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Business micro-computer sales

Year	IBM PC*	IBM compatibles	Other PC*
1985	1	1	1
1986	2	2	2
1987	3	3	3
1988	4	4	4

*Based on data by Forster

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Mark Williams LETS C	MS-DOS	£ 75
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Lattice C	ATARI	£ 75
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PRICES & DELIVERY

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For other products in our range see our other page in this issue or ask us to send you a complete price list.

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db-VISTA (with source)	MS-DOS	£375
Lattice dBCII (L)	MS-DOS	£175
Lattice dBCIII (L)	MS-DOS	£175
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Novum Database (CI,DS,L)	MS-DOS	£350
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Softfocus ISAM (source any C)		£ 40

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Vedit-Plus	CP/M-86	£155
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CSE (With C source)	CP/M-80	£ 60
MIX Editor	Z80 + CP/M-80	£ 35
Nevada Edit	CP/M-80	£ 30
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Expert Systems	Fortran Compilers
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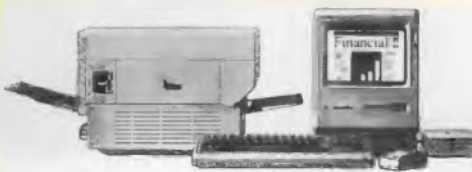
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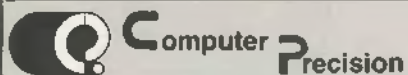
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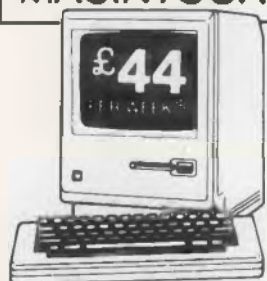
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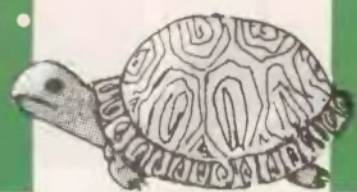
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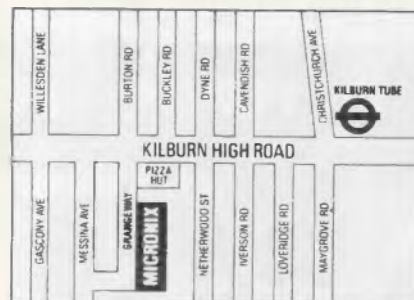
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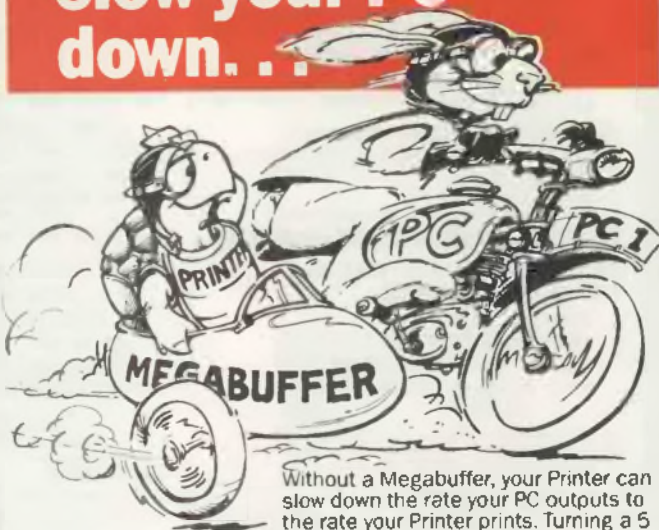
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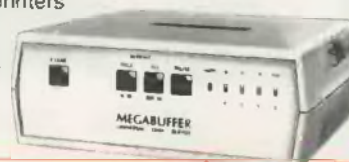


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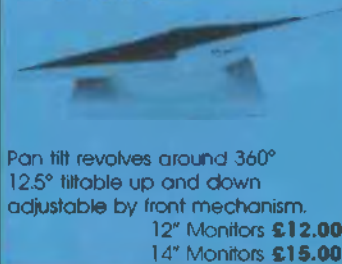
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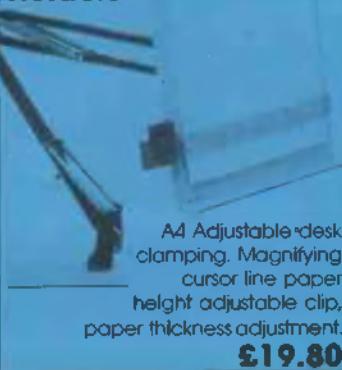
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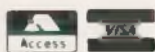
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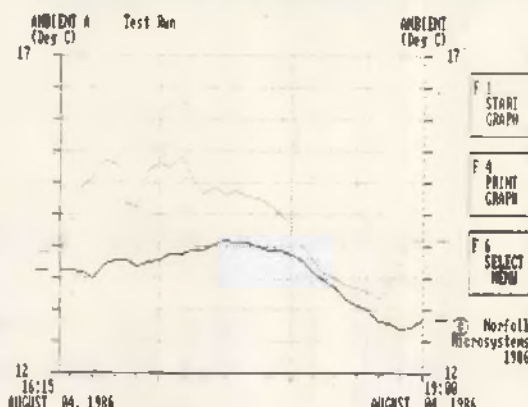


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A single strip can hold up to 5,500 bytes of information (about four pages of double-spaced typewritten text) and can be read in about 30 seconds.

In fact, wherever data is to be stored, retrieved or distributed, Softstrip can be used.

For instance, a Softstrip containing a new price list or a parts list could be sent out to wholesalers and distributors and immediately read into their computers.

Softstrip is a trademark of Cauzin Systems, Inc. Macintosh is a registered trademark of Macintosh Laboratories Inc., and is licensed to Apple Computer Inc.

A company's confidential personnel records could be coded onto strips - making them safe from unwelcome eyes.

Even the strip printed on this page is computer-readable.

How do you read a Softstrip?

All you need to read these remarkable strips is a Softstrip Reader. A low cost piece of hardware that plugs into most popular personal computers.

When placed over a strip, the Reader scans the data and transmits it to the computer.

Even if the paper is folded up, the strip can still be read. The Reader will also scan through colours, dirt - even coffee stains.

If you find that hard to believe, fold up the page opposite and take it to your nearest Softstrip dealer. He'll read the strip for you.

The benefits of paper.

As Softstrip is on plain paper, a major advantage is the price. Merely compare the cost of paper to a floppy disc to see the difference.



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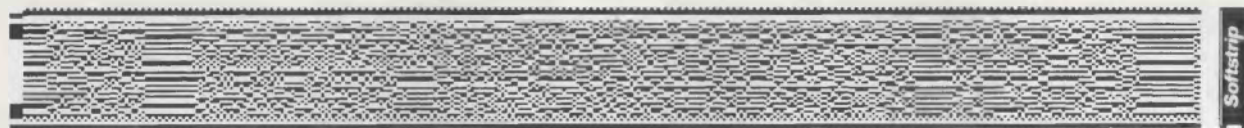
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Can your business use the Softstrip technology?

That's entirely up to you. In five minutes you could probably come up with half a dozen uses of your own.

For further information on the Softstrip technology and why your business should not ignore it, cut the coupon or take this page to your nearest dealer.

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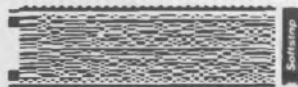
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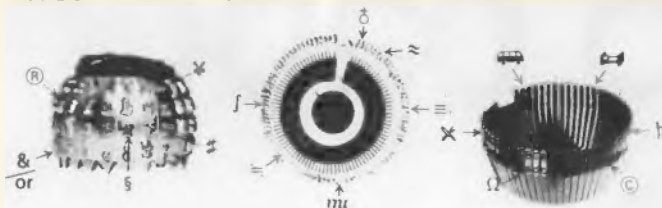
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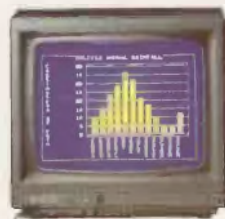
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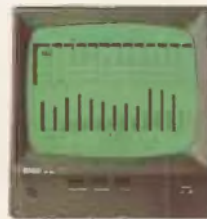
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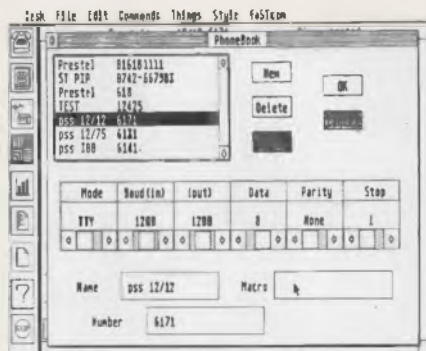
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- 2) TOS - Tripartite Operating System (fitted in ROM)
- 3) 1st WORD - Word Processor by GST using GEM
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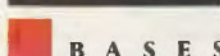
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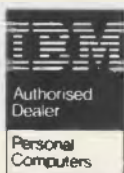
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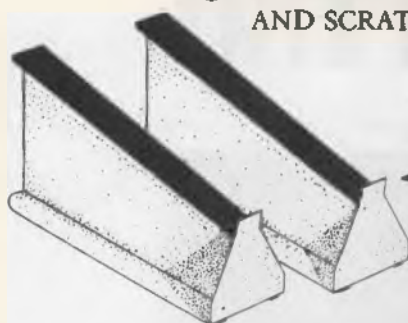
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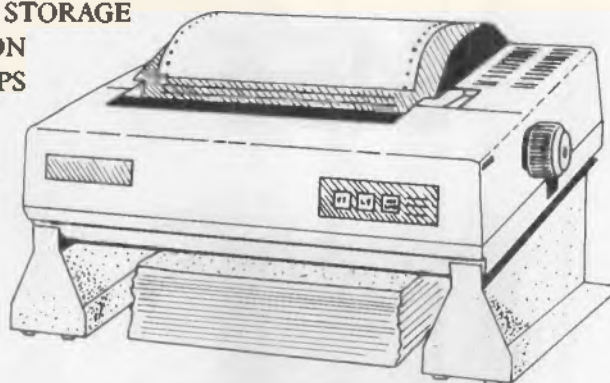
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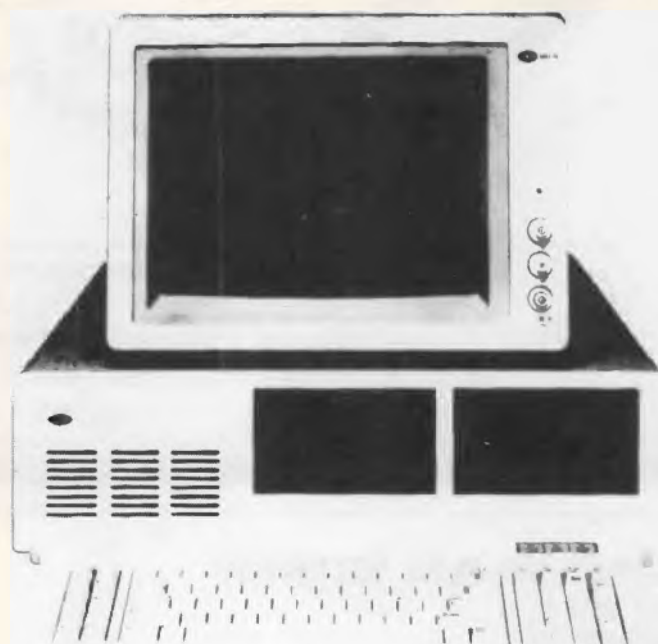
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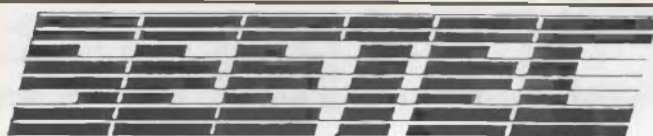
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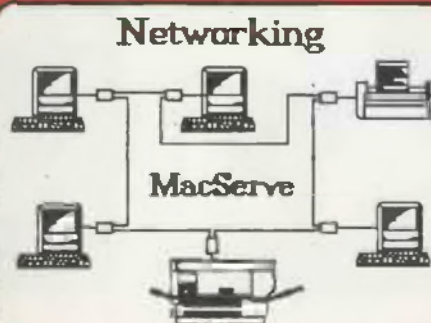
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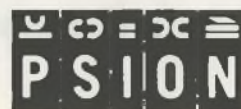
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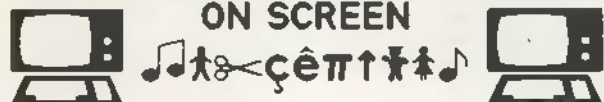
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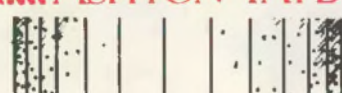
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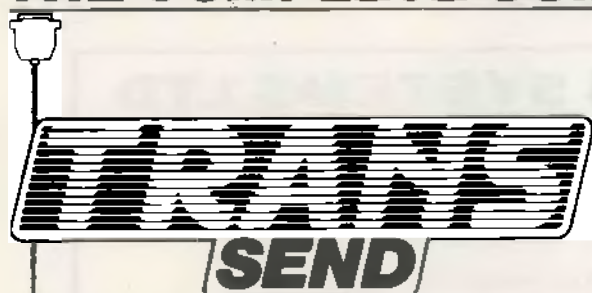
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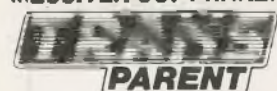
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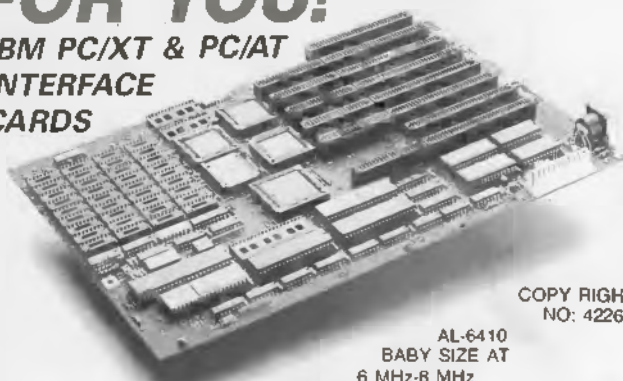
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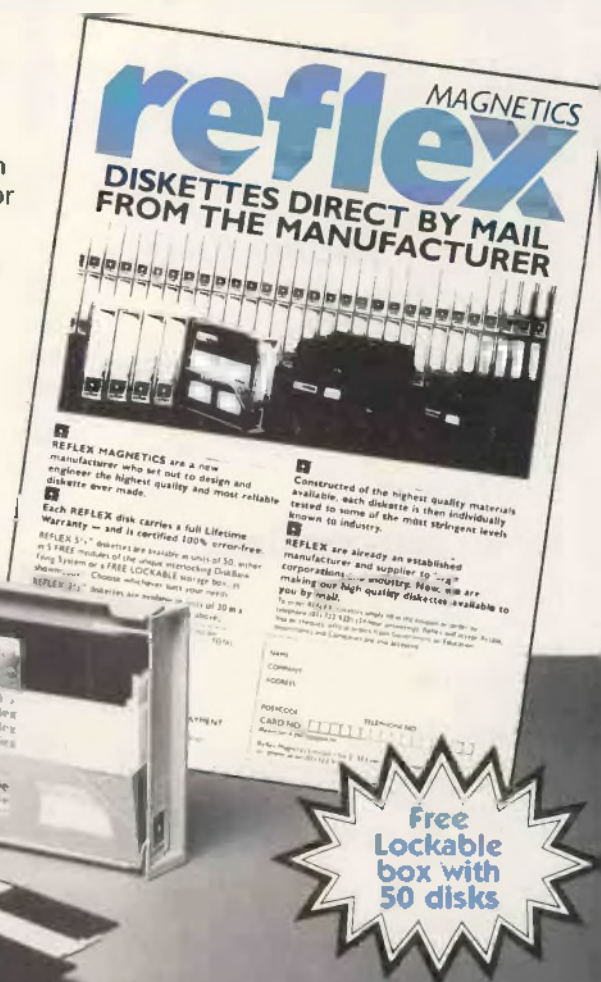
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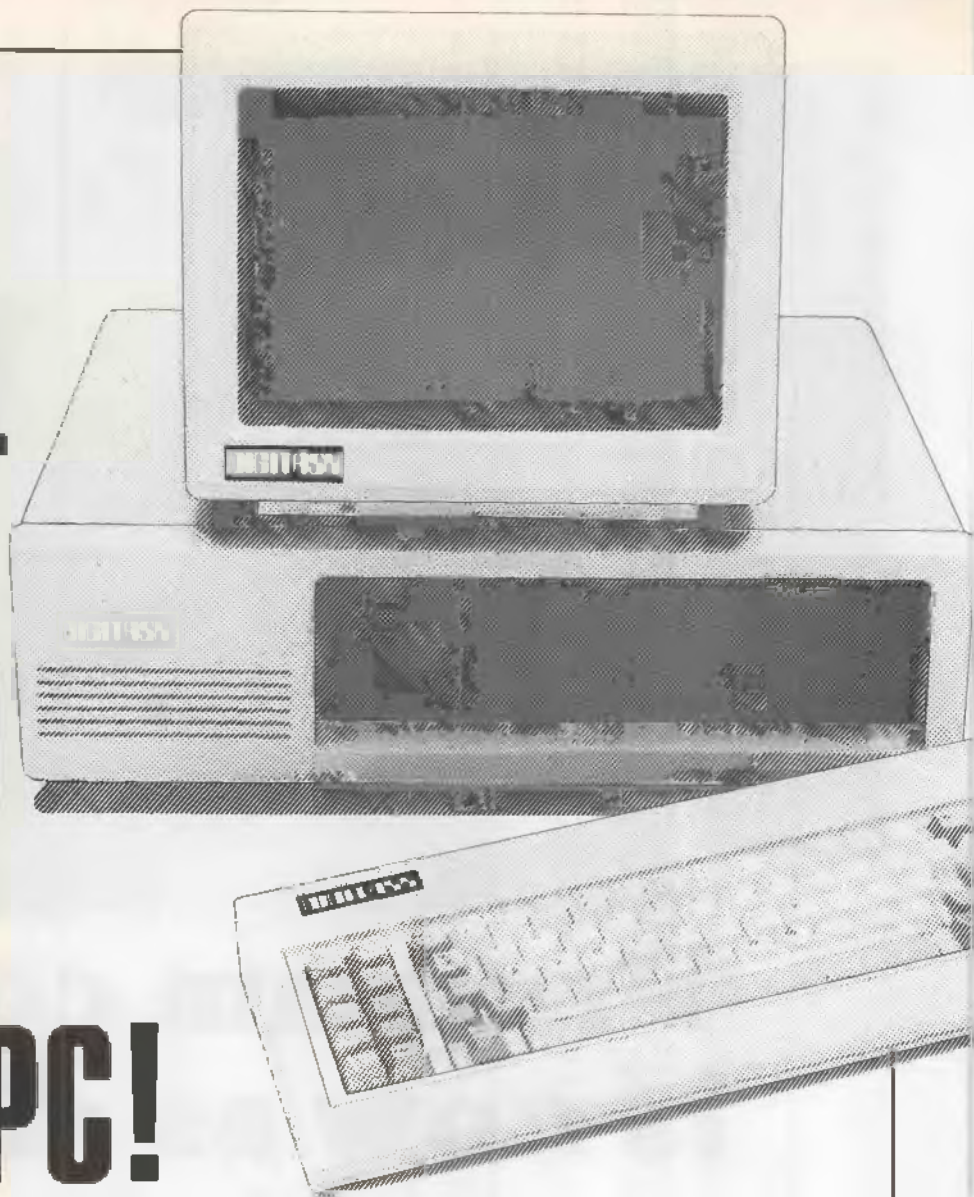
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MODIFY FLOWCHART.....	«2»	SET FILE POINTERS.....	«12»
CODE THE PROGRAM.....	«3»	READ FROM FILE.....	«14»
MERGE TWO FLOWCHARTS.....	«4»	WRITE TO FILE.....	«15»
ABORT.....	«5»	SEARCH OR SORT.....	«16»
KEYBOARD INPUT.....	«6»	MERGE DATA OR FILES.....	«17»
DISPLAY DATA.....	«7»	CHECK/AMEND RECORDS.....	«18»
BRANCHES.....	«8»	DELETE A FILE.....	«19»
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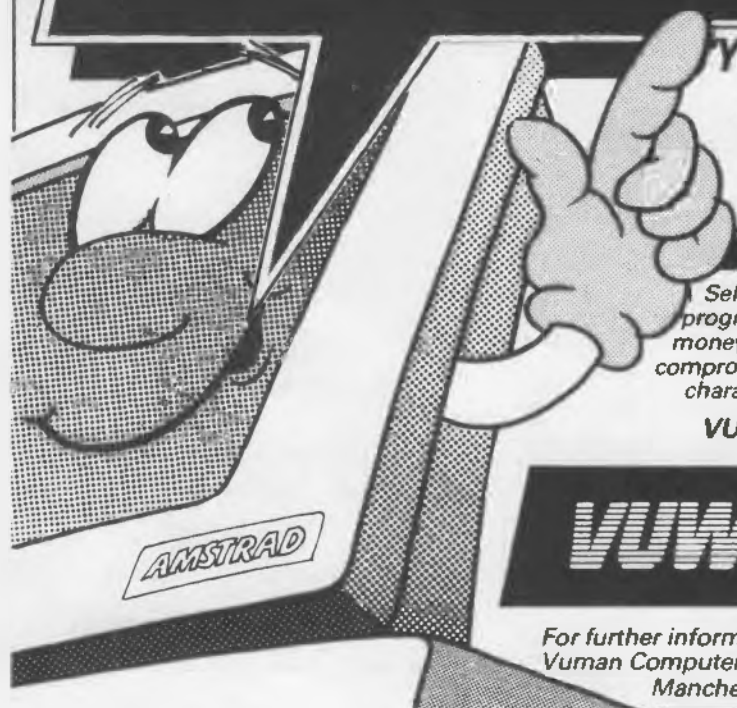
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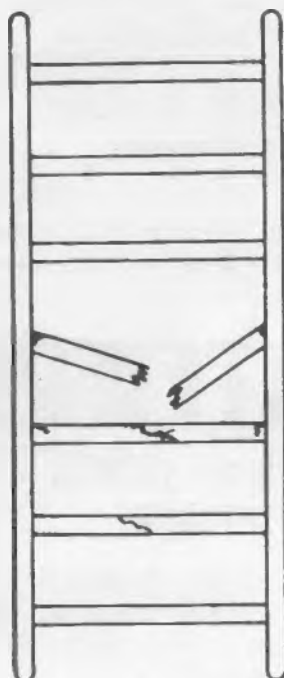
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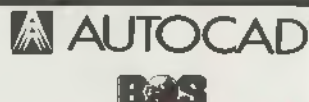


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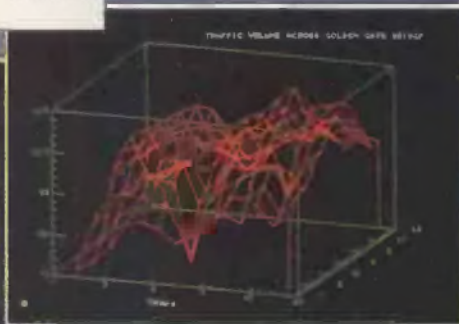
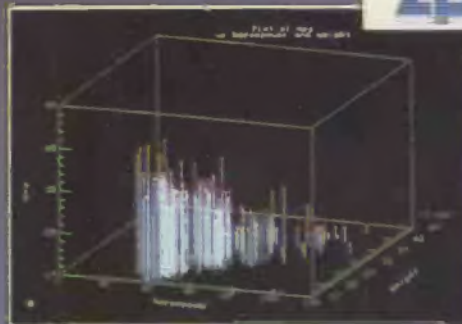
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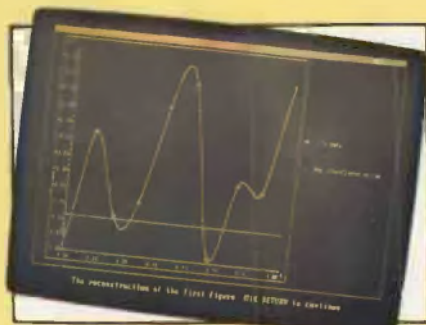
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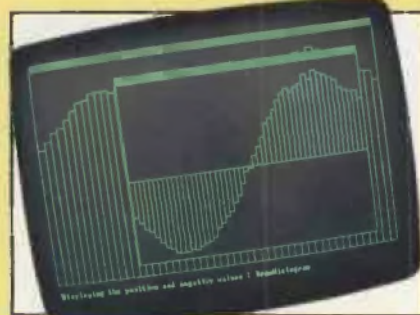
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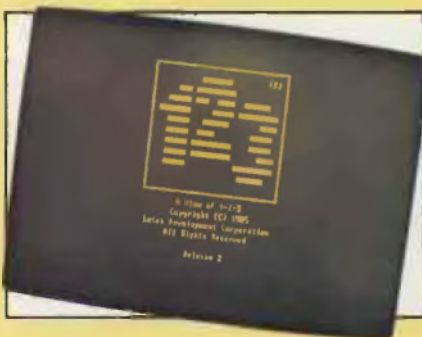
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The betting is on for the product to win IBM's approval in the desktop publishing arena, and sorcerers and wizards are the talk of the day (and night!) as MUD increases in popularity. Just some of this month's news from Guy Kewney.

