMENTS**
Apple II + or //e with minimum 128K RAM and 1 disk drive.

**MEMORY EXPANSION CARDS**
The Shuttle will let you load 2 × 64K programs into a 128K Apple. Naturally, the more memory you have, the more programs you will be able to load. The Shuttle works with all the popular RAM cards including Apple's new Memory Expansion Card.

Cirtech 64K extended //e 80-column card..... £ 55.00
RAMrod 128K (includes DOS 3.3 RAMdisk software) £160.00
Glanmire 512K extended //e 80-column card ..... £399.00
(includes Appleworks expansion software).

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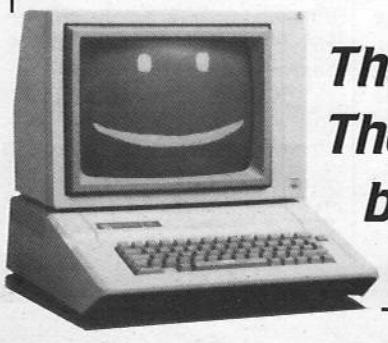

## The Snapshot Shuttle. The shortest distance between your favourite programs.

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# QUIET TIME

*IT'S all quiet on the Apple UK front – and that's official.*

*A dearth of statements from Apple's public relations company Kingsway for several weeks prompted the question from Apple User – Why?*

*"We have no new products", replied the official spokesman. "In fact, we have no new prices.*

*"Come to think of it, we have no new personnel as far as I am aware.*

*"Nor have there been any fresh financial reports.*

*"It all boils down to the fact that nothing has been happening. There is simply no news".*

*Asked if in the light of all this there was a possibility that the company might have closed down without letting them know, the spokesman somewhat wearily replied:*

*"Nobody has bothered to tell us if they have".*

# New note for Midi men

PUTTING low cost but powerful electronic music systems based on the Apple within reach of schools is recently formed company Take Note.

It says its aim is to develop the educational role of such systems and at the same time destroy the myth of high tech being high price.

The system it has devised has the Apple II at its heart running a DS:3 sound sampler and sequencer from Greengate.

Take Note is also awaiting the arrival of a suite of programs from the States. The company claims Dr T's Music Software will turn the Apple into a full blown Midi sequencer or echo chamber – in essence, a mini recording studio.

The suite comprises a Midi sequencer, Midi Echo and patch libraries/editors for the Yamaha DX and Casio CZ range of synthesisers.

"The music teacher now has the opportunity to introduce a whole new creative element into the curriculum", said Nick Kiey who co-founded the company with Michael Newton.

The system's facilities allow users to record and edit musical data and enables musical instruments to communicate with one another.

# Hilderbay taken over

THE Hilderbay range of business software for the Apple II range has been acquired by a new company, Centretime.

Despite the popularity of its products over the past six years Hilderbay had run into difficulties which culminated in it going into voluntary liquidation.

Now Centretime has bought the rights to Hilderbay's Payroll, Invoicer, Bookkeeper, and Statutory Sick Pay packages.

A Centretime spokesman told *Apple User* his company was seeking dealer outlets for the four packages which cost £119 each.

# MAG DROPS MAC

ONE of the original American magazines devoted to Apple products has decided to drop all further coverage of the Macintosh.

Call-A.P.P.L.E. had allocated a significant number of its pages to Macintosh features and products since early 1985. But it will opt out in favour of dedicating the entire contents to the Apple II range.

Announcing the decision, Don Elman writes in the latest issue: "Reactions to the Macintosh coverage have been mixed. Many seem to feel that the Apple II and the Macintosh have little in common beyond their corporate parent's name.

"Except for the small number of users who straddle both camps, Apple II users tend to resent the intrusion of Macintosh articles.

"Therefore Call-A.P.P.L.E. will be phasing out its Macintosh section after this issue".

# Managing on disc

A BOOK and complementary software that explains marketing management in the engineering and allied industries and can also be used in marketing education is available to Apple II users.

Microcomputers and Marketing Decisions is written by engineer and marketing expert Leonard Williams and published by the Institute of Electrical Engineers, priced £22.

Its central theme is that the essence of management is control. For marketing management this means market planning, which depends on knowledge in four vital areas – market size, marketing mechanism, cost and resources.

The book contains listings for the Apple II of programs covering key areas of marketing decision. Twelve of these are available on disc for £120 from EMR.

FROM PAGE 6

(HFS) version of the Finder (Finder 5.0).

- 800 kbyte internal double-sided drive, optional 800 kbyte external drive also available.
- Enhanced keyboard with numeric keypad and direction-arrow keys.
- SCSI (10 mbits/sec) port This is primarily intended to provide the high-speed data-flow that's necessary to get full benefit from Apple's own HD20, or, indeed, any external hard disc.

The Resource Manager has been generally speeded up. Compacting a resourced file is now smarter and therefore much, much faster.

It has a new "supercharging" capability which allows specially formatted applications to start up much faster and also uses a RAM cache system, not unlike Mac Turbo Touch to minimise disc access. Quickdraw has been speeded up by about three times.

The Font Manager is greatly improved, with fractional spacing now possible. This is particularly useful for LaserWriter applications.

The new font numbering scheme will support up to 65536 (yes Virginia, that's right, 65536) unique font families, compared with the measly 512 offered under the old system.

The Scrap now writes to the boot disc every time, not the default volume.

This is more speculative, but rumour has it that Rocky will cost about the same as the present price of a 512k Mac.

What this will do to the price of the 512k machine, I leave to your imagination, but a clue is that it's also rumoured that the upgrade from 512k to Rocky will be under $500 and involve removing and replacing the keyboard, motherboard, internal drive and rear external panel.

Apple stopped making 128k Macs some two months ago.

Jonathan is the code name of the "Modular Mac", which will come along about six months after Rocky.

At present it's expected to use a MC68020 CPU, have at least 2 mbytes on the motherboard, be expandable to 8 mbytes (some say 16), have built-in hard disc, will clock at 16 MHertz, have slots (number unknown), have a detachable monitor with horizontal and vertical dimensions two times the present screen but the same pixel density per square inch.

Apple will not supply a colour monitor, but with detachable monitor, this becomes an option for a third party to supply.

Price? Unknown, but between $3,000 and $4,000 seems the probable target.

MicroLink
in association with
TELECOM GOLD
No. 5 January 1986

# NEWSLETTER

## Now it's e-mail with flowers

NOW MicroLink subscribers can say it with flowers at whatever hour of the day or night the mood strikes them, and their floral gift will be delivered anywhere in the British Isles.

MicroLink has joined forces with the world famous flower delivery service Interflora to create FloraLink, which for the first time ever enables people to send flowers and plants by way of their computer.

FloraLink will have 24-hours-a-day open access and deliveries by Interflora's 2,700 members throughout the UK and Eire can usually be made any day other than Sunday.

Orders sent to FloraLink before noon on a working day can be processed and delivered the same day.

The selection includes freshly cut flowers, bouquets, wreaths and sprays and potted plants – all manner of sizes and specially shaped arrangements to suit the customer's pocket.

FloraLink will carry a price list to give subscribers an idea of just what is available, and payment for the flowers will be by credit card.

Eventually it is hoped to expand FloraLink to cover all Interflora's 44,000 members in more than 130 countries.

THE MicroLink family is getting bigger and bigger. Electronic mail users in Eire and New Zealand can now be reached directly through MicroLink.

Subscribers can communicate with them just as easily as they can with other users in the UK.

All that's needed is the system code number – like MicroLink's 72 – of the person in Eire or New Zealand to be put in front of their ID number.

Fourteen countries are now part of the international electronic mail network – Australia, Canada, Denmark, Eire, Germany, Hong Kong, Israel, Korea, the Netherlands, New Zealand, Puerto Rico, Singapore, UK and USA.

**YOUR chance to join MicroLink – turn to Page 52**

## Link to a train

WITH the aid of MicroLink an historic German built steam locomotive has been saved from the scrap heap and brought to Britain to feature in a permanent display of railway nostalgia.

Steam enthusiast Martin O'Keeffe used MicroLink's telex facility to negotiate a deal with Kolmex, a Polish import-export firm specialising in the sale of railway equipment.

What he was after was a narrow gauge loco that had been retired from its job of hauling sugar beet from the fields to a processing factory.

It had been built in 1918 by the firm of Henschel at Kassel in Germany for use by the German army on railway networks built by military engineers to supply the front lines in the 1914-18 war. O'Keeffe's research showed that the loco had been used by the Polish factory since 1937.

It is now the property of the North Gloucestershire Narrow Gauge Company, a small group of enthusiasts to which O'Keeffe belongs.

When it is eventually restored to mint condition the engine will be one of the feature attractions of the museum railway at Toddington in Gloucestershire.

There are a number of locomotives on display and O'Keeffe and his fellow train buffs operate them on open days during the summer.

## Motivation for youngsters

CHILDREN with learning difficulties and disabilities are being taught with the aid of MicroLink.

The 76 pupils at Kaimes School in Edinburgh all have special needs in the educational sense – but that doesn't mean they miss out on information technology.

Micros have been in use at the school for several years and, apart from their value as teaching aids, are extremely popular with all age groups says headteacher Jennifer Ruddick.

The primary age youngsters use the computers to help them learn simple maths and spelling, while children at the secondary level are taught the practical uses of micros and even some programming theory.

The school is a Prestel subscriber, which gives the youngsters access to a massive information database which is complemented by MicroLink's electronic mail services, computer industry news, UK bulletin boards list and telesoftware.

Asked if micros have advantages over more traditional methods of teaching children with learning difficulties, Miss Ruddick said: "Absolutely, although we naturally have a low ratio of teachers to pupils because of the children's special needs, our youngsters are much more motivated to learn through the use of micros than by blackboard, pen and paper".

The school uses a number of special programs, including the micro special pack from the Scottish MEP in Glasgow which helps learners of low ability to grasp the basics of the three Rs as well as preparing them for life after their schooldays.

"But we are just as interested in seeing what computers can do as in getting information from them", says Miss Ruddick. "We will use MicroLink's special features to help our pupils learn even more about practical applications of information technology".

# Greasing the wheels of Pascal progress

ALTHOUGH the typical Apple Pascal program executes about ten times as fast as its Applesoft equivalent, there are still times when we want our programs to run a little faster. Also, despite the fact that we can segment our programs, and that segments stay on disc until they are required, we sometimes run out of memory space.

This month I'll try to identify a number of rules to help us optimise execution time and memory usage. One problem is that the two ideals are often in conflict – the faster program frequently uses more memory.

***Rule number 1*** is "Go and buy an Accelerator if you haven't got one already". This hardly qualifies as advice about Pascal, but the difference that a 3.6MHz processor makes is amazing. Of course, disc accessing is only a little faster, but editing, compilation and most applications double in speed.

In terms of pure computation, an accelerated Apple is about twice as fast as an IBM PC. Be aware that IIes and II+s require different cards – IIe's must have a IIe Accelerator and some II+'s won't work with a IIe card.

***Rule number 2,*** and the first proper Pascal rule, is "Watch your order of declarations". The p-machine, the theoretical computer whose instructions are obeyed by the interpreter in SYSTEM.APPLE, has a special set of instructions for accessing the first variables declared in a program, or within any procedure. To be precise, the first 16 words are accessed more quickly. Integers, chars and booleans all take one word, reals take two and arrays may take many hundreds of thousands.

Consider the following alternatives:

```
var   i,j,k:integer;
        ch:char;
  xref,yref:real;
      store:array[0..1023] of integer;
```

---

```
var   store:array[0..1023] of integer;
      i,j,k:integer;
        ch:char;
  xref,yref:real;
```

The first example will both run much faster and produce a shorter program, as whenever the integers, chars and reals are accessed their addresses will be part of the one byte op-code. In the second example no variables will benefit from this shortened instruction form.

If you cannot get frequently used variables into the first 16 words, then do get them into the first 127. In the same way that the 6502 accesses data in zero page (the first 256 bytes of memory) much more quickly, the p-machine instruction set has a similar feature. Again, access is faster and the code is smaller.

***Rule number 3:*** "Watch WHERE you declare your variables". It is bad programming practice to declare everything globally, that is at the top of the program. On the grounds of debugability, readability and memory usage, declare variables in the procedure in which they are used. However a problem arises if a procedure uses variables declared within the procedure which called it.

For example:

```
program silly;

  procedure outer;

  var ar:array[0..4000] of integer;

    procedure inner;

    var i:integer;

    begin
      for i:=0 to 4000 do
        ar[i]:=35
    end; (* of inner *)

  begin (* outer *)
    writeln('initialising');
    inner
  end;

begin (* main program *)
  outer
end.  (* main program *)
```

The procedure inner is accessing the array ar declared in outer. The p-machine has three type of instructions to access memory locations. They are:

*Local memory:* Variables declared in the current procedure,

*Global memory:* Variables declared in the main program,

*Intermediate memory:* Variables declared in another procedure.

Access to the first two is fast. However the third case, because the interpreter has to follow a chain of pointers, is very slow. In the example above it might have been better to declare ar globally. However, this would mean that space is allocated for ar all the time, not just when outer is active.

The reverse of this problem can be seen here:

```
program silly2;

  procedure one;

  var arone:array[0..10000] of integer;
  begin
  end;

  procedure two;

  var artwo:array[0..10000] of integer;

  begin
  end;

  procedure fre;

  var arfre:array[0..10000] of integer;

  begin
  end;

begin (* main program *)
 one;
 two;
 fre
end.
```

Because only one of the three procedures is active at any one time, and because when a procedure is exited its variables are no longer stored, the three

```
program fastone; (* this program obeys all the rules! *)

(*Rule 6 obeyed; program debugged! *)
(*$R- *)

(*Rule 1: Accelerator installed!*)

(*Rule 2: as follows: *)

    var  f,g,h,i,j,k,l,m,n,x,loop:integer;

(*Rule 3: following array declared globally, rather than in
         procedure 'outer', as it is also accessed in 'inner'.*)

       outar:array[1..1000] of integer;

(* (Rule 4 does not help speed - but may allow an array to be
    fitted into memory that would otherwise not fit.) *)

procedure outer;
var count:integer;

    procedure inner;
    var point:integer;

    begin
      for point:=1 to 1000 do
        case count of          (*note: case labels in order, 0..9*)
        0,1: outar[point]:=-1; (*cannot be zero, but quicker*)
      2,3,4: outar[point]:= 3;
  5,6,7,8,9: outar[point]:= 7
        end; (* of case *)
    end;

begin (*outer*)
  for count:=1 to 10 do
    (*Rule 7 obeyed: *)
    begin
      fillchar(outar,sizeof(outar),chr(0));
      inner
    end;
end;

begin  (*main program*)
  writeln('Start timing NOW ',chr(7));
  for loop:=1 to 10 do
  begin
    writeln(loop:2);
    for x:=1 to 1000 do
      f:=g+h+i+j+k+l+m+n;
    outer
  end;
  writeln('Stop  timing NOW ',chr(7))
end.   (* about 53 seconds with an Accelerator *)
```

```
program slowone; (* this program disobeys all the rules! *)

var             filler:string[128]; (*not used- stops fast
                                     access to the integers below! *)
f,g,h,i,j,k,l,m,n,x,loop:integer;

procedure outer;
var outar:array[1..1000] of integer;
    point,
      ptr,
    count:integer;

    procedure inner;

    begin
      for point:=1 to 1000 do
        case count of
          1: outar[point]:=-1;
  6,5,9,8,7: outar[point]:= 7;
      3,2,4: outar[point]:= 3;
        end; (* of case *)
    end;

begin (*outer*)
  for count:=1 to 10 do
    begin
      for ptr:=1 to 1000 do
        outar[ptr]:=0;
      inner
    end;
end;

begin  (*main program*)
  writeln('Start timing NOW ',chr(7));
  for loop:=1 to 10 do
  begin
    writeln(loop:2);
    for x:=1 to 1000 do
      f:=g+h+i+j+k+l+m+n;
    outer
  end;
  writeln('Stop  timing NOW ',chr(7))
end. (* about 121 secs, even with an accelerator! *)
```

large arrays can re-use the same area of memory. Were they to be declared globally 30000 words would be needed, not 10000! Here is a classic example of the trade-off between memory and speed.

***Rule 4:*** "Pack your arrays". This saves memory at the expense of speed. By declaring an array to be packed huge savings can be made because, rather than allocating one element of the array to each word, the elements are packed as tightly as possible, with the proviso that no element is stored across a word boundary. For example:

'array[0.2047] of boolean' takes 2048 words,
'packed array[0.2047] of boolean' takes 256 words.
'array[0..300] of 0..225' takes 301 words,
'packed array[0..300] of 0..255' takes 151 words.

Obviously there's no point packing integers or reals, they take one or more words for each element. Remember that records can also be packed – see the first three articles in the series.

***Rule 5:*** "Be careful with your CASEs". Not a reminder for those on holiday, but a warning that the Pascal case statement can produce very inefficient code if we are not careful. The Pascal compiler produces a table with an entry for all the possible values that are to be handled by the case statement. The first entry is the first value, the last is the highest, with

entries made for all intervening values. A statement like this:

```
case i of
   1: write('it is one!');
 180: write('One hundred and A T!')
end;
```

will produce a table with 180 entries. It is often more efficient to use some if . . then statements.

A second problem is that the case statement is much more efficient if the first value is zero. If it is not, code is produced to subtract the first value from the generated one to give the pointer into the table. Hence, even if zero will not be encountered, start the list with 0 rather than 1. Finally, if several different values require the same actions, keep the list in order, this produces smaller and quicker code.

***Rule 6:*** "If it works, turn off Range-Checking". Whenever a program accesses an array element code is generated to make sure that it is within the limits of the array. When a program is debugged – and not before – we can stop this code being produced by use of the (*$R-*) pseudo-comment in our program. This should speed things up by about 20 per cent. Program size will also be reduced. But be warned, use of this option with a bug-ridden program is a sure-fire way to crash the system.

***Rule 7:*** "Use the special procedures in Apple Pascal". Since they are not to be found in standard Pascal, those who have learnt the language from a general course or book often forget to use them. Their advantage is that they execute far more quickly than the equivalent programs written in Pascal by the programmer. Of particular interest are the byte-orientated built-ins listed on pages 51 to 53 of the Language Manual.

Consider this piece of code:

```
var   x:integer;
      i:array[0..3000] of integer;

begin
  for x:=0 to 3000 do
    i[x]:=0;
  fillchar(i,sizeof(i),chr(0))
end;
```

The for loop and fillchar statement produce the same effect. However, the fillchar will execute much more quickly. The sizeof function returns the number of bytes occupied by i, which have to be filled by the character whose code is 0. Use fillchar for integer arrays and strings, but not for sets, nor arrays of reals, as the internal storage of reals is rather complex.

Again, using scan to find a particular character in a string is much more efficient than using a for loop.

Many more comments could be made – about not mixing integers and reals in assignments because of the conversion overhead, about careful use of segmentation to increase memory usage without too much disc access, about using the smallest possible variables – 0..255 rather than integer can halve memory requirements if the array is packed, and nothing larger than 255 is to be stored, about turning I/O checking off before doing a sequence of 'write's or 'writeln's to the screen.

The two demonstration programs show the effects of the techniques which we have considered.

● *Next month, we tackle one of the features not found outside the Algol-like family of languages, dynamic data structures.*

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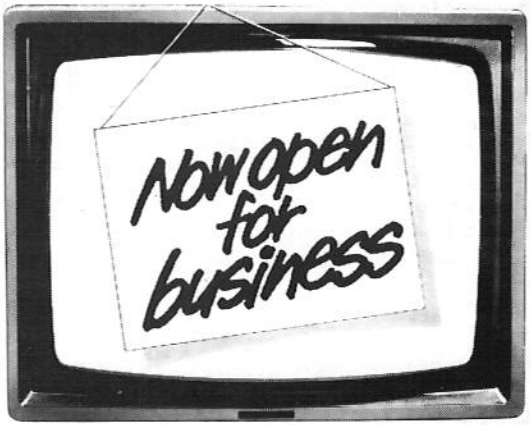


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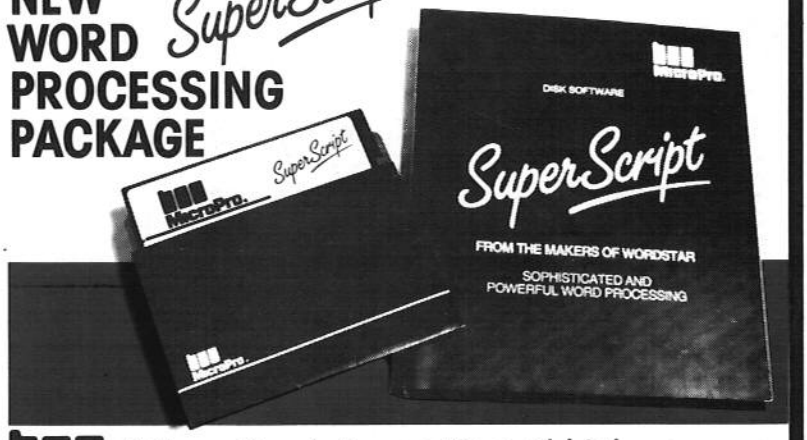


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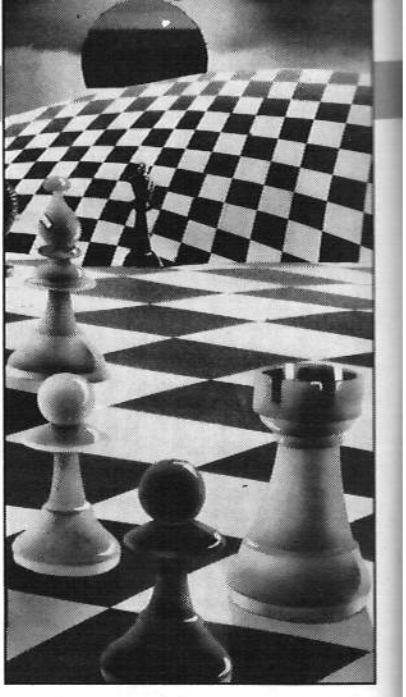


# Colossus: A king among chess programs

BRUSHING aside all opposition in the home computer chess software stakes comes Colossus 4.0, a program that not only plays a superb game of chess but has a veritable galaxy of useful features. Forget the rest – Colossus knocks them all for six.

The author of Colossus is Martin Bryant who, with an earlier version, White Knight, won the 1983 European home computer chess championships.

In Colossus he has produced a personal computer chess program that outshines the cream of the current crop including Hayden's Sargon III and Odesta's Chess 7.0 (Apple), Parker Chess (Atari), Mychess and Grandmaster (Commodore 64), Cyrus I.S. Chess and Superchess 3.5 (Spectrum) and his own champion, White Knight (BBC B).

When the program is loaded, you are greeted with a familiar two dimensional, top-to-bottom playing view of a large chessboard with sharp and attractive Staunton type pieces. Around the edges of the board are the usual rank and file descriptors (1-8 and a-h).

If you don't like the traditional bird's eye view, the program offers an alternative – a three dimensional view across

the board. Most impressive and much more like the real thing. Of course, it's all down to a matter of personal preference in the end, but it's nice to be given a choice.

Although you only need 48k for all the chess-playing parts of the package, the 3D view requires a 64k machine. An Apple II+ with language card will suffice.

A message at the bottom of the screen invites you to make your move, and the game's afoot. The pieces are moved in either of two ways – by cursor or by using traditional algebraic notation. The cursor, a thin, horizontal stripe, always starts out on the a1 or a8 square, depending on whose move it is.

Using the cursor control keys the stripe is first positioned on the square of the piece to be moved and then Return is pressed. The procedure is repeated for the destination square. Once both squares have been actioned, the cursor flashes on the two squares and the piece is moved.

The other method of moving entails typing in the designations of the two squares, say e2 (Return) e4 (Return). This way may be preferable for those used to algebraic notation. If the rank or file are the same, you can abbreviate – e2 (Return) 4 (Return).

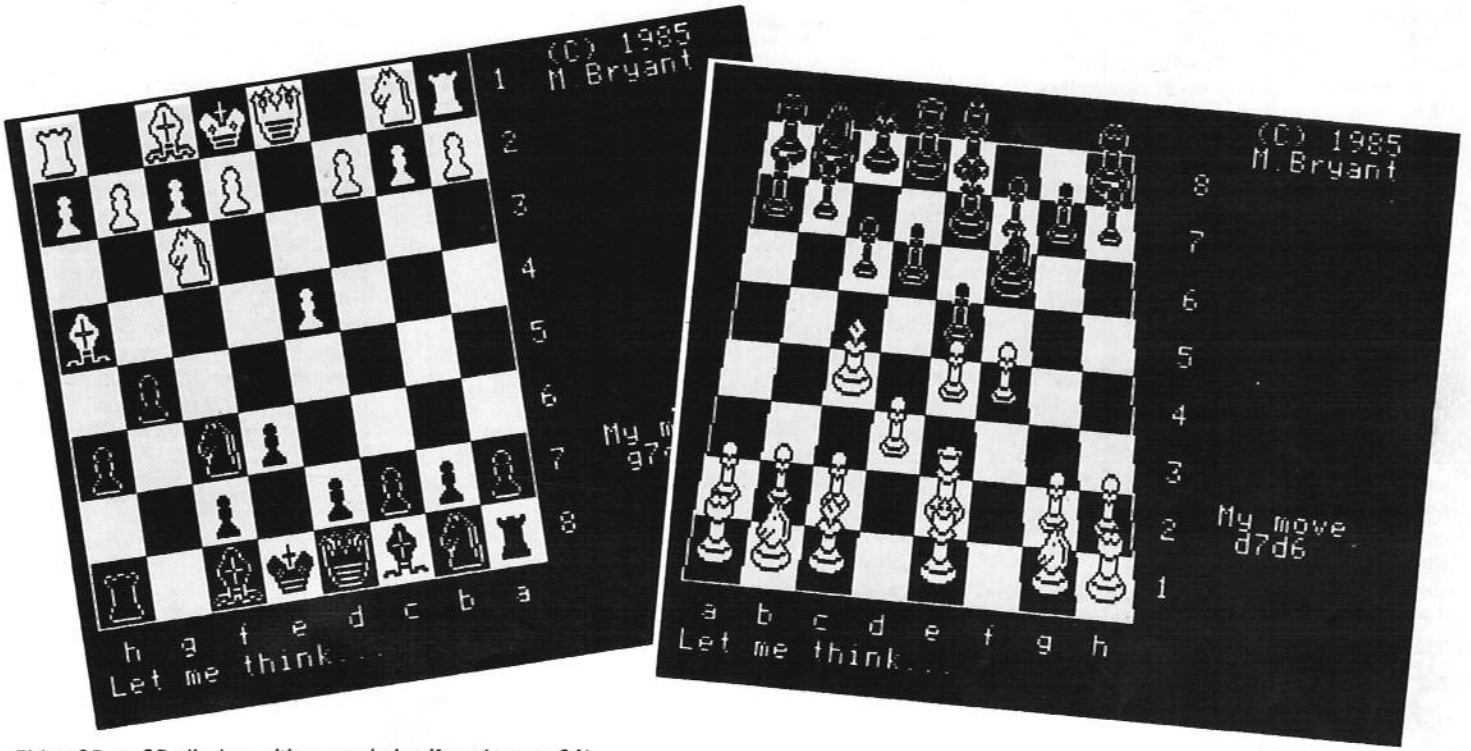
Two screens are at your disposal. One displays the board, together with the program's last move, messages and prompts. The other shows a record of the moves, two chess clocks, and a variety of information on the computer's thought processes. Switching between the two is simple – the space bar acts as a toggle.

The information displayed gives a fascinating insight into the working of the program. It tells you how many moves ahead it is looking, the total number of positions being

**The information displayed gives a fascinating insight into the working of the program**

## Just some of the many Colossus features

***Step back and forth through a game.***
***Set up a board position.***
***Adjust the chess clocks.***
***Interrupt the computer, forcing it to play the best move found so far.***
***Force the computer to play a move for the other side.***
***Play "blindfold" chess by making either or both side's pieces invisible.***
***Make the computer play a match against itself.***
***Display all the legal moves of a piece.***
***Play White or Black, up or down the board.***
***Show an automatic replay of the game.***
***Stop the program from making any moves, thus allowing a game between two players.***
***Adjust certain parameters to make the game function differently including preventing the program searching its opening book or making it less or more willing to play for a draw.***
***Save/load move records and positions to/from disc.***
***Turn the audible beeps on and off.***
***Start a new game.***
***Tell the computer to replace its current move with its next best move. This is especially useful when you want it to use a particular opening line.***




*Either 2D or 3D display – it's your choice if you've got 64k*

examined, the best line found so far and the evaluation of that line.

This evaluation is carried out on two factors: material gained (the number of pawns up or down) and positional strength. A positive number indicates that the program is better, negative that the opponent is better.

Colossus offers a wide range of options. For a start, there are six modes of play:

**Tournament** in which four parameters have to be supplied:

☐ Number of moves to first time control.

☐ Number of moves to second time control.

☐ Time of first control.

☐ Time of second control.

The program will not exceed these controls. If you do, don't

worry – Colossus won't enforce the rules and claim a win!

**Average** with one parameter for each side – the average amount of time allowed per move. This effectively gives you thousands of levels of play to choose from.

**All the moves.** Simply enter the total time allowed in which the game must be finished.

**Equality mode.** The program will match its elapsed time to yours.

**Colossus is simple to use and foolproof in its operation**

**Infinite mode** is ideal for study or postal chess. The program will keep searching for the best line until it has found mate, reached its maximum lookahead (12 ply), or is stopped by you.

**Problem mode** lets you solve chess mating teasers. Uniquely, Colossus can solve three types of mates. These can be for either black or white and up to seven moves ahead, the highest I have seen a program go.

The first type is the usual "White (or Black) to move and mate in x moves".

The second concerns selfmating problems, say "White (or Black) to move and mate itself in x moves".

The third, and completely new, covers Help mates, for example "White to play and help Black to mate White in x moves".

I have not seen these last two facilities on any other chess program. And what's more, I have never seen a program solve problems as fast as Colossus – blink on a mate in two problem and it has solved it.

Colossus is very simple to use, foolproof in its operation. Any of the options can be called up by pressing the appropriate Control key combination (Ctrl-R for replay, Ctrl-B to step back a move).

Any numeric parameters – hours/mins/seconds – are handled in a standard fashion. Default values are built in – all you have to do is press cursor up or down to increment or decrement the values.

Should you make a mistake, like entering an erroneous but

legal move during a game, the step back feature can be used to rectify the mistake. It can also be used for retracing a game to a point where you can recontinue with a different line.

The replay/step forward facilities can also be used for this purpose – the delay between Replay moves can be

set from 0-20 seconds and the replay can be stopped at any point, allowing you to continue play from that point.

The display legal moves command comes into its own as

a teaching aid. On the secondary screen, the best line information, should you find the temptation to read it irresis-

table, is a very handy hint facility.

The beauty of all the option features is that they are easily memorised – N for new game, U for use next best move – and they can all be accessed and changed during the game, not just at the beginning.

All very nice, you say, but how well does it play? This program is much, much more than a pretty face – it plays an excellent game of chess.

For starters, it has an openings book (built-in database of standard opening moves) of about 3000 positions which it accesses to play the first few moves swiftly and accurately. The lines of play in the book vary from 2 to 17 ply deep.

During a game Colossus examines an average of 300 positions a second. Its publishers assess Colossus' chess rating at about 1850 ELO (156 BCF). Pretty good, eh?

To put it through its paces, I pitched Colossus against some of the above mentioned competitors (using similar time levels in several games and letting it play White then Black). Colossus amply demonstrated its superiority against every one.

The accompanying instruction manual is easy to use, being both lucid and thorough. The program is so user friendly, though that you are unlikely to need the manual after a first reading other than for a quick reference or occasional refresher.

Colossus plays a great game of chess and has an abundance of really useful extras that add to the enjoyment of playing. It is a programming tour de force.

To all lovers of the royal game, from novice to expert and to those who may never have considered playing chess before, my message is this – buy Colossus. It is magnificent, a queen of programs, the king of chess-playing programs.

**Bob Chappell**

*Title: Colossus Chess 4.0*
*Author: Martin Bryant.*
*Publisher: CDS Software.*
*Requirements: 48k Apple II, 64k needed for 3D option.*

# AND NOW FOR SOME MUSIC WHILE YOU WORK

BEFORE micros were commonplace, my ambition was always to be a record reviewer. *(Pity he never made it!* Ed.) I figured that listening to records had to be easier than working for a living – after all, most of my spare time was spent listening.

I was a bit surprised, though, when a record turned up at the *Apple User* office for review. Still, here at last was a bit of black plastic that I was happy to spell as "disc", my personal spelling proclivities being at variance with the magazine house-style.

One Man Band by Christopher Light was produced using an Apple II+. It's a collection of American, Irish and Scottish folk music and the Apple has been "programmed to imitate traditional instruments".

The final sound isn't pure Apple though, because a small amount of reverb and equalisation has been added in the studio "in keeping with modern recording practice". Maybe that's why my recordings don't sound quite as good.

If Christopher's name seems familiar to you, it's probably because he used to be a contributing editor on Softalk magazine and he has also written for Creative Computing.

The music on the album was produced using three different software packages. However most were done using Mountain Computer's MusicSystem and associated hardware – unfortunately no longer being manufactured. One piece was done using the Alf board, and two were produced using the Electric Duet package.

In addition to the sleeve notes on the various pieces, there's also a booklet, "How computers make music", in the package. This gives a general introduction to the field and describes the Apple packages in more detail.

The album music is fine if you like that kind of thing, and I must admit that I do. The pieces have obviously been chosen with the micro in mind because none sounds out of place.

The "traditional instruments" include fiddle, bagpipes, accordian, hammered dulcimer and even a tuba. On the whole they sound good, although the bagpipes sound produced on Electric Duet sounds a bit "clicky". The drone is fine, but the individual notes seem to be accompanied by a slight click.

One side of the album is devoted to American music, while the other features Irish and Scottish tunes.

Purists might be surprised to see Amazing Grace on the American side, but the sleeve notes do admit that the tune "probably originated in Scotland". The church organ sound used to perform this piece is particularly nice.

I admit to a certain ambivalence about computer music. The uncertainty centres on whether the micro should try to faithfully imitate "real" instruments or strive to be an instrument in its own right.

This album muddies the water somewhat by aiming to imitate but sometimes sounding distinctly machine-like. Even on these occasions though, the music is perfectly acceptable.

The fact that the album is only available by mail order from America means that it's unlikely to sell in great quantities over here. After all, there are lots of readily available excellent albums bursting with traditional folk music.

However if you are a committed Appleophile and a folk music fan you would not be disappointed by this album. I've bought other records on the Kicking Mule label in this country, so you just may see it in a specialist shop somewhere.

If computer music is a particular interest of yours, you should also read David Williams' review of the Lemi Midi interface. David is offering a tape of music he's produced.

Maybe I should dig out my copy of Electric Duet again – I wonder if there's anywhere to plug in my Apple down in the tube station . . . ?

**Cliff McKnight**

*Title: One Man Band*
*Programmer: Christopher Light*
*Publisher: Kicking Mule Records, PO Box 158, Alderpoint, California 95411, USA*
*Price: $6.95 + shipping of $4 (surface) or $10 (air)*

## PERIPHERAL CARDS

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| Serial Buffer (64K) | £149 |
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| 80 column for II including inverse video chip compatible with all software (British manufactured) | £54 |
| 80 column for II with softswitch | £59 |
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| Soft switch (upgrade kit) | £12 |

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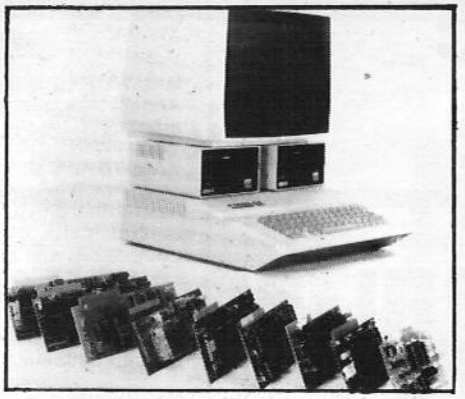

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| EPROM writer up to 27256's | £99 |

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| RGB colour adapter for IIc | £76 |

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| External drive for IIc | £120 |
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# 640K IIc

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**Z-RAM** is available with either 256K or 512K of additional memory PLUS a powerful Z-80B microprocessor for running CP/M software. Added to the IIc standard 128K of memory, that gives 384K or 640K of Ram, which gives an AppleWorks desktop size of 229K or 413K.

**Z-RAM with AppleWorks will knock your socks off.**

As well as expanding the actual desktop size, **Z-RAM** will also simultaneously load the AppleWorks program into memory thus eliminating the need for a second disk drive. This "Ram-disking" also means that AppleWorks will now run about 10 times faster.

And don't worry about the desktop files being larger than floppy disk capacity – if the file is bigger than the remaining space on a disk **Z-RAM** will automatically segment the file and prompt you when to insert subsequent disks.

**Z-RAM** will expand the AppleWorks DataBase to 5100 records per file, and doubles the Word Processor size to 5100 lines per document.

**Z-RAM** even gives you a printer buffer (print spooler). So you're back into AppleWorks without waiting for the printer to finish.

**Z-RAM** is also a high speed solid state disk drive or Ram-Disk and is compatible with Applesoft, PRO-DOS, DOS 3.3, PASCAL and CP/M.

**Z-RAM** is totally compatible with all IIc software and hardware, and installs easily and securely inside the IIc in less than half an hour. Installation is easy, clear instructions show you how and all you need is a screwdriver. (Absolutely no soldering).

**Z-RAM** is easily handled by the IIc power supply by using a patent-pending power saving design.

**Z-RAM** comes complete with manual, Ram-Disk software (CP/M, ProDos and Dos 3.3), Z-80 operating system, CP/M manual and AppleWorks Expansion software.

## SOFTWARE FOR APPLEWORKS

**JEEVES - Personal Assistant**
Desktop Accessory for AppleWorks and IIc. Co-resident with AppleWorks and provides Appointment Calendar, Calculator, Note Pad, Alarm Clock and PhoneDialer – all just one keystroke away.

**Graphworks**
Provides business graphics for AppleWorks. Graphs directly from AppleWorks Spreadsheet Graph Types: Pie, Bar, Stacked-Bar and Line.

## 2.5 MEG IIe with RAMWORKS

**RAMWORKS** is the memory card for the Apple IIe that gives the Appleworks user previously unheard of memory capacity. And more.

**RAMWORKS** simply plugs into the Apple IIe auxiliary slot (Slot 3) and completely replaces an 80 (or extended 80) column card. In use it functions and behaves EXACTLY like Apple's extended 80 column card, but with much more memory. It is TOTALLY compatible with ALL Apple 80 column software.

**RAMWORKS** has the same features as **Z-RAM** except that it does not have an in-built Z-80 co-processor (it provides 80-column display) and the print spooler works with Apple's Super Serial Card (or compatible).

**RAMWORKS** can be expanded to a greater size (2.5 Megabytes). Additionally, there is an RGB option which will provide double-hi-res colour graphics without using a further slot.

| Ramworks | Appleworks Desktop |
|---|---|
| 128K | 101K |
| 256K | 183K |
| 512K | 367K |
| 1 MEG | 736K |
| 2.5 MEG | 1837K |

As well as AppleWorks, other programs supported by **RAMWORKS** and **Z-RAM** include: Magicalc, Flashcalc, Supercalc 3A, Diversi-DOS and others. Also, **RAMWORKS** supports Dark Star's Shuttle Multi-Tasking System.

## CLOCKS for IIe & IIc

### TIMEMASTER H.O. – IIe
### SYSTEM CLOCK – IIc

Both these clocks offer full Pro-Dos compatibility and automatic time and date stamping of files – including AppleWorks files. When used in conjunction with RAMWORKS or Z-RAM, these clocks will continuously display the date and time on the Appleworks screen, and give automatic access from AppleWorks database (just use a time or date field).
**Timemaster** for IIe plugs into any slot, features a 20 year auto-recharging battery and will emulate other clocks.
**System Clock** for IIc features a pass through serial port – the IIc system clock plugs into either IIc serial port, then the modem or printer plugs into the clock. Batteries are replaceable (1-2 years).

## ORDERING INFORMATION

| | |
|---|---|
| 256K Z-RAM | £499.00 |
| 512K Z-RAM | £599.00 |
| 128K Ramworks | £249.00 |
| 256K Ramworks | £299.00 |
| 512K Ramworks | £399.00 |
| 1 Meg Ramworks | £649.00 |
| 2.5 Meg Ramworks | £1,599.00 |
| 640K Floppy Disk Drive (IIe) | £269.00 |
| Timemaster H.O. (IIe/II+) | £129.00 |
| System Clock IIc | £89.00 |
| Ram-disk software for Ramworks | £29.00 |
| CP/M Ram-disk software for Ramworks | £29.00 |
| Visicalc IIe Expander software | £29.00 |
| RGB Option for Ramworks | £129.00 |
| Z-80+ (CP/M card/software) (IIe/II+) | £139.00 |
| Z-80c (CP/M card/software for IIc) | £159.00 |
| Viewmaster 80 (II+) (80 cols on II+) | £139.00 |
| Graphworks | £79.00 |
| Jeeves (IIc) | £49.00 |

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# Forecasting sales via Visicalc

## TERRY MORRIS introduces a spreadsheet model which cuts the time preparing a sales forecast by 80%

MOST of the example spreadsheet programs I have seen are concerned with the accounting side of business, and very useful they are too at reducing the workload of repetitive calculations.

However before the accountants can get going one essential piece of work needs to be done – the sales forecast. Without this there can be no cash flow forecast, no profit estimate, and no business lunches.

The sales forecast is 90 per cent repetitive calculations and therefore a natural for a spreadsheet program – yet it has not received the attention it deserves from spreadsheet model builders. I describe here such a model, which in practice has cut the time of preparing a monthly sales forecast by 80 per cent.

It uses one basic formula, replicated over 12 months and the number of products, together with a small number of "working fields" to help get the sums right.

A 48k Apple II can cope with about 10 different sales forecasts, so a memory expansion card is needed for large product ranges, though companies which are likely to find this model useful probably would have one anyway. Each additional product occupies about 1.3k of memory, so a 64k Apple could cope with 22 products.

Essentially the model calculates a sales forecast in response to an expected percentage share of sales in a given sales period input by the user.

However there is an inbuilt flexibility to the model which means that nearly all regular conditions are catered for. The model as designed caters for only one cyclical effect, but could easily be altered to cope with models grouped in different periodicities.

Sales forecasts for individual models fall into four categories:

***Normal selling lines***

The easiest to cater for. The user inputs the forecast for the whole year and sales to date, the model calculates a monthly forecast according to input percentages.

***New lines***

The user inputs the forecast for the whole year, and the number of the first period in which sales are expected. The model calculates the monthly split only from the period specified.

***Lines to be discontinued later in the year***

The user inputs the whole year forecast and the number of the period in which sales will be ended. The model splits the sales up into the months wanted.

If sales will take place only in part of the year then a start and an end month can be specified.

***Extraordinary orders***

A frequent occurrence. In addition to the usual inputs the user can overwrite any of the individual month's calculations with his own figure. All calculations made for succeeding months in the year will take account of this adjustment and be raised or lowered accordingly. Since this type of adjustment tends to be made only one or two months ahead the bulk of the work is still carried out by the computer.

All figures are rounded to 100, except the first forecast period calculated by the computer, whenever it is, which takes up any odd digits in the year to date to ensure that the total adds up to the expected year forecast exactly.

Sometimes, especially when a sales line is to be deleted, the total forecast for the year will not be expressed in round hundreds, but will be the exact remaining stock figure. This is also taken into account by the first figure calculated by the computer.

Obviously the first forecast for a year would have 12 monthly forecast figures, followed, if updated monthly, by 11, 10, 9 figures etc. To make printing easier and the result look better the columns used are always the 12, 11, 10 etc immediately to the right of the year to date sales figure. Since all redundant columns are therefore at the extreme right of the model, they need not be printed.

The model can easily be extended to incorporate the average selling prices and calculate monthly turnover figures, and it can also be used to calculate orders for the production line. It is a simple matter to extend the model to 13 sales periods if required.

Now to the model. First, type "/GOR". This command changes the direction of calculation from down the columns to across the rows. It is necessary to do this in order to avoid the dreaded "forward reference" which means that multiple pressings of the recalculate key are necessary to achieve a stable result. In this model a single pressing only is required.

Between C1 and F1 type "FORECAST AFTER 1 PERIODS". "1" is a value and must occupy E1. The rest of your title can start at G1. In R1 type "CHECK", in T1 "WORK FIGS".

In F2 put the following formula: "+E1+1", and in G2 put "+F2+1". Now replicate G2 from H2 to Q2. When asked whether "RELATIVE" or "NO CHANGE" type "R".

In D3 put "TOT.VOL" and in E3 and E4 "Y.T.D VOL". Month names occupy F3 to Q3, if you want them. The percentages of business you expect are put in cells F4 to Q4 – for the moment use the ones I show so that you can prove the model. In R4 put the formula "100–@SUM(F4...Q4)". This is a check to ensure that your percentages add up to 100!

To save memory space some working figures are used, and they are mostly contained in the rectangle U2-AG2-AG4-U4. In U2 put this formula: +F4/100. Now replicate U2 from V2 to AF2. When asked for RELATIVE or NO CHANGE type R. In U3 type 1–@SUM(T2...T2).

Now replicate U3 from V3 to AF3. When asked for the usual reply first type N then R. The formula in cell AF3 should read 1–@SUM(T2...AE2) – if it doesn't then check your replication.

The final set of working figures is contained between cells U4 and AG4. In U4 enter 1– U3, then replicate it from V4 to AG4, typing R when asked for a response.

Cells B5 and B6 are reserved for side headings – in my case simply PRODUCT underlined. In S5 put 1ST PER and in T5 put LAST PER.

In R7 enter +D7–@SUM(E7...Q7), then replicate R7 from R8 to however far you need to go for your product range – not forgetting the warning on memory capacity given at the beginning of the article. When asked for a response type R then R then R.

One other working field is needed, and it is contained in column A in order to avoid forward references. In A7 type @IF(T7<>0,@CHOOSE(T7–E1,V4...AG4),1). Now replicate

A7 from A8 down the column giving the following responses R, N, N, N, N.

Column B is used for model identification.

In F7 type the following formula (deep breath!):
@ABS(@IF(@OR(U4>=A7,F2<S7),0,(@INT(D7–@SUM(E7...E7)*(U2–A7+U4)/(A7–U4)/100–.5))*100–@SUM(E7...E7)+D7)).

It is a good idea to make sure that you have typed this in correctly since this formula is replicated over the whole of the model to calculate your sales forecast.

Since the formula probably appears somewhat odd and repetitive a few words of explanation are perhaps needed.

Rounding to 100 is achieved by dividing the calculated figure by 100 and subtracting 0.5 then multiplying by 100 to arrive at the rounded value. Normally you add 0.5 to do this, but at the point in this formula that round takes place the figure is always negative.

The reason for @SUM(E7...E7) appearing more than once is so that the odd digits caused by the year-to-date figure are taken up.

I have devoted so much memory to rounding because in my experience making sales forecasts add up to precisely the right figure (which they must do, of course) takes more time than agreeing the total figure, which is what is important.

@SUM(E7...E7) is used rather than +E7 because it makes for easy replicating. The @OR function checks that the product is available for sale in this period, that is neither before its start date nor after its finish date.

@ABS stops the (very) occasional negative figure from appearing – if sales figure of less than 50 is calculated then under certain circumstances this can be rounded to less than 0 – it may be mathematically correct but it looks odd on a sales forecast!

The @ABS function effectively cancels the rounding that causes the problem. If this happens then the odd digits are taken up in the subsequent month.

The formula to be rounded is the following:

$$\frac{(a-c)b + c-a}{e-f}$$

Where a=total annual qty.
b=% business this month /100.
c=business done before this month (in units).
e=total % of year this product will be sold /100.
f=% of the year which has past by last month.

This formula take up less space in Visicalc if it is regrouped as:

$$\frac{(a-c)\,(b-e+f)}{e-f}$$

After rounding c is subtracted and a added back in to arrive at the correct figure.

You should now replicate F7 from G7 to Q7. When the computer asks for N or R as it displays the various variables, respond as follows:

**U4 – R**
**A7 – N**
**F2 – R**
**S7 – N**
**D7 – N**
**E7 – N**
**E7 – R**
**U2 – R**
**A7 – N**
**U4 – R**
**A7 – N**
**U4 – R**
**E7 – N**
**E7 – R**
**D7 – N**

You should now replicate


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| | FORECAST AFTER | 1 PERIODS | MONTHLY PRODUCT FORECAST 1986 DATE X/XI/86 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| FORECAST | TOT.VOL | Y.T.D | FEB | MAR | APL | MAY | JUN | JULY | AUG | SEPT | OCT | NOV | DEC |
| | | VOL | 4 | 8 | 8.8 | 5.7 | 15.9 | 12.3 | 5.3 | 10 | 11.4 | 11.8 | 6.8 |
| PRODUCT | | | | | | | | | | | | | |
| A | 29000 | 12345 | 655 | 1300 | 1500 | 900 | 2700 | 2000 | 900 | 1700 | 1900 | 2000 | 1100 |
| B | 29000 | 0 | 0 | 0 | 0 | 2100 | 5800 | 4500 | 1900 | 3700 | 4200 | 4300 | 2500 |
| C | 29004 | 12345 | 959 | 1900 | 2100 | 1400 | 3800 | 2900 | 1200 | 2400 | 0 | 0 | 0 |
| D | 29000 | 0 | 0 | 0 | 0 | 3400 | 9400 | 7200 | 3100 | 5900 | 0 | 0 | 0 |
| E | 29004 | 12345 | 659 | 1300 | 1500 | 900 | 2700 | 2000 | 900 | 1700 | 1900 | 2000 | 1100 |
| F | 29000 | 12345 | 5000 | 500 | 1155 | 700 | 2000 | 1600 | 700 | 1200 | 1400 | 1500 | 900 |
| G | 900 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 0 | 100 | 100 | 100 | 100 |
| TOT THE ABOVE | 174908 | 49380 | 7273 | 5100 | 6355 | 9500 | 26500 | 20300 | 8700 | 16700 | 9500 | 9900 | 5700 |

*The model as it would be printed out after one month's sales – only 11 of the 12 columns are being used*

F7...Q7 from F8 for as many products as you have. You will be asked, as usual, to specify rather a lot of Ns and Rs, but this is quite straightforward. If the cell number contains a 7 – E7, A7 etc – press R, if it doesn't press N.

All that remains now is to add subtotals and totals where you want them and you have a completed model.

Save the model to disc and try using it with the figures in the example to see if you get the same answers. (Notice that the figures in periods 2 and 3 for product F have been entered manually!). You might like to use a pocket calculator to check some of the figures.

### *Setting Up*

Put your annual forecast figure for each model in column D, then the year-to-date sales figure, if there is one, in column E.

Now go to columns S and T to enter the start and finish dates. Note that this needs to be done only for products which do not start in the first sales period or which end before the last period – products which are on sale for the whole period do not need figures in these columns.

Only if a product starts late and finishes early would both these columns have entries. Now recalculate. Save to disc under the name SALES FORECAST TEMPLATE.

All the regular forecast conditions have now been catered for except those "extraordinary orders". You should now enter these figures in the appropriate cells by overwriting the formula. All subsequent periods calculated will adjust themselves up or down proportionately to take account of any changes you make here.

> **"It does not take very long to fall into the routine of doing it"**

If you want to remember what changes you have made – something I have found less useful than it sounds – you could make each altered cell format to the left.

Now recalculate, then scroll down column R – the check column. If any value in the check column is not 0 then you have made a mistake.

The most common errors I have made are not getting percentages to add to 100, and overwriting a cell with a value greater than there is left according to your assumptions in columns D and E.

Once you are satisfied with what you have done, save to disc under SALES FORECAST.DATE or similar, then print it out.

### *Updating*

Rather than use the final version of your sales forecast – which contains formulae overwritten in some cells – to update, you should use the sales forecast template which you first saved. This contains all the most recently used annual volume figures, but no overwritten formulae.

The first step is to update cell E1 with the new period number, then write some new percentage figures in row 4. Even if you do not wish to change the values of the remaining months relative to each other, you must change the percentages anyway since you have at least one month less in the forecast than last time and the percentages must add up to 100.

If you were to update the example given at the end of February, and you wanted to leave the percentage figures the same in relation to each other, the figure for March would become (8 / (100 –4)) * 100 = 8.33, April would become 8.8 / 0.96 = 9.17 and so on for the remaining months.

Put in words, it means that each remaining figure is increased to take account of the percentage not now used because the month has passed. It would be fairly easy to make Visicalc do this for you, but I have preferred not to since it is a good idea to review these figures anyway.