Desktop publishing race is on

The 'desktop publishing' product which wins in the IBM market will be the one which gets into the market in the next two months. Increasingly, this looks like being the winner of a race between a new product called Ventura and the Windows-based version of PageMaker.

The reasons for this are simple: Microsoft, as author of Windows, is throwing its full cheer-leading abilities behind PageMaker (the Macintosh brand leader). And rival firm Digital Research, author of GEM, is throwing its authority into the fray on behalf of Ventura.

The fact that Ventura is based on GEM (graphics environment manager) is seen as very exciting at Digital Research. People there are totally convinced that the Amstrad is going to swing the UK behind GEM as a standard. And at a price of £750 or less, Ventura on an Amstrad lacks only one thing

— high-resolution graphics.

More to the point, GEM is available on the Atari ST, and a lot of effort is going into desktop publishing on that machine.

Why? Well, the Macintosh has been selling in the UK almost entirely on its ability to run PageMaker.

The mathematics is simple: a Macintosh requires a £7000 laser printer, which includes a 68000 chip and 2Mbytes of memory, in order to cope with the graphics language PostScript. The new Atari ST has 2Mbytes of memory and a 68000 — and a simple, unadorned laser engine can cost under £1000. Add software costing (say) £600, and a total DTP (desktop publishing) system costing comfortably under £3000 comes into being.

On a technical base, Ventura should win (in my own opinion) simply because it seems to be more reliable. I have only fiddled with a beta-test version, but it was working a great deal better than PageMaker on the Mac, which tends to crash all the time.

There are other GEM-based products in this area. Archetype's Impression package is one which my sources speak highly of; the only question there is 'when?' and the answer looks like 'not this year'.

But the longer it takes to get the product into the market, the more chance the rival product has to establish itself. And PageMaker does look likely to win that race unless Xerox, the licensee of Ventura, wakes up and does something clever with the product.

Xerox is dithering. It doesn't know what to do in Europe, and Europeans are already being driven to obtain beta-test Ventura copies from American colleagues. Not everyone will be so patient or determined, however, as people in the UK recognise full well.

My own bet is that Rank Xerox will move independently of Xerox and give the product to distributors in the UK. Xitan's new Graphics Displays Limited (GDL) subsidiary was set up specifically to handle this kind of software, and sources insist that this company will have distribution rights.

P&P Micro is a distributor of PageMaker on the Mac, and is seen as a 'must' outlet for Ventura. And CCA Microrentals will put in a strong bid.

PCW plans to do a screen test of Ventura in the January 1987 issue. Till then, interested parties should contact Xitan in Southampton, which has seen the product and is in a position to pass on useful information.

Details on (0703) 871211.

but it also has the greatest graphics. It's ... it's hard to describe.

Get one, and get an Atari ST to run it on.

Most successful games are designed for the arcades, where kids put coins in expensive hardware. They are re-written for cheap micros, and they are vaguely fun.

Just occasionally, a game like Elite arrives, totally new in concept, execution and appearance. Star Glider is the best of these so far.

'Jez' San is something of a celebrity in programming circles. He was the first 'external' wizard in the Multi-User Dungeon at Essex University — in the days when 'external' players played under the handicap of 300 bits per second modems, while 'internal' student players were on 9600 bits per second terminals. He has written (personal) utilities to copy every uncopiable BBC Micro disk; he wrote the very clever software in the otherwise dismal Demon modem; and he worked on versions of Elite. In other words, he's a pretty handy hacker.

And he's been working on Star Glider for 18 months, polishing, improving and perfecting it, to the rage, frustration and panic of all around him who wanted him to finish it.

Unlike any other 'arcade' game, there appears to be no way of simply learning Star Glider and playing it. It's always ahead of you.

Just learning to fly the Air-Ground Attack Vehicle is the first hurdle. Then you gradually learn where to fly it. Finally, you discover where you can re-fuel it, and how. And only then, at the very least a day after you start playing, do you get instructions on what you're trying to achieve. At that point, when you reckon you're getting the game down, it tells you you're rated 'Rookie'. I nearly got into Level Three — really advanced. Gary Scheinwald, who did the documentation, actually *did* get to level three, once. He says there are over 20 levels ...

Atari ST Star Glider

For the first time, there is a convincing reason to buy an Atari ST. It is a game called Star Glider, written by Jeremy San, and it is unique.

It's like a flight simulator, with strange hostile objects floating above the landscape. It's like an adventure game, except the problems are hurtling at you at hundreds of miles an hour. It's like the most enthralling zap 'em-dead game you ever played,



For those Amstrad machines that use 3in diskettes, Pace has produced this 5 1/4in drive as an alternative. It provides a thumping big 800k of storage, and it gives you the ability to read data produced on an IBM machine — including Amstrad's own PC.



Call this 'a colour screen', and Microvitec will probably arrange your ritual slaughter. It's much more grandiose: it's the company's 14in EGA display, costing £525 (excluding VAT), and is the first of several really high-resolution screens which the company believes will put it ahead of the Japanese and American competition.

Most were due to be launched at Compec (a week or so ago, as you read this) and they are not hobbyist parts, but full-blown CAD terminals starting at £1000 or even more.

Microvitec sales director Mike Cooke says his company has decided not to follow NEC's lead and produce a three-standard model, like the NEC Multisync. That model switches scan frequency from the standard (CGA) colour to enhanced graphics (EGA) (22KHz) frequency, and also goes up to the higher standard needed for the Professional Graphics Adaptor (PGA).

Cooke predicts that the main requirement will be for straightforward EGA and CGA capacity. Above that, he says, the main demand will be for very much more than EGA, and the most advanced Microvitec display provides instant 'zoom-in and zoom-out' on AutoCAD computer-aided design pictures.

Details on (0274) 390011.

Two other multi-standard screens have been launched onto the market — one appeared at the PCW Show and I missed it. That was Tatung's 14in CM-1322 which works with both XT and AT machines. At a price of £349 it is noticeably cheaper than many EGA compatibles. Tatung claims that the CM-1322 has a unique feature — analogue display technology. This, the company says, permits 4096 colours, where digital screens offer a maximum of 64. I hope to get a chance to test this soon — sounds interesting.

And from Reflex in Basingstoke, Electrohome has launched a new 13in monitor compatible with three standards. This monitor accepts digital or analogue signals, says Reflex, and again, is on my shopping list of things to try out soon.

Details from Reflex on (0734) 884611.

As you fly around, shooting and dodging shots, you will see objects appearing on the horizon and approaching you, growing in size smoothly, turning and whirling as they come.

It's not only fast, it's realistic. You find yourself leaning over in your chair, dodging missiles.

Incredibly, the game plays on both monochrome and colour displays. Many Atari games insist that you have one or the other: Star Glider works on either. (You should play it on a mono screen, by the way, because it's more accurate.)

As if this weren't enough, the sound includes digitised speech and an advertising jingle of astonishing skill.

Just occasionally, a program comes along that makes a machine sell, in order to run the program. Until Star Glider arrives on the Amiga, it's a water-tight reason for paying Atari's excessive prices for the ST.

Star Glider will be available, soon, on the Commodore 64, but will be nowhere near as impressive. And a Macintosh version is also very possible, says Rainbird Software.

Another 386 without software

Jarogate has moved into the biggest league with its new

80386-based micro, the Sprite 386.

This puts Jarogate behind Rair and in front of IBM. Like Compaq, it has a desktop version, the 386 PC, and like Rair, it has a multi-user super-mini. The cheap price is £4000 for the single-user machine and the high price is £10,000 for the multi-user version.

Having said that, the subject is almost worth dropping. At the moment, the world is waiting faithfully for IBM to point the way with a new operating system for Intel chips.

The shopping list is simple. It must run IBM PC programs in all screen modes, badly-behaved or not. And also, it must use multi-tasking, extended memory and protected memory.

Theoretically, Advanced DOS 1 (or PC-DOS 5.0 from Microsoft) will do this, and the question is only 'when?', or so Microsoft says.

Mark Potts at Rair snorted with disbelief when I suggested this to him. Not only does he not think Microsoft will do it on time (middle of 1987) but he doesn't think the company will do it at all.

'There's no sign that Microsoft is capable of doing the work,' he said bluntly. 'We've gone for a version of Concurrent DOS which we've adapted for our own purposes. But there's no sign of Microsoft doing it — they have yet to launch a working

product they wrote themselves.'

Potts was alluding to the little-publicised fact that Microsoft bought the kernel of MS-DOS, originally, from Seattle Computing and re-wrote it.

The latest rumours from IBM don't point firmly and clearly to a super-micro based on the 386, and undercutting the company's own RISC Technology RT 6150.

Instead, people talk about a product called 'Entry' — based on rumours of a \$400 PC clone, using the 8086 (as in the Amstrad PC) but without expansion slots. That one, my rumour sources say, uses a 3½in, 720k diskette. Or they talk about an \$800 system with 5¼in drives, called 'Renegade', according to the weekly trade paper *PC Business World*.

Read all these rumours, if they amuse you. Believe what you like, because the future is an area for faith, not facts.

No-one can tell you for sure which machine IBM will announce, even if they can tell you what it *ought* to announce.

The simple fact is that IBM doesn't make up its mind about launching a product until the day it launches it. There are a great many prototype systems inside IBM, and at astonishingly short notice, many of them can be rushed into production — a good example must be the XT 286

(see Benchtest on page 130). But until they are actually presented to the world, they can be cancelled.

And on several occasions, they have been.

Not quite paradise

Paradise, a San Francisco company turning over something like \$50m per year, makes enhanced graphics adaptor cards, chips and systems. The company has just set up a London office, has loaned me a Paradise card, and has been taken over by Western Digital, a company known for its dominance of the disk controller market.

The claims of Paradise, now, include that it has the lion's share of the American EGA market; that its new, giant, corporate identity makes it bigger than all other 'IBM add-ons' market suppliers put together; and that it has the only EGA card which automatically switches from CGA to EGA when software expects it to.

My own figures suggest that a company called Sigma has at least the same share of the US EGA market, but let's not quibble.

The claim that it's the only EGA that automatically switches into high scan rate is one which (at first) seems nonsense. Lots of packages use EGA, and all of them

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turn the IBM EGA card into high scan rate.

The difference between IBM (and imitation) EGA and Paradise is simple: Lotus.

Lotus 1-2-3 version 1a doesn't use the official operating system method of asking the EGA to speed up into higher resolution.

Instead, it feeds data directly into the 6845 chip on the colour graphics adaptor. IBM's EGA doesn't have one of these, so it doesn't work.

On the Paradise card, however, the company has built its own 6845 emulation, including the registers, so that Lotus 1a works properly.

Checking Joyce's spelling

The Ansible program mentioned in 'Newsprint' last month is *not*, after all, a spelling checker, but a word counter. From Arnor, however, Protext is a program that does, really and truly, include a spelling checker.

The program is a word processor, a mail-merge package and a spelling checker, and costs £80. Versions are available for Joyce (PCW8256) and CPC6128 Amstrad models, on one 3in disk. It runs under CP/M.

Details on (01) 684 8009

A natural upgrade

Acorn is following up the BBC Micro with the truly exciting ARM, and there can't be anyone who hasn't heard that, and who hasn't said 'Yes, but when?' and changed the subject.

So much attention has focused on that particular development, that a rather more obvious fact has been forgotten.

That fact is: the ARM is a natural upgrade for the 6502 chip.

In a year's time, however, you will start hearing interesting rumours out of Cupertino, California, where Apple has its offices. To Apple, the Acorn RISC Machine is potentially a life-saver.

Sales executives at Acorn's Palo Alto (California) research office are already anticipating the future. Ask them if they have had any interest from customers

other than Acorn and they say 'Sure! Apple is very interested!'

The ARM was designed by Roger Wilson, described by his peers as 'probably the world's best 6502 programmer.'

He was that five years ago, and he's designed the ARM to suit himself. And indeed, the 6502 has many of the characteristics of a reduced instruction set computer (RISC). All the ARM does is many of the same functions in 16-bit and 32-bit chunks, on a 24-bit address bus, and very, very much faster.

Well, of course, Apple may think about the ARM for years and never actually produce a product. But also, Apple may take the obvious step of upgrading its 6502 machine one step further than the GS has gone, by using the ARM.

If that happens, remember, you read it here... if it doesn't, of course, forget it.

Cut down, but OK

The panic among software producers is under way, full steam ahead, as they flee from the advancing tide which is the Amstrad PC1512.

The most impressive responses are from new-style publishers.

For example, In Touch has contacted us with a catalogue of low-cost stuff, all under £100 — it's a long list including Doubledos, Able 1, Safety Net and Mystic Pascal. Details from Fairfield House, Brynhyfryd, Caerphilly CF8 2QQ.

Abtex Software has a low-cost version of its project control package, In Control!, and normal reaction to cut-down programs for Amstrad, here, is laughter. With Pert packages, however, there's a real demand for simpler packages and, at £50, Abtex may have found a new market for this kind of software.

More obviously amusing are products from Ashton-Tate and Compsoft, both of which have decided that their full-blown products are too good for Amstrad buyers.

Compsoft has described its Budget range as a 'successful launch' and as 'reduced in capacity merely to suit the machines they are designed for,' which is an excellent jest, given that the

Amstrad PC is actually bigger and faster than most standard PCs. And similarly, Ashton-Tate has produced something called Framework/Amstrad which 'offers many of the functions of the full Framework.'

Along the same mordantly humorous lines, PC Promise, from Duncan Database, 'has all of the features of the original package but limits the user to 32,000 records per file, with four files open simultaneously.'

Comment on this entertainment: if you have the manufacturer's assurance that his product is an inferior product, why buy it? There are rival suppliers around who don't wear the same blinkers.

For example, Camsoft (Cambrian, not Cambridge

Cam) has taken its Joyce software and re-written it for the PC. Cambase costs £50, Financial Manager costs £150, and Payroll costs £30. Details on (0766) 830801.

New Star is carrying VP Planner, a Lotus clone from Paperback Software, Adam Osborne's company. It's copy-protected, but carries a deal which allows you to register as a user and then get a non-protected, personalised copy. More interesting is the memory-resident spreadsheet, Cracker, with NewFile, Streaker and VP Info (a dBase clone) also on the list.

Poor old William Poel at New Star Publishing in this country has just been overtaken by a potential disaster, with the news that WordStar-producer MicroPro



The difference between modems from Tandata and Dacom, and modems from everyone else, is that Tandata and Dacom are sold on Telecom's Epad system.

Epad is a system for using Prestel-style 1200/75 (V23) modems so that they never work at 75 bits per second. They transmit at 1200 bits per second, and then switch themselves round so that they can receive at 1200 bits per second, and instruct the modem at the other end to switch round and transmit at high speed.

Telecom calls this an 'error correction' protocol, because it is. As the modem is working in half duplex (it doesn't echo the character it has received back along the line) the only way you can tell that the message is getting through is to send back a message saying 'message correctly received', making a real virtue out of necessity.

This picture isn't the Tandata one. It's the new Dacom DSL2123AD, and it's now even more special. It has Hayes dialling and commands, and it has a security version, too, which won't let you use it, but insists on calling you back on your official number.

Full details and prices (they start at £260) from Dacom on (0908) 675511.

Tandata has just announced new prices, by the way, for its modem range: contact the company on (06845) 68421 for details. Tandata still doesn't have a V22 Hayes-compatible machine, astonishingly, but a fairly nicely-priced version is on the way around Christmas.

has taken over New Word producer, New Star, in the US. Both MicroPro and New Star UK have had to start rebuilding bridges, destroyed in previous acrimonious battles between them. New Word Three is a sensible alternative to WordStar 2000 for WordStar lovers, but is probably overpriced. Details on (0277) 220573.

Compact Software, finally, has produced new versions of its accounting software, starting at £50 for its financial reporting module when added to the other modules. The Compact Accounts Bundle fetches £200, and Nucleus, the program generator, goes for £100. For further information on both products call (0306) 887373.

PCW8256 hard disks

Hard disks are appearing for the PCW8256 and appear to function without flaws — as far as one can judge by watching demos at exhibitions.

One from ASD Peripherals of Erith in Kent costs £449 plus VAT for a 10Mbyte version, with a 20Mbyte version due out shortly at £600. Details on (03224) 49235.

Word power

For £150, users of BBC Model B micros can experiment with talking to

their machines. The new box is Micro-Voice, from R&D Speech Technology in Ely, Cambridge. Only one thing: restrict your verbosity to 10 words.

R&D suggests you use Micro-Voice to play adventure games, using words like 'up' and 'kill', because (the company says) it is very quick and easy to change one or more of your 10 words. 'Typically, it will require only two examples of each word to train the device,' says the official announcement.

Great for playing MUD! 'Kill Raistlin with longsword' could be a single syllable, spoken from the comfort of an armchair as soon as that miscreant enters the room.

Details on (0353) 2879.

Join the club

If Philip Dixon wants to start an Apple II Programmers Club, why should I not mention it, briefly, here? On his own head be it — he's charging £1 per year subscription, sending out four newsletters a year, concentrating on assembler and Basic skills, and is available in Hexham, Northumberland on 606311.

There, I did it.

And if Tony Treadwell and Jean Thorn reckon they have the country's most extensive Adventure Help service, based in Leeds, why not pass on their modest claims to you? Let them deal with the phone calls. The *Adventurer's Magazine*



This time next year, a new British company called Perihelion is planning to launch a machine costing under £1000. It will probably have 1280 x 960 pixels resolution in four colours, a processing power measured at 10 million instructions per second, plus at least 1Mbyte of memory and a disk of some sort.

Details are all secret, according to Jack Lang, founder of Perihelion. But it will run a multi-tasking operating system — probably Tripos — and in that detail lies a tale that suddenly involves the Commodore Amiga.

The problem arises because the man who proposes to produce the operating system Dr Tim King, is the man who wrote Commodore's operating system.

Commodore's chances of success with the Amiga have been looking increasingly weak. It's overpriced, undersold, and now faces competition with the powerful appearance of Apple's IIGS which people expect will be heavily promoted to the typical Amiga buyer.

By the time you read this, two new Amigas will be announced, one very much cheaper and one very much bigger, including (my sources suggest) a complete IBM AT emulation (80286 chip and memory) on the board.

These new Amigas have been dealt a nasty blow with the departure of Dr Tim King from Metacomco.

Metacomco is an otherwise obscure Bristol software company which just happens to have written

Amigados, the operating system. Tim King was the author.

The split is between the chairman, Derek Budge, the newly-shaven gentleman on the far right of our picture, and Tim King, the dark-haired programming genius on the left, foreground. It's messy.

King's interpretation of events doesn't differ in substance from Budge's — there was a dispute over the direction the company took, they both say — and King (and two or three others) left.

King tells the tale as if he and his fellows approached Budge and served notice on him. Budge responded by buying a majority of shares in the company and serving notice on them.

On the other hand, Budge's version of history puts more emphasis on his need to acquire more shares to 'tighten up decision-making.' King, he says, opposed this idea.

The end result, however, is that no-one knows for sure who actually has the right to maintain and support *Amigados*.

While at Metacomco, Tim King licensed a version of the operating system, Tripos, from the University of Bath. This, he says, covered only the Motorola 68000.

This was adapted for Commodore, and called *Amigados*, and Metacomco has just announced (PCW announced it a couple of months ago) that this software is now for sale to other system builders.

King, however, has now approached Commodore with an offer to maintain the code he wrote. He says he doesn't want the royalties — they belong to Metacomco.

Budge says that Tripos doesn't belong to King, and if he makes any move to sell a version of it to anybody, he'll have an injunction across his bows. He thinks that King should do maintenance under contract to Metacomco.

King says that the contract between Metacomco and Commodore ended the day he left Metacomco: 'I'm not totally stupid.'

And he also observes that Tripos is a public domain program, with many versions available from Cambridge and Bath universities.

Derek Budge has used phrases like 'he may be attempting to procure a Metacomco customer' and words like 'injunction' — words which will sound exciting only to lawyers.

Commodore would like the situation cleared up. Those of us who feel that the Amiga is an important step forward in personal computing should feel the same way — Commodore has had enough bad luck with the machine already, and it will be a tragedy if this dispute causes it to fall further behind.

comes six times a year for £6 per year subscription, which also pays for 12 issues of the newsletter, and details are available on (0532) 326087 from Jean Thorn.

Gold on Prestel

December marks the end of the strange situation whereby Telecom owned both Telecom Gold and Prestel, and kept them firmly apart. Assuming everything goes ahead smoothly, Christmas will mark the launch of a system on Prestel which enables people to read 'scrolling' messages on the normal page-by-page display of 40 columns (see 'Mailbox' in this issue).

It won't be ideal, but the disadvantages of having to read text in that format will be trivial to a lot of people with tight budgets, because Prestel is available in most places at local call rates while Telecom Gold is available on the rather costly Packet Switchstream Service (PSS) outside London.

MUD monsters

When I last left the Multi-User Dungeon (MUD) they were killing the worst monster of all. It's a computer. They'd finally got sick of it, and bought a new one.



Despite the fact that the advantages of a mouse over a touch screen have been conclusively proved, demonstrated and analysed, people still design touch screens. Get hundreds of dirty fingerprints on the glass and sore elbows and tired forearms with this screen from Ellinor Peripherals, which imports it from Personal Touch Corporation, California. Details from Ellinor on (0734) 867395.

There is treasure in MUD, and there are monsters — other monsters, not nearly as fierce as the computer.

They include a goat, an ox, a thief, an old man, a shark and a dragon, all of which can be attacked, and (if your character is strong enough and clever enough) killed. You get points according to the value of the monster you kill. And the same thing applies to yourself because you are just another monster, as are all the other players. Kill one of your fellow players and get their points... that's what MUD is all about.

I've been playing quite a bit — enough to get one character up to the level of Sorcerer, another up to Superhero. The object of all this late-night 'work' is simple: to try and decide whether I can recommend that you spend your own money on a 'mud-pack' which gives you access to the Land of MUD.

The answer is yes, you should. But it isn't as clear-cut a 'yes' as I thought it was going to be.

There are problems with MUD, as sold to the innocent public by Multi-User Entertainments (MUSE) and most of them derive from the fact that MUD is, these days, something you pay money for. It wasn't when it was designed.

The other problems derive from the fact that British Telecom, which provided the computer on which it runs,



The solution to PC networking proposed by Quadram is delightfully perverse: put a 68000 micro in your PC to handle the net.

The product is Masterlink. It includes Quadnet VI (shown here), a local area network at 1.4Mbps, with the alternative of Quadnet IX which runs at 10Mbps. Then there's Minilink, a gateway or standalone terminal emulator (5020 terminal) — this is the plug-in 68000 card. And there's Mainlink, which does micro-to-mainframe communications.

No, it isn't simple to explain. Call Interquadram for details on (0753) 34421.

isn't a group of unanimously dedicated people, determined that MUD shall run sweetly.

I'd like to analyse the game a bit before complaining about the computer.

Originally, you played MUD on Essex University's campus computer, starting at 6pm each night when the staff went home. Most players were on terminals connected (at 9600 baud) to the DEC mainframe. Outsiders discovered that they could dial-in via Packet Switching, and several actually became Wizard-level players before the system became bogged down and was restricted to 2am onwards. I'm told it's still bogged down.

The main design constraint was to encourage people to play with each other — that is, to fight each other.

Sure, there was treasure, from diamonds, through a miraculous oracle that divines the locations of other treasure, right down to emeralds, rubies, a red disc, a cricket bat, and even a stale kipper. Drop them in the swamp, and as they sink down, you get points (not much for the kipper).

But the main object of the dungeon was not to entertain the players, but to keep students instructed — to teach the writing of parsers, multiple interactions, room descriptions, and other arcane parts of computer science. And frankly, if the

players gave up after an hour or so, that was fine, because other people would be able to join.

On MUSE's MUD, however, the object is entertainment, and the object for MUSE is to take money from players.

So why have a game that encourages people to quit?

The first reason for quitting is that the treasure is all dropped in the swamp. The second is that when all the computer-generated monsters have been killed, the players have to turn on each other and hack each other to bits with swords, axes, scimitars, staves and cricket bats. At that point, you have to quit or die.

When that's all over, the dungeon resets everything. The diamond returns to a secret place in the forest, the emerald goes into a field, and swords and other weapons litter the landscape. All the surviving players are evicted.

Simon Dally, founder and business manager of MUSE, doesn't really understand the problems this causes for players. He's never really had to play, being an honorary Arch-Wizard with unlimited powers.