Now you should update Column E with new year-to-date sales figures, and Column D with any new forecast annual volume figures.

Now update Columns S and T if necessary with new introduction and discontinuation periods. Note that these columns only need updating if the dates have changed, not otherwise.

Now recalculate. You may notice that Column F now contains period 2, so if you are using labels for months you will have to move these across one to the left also. This is quite easily done by replicating G3...Q3 from F3. Save to disc under the name SALES FORECAST TEMPLATE ready for use again next month.

Finally, overwrite any cells with extraordinary orders, recalculate, scroll down the check column and if all values are 0 then save to disc under the name SALES FORECAST.DATE and print.

The problem with step by step instructions is that everything seems so complicated on a first reading.

I will stress, then, that this model has saved me a great deal of time in the preparation of monthly sales forecasts, and that it really does not take very long to fall into the routine of doing it.

You can then devote all your effort to making a correct judgement of the annual sales figure – which the computer cannot do for you.

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**(BEFORE THE COMPETITION DOES)**

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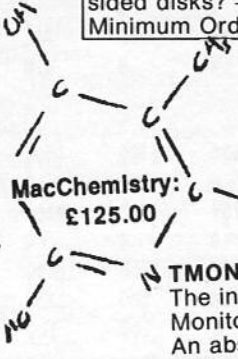


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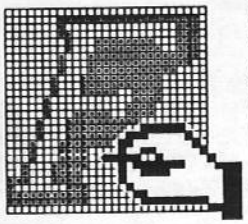

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**File.... Edit.... Goodies!**

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# Open all hours...

**BRYAN WILLIAMS takes a look at what one shopkeeper has in store for his IIc**

A SMALL but busy store in the wilds of Northumberland's Kielder Forest seems an unlikely setting for a computer – but that's exactly where you will find an Apple IIc.

Mr W. Charters, the owner of the Kielder general store, bought his Apple IIc in August 1984. His original intention was to use it to collate orders for the scouts' adventure camp a few miles down the road: "I supply several scout groups (up to 30 a week, which is approximately 1,500 people) with a variety of foods both from my own store and a number of other suppliers.

"The process of ordering in bulk from my suppliers and correctly delivering and invoicing the goods for each group was getting too complicated and taking too long. I decided a micro computer would do the job", he said.

When Mr Charters called his local computer dealer in Hexham, he had never seen a computer in his life. In fact, the first one he saw was the one he eventually bought, an Apple IIc transportable with monitor, monitor stand, external disc drive and Epson printer.

He uses Blyth's Omnis 2 software for an impressive number of tasks – weekly and yearly accounts, VAT calculations, invoices, word processing, his thrice-weekly bread order and the scouts' orders.

Although a micro novice, Mr Charters was determined to have a system that worked for him according to his methods of running his business. So he got his dealer, Business Sense Computing in Hexham, to set up Omnis 2 for him and then started adapting the software to suit his own needs.

After six months of experimentation and help from Business Sense he now feels that his system is working efficiently. "The thing is amazing – it's mainly common sense", he says.

Ironically enough, he did not immediately put the IIc to its intended use. He set up his software to handle the next season in the adventure camp over the winter months, and this is now ready. "I wanted time to make sure it would work properly", he said.

But this does not mean that the IIc has been idle in the meantime. Mr Charters uses it for all aspects of his business except for stock control, and he is particularly pleased with the accounting package. "This is really useful. It's hard to make mistakes because the machine tells you, and you can double check weekly totals for discrepancies against the yearly accounts", he said.

Although Kielder is not heavily populated, Mr Charters' store is doing very well. This is his sixth year there and he attributes his success in drawing customers from about 20 miles around to the fact that he stocks what people want at competitive prices.

In a small business such as this it is very important to keep accurate records, and Mr Charters now enters outlay and takings into the Apple IIc every day, doing the accounts for the whole week each Sunday afternoon.

He finds it hard to quantify the amount of time saved by the Apple – particularly since he works a 12 hour day during the holiday season – but he makes the best possible use of his time and his computer.

"Entering the information is fairly slow, but you can then leave the machine to work everything out. I go away and do something else, and when I come back all my VAT calculations have been done. The calculations are extremely fast".

His accountant has seen his system, which has now been operational for six months and approves of the results. In the first full financial year Mr Charters expects to halve his accountant's bill, so dramatically has the Apple IIc improved the efficiency of his own records.

With the money accounted for, Mr Charters turned his attention to his bread order, which is placed three times a week and can contain up to 50 different names and a range of about 20 possible items.

Before he bought the IIc he used to rewrite the entire list of names about once a month because it became illegible . . . "people change their minds so often".

What he now has is a simple program that lists all the items available into which he enters each customer's name and order by day. The total orders of each item for each day are then printed out for Mr Charters' supplier. If there are any changes, these are easily edited on the IIc, and at the start of the next week new orders can be entered according to the usual criteria.

Mr Charters' attitude to his Apple is a mixture of enthusiasm and pragmatism. "You learn what the computer can do, and you get better at getting the best out of it. I'm sold on it", he said.

He is now something of a celebrity in the region, being the only businessman to use a computer. He's spreading the word, advising friends on how best to organise their own business on the system, and he has even prepared a wages program for one friend. "He couldn't believe how fast it was!" he recalled.

Mr Charters is adamant that the IIc does exactly what he wants it to do, and the best example of this is the package he uses for the scouts' camp. Orders come in to his store two to three weeks in advance for each group visiting the camp for a wide variety of fresh and frozen foods. All these items are stored on floppy disc, so all Mr Charters has to do is enter the name of the group to be supplied and the appropriate quantities. Should his own stocks change he has a facility to edit food items at any time.

He then goes into the report section and prepares an order for each of his suppliers. A typical report for the butcher contains orders for each day in a week according to scout group, items required and quantities. When the supplies arrive each day Mr Charters allocated them by group according to his own report printouts, then delivers the whole order with an invoice created on the Apple IIc showing the total amount owed to his store by the group for the week.

The beauty of the program is that all the information has to be entered into the computer only once – all the other material is generated from the initial inputs. Not only is this time saving, it also virtually eliminates error and greatly simplifies a complicated and troublesome task.

There is another advantage in it for dealings with Mr Charters' suppliers. For items that are not ordered by the pound, such as bags of vegetables, he can now print out the order and get the price totals much earlier, allowing him to deliver the bill at the same time as the goods.

Mr Charters' initial investment was quite substantial, but he is more than happy with it after only six months use. Future developments will probably not be too dramatic, although he would eventually like to store information on hard disc instead of floppies, which he is constantly erasing to allow room for current data.

He may eventually put stock control on to the Apple IIc as well – in fact, he already has it on wheels for easy access to the stores!

APPLE USERS USE APPLE DEALERS USE P & P MICRO

# The Register

January 1 1986

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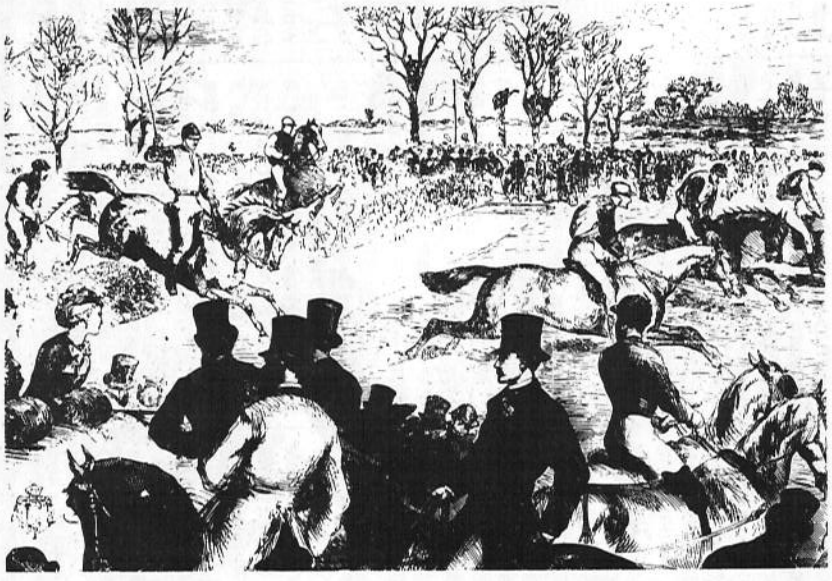

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*Matt Eighty's word boys hard at work*

*Sickened Apple user being consoled by a friend.*

Our Computer Correspondent Chris Cross broke down earlier this week on hearing the latest price of a Triumph Adler Daisy Wheel Printer. Having bought a similar model only last week for over £400, he learnt that the Triumph Adler TRD 7020 is now available for just £250 + VAT.

**(A bargain if ever I saw one — Ed.)**

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**(Sounds like a terrific buy to me — Ed.)**

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# Lawtant disc controller plus NEC drives make a powerful pair

**By TONY GAME**

THE Lawtant disc controller is a highly intelligent, multi purpose, floppy disc controller for the whole of the Apple II range apart from the IIc.

Its circuitry makes it compatible with the IBM formats for 8in drives, both single and double density. This allows it to be used with standard Shugart 8in drives, or, as I have used it, with NEC 5.25in high density drives, which are electrically compatible with the IBM formats.

Since the card is intelligent enough to also recognise the presence of the standard Apple floppy disc controller in slot 6, which is used exactly as normal, its presence is almost completely transparent to the user.

As if this were not enough, there are also plans to make it compatible with any 80 track drives, and this could well be the answer to the prayers of those lucky enough to own both an Apple and a BBC Micro.

The end of the card consists unusually of an edge connector with gold plated fingers, which receives a slide-on connector attached to a large ribbon cable.

A system of links between the card circuitry and the edge connector fingers allow links to be easily made or cut to configure the card for either 8in or NEC 5.25in drives, and these particular linkages are marked on the card.

Other drives could undoubtedly be set up by this system, but this would obviously be the responsibility of the user. The board looks a high quality product, carefully built and laid out, and proved to run very cool in use.

When the card, which lives in slot 7, is plugged in and the appropriate drive or drives connected, the fortunate user finds himself with up to 2 mbytes of storage on-line.

The difference that this makes to many standard software packages has to be experienced to be believed. Instead of the constant disc swapping so often necessary, especially with CP/M, one finds oneself with everything on the one disc with plenty of room to spare. For instance, I am writing this review with one 1 meg disc on which I have two Wordstars – one set up for a Juki printer and the other for an Epson – the install program, Spellstar and Mailmerge, all the overlay files, Stat, Pip, Cat, and still have 300k or so for my file.

The joy of Spellstar with no disc swaps and the ability to update the dictionary easily has to be experienced to be believed.

The greatest limitation of the Apple II range nowadays is probably the very small, by modern standards, 140k of disc store, and this can now be inexpensively and elegantly overcome.

As with Wordstar so the dBase. Everything can live comfortably on one disc and all swapping can be forgotten. If one has two drives then the obvious set-up, which works beautifully, is to have the program files on one and one's own efforts on the other.

Problems of what to index, always keeping an anxious eye on disc space, can now to all intents and purposes be completely forgotten.

I have spoken so far about CP/M because this is at the moment the only operating system which allows double density.

Pascal, DOS and ProDOS are supported in single density, giving approximately 500k per disc, and there are plans for Pascal to be supported in double density in the near future. The version of CP/M supported is 2.2b, and I have found nothing that will not run under this.

In use, when the Apple is switched on it looks always at slot 7 first to see if a disc is in the big drives. If it finds one other than CP/M it boots it, otherwise the Apple goes at once to the drives in slot 6, which are booted exactly as normal. This allows the use of all standard software, protected or not.

Naturally the large drives cannot usually be used if the protected software employs a non-standard DOS.

The software provided is menu driven, giving options for formatting in double and single density, for single or double sided discs, making discs to boot under DOS, ProDOS, or Pascal, fast copying of complete discs, and booting CP/M.

CP/M is always booted from the standard Apple drive in slot 6, and the disc for this contains programs which link in the big drives.

There are programs for all the various combinations of single/double side and density, and the manual contains brief notes describing how to auto boot the correct one for one's own set-up. The requirements of CP/M demand that a disc be present in drive A at all times.

As I have said, I tested the system with the NEC 5.25in drives, which are available with the card. They come in a very neat cream metal case 12in long by 6in square.

They contain their own power supply, so draw nothing from the Apple, and use the latest direct drive motors and metal band head drives.

All this should mean that problems with drive speeds and head alignment are entirely a thing of the past. In fact these drives are very impressive indeed, giving a similar impression to a fine Swiss watch.

The disc eases in against a gentle pressure, finally closing a switch, and if one listens very carefully one can hear that at this point the motor switches on, so that as the closing lever is engaged the disc is perfectly centered on the moving spindle.

The head movement is much more audible, though not

unpleasant, and together with the firm click of the head loading mechanism, gives a fine impression of mechanical precision.

Altogether I am very impressed indeed with these drives, which I would expect to have an extremely long life. I regard the fact of their being self-powered, so putting no further strain on the Apple's PSU, as being a big plus feature.

Since the motors have not had to be built with small power draw in mind, they have obviously been more robustly designed, and this is confirmed by even a cursory inspection.

The 18 page handbook I was supplied with is clearly an early version, but even so shows great attention to detail. The pin outs and linkages for Shugart SA 850/851, drives and those for the NEC FD 1155 5.25in drives are listed in considerable detail for the technical buyer, though most will probably wish to order the card already set up for one or the other.

The description of the provided software, and general use of the card and drives, though sparse, is probably adequate, and as I have said my copy was a very early version.

In general the notes for CP/M users are fuller, and presumably the rest will be brought up to this standard before general issue.

In line with the fact that double density is only supported under CP/M at the moment, this system is probably most successful when used for CP/M. However this is not to discount the other operating systems, and it should be realised that even using single density the equivalent of nearly four standard discs is available on each of the big discs.

When Pascal is also available in double density this will revolutionise the use of such packages as Omnis and Ormbeta.

The question many readers will ask themselves is how the card and drives compare with a hard disc. It is not an easy question to answer. Certainly the two options are entirely different.

Apart from the fact that the hard disc, even now that prices are beginning to come down, will be a lot more expensive, there are other considerations.

First of all, the fact that a new box of 10 discs provides another 10 mbytes of store with these drives is a cogent one for those with many different applications.

Then there is the question of life, and almost certainly the robust nature of the drives means that they will outlast a hard disc many times over.

Copying also is very quick and easy from disc to disc, and the hard drive would need a tape streamer, costing as much as the drive itself to compare in this respect.

Where one loses out, of course, is in the speed of the hard drive, since the big floppies are not much faster, although there is a distinct difference, than the standard Apple floppies.

My final impressions? Very favourable indeed. The controller card itself is something that has been needed for a long time – if only the original Apple controller had been like this – and the NEC drives, if one decides to have them, are mechanically most impressive.

If the expense, even at this very reasonable level, is too great, then it is perfectly possible to manage with just one drive, which still gives one the megabyte of store that makes CP/M in particular so much easier and nicer to use.

*Lawtant disc controller with software: £150.*
*NEC drive unit with card, cable, and one drive: £390.*
*NEC drive unit with card, cable, and two drives: £550.*


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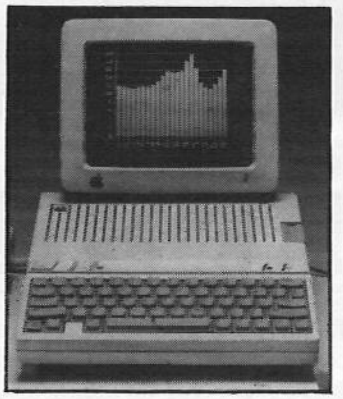

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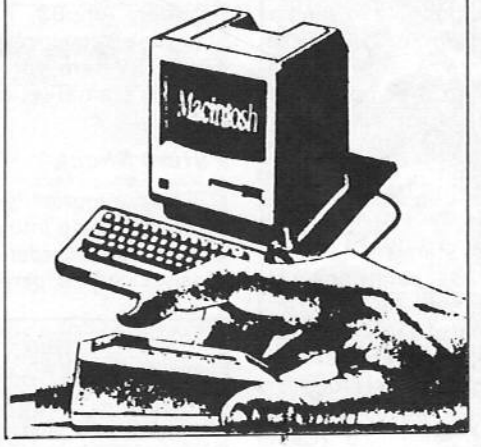


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# MIDI means music by micro

**DAVID WILLIAMS assesses the Lemi interface**

MIDI stands for Musical Instrument Digital Interface and has become an RS232 of the music world. It provides a means of communicating with musical instruments such as synthesisers, electric pianos and drum machines as well as a means of controlling sound processors such as delay and reverb units.

In recent years such devices have become increasingly digital, and the music industry have got together to produce a communication standard.

It is now possible to send all the data from a synthesiser keyboard to a similar synthesiser or to a computer and that data can faithfully reproduce all the "events" at the keyboard – pitch, note duration and even how hard the note was struck.

The Midi standard can cope with up to 16 separate channels of Midi data simultaneously and each channel of data can control a separate musical device.

Midi equipped synthesisers are now commonplace and start in price from £125 (Casio MT52). The true power of Midi only becomes apparent, not when two keyboards are connected together, but when a keyboard is connected to a computer.

The Lemi interface permits communication between the Apple and any Midi-equipped device.

The interface consists of a card which has to be plugged in slot 4 and a connector box which allows all the connections which can be made to be brought outside of the Apple for ease of use.

The connector has one Midi input, three Midi outputs and two jack sockets for a remote start/stop pedal and external clock-in signal allowing the unit to be synchronised with a drum machine or a multi-track tape recorder. In addition, the software makes use of the cassette IN and OUT sockets of the Apple.

The unit comes with one software package. The software packages consist of Future Shock, a real-time 8 track recorder, Amp83, a real and step-time sequencer, and DX7 Filing System for use with Yamaha's amazing digital keyboard.

### *Future Shock*

This program effectively turns the Apple into an 8 track polyphonic recorder. The synthesiser can be played and all the information that the synthesiser is capable of receiving is sent to the computer's memory.

This can be replayed at the press of the Apple's keyboard and the entire performance is reproduced just as it was played. At the same time as the "track" is replayed another can be recorded simply be playing the synthesiser keyboard.

This process can be reproduced for up to eight tracks. In fact, there is a facility to merge several tracks into one in much the same way as a mixer allows tracks from a multi-track tape recorder to be mixed so that if all the eight tracks are used they can be released and re-used.

Unlike a mixer, there is no degradation of the sound. The output of each track can be directed to different Midi channels so that up to 16 instruments can be controlled and played back at the same time.

The "record" can get its timing signals from the computer, in which case the Apple speaker functions as a metronome and a visual indication of beats per minute is given on screen, or the interface will allow the timing signals to come from an external source such as a drum machine clock or click-track on a tape recorder.

One useful feature, especially for poor keyboard players such as myself, is the facility to record at a slow speed then to play back at a faster tempo, giving a much smoother or tighter sound to the music without, as would be the case with increasing the speed of a tape recorder, altering the pitch of the music as it was speeded up.

The tracks can be scanned by the computer and any notes played slightly out of time can be fixed automatically, although in practice this tends to give a mechanical feel to the music. Compositions can be saved to disc as complete works or as individual tracks.

Tracks can be transposed up or down in pitch. By combining both of these features, one can record a sequence of music, save it as a track, reload it in another track and transpose it up an octave or other music interval, effectively doubling the number of hands playing. One irritating feature of the software is that it does not use drive 2, and so the program disc must either be swapped in and out or used to save data on.

The software is not protected, so there is no problem with backing up the program disc. The manual is clear and comprehensive and the program features a Help command should you forget the simple mnemonic-type one-key commands.

### *Amp83*

This software package comes as an unprotected disc and a ROM which plugs into the interface card. It transforms the Apple into a 16 channel recorder.

Each channel is monophonic, that is it can only send one note at a time, but by using several channels up to 16 different

POLYSEQ-83

| CHANNEL | VERBE | NOTE £ | PITCH | DUR | ART |
|---|---|---|---|---|---|
| 1 | 120 | 4 | 166 | 50 | 0 |
| 2 | 91 | 4 | 59 | 2 | 1 |
| 3 | 100 | 7 | 55 | 2 | 1 |
| 4 | 71 | 4 | 40 | 2 | 1 |
| 5 | 120 | 4 | 166 | 50 | 0 |
| 6 | 130 | 14 | 73 | 2 | 0 |
| 7 | 131 | 7 | 63 | 2 | 0 |
| 8 | 133 | 2 | 166 | 50 | 0 |
| 9 | 138 | 4 | 166 | 50 | 0 |
| 10 | | INACTIVE CHANNEL | | | |
| 11 | | INACTIVE CHANNEL | | | |
| 12 | | INACTIVE CHANNEL | | | |
| 13 | | INACTIVE CHANNEL | | | |
| 14 | | INACTIVE CHANNEL | | | |
| 15 | | INACTIVE CHANNEL | | | |
| 16 | | INACTIVE CHANNEL | | | |

*Amp83 screen display in debugging mode*

notes can be played simultaneously.

Each channel can get its data in one of two ways, either in STEP TIME or in REAL TIME. In STEP TIME each note is programmed by entering four items of data – pitch, duration, articulation and velocity.

Pitch data corresponding to low or high pitch consists of a number between 1 and 127, any number greater than 127 corresponds to a rest.

Duration is best thought of, not as the length of the note but the time interval between the note programmed and the next one.

Articulation corresponds to the time that a key on the keyboard is actually pressed. By combining both of these events one can easily program staccato or legato playing.

Velocity corresponds to how hard the note was pressed, and usually is used to control the loudness of any particular note.

*If you'd like to hear what can be done with such a system – and after all it's the sound that counts – David Williams will send you a cassette of music on receipt of £2.50. His address is: Crest View, Hollow Glade, Godshill Ventnor, Isle of Wight, PO38 3JQ.*

Although it may appear cumbersome, in practice it is easy to use and it is relatively easy to produce live-sounding music rather than mechanical or monotonous "computer" music.

Groups of up to 64 notes, called verses, may be placed in sequences so that repetitive sequences do not require long sessions at the computer keyboard. Sequences can contain up to 255 verses.

There are two very powerful features which can be used to transpose sequences of verses up or down in pitch. The first is the facility to use one track to record transpose information directly from the keyboard.

This would allow one, for example, to enter a simple four note bass line verse and replay the verse repeatedly playing a different note from the keyboard to transpose the sequence up and down corresponding to chord changes.

This facility can be used on one or several tracks at a time. The other transpose feature allows an entire sequence of up to 255 verses each verse containing 64 notes to be transposed up or down in pitch.

A verse sequence can be reproduced in another track and transposed, giving very powerful musical effects.

The facility to copy an entire sequence to another track and edit it allows one to introduce a short delay at the beginning of the second track and get the ADT (automatic double track) effect previously only possible with expensive sound delay units.

The tracks do not need to contain only notes, but can, when used with a Midi equipped drum machine, contain all the drum tracks.

The software on board the drum machine becomes redundant and the control over velocity (loudness) is far greater than most drum machines will permit.

If all this was not enough, the software is also capable of recording both monophonic and polyphonic live playing on the keyboard. This software, simply used with a single keyboard, is fairly impressive, but it can be used to control 16 keyboards if wanted – or two of Yamaha's TX816s – and more realistically can be used with a multi-track tape recorder allowing a single keyboard to record each part separately.

The Lemi interface and software is available from Computer Music Studios, Park House, Llangennech, Dyfed. The interface costs £253, Future Shock £69, Amp83 £69 and DX Filing System £74.75.

### *DX7 Filing System*

This last item was a little disappointing. It allows the Yamaha DX7 keyboard voices to be saved to and loaded from disc either individually or in banks of 32.

It will give a screen display or printout of voice names in any bank of 32 or individual voice data in any single voice transfer.

It does not allow editing of a voice or save the performance data, as the TX7 does, nor does it allow one to assemble a bank of 32 voices selected from disc in a simple way.

When one considers that programs that will do this are available from around £18 for other micros there is little justification for the £75 price tag.

In its favour, though, is that the package comes with five banks of 32 voices, some of which are among the best I've come across. The DX-Owners Club expects to have a disc of nearly 900 voices available soon.

**VERDICT: Going Midi is expensive. It involves the purchase of a Midi synthesiser or electric piano and most probably a Midi drum machine in addition to a Midi interface for the computer.**

**The results, however, justify the costs. Mountain Hardware Music System's and similar cards sound thin and mechanical in comparison. The Lemi interface is expensive compared to Midi interfaces available for other micros, but if you are already an Apple owner it is worth considering.**

**Remember that disc drives for some micros can cost £400, so if you already own all the usual peripherals of monitor, printer and disc drives it is still one of the cheapest ways of going Midi.**

**The software is powerful, and thankfully seems to have been heavily influenced by the needs of musicians. One can only hope that Lemi continue to produce additional packages for this interface.**

```
************  YAMAHA DX7  ************

VOICE: VANGELIS
PROGRAMMER: DX OWNERS CLUB


      ------- LFO -------        -- A M S --
AL F WAV SP DL PM AM SYN PMS  1 2 3 4 5 6

5  0 SIN 20 00 12 13 ON   3   0 0 0 0 0 0

O S M                - ENVELOPE  GENERATOR -
P Y O  FREQ. DE   R1 R2 R3 R4 L1 L2 L3 L4

1    R   0.50 -5  99 35 30 40 99 95 80 00
2    R   1.00 -5  99 53 30 28 80 40 40 40
3  O R   1.00 +2  99 35 30 40 99 95 80 00
4  N R   3.00 +2  99 46 30 28 99 83 70 50
5    R   1.00 +7  99 35 30 40 99 95 95 00
6    R   3.00 +7  32 25 32 40 40 99 99 40

O -KEYB. LEV SCAL- K OP V   PITCH EG KEY
P BRKP LC RC LD RD R LE S   RATE LEV TRAN

1 A -1 -L -L 00 00 0 90 2   1 99 1 50 C 3
2 C 4  -L -L 00 00 0 70 2   2 99 2 50
3 A -1 -L -L 00 00 0 99 2   3 99 3 50
4 C 4  -L -L 00 25 0 90 2   4 99 4 50
5 A -1 -L -L 00 00 0 95 2    VOICE NAME
6 A -1 -L -L 00 00 0 90 2    VANGELIS
```

*Printout of data for a single DX7 voice*

# HEAPSORT

## Useful things can be found growing on binary trees

IN order to understand how Heapsort works it is necessary to understand trees.

A tree is a data structure comprised of nodes, and these nodes may be considered as parents or children or both.