If he is trying to map a maze (there are several and they change from game to game) he can pick up many useless objects, from a pin to a dead stick, and use them to trace his path. If a Wizard wants to get down to the Sea, to work out a path across it, he has a complex

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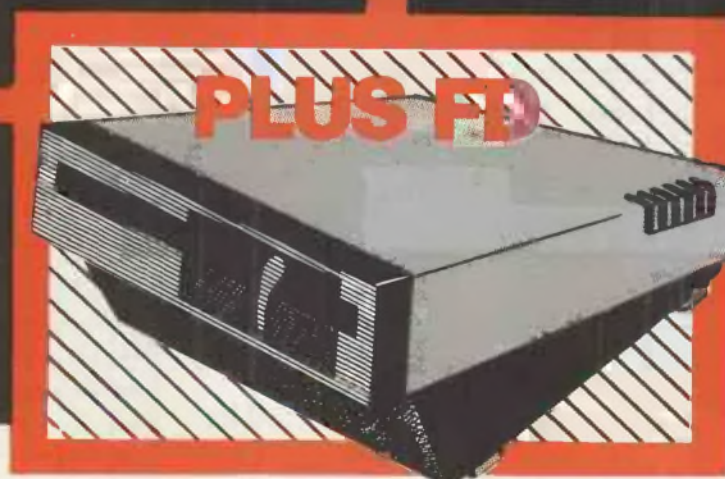


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 - 2 .. Ascii Table
 - 3 .. Address Book
 - 4 .. Parameters
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routine to work out, gathering things he knows are necessary; but having gathered them, or fought the people who have them, or stolen them, he can do so with a peaceful mind.

For the beginner, however, with no magic spells, these problems are more frustrating than they would be if they were just playing an adventure game, and the designer, Richard Bartle, has recognised this problem by changing MUD slightly.

To people who have solved the problems, the troubles of beginners seem petty. 'You're like all mortals,' said Dally from his high chair, 'whine, whine, can't we have more T, whine, whine.' T, by the way, is MUDian for Treasure.

Well, more T would be nice, but that isn't really it (though, if it weren't important, MUD wouldn't bother resetting, would it?). What is irritating is stupidity.

To get across the sea, you need an umbrella (never mind why).

Beginner players who have discovered a simple spell can find the umbrella. They will value it, discover it's worth a few points and drop it in the swamp. Their score goes up. And no-one can explore the

sea until next reset!

There are other examples of these problems — all very much part of the challenge of MUD once you cotton on. People who take the keys and fall over the cliff with them. People who carry useful tools into the swamp, start a fight, flee, and drop everything. It all adds to the fun and the challenge, perhaps, but it means certain treasure can't be found, and until it is, the dungeon won't reset.

Richard Bartle, I'm relieved to say, took my 'whining' more seriously than Simon did, and changed a few things.

Firstly, he has given novices a magic spell. It works in the tea room, and is very helpful in giving you a chance to find certain useful devices before advanced players routinely drift through their dull chores of collecting all the important treasure, killing the dragon, and amusing themselves making life difficult for beginners till reset.

Naturally, the higher-up wizards complained bitterly. One particular dungeon monster, Skiff (also known as Tont, or Tisiphone, among several personae) felt it was a scandal, and he'd fought

WILDING



Office equipment retailer Wilding has done a deal with printer manufacturer Brother which gives savings of up to £112 on a Brother printer when purchased at the same time as an Amstrad PC1512.

But Wilding is short of 1512s and prices may well have risen by the time you read this.

his way up minute by minute, and it was a perversion of logic for beginners to be able to cast spells.

Skiff is a dungeon monster which no adventure programmer would ever dare put into a game. Believing himself to be a laugh a minute, he rampages around, setting little puzzles for beginners — like kindly turning them invisible — just when they were trying to have a conversation about lifting a heavy barrier. Or giving them little races to run, and rewarding the winner with T. Or setting traps.

The dungeon wouldn't be MUD without Skiff — but that doesn't mean that MUD can pretend everyone else is like him. For a start, he's spent a fortune on MUD-playing — gossip in the saloon bar suggests over £2000. For teenage experimenters, there has to be another way of getting to Wizard status!

Ah, well, I could go on for hours, and it would get very tedious for those who haven't played. I suggest you do, and you will quickly see that the faults are secondary to the virtues. But do make sure you get a good night on the computer!

The machine on which MUD ran for its first year at BT was not big enough to handle the load, and very prone to collecting bugs.

There is now a bigger VAX installed. It is less likely to freeze you in place, unable to do a thing, while other players hack you to bits. It's less likely to spend a minute thinking between moves while it sorts out a database

for Telecom Hotline. And it's able to cope with quite a crowd of players.

But bugs the dungeon still has. As I went to press, I met Verna the Witch, disconsolately sitting in the Elizabethan Tea Room with the status of Novice. 'What happened?' I asked maliciously. 'The VAX has a bug, and thinks you're dead dead when you quit,' she said sadly. Dead dead means you start again. Normally Wizards can recover from that, but Verna couldn't even recreate her own persona.

A few days before that, if you picked up a bunch of keys, you couldn't separate them. Before that, if you used the staff, it hurt you, not the person you were fighting.

The VAX is, and I'm sure will remain, the most unpredictable, the moodiest, the least placatable monster in MUD. If you can bring yourself to think of it as just one more challenge and persist through the first two weeks of confusion, you will enjoy this new game.

To get a sample of MUD, you don't have to spend money, however. You can play for five minutes at a time as a guest.

Call up Packet Switching address A21880100300 after six in the evening, and when asked for Username, say MUDGUEST. When asked for password, say PROSPECT. Direct lines are (01) 998 8899 for V23 modems, or (01) 997 9433 for 300 bits per second. Fast V22 modems can call in on (01) 840 0317.

Send any message you may have to Malice, via Forum, and I'll reply. Don't use Prestel software

END



Poor old Compaq. Having just announced the vastly expensive 386 range, and now offering this 70Mbyte desktop system, the company has just heard that Intel has produced a \$2000 plug-in board for existing PC users, which provides the 80386 processor as an upgrade.

Admittedly the upgrade won't give you a fast hard disk, but then again, it doesn't cost £6000 either... and fast hard disks can be purchased for less than £1000 these days.



Our East Coast correspondent, David Ahl, reminds us of the slow start for erasable optical laser disks and assesses Compaq's move to be first with the 80386 processor.

Out of sight

When optical laser discs first made their appearance 10 years ago, engineers were confident that an erasable version was just around the corner. Ten years later, it still is. Companies in the field, such as 3M, Philips, Kodak, Sony and IBM, have reportedly invested several hundred million dollars in research and have only a few imperfect prototypes to show for it.

Currently, the most promising system is one from 3M that's a hybrid of magnetic and optical disks called magneto-optics. Like pure optical players, a laser and lens hovers above the spinning disk. In addition, a magnet sits below the disk. To record, a high-power writing laser quickly warms a tiny area on the metallic surface of the disk, causing the magnetized molecules to line up with the magnet below. On playback, a low-power laser beam strikes these molecules and is altered slightly as it bounces off the disk. According to 3M, the disk can be written and erased more than 200,000 times.

As the read/write process is rather slow compared with conventional magnetic

floppy or hard disks, the system will probably be used mainly for archival and back-up data storage.

The Philips system is much faster than that of 3M; it uses an orderly crystalline material that can be written by a high-power laser which simply melts the crystals in a tiny area on the disk and destroys the orderly arrangement. To erase, the area is reheated and cooled more slowly so it has time to recrystallize. One problem: the material gets brittle after about 1000 write/erase cycles, far fewer than most users require.

Compaq takes the risk

Looking to beat IBM to the punch, Compaq became one of the first manufacturers to introduce a computer based on the Intel 80386 MPU (see PCW Benchtest, November). The introduction of the Deskpro 386 is a gutsy move for Compaq, since IBM's intentions for using the 80386 are unknown. The move contradicts Compaq's previously successful strategy of following IBM's lead with highly compatible products.

Even more risky is the fact that there is no commercially available software nor operating system that takes advantage of the 80386; hence, at the moment, the only real advantage of the 80386 is its 16MHz speed

which makes it considerably faster than other XT or AT machines. Furthermore, the 40Mbyte or 130Mbyte hard disk drives available with the Deskpro 386 are reported to be at least twice as fast as the fastest XT drives.

The Deskpro 386 currently runs a Unix operating system, Microsoft Xenix V/286, and will run Xenix V/386 when it becomes available in early 1987. Both these systems support up to three users. For a single user, the machine also comes with MS-DOS 3.1 which reportedly runs three times faster than on the AT.

In a related announcement, Microsoft indicated that it would not have MS-DOS for the 386 ready for at least 18 months. However, The Software Link Inc. of Atlanta, Georgia, plans to release PC-MOS/386 in February 1987. This operating system is said to behave identically to MS-DOS. It is intended as a single-user system, but it can also be used as a multi-tasking system in either stand-alone or multi-user configurations.

Random bits

Digital Equipment Corp has introduced the VAXmate, an 80286-based machine that can run MS-DOS applications and communicate easily with DEC's VAX line on minicomputers and workstations. The base unit with 1Mbyte of system memory, a single-floppy disk drive and a DEC mouse is priced at \$1945. Options include an expansion unit with a hard disk controller, a half-height 20Mbyte hard disk and two expansion slots for \$1945, a 2Mbyte memory expansion for \$1600, a Hayes-compatible internal modem for \$995, and an installed 80287 maths co-processor for \$500.

New desktop publishing packages were recently announced by a number of hardware and software vendors. Xerox has brought out the Ventura Publisher Edition (\$895) for the PC; it features an interface that

allows users to edit, modify and view documents on-screen as they will be printed. Aldus has finally released its PageMaker package for the PC (\$695) as well as Version 2.0 for the Mac (\$495). Bestinfo has introduced a new version of its PC-based Superpage package which, with hardware and software, sells for \$7000. Convergent Technologies, a hardware manufacturer, has released the Office Publishing System which runs on its NGEN Series 286-based workstation (\$7600 complete). In a related move, Layered Inc has announced a Macintosh desktop accessory, Notes for PageMaker, a tutorial on how to use PageMaker, and a primer on graphic design for the non-artist.

Retailers expect that IBM, in the wake of the introduction of its 286-based XT, will de-emphasize the existing PC, XT and AT products as it gets ready to phase them out. Zenith Data Systems continues to make inroads into the military with a contract to supply Z-248 PCs to the US Military Academy at West Point, the Naval Academy at Annapolis, and the Air Force Academy at Colorado Springs. For people who still don't understand MS-DOS, Microsoft has released a computer-based training package (\$50) called Learning DOS. It has 24 lessons and is aimed at novice and intermediate users. MicroPro has released new versions of its word processing packages, WordStar 2000 and Easy, which allow users to directly integrate Lotus 1-2-3 and Symphony spreadsheets into wp documents.

Remember when it was IBM and the 10 little Indians, then IBM and the seven dwarfs, and then IBM and the BUNCH (Burroughs, Univac, NCR, Control Data and Honeywell)? Now, with the Burroughs/Univac merger, the BUNCH loses another member and its only vowel; does anyone have any suggestions what the remaining mainframe industry should be called? **END**



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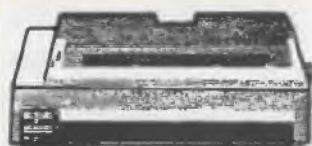
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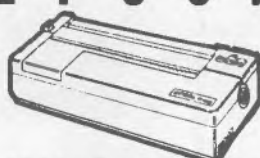
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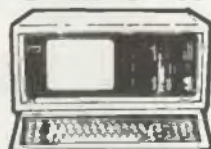
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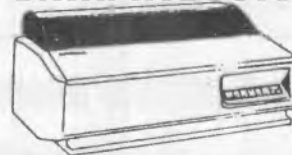
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THE WEST COAST CONNECTION



Tim Bajarín brings you the low down on the very latest developments in microcomputing USA-style. This month he takes the wraps off Ashton-Tate's surprise new package and reveals a way of buying ridiculously cheap software even cheaper.

Ashton-Tate takes a real shine

For some months now industry watchers have been hearing about a product from Ashton-Tate code-named 'Black Gold'. This product was supposed to challenge Software Publishing's PFS File and give the low-end database market a powerful new entry.

The 27 October announcement of the product, officially named Rapid File, took many by

surprise. It turned out to be more of a competitor to Software Publishing's top-end Professional series and Symantec's Q&A.

Priced at \$395, this very nifty program is for users who want versatility and do not need the power of a dedicated dBaseIII type of product. Running in 256k RAM, Rapid File uses virtual memory, and includes a file manager, report writer, memo writer and a way to

handle mailing labels. All files are interactive with pull-down menus similar to those of Framework and dBase. The comparable product configuration from Software Publishing would cost you over \$500.

I expect this new product to make a real impact on the products coming from Ashton-Tate's competitors. It should be a real winner for those in business buying low-cost PCs.

600 disks going cheap

It was for both programmers and users that user-supported software, also known as shareware, was developed and made available to the masses.

One of the ways to get these programs is through online services like CompuServe and The Source. If you have the right software communication protocols, you can upload these programs at will and try them out.

Most user-supported software distributors ask for donations of anywhere from \$10 to \$100.

The most successful group to take user-supported software and make it easy to get is PC-Sig based in Sunnyvale, California. PC-Sig is a major pipeline for software programmers wishing to list their products and it sells these programs for around \$6 per disk.

The PC-Sig library contains over 600 disks containing some 10,000 programs; the entire library is also available on CD-ROM for \$195.

A new division of PC-Sig called SIGNificant software, is about to be formed. This will take many of the programs and bundle them together, giving the user as many as 18 programs for \$19.95.

Look out for the first two products from the company: Trivial Trauma, for older PC users — ages seven and up; and Arcade Mania, which is aimed at even smaller children with access to a PC.

Power to PC publishing

Interest is rapidly growing in the desktop publishing world but, at the present time, Apple has made the running in electronic publishing. If you truly need to have text and graphics integrated, then the Apple Macintosh's bit-mapping capabilities allow the best solution today. But since there are so many IBM PCs and compatibles, there is obviously a big demand for desktop publishing software for these machines.

The PC version of Aldus' Pagemaker, already the most popular product on the Mac, runs under Microsoft's Windows application. Aldus has used the Windows approach so that the PC version is almost identical to the Mac version. It is a very powerful package but, like the Mac product, it only allows you to lay out one page at a time. Selling at \$695, it is slated to ship later this month, but my sources say it is more likely to be January.

The product that will probably become the industry's *de facto* standard is Ventura Publisher from Xerox.

Written under Digital Research's GEM operating environment, Ventura Publisher looks similar to a Macintosh program. Nonetheless, company insiders say that they are working on a Microsoft Windows version which will be out under this environment in 1987.

Ventura is different from Aldus' Pagemaker in that it allows you to lay out as many as 50 pages at a time, and it has a running text flow capability that others will try to emulate. Priced at \$895, it should be available in the UK in late December/early January.

Watch out for both of these products. They will allow the PC world to move quickly to pass the Mac as the main machine for doing desktop publishing.

Boosters for 1-2-3 users

Products that serve as add-ons to Lotus 1-2-3 have been popping up ever since the first Lotus product was released. But, two products deserve special attention.

The first, HAL, to be published by Lotus, is a natural language front-end query product that sits on top of your Lotus spreadsheet. Once you learn its vocabulary, you can ask questions such as 'What sales territory did the largest dollar volume in 1986?' It's fast, user-friendly and demystifies the use of spreadsheets. This package is a must for new Lotus users as it cuts down the learning time of anyone who wants to use 1-2-3.

The second product, 4 Word, from Turner Hall Publishing, is a powerful word processor that works with your Lotus files and spreadsheet and also sits on top of the main product. Price is not yet fixed.

Bottom line microcomputing bargains: only Californian residents need apply!

In California a major trend is developing around the 'flea market' concept. Called the 'North-West Computer Shop', this high-tech swap started originally as a place to sell computer overstock or used products. But these trading forums are rapidly

becoming places where even serious computer manufacturers are setting up shop.

Held quarterly in one of three Californian locations, knowledgeable users can walk the floor of this high-tech market and get almost

unheard-of bargains. You can buy anything from semiconductor chips, keyboards or monitors to complete PC systems for as little as 20 per cent of their original cost.

At San Jose State University, they offer a 'build

your own PC class'. For \$45 you get four hours of instruction, a video tape and a shopping list. Many of these students take their instruction sheets to the computer swap and purchase all they need to make their own PC. **END**



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LETTERS



Give them enough rope...

With reference to the article in 'Newsprint' ('Watch out — shady software about') PCW, October, I believe the article reiterates exactly my observation some time ago to your excellent (snivel!) magazine on this subject, when I stated something along the lines of: '...the cost of software has little to do with its cost of design/development, only the cost of the machine it is written for...'

When will the avaricious software houses realise that they are slowly killing the goose that lays the golden egg? Can they not see that it may be better to sell, say, 5000 copies of 'BLAH+' at only (only) £1 profit each copy, than 1000 copies at a profit of £5 each copy? Admittedly the total profit is the same, but the most important point (which none of them seem to have yet grasped) is that 'Bloggs Soft Inc', or whatever, is now 'on the map'. When it comes to marketing its next masterpiece, there are now five times as many potential purchasers (assuming, of course, that 'BLAH+' was of some use).

As I said then, if the software is cheap enough, 99 per cent of computer users won't bother to 'pirate' programs; only those who would pirate it if it were free, for the sheer kick they get, would bother, and you can't stop them in any case!

I believe that the recent spate of 'deaths' in the software publishing industry are due, broadly speaking, to the gross overcharging that the industry indulges in. There will be more if the lesson isn't learnt.

HC Leivers, Pontypridd

This is the chance to air your views — send your letters or contact us on Telecom Gold 83:VNU200 or PCW Online: PCW 009.

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We all know that the actual physical cost of software is quite small, and it's also recognised that some software companies have been pricing their software according to what the market will bear.

But whether users buy software at £50 or £450, they will still expect a certain level of support from the dealer or publisher. And no-one can afford to support a product that carries a profit margin of £1.

How would you feel about paying extra for software support? Increasingly, software companies are charging extra for support as they are forced to drop their prices and margins. Are those consequences preferable?

Beauty's only skin deep

Although Guy Kewney can't suggest why anyone would want anything but an Amstrad PC1512 in place of a standard PC (Benchtest, PCW, October), I can.

The Amstrad PC is certainly an attractive, keenly priced machine, but so are numerous clones which have already been competing near, or at the same price, with virtually the same functional specifications.

The reviews I have seen of the Amstrad PC, including Mr Kewney's, report factually enough on some of the machine's drawbacks, but their importance is lost in the effusive praise which leaves the reader with the impression that the machine is so nearly perfect that it has somehow managed to transcend all the pitfalls of microcomputer cloning in design, manufacture, packaging and distribution. It seems unlikely to me.

The drawbacks of the Amstrad PC1512 can be summarised as follows:

1) the keyboard and screen are poor; 2) the machine has not been used in anger long enough to know truly how compatible it is; and 3) its

expandability is limited.

Thanks to the PCW Show, we all got a chance to see and feel the genuine article. Not bad, but you couldn't help noticing that the screen resolution was poor. After all the abuse heaped on the IBM colour display, it hardly seems appropriate to downplay the fact that using the Amstrad display for any length of time could be more tiring on the eyes than the most berated screen in the industry.

Keyboards are more subjectively appreciated, but for my taste I would not like to type for long periods on the Amstrad keyboard. It has the same design fault as the Macintosh keyboard — the front is too high. It doesn't feel durable enough to withstand long periods of production word processing work.

From a non-technical user's point of view, the look of the display and the feel of the keyboard are the two most important ergonomic features of a machine. The Amstrad's faults are serious.

Already we are seeing evidence of compatibility problems with the Amstrad PC. I agree that EGA compatibility is not important at the low end of the market, but can you be so dismissive about choosing add-on cards which have a parallel port ('Newsprint', PCW, October)? Having to know anything about which add-on cards are compatible immediately ejects the user from the state of grace he supposedly enjoys in the Eden of Amstrad's packaging. Some unsuspecting users will lose money because of incompatibilities, no less so than with other compatibles or clones.

If you want to upgrade the RAM from 512k to 640k, you must do it when you buy the machine, or later bring it back to a dealer who can install the extra chips. For the price of the upgrade, do dealers really want to do this? They must charge more than the comparable upgrade on other clones where you can do it yourself

for the price of the chips, which are now very cheap. Users will end up paying for the extra dealer service.

The acid test of compatibility in the corporate market will be in networking. Here it is very clear. The clones, and certainly the compatibles like the Amstrad, will sooner or later be left disconnected by IBM. Firstly, it is technically difficult to ensure full compatibility for networking. Secondly, connectivity is IBM's trump card in holding on to its corporate market — it seems certain that IBM will go to great lengths to ensure that the vast majority of network stations will be IBM machines.

There is no question that the Amstrad PC is having a beneficial effect on the end-user prices of software, but it is not a panacea for the home user or small businessman because of its all-in packaging. Is there a small business market that wants to buy boxes instead of solutions? Haven't the High Street shops been burnt enough already to know that there isn't a home market?

I question who will buy this machine. In the short-run, lots of people. Barring manufacturing and supply problems, it will be moderately successful.

In the longer run, I can't help but feel that your own Martin Banks, writing in the 3 September PC Week, is right: Amstrad '...stands every chance of being a very ordinary also-ran...' in a field littered with products which are of equally good value. The clone manufacturers can do to Amstrad what they have done to IBM. They will match the product, price for price and feature for feature. And the cheap software publishers will publish their software for non-Amstrads too.

In a year, sellers of the Amstrad PC1512 will be scratching around in educational institutions — which, for many reasons, is the right market for this machine. There will be an alternative Amstrad PC

(Continued on page 127)

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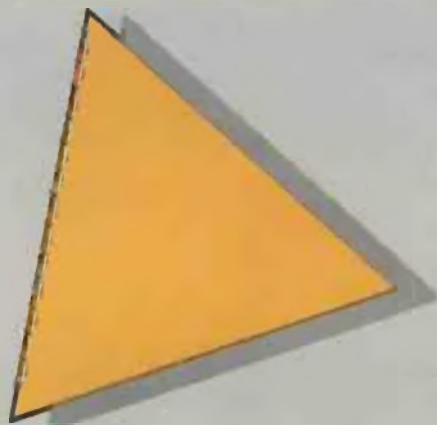
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FOR ATARI ST/COMMODORE AMIGA

(Continued from page 124)

standard to the IBM PC standard which will have moved on with corporate users in tow. The Amstrad alternative standard will enjoy an early old age. The users of this standard will seem somewhat like BBC users do now — quietly disconnected from the mainstream.

Paul Herzlich, London SW3

Attitudes to computer components like keyboards and displays are very much personal matters, and it's good to hear an alternative view to Guy Kewney's.

As with all computers, anyone considering buying an Amstrad PC1512 should make sure that it performs the functions they want before spending one penny. If monitor quality or expandability are important, then try out your software and add-ons first. And if the dealer won't let you, go somewhere else — it's your money.

As the Checkout on page 142 of this issue shows, there are plenty of other low-cost compatibles available.

A fine line

Mr Banks is apparently unaware ('System crash', PCW, October) that human beings are already redundant.

The Insect Intelligence controlling the infrastructure of this planet (known as Ahri-man — the Devil to you) decided many moons ago to phase out the wetware in preference to those nice, new, neat and clean crystalline peripherals you call computers.

The advantages are obvious to a truly competent (and detached) mind. Stop snivelling — are you a man or a machine? It's them or us: power off now, and avoid the rush.

Mike Moscoff, London NW3

'British Disease' solution

I have read with interest the recent correspondence relating to the 'British Disease' and unhelpful suppliers of software and hardware in general, and would like to offer the following suggestions to

those who have problems:

- 1) If you send a letter, send it by recorded delivery. Nothing focuses the attention more in a company than someone having to sign a receipt for what could be an embarrassing piece of correspondence.
- 2) Do not make threats that you are not prepared to carry out. If more dissatisfied customers carried their claims through to a conclusion, more bad suppliers would vanish before much harm was done.
- 3) If you return goods, register the parcel and give a deadline for the return of your money.
- 4) Keep accurate copies of all correspondence.

I would suggest that it's in the interest of both PCW readers and advertisers that your magazine should more frequently publish articles designed to appraise readers of their rights, perhaps even to the extent that PCW itself might undertake to investigate frequent complaints and publish the results. Good suppliers would benefit from having less competition, the industry would benefit from having a better public image, and the customers would be forewarned.

John Oliver, London N13

Digital Research answers back

I would like to correct a number of points made about Digital Research products in the review of the Amstrad PC1512 (PCW, October):

- 1) I have to correct the mistaken assumption that Alan Sugar 'got DOS Plus free when he bought GEM'. Developing operating systems is a long and costly process and Amstrad is paying Digital Research for every copy of DOS Plus shipped (although our contract with Amstrad precludes us from disclosing how much). DOS Plus is a high-performance operating system which offers certain features not available under MS-DOS, the other operating system included with the Amstrad PC. These are:

— It is a multi-tasking operating system which runs up to three applications in the background while a main

program is onscreen.

— In addition to PC-DOS applications, it runs CP/M-86 applications, providing a large choice of software for the user.

— It is compatible, through its ability to run CP/M-86 software, with the Amstrad PCW and CPC ranges of which a very large number of machines have been sold.

2) Loading GEM for the first time on a PC1512 is hardly a 'long-drawn-out nightmare', as stated by your author. It involves booting with one disk, inserting a second disk and clicking the mouse on the 'OK' box. I can only assume that the author was not following this standard procedure. Your author goes on to defend his position in an article in the November issue of PCW by suggesting that a user might first manage to screw up the GEM boot disk. Well, enough said.

3) Basic 2 does not use an 'enhanced and improved' GEM. Rather, in building its application, Locomotive has made excellent use of the functionality which is standard in GEM.

4) I think there must have been a sub-editing slip in the paragraph on page 134 referring to applications software. After mentioning that both GEM Paint, a freehand and painting program, and a screen-based text editor called RPED are supplied, it talked about having one rather than the other, as if the user had to make a choice. Both are included with the new Amstrad PC. It is anyway quite difficult to ascertain how you would actually compare a text editor with a paint program.

The Amstrad PC was designed as a GEM machine from the start, with all the necessary facilities included as standard. It was designed to expand the market for PCs and, by implication, it had to appeal to a large number of first-time users. I find it hard to believe that it was the author's intention to encourage PC1512 buyers to discard their GEM Desktop in favour of the DOS command language as the easiest way to use their computer. This would relegate it to the ranks of an unenhanced clone sporting the A> user interface. The Amstrad PC offers a lot more.

Paul Bailey, senior vice president, Digital Research Inc, Europe

Guy Kewney replies: Paul Bailey is quite right in suggesting a slip in the paragraph on GEM Paint and RPED, and only wrong in suggesting the fault was with the sub-editors. It was my own work, and remains a mystery to me. Not even my memory yields any clues as to what on earth I was trying to say.

As for the rest — well, I told you Paul and I weren't going to agree on this one.

The problem with DOS Plus is not easily resolved. What Amstrad did or did not pay is a matter of interest only to Digital Research, and my 'assumption' was nothing of the sort. It was just a cruel way of disparaging the version of DOS Plus on the Amstrad PC machine.

The problem with DOS Plus on the Amstrad is simple: it may run CP/M-86 programs brilliantly, but I don't have any of those. I have programs requiring MS-DOS 3.0, and I also have memory-resident programs.

The current version of DOS Plus won't allow me to use these.

To Digital Research, these programs are irritating trivia. To me, they are crucial. But nonetheless, according to Digital Research, the new version of DOS Plus will allow SideKick, Outline, Smartkey, Mirror, and so on and so on, to run.

Is this new version going to be on the Amstrad? Paul Bailey says Amstrad has the rights to the new version. Amstrad says that's as maybe, but it isn't distributing the new version. Bailey says it is. I think he's in for a surprise, unless he can renegotiate the deal.

Locomotive considers it has improved on GEM. It considers it has left out some bits which didn't fit in with others, and written things which GEM should have contained anyway. Possibly, Locomotive was more tactful in the way it put these facts when it spoke to Paul Bailey, than it was when it spoke to me.

To add one final comment: I don't dislike GEM. It is, a lot of the time, an improvement on A> and it is, in many ways, an improvement on MS Windows. But I stick to my opinion that the pair of them, as far as windowing environments are concerned, are not a patch on the Macintosh, and they never will be.

END



BANKS' STATEMENT

True spirit

Martin Banks narrates a cautionary tale about Christmas past, present and future.

Well, Christmas is nearly upon us once again and the kids are getting excited because parent persons are considering ... just considering, mind ... whether they might indulge in a personal computer this year.

It's a difficult problem for them. Maybe they missed out on the last rounds of Christmas techno-gluttony, when parents from every part of this festered isle seemed to rush out and buy their offspring a Spectrum or a BBC or a Commodore 64 or a whatever, only to find that in a reasonably high percentage of cases it didn't fulfil the parental dream.

Instead of intently learning *all* about computers, getting jobs as chief programmers with software companies and getting a Ferrari they were too young and inexperienced to drive (a particular dream of the yuppy parent, who might then get the chance to drive the thing themselves), most kids simply learned how to zap space invaders of one race, colour, and dubious religious persuasion in a bloodless orgy of commuted violence.

If not that, the luckless Christmas present found its way into the back of a cupboard, there to remain until discovered, many centuries later, by ardent anthropologists who would set out to prove that the find marked the emergence, or breakdown, of 'civilisation'.

Some lucky machines would be given some useful status in the home, propping up the short leg of the kitchen table, for instance.

All that was in the old days, however. Now the parent persons have a justifiable reason to rush out and buy a personal computer for the family, a reason of their own. The emergence of the Amstrad PC1512 brings them the industry standard desktop marriage of person and machine at a price which makes it attractive for the home user.

It has all the bits needed; PC compatibility (well, at the time of writing this, the first doubts about how *total* that compatibility is have already started to appear... needless to say, it is unlikely to prove as compatible as most others). It is also generating a new splurge of cheap applications software spun off the back of old, usually fairly well-proven, packages.

Best of all, it is not expensive.

This, for the individual home user, is not quite the same thing as being cheap. At £458 for the lowest-cost single-disk version, it is still a goodly lump of disposable income. This is not the whole price story, either, for most users are going to want a printer, and even a cheap one adds to the price. Also, any half-serious user will soon appreciate that a dual-disk version is a much better option, so once again the real price will go up.

Despite all this, it still represents what marketing executives love to call an 'aggressive price position relative to the competition'. That competition has, until now, had its sights firmly set on the business side of the IBM PC-compatible market-place. That, after all, has been where virtually all the sales have been. One of the key levers that could bring the Amstrad machine into the home in large numbers this Christmas, is the fact that there are now many people using PCs at work.

Having a PC at home as well could prove to be very helpful in the parents' working lives, making them able to do something creative/essential/demanded-of-them-by-their-boss in their own time. It could also go a bundle in the self-esteem battles with the neighbours ... 'Still trying to do consolidated accounts on that?' you could say to a neighbour, as you disdainfully stare down at a tarted-up games machine.

But hereby lies a potential problem for Amstrad in getting the PC1512 into homes. Alternatively, it could spell a problem for lots of computer manufacturers, IBM being not least among them.

The nature of the problem is in the existing systems used by many companies (and therefore many potentially Amstrad-buying parents). The growth in the clone market generally has cut IBM to the quick, and there is a general consensus that the company is now going to do its best to move the business/corporate PC market-place to new machines, probably of a more proprietary nature.

There is much less consensus as to what these new machines might be like; whether they will be based on Intel's new 386 processor, the existing 286 processor with new, prop-

rietary software, or the RISC-based RT/PC line. It could move in any or all of these directions, and probably will, fairly soon.

The next question, however, is whether those corporate users will actually play the game and follow the new tracks being set out for them by IBM, and some other manufacturers as well. To be sure, some of them will.

Some will be IBM houses right across the board, in which case a move to new machines (that will almost certainly include integral facilities for micro-and-mainframe communications) will be natural and essential. Others will be DEC-based establishments, in which case the new VAXmate MS-DOS machine will attract, as it gives them the growth path they would like between the PC environment and the overall VAX environment.

For executives in these companies, they may find that the idea of having a PC at home could be severely prejudiced by its potential incompatibility with what the company is now going to use. This, in turn, could adversely affect the demand for Amstrad PCs in the home market.

On the other hand, there could be growing instances of what I have in the past referred to as FIRM: Functional Inertia Response Neurosis. This can come in many forms, including the classic: 'Wait until the price drops low enough to buy, and then when it does, find that a later model has more interesting features that you are willing to wait for until the price drops low enough' (repeat endlessly until the technology is no longer relevant).

Another form, however, is where existing users just get fed up with all the changes foisted on them by the industry. In this case they simply refuse to buy, partly because they don't yet understand the capabilities of the systems they already have, and partly because they haven't yet used up their machines' applicability.

In this case, they will stick with what they know - the PC. The big companies will get egg on their collective faces and Amstrad ... well, Amstrad could sell heavily not only into the home, but business as well. Next year should be fun.

END

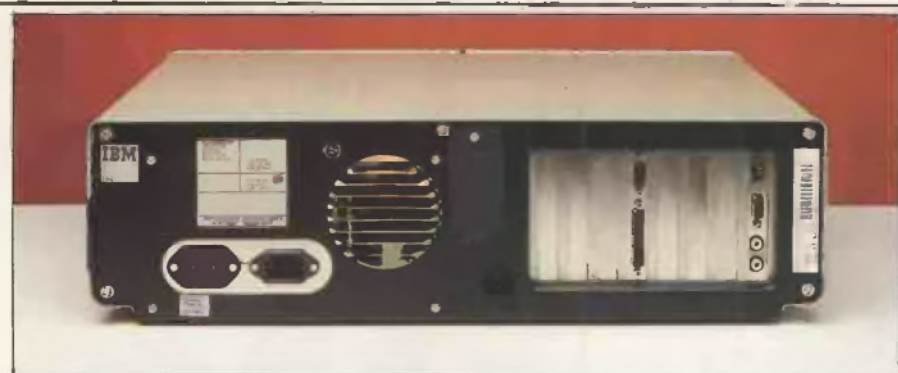




IBM XT 286

While surely never hoping to repeat the immortality IBM has achieved with the PC, the company continues to produce machines which seemingly serve as stopgaps before it sets the next standard. The XT 286 is either that, or a rather hurried attempt to sound the death-knell for the 8088 processor. Peter Jackson sounds it out.





The eight expansion slots are low — PC height, not AT height

It's a sign of the times that when Amstrad and IBM launched their new PC models simultaneously in September, Alan Sugar's machine got top billing just about everywhere. This, considering the size of the companies and their status as PC originator and mere clone maker respectively, is peculiar indeed. True, it's not every day that a £399 IBM-compatible appears on the jaded market. But it's not every day that IBM launches a PC either, even one that receives the mixed welcome the PC/XT Model 286 did when it came out battling against the PC1512.

The commentators — those who could find space to comment around the Amstrad material — found it hard to see a purpose for an 80286-based machine, competitive with the AT but in a PC box, unless it was the first sign that the ancient regime of the 8088-based IBM PC was coming to an end. And even then, the XT 286 was not the much-rumoured cheap clone-killer, or the dynamite-priced new AT, or even the new IBM 386 machine that is already appearing, we hear, in corporate beta test sites. Comments ranged from 'a stopgap measure', through 'the end of the 6MHz AT', to 'I don't get the point of this machine.'

But as the first non-AT PC to emerge from IBM since the less-than-dramatic announcement of half-height floppies and a 20Mbyte Winchester for the XT in the spring, the XT 286 deserves consideration. It could be the pall-bearer for the 8088, and the future standard PC in the IBM line — and then again it might not. Let's take a look and see.

Hardware

The initial IBM PC design in 1981 has become something of a classic, at least externally. It may look nothing more than a big square box that is too high to stand a monitor on, but in fact IBM was limited by the design philosophy it had chosen. It wanted a machine that had space for at least one floppy disk drive, and preferably two, since the floppy drives of the day only held not much more than 100k.

These floppy drives were full-height, since there was nothing else around then, and putting two of them side by side set the minimum width and height of the box. The depth of the drives with a shielded power supply box behind them governed the depth of the external case, and the decision to include Apple II-style expansion slots — the single greatest contribution to the PC's success — meant that they had to go to one side of this floppy/power supply block. With the depth and height of the case fixed, the maximum size of the expansion boards was automatically fixed at the dimensions that are so familiar today.

The result was the system unit that forms part of the three-box set-up which is now typical, but was very rare indeed in 1981 when keyboards were built into the computers or all the work was done at terminals. Mark my words, the PC system will get a design award after the machine itself is dead.

The XT 286 system unit uses the absolutely standard PC case, all in grey and beige sheet steel, with the

normal two full-height disk drive holes and ventilation slots in the slanted front panel. All the dimensions are precisely the same, and the only concession to the new product is the new IBM name-and-type badge proclaiming that it is indeed a Personal Computer XT Model 286.

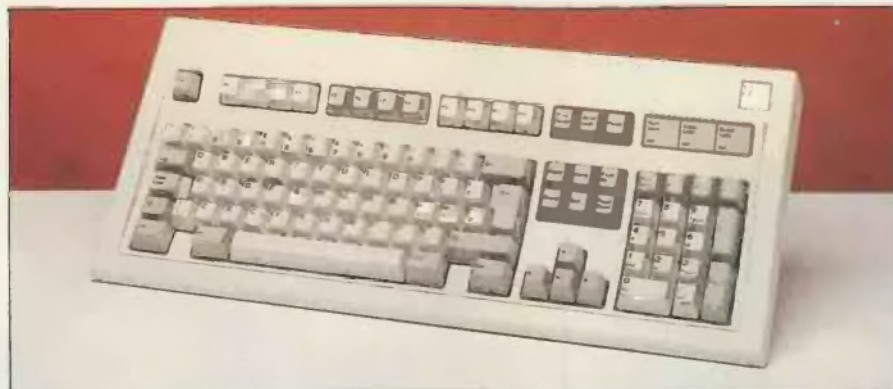
Removing the system unit case has a familiar feel to it; removing five screws from the back panel allows the case to slide off forwards and leave the chassis exposed.

As mentioned earlier, the general internal design of the PC has not changed over its five years of life, but the basic circuit design of the motherboard has been through a number of incarnations. First there was the original PC, with 16k RAM installed and sockets to take that up to 64k using 16k RAM chips, along with five 8-bit expansion slots, a home computer-style tape cassette interface(!) and Basic in ROM. Then came the XT, with up to 256k RAM on the main board thanks to 64k memory chips and eight 8-bit expansion slots of various lengths, a bit closer together than those on the PC. Then came the AT, with a completely new motherboard built around the 80286 processor, with 512k RAM on the board and a new combination of 8-bit and 16-bit slots. And then came the new XTs, with expansion to 640k RAM on the motherboard but otherwise just the same as the old ones.

Now the XT 286 adds to the list. The new motherboard fills the gap between the hefty metal casing of the power supply and the side of the chassis, overhung by the left-hand floppy drive. As usual, the half of the board furthest away from the front panel is dominated by the expansion slots; in this case there is yet another new combination of three 8-bit PC-style slots and five 16-bit AT-style slots. Two of the three 8-bit slots are short ones, behind the floppy drive, while the other is a long one at the extreme edge of the board.

The other obvious change from the old XT is the replacement of the 8088 processor chip by the big, square 68-pin block of the 8MHz 80286, right at the front of the board alongside the empty socket designed to take the 80287 maths co-processor that is now readily available off the shelf for £300 or so.

And apart from that, the board is a very peculiar object indeed. The memory area of the old XT, forward of the expansion slots, is now filled with a mish-mash of simple, standard, Advanced Low-power Schottky TTL chips surrounding the 80286. These chips, with numbers like 74ALS245 or 74ALS02, appear in all computer systems to do the house-keeping jobs around the board. They normally include just a few logic gates, or inverters, or level shifters, and tailor and manipulate the signals



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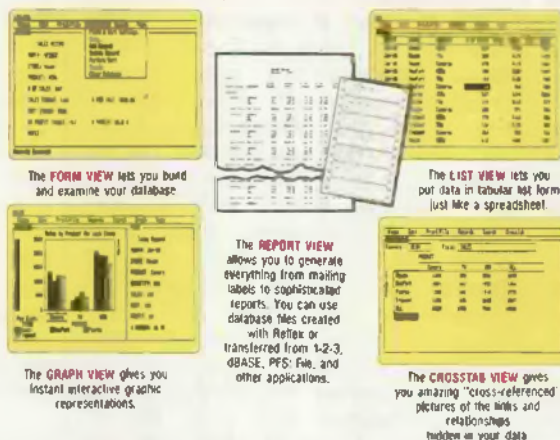
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travelling around the computer's circuitry.

As there is a lot of signal-tidying to be done, there are normally a lot of these chips in an initial board design. But the big breakthrough in the last five years has come with custom and semi-custom gate array chips, often just called uncommitted logic arrays or ULAs. These are large chips with hundreds of logic gates on them, and the connections between these gates are not made until the last manufacturing stage. This means that chips can be tailored to do a specific set of logical jobs; and this in turn means that a single ULA can be customised to replace a large number of standard TTL chips and simplify board design. Hence, later models of computers tend to have their TTL chips changed into ULAs in order to get cheaper manufacture and higher profit margins.

But you would not guess from the XT 286 board that IBM had *heard* of ULAs, even though it has just done a deal with chip-maker Intel covering the technology. IBM is so good at custom and semi-custom chip design that Intel has handed over manufacturing and technology rights to its existing and future microprocessors, just to get hold of IBM's computer-aided chip design system and its standard custom chip library. It's painful to think it, but the XT 286

board looks like an early version that will be tidied up later, or something that has been put together by designers in a hurry.

One interesting incidental is that IBM seems to have already taken up its manufacturing options, since the 80286 in the review machine had an IBM manufacturing label rather than an Intel one.

The memory arrangement is a little strange, too. Gone are the neat rows of memory, each with nine chips instead of the more usual eight to allow parity error-checking, so familiar from the XT and the AT. On the new board there are two single in-line packages (SIPs), each holding nine surface-mounted 256k RAM chips and providing 512k of RAM. Next to the new SIPs is an odd combination of two more 256k RAM chips in more conventional form, combined with four physically larger and more archaic 64k RAM chips. By my calculations, that gives the XT 286 a total of 672k of RAM, 640k of it for the user.

However, the combination of SIPs and a patchwork of conventional RAM chips in the XT 286 is not so easy to understand. In the absence of the IBM technical reference manuals for the machine — the review model was supplied by big City dealer Personal Computers — the memory architecture remains a mystery. The

power-up RAM test of the machine, however — much speeded up over the one on the conventional PC or XT — showed 640k available.

The notion that the motherboard is a preliminary product is given further weight by the use of EPROMs for the 64k of ROM on the motherboard, used mainly for the Basic Input/Output System (BIOS) and IBM ROM Basic. EPROMs, which can be erased using ultraviolet light and then re-used, are normally used for prototyping software that will, in the end, be hard-wired into proper ROM chips where the software contents are fixed during manufacture.

As with the original XT, the only other major function on the motherboard is a real-time clock maintained by a trickle of power from a battery pack mounted in the back panel. The other necessary functions, like the display and input/output ports, are driven by plug-in cards.

The only plug-in card that automatically comes with the XT 286 is the disk controller board, since the minimum configuration of the machine comes from the factory with a 20Mbyte winchester drive and an AT-style 1.2Mbyte floppy drive. The controller board uses a Western Digital 1100 custom controller chip rather than the NEC chip on the original PC, and can handle combinations of both hard and floppy drives. It's a long board, and takes up one of the 16-bit slots in the machine; due to the positioning of the drives and their interface cables, it really has to go in the last of the 16-bit slots right next to the floppy drive.

The choice of display and input/output adaptors is up to the customer, who can either buy the (expensive) IBM products or go for third-party expansion boards from the dealer's shelves. The review machine came with an Enhanced Graphics Adaptor from AST Research, since the dealer had no stocks of the official IBM product, and with a board combining a standard IBM Centronics parallel port and a nine-pin RS232 port as provided on the AT. This second board had no maker's name on it, and was an unusual size; it would not fit in one of the short slots, since it was too long to go behind the floppy drive casing, and had to go in one of the 16-bit slots despite being an 8-bit board.

Handling the power requirements of the EGA card and the other sorts of expansion boards available today, not to mention the power-hungry 80286 itself, needs a beefy power supply. The XT 286 now comes with a 157W supply, as against the 130W of the original XT and the 63W of the original PC.



The XT 286 contains large amounts of TTL logic chips — there are no ULAs

As briefly mentioned above, the standard configuration of the XT 286 includes a 20Mbyte hard disk and a 1.2Mbyte floppy drive. On the review machine the half-height floppy came from a large but unsung Japanese company, YE Data, while the full-height winchester was actually built by IBM Japan rather than bought in from an OEM. Perhaps IBM's unhappy experiences with the AT's initially flaky third-party hard disks have driven the company back to sourcing in-house.

The big surprise about the disk drives is not that the hard disk comes as standard — most users these days demand that — but that it's the same much-criticised hard disk used in the 8088-based XT. One drawback of the XT is its slow hard disk access — 85 milliseconds average — when its full-height winchester is compared with the fast half-height 5¼in and 3½in drives now on the market, and even IBM acknowledged this when it went for the faster 35-millisecond drives for the AT range.

The decision to lumber the XT 286 with this slow drive, when the machine is fundamentally comparable with the AT/X as far as its electronics are concerned, seems ridiculous when faster drives are available. It starts to seem criminal when the customer or dealer is not even given the option of installing a faster hard disk without first buying the slow one, and then, presumably, throwing it away or propping up a table leg with it.

The only explanation that makes sense is that IBM doesn't want the XT 286 to compete head-to-head with the AT/X, and has slugged the hard disk drive with enough of a performance difference to push the corporate power users upmarket to the more expensive machine. Of course, it could just be that IBM Japan had a warehouse full of slow, full-height, four-platter drives that it needed to get rid of at cost...

Quizzed on this subject, an IBM spokesman in the US, with typical openness, said that the drive had been used and fitted as standard because IBM had designed the machine that way — end of story.

The obvious use for the spare half-height floppy slot is to put a standard 5¼in, 360k drive in there, since the 1.2Mbyte drive, like that on the AT, can happily read 360k disks but has trouble writing them reliably. However, the option now exists to install an internal 3½in floppy drive for file transfers between the XT 286 and the IBM Convertible, the Data General One, the Toshiba 2100 and 3100 PC-clone and AT-clone laphelds, the Atari ST, or any other machine that uses a standard 3½in format. The review machine was supplied with MS-DOS 3.2, whose main

advantage over 3.1 is support for the smaller floppy size.

The XT 286 keyboard is the enhanced model introduced with the AT/X and the half-height-floppy XT's earlier this year, which has had mixed reactions. IBM intends this keyboard to be standard across its entire range of products including mainframe terminals, all the PCs, and even the PC/RT RISC machine that IBM UK insists on calling the 6150, and some of the changes to the familiar PC layout have been made to increase compatibility with the keyboards used by hundreds of thousands of IBM mainframe terminal users worldwide.

Of course, these changes are also calculated to drive experienced PC users insane.

The most obvious differences are the new row of function keys along the top of the keyboard and the separate cursor and editing key groupings, which leave the numeric keypad free for fast number entry without any annoying switching to get back to cursor mode.

The function keys have not only been moved from their usual position at the left-hand of the keyboard — making thousands of application software function key templates obsolete overnight — but have also been increased in number to 12 for compatibility with mainframe terminals. Existing software that only uses 10 function keys will work fine, with keys 11 and 12 doing nothing, but will have to be re-written to take advantage of the extra two keys. It seems unlikely that publishers of existing software packages will bother.

The other changes to the keyboard are more subtle and thus more aggravating when they are found. The Escape key used so often in menu-driven applications is now off the main part of the keyboard altogether, and is positioned in a hard-to-hit place alongside the function key row as if it were Function Key 0.

Worse, the great leaps forward made with the IBM AT keyboard — the enlargement of the left Shift key

to get rid of the extra key between Z and Shift, and the enlargement of the Return key to cut down the reach from the touch-typist's home keys — have been reversed. The backslash ('\') moves again from its useful position next to backspace to take up its old place between Z and Shift, and the Return key has been cut down to fit an extra hash ('#') key between the quote key and Return.

And worse still, IBM has made a great leap backwards by moving the Control key down below the left Shift key, and putting Caps Lock — of all things — where any sane computer user expects Control to be. Apparently, IBM typewriter users expect the Caps Lock to be above the Shift, and that is why the change has been made. Fine, fine. Of course, typewriter users don't need to use the myriad control key sequences in WordStar, to name just one package.

This is madness. The changes to the original PC keyboard demanded by touch-typing users have been changed back again for no apparent reason, and should cause the same anguished howls that went up when the PC was first released.

There will be less argument about the other changes. Those out-of-place system control keys at the top row of the numeric keypad have been moved up alongside the function keys, and the numeric keypad now has its own Enter key and a more logical arrangement of mathematical keys. And the shape of the board has been changed, with a distinctively mainframe terminal-like curve upwards at the top, to allow touch-typists to reach for the new row of function keys without too much stretching.

The 'enhanced' keyboard has kept the same clacky and positive feel as the original PC board, and feels like a heavy-duty product that will take a lot of pounding. But there's no chance of my switching from the AT layout to the new one, simply because of the crazy recidivist changes to the design. If I hit Caps Lock one more time when trying to do a Control-U...

On the other hand, the Enhanced Graphics Adaptor and the Enhanced Colour Display monitor really do live up to their grandiose names. For those used to the muddy purple and horrible blue of the IBM Colour Graphics Adaptor, the bright shades and sharp edges of the EGA card and monitor will come as a revelation. Window-based applications like GEM suddenly become much more Macintosh-like — the EGA display has more resolution than a Macintosh, in 16 colours — and with an 80286 in charge, the performance is high enough to drive the display to advantage. It's no wonder that the EGA is becoming the new standard, and with third-party board makers in

	IBM XT 286 BasicA	IBM PC BasicA
Intmath	1.9	6.2
Realmath	2.3	8.2
Triglog	8.3	47.0
Textscrn	59.7	100.0
Grafscrn	12.2	49.0
Store	2.8	12.8
The XT 286 used a 2Mbyte hard disk for store; the IBM PC used a standard IBM 360k floppy		
<i>All timings in seconds. For a full listing of the Benchmark programs, see page 180, October 1986 issue.</i>		

The ~~Daley Thompson~~ guide

100m and 400m

The speed of Epson's new FX800 printer has to come first on two counts.

In draft Elite, the printer sprints along at 240 characters per sixtieth of a minute. (Note: the word s****d has no place in our vocabulary.)

And even in letter-quality mode, it dashes along at 35 c.p.s.. This makes the FX800 an astonishing 50% faster than the popular FX85 machine which it supersedes.

Long Jump

A longer version of the FX800 is also available — the FX1000. This does everything the FX800 can, but has the further advantage of allowing you to run up spreadsheets (up to 0.406 metres flat out).