In a tree there will be one node which has no parent, the root node. In addition there will be one or more nodes which have no children and these are known as leaf nodes (see Figure I).

A binary tree is a tree in which each parent has no more than two children and is said to be complete when each level in the tree (with the possible exception of the last level) contains twice as many nodes as the previous level.

It can be seen that in a complete binary tree leaf nodes cannot exist on more than two adjacent levels. If every level in a complete binary tree including the last contains twice the number of nodes as the previous level then the tree is said to be a full binary tree.

Few programming languages provide a built-in tree structure for the storage of users' data. There are several ways of implementing a tree structure as an abstract data structure using simpler structures.

A straightforward way of doing this is to use an array. In the case of a complete tree this method is also efficient in terms of storage requirements.

We can use the fact that each level in a complete binary tree contains twice as many data items as the preceding level to determine the position that a data item will be stored in the array.

If the root node is stored as element (1) in the array with its children as elements (2) and (3) and their children as elements (4), (5), (6) and (7) and so on this gives a useful representation of the tree.

To get from any parent to its first child it is only necessary to double the element number of the parent. Adding one to this number gives the element number for the second child. To locate the parent of a child you just divide the element number of the child by two and treat the result as an integer.

A data structure is often required in which it is easy to add a new data item and also easy to retrieve the largest data item. It is easy to add a data item to a stack or queue, but retrieving the largest item would require looking at every item.

Using a sequential ordered list would make it easy to locate the largest item, but adding a new item might entail moving all the items in the list. A structure that satisfies both requirements is known as a priority queue.

One way of implementing a priority queue is to use a heap. A heap is a complete binary tree in which the value of any parent is greater than or equal to either of its children.

In the case of a heap where the nodes have discrete values then the root node will contain the largest value.

It is also possible to use a heap in which the root node contains the smallest value and the demonstration programs take this route. If you want the root mode to contain the greatest value change the > signs into < signs in lines 465 and 480 of the Basic program.

One of the uses for a priority queue is in simulation applications where an event list is used to determine the sequence of events. An event which was to occur after one second could have a priority of −1 and an event which would happen after one hour a priority of −3600.

In order to use heaps several procedures are required to manipulate and create the heap as follows:

☐ A procedure to create a heap from data contained in an array (MAKEHEAP).

☐ A procedure to obtain the value of the root node. Using the array method of implementing the heap this is easy as the root node is contained in the first element of the array.

☐ A procedure to insert a new data item into an existing heap (INSERT). This procedure is not required by heapsort but I have included it in the Basic listing for the benefit of readers who would like to try out other uses of heaps.

☐ A procedure to correct a heap in which all of the nodes with the possible exception of the root node satisfy the heap property (FIX). The purpose of this procedure is that the root node, after its value has been used, can be replaced by the last of the leaf nodes then the end of heap pointer is moved up one and the heap restored.

The method used by Heapsort is to transform the data (in array A) into a heap by calling MAKEHEAP. This works by repeatedly calling FIX, working up from the leaf nodes as it can be seen that a leaf node and its parent must constitute a heap in which only the root node is allowed to violate the heap property.

When the data has been transformed into a heap then the root node is exchanged with the last of the leaf nodes, thus moving the largest data item into the last position in the array. The end of heap pointer is then decremented and FIX is called to restore the heap. This procedure is repeated until the entire heap has been transformed into a sequential ordered list in ascending order.

As far as performance is concerned Heapsort is not the fastest method, taking 5 minutes 50 seconds in Basic and 38 seconds in Forth to sort 1000 data items. This is roughly twice as long as Quicksort (see *Apple User,* February 1985). However it provides a good example of the use of heaps, an important data structure with many practical applications.

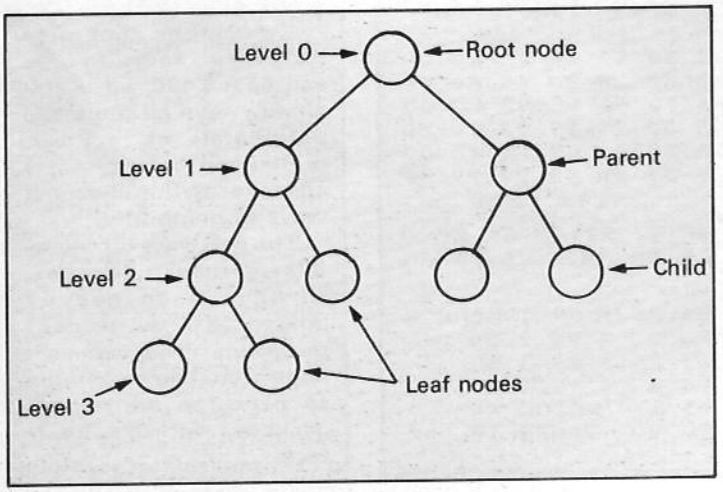


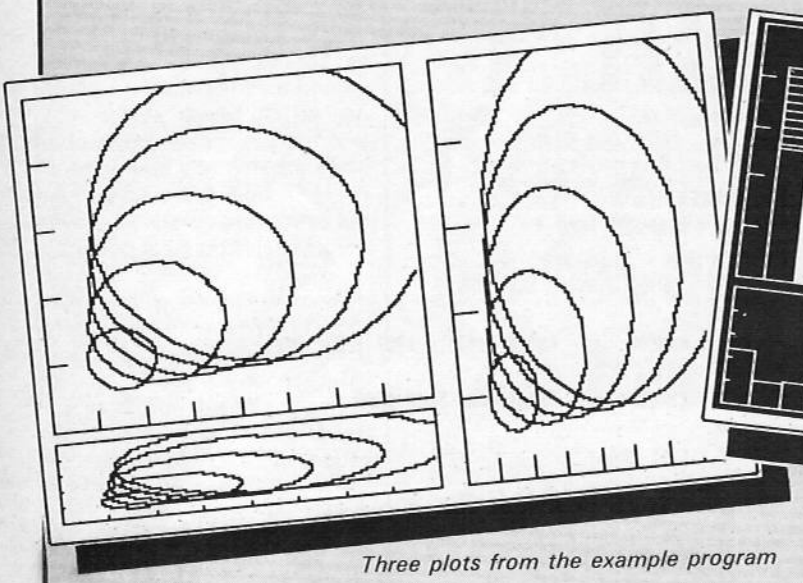

*Figure I: A binary tree*

```
100  REM  HEAPSORT DEMO
110  REM
120  LET N = 1000: DIM A(N)
130  HOME : PRINT "STANDBY
     LOADING ARRAY"
140  FOR K = 1 TO N:A(K) =
     INT ( RND (1) * 1000) +
     1: NEXT
150  HOME : PRINT "SORTING"
160  PRINT  CHR$ (7): GOSUB
     230: PRINT  CHR$ (7);
     CHR$ (7): HOME
170  FOR K = 1 TO N
180  LET AK$ =  STR$ (A(K))
190  IF  LEN (AK$) < 5 THEN
     AK$ = " " + AK$: GOTO 190
```

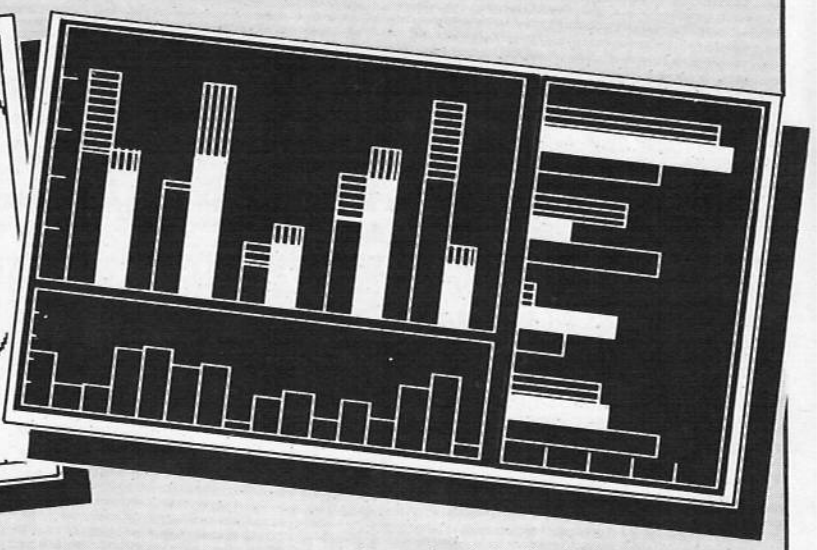
```
SCREEN #40
 0 ( FIX )
 1
 2 1000 CONSTANT N     1 N ARRAY A
 3
 4 : GET-IT  DUP A @ ;       ( N,Q---N,Q,D )
 5 : SET-PTR SWAP 2* ROT ;  ( N,Q,D---D,R,N )
 6 : IN-HEAP 2DUP <= ;       ( D,R,N---D,R,N,f )
 7 : NOT-LAST  2DUP < ;      ( D,R,N---D,R,N,f )
 8 : SMALL-CHILD OVER DUP A @ SWAP 1+ A @ <  ; ( D,R,N---D,R,N,f )
 9 : SELECT-LARGER  SWAP 1+ SWAP ; ( D,R,N---D,R,N )
10 : PLACE-FOUND   -ROT 2DUP A @ > ; ( D,R,N---N,D,R,f)
11 : CHILD-UP  DUP A @ OVER 2/ A ! ; ( N,D,R---N,D,R )
12 : PTR-DOWN  2* ROT ;     ( N,D,R---D,R,N )
13 : INSERT   -ROT 2/ A ! ;   ( D,R,N---N )
14 -->
15

SCREEN #41
 0 ( FIX-CONTD )
 1
 2 : FIND-PLACE   BEGIN            ( D,R,N---D,R,N )
 3                  IN-HEAP WHILE
 4                   NOT-LAST IF
 5                     SMALL-CHILD IF
 6                       SELECT-LARGER
 7                     THEN
 8                   THEN
 9                   PLACE-FOUND IF
10                     ROT EXIT
11                   ELSE
12                     CHILD-UP PTR-DOWN
13                   THEN
14                 REPEAT ;
15 : FIX   GET-IT SET-PTR FIND-PLACE INSERT ;  ( N,Q---N ) -->

SCREEN #42
 0 ( MAKEHEAP,HEAPSORT )
 1
 2 : MAKEHEAP   0 OVER 2/ DO   ( N--- )
 3               I FIX
 4             -1 +LOOP DROP ;
 5
 6 : INTERCHANGE   DUP A @ 1 A @ ROT A ! 1 A ! ;    ( I--- )
 7
 8 : HEAPSORT   N MAKEHEAP          ( --- )
 9              1 N DO
10                I INTERCHANGE
11                I 1- 1 FIX DROP
12              -1 +LOOP ;
13 -->
14
15

SCREEN #43
 0 ( HEAPSORT DEMO )
 1
 2  VARIABLE RND   HERE RND !
 3
 4 : RANDOM       RND @ 31421 * 6927 + DUP RND ! ;
 5
 6 : CHOOSE        RANDOM U* SWAP DROP ;            ( U1---U2 )
 7
 8 : FILL-ARRAY
 9                N 1+ 1 DO
10                        1000 CHOOSE 1+ I A !
11                      LOOP ;
12
13 -->
14
15

SCREEN #44
 0 ( HEAPSORT DEMO CONTD. )
 1
 2 : DISPLAY      N 1+ 1 DO
 3                         I DUP DUP
 4                         A @ 4 .R SPACE
 5                         12 MOD 0= IF CR THEN
 6                         240 MOD 0= IF PAUSE PAGE THEN
 7                         LOOP ;
 8
 9 : HEAPSORT-DEMO     PAGE
10                     ." STANDBY LOADING ARRAY "
11                     FILL-ARRAY PAGE
12                     ." SORTING " BELL
13                     HEAPSORT
14                     BELL BELL
15                     PAGE DISPLAY ;
ok
```

```
200  PRINT AK$;: IF K / 12 =
   INT (K / 12) THEN  PRINT
210  IF K / 240 =  INT (K /
   240) THEN  GET A$: HOME
220  NEXT : END
225  REM
230  REM  HEAPSORT
240  REM
250  REM  CALL
   MAKEHEAP(A(),N2)
260  LET N2 = N
270  GOSUB 350
280  FOR P = N TO 2 STEP  -1
290  LET TEMP = A(P):A(P) =
   A(1):A(1) = TEMP
300  REM  CALL FIX(A(),Q,N2)
310  LET Q = 1:N2 = P - 1
320  GOSUB 420
330  NEXT P
340  RETURN
345  REM
350  REM  MAKEHEAP
360  REM
370  FOR Q =  INT (N2 / 2)
     TO 1 STEP  - 1
380  REM  CALL FIX(A(),Q,N2)
390  GOSUB 420
400  NEXT Q
410  RETURN
415  REM
420  REM  FIX
430  REM
440  LET R = 2 * Q:IT = A(Q)
450  IF R > N2 THEN 520
460  IF R = N2 THEN 480
465  IF A(R) >  = A(R + 1)
   THEN 480
470  LET R = R + 1
480  IF IT > A(R) THEN 520
490  LET A( INT (R / 2)) =
   A(R)
500  LET R = 2 * R
510  GOTO 450
520  LET A( INT (R / 2)) =
   IT
530  RETURN
540  REM
543  REM  INSERT (A(),N2)
545  REM
550  REM  INSERTS THE VALUE
   IN A(N2)
560  REM  INTO THE HEAP
   STORED IN
565  REM  A(1) TO A(N2-1)
570  LET S = N2:T =  INT (S
   / 2):IT = A(S)
580  IF T <  = 0 THEN 620
590  IF A(T) <  = IT THEN
   620
600  LET A(S) = A(T):S = T:T
   =  INT (T / 2)
610  GOTO 580
620  LET A(S) = IT
630  RETURN
```

# apple user Graphics Library



*Three plots from the example program*



*Example of the flexibility created by calling the routines three times*

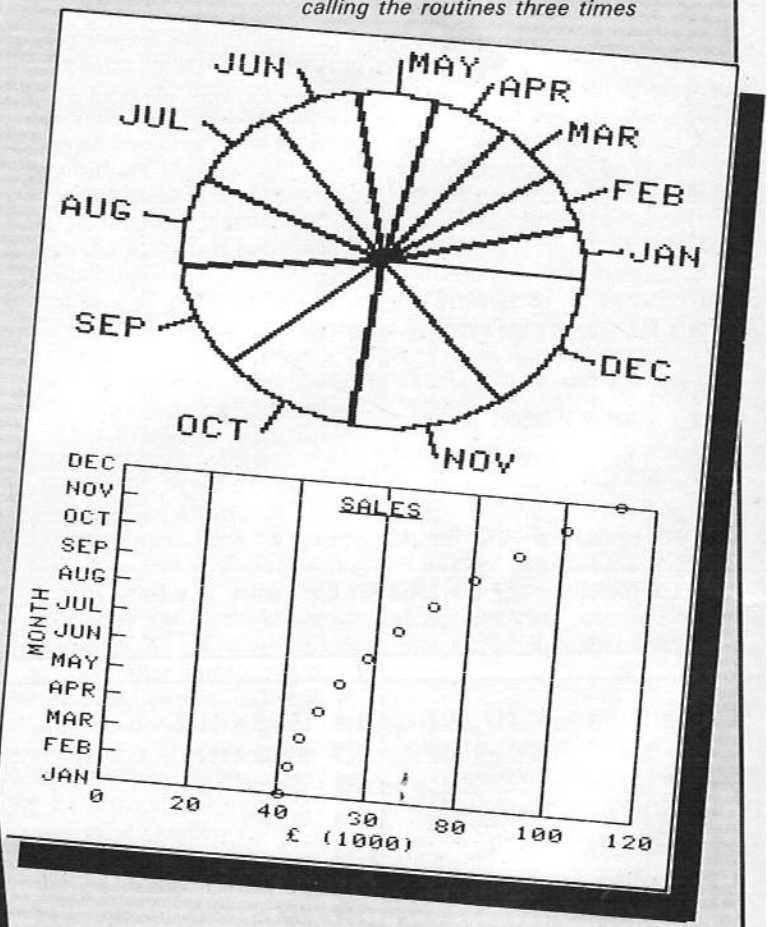
The November issue of *Apple User* saw the last in the Graphics Library series. For the benefit of those readers who missed some of the articles the complete list of issues that featured the Apple User Graphics Library are given in the panel below. Back numbers are still available, and these are listed on Page 60.

A disc has now been prepared containing all the routines presented in the series and this is available for £5.95.

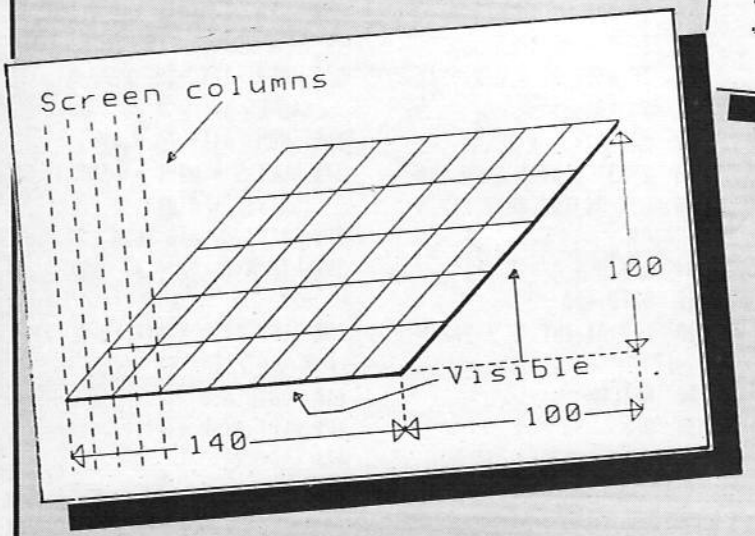
A complete set of photocopies of all the articles can be obtained, also for £5.95.

The cost of the disc plus the photocopied articles is £9.95.

***To order, use the form on Page 61.***




*Produced by the example program*




| | | | |
|---|---|---|---|
| Part 1 | February 1984 | Part 10 | December 1984 |
| Part 2 | March 1984 | Part 11 | February 1985 |
| Part 3 | April 1984 | Part 12 | March 1985 |
| Part 4 | May 1984 | Part 13 | May 1985 |
| Part 5 | June 1984 | Part 14 | July 1985 |
| Part 6 | August 1984 | Part 15 | August 1985 |
| Part 7 | September 1984 | Part 16 | October 1985 |
| Part 8 | October 1984 | Part 17 | November 1985 |
| Part 9 | November 1984 | | |

# TOTAL CONTROL

## Modify your Apple disc drives with PETER WILSON and cut costs in two

UNDER normal factory fresh conditions the Apple Disk II drives are one sided utilising the underside of the disc to record data.

To cut costs of data storage some time ago I removed the write protect switch on my No. 2 drive to enable me to use the reverse – which is really the top – of my discs, thereby cutting my costs in half.

In the July 1983 edition of *Windfall* I wrote an article showing how to gain total control over the Apple Disk II drive by replacing the microswitch with a double pole double throw switch and having a visual indication of write/enable or write/protect via two LEDs.

Since then Apple has changed the mechanical method of write protect/enable to an electrical one, and I have also recently uprated to an Apple Duodisk, which is a pair of Apple drives neatly packaged in a case with a single cable drive controller.

I very quickly missed the ability to write to the rear of my discs and decided to alter this state of affairs by fitting a switch and indicator to each drive of the Duodisk.

Apple still fits the mechanical method to the Disk II, so if you have one of these you can follow my previous article, but if you have a Duodisk or one of the type that have a solid state four wire system, read on.

I will refer to the Duodisk, but the method is approximately the same, as far as I can tell from looking inside a friend's P&P drives, to the various other types of drives you can now buy.

I obviously cannot vouch that if you have a drive other than the Duodisk that this will work, so please don't blame me if it all goes wrong on your Taiwanese drive.

Using the method described you will be able to:

- Write to either side of the disc without having to resort to cutting a slot in both sides of it (in fact with this method you can write to a disc with no slots at all).
- Write-protect either side of a disc totally, even if there is a slot in the disc.
- Be able to read at any time either side of the disc – obviously only the side which has the read/write head.
- Know at a glance which mode you are in, either total write/protect or total write/enable.

This modification to your disc drive will almost inevitably nullify your warranty, so it is NOT recommended if your drive is under one year old.

*To carry out the modification you will need for each disc drive:*

- 2 LEDs (light emitting diodes), one red and one green, preferably the ones with long leads and a "hood" on the front for easy mounting.
- 1 miniature double pole double throw switch.
- 2 220 ohm resistors.
- A soldering iron and solder.
- An assortment of drills to make six holes in the front cover of the disc drive.
- A Phillips screwdriver.
- About an hour or so.

This is the procedure for the Duodisk. Remove the two screws on the rear of the drive and remove by lifting slightly at the rear and then sliding off.

With the drive front away from you remove the following:

☐ The screw on top of the right hand drive.

☐ The screw that faces towards you tying the two together.

☐ The right hand cover (the one we are going to remove) has a slotted location piece at the front, so lift the rear carefully with a screwdriver and slide away from you, and then up to expose the works.

Locate the following:

☐ The two plugs with lots of wires coming from them marked JAE20C. On each of the plugs identify the sequence of the colours from the right as blue, brown, orange, mauve on the top row of wires. We are going to cut the brown and mauve wires.

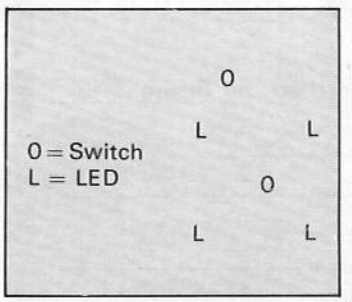



*Figure I*

☐ The pin marked TP3 (Test Point 3). This is to the left of IC R18 which is a SN74LS33N.

☐ The small black 470µf 6.3v capacitor at position C21 (the left hand one). Note the positive (+) side.

The next step will take a bit of planning, as we have to cram two switches and four LEDs into the small amount of space to the left of the drives.

I would suggest one switch as high as you can get it in the centre with its LEDs either side and lower down, to achieve a pattern as in Figure I.

Make the holes for all the switches and LEDs, ensuring that they fit.

Then carefully fit the LEDs, but not as yet the switches. Refer to Figure II, and fit the resistors to the switches.

Now solder three wires to the switches at points 1, 3 and 5 and route them through the hole in the back of the drive where all the other leads go. Cut the brown and mauve wires approximately 1" from the JAE plugs and solder the three wires on to them.

The brown wire from within the unit is not required, and may be taped up with a short length of insulating tape.

Next solder a length of wire from position 4 on to the plus (+) side of the capacitor. Rather than take two wires to the capacitor, just link a short length of wire from one switch to the other, also at position 4.

Now solder all the LED cathodes (normally black) together, and run a length of wire on to TP3 on the PCB (printed circuit board). The anodes of the LEDs (normally red), can now be soldered on to their respective positions on the switches.

Make sure that all exposed joints are insulated with tape, and route all the wiring (eight wires) down at the rear, poking them down into the small gap behind the drives.

You should now have a "birds nest" of wires around the position where you have made the holes. Show them who's boss and carefully fit the switches in place. Before fitting the covers, test out your

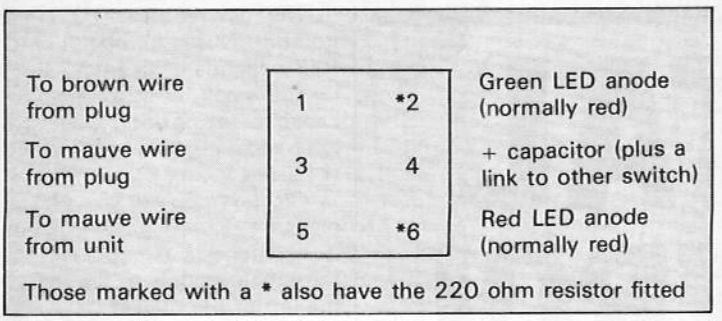



*Figure II: View from rear of switch*

modifications by plugging in the controller cable and booting DOS. If all goes well and according to plan, you should now be able to write to the back of your discs with the switch in one position (light green) and vice versa with the light red. If not, check your wiring and soldering.

Now replace the cover to the drive, making sure you refit the earthing braid correctly under the screw.

Don't forget the tie screw and then fit the plastic cover ensuring you do not trap or pull any of the extra wires you have just fitted.

Now you have total control.

appletip

# Make the most of flippies

Readers may be interested in an odd quirk regarding the Cumana half-height disc drives as advertised in Apple User and the multi-coloured discs that were on sale at Apple '85 by a company called Disking.

The oddity is that if the discs are inserted upside down – known colloquially as flippies – whereas normally you would have to cut a write-protect notch or have a specially adapted disc drive, you can write to them without doing either of these. First check the surface is OK however! You cannot do this with the ordinary black discs.

It may be confusing to some if I add that ordinary Apple drives do not do this, and also the fact that the blue discs do not partake of this scheme. Furthermore, if you put on a write protect tab where the notch should be you can no longer write to the disc.

The reason, I think anyway, is that the Cumana drive scans the notch via an optical beam of sorts – it is a physical microswitch in Apple drives – and the coloured discs allow such a beam through with the exception of the more opaque blue. Thus as far as it is concerned it is not write-protected.

**Ian Sidwell**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MacReview

# When it comes to the crunch...

## ...does your spreadsheet measure up? JIM MANGLES puts this powerful program from Paladin through its paces

WHILE Lotus was making an incredible fuss, aided and abetted by Steve Jobs, about its wonder program Jazz, and Microsoft was doing its best to steal the Lotus thunder with Excel, a third product that claims to belong in the same category has been released in the United States (relatively) quietly.

Crunch is described as "The power spreadsheet for the Macintosh" by its publisher, Paladin Software of San Jose, California. Paladin is the successor to VisiCorp, so perhaps it knows a powerful spreadsheet when it sees one.

Just how much power does Crunch have, and will it be enough to take on Jazz and Excel?

Well, there's no doubt that it does have some very powerful features – for example the worksheet has 250 columns and 9,999 rows, a total of 2,499,750 cells – five times more than 1-2-3 and 160 times more than Visicalc.

Numerical data can be turned into a graph with two clicks of your mouse. You can designate areas of the spreadsheet to be a database, and sort and summarise the data there to your heart's content.

Up to six worksheet windows, a notes window, a directory window, and four graph windows can be on screen at one time, together with the usual desktop accessory windows such as the scrapbook or alarm clock.

Because a single set of pulldown menus are used throughout the program, learning to use the program is simplified.