Shot Put

A powerful 8K memory is another of the FX800's great strengths. This enables you to put your computer to other uses while it is still printing, instead of being shouldered with a tiresome wait.

High Jump

The FX800 printer has a far higher speed than the old FX85, it is clear — yet the price has been left exactly where it was. The FX800 costs only £438 — and the FX1000 is just a few notches up at £569 (both RRPs, bar VAT).

110m Hurdles

Making quick leaps from one typestyle to another is no problem with the FX800.

You no longer have to stumble over difficult software commands or trip awkward DIP switches on the back of the machine.

For by simply pressing one or two buttons on the 'Selectype' panel on the front of the FX800, you can change the typeface over and over again in no time at all.



to being a great all-rounder.

Discus

Discussion papers, reports and accounts can be greatly enhanced if you throw in a few pie charts, bar or line graphs.

Of course, you can rely on the Epson FX800 to come up with the goods every time.

1500m

Finally, as you would expect from the world's number one, the FX800 will run on and on and on with no sweat.

Indeed, it is so well-built that its print head will pound the paper at least 100 million times before it even thinks of giving out, which means that it stands head and shoulders above its so-called rivals.

Pole Vault

The FX800 is highly flexible on several levels.

It is compatible with the vast majority of PCs, as it has a full IBM character set built in.

It can produce high-resolution graphics as well as text.

But over and above all this, a range of paper feed options is available to enable you to free your hands when your workload is at its peak.

Javelin

The sharpness of the FX800's print quality far surpasses that of any other printer in its price range.

In fact, it is armed with not one, but two correspondence-quality fonts for you to use when sending out business letters.

However, even when the FX800 is flying along in draft, the quality is still perfectly fit for internal memos, labels, spreadsheets and general data sheets.

When you add up all the points above, there can be no doubt that, for its price, the Epson FX800 is unbeatable for daily use in the office.

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the ring, the price is coming down fast. Users will soon demand it as they have demanded the full 640k of memory.

Compatibility

If anyone should know how to make an 80286 machine compatible with an 8088 machine, it's IBM. And the company seems to have done a good job with the aid of all that random TTL circuitry. The Thesys 2Mbyte Lotus-Intel-Microsoft expanded memory board went in and worked first time, as did the Racal-Milgo PM22 internal 1200-baud modem and the Mountain DriveCard plug-in 20Mbyte winchester (which is, incidentally, as slow as or slower than the XT 286's main drive).

All the software tested worked fine and quickly, including Smart, Side-Kick, Turbo Lightning, WordPerfect, Interface Technologies' Modula-2 compiler, Microsoft C, AutoCad, GEM and all its applications, and everything else. And all of them looked much better with the EGA display.

In fact, the surprise would have been if any of them had failed to run. At the launch of the AT there were some packages that failed, but any software publisher worth its salt has new versions out that will work on any PC from the AT down, and that includes, by default and IBM's design, the XT 286.

The only potential problem is a

physical one: the AT case is at least half an inch deeper than the XT 286's, and some AT-specific cards — AST's RAMpage springs to mind — just won't go in the XT 286 with the lid on.

It was fascinating to run, side by side, an 8088-based PC, the XT 286, and a 32-bit Compaq DeskPro 386, all running the same software with roughly the same performance gap between them. The XT 286 was roughly twice as fast, for most applications, as the PC, while the Compaq was twice as fast again. It was even more intriguing to run the Compaq 386 demo program — using lots of graphics and pushing the EGA to its limits — on the XT 286. The program ran perfectly on the smaller machine, albeit slower and more jerkily, and I'm not sure whether that is a credit to the compatibility work of Intel, IBM, Compaq, or all three.

System software

The operating system provided was PC-DOS 3.2, the IBM-badged version of MS-DOS 3.2. There is little point in rehearsing the description of MS-DOS here, since so many users are deeply familiar with its ins and outs; and 3.2 adds little to 3.1 apart from 3½in disk support.

Price

The base price for the XT 286 system unit, including 640k RAM, one floppy

drive and one 20Mbyte hard disk drive, is £2686 ex VAT. In the review configuration, with extended keyboard, PC-DOS 3.2, the AST EGA card and a serial/parallel adaptor, and IBM Enhanced Colour Display, the price goes up to £3888.

Conclusion

The XT 286 is, in itself, a good PC-compatible that no clone-maker would be ashamed of. Its performance is higher than the old 8088-based PC or XT, apart from the sluggish hard disk drive, and if the manufacturer was not IBM there would be no complaint.

However, since the manufacturer is IBM, there are other considerations. The XT 286 doesn't seem to fit properly into the PC line, squeezing its way in between the XT and the AT/E with difficulty as the AT price falls and the justification for buying a lower-performance PC diminishes.

As an AT in an XT box, the drawbacks of the XT 286 are the difficulties with AT-sized expansion boards and the compulsory purchase of an inferior hard disk drive. The advantages are harder to spot, apart from a price difference that begins to seem less important when the advantages in performance of the AT are considered.

If the XT 286 had been launched as the original XT, IBM would have had a winner on its hands. If the XT 286 is the replacement for the XT, with the AT going up-market to sit underneath the putative 80386-based 32-bit machine, then it would be adequate to the task.

But as it stands, the machine looks like a temporary measure that will not long survive the rash of new PC product introductions that IBM is readying for sometime in 1987, and that will not be able to handle the forthcoming dedicated 80286 operating systems adequately unless the memory architecture is less peculiar than it appears.

If you *must* buy IBM and an AT is out of reach, then the XT 286 would be a good choice to beef up the performance of a PC application. If you don't have to buy IBM, then the better course would be to buy an AT clone that would be cheaper than the XT 286 and would do the beefing up rather better.

And if that sounds like faint praise of the machine, it is. IBM is acting as though it has the only PC product line in the world, and as its market share and profit figures show, *that just ain't no longer so.*

Machine supplied by Personal Computers on (01) 377 1200.

END

Technical specifications

Processor:	Intel 80286, 8MHz
RAM:	640k
ROM:	64k
Mass storage:	1.2Mbyte floppy drive, 20Mbyte hard disk
Display:	Monochrome, CGA and EGA adaptors and monitor
I/O:	Various adaptors available
Expansion slots:	One long and two short 8-bit slots; five long 16-bit slots
Keyboard:	IBM extended, 102 keys
Operating system:	PC-DOS 3.2
Bundled software:	None

In perspective

The XT 286 has to compete in the market not just with cheap AT clones offering more for less money, but with the host of cheap upgrade products like the Mountain Racecard or the Orchid Baby 286 that will give an existing XT an 80286 processor and all the advantages that the XT 286 does apart from the 20Mbyte winchester. And add-on hard disks for XTs are not hard to come by (cheaply).

The market for the XT 286 looks slender and temporary, and the reasons for launching it are obscurely hidden inside IBM's corporate structure. Of course, if the XT 286 suddenly becomes the base level of IBM's PC line, with a price cut to match, then this analysis fails; but the artificial crippling of the machine seems to point to a temporary niche product that will not have a long market life.

As always, time will tell. But when the AT is becoming the minimum standard thanks to the clone makers, the XT 286 looks less than enough.

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PC clones

The Amstrad PC1512 may have its faults, but, when compared with other low-cost IBM clones, it's definitely the next-best thing to the PC. John Donaldson came to this conclusion after looking at five PC 'pretenders', and here he presents his findings.

The introduction of the Amstrad 1512 has focused many people's attention on the cheap IBM PC clone market. However, this market isn't the sole preserve of Amstrad and there are a great many companies offering sub-£600 PC clones.

The Amstrad machine is not without its faults; the question is: do the other products in the market have anything special to offer the potential Amstrad buyer? In this review I shall be looking at five entry-level systems to assess their viability against the Amstrad.

Tandy 1000EX

Tandy is a strange company. It sells everything from lie detectors to hi-fi, pausing briefly for computers somewhere along the way. Along with Apple, Commodore and Atari, Tandy was one of the first companies to offer reasonably priced home micros through its chain of retail shops.

As the market for business micros progressed, Tandy stuck to its own path with an increasingly outdated product range. This looked all set to change with the introduction of the model 1000, Tandy's first IBM-compatible machine, which was generally acknowledged to be a good machine.

The 1000EX is totally different from the 1000. Although it's IBM-compatible, it has been designed as a low-priced machine for home/business use. As far as I'm concerned, it marks a return to the bad old days for Tandy.

One thing Tandy can be sure of is that it won't be sued by IBM for copying the PC casing — the 1000EX could hardly look less like an IBM if it tried. The keyboard and the system

unit are combined into one unit, with the single 360k floppy disk tucked away on the right-hand side. The keyboard is horrible. It's the first unit I have seen on an IBM-compatible which isn't in the least like an IBM keyboard. It looks like a combination of bits of the keyboard from the PC, the AT and the AT Enhanced. The layout effectively means that you won't be able to use the keyboard templates supplied with many popular IBM programs. It's also guaranteed to drive anyone who is familiar with the PC or AT keyboard totally mad.

The rear of the machine has I/O ports for a printer, an external disk drive, composite and RGB video, and three blanking plates for expansion cards. This might sound good, but from a compatibility point of view it's a disaster.

The printer port is an edge connector onto the main circuit board and is markedly unlike the IBM 25-way D socket. The external drive port can take either a 5¼in IBM-compatible drive or a 3½in 720k unit. I take a dim view of external disk drives, especially on a PC-compatible, but I suppose it's better than nothing.

The processor inside the 1000EX is the same Intel 8088 as used in the IBM PC. The main difference is that it is clocked at 7.16MHz as opposed to the 4.77MHz of the PC. If required, it can be slowed down to 4.77MHz by issuing a command from DOS.

Finally, we come to the expansion slots. As you may have guessed by now, these aren't IBM-compatible either. The base model 1000EX comes with 256k of RAM and one expansion slot. You can increase the memory to 384k by adding the Memory PLUS Expansion Adaptor. As



Low-cost IBM clones line up for inspection

well as giving you extra RAM, this card also gives you two more expansion slots and adds a DMA chip to the system. Memory can be taken to a maximum of 640k by adding another kit available from Tandy.

Having got all that off my chest, I must admit that Tandy has done a much better job on software compatibility than it has with the hardware.

The system is supplied with MS-DOS 2.11, which is fine when you consider that it isn't possible to add a hard disk or to network the machine. It's also supplied with the Phoenix ROM BIOS to give it PC compatibility. Phoenix has supplied



top row: ARC's The World, the Barbatan PC and the Walters PC; bottom row: the PC Sport and the Tandy 1000EX

its ROMs to a great many of the leading American clone makers and has a good reputation for compatibility. The major threat to compatibility comes from the wacky keyboard rather than from the system software.

As far as pricing is concerned, at least Tandy has done the decent thing and included a monitor in the price. The 1000EX costs £449 plus VAT with a monochrome monitor, and £549 plus VAT with a colour monitor. Add £199 for an external 3½in disk drive or £169 for a 5¼in unit. Memory costs £99 plus VAT for the expansion adaptor and an extra £79 to take the RAM up to 640k.

PC Sport

In many ways, the PC Sport is similar to the Tandy 1000EX. It has the same unitary design, combining the keyboard with the system electronics and adding a disk drive for good measure. Although it's slightly smaller than the Tandy, it weighs about the same and has the advantage of having a carrying handle built into the back of the casing.

The overriding impression of the PC Sport is one of fragility. The casings are very thin and look like they are made of the kind of plastic you associate with the presents inside

Christmas crackers. The keyboard has a similar feel — when you press a key, you can feel it grating against its neighbour. I suppose this does show up one advantage of the Tandy 1000EX — at least it's well made.

The layout of the keyboard is exactly the same as an IBM PC, so there shouldn't be too many problems here as long as the keys don't fall off.

The rear panel of the PC Sport houses I/O ports for RS232 serial connection, RGB video, a parallel printer and an expansion bus. The side of the unit houses a composite monitor output and a games port.

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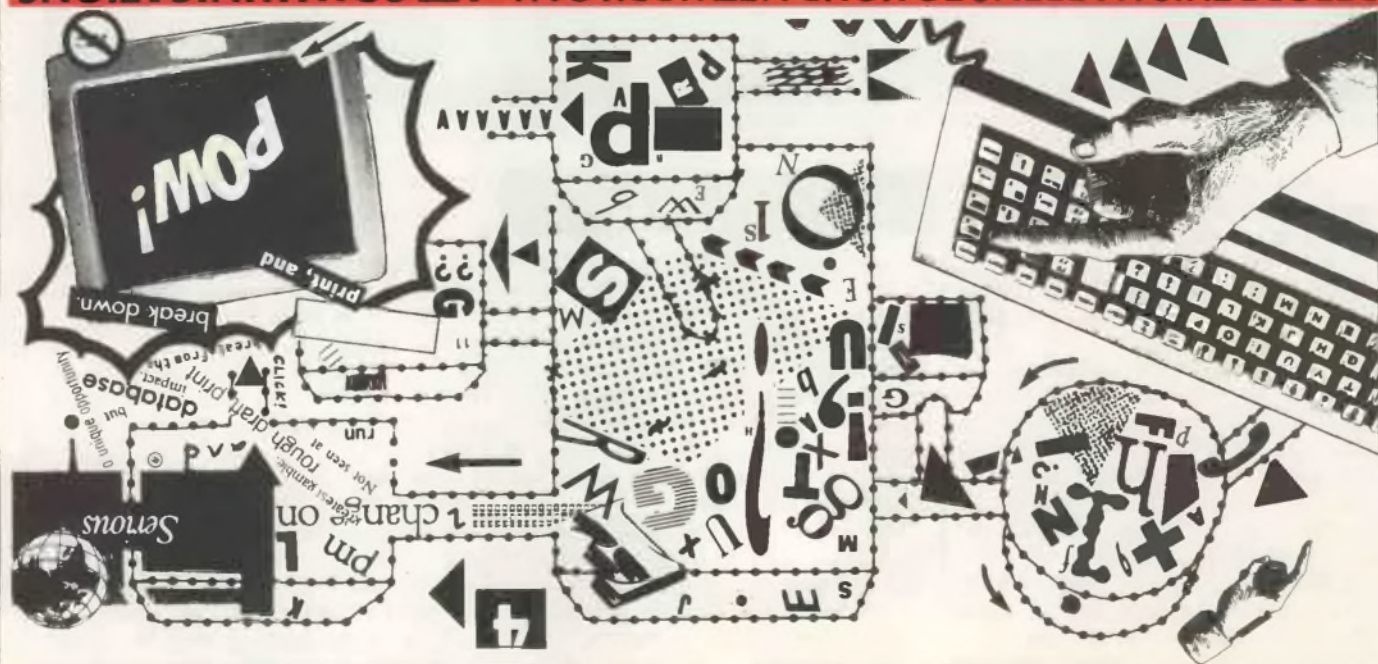
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over the Tandy 1000EX is that the RS232 and printer ports are IBM standard, so the connection of peripherals shouldn't be a problem.

The PC Sport is supplied with one built-in 360k, IBM PC-compatible disk drive. An external drive can be added by the simple but inelegant method of connecting it to the power supply and ribbon cable which poke out of the back of the machine. While I'm sure this will work, it's very tacky and I'm not sure how robust the connection would be.

The main processor inside the PC Sport is an Intel 8088 running at 4.77MHz; there's no option to run the processor any faster. The entry-level machine is supplied with 256k of RAM on the motherboard. This can be increased to a maximum of 640k by plugging extra RAM chips into the system, but this isn't as easy to do as on a normal PC clone due to the confined space inside the PC Sport. First you have to take off the casings, then you have to strip out the display and disk controller cards, then you have to reset the DIP switches on the motherboard. The DIP switches also

have to be changed if you add a second disk drive or if you want to change the display mode.

The space limitations of the PC Sport also mean that there's no way of adding IBM expansion cards inside the machine. Although there's an expansion slot on the back of the machine, it will not accept IBM cards directly.

The PC Sport supplied for review was not bundled with any system software (that is extra), so I used a copy of MS-DOS version 3.1 that happened to be lying around. This booted quite happily and didn't cause any problems.

The PC Sport is supplied with the Mega BIOS compatibility ROM. I must admit that I haven't come across this one before. It ran everything I tried, but I can't help feeling uneasy with strange, unfamiliar BIOSs.

The PC Sport sells for £399 plus

VAT. To this you will have to add £50 for MS-DOS and another £75 for a composite monitor. If you want the second disk drive, you will have to add another £100. Suddenly, the system doesn't look quite so cheap.

ARC The World

This is a strange-looking micro with a name to match. Externally, the ARC machine looks like an IBM PC cut in half. This does have the advantage that the machine takes up less desk space than most other desktop PC-compatibles, but it left me wondering where the rest of the machine had gone.

Surprisingly, The World is sold as a transportable rather than as a desktop micro. Although it doesn't have a handle built-in, it is supplied with a custom-designed rucksack so you can strap The World to your shoulders and head for the hills. I would be surprised if many people actually bothered to do this — The World is quite heavy.

The front panel has space for three half-height storage devices stacked



TANDY 1000EX

CPU: Intel 8088 4.77MHz or 7.16MHz; 256k RAM expandable to 640k; Phoenix BIOS; MS-DOS 2.11; Ports: printer (non-IBM), joystick, RGB and composite video; no IBM expansion slots; single, internal 360k disk drive, 360k or 720k external drives available; composite monitor; keyboard.

Price (ex VAT): £449.

Extras: colour system add £100; 720k disk drive £199; 360k disk drive £169; RAM card to 384k £99; extra RAM to 640k £79.

Available from: Tandy on (0922) 477778.



PC SPORT

CPU: Intel 8088 4.77MHz; 256k of RAM expandable to 640k; Mega BIOS; Ports: printer, games, RGB and composite video, RS232; no IBM standard expansion; single, internal 360k floppy drive; keyboard.

Price (ex VAT): £399.

Extras: composite monitor £75; MS-DOS £50; external drive £100; 640k RAM expansion £80.

Available from: AMI on (01) 452 4286.



ARC THE WORLD

CPU: Intel 8088 4.77MHz or 8MHz; 256k of RAM expandable to 640k using optional multi-function card; ARC BIOS; MS-DOS 3.1 with ARC modifications; five IBM slots — two free on base machine; single 360k drive; room for up to three half-height drives; choice of Hercules-compatible or CGA displays; keyboard.

Price (ex VAT): £475.

Extras: monochrome monitor £120; CGA monitor £349; multi-function card with 640k RAM £159.

Available from: ARC on (01) 684 4144.

on top of each other, so you could add a hard disk and a tape streamer at a later date. The rear panel is very simple and has connectors for the keyboard and power input, and space for four expansion cards.

When you look inside the machine, the reason for its lack of width becomes apparent. The traditional arrangement as used by IBM and most clones is to use a motherboard containing the processor, RAM, ROM and all the associated circuitry, and then to have up to eight expansion slots to hold cards for display, I/O, and so on.

The World dispenses with the traditional IBM-style motherboard and simply uses an extra expansion card to house the processor, RAM, ROM and all the rest. The advantages are that you save space and have the option to add a different processor card as the technology progresses. The disadvantages are that it can cause some hardware incompatibility problems and it restricts expansion.

The World has five slots on its bus. Of these, one is used for the processor card, one for the monochrome display adaptor/printer card, and one for the floppy disk controller. This leaves just two slots free for other

uses. These could easily be used with, say, a multi-function card with an RS232 link in one slot and a hard disk controller in the other.

The main processor in the ARC machine is an Intel 8088 running at 4.77MHz or 8MHz. The entry-level machine is supplied with 256k of RAM, but the only way to increase this is by adding a multi-function board which takes the total RAM up to 640k.

The machine supplied for review came with a Hercules-compatible monochrome display adaptor and an amber monitor. These worked well, but the character set used by ARC does look slightly odd until you get used to it.

The keyboard is an exact copy of the IBM AT keyboard, so there shouldn't be too many problems with keyboard overlays and the like. The construction quality is quite good and feels very similar to the Keytronics units found on other PC clones.

Software compatibility looks quite good. The World is supplied with a custom BIOS which was written by ARC. The review machine was supplied with MS-DOS version 3.1, which has also been modified.

Although it ran most of the programs I tried, The World did have trouble with Turbo Lightning from Borland. The program would load and run in the background, beeping away quite happily, but occasionally the machine would lock up and had to be reset.

The entry-level World machine with processor, 256k of RAM, a monochrome display and a single disk drive costs £475.

Walters XT

Walters supplies a whole range of cheap Taiwanese IBM clones, from portable through basic PC clones through to copies of the IBM AT. The machine supplied for review was its most basic desktop PC clone. Of all the machines in this review, the Walters PC is the only one which resembles the original IBM PC. All the other machines look totally different.

The Walters is a large machine and needs significantly more desktop space than the others. The front panel has space for up to four half-height storage devices arranged in two banks of two units. The review machine was supplied with a single 360k floppy disk drive, and large



WALTERS PC

CPU: Intel 8088 4.77MHz or 8MHz; 256k of RAM expandable to 1Mbyte; Phoenix BIOS; Ports: IBM printer; eight IBM slots, six free on base machine; single 360k drive; up to four half-height drives; Hercules-compatible adaptor; monochrome monitor; keyboard.

Price (ex VAT): £599.

Extras: CGA card and monitor £200; MS-DOS £65; extra drive £100; 640k RAM upgrade £40.

Available from: Walters on (0494) 32751.



BARBATAN PC

CPU: Intel 8088 4.77MHz or 8MHz; 640k of RAM expandable to 1Mbyte; Phoenix BIOS; MS-DOS 2.11; eight IBM slots — two half-length, five free on base machine; twin 360k drives; room for two half-height drives; Hercules-compatible adaptor; monochrome monitor; keyboard.

Price (ex VAT): £595.

Extras: CGA card and colour monitor £342.

Available from: Barbatan on (0272) 213928.



AMSTRAD PC1512

CPU: Intel 8086 8MHz; 512k RAM expandable to 640k; Amstrad BIOS; MS-DOS 3.2, DOS Plus, GEM; Ports: RS232, IBM printer; mouse; three IBM slots; single 360k drive; room for two half-height drives; paper white monochrome monitor; keyboard; mouse.

Price (ex VAT): £399.

Extras: twin disks, add £100; colour, add £150; 10Mbyte Winchester, add £300; 20Mbyte Winchester, add £400.

Available from: Amstrad on (0277) 230222.



blanking plates covered the vacant slots. The rear of the machine houses connectors for keyboard and power input and output. To the right there's provision for the full eight IBM expansion cards.

Inside, the impression is of vast areas of unused space. The layout is similar to that of the IBM PC, with a large motherboard housing the processor, RAM, ROM and expansion slots.

The base-level Walters PC is supplied with 256k of RAM. This can be expanded to 1Mbyte on the motherboard by plugging in extra 256kbit RAM chips. The processor is an Intel 8088 running at 4.77MHz. An 8MHz version costs an extra £40.

The fact that the Walters comes with eight expansion slots means that there's plenty of room for your system to grow. On the review machine, two of the slots were occupied by a Hercules graphics adaptor and the floppy disk controller card. However, this still left six slots free — more than the total number of slots on the ARC. My general impression of the electronics and the casings are that they are well-made and look solid and reliable.

The review machine was supplied with a monochrome monitor and a Hercules-compatible graphics card. The inclusion of a Hercules graphics capability is something of a bonus and could be useful if you plan on using Lotus 1-2-3 graphics or the like.

The display quality is very good. The onscreen characters are much better formed than on the ARC, for example, and I found the display very easy to use.

The keyboard is not so good. It's a copy of the standard IBM PC layout, but it feels light and insubstantial.

Software compatibility seems good. The Walters PC is supplied with version 2.27 of the Phoenix ROM BIOS. As I stated earlier, the Phoenix ROM is used by many manufacturers and is well-respected, so there shouldn't be too many problems.

My only problem with the review machine was that it wasn't supplied with a copy of MS-DOS. In the end, I used the Walters with a copy of DOS 3.1 that was supplied with the ARC machine — this seemed to work quite happily.

The entry-level Walters PC with monochrome screen, 256k of RAM and a single, 360k floppy disk costs £599.

Barbatan PC

The Barbatan PC is certainly a stylish-looking PC clone. In terms of size it's about halfway between the ARC and the Walters machines; but,

unlike these two, the Barbatan is finished in a light grey colouring with what must be the ultimate in sophistication — white disk drives.

The front panel looks unusual because it is narrower than most PC clones, and because the disk drives are mounted centrally instead of to one side. Although this looks good, it means that the Barbatan can only accommodate a maximum of two half-height storage units — this could be limiting.

The back of the machine houses the power switch, sockets for power in and out and the keyboard, and eight expansion card plates. On the review machine the hole in the casing didn't line up properly with the keyboard socket, so it was very difficult to plug in the keyboard.

Inside the Barbatan, everything is very well laid out. As the machine is smaller than the Walters, there isn't so much room, but there's still plenty of expansion capability in this machine.

The main PCB houses the Intel 8088 processor running at either 4.77MHz or 8MHz. The speed can be changed either by moving a jumper on the main PCB or by issuing a command from DOS. The base model comes with 640k of RAM; this can be increased to 1Mbyte onboard by adding extra RAM chips.

Although the system has eight expansion slots, two of these are obscured by the disk drives, so they can only take half-length expansion cards. On the review machine three slots were occupied by a Hercules-compatible monochrome graphics card, an RS232 serial card and a floppy disk controller card.

The review machine was supplied with a very good monochrome monitor with a green screen. This worked fine with the display adaptor supplied with the machine.

The keyboard is OK but it isn't anything to write home about. It feels very cheap, and the keys are slightly loose and springy. One oddity is that, although the keyboard copies the layout of the IBM AT keyboard, one of the LEDs that signifies Scroll Lock on the AT has been converted to a power light on the Barbatan. I found it annoying to have the LED on all the time I was using the machine.

Like the Walters and the Tandy, the Barbatan PC uses the Phoenix ROM BIOS to provide compatibility with the IBM PC. The machine wasn't supplied with a copy of MS-DOS but it was supplied with a copy of the MS-

DOS manual, which was strange.

Although the machine seems to be fairly compatible, I did experience problems with its disk drives while I was using it. The machine somehow managed to corrupt part of this Benchtest while I was writing it and then refused to acknowledge that the B: drive existed. Very mysterious.

The entry-level Barbatan PC with 640k of RAM, a monochrome monitor and twin 360k floppies costs £595.

Conclusion

I was surprised by how different all the PC clones were. At one end you have the Tandy and the PC Sport which are trying to be a cross between home and business machines. For the most part, they fail miserably. There's not much good games software for the IBM, and the machines reviewed here are too limited to be considered for serious business use.

The other machines all have their good and bad points. The ARC is compact but lacks expansion potential. The Walters has vast expansion potential but needs a vast desk to go with it; and the Barbatan is a stylish machine with a few rough edges.

All these machines have to compete with the new king of the clones — the Amstrad 1512. This is a better machine than the ARC, the Tandy or the PC Sport, but it's a close-run thing when you compare it with the Barbatan or the Walters.

Technically, if you don't need much expansion potential, then the extra scope provided by the Walters and the Barbatan won't be important and you'll buy an Amstrad. But it's surprising how fast those slots get used up — a hard disk here, a multi-function card there, and suddenly the Amstrad is struggling.

However, if your business is going to rely on your new PC clone, then you'll need to consider more than mere technicalities. The reliability of the supplier and the quality of maintenance are just as important as the number of expansion slots or the type of processor.

In this respect, Amstrad has a definite advantage. It's a larger supplier than any of the other companies mentioned here (with the exception of Tandy), and it has a very good servicing deal with Dictaphone which will offer you a 24-hour service contract for as little as £40pa.

If I had to rate the companies in order of those most likely to be here in a year's time, I'd put Amstrad and Tandy at the top of the list, followed by Walters and ARC, with Barbatan and the suppliers of the PC Sport at the bottom.

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Class of '82

When the bubble finally burst on the home computing market back in 1984, only the fittest products survived. The Spectrum, Commodore and BBC have stood the test of time, albeit in a repackaged and renamed form.

Simon Goodwin looks at the enhancement models which have been launched in time for the Christmas market.

Anyone looking to buy a home computer for Christmas will need to make one fundamental choice — whether to gamble with the latest 16-bit technology or stick with an old but well-supported 8-bit machine. In this review we take a look at the latter option in the shape of Amstrad's Spectrum 128+2, the Commodore 64C and Acorn's BBC Master Compact. It is a reflection on the state of the home computer market that all three computers are not new but 'improvements' on machines originally launched back in 1982.

Spectrum 128+2

The Spectrum 128+2 is the fifth version of Sinclair's Spectrum which has sold four million machines, half of them in the UK. In its day, the Spectrum's price and performance were unbeatable. A host of third-party suppliers bolstered Sinclair's own erratic marketing efforts — Spectrum add-ons are many, varied and cheap.

The Spectrum 128+2, Amstrad's first 'Sinclair' product, was launched at the 1986 PCW Show. There have been some production problems, but machines should now be in the shops. The +2 is made in Taiwan and in Scotland.

Hardware

The +2 is a big improvement on the first Spectrum. There's a proper keyboard and a built-in cassette drive. The box is the biggest yet, at 435mm x 170mm x 55mm. It has an extra 80k of memory and interfaces for joysticks, monitor displays, printers and musical instruments. Three new sound channels play through the TV or an external amplifier, rather than a built-in beeper. Earlier models had black boxes, but Amstrad has opted for light grey, with red and silver lettering and a striped

flash across the tape-drive lid. The resultant computer looks as if it is wearing school uniform.

The new keyboard is well-sprung and touch-typists should be happy with the 'feel', although they won't find the semicolon key in the usual place. Key rollover — pressing another key before you release the first — is handled properly, but

quickly repeated characters can get lost, so 'BEEP' sometimes becomes 'BEP'. Annoyingly, keys are momentarily ignored after you enter a line and as you start to use the editor.

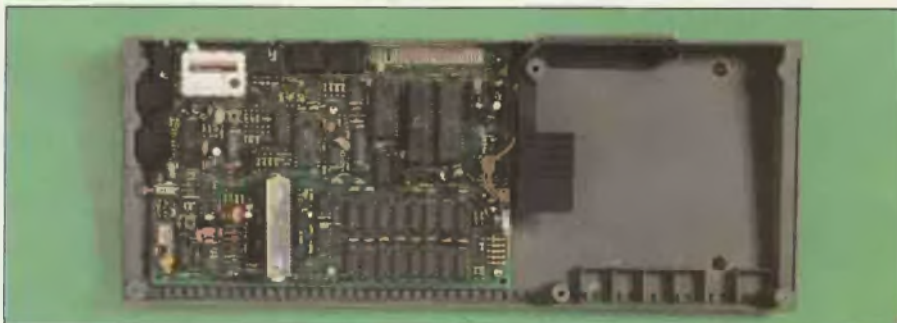
Old Spectrums use a keyword entry system of great complexity; depending upon context, each key produces a variety of commands or graphics symbols. By default the new



The complex keyword entry system of the old Spectrum has been dropped, and touch-typists will like the 'feel' of the new, uncluttered keyboard



The +2's video port produces composite PAL and RGB signals, but several add-ons won't fit unless you use an extension cable



Inside, the +2 is essentially a Spectrum 128 with a compacted circuit board and Amstrad part numbers on old Sinclair custom chips





machine expects commands to be typed in full, letter by letter, so there's no longer any need to clutter the keyboard with text: the only keywords that still appear are RUN, LOAD and CODE. You can still use the others if you remember them, or look them up in the manual.

The +2's joystick interface uses normal 9-pin sockets, but the wiring pattern is jumbled so that you can't use standard sticks without an adaptor. This 'marketing decision' is meant to force you to use Amstrad's own poor-quality SJS-1 joystick. In fact it's just a needless irritation — Cheetah has already produced better sticks with special plugs for the +2, and several firms have launched adaptors to allow normal sticks to be used with the machine. The joystick ports are not compatible with all Spectrum software. The interface simulates key-presses, like Sinclair's unpopular Interface 2; it does not use the common Kempston codes.

There's a socket for a numeric keypad, as on the 128, but Amstrad has no plans to produce one; the same functions are available from the main keyboard in any case. There's an external power supply and a recessed Reset button, but no power switch.

The video and serial ports use DIN and telephone sockets respectively; these match the connectors used on the QL, so leads and adaptors are readily available. The video port pro-

duces composite PAL and RGB TTL signals, with a separate 'BRIGHT' control which most monitors will ignore. The review machine worked very well with a monitor, but would not produce colour on a TV. Amstrad says that only pre-production units have this serious fault.

The serial port will just transmit information to musical instruments or printers — it can't receive data. However, several firms make add-ons that fix this problem.

The main port on the old Spectrum was the edge connector at the back of the box. This appears on the +2 as well as a handful of new sockets. Almost all of the old signals are there, but the edge connector is wrongly positioned. Several add-ons, including Sinclair's own Interface 1 microdrive and network controller, won't fit the +2 unless you use an extension cable to keep the peripheral and the computer apart.

The Kempston joystick interface, Multiface 1 and Mirage microdriver obscure the serial socket unless an extension cable is used. Cheetah's Spectrum and Sound Sampler also get in the way if plugged in directly.

Currah's Microspeech fitted but stopped the computer from working. The popular VTX-5000 modem also

plugged in, but the computer ignored it. The same was true of Datel's Sound Sampler, although a new version is promised.

The Sinclair ZX printer fits OK but doesn't work in 128 mode, when printing commands are re-routed to the serial port. ZX LPRINT — a popular parallel printer interface — worked in 48 mode, but crashed the machine in 128 mode.

Internally the +2 is much like the old Spectrum, so these problems can be resolved, but the short-term message to consumers is clear. Don't rely upon compatibility; make certain that products will work on a +2 before you buy. An extension card or cable may also be a sensible investment.

The built-in tape drive looks fragile but worked well. There's a 3.5mm socket for sound output to an external amplifier, but no cassette input or motor control. There's no tape counter and no auto-stop when rewinding or winding on. It takes 52 seconds to rewind a C-15 — hardly speedy!

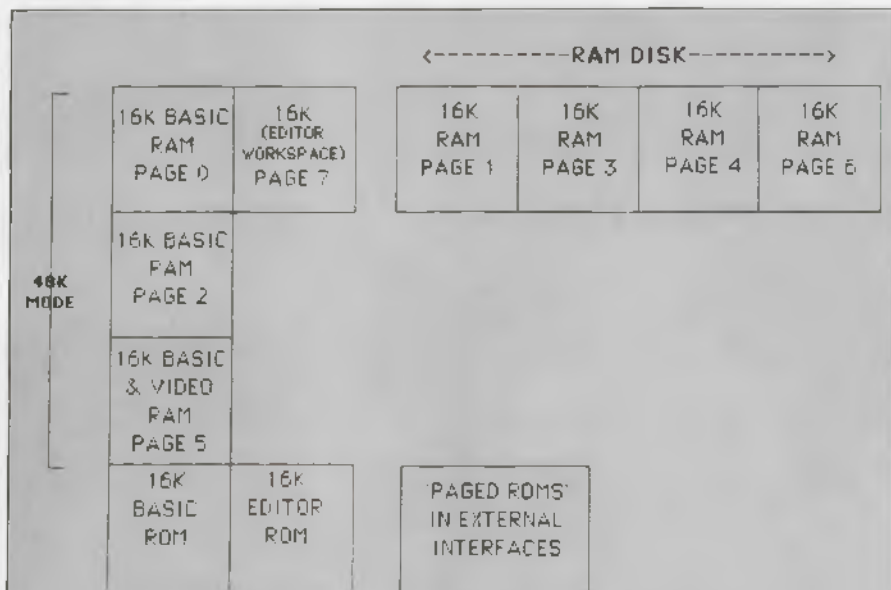
Inside the box everything is neat and tidy, though I found three components soldered under the circuit board. The machine uses no less than 33 chips. Essentially it is a Spectrum 128 with a compacted circuit board and Amstrad part numbers on Sinclair's old custom chips. Heat-sinks, for cooling, were reassuringly prominent.

Software

ZX Basic is friendly but slow; it re-uses a lot of machine code from the ZX-80 and 81, where brevity was more important than speed. You can stop, and even edit, programs without losing variable values, and RETURN information — a rare and wonderful feature. The syntax of program lines is checked as they are entered and there's a good full-screen editor.

Arithmetic is accurate to nine decimal places. Array and string handling is generally good — simple strings can vary dynamically in length up to about 40k — but string arrays use wasteful fixed-length elements.

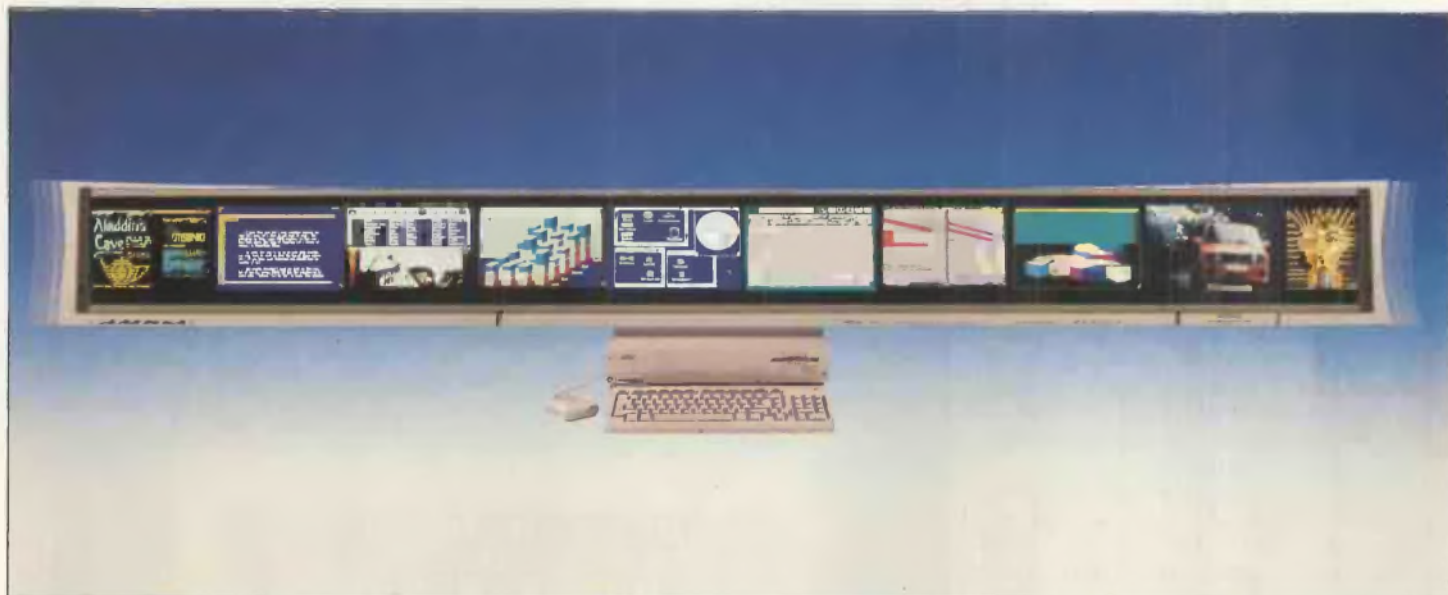
The language itself is quite simple; there are no block structure facilities and no RENUMBER, EDIT or DELETE commands. Graphics and sound are well-supported, although the music command PLAY would be more useful if program execution continued while sounds were produced. You can do this by writing values directly to the sound chip, but it's hard work. Serious Basic programmers tend to use Beta Basic, a much-improved structured interpreter from Betasoft. Good compilers for ZX Basic, Prolog, C and Pascal are also available.



The Spectrum 128+2 packs 128k of RAM (alterable memory) and 32k of ROM (pre-programmed memory) into the 64k that the Z80A processor can address. Memory is handled in switchable 16k lumps. The bottom 16k of the map is for ROM only. The top 16k can refer to any page of memory, even to two pages that also appear in the middle 32k!

Only 41k of memory can be directly used by Basic programs, but another 64k is available as a RAM-disk — a fast filing system which can hold programs or data. 16k of RAM is used by the Basic editor, and the display and system variables occupy about 7k

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The 128+2 packs 128k of RAM (alterable memory) and 32k of ROM (pre-programmed memory) into the 64k address space of the Z80 processor. Only 41k of RAM can be used for Basic programs; 7k is used by the system, and the remaining 80k is indirectly accessed, as discussed on the memory map.

The display format is a simple array of 256×192 points, with a different pair of colours available in each 8×8 point square. Eight colours are available, and each square can also be made bright or flashing. This scheme is limiting, but very fast.

You can access the full 128k with PEEK and POKE, using a little undocumented trickery. The 'extra' memory will appear in 16k pages between address 49152 and 65535, as shown in the memory map. First CLEAR 49151, then POKE 23388,16+N, where N is the number, 0 to 7, of the page you want. Page 0 — the default — is selected when your program stops.

There are two 'modes' of operation. In '128 mode' you can use the new features — for example, RAM disk, screen editor, serial port, while '48 mode' restricts you to the features of the original Spectrum, plus a few extras, such as the video and joystick ports, which don't affect compatibility. The idea is that new software will work in 128 mode, while older programs use 48 mode.

In 48 mode the +2 uses a copy of the old Spectrum ROM and the original memory arrangement. There are 10 very minor changes in the ROM — Amstrad's name, for instance — and there's a lump of new code in an area that used to be empty. This can cause problems if programs rely upon the values in that area when vectoring interrupts, but that is a rare trick; 95 per cent of old material works fine, including compilers and utilities that make heavy use of the ROM. A 'Sinclair Quality Control' mark on new programs should guarantee that they will run on all machines.

Documentation

The +2 User Guide was on a slow boat from Taiwan during our review; however, I did spend a day looking through an early copy at the PCW Show. The 200-odd paperback pages are based upon the first Spectrum manual, which was excellent, but it has been well-updated by Amstrad.

Commodore 64C

The Commodore 64 was a follow-up to the best-selling Vic 20 games computer. It was also intended to challenge the Atari 400 and 800,

machines which dominated the US games market for several years. The name refers to the 64k of memory, which was considered a lot for a home computer at the time.

The 64 has always been best-known as a games machine, although programs for many other applications are available. This year Commodore has decided to move the machine up-market a little, with the launch of the 'Commodore 64C' — a re-vamped 64 with a new box and extra hardware and software.

The 'C' is meant to stand for 'Connoisseur', so the extras have rather an intellectual flavour.

Hardware

The Commodore 64C computer is similar in size to the other machines tested — it covers about 412mm $\times$ 240mm of desk space, and rises to a height of 68mm. The case is light cream in colour, with four slightly darker function keys at the right-hand end. There's a grille across the rear of the machine, and the keyboard slopes quite steeply in front of this. This styling makes the 64C look incomplete — as if it has been detached from some larger system.

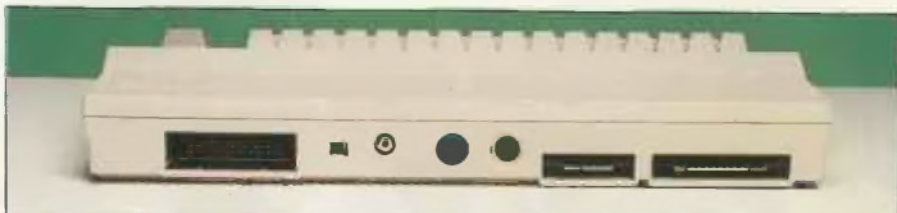
The keyboard is easy to type on and generally well laid out — you



The 64C's keyboard is well laid out, although the cursor key arrangement is rather odd — one key each for horizontal and vertical movement



In electrical terms, the 64C is almost identical to the 64; the only obvious difference is the use of two high-capacity RAM chips for the 64k memory



Can you tell the difference? The back of the 64C looks exactly like the back of the 64, right down to the last socket

don't have to press the Shift key to type common maths operators, for instance. Graphics legends are printed in grey on the front of each key. The cursor key arrangement is weird — there is just one key for horizontal movement and one for vertical; you press Shift with the appropriate key to move 'backwards'.

The right side of the box carries a connector for the external power supply, two standard 9-pin joystick/paddle/mouse sockets and a power switch. Along the back you find an expansion port — mainly used for plug-in cartridges — TV and Commodore monitor output sockets, and a non-standard serial link for Commodore's own disk drives and printers.

The serial link first appeared on Atari computers; the idea was copied on Commodore's Vic 20. Any peripheral with an appropriate connector can be connected, singularly or in a 'daisy chain', to a 64 or Vic 20, which can then choose a device by transmitting an appropriate device number.

The serial link keeps peripheral wiring simple and allows several devices to be connected to one DIN socket. It also allows Commodore to dominate the market for peripherals,

as you can't use common Centronics, Shugart or RS232 devices without an expensive adaptor, whereas Commodore's own hardware will plug in directly.

There are two snags. Firstly, you're stuck with Commodore's range of add-ons. Secondly, the serial link is very slow — Commodore's 1541 disk drive works more slowly than some audio cassette interfaces! An edge connector to the right of the serial link caters for the C2N cassette drive which is included in the package. This worked fine throughout our tests, although it did not stop automatically when fast-wound to the end of a tape. It has a tape counter and derives power from the computer. The last connector on the back of the 64C is the user port — an eight-bit programmable interface which you *could* use to bypass Commodore's serial link.

All the electronics are enclosed in a metal shield, which reduces radio interference and helps to conduct heat away from the chips. Two jumpers allow the circuit board to produce NTSC signals for American TVs, or PAL-I for some European countries. A US modulator can be fitted in place of the British UHF model —

there's a hole in the back of the box for a VHF channel switch.

In electrical terms the 64C is almost identical to the 64; the same custom chips are used, and the only obvious change is the way that 64k has been crammed into two 256kbit memories.

The 64C has 20k of ROM and 64k of RAM. Many control ports also intrude upon the memory map. These ports allow access to the pair of custom chips which give the 64 its power. The graphics chip provides a good compromise between speed and detail; graphics resolution is 320 × 200 points if you accept the C64's restriction of two colours per character square; you can use four colours per square if you reduce the horizontal resolution to 160 points. Sixteen preset colours are available.

Best of all, the 64C has eight sprites. These programmable symbols are automatically superimposed upon the background picture — the programmer does not have to redraw the background as sprites move, and they can be re-positioned with just one machine code instruction. Sprite colours can be set independently. Single-colour sprites can have up to 21 × 24 points; three-colour sprites may be half that size.

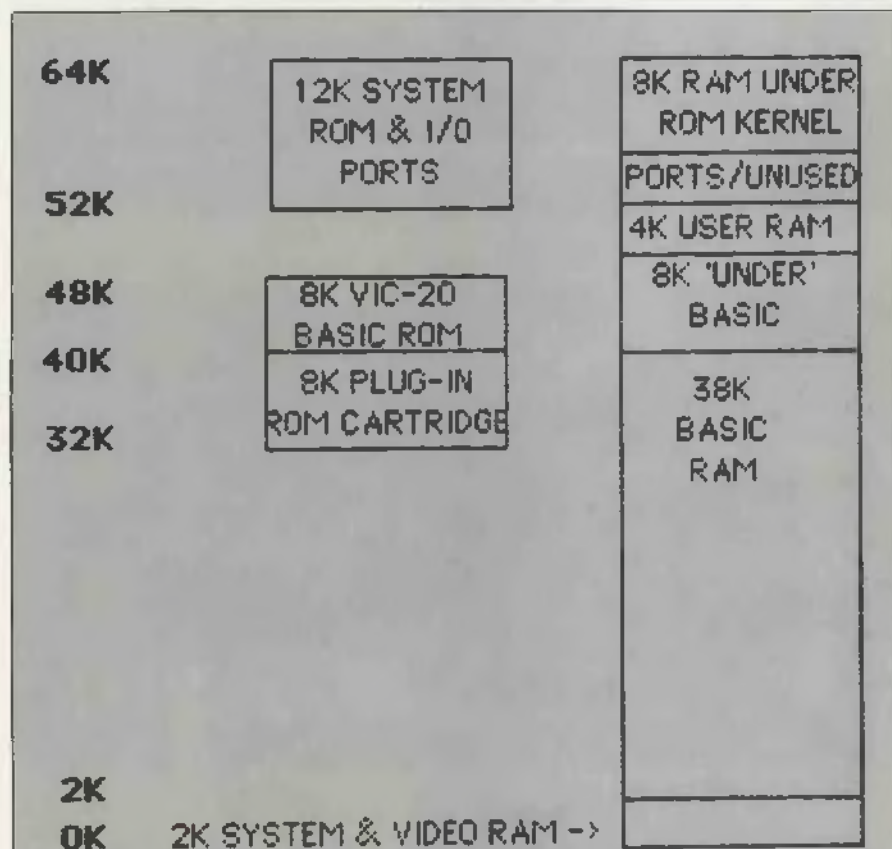
The other custom circuit handles sound effects and interfacing. The 64C's sound facilities are the best of any low-cost micro, although claims of 'synthesiser' quality are exaggerated. There are three channels and four basic waveforms, with plenty of options to filter and shape effects. Sound is routed to the TV speaker and the monitor.

Software

The 64's Basic interpreter has come straight from the Commodore Pet. Back in 1980 it was known as 'the new ROM'. It's dreadful. You can only access the custom chips by writing values directly to the 75 control ports; many of these have composite functions and all must be identified with un-memorable five-digit addresses. It takes six POKes just to play a note. Despite much experimentation I was unable to plot a single graphic point from Basic!

The screen editor is easy to use, but there are no DELETE or RENUMBER commands, and no block-structure extensions. Only two characters are significant in variable names. A 16-bit integer datatype is supported, but integer handling is even slower than the default 10-digit floating point format. Strings of up to 255 characters are dynamically allocated.

The good news is that the Independent Commodore User Group has implemented Comal on the 64. This £47.50 plug-in interpreter provides proper support for the hardware and



The Commodore 64C's memory map reveals the machine's simple architecture. 64k of RAM fills the whole of the 6510 processor's address area, but control ports and 20k of ROM normally overlay much of the space, leaving just 38k for Basic programs. A further 2k is used by the system, and the remaining 4k is only useful for machine code or POKed data. If you de-select Basic you can free 52k of RAM, or 60k if you discard the operating system

block-structured programming.

The 64C's bundled software is aimed at the armchair strategist. Leisure Genius's Scrabble, Cluedo and Monopoly are fun and well-presented; Othello and Grand Master Chess date from 1982 and show it — they're crude, but they work. The Pitman Typing course seems aimed at secretaries with typewriters — it has been transferred to computer very unimaginatively.