Crunch has 74 built-in functions, covering all the usual areas – maths (24), logic (12), statistics (13), financial (9), dates (5), together with 11 other special functions.

And if you need to, you can use a facility known as the Directory (more on this later) to create as many as 1,000 more. These custom functions are really names which can be specified for complex or frequently used formulae or calculations.

To this extent, they have some similarity with the macro facilities found in 1-2-3 and Advanced Visicalc, but are not true macros.

It is not possible to define sequences of keystrokes and mouse moves as function names, which are restricted to combinations or permutations of values, text strings, and the built-in functions. I understand that Paladin hope to incorporate true macros in later versions.

Calculation order can be set to natural – the default – and row. If you wish to use circular references, you must specify row and then set the number of iterations. Recalculation can be set to automatic or manual. In large worksheets, selecting manual will enable you to work much more quickly.

Full auditing facilities are provided, for both formula and references. The formula audit sets all values to 10. If the resultant value in a cell come from more than one constant, the number that appears will be 10 times the number of constants. This is to let you quickly check that the formula refers to the correct number of cells.

References are audited in the form of a printout of the worksheet showing a list of the other cells and Directory entries that reference each cell.

Column widths can be set, globally or individually, to any width between 3 and 50 characters. It seems strange that columns cannot be set to be less than three characters wide. Wide labels can be set to spill over into adjoining cells or not as desired.

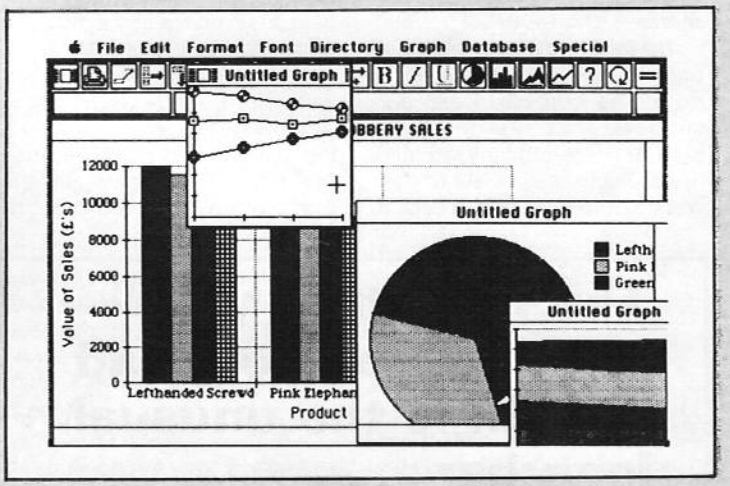
Cells can be formatted to display left, centre, and right alignment, currency, percent, scientific, date, thousands, millions, commas, and fixed or floating decimals are available options.

A menu of eight date styles is offered, including four in the European format with the day preceding the month. There are powerful built in date functions, but no time functions are provided. Date arithmetic is performed automatically when you copy a date cell over a range.

Areas of your document which contain confidential or sensitive information can be hidden from view or protected from change. Unauthorised users can be prevented from viewing hidden cells or modifying protected ones by installing passwords.

Using the Preferences dialogue box you can set up options for the entire worksheet, such as the number of decimal places in value cells, the currency symbol – there's no problem setting it to £! – and whether to show K and M units if numbers are formatted to thousands or millions.

Unfortunately it is not possible to have more than one currency symbol, date format, or text font in your document at one time. Thus, for example, the currency must be all dollars, pounds, marks, or whatever. This could be a nuisance if




*Examples of graphs using Crunch*

# MacReview

you're engaging in foreign exchange speculation.

Crunch lets you generate pie, line, bar, and area charts from your spreadsheet data quickly and easily. A maximum of four graphs can be on the screen at one time.

Straightforward dialogue box options let you change your chart size, titles, patterns, grids, legends, labels, and scales rapidly. However, the sizing options are restricted to just three – small, medium and large.

Although the large size fills the screen nicely, the result looks rather lost in the middle of the paper when you print it out, especially on a 15 inch Imagewriter. Dragging the window size icon had no effect on the size of the graph in the window.

Graphs are supposedly dynamically linked to the worksheet, so that changes there are automatically reflected in the graph. However I found that it was necessary to return to the graph window, reactivate it, and do something to it, even if no more than pull down the graph menu and release it again, before the graph does in fact update itself to reflect changes to the spreadsheet.

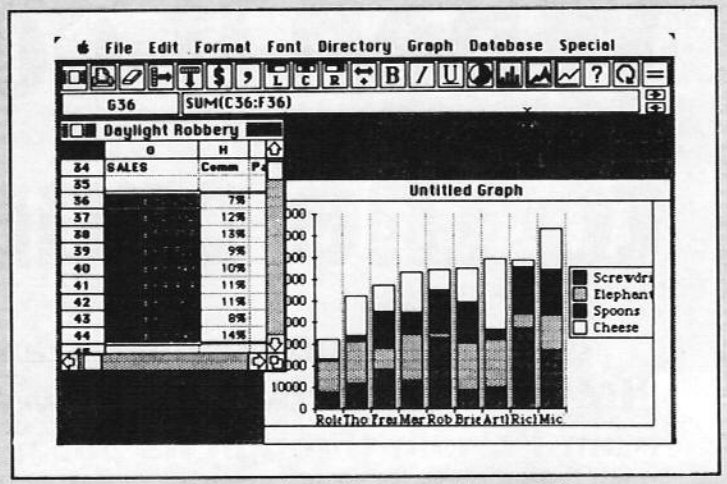
Any group of worksheet rows can be selected to form a database. This data can be sorted, queried, screened, and summarised very quickly. A wide range of calculations can be performed on records meeting specific criteria.

Records are sorted in "dictionary" order, unlike Quartet and Multiplan, where the sort order is first of all upper case, then all lower case, then numbers.

There's also a note-taking facility which could not be called word processing by even the most generous critic, but to be fair, Paladin don't claim it is, either.

You can use the Notes facility to help document your worksheet. Up to two and a half pages of notes can be added to a document as memos, or for documenting the underlying assumptions about your calculations.

Together with the built-in auditing features, this helps you




*Database information sorted and displayed in bar-graph form*

or other users understand what is happening, so avoiding mistakes and misinterpretation of results.

The first thing you'll notice when you load Crunch is the unusual icon bar which appears just below the pull-down menu selection bar at the top of your Mac's screen.

These 21 icons are provided as shortcuts to what, in Paladin's opinion, are the most common spreadsheet operations. If it turns out that you don't follow the herd, or find the bar distracting, it can be removed from the screen very easily, and as an incidental bonus, a larger area of your spreadsheet will then appear in the screen window.

If you're keen to see even more of your spreadsheet at one go, select Belleview 6 (yes, 6) from the font menu, and a surprisingly large area of the sheet will be visible on your screen.

Up to 31 rows are visible at once in this mode if you've got rid of the icon bar. I can only suppose that this font was provided specifically to give users a panoramic view of their work before they switch back to another, larger one, because it's almost unreadable on the screen.

If you need to print a lot of data in one line I would strongly recommend using a more normal font and size with the Page Setup menu set to 50 per cent reduction, assuming you've got the new printer driver. If you haven't, get it – you don't know what you're missing.

Alternatively, you can print your data sideways with no loss in print quality.

Every Crunch document has a Directory associated with it. In there, you can define names for windows, areas, cells, formulae, and functions. Hence the ability to create additional functions referred to earlier. But more than that, it can be used to link worksheets in a manner similar to Multiplan.

Using this method, information from a series of spreadsheets, which do not all have to be on the same disc, can be gathered together automatically on the active worksheet.

I found the Directory confusing to use at first, partly because the instructions given in the manual on this subject are rather opaque, and downright wrong in some respects. However persist.

Once you do fathom it out you'll discover that the Directory is one of the most powerful tools in Crunch. To find out how big a file can be created I replicated the A1+1 formula over as large an area as possible.

An oddity, and a problem, is that often Crunch will advise you that it has insufficient memory to complete an operation, even as it is simultaneously reporting as much as 19 per cent memory free.

Paladin claims that the maximum possible number of active cells is between 15k and 18k.

In reality, it would seem that the largest number of filled cells that you can have in a single document is about 8 or 9 thousand. If you are perverse enough to use the extreme bottom right corner for your work, the limit may be as low as two or three hundred cells.

The largest document that I created had 8,635 active cells. The program refused to accept any additional operations beyond this, yet simultaneously informed me that there was 9 per cent memory free.

This particular table was five columns wide and 1,727 rows deep. It took 39 seconds to replicate the formula over this area, and recalculation took 19 seconds, which doesn't seem too bad – in fact, it's faster than 1-2-3 on an IBM-PC.

However, saving took about five minutes, which is not so great, and loading the 215k file so created back into the worksheet turned out to be impossible – "Insufficient memory to complete this operation", and that after waiting patiently through four and a half minutes, admiring the famous Macintosh wristwatch as the disc whirred away.

Obviously this is not an acceptable situation, and I can only hope that Paladin plans to do something about this in the near future.

Paladin specifies the system requirements for Crunch to be a 512k Mac with one drive. I presume that must mean one external drive, because it's

**The first thing you'll notice when you load Crunch is the unusual icon bar . . .**

almost impossible to run without that second drive.

The Crunch program file is large – 246k – and together with the Help file and a stripped-down system folder, the disc that it comes on is very full. There's only 10k left free as disc space for you to save your work on.

The program is compatible with the Switcher and the Apple Numeric Keypad. Both wide and narrow Imagewriter printers and the LaserWriter are supported.

The manual is well laid out and attractive. It doesn't follow the standard format that seems to have developed for Macintosh software, but is none the worse for that.

However, as indicated earlier, it does suffer from a number of small and irritating inaccuracies, not all of which have been picked up in the 12 page addendum enclosed with the Crunch package. Hopefully, Paladin will correct this soon.

No reference card is provided. There should be. Even though the Macintosh is supposed to be "the computer for the rest of us", a full power spreadsheet – which Crunch is – remains a complex system to use, no matter what computer it's running on.

Crunch works with other Macintosh applications that use standard interfaces, so that you can, for example, use worksheet data or graphs in a MacWrite document, or embellish a Crunch graph in MacPaint.

Paladin has announced that a Crunch File Conversion Program is projected which will enable users to convert existing worksheets created with Multiplan, and possibly other programs, to Crunch format.

How will Crunch get on in its battle with Jazz and Excel?

Only time will tell. Crunch seems to be more like Excel than Jazz – a spreadsheet with graph and database extensions, in the true 1-2-3 tradition.

Meanwhile Jazz, from the stable that produced 1-2-3, is oddly the one that attempts to go further towards a truly integrated system. It includes a proper word processing facility, plus forms and communications. Whether it will prove more useable than Symphony, Lotus's other integrated system which runs on the IBM-PC, we shall have to see, although I believe that the Mac environment should prove much more suitable than the painful IBM one for that sort of complicated program.

However, Excel has a full-blown (mind-bogglingly powerful, I would say) macro facility, which Crunch presently lacks, as does Jazz.

On the other hand Jazz costs $595 in the States, Excel $395, and Crunch is $295, (US prices are given for comparison, because Crunch is not yet on sale here).

Jazz comes on six discs, Excel two, and Crunch fits on to just one.

Jazz has the most fiendish copy-protection system yet installed on any Macintosh program. There is a story going round that the reason for the delay in releasing Jazz earlier this year was directly related to this; Lotus was not prepared to release the program until the copy protection system was foolproof, and this turned out to take much more time and effort than expected.

Excel is also copy protected. Both programs can be installed on, and run from, a hard disc provided you have the original master disc inserted in Mac's onboard drive. The original disc can still get lost, stolen, damaged, or give up the ghost, leaving you up the creek.

Crunch is not copy protected. It could not be easier to install on a hard disc, and will then run without needing to "prove" to the computer that you have the original.

I believe this alone is worth a lot, and is a refreshing vote of confidence from a major software publisher in the integrity of the program-buying public.

**VERDICT: Should you buy Crunch? It's not perfect, as I have indicated. But it's cheaper than its rivals, fits on one disc, and can be used from a hard disc without hassle. It's a powerful, heavyweight program which should serve the needs of most spreadsheet users well, especially if the rough edges are smoothed off and a proper macro ability can be installed in the near future.**

## Stop Press

*SINCE I wrote this review, Paladin has announced Super Crunch.*

*I don't have a copy yet, but the blurb makes interesting reading. If the product only half lives up to what is promised, it's going to give Jazz and Excel more than a run for their money.*

*Here is a summary of the main features of Super Crunch:*

- *There are a total of 63 icons on an icon palette, where the user will be able to mix and match to select 21 to reside on the on-screen icon bar.*

*In addition to the predefined icons found in Crunch, there will be new ones for such purposes as summing a row of information or cutting and pasting from one spreadsheet to another.*

*Users will also be able to allocate macros to icons, making macro execution exceptionally simple. What's more, users will be able to redesign the look of the predefined icons.*

- *Super Crunch offers two kinds of macros – learn mode, or recording macros (like Excel), and programmable macros which will employ a built-in macro language much like Pascal.*

*This will be ideal for the more sophisticated power user, and will be the most advanced macro language available on any spreadsheet, including commands such as GO-TO, BEGIN-END, RETURN, LEAVE, CALL, NUMBER, IF-THEN-ELSE, and FOR-DO.*

- *The new spreadsheet is also three-dimensional. Like Crunch, it is 250 columns across by 9,999 rows down, but it is also 250 levels deep. This appears to mean that a user can, say, add not just a row or column of adjacent cells, but also a "depth" of them.*

*This 3D approach will also enable people to explore endless "what-if?" scenarios – all at once.*

- *Finally, Super Crunch can talk! Using its Say It feature, you'll be able to proofread all by yourself. Instead of needing someone else to read out text and numbers while you check their accuracy, Super Crunch will read both text and numbers out loud from the spreadsheet for you.*

*There are some other minor enhancements to the original version such as improved graphics and faster recalculation, but no mention of faster save/loading.*

*Paladin's pricing policy on Super Crunch seems exceptionally generous. When the new version is released it will retail at $295 in the States, and the old Crunch will be repriced at $149. Existing registered users of crunch will be able to upgrade free of charge.*

*I'm told I'll have a copy of Super Crunch in my hands within a month, so I look forward to seeing if it lives up to its promise, and reporting to you on that in the near future.*

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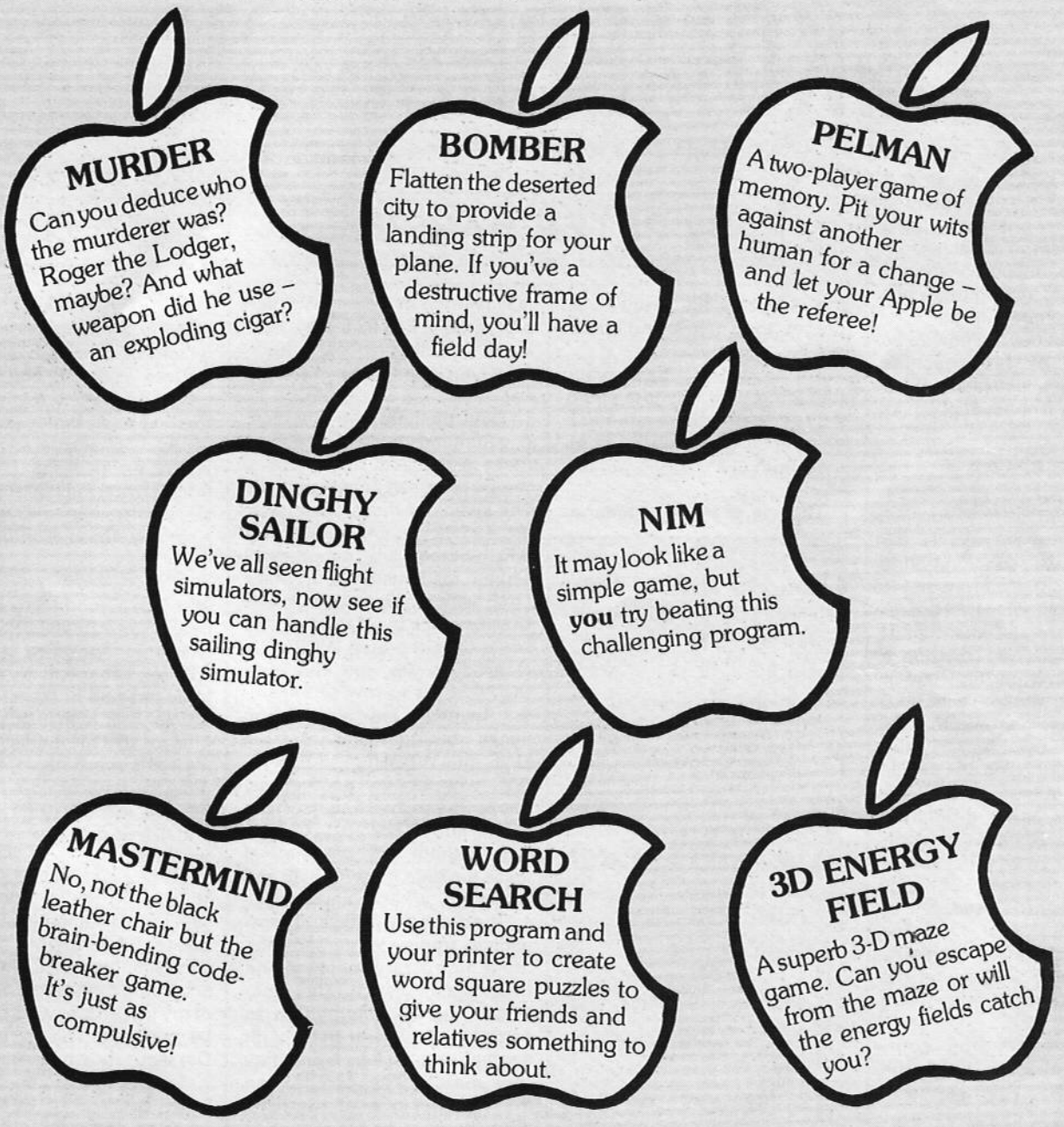


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# &EXPANSION and &KOMPRESSION

By PETER HARRIS

IN my last article I presented some Basic routines for splitting integer and string variables into their significant component bits with a view to storing these bits in a more compact form.

These routines are now to be supplanted by fast machine code routines activated by & commands. The syntax is as follows:

**&E,B,N,A%**

or **&E,B,N,A$**

where B in each case is the address in which the first bit is to be placed. When working with integer variables, for example A%, N is the number of significant bits, thus setting a maximum limit on the value of A% to be processed – with N=5 only 5 bytes will be used to store bits from variable A%, the maximum value being $2^5-1=31$.

With a string variable, for example A$, N has a different meaning: N=0 means no compression. Seven bits are used for each character; all 127 Ascii characters can be used. N<>0 means compression. Only five bits are used for each character, so only capital letters and the space character can be accepted.

The corresponding compression routines have the syntax:

**&K,B,N,A%**

or **&K,B,N,A$,L**

The parameters B and N are the same as for the &E routines. The first command processes the row of 1s and 0s which have previously been placed in memory starting at address B, and evaluates the result to an integer, the value being placed in A%.

The second command evaluates the row of bits to a string, and needs an extra parameter L, which is the maximum permissible length of the string variable A$.

The use of these commands is illustrated in a demonstration programme EKTEST (see Listing I) which includes a functional decimal integer-to-binary converter.

```
2 REM EKTEST
5 HOME: L2 = 8192: REM $2000
10 INPUT "ENTER A DECIMAL
   INTEGER ";A%
20 FOR N = 1 TO 16
30 & E,L2,N,A%
40 FOR M = 1 TO N
50 PRINT PEEK(L2 - 1 + M);:
   NEXT: PRINT "   ";
60 & K,L2,N,B%
70 PRINT B%: NEXT
100 INPUT "ENTER A STRING
   --> ";S$
110 PRINT: PRINT "FULL
   ASCII:"
120 & E,L2,0,S$
130 FOR N = 1 TO LEN(S$)
140 & K,L2,0,T$,N
150 PRINT LEN(T$),T$;"
   ": NEXT
200 PRINT: PRINT
   "COMPRESSED:"
210 & E,L2,1,S$
220 FOR N = 1 TO LEN(S$)
230 & K,L2,1,T$,N
240 PRINT LEN(T$),T$;"
   ": NEXT
```

*Listing I*

With the help of a few more & commands we will be able to make a practical reality out of the Datasquash considerations. The syntax of these commands are as follows:

**&Z** (without any parameters) serves to initialise the areas LINE, which is cleared to 0s, and CLINE, which is set to 1s. At the same time the area WRBUF is cleared to 0s and the area COMP is set to row of $FFs.

**&J** (without any parameters) packs the bitwise data from LINE into WRBUF.

**&Y** (without any parameters) packs the bitwise data from CLINE into COMP.

**&S** (without any parameters) takes the data from RDBUF and spreads it out into bits in LINE.

The cross-checking and comparison routine is perhaps the most important part of the Datasquash system. The function of the &X command is to compare one set of bytes with another and to flag a satisfactory match. The comparison may be performed in three different ways, so the routine to be followed must be set up beforehand by a command of the form &X(LETTER,number, number). The LETTER may be A,W or C. The form:

**&X(A,B1,B2)**

sets up a comparison routine which compares the contents of buffers WRBUF and RDBUF between bytes B1 and B2, treating each buffer as a series of Ascii characters. In other words, the most significant bit is ignored, making this suitable for comparisons in a Datasquash I-type database. The form:

**&X(W,B3,B4)**

sets up a routine to compare bytes B3 to B4 in WRBUF with the corresponding bytes in RDBUF according to the truth table in Table III of last month's article, reprinted below, where bits set to 1 in the key bytes in WRBUF must be matched by 1s. This type of comparison is needed in both Datasquash I- and II-type databases. Similarly, the form:

**&X(C,B5,B6)**

sets up the comparison of bytes B5 to B6 in COMP with the corresponding bytes in RDBUF according to the logic of table IV of my last article, where 0s must be matched. This is needed in Datasquash II-type files.

Integrated commands of the form &X(W,B1,B2)(C,B3,B4) are also accepted. Usually the same range of bytes needs to be

| | | Record (in RDBUF) 0 | 1 | |
|---|---|---|---|---|
| Key (in WRBUF) | 0 | A | A | A = record accepted (matched) |
| | 1 | R | A | R = record rejected |

*The truth table from December's Apple User*

```
10 REM  XCHECK TEST
80 COL$ = "' ' ' ' 8 4 2 1"
90 DEF FN IT(A) = PEEK(A) +
   256 * PEEK(A + 1)
95 DI = 0: WRBUF = FN
   IT(952): RDBUF = FN
   IT(954)
100 COMP = FN IT(956): LINE
   = FN IT(958)
110 DEF FN RAN(A) = RND(1) *
   57 + 33
115 REM ASCII comparison of
   1st 5 bytes WRBUF/RDBUF
120 & X(A,0,4)
130 FOR N = 1 TO 100: W$ =
   "": R$ = ""
140 FOR W = 0 TO 5: A = FN
   RAN(A)
150 W$ = W$ + CHR$(A): POKE
   WRBUF + W,A: NEXT
160 IF N / 10 = INT(N / 10)
   THEN W$ = ""
170 FOR R = 0 TO 5: A = FN
   RAN(A)
180 IF N / 10 = INT(N / 10)
   THEN W$ = W$ + CHR$(A):
   POKE WRBUF + R,A
190 R$ = R$ + CHR$(A): POKE
   RDBUF + R,128 + A: NEXT
200 & X: IF PEEK(DI) = 0
   THEN INVERSE
210 PRINT W$,R$: NORMAL:
   NEXT
220 SPEED = 150
230 REM Match 1's in
   WRBUF/RDBUF
232 PRINT "MATCHING 1'S..."
235 GOSUB 800
240 & X(W,0,1): POKE
   WRBUF,4: POKE WRBUF + 1,2
250 FOR N = 0 TO 255: GOSUB
   900: NEXT
260 REM Match 0's in COMP
   and RDBUF
262 PRINT "MATCHING 0'S..."
265 GOSUB 800
270 & X(C,0,1): POKE
   COMP,251: POKE COMP +
   1,253
280 FOR N = 0 TO 255: GOSUB
   900: NEXT
285 SPEED = 255
290 END
800 PRINT "Match '4' column
   of first byte"
810 PRINT "  and '2' column
   of second byte"
820 PRINT "Press a key to
   continue ";: GET A$
830 HOME: RETURN
900 POKE RDBUF,N: POKE RDBUF
   + 1,255 - N
910 IF N / 20 = INT(N / 20)
   THEN PRINT: PRINT COL$"
   "COL$: PRINT
920 & X: IF PEEK(DI) <> 0
   THEN RETURN
1000 & S: FOR BYTE = 0 TO 1
1005 FOR BIT = 0 TO 7
1010 PRINT PEEK(LINE + BYTE
   * 8 + BIT)" ";: NEXT
1020 PRINT " ";: NEXT
1030 PRINT N: RETURN
```

*Listing II*

```
990 REM SET UP XCHECK
1000 RECLN = 80: REM
   ARBITRARY NO OF BYTES IN
   RECORD
1010 FOR W = 0 TO RECLN - 1
1020 IF PEEK(WRBUF + W) THEN
   B1 = W: W = RECLN
1030 NEXT
1040 FOR W = RECLN - 1 TO 0
   STEP -1
1050 IF PEEK(WRBUF + W) THEN
   B2 = W: W = 0
1060 NEXT
1070 FOR W = 0 TO RECLN - 1
1080 IF PEEK(COMP + W) < 255
   THEN B3 = W: W = RECLN
1090 NEXT
1100 FOR W = RECLN - 1 TO 0
   STEP -1
1110 IF PEEK(COMP + W) < 255
   THEN B4 = W: W = 0
1120 NEXT
1130 & X(W,B1,B2)(C,B3,B4)
```

*Listing III*

compared in both ways (in Datasquash II) in which case B1 is equal to B3 and B2 to B4.

Having thus set up the comparison criteria, the actual comparing is done by issuing the command &X, without any parameters. The result of the comparison is left in RAM address 0: if the result of PEEK(0) is 0, then no discrepancy between the ranges of bytes scanned has been found, that is there was an acceptable match.

The mode of action is illustrated in the demonstration programme XCHECKTEST (see Listing II).

It is not always necessary to scan an entire record when only a few fields in that record need to be compared. If a key byte in WRBUF has a value of 0 then it is not significant for matching purposes, and may be ignored.