The bundled mouse is a neat Japanese unit which only works with the Cheese software package, also supplied. Indeed, the keyboard won't work properly when the mouse is plugged in! (Cheese is a well-designed but extremely limited icon-based graphics package.)

Documentation

The 200-page spiral-bound user manual is an inadequate, badly thought-out tutorial — it makes no mention of high-resolution graphics, for instance.

The only concessions to reference use are some appendices, apparently culled from another title, a poor index, and a pull-out card listing the few Basic commands. Luckily, information about the 64 is widely available elsewhere.

BBC Master Compact

The latest machine from Acorn fits in at the bottom of the 'Master' range; the manufacturer calls it the 'Acorn BBC Master Compact' — like everyone else, I shall refer to it as the 'Baby Beeb'. Prices start at £400 plus VAT, not including the display. Acorn stresses that this machine is not another replacement for the Model B — it is a cut-down model for those who can get by without the expansion potential of the Master 128.

Hardware

The basic system consists of two boxes. The larger one is cream in colour, with a black reflective strip across the front. It measures 332mm x 350mm at the top, and is 90mm deep, including its four rubber feet. Most people will rest their display on top of this box, which houses the switched-mode power supply and one or two disk drives. Electric kettle-style plugs and sockets admit the mains supply and pass power on to the monitor. The on-off switch only affects the computer — not the display.

Our review machine had a single 640k 3½in Sony disk drive, and a colour monitor from Taiwan — the rest of the system was assembled in the UK. The display was quite crisp, but bright-coloured text was quickly fati-

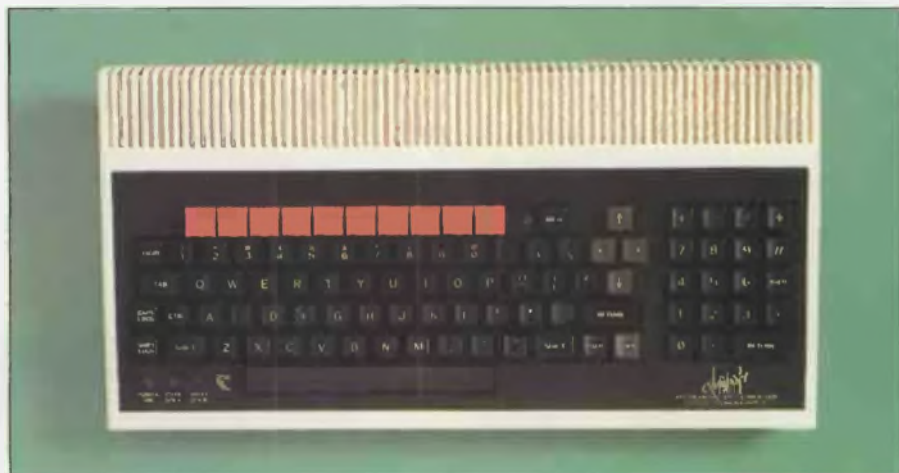
guing. Our computer had a video fault which made text and graphics flicker, but Acorn states that this is 'a very rare problem'.

The other box contains the computer and keyboard. It has a flat, sloping top, 74mm deep at the rear and 35mm at the front. The upper surface measures 215mm x 423mm — much the same size as the 64C and the Spectrum+2. The classy BBC colour scheme has been retained — cream, with brown keys and key-surround and 10 orange function keys. The cursor arrows and the Copy key are khaki. Acorn has dispensed with the

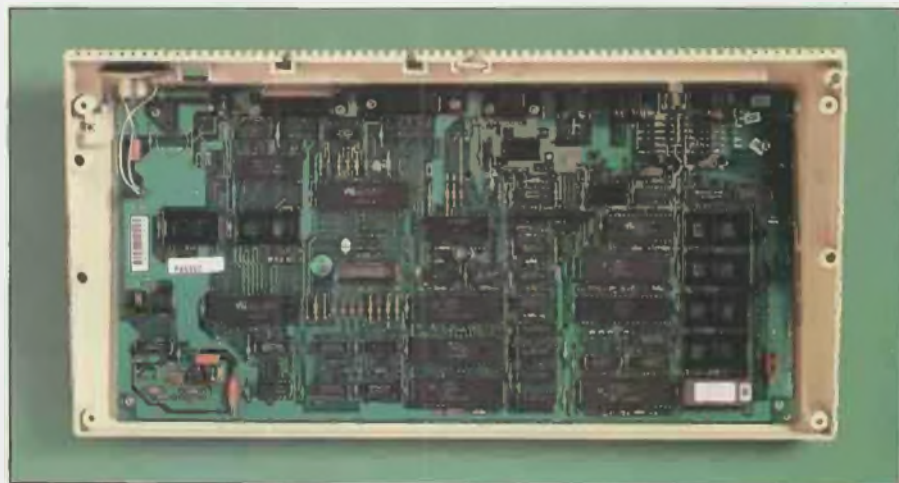
transparent strip above the function keys, but labels are still available to go under it!

Three leads connect the keyboard to the rest of the system. The plugs on the display are helpfully marked 'computer' and 'monitor'. The disk ribbon cable and power lead come directly out of the base and back of the disk box, and plug into the rear of the keyboard. There's only about 300mm of slack wire, so you must keep the keyboard close to the disk drive — you can't put it on your lap.

An edge connector from the main circuit board sticks out of the right-hand side of the machine. This is said to carry most of the signals within the system, though it does not replace the 'Tube' or 1MHz bus which appears on other machines in



The Baby Beeb's cursor keys are arranged in a sensible cross pattern, and accountants and mathematicians will welcome the inclusion of a numeric pad



Acorn, like Commodore, has chosen larger memory chips for its new micro: all 128k of memory is supplied on just four chips



The user port on the old BBC machines has been re-cast on the Baby Beeb as a 9-pin interface for a joystick or mouse

this range. Without these ports the Baby Beeb has limited expansion potential.

A monochrome composite video port was present, as well as a parallel printer socket. The RS232 and Econet (network) sockets were covered up — upgrades to make them work cost £30 and £50 respectively. There isn't a cassette port, but software houses should have little trouble transferring 'well-behaved' software to 3½in disk — if potential sales make this seem worthwhile.

The old user port has been re-cast as a 9-pin interface for a joystick or mouse. A standard switched stick worked fine, but the port will not support the analogue joysticks expected by earlier Beebs. The manual suggested that any mouse with an appropriate connector would work, although my efforts proved otherwise. Apparently Nidd Valley's £35 Digimouse is compatible.

The machine has a standard three-channel sound chip. Some clever interrupt-driven software pushes this to its limit, but there's no control over the timbre of sounds and the tiny built-in speaker lets things down a little.

The keyboard action was good, although it was easy to hit Control A instead of A, rather confusingly diverting the next character to the printer. Red lights indicate capitals and shift lock. At last the cursor keys are arranged in a sensible cross pattern; Delete is still tucked away under Return. The Break key has been moved further from F9, and it can be locked up (or down!) by turning a screw. Accountants and mathematicians will welcome the numeric pad.

The keyboard is held together with four self-tapping screws which must

be removed to plug programs into the four ROM utility sockets. The printed circuit fills the base of the machine, with space for the Econet and RS232 interface components. All 128k of memory is supplied by just four chips; the original Beeb used 16 chips to provide only 32k. A blanking panel and an unused area at the top left corner of the board might accommodate a modem and telephone socket.

Software

The machine comes with a disk containing 30-odd programs and demonstrations, with 'pointer control' to select options. Numbered menus would be easier to use, but much less fashionable.

There's a set of trivial 'desktop' applications — a simple card index, a calculator, a small 'notepad' and a clock display that stopped while the index or notepad were in use. Other utility programs let you fiddle with files, graphics and sound effects. There's a 'control panel' to configure default settings which are retained when the machine is turned off.

Bundled in are: two games, an attractive 'Centipede'-style arcade game and an atmospheric text adventure with an inadequate vocabulary; four 'tutorials' which discuss graphics, text, the keyboard and ADFS — the 'Advanced Disk Filing System'; two complementary word processors, the powerful but complicated VIEW, and ABC, a beginner's word processor; Logotron Logo, as well as a separate 54-page manual; and two versions of BBC Basic. You use the normal Beeb addresses to store programs, allowing up to 28k, with graphics in a separate bank, while the other version keeps prog-

rams in the 'sideways' RAM pages shown in the memory map, allowing a full 64k of program or data.

BBC Basic has many enthusiastic users and allows comprehensive control over the machine — there's even a built-in machine code assembler, hardly mentioned in the manual.

But BBC Basic is uncommonly speedy, although it has many stylistic faults. However, the new version has many enhanced features.

Graphics support is comprehensive and fast, as you might expect from the BBC. There are eight graphics modes, offering up to eight preset colours, plus flash. The highest resolution offers 640 x 200 points. The fast text display can cope with up to 32 lines of 80 characters, and several character sets are provided.

String and file-handling is flexible, though you must do your own record-handling.

Documentation

The 210-page ring-bound *Welcome Guide* was produced as part of the BBC Computer Literacy project. It is a brilliantly written tutorial introduction, but it is much too short.

Conclusion

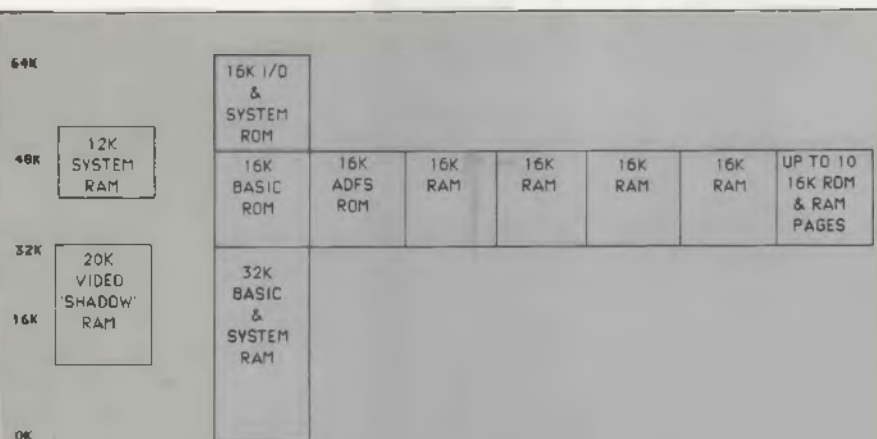
All three machines are popular, and no doubt they'll stay that way for years to come. They are all some way behind the state of the art, but interesting, usable machines nonetheless.

At £140 the Spectrum +2 is competitively priced. It is a shrewd rehash of the original machine, which should do well if — as seems inevitable — it wins the support of the hundreds of small firms that created the Spectrum market.

The Commodore 64C is less of a bargain at £250; the hardware is well-made but the bundled software — apart from the Leisure Genius material — is second-rate. If you want a Commodore 64 you should consider buying the old model on its own, rather than the 'Connoisseur' bundle; that way you could save £50-£100.

The Acorn BBC Master Compact is overpriced and lacks the expansion potential of earlier models. A version that works with your existing TV will set you back £489 — the price of an Amstrad PC with a monitor and 512k of memory. If you want an Acorn monitor with your Compact you'll need £539 for the monochrome and £689 for the colour version.

Acorn's bundled software is good, and well-integrated, but it won't suit everyone. The new Beeb is not a games machine, and programmers will find it rather old-fashioned, but it is well-suited to education, graphics and word processing. **END**



The Acorn Master Compact ('Baby Beeb') can run as a standard BBC, with 28k for Basic programs, 12k reserved for the ADFS and 20k of graphics memory, separately addressed so that it no longer encroaches on program space.

Alternatively the remaining 64k of 'sideways' memory can be used to store Basic, or code in lumps of up to 16k; the standard 32k can be used to hold the Basic interpreter or other machine code. Ten more 16k pages of RAM or ROM can be added, but there's only room in the box for three 16k ROMs and a 32k one

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HiSoft Software What's New?

A lot! We've been very busy over the summer months, carefully crafting more programming tools for the popular home computers. Our move into new offices (see the address below) with extra space and quiet country surroundings sparked off many new programs, like HiSoft BASIC & Knife86, and improvements to existing ones such as Pascal80 & Write Hand Man. Of course, all the old favourites like C and Devpac are still with us (DvpacST is voted Bruce Webster's Product of the Month in November's Byte magazine) and our free catalogue is fatter than ever (just phone or write for a copy) but we'd like to use this space to tell you something new!

HiSoft Pascal80

Pascal80, our popular Pascal compiler for CP/M machines like the Amstrad and Einstein computers, has changed dramatically. It now includes a fully-interactive editor so that you can edit, compile, correct, re-compile and run all from a simple menu, error messages rather than numbers, variant RECORDS, FILES of any type, register variables, upper or lower case reserved words, CHAINing and more. Pascal80 is now a complete Pascal development system, is still much faster than Turbo Pascal and yet costs only ... **£39.95**
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Runs on any CP/M 2 or 3 system

HiSoft The Old School, Greenfield, Bedford, MK45 5DE. (0525) 718181



Red Boxes

If your home micro is languishing in a cupboard, it may be high time to rediscover its versatility. Red Boxes from General Information Systems Limited provides an inexpensive and easy way to interface your computer with domestic appliances. Owen Linderholm connects it up.

When home computers first started appearing on the market, one of the main questions asked by the general public and the media was 'What use are they?' Among the usual replies about learning programming, calculation, home finance, small business use, and so on, was another more unusual one — use them to control your home. With a home computer you can turn your central heating on and off, control lighting and have a cup of tea waiting for you when you wake up. Time has shown that this isn't so simple after all, and

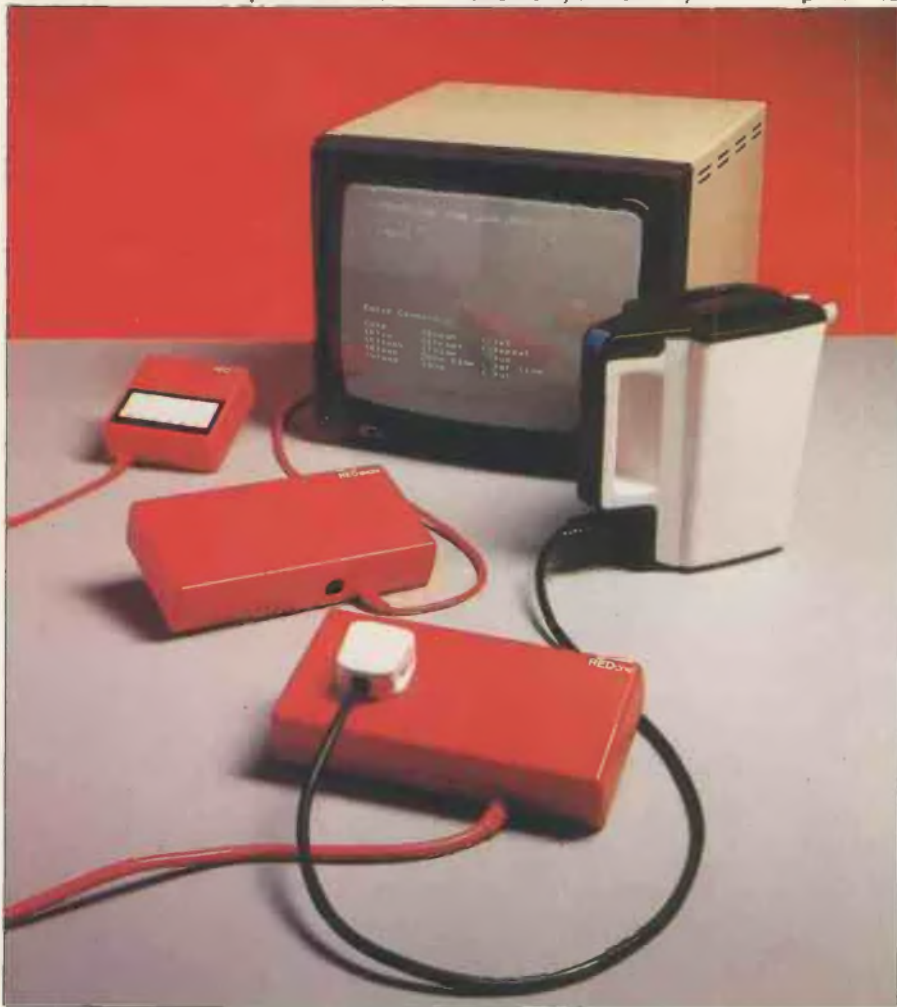
that to actually do most of these tasks would require considerable knowledge of electronics. All this was pointed out to me by Chris Curry, one of the founders of Acorn, at a press conference to launch a new product from his new company, General Information Systems Limited (from now on 'GIS').

The product is called Red Boxes and it completely solves the problem outlined above. With it, you can give your Spectrum, Commodore or BBC Micro a new lease of life. Red Boxes allows you and your computer to

control various devices connected to the mains. No special wiring is needed since the messages are transmitted by modulating the mains supply itself.

A Red Boxes starter pack consists of three units and a manual. The units you get are one each of the three available so far. They all very much live up to their name, since the units are solid-looking, moulded plastic coloured bright red in the Habitat style. The first and most important is Red Leader — the control box for the system. Red Leader contains a 6502 processor and runs a powerful version of Basic which has additional control commands. The box is about 21.5cms x 11cms x 5cms and has a lead to the mains supply on it as well as a 7-pin DIN socket, a small LED and a reset button. The second unit is called Red One and is the same size. It looks exactly the same except that it doesn't have the DIN socket, but a standard 3-pin mains socket on the front. The purpose of the unit is to switch power on and off for any device that runs from a mains power socket. The device to be controlled plugs into the socket on Red Two which itself is plugged into the mains. Red Two can then let mains power reach the device, or not, under the control of Red Leader. The third unit is called Red Two. It looks somewhat different, since its purpose is motion detection by infra-red. The box is 11cms x 11cms x 5cms. It, too, has a lead to the mains supply and a reset button and a LED. On the front, there is also a white plastic panel, behind which is the infra-red sensor.

The interesting thing about Red Boxes is that no interconnecting wires are needed. The system communicates over the mains power supply itself. This is done by treating the mains circuitry as a broadcast medium and then using FM to transmit signals. The same principle is used in the wireless intercomms and



baby alarms that are available today. It is a reasonably well-known method and the British Standards Institution has even set up standards and guidelines for transmitting information along a standard 13amp ring main. Reassuringly for the non-technical or nervous, Red Boxes conforms to these standards and even to BSI recommendations which have not yet become standards.

Getting started

What all this means in practice is that Red Boxes provides a cheap, trouble-free and easy way to interface computers with domestic appliances. As an example, within 10 minutes of opening up the starter pack at home, I had things set up so that my electric kettle switched on when I went into the kitchen. Doing this required no specialist computer or electronic knowledge beyond being able to turn a BBC Micro on correctly and type in a few simple commands.

The start-up process is very simple and clearly explained in the manual. When you have set everything up, you have to get your computer running. You then attach Red Leader to it with the cable provided, type in a short command on the computer telling it to expect a message from Red Leader and switch Red Leader on. Red Leader itself then identifies which computer it is talking to and sends it a short program which is basically a simple terminal and control program in Red Basic. What happens on the screen is that there is a short pause while the program loads and then a display appears that allows simple control of devices.

Next you have to install each extra red box by giving it a name and entering a code which is individual to it. This is part of a careful encryption scheme which is necessary for the system to operate correctly and which is described below. Once this has been done, each device can be controlled by the name you have given it. To have the kettle go on when someone enters the room, first plug the devices in correctly. They each identify themselves immediately to Red Leader and then wait for more commands. Now tell the kettle to 'copy' the detector — this is one command. Now when the detector goes on the kettle goes on, and when the detector goes off the kettle goes off. Then set the detector to 'on' by moving in front of it. Immediately, the detector communicates with Red Leader via the mains. Red Leader then passes the message back to Red One (the kettle), which promptly boils the water for the cup of tea you require.

Versatility

In practice, the starter pack alone merely provides a sample of what

can be done. The core of the system, Red Leader, can control far more than just Red One and Red Two. These can do things like boil the water for a cup of coffee in the morning, or switch the light on when you walk into a room, but if you add more Red Ones and Red Twos, then many other tasks are possible. As a really simple example, a powerful home security system could be set up, with a Red Two detection unit for each room and a couple of Red Ones to activate alarms, lights, and so on. I did a little research and discovered that someone I know has a home security system consisting of six motion detectors similar to the Red Two units, a control centre to turn it on and off, and a loud external alarm. This cost £618. A similar Red Boxes set up, if you already had the micro, would cost about £400 including an alarm and miscellaneous costs.

Other possibilities are to fit the whole house out with automatic lights, or automate *illegal* activities like making tape recordings of radio programmes. Red Leader can control this because it includes an internal clock which can be accessed by programs.

General Information Systems plans to introduce other units, including an alarm, pressure pads, heating controls and even a simple telephone modem. This would allow you to dial home to let the system know you were on your way. The heating could then go on and about half an hour later, say, the kettle would boil and then after another five minutes, the porch light would come on and the TV would be turned on. Alternatively, if you had an ill relative who you were concerned about, a Red Boxes system could be installed so that if no movement occurred in the house during a certain period, it would call you up and play you a pre-recorded telephone message asking you to take some sort of action.

At present, Red Boxes only works with Commodore 64s, BBC Micros and ZX Spectrums. General Information Systems says it will be introducing an Amstrad version and then a general RS232 version. This will require that the user provides his own terminal software, but will give the system much wider flexibility and appeal.

Technical details

The hardware that controls Red Boxes is reasonably sophisticated. Inside Red Leader is a 6502 processor, a 6520 peripheral interface controller and two 16k ROM chips. These are used for overall control, communicating with the computer to be used as a terminal and programming the system. Besides this the box contains the circuitry for what GIS calls a 'mains modem'. The circuitry for these is in all the Red Boxes. It con-

sists of an 8608 4-bit processor and various other bits and pieces. It is important to realise that each unit is modulating frequencies on a mains circuit and so there is mains current and voltage inside each unit. This can be very dangerous and so the units should not be opened.

The other boxes have the 'mains modem' circuitry plus other circuits to control their specific functions. They also each have a custom gate array chip for the packet data encryption and decryption. Interestingly, each of these has a little sticky label on it, similar to the label on the outside showing the unit's special code. This label shows a simple representation of the pins for the chip, with a few of the pins marked. The pins on the real chip that correspond to the marked pins have been physically broken. This seems to be a cheap way of providing the individually customised circuitry that is necessary.

I have referred to the encryption schemes used by Red Boxes already. These are necessary for a variety of reasons. Firstly, Red Leader needs some sort of scheme for differentiating between the devices it is talking to. Also, there is the potential for confusion with other mains modulating devices like intercomms. Finally, the transmission itself carries about 300m along the mains circuitry, which is easily enough to reach for a couple of houses along the average suburban street. This then creates problems to do with interference with next door's Red Boxes system, or nasty people recording a pattern of data off the mains when you switch off the alarm system and then re-playing it at a later date in order to switch your system off.

The encryption system used gets around all these problems. Firstly, the code on each Red Box unit is unique and acts as an identifier of the unit for Red Leader. This code is encrypted each time it is used by the subsidiary Red Box or Red Leader and decrypted by the device for which it is intended. In addition, each transmission by a Red Box has an additional set of bits attached that either Red Leader or another Red Box can decode because it has already identified where the message is coming from.