Similarly, a byte in COMP with a value of 255 is not significant and may also be ignored. This may provide a useful increase in speed – see Listing III which establish the first and last significant bytes in WRBUF and COMP before formatting the &X comparison.

Before embarking on writing a database program it is as well to consider a few points first. It is vitally important to make data entry easy for the user, otherwise he gets tired, and fed up with the programmer.

It is therefore a good idea to plan the screen layout carefully, noting in detail the rows and columns on the screen where the text pertaining to each field of a record is to be positioned. If there are many fields, legibility may be improved by using two or more screenfuls of fields presented in sequence.

Secondly it is desirable to prevent the user from entering nonsense, say digits when the letters of a name are required. This introduces the concept of data types, which also must be noted in relation to each field.

By the time one has built up a neat table incorporating row, column, text, data type, number of bits required and so on – this sort of information is sometimes referred to as metadata – one comes to the conclusion that one needs to write another database to manipulate the information about the main database, a somewhat vicious circle.

We can break out of the circle by writing a single program which draws metadata from data statements in the program to feed the form generator which designs screen layouts for the main database. The output of the form generator is metadata for the main database, which can be stored on disc.

In the demonstration form generator and database program to be presented next month metadata is stored in the first few records of each file, followed by the actual data.

This saves on the space overheads of opening a second file to carry the metadata, and results in a considerably more compact disc catalog.

*Listing IV*

```
SOURCE FILE: DOSFILE
     9366:          593         LST  ON

                    595 **********************
9366:               596 *
9366:               597 *  COMPRESSION/EXPANSION
9366:               598 *
                    599 **********************

0000:               601         DSECT
0000:               602 SHIFT   DS   1
0001:               603 STRLEN  DS   1
0002:               604 BLOCKADR DS  2          MUST BE SAME AS BUFP
0004:               605 LINEADR DS   2
0006:               606 VARADR  DS   2
0008:               607 COUNTER DS   1
0009:               608 NEEDBITS DS  1
9366:               609         DEND

9366:20 BE DE       611 PARMGET JSR  CHKCOM
9369:20 67 DD       612         JSR  FRMNUM
936C:20 52 E7       613         JSR  GETADR
936F:A4 51          614         LDY  LINNUM+1
9371:A5 50          615         LDA  LINNUM
9373:60             616         RTS

9374:AD BE 03       618 SETADR  LDA  LIX
9377:85 04          619         STA  LINEADR
9379:AD BF 03       620         LDA  LIX+1
937C:85 05          621         STA  LINEADR+1
937E:A9 08          622 SETBITS LDA  #8
9380:85 09          623         STA  NEEDBITS
9382:AC AE 03       624         LDY  RECLN
9385:84 08          625         STY  COUNTER
9387:88             626         DEY
9388:60             627         RTS
9389:20 74 93       628 SETADR2 JSR  SETADR
938C:AD B8 03       629         LDA  WRX
938F:85 02          630         STA  BLOCKADR
9391:AD B9 03       631         LDA  WRX+1
9394:85 03          632         STA  BLOCKADR+1
```

```
9396:60        633         RTS

9397:AD C0 03  635 SETADR3 LDA  CLIX
939A:85 04     636         STA  LINEADR
939C:AD C1 03  637         LDA  CLIX+1
939F:85 05     638         STA  LINEADR+1
93A1:AD BC 03  639         LDA  COX
93A4:85 02     640         STA  BLOCKADR
93A6:AD BD 03  641         LDA  COX+1
93A9:85 03     642         STA  BLOCKADR+1
93AB:D0 D1     643         BNE  SETBITS

93AD:          645 * COMPRESS CLINE INTO COMP
93AD:20 97 93  646 JCOMP   JSR  SETADR3
93B0:D0 03     647         BNE  LINEBLOCK

93B2:          649 * COMPRESS LINE INTO WRBUF
93B2:20 B9 93  650 JOIN    JSR  SETADR2

93B5:A2 00     652 LINEBLOCK LDX £0
93B7:A4 09     653 LB1     LDY  NEEDBITS
93B9:B1 04     654 LB2     LDA  (LINEADR),Y
93BB:4A        655         LSR  A
93BC:66 00     656         ROR  SHIFT
93BE:88        657         DEY
93BF:10 F8     658         BPL  LB2
93C1:A4 09     659         LDY  NEEDBITS
93C3:C0 08     660 LB3     CPY  £8
93C5:F0 05     661         BEQ  LB4
93C7:46 00     662         LSR  SHIFT
93C9:C8        663         INY
93CA:D0 F7     664         BNE  LB3
93CC:A5 00     665 LB4     LDA  SHIFT
93CE:81 02     666         STA  (BLOCKADR,X)
93D0:20 FB 93  667         JSR  UPADR
93D3:D0 E2     668         BNE  LB1
93D5:60        669         RTS

93D6:          671 * EXPAND RDBUF INTO LINE
93D6:20 74 93  672 SPLIT   JSR  SETADR
93D9:AD BA 03  673         LDA  RDX
93DC:85 02     674         STA  BLOCKADR
93DE:AD BB 03  675         LDA  RDX+1
93E1:85 03     676         STA  BLOCKADR+1

93E3:A2 00     678 BLOCKLINE LDX £0
93E5:A1 02     679 BL1     LDA  (BLOCKADR,X)
93E7:85 00     680         STA  SHIFT
93E9:A4 09     681         LDY  NEEDBITS
93EB:88        682         DEY
93EC:66 00     683 BL2     ROR  SHIFT
93EE:8A        684         TXA              CLEAR ACC
93EF:2A        685         ROL  A
93F0:91 04     686         STA  (LINEADR),Y
93F2:88        687         DEY
93F3:10 F7     688         BPL  BL2
93F5:20 FB 93  689         JSR  UPADR
93F8:D0 EB     690         BNE  BL1
93FA:60        691         RTS

93FB:18        693 UPADR   CLC
93FC:A5 04     694         LDA  LINEADR
93FE:65 09     695         ADC  NEEDBITS
9400:85 04     696         STA  LINEADR
9402:90 02     697         BCC  U1
9404:E6 05     698         INC  LINEADR+1
9406:E6 02     699 U1      INC  BLOCKADR
9408:D0 02     700         BNE  U2
940A:E6 03     701         INC  BLOCKADR+1
940C:C6 08     702 U2      DEC  COUNTER
940E:60        703         RTS

940F:          705 * INITIALISE LINE AND CLINE
940F:20 B9 93  706 ZERO    JSR  SETADR2
9412:A9 00     707         LDA  £0
9414:91 02     708 Z2      STA  (BLOCKADR),Y ZERO WRBUF
9416:88        709         DEY
9417:C0 FF     710         CPY  £$FF
9419:D0 F9     711         BNE  Z2
941B:20 E3 93  712         JSR  BLOCKLINE ZERO LINE
941E:20 97 93  713         JSR  SETADR3
9421:A9 FF     714         LDA  £$FF
9423:91 02     715 Z3      STA  (BLOCKADR),Y SET COMP TO $FF'S
9425:88        716         DEY
9426:C0 FF     717         CPY  £$FF
9428:D0 F9     718         BNE  Z3
942A:F0 B7     719         BEQ  BLOCKLINE SET CLINE TO 1'S

942C:20 66 93  721 STNUMPRM JSR PARMGET
942F:85 04     722         STA  LINEADR   =MSB
9431:84 05     723         STY  LINEADR+1
9433:20 66 93  724         JSR  PARMGET   CODE/BITS --> LINNUM
9436:20 BE DE  725         JSR  CHKCOM
9439:20 E3 DF  726         JSR  PTRGET
943C:A5 83     727         LDA  VARPNT
943E:85 06     728         STA  VARADR
9440:A5 84     729         LDA  VARPNT+1
9442:85 07     730         STA  VARADR+1
9444:20 5D 93  731         JSR  INTADR
9447:A5 81     732         LDA  VARPNT-2  VALUE >$80 INDICATES AX
9449:          733 *                      <$80 MEANS A$
9449:60        734         RTS

               736 **********************
944A:          737 *
944A:          738 * &K,MSB,NO OF SIG BITS,AX
944A:          739 *
944A:          740 * &K,MSB,CODE,A$,LEN
944A:          741 *
               742 **********************

944A:20 2C 94  744 COMPRES JSR  STNUMPRM
944D:10 36     745         BPL  STRGCOM

944F:          747 * SET UP PARAMETERS FOR LINEBLOCK
944F:A9 01     748 NUMCOM  LDA  £1
9451:85 08     749         STA  COUNTER
9453:A5 50     750         LDA  LINNUM    NO OF SIG BITS
9455:85 09     751         STA  NEEDBITS
9457:C9 09     752         CMP  £9        1 OR 2 BYTES?
9459:90 12     753         BCC  NBYTE2
945B:38        754         SEC
945C:E9 08     755         SBC  £8
945E:85 09     756         STA  NEEDBITS
9460:20 B5 93  757         JSR  LINEBLOCK

9463:          759 * SET UP FOR 2ND BYTE
9463:A9 01     760         LDA  £1
9465:85 08     761         STA  COUNTER
9467:A9 08     762         LDA  £8
9469:85 09     763         STA  NEEDBITS
946B:D0 0B     764         BNE  NBYTE2A

946D:          766 * SET UP FOR ONLY 1 BYTE (2ND)
946D:A0 00     767 NBYTE2  LDY  £0
946F:98        768         TYA
9470:91 02     769         STA  (BLOCKADR),Y
9472:E6 02     770         INC  BLOCKADR
9474:D0 02     771         BNE  NBYTE2A
9476:E6 03     772         INC  BLOCKADR+1
9478:20 B5 93  773 NBYTE2A JSR  LINEBLOCK
947B:A0 01     774         LDY  £1
947D:B1 6D     775 NBYTE2B LDA  (STREND),Y
947F:91 06     776         STA  (VARADR),Y
9481:88        777         DEY
9482:10 F9     778         BPL  NBYTE2B
9484:60        779 NBYTE3  RTS

9485:A0 07     781 STRGCOM LDY  £7
9487:A5 50     782         LDA  LINNUM
9489:48        783         PHA              CODE -> STACK
948A:F0 02     784         BEQ  C06
948C:A0 05     785         LDY  £5
948E:84 09     786 C06     STY  NEEDBITS

9490:20 66 93  788         JSR  PARMGET   GET MAX LENGTH OF STRING
9493:F0 EF     789         BEQ  NBYTE3
9495:85 01     790         STA  STRLEN
9497:85 08     791         STA  COUNTER
9499:20 B5 93  792         JSR  LINEBLOCK

949C:          794 * SHORTEN STRING LENGTH BY IGNORING
949C:          795 *  ANY END ZEROS
949C:C6 01     796 C07     DEC  STRLEN
949E:A4 01     797         LDY  STRLEN
94A0:B1 6D     798         LDA  (STREND),Y
94A2:F0 FB     799         BEQ  C07

94A4:68        801         PLA              CHECK COMPRESSION CODE
94A5:F0 11     802         BEQ  C08

94A7:          804 * COMPRESSED CODE -> ASCII
94A7:B1 6D     805 C010    LDA  (STREND),Y
94A9:F0 04     806         BEQ  C09
94AB:18        807         CLC
94AC:69 40     808         ADC  £$40
94AE:2C        809         DFB  $2C
94AF:A9 20     810 C09     LDA  £$20
94B1:91 6D     811         STA  (STREND),Y
94B3:88        812         DEY
94B4:C0 FF     813         CPY  £$FF
94B6:D0 EF     814         BNE  C010

94B8:          816 * ADJUST STRING POINTER TOWARDS INTBUF
94B8:          817 *  AND STRLEN
94B8:E6 01     818 C08     INC  STRLEN
94BA:A5 01     819         LDA  STRLEN
94BC:A0 00     820         LDY  £0
94BE:91 06     821         STA  (VARADR),Y
94C0:C8        822         INY
94C1:A5 6D     823         LDA  STREND
94C3:91 06     824         STA  (VARADR),Y
94C5:C8        825         INY
94C6:A5 6E     826         LDA  STREND+1
94C8:91 06     827         STA  (VARADR),Y

94CA:4C DE E2  829         JMP  FRE       CLEAR INTBUF BY MOVING STRING
94CD:          830 *                        UP IN MEMORY

               832 **********************
94CD:          833 *
94CD:          834 * &E,MSB,NO OF SIG BITS,AX
94CD:          835 *
94CD:          836 * &E,MSB,CODE,A$
94CD:          837 *
               838 **********************

94CD:20 2C 94  840 EXPAND  JSR  STNUMPRM
94D0:10 2E     841         BPL  STRNGEX

94D2:          843 *  TRANSFER AX VALUE TO INTBUF
94D2:A0 01     844         LDY  £1
94D4:B1 06     845 NUMEX   LDA  (VARADR),Y
94D6:91 02     846         STA  (BLOCKADR),Y
94D8:88        847         DEY
94D9:10 F9     848         BPL  NUMEX

94DB:          850 *SET UP PARAMETERS FOR BLOCKLINE
94DB:A9 01     851         LDA  £1
94DD:85 08     852         STA  COUNTER
94DF:A5 50     853         LDA  LINNUM    NO OF SIG BITS
94E1:C9 09     854         CMP  £9        1 OR 2 BYTES?
94E3:90 10     855         BCC  BYTE2
94E5:38        856 BYTE1   SEC
94E6:E9 08     857         SBC  £8
94E8:85 09     858         STA  NEEDBITS
94EA:20 E3 93  859         JSR  BLOCKLINE

94ED:          861 *SET UP FOR 2ND BYTE
94ED:A9 01     862         LDA  £1
94EF:85 08     863         STA  COUNTER
94F1:A9 08     864         LDA  £8
94F3:D0 06     865         BNE  BYTE2A    FORCED BRANCH

94F5:          867 *SET UP FOR ONLY 1 BYTE (2ND)
94F5:E6 02     868 BYTE2   INC  BLOCKADR
94F7:D0 02     869         BNE  BYTE2A
94F9:E6 03     870         INC  BLOCKADR+1
94FB:85 09     871 BYTE2A  STA  NEEDBITS
94FD:4C E3 93  872         JMP  BLOCKLINE
9500:          874 * GET STRING PARAMETERS
9500:A0 02     875 STRNGEX LDY  £2
9502:B1 06     876 SX1     LDA  (VARADR),Y
9504:99 01 00  877         STA  STRLEN,Y
9507:88        878         DEY
9508:10 F8     879         BPL  SX1
950A:A5 01     880         LDA  STRLEN
950C:F0 36     881         BEQ  ENDEXP
950E:85 08     882         STA  COUNTER

9510:          884 * TRANSFER STRING TO INTBUF AREA
9510:C8        885         INY
9511:B1 02     886 SX2     LDA  (BLOCKADR),Y
9513:91 6D     887         STA  (STREND),Y
9515:C8        888         INY
9516:C4 01     889         CPY  STRLEN
9518:90 F7     890         BCC  SX2
951A:A0 07     891         LDY  £7
```

```
951C:A5 50     893          LDA  LINNUM    EXPANSION CODE
951E:F0 1C     894          BEQ  EX3

9520:          896 * ASCII -> COMPRESSED CODE ROUTINE
9520:A4 01     897          LDY  STRLEN
9522:88        898          DEY
9523:B1 6D     899 EX4      LDA  (STREND),Y
9525:C9 5B     900          CMP  #$5B
9527:B0 08     901          BCS  SPACE
9529:C9 41     902          CMP  #$41
952B:90 04     903          BCC  SPACE
952D:E9 40     904          SBC  #$40
952F:D0 02     905          BNE  STORE
9531:A9 00     906 SPACE    LDA  #0
9533:91 6D     907 STORE    STA  (STREND),Y
9535:88        908          DEY
9536:C0 FF     909          CPY  #$FF
9538:D0 E9     910          BNE  EX4

953A:          912 * EXPAND INTBUF INTO LINE
953A:A0 05     913          LDY  #5
953C:84 09     914 EX3      STY  NEEDBITS
953E:20 5D 93  915          JSR  INTADR
9541:20 E3 93  916          JSR  BLOCKLINE
9544:60        917 ENDEXP   RTS
               919 ****************************************
9545:          920 *
9545:          921 * &X(A,B1,B2)(W,B3,B4)(C,B5,B6)
9545:          922 * ASCII COMPARISON OF BYTES B1-B2
9545:          923 * WHOLE BYTE COMPARISON (MATCH 1'S) WRBUF-RDBUF BYTES B3-B4
9545:          924 *   "    "       "     (  "   0'S)  COMP-RDBUF BYTES B5-B6

9545:          925 *
9545:          926 * &X TO MAKE COMPARISON
9545:          927 *
               928 ****************************************

0000:          930          DSECT
0000:          931 WR       DS   2
0002:          932 RD       DS   2
0004:          933 CO       DS   2
0006:          934 YREG     DS   1
0000:          935 DIFF     EQU  WR
9545:          936          DEND

9545:F0 63     938 XCHECK   BEQ  XCHECK1
9547:A0 00     939          LDY  #0
9549:8C A3 95  940          STY  XA
954C:8C A6 95  941          STY  XW
954F:8C A9 95  942          STY  XC
9552:20 BB DE  943 XPAR1    JSR  CHECKL
9555:A0 00     944          LDY  #0
9557:84 06     945          STY  YREG
9559:          946          MSB  OFF
9559:C9 41     947          CMP  #'A
955B:F0 17     948          BEQ  XPAR2
955D:E6 06     949          INC  YREG
955F:E6 06     950          INC  YREG
9561:E6 06     951          INC  YREG
9563:C9 57     952          CMP  #'W
9565:F0 0D     953          BEQ  XPAR2
9567:E6 06     954          INC  YREG
9569:E6 06     955          INC  YREG
956B:E6 06     956          INC  YREG
956D:C9 43     957          CMP  #'C
956F:F0 03     958          BEQ  XPAR2
9571:4C C9 DE  959          JMP  SNERR
9574:20 B1 00  960 XPAR2    JSR  CHRGET
9577:20 BE DE  961          JSR  CHKCOM
957A:20 93 95  962          JSR  XVALSTOR
957D:E6 06     963          INC  YREG
957F:20 BE DE  964          JSR  CHKCOM
9582:20 93 95  965          JSR  XVALSTOR
9585:C8        966          INY
9586:98        967          TYA
9587:99 A1 95  968          STA  XNSTOR,Y
958A:20 BB DE  969          JSR  CHECKR
958D:20 B7 00  970          JSR  CHRGOT
9590:D0 C0     971          BNE  XPAR1
9592:60        972          RTS

9593:20 67 DD  974 XVALSTOR JSR FRMNUM
9596:20 52 E7  975          JSR  GETADR
9599:A4 06     976          LDY  YREG
959B:A5 50     977          LDA  LINNUM
959D:99 A1 95  978          STA  XNSTOR,Y
95A0:60        979          RTS

95A1:          981 XNSTOR   DS   2
95A3:          982 XA       DS   1
95A4:          983          DS   2
95A6:          984 XW       DS   1
95A7:          985          DS   2
95A9:          986 XC       DS   1

95AA:A2 05     988 XCHECK1 LDX  #5
95AC:BD B8 03  989 XCHECK5 LDA  WRX,X
95AF:95 00     990          STA  WR,X
95B1:CA        991          DEX
95B2:10 F8     992          BPL  XCHECK5

95B4:AD A3 95  994          LDA  XA
95B7:F0 12     995          BEQ  XCHECK2

95B9:          997 * PERFORM ASCII CHECK
95B9:AC A2 95  998          LDY  XA-1
95BC:C8        999          INY
95BD:88       1000 ASC      DEY
95BE:38       1001          SEC
95BF:B1 00    1002          LDA  (WR),Y
95C1:F1 02    1003          SBC  (RD),Y
95C3:0A       1004          ASL  A
95C4:D0 33    1005          BNE  XCHECK4
95C6:CC A1 95 1006          CPY  XA-2
95C9:D0 F2    1007          BNE  ASC

95CB:AD A6 95 1009 XCHECK2 LDA  XW
95CE:F0 12    1010          BEQ  XCHECK3

95D0:         1012 * MATCH 1'S *
95D0:AC A5 95 1013          LDY  XW-1
95D3:C8       1014          INY
95D4:88       1015 WRRD     DEY
95D5:B1 02    1016          LDA  (RD),Y    BYTE TO BE COMPARED
95D7:49 FF    1017          EOR  #$FF
95D9:31 00    1018          AND  (WR),Y    BYTE FOR COMPARISON
95DB:D0 1C    1019          BNE  XCHECK4
95DD:CC A4 95 1020          CPY  XW-2
95E0:D0 F2    1021          BNE  WRRD

95E2:AD A9 95 1023 XCHECK3 LDA  XC
95E5:F0 12    1024          BEQ  XCHECK4

95E7:         1026 * MATCH 0'S *
95E7:AC A8 95 1027          LDY  XC-1
95EA:C8       1028          INY
95EB:88       1029 CMPRD    DEY
95EC:B1 04    1030          LDA  (CO),Y
95EE:49 FF    1031          EOR  #$FF
95F0:31 02    1032          AND  (RD),Y
95F2:D0 05    1033          BNE  XCHECK4
95F4:CC A7 95 1034          CPY  XC-2
95F7:D0 F2    1035          BNE  CMPRD

95F9:85 00    1037 XCHECK4 STA  DIFF
95FB:60       1038          RTS

*** SUCCESSFUL ASSEMBLY: NO ERRORS
```

appletip

# Avoid hang-ups by downgrading

Using programs written for the Apple II+ on an Apple IIe sometimes causes the computer to hang. Other programs just do everything, but not what they used to do on a II+.

This results from the fact that the IIe monitor ROMs are slightly different than the ones in the II+. Although the entry points of commonly used subroutines are the same, the following code can be quite different.

If all programmers only called these routines by their entry points there would be no problems, but sometimes they jump into the middle of such routines.

If a program uses this technique it will probably run properly on an Apple IIe if you place a copy of the ROMs of the II+ inside the bank-switched memory of the IIe. To do this issue the following commands on an Apple II+:

| | |
|---|---|
| **CALL-151** | Enter monitor. |
| **2000<D000.FFFFM** | Copy ROM into RAM. |
| **BSAVE MONITOR,A$2000,L$3000** | Save contents on disc. |

On the IIe you do the following:

| | |
|---|---|
| **CALL-151** | Enter monitor. |
| **C089** | Enable writing into bank-switched memory. |
| **BLOAD MONITOR,A$D000** | Load II+ ROMs into bank-switched memory. |
| **C088** | Enable reading from bank-switched memory. |
| **3D0G** | Return to Basic. |

After this your IIe acts like a II+ and you can run your program.

However not all programs will now work properly. The reason for this is that the II+ monitor remains active as long as the bank-switched memory is switched on.

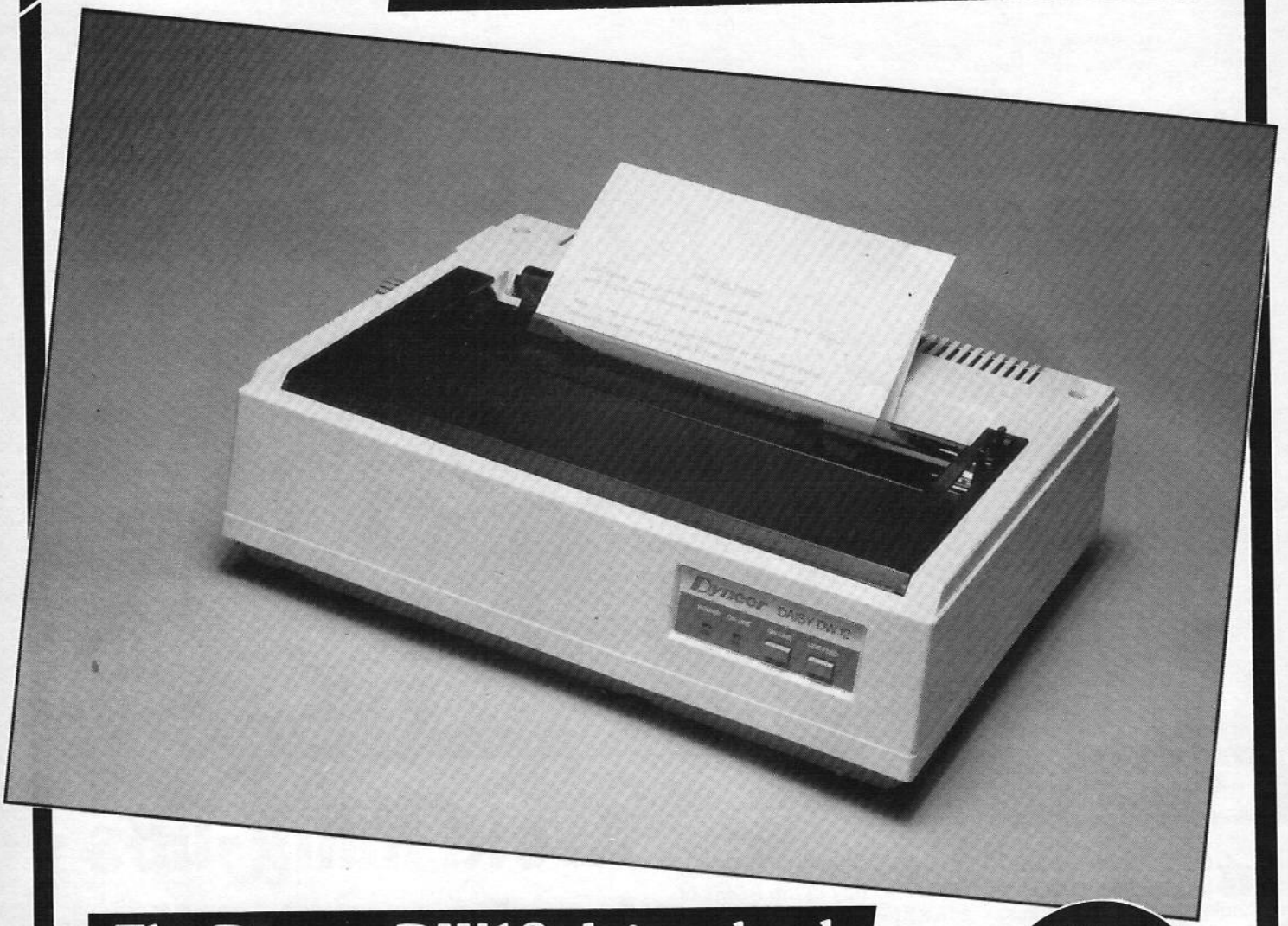
If any of the softswitches used to select the bank-switched memory is affected, your IIe reverts to normal.

If a cold start is necessary to run the program this method will definitely not work. The bank-switched memory is switched off during a cold start.

**Martin Keesen**

apple user SPECIAL OFFER

# Here's an exceptional daisywheel printer at an exceptionally low price!

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- Subscript
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## MacReview

MAC + ][

```
70   NEXT R
75   PRINT : PRINT CHR$ (4);"RUN
      DESS1"
80   END
100   DATA 4,4,4,5,4,4,4,5,4,4,4,5
      ,4,4,4,5,4,5,4,5,4,5,4,5,5,5
      ,4,5,5,5,4,5,5,5,4,5,5,5
200   DATA 6,6,6,7,6,6,6,7,6,6,6,7
      ,6,6,6,7,6,7,6,7,6,7,6,7,7,7
      ,6,7,7,7,6,7,7,7,6,7,7,7,0

]CATALOG

DISK VOLUME 254

 A  002  HELLO
 A  002  DESS1
 A  002  DESS2
 A  002  DESS3
 A  002  DESS4
 A  002  DESS5
 A  003  FLEUR

]
```

# Don't look now, but I'm running Apple II programs on my Macintosh

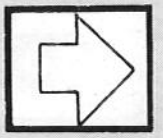
A TYPICAL scene. I was sitting in front of my Apple computer, working on my latest lengthy Applesoft creation. I typed RUN, and the program (naturally!) worked. As a last stage I loaded Apple's Renumber program, and carefully renumbered the listing. Finally, to check all was well, I listed the program, halting the display with Option-S ... hold on – Option-S?

Well, yes for I wasn't working on my trusty old Apple II Europlus, but on my Apple Macintosh and the Applesoft program, which had originally been written on the Apple, had been transferred over to the Mac, where it was happily running.

Those who, like me, assumed this was impossible, will be interested in Mac+II, a new Applesoft and 6502 emulator program for the Mac. This impressive piece of software allows not only Applesoft, Integer Basic and machine language programs to be run on the Mac, but also permits the Imagewriter cable to be used to connect Apple and Mac together, so that DOS 3.3 programs may be exchanged between them.

Available by mail order from Meacom in Houston, the package consists of a comprehensive manual and three discs, a 5¼in one for the Apple and two for the Mac. It isn't actually essential to have an Apple, although it does make things easier if you want to avoid rewriting your old Basic programs by piping them across.

The Mac discs act as a two-stage loading process for DOS 3.3. On booting with the first, Mac+II, a kite-like symbol is displayed as a trademark, soon replaced by a Mac window headed Mac+II, and a non-flashing cursor. You're in Applesoft! To load DOS, the second disc, Mac DOS/Mac Com, is loaded, using a nostalgic PR#6. The Hello program



# MacReview

allows a choice of Integer Basic, Applesoft, the Com. program (to communicate with an Apple), or a Quit option.

If Applesoft is selected, the Mac operates impressively – and depressingly! – like a standard Apple II. Upper case, no mouse, and a 40 column screen although it is black on white, rather than the white on black of the original.

All Applesoft commands appear to work. It's quite eerie, for example, to type CATALOG, D2 and watch while the Mac reads a disc. Only discs created under Mac+II can be read, incidentally, although they can contain 400k of programs. A standard Mac disc won't be recognised, and Mac+II discs can't be read from the normal Mac environment.

I created several small programs which worked exactly as I expected them to. The Mac DOS/Mac Com disc contains a copy of the original Master Disc for DOS 3.3, and all those familiar programs loaded and ran perfectly.

The Mac keyboard doesn't duplicate that of the Apple. Although the Mac has more keys, it doesn't have some which are needed by Applesoft.

The Option key acts as Control, the Tab as cursor right, and § is used for Escape, not ~ as in the manual.

The first disc I received had the American keyboard installed – that old favourite of Mac users, which types Return for space, and M for N.

The usual modifier program didn't work, resulting in an unbootable disc. A replacement with UK keyboard installed arrived promptly from France, where the program apparently originated.

Tired of playing with short programs, I thought that I'd try transferring a few very large ones from my Apple, and looked up the part of the manual dealing with direct connection. It was very straightforward – and what a brilliant idea to use the Imagewriter cable to connect the two computers.

One end is connected to the Mac's modem port, and the other to a Super Serial card in the Apple. The terminal block on the card needs turning round first, and the dip switches resetting. It took me about five minutes, going very slowly and carefully.

Assuming you wish to send files from the Apple to the Mac, the Mac DOS/Mac Com disc is booted and the Com option selected. This asks in which Mac drive the disc to receive files is located. After selection the Mac waits.

Meanwhile, the Apple is booted with its own version of the Mac Com disc. The program asks for slot and drive of the originating disc, and displays a catalog before asking for the name of the file to be transferred. When given the name followed by a carriage return, the file is sent across. With the two computers side by side, it really is impressive to see the process in action.

I found no problems in moving any files, even an enormous data file of more than 300 sectors and all my Applesoft programs worked, although those with heavy screen use did seem a little slower.

It was a different story with commercial software written in machine language, which tended to lock up instead of displaying hi-res graphics.

The manual explains that adding extra 68000 instructions to check whether or not to update the Mac screen display whenever the screen mapped memory of the emulated machine was modified would have considerably slowed down normal execution.

It's left to the programmer to modify the program for the Mac to specifically request an update when one is needed. This is obviously unlikely to be a problem to those running only Applesoft programs.

The Com program also allows direct communication between Apple and Apple, and even Mac and Mac – although regrettably only between Macs running the Apple emulation.

Although I would have liked to have been able to have read Apple text files into the normal Mac environment – I've discs full of Applewriter files I'd love to convert to Word, for example – there is no doubt that overall the package does perform well, recreating an Apple II within your Mac.

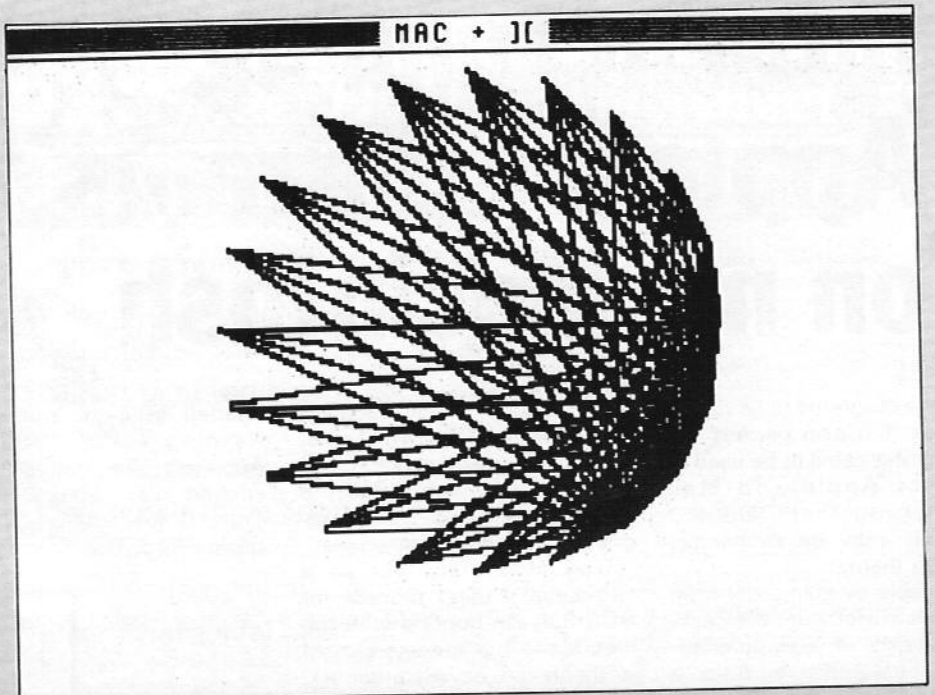
I understand that a new version of Mac+II is planned for the 512k Mac, supporting ProDOS and the new Apple II 3.5in drive, as well as the new Pascal 1.3 but this version seems comprehensive enough for all but the most enthusiastic.

There must be many Apple owners who, having moved up to the Mac, do occasionally look nostalgically over their shoulders and think warm thoughts of Applesoft and who perhaps have favourite programs they would hate to finally discard.

I liked this package, although I must confess I liked even more rebooting my Mac and returning to the user-friendly world of the mouse.

*Mac+II is available by mail order from Meacom, PO Box 272591, Houston, Texas 77277, USA, price $99 plus $10 for shipping.*

**Duncan Langford**




*Even graphical output is possible: An Applesoft program produced this on a Mac*

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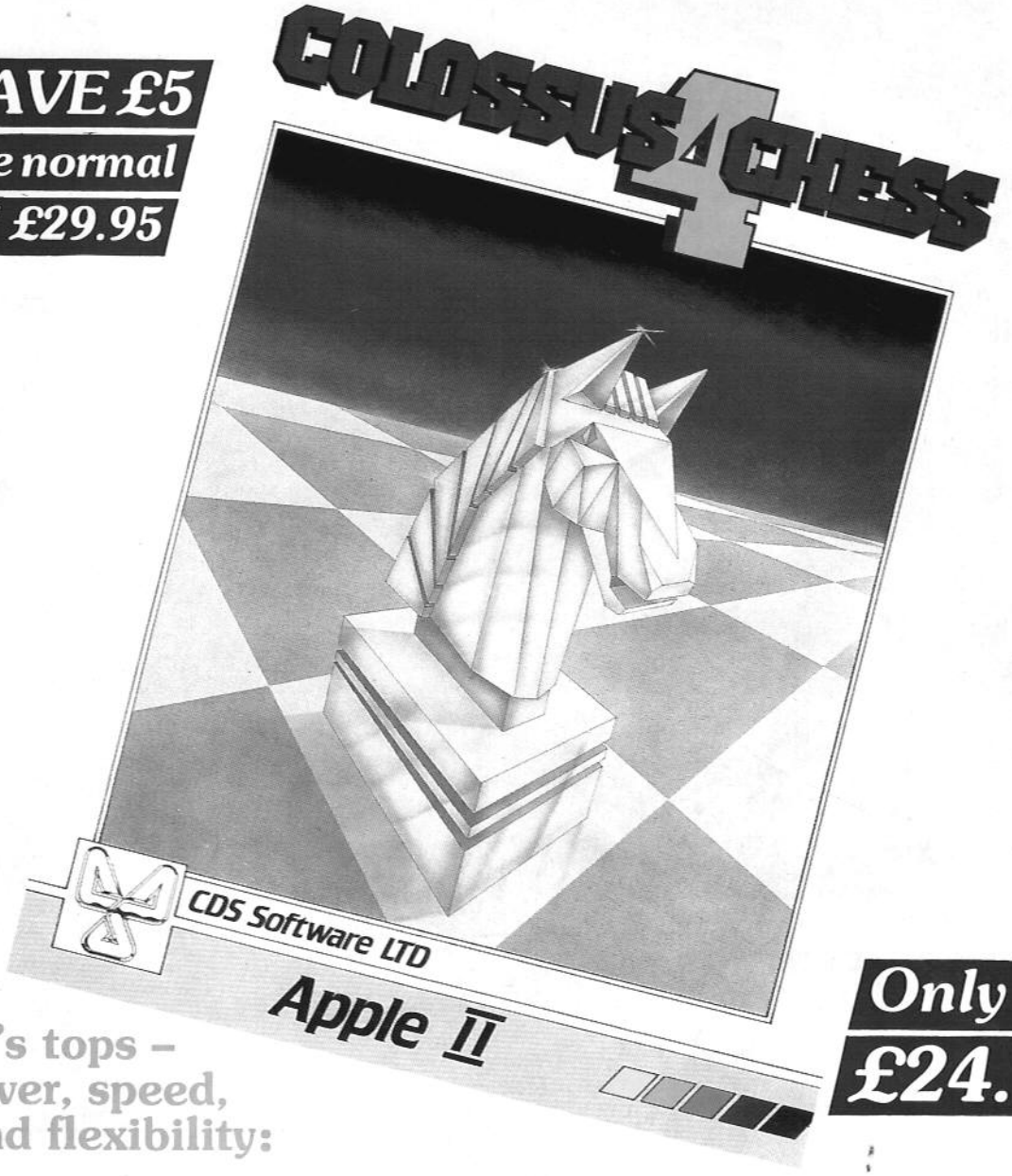


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## Why it's tops – for power, speed, size and flexibility:

**Power:** In a series of 16 game matches, Colossus Chess 4 has defeated 24 other chess programs – the results varying from 10-6 to 16-0 in Colossus' favour.

**Speed:** The average number of moves examined per second is 300 with the program working from 2 to 17 ply ahead.

**Size:** There is 22k of machine code program driving Colossus 4, with 5k of data and a "book" of over 3,000 opening moves on the disk.

**Flexibility:** Besides having an infinite number of levels, to suit both the beginner and the expert, Colossus 4 is far more flexible than any credit card! The program can play one or both sides of a game, swopping at any point in the game. It can display the board in two or three dimensions or even invisibly – if you so desire. It will give you a hint at anytime – just ask. You can even backtrack to correct your mistakes. Two full feature chess clocks are available with tournament and five other modes. So many features that it takes the programs author, Martin Bryant, 28 densely packed pages to explain them all.

**Order form on Page 61**

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# What it offers the Apple user...

## Give your micro mainframe power

With MicroLink your micro becomes a terminal linked directly to the Telecom Gold mainframe computer, and able to tap its tremendous power and versatility. Right away you'll be able to use giant number-crunching programs that can only run on a mainframe. You can set up your own computerised filing systems, store and update statistics and other information, cross-reference material between files, selectively extract the information you want, perform massive calculations and design reports to display information from any of the files and in any format you choose.

## The biggest bulletin board of them all

The number of bulletin boards is growing rapidly. New ones are springing up in all parts of Britain and all over the world, with people of like minds chatting to each other on all manner of subjects. The only snag is that the vast majority are single-user boards – which means lots of other people are also trying to make contact and all too often all you get is the engaged tone. But with the MicroLink bulletin board there is no limit to the number of people using it at the same time. And no limit to the number of categories that can be displayed on the board.

## We're only a local phone call away

More than 96 per cent of MicoLink subscribers can connect to our mainframe computer in London by making a local phone call. This is possible because they use British Telecom's PSS system, which has access points all over Britain. A local phone call is all you need, too, for access to the international Dialcom system through MicroLink.

## Telemessages – at a third of the cost

The modern equivalent of the telegram is the telemessage, which if sent before 8pm is delivered by first post the following day (except Sunday). Originally designed for people to phone their message via the operator, the service costs £3.50 for 50 words. Now it's available via MicroLink – and costs only £1.25 for up to 350 words!

## Send and receive telex messages

With MicroLink you can turn your micro into a telex machine, and can send and receive telex messages of any length. You will be able to communicate directly to 96,000 telex subscribers in the UK, 1½ million worldwide – and even with ships at sea via the telex satellite network. Business people can now send and receive telexes after office hours, from home or when travelling. You can key in a telex during the day and instruct MicroLink not to transmit it until after 8pm – and save 10 per cent off the cost!

## The mailbox that is always open

MicroLink is in operation 24 hours a day, every day. That means you can access your mailbox whenever you want, and from wherever you are ... home, office, airport – even a hotel bedroom or golf club! No-one needs to know where you are when you send your message.

## What does it all cost?

Considering all the services you have on tap, MicroLink is remarkably inexpensive. You pay a once-only registration fee of £5, and then a standing charge of just £3 a month. On-line costs are 3.5p a minute (between 7pm and 8am) or 10.5p a minute during office hours. There is an additional 2p a minute PSS charge if you are calling from outside the 01- London call area. Charges for telex, tele-messages and storage of files are given on the next page.

# How much it costs to use MicroLink

**Initial registration fee:** £5.

**Standing charge:** £3 per calendar month or part.

**Connect charge:** 3.5p per minute or part – cheap rate; 10.5p per minute or part – standard rate.
*Applicable for duration of connection to the Service. Minimum charge: 1 minute.*
*Cheap rate is from 7pm to 8am, Monday to Friday, all day Saturday and Sunday and public holidays; Standard rate is from 8am to 7pm, Monday to Friday, excluding public holidays.*

**Filing charge:** 20p per unit of 2,048 characters per month.
*Applicable for storage of information, such a telex, short codes and mail files. The number of units used is an average calculated by reference to a daily sample.*

**Information Databases:** Various charges.
*Any charges that may be applicable are shown to you before you obtain access to the database.*

**MicroLink PSS service:** 2p per minute or part (300 baud); 2.5p per minute or part (1200/75 baud).
*Only applies to users outside the 01- London call area.*

**Telex registration:** £10.

**Outgoing telex:** 5.5p per 100 characters (UK); 11p per 100 (Europe); 16.5p per 100 (N. America); £1.15 per 400 (Rest of world); £2.75 per 400 (Ships at sea).
*Deferred messages sent on the night service are subject to a 10 per cent discount.*

**Incoming telex:** 50p for each correctly addressed telex delivered to your mailbox. Obtaining a mailbox reference from the sender incurs a further charge of 50p.
*It is not possible to deliver a telex without a mailbox reference. If a telex is received without a mailbox reference the sender will be advised of non-delivery and asked to provide a mailbox address.*
*Each user validated for telex and using the facility will incur a charge of 6 storage units a month. Further storage charges could be incurred depending on the amount of telex storage and the use made of short code and message file facilities.*

**Telemessages:** £1.25 for up to 350 words.

**Radiopaging:** No charge.
*If you have a BT Radiopager you can be paged automatically whenever a message is waiting in your mailbox.*

**International Mail:** For the first 2,048 characters – 20p to Germany and Denmark; 30p to USA, Australia, Canada, Singapore, Hong Kong and Israel. For additional 1,024 characters – 10p; 15p.
*These charges relate to the transmission of information by the Dialcom service to other Dialcom services outside the UK and the Isle of Man. Multiple copies to addresses on the same system host incur only one transmission charge.*

**Billing and Payment:** All charges quoted are exclusive of VAT. Currently all bills are rendered monthly.

## Software over the telephone

MicroLink is setting up a central store of software programs which you'll be able to download directly into your micro. The range will include games, utilities, educational and business programs, and will cover all the most popular makes of micros.

## Talk to the world – by satellite

MicroLink is part of the international Dialcom network. In the USA, Australia and a growing number of other countries there are many thousands of users with electronic mailboxes just like yours. You can contact them just as easily as you do users in Britain – the only difference is that the messages from your keyboard go speeding around the world via satellite.

## What you need to access MicroLink

You must have three things in order to use MicroLink: a computer (it can be any make of micro, hand-held device or even an electronic typewriter provided it has communications facilities), a modem (it can be a simple Prestel type using 1200/75 baud, or a more sophisticated one operating at 300/300 or 1200/1200 baud), and appropriate communications software.

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Signature _____ Date _____

**C. Please invoice the company/authority.**

(✓) □ If you select this option, which is ONLY AVAILABLE to government establishments and Public Limited Companies, you will be sent an authorisation form for completion which will require an official order number to accept unspecified amounts.

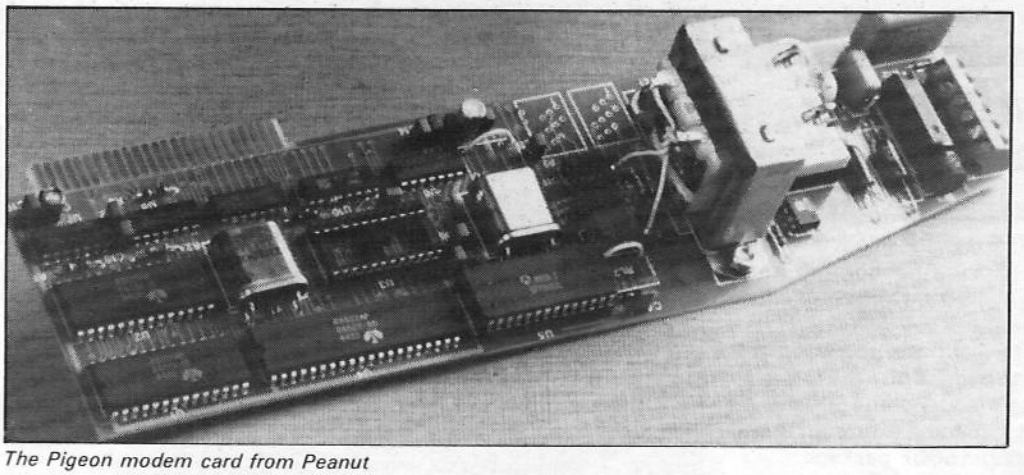
## Double hi-res viewdata

A PIGEON modem card version of the comms package Data Highway is now available for Apple II+ and IIe computers.

The card from Peanut Computer handles full file transfer of all Apple operating systems together with full colour, double hi-res graphic presentation of Prestel viewdata.

The software costs £75 and the Pigeon modem £155.

● *Peanut Computer, North Hills, Brill, Aylesbury, Bucks HP18 9TH. Tel: 0844 237507.*



*The Pigeon modem card from Peanut*

## Text formatter

A TEXT formatting system which enables users to create and maintain bibliographies has been produced for the Macintosh.

The Professional Bibliographic System offers variable length fields and 20 different document types that range from books and articles to maps and music scores.

Its screen editor's facilities include inset, delete, exchange, move or copy. Any word, date or phrase keyed into the index field – which can be up to 74 characters long – becomes a searchable item.

Price: $295.

● *Personal Bibliographic Software, PO Box 4250, Ann Arbor, MI 48106. Tel: 0101 313 996 1580.*

## Diary for AD 2000

WHILE ordinary diaries only help to plan a year ahead, a new computerised version for Apple II users can keep track of appointments up to the year 2000.

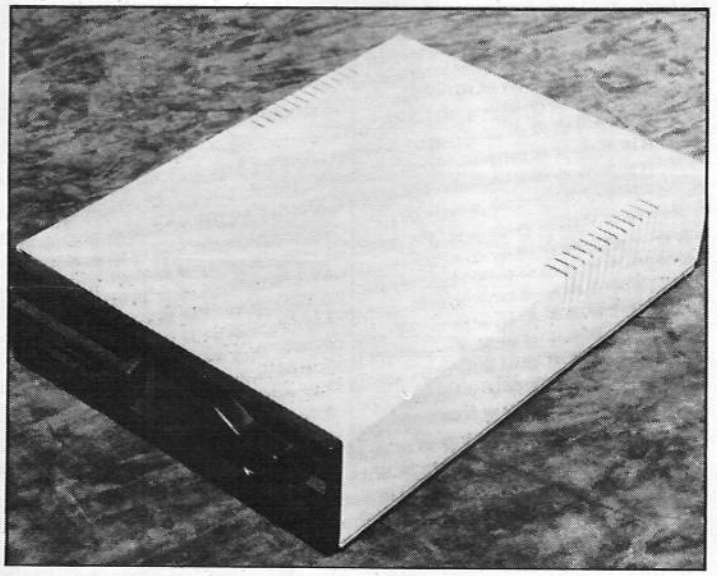
Date Tickler can schedule up to 100 appointments at any one time and up to 2000 AD. Entries can be in any format up to 127 characters and alphabetically, chronologically or by any other means.

A ''tickling'' function reminds users of forthcoming events after a delay of any number of days specified by them. Engagements can be found through a search option using key words, phrases or numbers, then printed.

In addition, any calendar month up to year 2000 can be displayed or printed and two small databases allow for the storage of telephone numbers, address or other information.

Price: $37.50 plus $1.50 shipping charges.

● *Allegory, PO Box 3540, Berkeley, CA 94703. Tel: 0101 415 428 1156.*



## Teac drive for Apples

PEANUT Computer has introduced this Apple compatible floppy disc drive, the Teac 55A, claimed to be the lowest priced in the market at £95.

● *Peanut Computer, North Hills, Brill, Aylesbury, Bucks. HB18 9TH. Tel: 0844 237507.*

## Mac output in colour

OUTPUT from most Macintosh software can now be printed in full colour on the new Apple ImageWriter II.

Enabling this is MacPalette from Microspot. It allows normally black and white charts, drawings and diagrams to be printed in full colour and in an infinite number of coloured patterns. Text can be printed in seven basic colours.

The package allows users to assign different colours to different type styles within the text. Price: £49.

● *Microspot, 9 High Street, Lenham, Maidstone, Kent ME17 2QD. Tel: 0622 858753.*

## Gem applications

PROSPERO Software has launched a Gem applications development language system for use with a Macintosh.

The system enables the programmer to write the applications software on an IBM PC compatible or 68000-based micro as the same source language can be used for both.

It has two components, Prospero's own language system and a programmer's toolkit from Digital Research.

Prospero says the system will be of use to those with existing Macintosh software which they want to port to the PC environment, and to those with PC software which they wish to front end with windows, icons, mice and pop-down menu user interface.

Together the language system and toolkit provide the Pascal or Fortran programmer with a complete solution to the development of Gem applications on the Macintosh, says the company.

Price of the language system is £320 for either Fortran-66 or Pascal versions and £420 for a Fortran-77 version. The toolkit costs £495.

● *Prospero Software, 190 Castelnau, London SW13 9DH. Tel: 01-741 8531.*

## CAD you can carry

TWO packages have been added by Robocom to the Robo 1500 range for the Apple IIc.

They are the Robo 1500P portable technical CAD system and Robo 1500HR, a high resolution extension to its existing 1500E package.

The portable CAD system, priced £495, is intended for anyone who works away from home and office. It is provided with a range of drafting functions including scale, angle lock, orthogonal lock, dimensioning and text.

Functions are selected with a IIc mouse and via the keyboard's arrow keys. The system's drawings are compatible with Robo 1500E data and can be plotted out on a wide range of plotters.

Robo 1500HR uses a secondary display processor to show Apple screen images at a resolution as high as 768 × 576 lines. Up to three times as much detailed information can be seen clearly at any time.

● *Robocom, Clifton House, Clifton Terrace, London N4 3TB. Tel: Freefone Robo.*

*Robo 1500P system provides technical CAD on the Apple IIc*

## For small businesses

LATEST in the Brother range of printers – now available for the Apple with RS232 or Centronics interface – is a small business model.

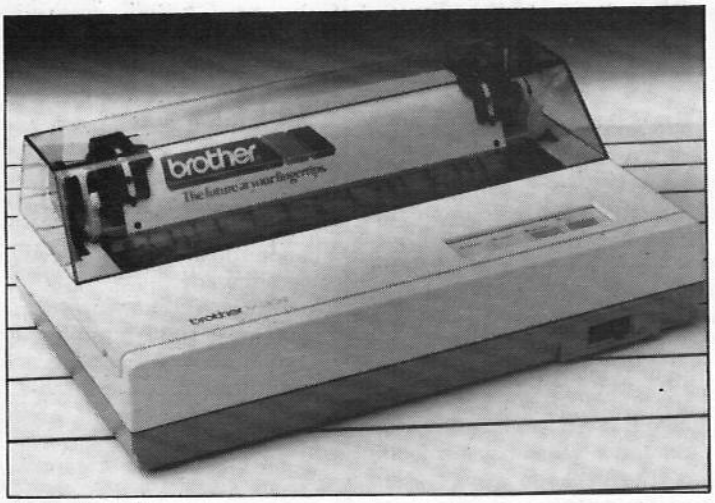
The 1109 follows quickly on the heels of the streamlined, multi-feature 1509. It operates at 100 characters a second, has a 25cps letter quality printing facility and standard 80 column width.

Other features include downloadable characters, a 2k buffer to relieve the computer for other work, built-in tractor feed and dual interface.

The 1109 can print in three type styles – Pica, Elite and Prestige – and in a variety of sizes from 14 to 132 characters a line. There is a choice of 12 international character sets.

Price: £155.

● *Brother Computer Peripherals Division, Shepley Street, Guide Bridge, Audenshaw, Manchester M34 5JD. Tel: 061-330 6531.*




*Brother's 1109 printer*

## Hitchhiker joins in

HITCHHIKERS Guide to the Galaxy has joined four other popular titles for the Apple under a new Infocom Classics logo.

Produced by Softsel, the range also includes the company's original fantasy game, Zork 1, and adventure games Seastalker, Planetfall and Deadline.

The original prices – from £34 to £50.60 – have been reduced. Hitchhikers Guide now costs £24.95, the others £19.95.

## Mac time saver

A TIME saving program for the Macintosh allows keyboard strokes and movements to be recorded and keys assigned to play them back.

Mac Tracks, from Assimilation, allows a file to be saved, a font changed or any other operation on the Mac menu to be carried out just by touching the cloverleaf control key plus almost any other.

The user can also create his own commands, record sentences, letterheads or even whole pages. Up to 5,000 characters can be stored on one key.

Mac Tracks is compatible with any Macintosh software and operable with either the mouse or Mac Turbo Touch. Price: £29.

● *P&P Micro Distributors, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancs BB4 5HU. Tel: 0706 217744.*

## Parallel connection

THE Macintosh's built-in external ports are designed to communicate with serial and not parallel devices.

So American manufacturer Assimilation has launched the Mac Port Adaptor to allow any standard or IBM compatible parallel printer or peripheral to run on the machine.

The adaptor includes a standard Centronics connector, a five foot cable and serial RS-422 port which, says Assimilation, eliminates the need for cumbersome and time consuming cable swapping. Its connector simply fits into the Macintosh's printer or modem port.

Price: £79.

● *P&P Micro Distributors, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancs BB4 5HU. Tel: 0706 217744.*

## Apple imports

FIVE new imports have been added to the range of peripherals and intelligent interfaces being supplied by CI Cayman for the Apple II series.

The first are a 64k printer buffer card which emulates all Grappler modes, and a standard interface. They cost £99 and £49 respectively.

The remainder are a numeric keypad for the II+ and IIe at £19, an extra fonts card, £49, and an image data processing card, £160.

● *C I Cayman, PO Box 77, Solihull, West Midlands B91 3LX. Tel: 021-705 7097.*

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# Copyright and a routine to relish

*IF you are awarding a prize for routine of the year, I should like to nominate Keith Nelson's Editing Routine published in your March 1985 issue.*

*It is the most useful and most used routine I have come across. I have it BSAVEd on a disc together with brief instructions for use.*

*Now some of my friends are asking for copies. Will they be infringing somebody's copyright if they copy my disc? If so, how do they obtain a licence to do it legitimately? –* **Louis Baker, Northwood, Middlesex.**

● The copyright is held by Database Publications, but since your friends could type in the routine from the magazine we would not mind if you save them the work by letting them copy your disc.

The point at which we would become concerned is if you – or somebody else for that matter – tried to sell the routine, or if someone else published it without permission.

## Video Board short cut

*SINCE writing last month's Video Board article a problem in implementation has cropped up. It would appear that the latest Apple IIes have very few of the chips in sockets.*

*Fortunately the 74S10, that is IC1 for a IIe, is in a socket. However the 74LS74, IC2, is not. There doesn't seem to be any logic as to which chips are in sockets and which are not. No doubt there is a very good Apple reason.*

*What this means in practice is that if you have one of these machines, the construction of the Video Board is simpler. Make sure that the power rails for the Video Board are taken from the ribbon cable to IC1.*

*Don't bother to make provision for the ribbon cable IC2.*

*Buy an IC test clip, the sort used to clip on a chip, so that you may connect a 'scope probe or meter to it (RS 432-627).*

*The RS version is a 16 pin clip, but a 14 pin clip is fine as well, if you have one. Connect a wire to the point where you would have connected the signal from IC2 pin 11 (sync). Connect this wire to pin 11 of the IC clip.*

*If you use a 16 pin clip bear in mind that you will have two extra pins on the clip. You should connect the wire to the pin that will correspond to pin 11 on the chip.*

*When you have constructed the board and connected it up, fix the clip to the chip at the normal location of C15 and all should be well.*

*There is no reason why you couldn't use an IC clip to get at the sync signal with the other machines, although using two ribbon cables makes a slightly neater arrangement and it's marginally cheaper.*

*If you order a kit or complete board from me, and you have one of these later Apple IIes – just see if all the chips are in sockets or not – then please add £1.50 to your order to cover the difference between the cost of the clip and the ribbon cable. –* **Chris Payne, Stoke Mandeville, Bucks.**

## Science and the media

*JOURNALISTS have reacted defensively to the Royal Society's recent report condemning inadequate media coverage of science. They have blamed censorship, politicking and bumbling by business and government.*

*Yet no national media covered the important Standard Business Software Award announced the day before.*

*This was more newsworthy than usual in that the priority decision systems which won the award made national news when several NCB and NUM representatives used the computer aids at Brunel University to agree a joint solution to the coal dispute and are currently used in topical government decisions like public expenditure cuts.*

*Compare such disinterest with media reports of equivalent literary awards like Booker and Pulitzer.*

*More ironically, Work Sciences Associates, who produced the computer-aided priority decision systems, have had more media publicity for their fancy-dress company Escapade Ltd, which they run as a business test site, than for all their scientific innovations over the last two years. –* **J. Algie & W. Foster, Co-Directors, Work Sciences Associates.**

● Readers may remember we carried a feature on the Priority Decision System, using the Apple II, in our February 1985 issue.

## Proportional spacing

*THANK you for an excellent article and listing on Wordstar – I have not encountered any bugs as yet.*

*I wonder if anyone has managed to incorporate the proportional spacing of certain dot matrix printers – notably the Epson FX-80 and Taxan Kaga KP-810 – into Wordstar. Columns of letters are all right but some proportional spaced, not true microjustification even in Wordstar – rather space-justification, letters would be even better, especially with the Taxan's NLQ print.*

*As regards the Taxan, has anybody written anything for downloading Applesoft Toolkit characters to the NLQ user-defined character set, or indeed for the Epson and Kaga the ordinary user-defined character set? Or for downloading any other character sets, say Beagle Brothers? –* **Ian Sidwell, Hampstead.**

● You should be able to patch Wordstar via INSTALL so that a user defined printer command, or alternate character command, puts the printer into proportional mode.

You then have to make sure that ROLUP/RLDWN can cope. Left justified proportional printing is then available but care has to be taken over tabbing.

To enable fully micro-justified printing involves moving the print head in 60ths of an inch which is not so easy on dot matrix printers because generally the printer control codes are too long.

Truly justified proportional printing is just about possible (sometimes) in Wordstar using the TPP (not in the manual) on daisywheels, but again I doubt that it is easy with dot matrix.

The full job will require feature of up to 1k of macros.

*I would like to pass on the following measurements to Mr MacGibbon:*

**Doc.Load = 24 sec**
**Doc.Save = 29 sec**
**Search = 4 sec**
**Scroll = 45 sec (10 sec using line-tabs)**

*4000 word document, 101 disc sectors (5.6 character average word length). Note: 4000 words filled 65 per cent of the SuperScript capacity in memory.*

**– W. Schmidt-Tebelmann, Chelmsford, Essex.**

# League leader

*I WAS interested to read John MacGibbon's comparison of Apple (8 bit) and IBM etc (16 bit) performance, running word processor programs in the November issue of* Apple User.

*I own an Apple IIe and numerous software packages. WP packages include Applewriter 2, Appleworks, Magic Window II and lately Superscript.*

*Although I used Magic Window for over three years and love it, SuperScript is in a completely different league.*

*Mail-merge, calculating facilities and spelling checker are all built in, plus a most useful*

patching Wordstar's code – I hope someone has done it – I'd love to see the result.

**Max Parrott**

## Language card DOS

*PLEASE could you tell me how to move DOS on to the Apple IIe language card.* – **Gregory N. Okeke, Belfast.**

● I think the best approach will be to join BASUG, P.O. Box 177, St Albans, Herts AL2 2EG because among their extensive list of available software there is such a utility.

## Improved scrolling

*I AM a regular reader of* Apple User *and find many of the articles both informative and useful. We have four IIes in the department on which we run Wordstar.*

*I was therefore particularly interested in the article in your August issue concerning improved scrolling. However I feel that it is rather misleading.*

*On our version of Wordstar (3.31) it is not possible to get at UCONO through the install program. The install program is called WINSTALL in this version of Wordstar. I wonder if the author of the article is aware of this.*

*Perhaps in your next issue you could mention this as I expect others might have been disappointed as we were.*

*This modification would be a valuable one to make to the program as the author is right when he says that the scrolling is abominable.*

*I think it should be possible to access UCONO though CPM DDT or perhaps changes he suggests could be made if we had been given the memory locations of UCONO.* – **Dr. D.S. Johnston, Royal Free Hospital School of Medicine, London.**

● We do not have version 3.31 and so do not know the label corresponding to UCONO, nor its address. You should easily find it from your install manual.

UCONO is the 'Optional User Console Output Routine' and you would put there a jump to your own routine.

However Horace Tong's own routine is specific to the Videx Videoterm and I doubt that you are using one as an 80 column card.

The IIe 80 column cards from Apple and Cirtech are very different from the older II+ type cards – which tend to be different from each other.

**Max Parrott**

## Flipping nuisance

*I AM using an American IIc in the UK, with an American IIc monitor. The CPU runs off a 240v power-pack, and the monitor off the mains through a step-down transformer.*

*So far, so good – at least since last August.*

*Recently from Apple I received a PAL modulator/adapter which gives me a crystal-clear colour image on a UK television – a Ferguson TX with no horizontal adjustment – but it won't stop flipping itself top to bottom.*

*I'm guessing that I've run into the 60Hz (US) vs. 50Hz (UK) bugbear.*

*Anything I can do about it? A soft-switch, or adapter?*

*I want to be able to carry the machine back and forth across the Atlantic, so the remedy would have to be reversible.*

*Also, is there any way to use the extra 64k on the IIc for a RAM disc while running Apple Pascal? Or is it already being used?*

*I notice Pascal compiles and runs code very quickly on the IIc.*

*Apple User is better than any single Apple magazine available in the States, and many thanks for the continuing Pascal support. Excellent.* – **Thomas Meyer, Sedbergh, Cumbria.**

● Your television set will have a vertical hold adjustment within it which should give the necessary results, but it might be better to adjust the Apple. You will have to change the crystal and make/break three or so jumpers.

It will be best to seek dealer help over this.

Pascal 1.2 is using the extra memory, Pascal 1.1 is not. It should be possible to use it in this case. – **Max Parrott.**

# Memorable roster

*BILL Hill's model of an office's duty roster (November* Apple User*) is very impressive, but uses quite a lot of memory.*

*It could be shortened a lot by using the boolean logic which is to be found in most spreadsheets (but alas, not in Appleworks):*

*G13-G29 and column H can be exchanged by something like this:*

| | | |
|---|---|---|
| **13** | **Hillsort** | **IF(OR(G2=1,G3=1,G9=1),0,1)** |
| **14** | **Gillsort** | **IF(OR(G2=2,G3=2,G9=2,G13=1),0,1)** |
| **15** | **Macsort** | **IF(OR(G2=7,G3=7,G9=7,G13=1, G14=1),0,1)** |
| **16** | **( )** | **IF(OR(G13=1,G14=1,G15=1),0,1)** |
| **17** | **Forbsort** | **IF(OR(G2=6,G3=6,G9=6,G16=1),0,1)** |
| **18** | **DESK SU/MO** | **SUM(G13...G15)+G17** |

*Line 16 is used as my Multiplan for the IIe will not take a list of more than five elements.*

*I hope I have got the logic in the model correct as I was too lazy to think out the whole model because of the lack of formulae in the article.* – **Jorgen Dybdahl, London W2.**

● Mr Dybdahl's idea for shortening the spreadsheet is excellent, although he is correct in his feeling that he doesn't have the logic quite right.

I was well aware that the model as outlined in *Apple User* was pretty crude. Although it worked, it worked about efficiently as travelling from Glasgow to London by way of New York!

There was good reason for that at the time. Refusing to attempt short-cuts meant that I could be absolutely certain that the concept behind the model actually worked.

Whenever there were problems, it meant that I could during the development stages, go straight to the cell or group of cells involved and pinpoint the error.

As he so rightly points out, this was incredibly wasteful of memory. However, it did allow the concept to be developed into a working model. If was always my intention to go back, once it had been seen to work, and radically re-write the whole thing.

Using the Boolean logic outlined by Mr Dybdahl, which is available in Excel, cells G13-G29 and column H can be exchanged for:

| | | |
|---|---|---|
| **13** | **Gillsort** | **IF(OR(G2=1,G3=1,G9=1),0,1)** |
| **14** | **Hillsort** | **IF(OR(G2=2,G3=2,G9=2,G13=1),0,2)** |
| **15** | **Macsort** | **IF(OR(G2=7,G3=7,G5=7,G13=1, G14=2),0,7)** |
| **16** | **Forbsort** | **IF(OR(G2=6,G3=6,G13=1,G14=2, G15=7),0,6)** |
| **17** | **DESK SU/MO** | **SUM(G13:16)** |

Line 17 then returns the sum of three zeros plus the code number of the man on duty.

FORBSORT does not require to look at cell G5, because Forbes does not work late or back shifts, being a specialist writer who only fills in on the newsdesk occasionally.

Mr Dybdhal's suggestion turns a section of the spreadsheet which originally required 51 cells into only 5.

Even more than that can be trimmed, of course. As readers will have spotted, columns F, I, L, O, R and U are in the nature of REM statements. They're only there for my guidance while working out the concept, and were designed to be cut from the final working version.

I estimate that my 185k spreadsheet, when completely re-worked will come down to perhaps half that size. It will also run very much faster.

But it's the old story – you have to invent the wheel first, before you can think about building a Formula One racer.

**Bill Hill**

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**APPLE IIe** twin 5¼in drives, Z80 card, RS232 and Centronix ports, modem, joysticks, CPM, Pascal, Wordstar, Multiplan, Omnis. Tel: 0294 840157 after 6pm.

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**APPLE II Plus 64k,** £230. Disc drive, £100. Controller card, £20. 80 column card, £25. Colour card, £25. Phone 0782 564561.

**FOR SALE:** IIe software, Applewriter, £50. Multiplan, £50. Pascal system, £100. All C/W manuals. Ring 0472 72367.

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Capitol CAD package – Automating CP/M with Pseudo disc drive – Wordstar on Epson printer – Relational Databases – Games (Lode Runner, Coveted Mirror, Crypt of Medea, Queen of Hearts, Quiz Listing) – Screensplicer – IIe super-res graphics – Pascal tutorial part VII (defining procedures) – Volume control for Apple II – Appleworks review – Lisa helping visually handicapped – Calculating mortgage repayments with Visicalc – PLUS News (including report on Apple '84), New Products and Letters.

**August 1984**
Communications – Apple in a haulage company – Book Review (Apple Basic Data File Programming) – Reviews (Scribe 3D CAD package, Sage CP/M Database, Codewriter IIe, Ramdrive IIe, ShortCuts) – Games (Plasmania, Bouncing Kamungas, Pinball Construction Set) – Graphics package part VI (text handling by machine code) – Lisa organising meetings – Pascal Assembler – Speech input via Voice Input Module – Multiplan helps with cricket scores PLUS News, New Products, Letters and Appletips.

**September 1984**
How an Apple helps police hero – Updating Apple graphics and arcade design – Serial data transfer – Games (Early Games Music, Learning with Leeper, Fuzzywomp, Hallowe'en) – and DIY Graphics Part VII (including review of Doublestuff) – Macintosh (journalist's view of MacWrite, Software Development, Translyvania, Linking Lisa to ICL mainframe) – Pascal Tutorial – Pilot Interpreter – Spreadsheet (including bug in VAV) – Reviews of Graphpak and Format-80 Enhanced – News, New Products and Letters.

**October 1984**
Appletips (drive-cleaning, DOS, REMs and Lists) – Apples in a clothing factory – Book reviews (games programming, Pilot, Apple IIc) – Games (Gruds in Space, Cherryspin, Aquatron) – Graphics Part VIII (including review of Spectragram colour card) – Mac software reviews (MacForth, Click Art and Mac the Knife) – Simulation of radioactive decay and Einstein solids – Pascal tutorial – Flashcalc – Reviews of Blackboard printer card and CW/P drive – PLUS Letters, News and New Products.

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**November 1984**
Apple in a primary school – Games (Flight Simulator II, Drol, BC's Quest for Tires) – Graphics Part IX (including review of Cat Graphics) – Pascal Tutorial: Introduction to Pascal Operating System – Macintosh languages: MacForth, MacBasic, MBasic & Instant Pascal – Two Macintosh books reviewed – Communications Part III: Software – Loading DOS Toolkit assembler onto language card – Software reviews (Digisolve's Pixel Paint, Hilderbay's Payroll) PLUS Letters, News and New Products.

**December 1984**
Games (Spare Change and Gumball) – Desert Island Discs with Pam Fisher – Pascal Tutorial (final look at the Operating System) – Spreadsheet (VisiCalc command table) – Lisa 7/7 Software – Macintosh games (Pensate and Frogger) – How Macintosh helps an actress – The world of the 6809 Pt. I: the Rehaflex board – Escher game listing – Graphics DIY Part X (including review of Sweet-P plotter) – Hilderbay SSP software review – Communications – PLUS News, New products and letters.

**January 1985**
John Sculley's View of 1985 – Games (Gelfling Adventure, Story Maker, Stellar 7) – Application: Apples down on the Farm – Cloze Technique (Plus review of Clozemaster) – World of the 6809 Part II: Flex Operating System – Apple II v ITT 2020 – Reviews (Ormbeta Compact Accounting System, CGL Half-Height Drive) – Apple IIe and IIc compatibility – Handling Interrupts and large arrays in Pascal – Reporter's view of Macintosh – PLUS News, New Products, Appletips and Letters.

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**February 1985**
Steve Wozniak talks about Apple II developments – Quicksort algorithm in Forth and Basic – Games (Deadline, Witness, Planetfall, Enchanter, Scorcerer, Expedition Amazon) – Graphics DIY part XI – Targeting with a spreadsheet – Apple to Apple file transfer – Miners' strike resolved by computer? – Chemical formulae on Lisa – two Macintosh books reviewed – World of the 6809 Part III – Software reviews (Sales Edge and Management Edge) – Application: book publishing – Split screen techniques – PLUS News, new products and letters.

**March 1985**
Circle drawing algorithms – Super Pilot System Log – Summarising data with VisiCalc – Competitive estimating with Multiplan – Graphics DIY part XII – Ampersand editing – Macintosh (MacTerminal, Mouse Stampede, optical mouse, plus Mac book) – Reviews (Merl modem, Intec hard drive, Vision 128/256 card, the Editor, plus three educational packages) – Fun and Games (Xyphus, Fighter Command, Picture Writer) – PLUS News, New products, letters and Appletips.

**April 1985**
Apples in the dental surgery – Adding graphics commands to Applesoft – Using the VBLANK signal – Getting to grips with software – Reviews (Spee-Demon card, PFS File/Report for Macintosh, W-P-LAB) – Weather forecasting with Mac – Pascal Filer's D command – Fun and Games (La Triviata, Design Your Own Home: Architecture, Interiors, Landscape) – Books (Appleworks, VisiCalc, Machine level programming) – Index to Windfall Vols. 1 and 2. PLUS News, New products, Letters and Appletips.

**May 1985**
Sports Day runs smoothly with Apples – Graphics DIY Part XIII (pie charts) – Reviews (The Workbench, Macputer IIc, Copytext, Omnis 2 on Macintosh, seven Logo books) – The RWTS explained and demonstrated with a disc verify routine – protecting programs from Copya – Pascal (directory access from within programs) – Bin-search in Forth and Basic – Reaction Timer – Apples in Hungary – Fun & Games (Smart Shopper, Plantin' Pal, Micro Cookbook) – PLUS News, New products, Letters and Appletips.

**June 1985**
Apples keep track of music companies and Macintosh designs record sleeves – Fun and Games (Music Construction Set, Song Writer, Music Readiness) – Pascal Tutorial: start of a new series looks at records – Reviews (Tick-Tack translation package for Apple II+/IIe, Musicworks for Macintosh) – Graphics (three books reviewed) – Mugraph: light dependent resistors making sounds – Ampersound: routines for making music and sounds from Basic – PLUS all the latest News, New Products and Readers' Letters.

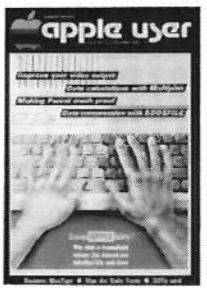
**July 1985**
Apples at the heart of Papworth Hospital – Fun & Games (Secret of Arendarvon Castle, Antagonists, Fahrenheit 451, Rendezvous with Rama, Amazon, Shadowkeep, Adventure Writer) – Pascal Tutorial: using files of records – Binary file load utility – Using extended 80 column card memory – Macintosh (Flowcharting, Preview of Guide) – Book reviews (Business Basic, Epson printers) – Reviews (FingerPrint and Printerrupt) – Graphics DIY Part XIV – DOS patches – PLUS News, New Products, Letters and Appletips.

**August 1985**
Spreadsheet secrets shared – Apple IIIs provide power behind computer bureau – Graphics DIY Part XV – Wordstar scrolling problems solved – Descartes data processing program generator – Fun & Games (Winnie the Pooh, Mickey's Space Adventure, Print Shop, Hitchhiker's Guide to the Galaxy) – Mac at the centre of a publishing revolution – Pascal Tutorial: random access files – Review of Micro Planner for Macintosh – Restore to any Data line – PLUS News, New Products, Letters and Appletips.

**September 1985**
Appleworks spreadsheet eases house purchase calculations – Pascal Tutorial: Units – Macintosh: Review of Lotus Jazz – Applesoft line by line comparator – Graphics dumps via a Super Serial card – Mac Publishing: Review of three page layout packages – Kitchen design based on Apple IIe – Choosing educational software – Bomb-proof input routines – Fun & Games (Skyfox, Wishbringer, Rescue Raiders) – Book reviews (Visicalc, Accounting software) – PLUS News, New products, letters and Appletips.

**October 1985**
&DOSFile: start of a new series – spreadsheet for home budgets – Apples in a Hertfordshire college – using Page 3 routines with a language card – Graphics DIY Part XVI – Reviews (Ramworks extended 80-column card, Computereyes and Magic digitisers) – add a factorial function to Basic – Pascal tutorial: assembly language programming – lower case Pascal – Fun & Games (Mix and Match, Spotlight, Instant Zoo, Ernie's Quiz) – free sectors on disk – PLUS News, New Products, Letters and Appletips.

**November 1985**
Graphics Library final part plus disc offer – MEMDOS operating system – calculating duty rosters with a spreadsheet – Macintosh: reviews of Microsoft's Excel and P&P's fat Mac upgrade – ProDOS gives Applesoft new lease of life – Review of Cirtech CP/M Plus system for IIc – Apple word processors compared with MS-DOS counterparts – &DOSFILE: two more routines added – Pascal tutorial: parameter passing – extra tracks on discs – Fun & Games (Suspect, Karateka, Dazzle Draw) – PLUS News, New Products and Letters.




**December 1985**
Hardware project to improve video output – Pascal Tutorial: bomb-proofing programs – &DOSFile: data compression techniques – date calculations with Multiplan – Application: Apples in an academic household – Review of DDTe debug card – Macintosh: reviews of MacType and Mac the Knife Fonts – Fun & Games (Sword of Kadash, Cutthroats) – Sliding block puzzle in Metacraft's Forth – Apple User Games Disc offer – PLUS News, New Products and three pages of readers' letters.

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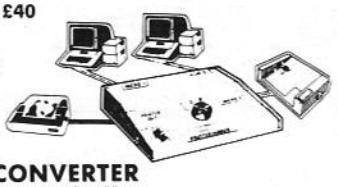

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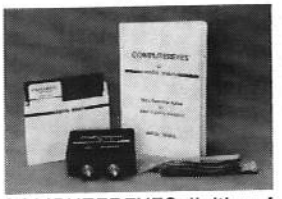

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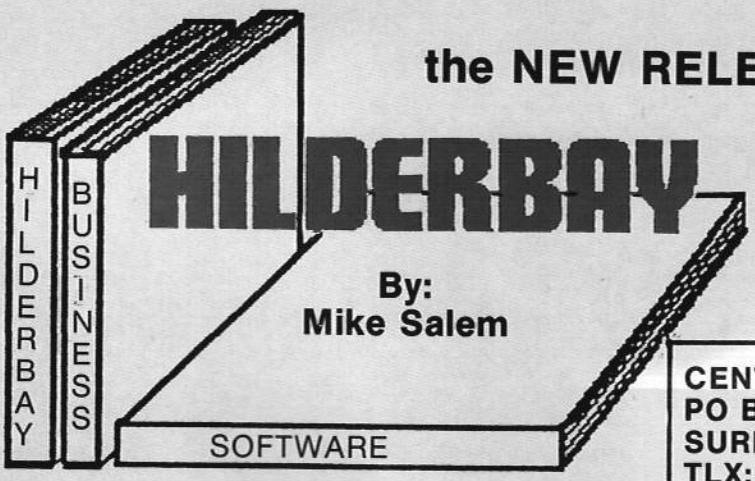


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