What this means in practice is that each real message between Red Boxes is enclosed in a package with enough encrypted data, that only the device for which it is intended will accept the data and be able to work-out what it is. Because of this a message from one Red Box to another will only affect the intended recipient and will not be subject to code cracking by malicious outsiders. That doesn't mean that the CIA, using a mainframe, wouldn't be able to decode the signal, so if the CIA are af-

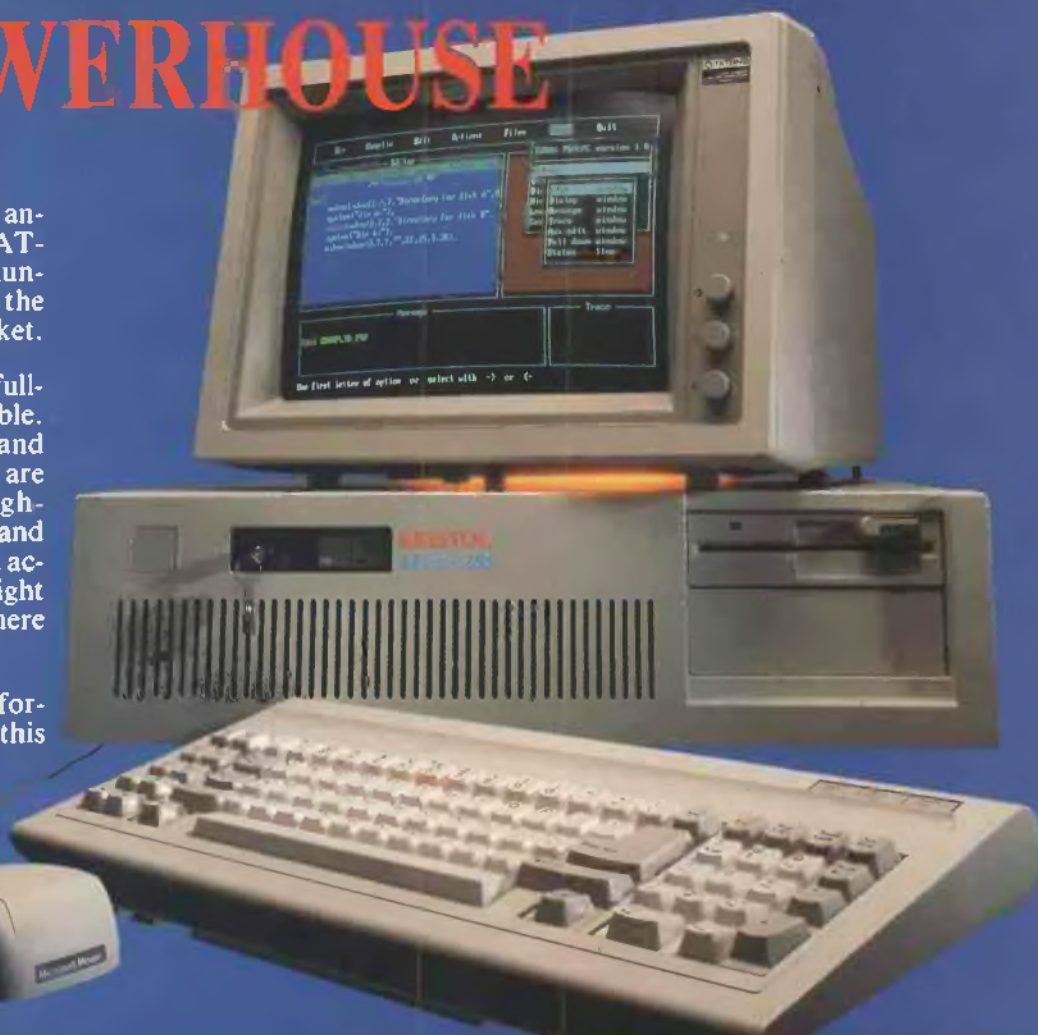
The POWERHOUSE

Bristol Micro is proud to announce its long-awaited AT-compatible, the Micro 286. Running at 10 MHz, this is one of the fastest machines on this market.

Like our XT-compatible, it is full-featured and fully expandable. Serial and parallel ports and battery-backed clock/calendar are standard, as are the high-performance 80286-10 CPU and fast 120ns RAM. The case will accommodate up to 5 half-height drives of various types and there are 8 expansion slots.

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System shown with optional EGA monitor and optional Microsoft Mouse. Facsimile on production version is somewhat different.

The Environment

If you are a 'power user', forced to wait while your XT slowly grinds its way through a large spreadsheet or engineering calculation, this is the machine for you. The Bristol Micro 286 is an 80286-based computer, compatible with the IBM PC/AT, but running at 10 MHz instead of the 6 MHz and 8 MHz of IBM's AT models. As a result, on the widely used Norton SI ratio system performance, the Micro 286 over 10, vs. the 1.00 score of the PC

Networking

The Micro 286 offers exceptional performance and exceptional savings as the server in a low-cost network. The system can be configured with fast Seagate or Tandon hard disk drives to over 100 megabyte storage. If disk caching software such as MicroCache is used, the performance is simply phenomenal. Bristol Micro can supply a local area network as a turnkey system. This includes a Micro 286 as file server, network interface cards, cabling, software, and XT-compatible workstations. This network can be as cheap as a multi-user system, has the same advantages. But instead of a terminal, each user has their own computer, which can be expanded with a hard drive, printer, etc.; and which is reliable, since it can be run completely independently of the Micro 286. If a multi-user system breaks down, even a single workstation stops working. If a station in a network

breaks down, some people are inconvenienced. It's a world of difference.

Computer-aided design

CAD is another area where a high performance system is essential. The Micro 286 can be configured as an ideal CAD workstation, with high resolution colour graphics, a maths coprocessor, mouse, and high-speed hard

disk drive — all for roughly the same price as an IBM PC/XT with 10-15% of the Micro 286's performance!

Unix

Recently, a full port of UNIX System V has become available on AT compatible systems; Bristol Micro is one of the first to offer this system in the UK.

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ter you, don't count on Red Boxes! What the encryption *will* stop is your neighbour trying to hack into your Red Boxes system with a BBC.

What Red Boxes can't overcome is excessive 'noise' from some of the intercomm systems that use the mains. Most of these don't conform to BSI standards and broadcast a continuous carrier. Red Boxes uses a time-sharing system. If it detects a carrier on the mains, then Red Leader stops everything else and listens out for a message. What this means is that if something else is generating a continuous carrier at 129KHz, Red Leader will be tied up waiting for a message. So a Red Boxes system *will* encounter problems if one of these is being used nearby. When intercomms finally conform to the BSI standards, this problem should disappear.

Programming

As an example of what can be done with the Red Boxes system, I set the system the relatively simple task of turning a light on when I entered a room and then turning it off after I had left. This is a bit more difficult than it sounds, since when one of the motion detectors is set on by motion within its field of vision, it stays on until ordered off by Red Leader so that it can continue to de-

tect motion in the room. Also, the light must not be turned off too quickly, in case the person in the room has simply stopped moving for a while.

What the program needs to do is periodically monitor the room to see if someone is there. If they are, then the light should be on; if they aren't, then the light should be off. In order for the program to be useful, it must also turn the light on as soon as someone enters the room.

The programming language Red Basic is quite sophisticated. It includes, for example, commands like DIM, IF... THEN... ELSE, FOR... NEXT, GOSUB, ON... GOTO/ GOSUB, LOAD, SAVE, PRINT, READ, INPUT, REPEAT... UNTIL. There are also a large number of additional commands for controlling Red Boxes and for timing, and even a few graphics commands for relevant machines.

The example program (see the listing) installs the two Red Boxes from the starter kit as a light and a detector. It then turns both devices off for

```
10 REM /RED BASIC PROGRAM TO TURN A LIGHT ON AND OFF
20 REM /CHECKS FOR SOMEONE ENTERING ROOM, THEN
30 REM /TURNS LIGHT ON. THEN STARTS LOOP TO
40 REM /PERIODICALLY CHECK FOR SOMEONE'S PRESENCE.
50 REM /IF THEY ARE THERE, REPEAT LOOP. IF THEY
60 REM /ARE NOT, TURN LIGHT OFF AND START THE
70 REM /PROCESS AGAIN.
80 REM
90 REM /INSTALL RED ONE AND RED TWO
100 INSTALL("LIGHT1",XX,XX,XX,XX)
110 INSTALL("DETECT",XX,XX,XX,XX)
120 REM /THE XX'S REPRESENT THE CODES GIVEN ON YOUR
130 REM /INDIVIDUAL UNITS AND IDENTIFY THE UNITS TO
140 REM /RED LEADER
150 REM
160 REM /SWITCH LIGHT AND DETECTOR OFF TO START WITH
170 TELL("LIGHT1",OFF)
180 TELL("DETECT",OFF)
190 REM
200 REM /IF MOTION DETECTED BY RED TWO, GOTO MAIN LOOP
210 REM /OTHERWISE KEEP CHECKING FOR MOTION
220 IF STATUS$ "DETECT"="ON " THEN 340
230 GOTO 220
240 REM /NOTE THE SPACE AFTER 'ON' IN LINE 220
250 REM
300 REM /MAIN LOOP - TURN LIGHT ON, RESET DETECTOR
310 REM /SET UP TIMING DELAY - 30 SECONDS
320 REM /IF STILL DETECTING MOTION, REPEAT THIS LOOP
330 REM /OTHERWISE TURN LIGHT OFF AND RETURN TO 160
340 TELL("LIGHT1",ON)
350 TELL("DETECT",OFF)
360 T=TIME
370 IF TIME<(T+30) GOTO 370
380 IF STATUS$ "DETECT"="ON " THEN 350
390 TELL("LIGHT1",OFF):GOTO 170
400 REM /TIME IS A RESERVED VARIABLE IN RED BASIC AND
410 REM /HOLDS A 24 HOUR CLOCK IN TERMS OF SECONDS,
Program to install two Red Boxes as a light switch and a detector
```

initialisation. If motion is detected in the room, the program branches to the main section. If not, it simply loops round, waiting. The main section then turns the light on and resets the motion detector. A timing variable is then used to wait for 30 seconds. After that time, if motion has been detected, this process is simply repeated. If no motion has been detected, the light is turned off and the program starts again.

Documentation

The instruction manual supplied with Red Boxes is extremely careful and clear about how to install the system and use the initial menu program that is downloaded to your home micro. It covers the programming language Red Basic rather less well and assumes that you have previous experience of Basic programming, and will draw upon it to use the language. This is a reasonable assumption since the product is aimed at those who already own home micros.

Price

The Red Boxes starter pack, consisting of Red Leader, Red One and Red Two, a connecting cable for either a BBC, Commodore or Spectrum and a manual, costs £129 plus £4 postage and packing. Further Red Ones and Red Twos cost £34.95 plus £2 postage and packing. A project manual providing many ideas, suggestions and programs costs £9.95. Other units under development are a digital to analogue control box, RS232 units, a 106dB warbling alarm, door and window contact switches and pressure mats.

Conclusion

Overall, I found Red Boxes to be easy to use and very well-presented. The boxes themselves are carefully designed and look like the solid consumer electronics goods they are. The information transmission system used is clever and gets around all the potential problems bar one. When other manufacturers of products that use mains-borne information fall in with BSI recommendations, then even this problem will be removed.

Initially, the aim is to sell Red Boxes to computer and electronics hobbyists to give old micros a new lease of life, as well as to finally let people make the old 'myth' of home control a reality. There is, however, potential for a wide range of very useful applications to develop around the basic principle and this is where Red Boxes could do very well.

For more details contact General Information Systems Limited, Croxton Park, Croxton, Cambridgeshire PE19 4SY.

END

Time's (nearly) up!

The new PCW Benchmarks have met with readers' general approval, but a few modifications are in order. Nick Walker guides you through, plus he provides example Benchmarks for the popular machine languages. Keep those timings rolling in!

There is probably no topic so controversial among computer users as that of Benchmarks. My article 'In the nick of time' (October PCW) brought in around 100 letters as well as numerous phone calls on the subject of the new PCW Benchmarks; of these letters approximately 80 per cent were in favour and 20 per cent were against.

The one major gripe, however, is that the Benchmarks were not specified in enough detail, so here is a tighter description of each Benchmark, with a few minor alterations.

You'll also find a table on page 166 giving all the results of the machine timings that I've checked so far. We'll publish an update of the result tables periodically, as there are still a lot of results to be checked.

Thank you for your response so far, but please keep sending in the results for all machines and all languages; even results for machines we've already covered will help to confirm their accuracy.

For the 'arithmetic' calculation we've changed the order of calculation in such a way that it is not a

zero addition. Apparently a very large number of compilers, even on micros, will recognise a zero addition and not perform any calculation.

For 'intmath', 'realmath' and 'triglog' we've specified to what accuracy the calculation should be performed. Obviously a floating-point calculation to 16 decimal places would take longer than the same calculation to an accuracy of six decimal places. Therefore, all real calculation should be executed as near to an accuracy of six decimal places as possible, and all integer calculation should be

English description of new Benchmarks

intmath:

```
declare three integer variables X, Y and I
assign X equal to 0 and Y equal to 9
write 'Start' to screen
repeat 1000 times using I as the loop variable:
  assign X equal to X + (Y * Y - Y) / Y
write 'Finish' and X to screen
```

realmath:

```
declare two real variables X and Y
declare an integer variable I
assign X equal to 0 and Y equal to 9.9
write 'Start' to screen
repeat 1000 times using I as the loop variable:
  assign X equal to X + (Y * Y - Y) / Y
write 'Finish' and X to screen
```

triglog:

```
declare two real variables X and Y
declare an integer variable I
write 'Start' to screen
assign X equal to 0 and Y equal to 9.9
repeat 1000 times using I as the loop variable:
  assign X equal to X + Sin(ArcTan(Cos(Log(Y))))
write 'Finish' and X to screen
```

textscrn:

```
declare an integer variable I
write 'Start' to screen
repeat 1000 times using I as the loop variable:
  write '1234567890qwertyuiop' and I to screen
write 'Finish' to screen
```

grafscrn:

```
declare integer variable X and Y
write 'Start' to screen
repeat 100 times using X as the loop variable:
  repeat 100 times using Y as the loop variable:
    plot pixel at screen position (X,Y)
write 'Finish' to screen
```

store:

```
declare an integer variable I
write 'Start' to screen
create a disk file 'Test'
open 'Test' for input
repeat 1000 times using I as the loop variable:
  write the record '1234567890qwertyuiop' to 'Test'
close 'Test'
delete 'Test'
write 'Finish' to screen
```

NOTES:

intmath Use integer divide if possible, final X value should be 8000

realmath Use as near to six-digit precision floating point numbers as possible. Specify if precision is grossly over or under this. Final X value should be 8899.96

triglog Same comments as realmath regarding floating-point numbers. Ensure that all the calculations are in Radians and the logarithm calculation is a natural (base e) calculation. Final X value should be -551.242

textscrn Use an 80-column x 25-line screen mode if possible. If not, then use as large a screen mode as possible and specify the number of rows and columns used. If the screen does not scroll by default, it should be made to do so. Use no special tricks in order to increase scrolling speed.

grafscrn Use the lowest resolution screen that will accommodate a 100 x 100 pixel square. Plot the actual pixels of this screen rather than any virtual screen coordinates

store State the disk drives and disk operating system used if this is not standard. Use the default record handling. Do not pre-declare the record size or file size. Use the most obvious commands for file manipulation. Do not use direct calls to operating system commands

signed 16-bit. There is no intention of making the Benchmarks a test of accuracy.

The order of calculation in 'triglog' has been changed, as many compilers now recognise Sine of Cosine as cancelling each other out and so remove the instructions. In general, I am not in favour of changing Benchmarks in order to defeat any optimisation of a compiler, as optimisation is in itself a sign of a good compiler. However, in these two instances I have been convinced that the kind of optimisation used is now very prevalent.

Each 'Write' instruction in 'textscrn' should be followed by a carriage

return/line feed combination. To avoid any discrepancy with screens of different sizes, always use an 80-column by 25-line screen. When the screen is full it should scroll; if it doesn't do this by default, it should be made to do so.

The only difficulty so far with 'grafscrn' is with machines that use a virtual coordinate system, typically 32000 x 32000 pixels.

Machines of this kind of system can spend an excessive amount of time calculating a pixel that is never plotted. In this case write the Benchmark in such a way that only the real pixels are switched on. In all cases use the lowest resolution possible that will accommo-

date 100 x 100 pixels.

No changes to the specification on 'store', just a call for more information on what kind of disk drives and disk operating systems should be used. This is especially true of machines like the BBC where practically all disk drives are of third-party manufacture.

I am now considering a set of extensions to the Benchmarks that will test features that are not present on every machine but will be important in the future. One of the most obvious of these is 'blitter' performance. I don't want more than four of these, making a total of 10 Benchmarks, so I shall be selective in what these are. Suggestions as to what these Benchmarks should cover would be gratefully accepted.

This should clear up any confusion as a result of the previous article. In one case, at least, the Benchmarks have already proved their worth: Mr David Jones of Harrogate used the store Benchmark to confirm that one of the floppy drives on his IBM PC was considerably slower than the other. Armed with the data from the Benchmark, he finally convinced his dealer, who has now replaced the drive.

PC Turbo Pascal Benchmarks

```

program intmath;
var i,x,y : integer;
begin
  x := 0;
  y := 9;
  writeln('Start');
  for i := 1 to 1000 do
  begin
    x := x + (y * y - y) div y
  end;
  writeln('Finish',x)
end.

program realmath;
var i: integer;
x,y: real;
begin
  x := 0.0;
  y := 9.9;
  writeln('Start',x);
  for i:=1 to 1000 do
  begin
    x := x + (y * y - y) / y;
  end;
  writeln('Finish',x);
end.

program triglog;
var i: integer;
x,y: real;
begin
  x := 0.0;
  y := 9.9;
  writeln('Start');
  for i := 1 to 1000 do
  begin
    x := x + sin(arctan
      (cos(log(y))));
  end;
end.

          writeln('Finish',x)
end.

program textscrn;
var i : integer;
begin
  writeln('Start');
  for i:= 1 to 1000 do
    writeln('1234567890qwertyuiop',i);
  writeln('Finish')
end.

program grafscrn;
var x,y : integer;
begin
  writeln('Start');
  GraphMode;
  for x:= 1 to 100 do
    for y := 1 to 100 do
      plot(x,y);
    TextMode;
    WriteLn('Finish')
  end.

program store;
var i : integer;
x : string;
testfile : text;
begin
  writeln('Start');
  x := '1234567890qwertyuiop';
  Assign(testfile,'test.$$$');
  Rewrite(testfile);
  for i := 1 to 1000 do
    write(testfile,x);
  Close(testfile);
  writeln('Finish')
end.

```

PC Forth Benchmarks

```

: intmath      ."Start"
               9 0
               1000 1 DO DUP DUP * OVER - OVER / R@ + DROP LOOP
               ."Finish" . ;

: textscrn     ."Start"
               1000 1 DO ."1234567890qwertyuiop" I. CR LOOP
               ."Finish";

: grafscrn     ."Start"
               6 MODE
               100 1 DO
                   100 1 DO J I 9 !dot LOOP
               LOOP
               3 MODE
               ."Finish";

: store        ."Start"
               LIT "1234567890qwertyuiop" I . CR LOOP
               21 1 DO I BLOCK
                   1000 0 DO I OVER + 2 PICK SWAP 20 CMOVE
                   20 + LOOP
               DROP UPDATE
               LOOP
               DROP FLUSH
               ."Finish";

```

MBasic Benchmarks

```

1 REM intmath
100 PRINT "Start"
110 X! = 0
120 Y! = 9
130 FOR I! = 1 TO 1000
140 X! = X! + (Y! * Y! - Y!) \ Y!
150 NEXT I!
160 PRINT "Finish",X!

1 REM realmath
100 PRINT "Start"
110 X! = 0
120 Y! = 9.9
130 FOR I! = 1 TO 1000
140 X! = X! + (Y! * Y! - Y!) / Y!
150 NEXT I!
160 PRINT "Finish",X!

1 REM triglog
100 PRINT "Start"
110 X! = 0
120 Y! = 9.9
130 FOR I! = 1 TO 1000
140 X! = X! + SIN(ARCTAN(COS(LOG(Y!))))
150 NEXT I!
160 PRINT "Finish",X!

1 REM textscrn
100 PRINT "Start"
110 FOR I! = 1 TO 1000
120 PRINT "1234567890qwertyuiop",I!
130 NEXT I!
140 PRINT "Finish"

1 REM grafscrn
100 PRINT "Start"
110 SCREEN 2
120 FOR X=1 TO 100
130 FOR Y=1 TO 100
140 PSET (X,Y)
150 NEXT X
160 NEXT Y
170 SCREEN 0
180 PRINT "Finish"

1 REM store
100 PRINT "Start"
110 X$ = "1234567890qwertyuiop"
120 OPEN "test.$$$" FOR OUTPUT AS #1
130 FOR I! = 1 TO 1000
140 PRINT #1,X$
150 NEXT I!
160 CLOSE #1
170 PRINT "Finish"

```


BENCHMARKS

Modula-2 Benchmarks (Atari ST using GEM)

```

MODULE intmath;

FROM InOut IMPORT Read, WriteString, WriteInt;

VAR X, Y, I : INTEGER;

BEGIN
  X:=0; Y:=9;
  WriteString('Start');
  FOR I:=1 TO 1000 DO
    X := X+(Y*Y-Y)/Y
  END;
  WriteString('Finish');
  WriteInt(X,6);

END intmath.

MODULE realmath;

FROM InOut IMPORT Read, WriteString;
FROM RealInOut IMPORT WriteReal;

VAR X, Y : REAL;
    I : INTEGER;

BEGIN
  X:=0.0; Y:=9.9;
  WriteString('Start');
  FOR I:=1 TO 1000 DO
    X := X+(Y*Y-Y)/Y
  END;
  WriteString('Finish');
  WriteReal(X,10,3);

END realmath.

MODULE triglog;

FROM InOut IMPORT WriteString;
FROM RealInOut IMPORT WriteReal;
FROM MathLib IMPORT sin, cos, arctan, ln;

VAR X, Y : REAL;
    I : INTEGER;

BEGIN
  X:=0.0; Y:=9.9;
  WriteString('Start');
  FOR I:=1 TO 1000 DO
    X := X + sin( arctan( cos (log(Y))) )
  END;
  WriteString('Finish');
  WriteReal(X,12,8);

END triglog;

MODULE textscrn;

FROM InOut IMPORT WriteString, WriteInt, WriteLn;

VAR I : INTEGER;

```

```

BEGIN
  WriteString('Start');
  FOR I:=1 TO 1000 DO
    WriteString('1234567890qwertyuiop');
    WriteInt(I,5)
  END;
  WriteString('Finish')

END textscrn.

MODULE grafscrn;

FROM InOut IMPORT WriteString, WriteLn;
FROM VDIControls IMPORT OpenVirtualWorkstation,
  CloseVirtualWorkstation;
FROM VDIOutputs IMPORT PolyMarker;
FROM GENVDIbase IMPORT VDIWorkInType, VDIWorkOutType,
  PxyArrayType;
FROM AESGraphics IMPORT GrafHandle;

VAR X, Y, I : INTEGER;
    Dot : ARRAY (0..1) OF INTEGER;
    VDIHandle, Dummy : INTEGER;
    PxyArray : PxyArrayType;
    WorkIn : WorkInType;
    WorkOut : WorkOutType;

BEGIN
  VDIHandle := GrafHandle (Dummy,Dummy,Dummy,Dummy);
  FOR I:=0 TO 9 DO WorkIn[I]:=1 END;
  WorkIn[10] := 2;
  OpenVirtualWorkstation(WorkIn,VDIHandle,WorkOut);
  WriteString('Start');

  FOR X:=1 TO 100 DO
    FOR Y:=1 TO 100 DO
      Dot[0]:=I;
      Dot[1]:=J;
      PolyMarker(VDIHandle,1,Dot);
    END
  END;

  WriteString('Finish');
  CloseVirtualWorkstation(VDIHandle);

END grafscrn.

MODULE store;

FROM InOut IMPORT WriteString;
FROM FileSystem IMPORT File, Create, Close, SetWrite, Rename,
  WriteRec;
FROM GEMDOS IMPORT Delete;

VAR I : INTEGER;

BEGIN
  WriteString('Start');
  Create(TestFile,'A:\');
  Rename(TestFile,'A:\TEST.DOC');
  SetWrite(TestFile);
  FOR I:=1 TO 1000 DO
    WriteRec(TestFile,'1234567890qwertyuiop');
  END;
  Close(TestFile);
  Dummy := Delete(Name);
  WriteString('Finish')

END store.

```

Table of results by machine

Machine & specification	Language	intmath	realmath	triglog	textscrn	grafscrn	store
ADVANCE 86B Internal 5¼in floppy, CGA graphics & screen	BasicA	4.56	5.2	44.8	81.0	23.5	11.8
	Turbo Pascal	0.12	11.8	14.7	37.6	3.72	13.0
AMSTRAD CPC6128 Internal 3in floppy disk drive	Locomotive Basic	4.5	7.6	16.3	159.6	22.0	28.6
APPLE IIE APPLE II Floppy disk drive, 80-column screen	Applesoft Basic	9.81	10.67	110.99	41.87	35.38	76.83
	Apple Pascal	2.78	8.46	209.4	139.5	35.57	249.24
	Personal Basic, Z80, CP/M	4.9	5.51	34.59	35.06	—	26.04
APPLE IIGS APPLE II 5¼in floppy, Apple DOS 3.3	Applesoft Basic	3.4	4.2	50.0	15.08	14.2 (ProDos)	41.8 18.6
APPLE MACINTOSH Internal 400k floppy disk drive	Turbo Pascal	0.043	4.6	6.4	51.5	15.0	10.4

APRICOT PC Internal 3½in floppy, MS-DOS 2.11	GW-Basic Vs3.10	3.14	4.9	39.26	243.48	33.87	23.26
	MS-Basic Vs5.28	4.49	5.27	37.55	73.35	—	19.73
	ProPascal	0.26	0.36	1.76	64.5	—	13.2
APRICOT Xi Apricot 20Mbyte hard disk, Internal 3½in floppy	GWBasic	7.7	8.0	30.2	291.2	53.2 (Hard disk)	22.4 17.5
ATARI ST Default output windows, no other windows open, medium- resolution colour monitor, 800k floppy disk drive	Fig-Forth Philon Fast Basic Megamax C ST Basic TDI Modula-2	0.63 0.65 0.16 1.5 0.045	1.15 0.92 1.1 3.5 0.43	— 0.76 7.9 7.9 6.0	23.6 78.5 39.6 44.8 6.2	0.77 24.46 7.7 92.7 40.0	— 26.8 14.1 56.0 9.9 15.0
ATARI 130XE 1050 floppy, Atari Dos 2.5	Microsoft Basic	7.08	15.6	96.7	66.9	52.04	116.04
BBC MASTER 128 ADFS Cumana 800k floppy disk drive	Basic IV	2.5	4.3	43.0	14.2	22.0	38.6
BBC MODEL B+ DFS Cumana 800k floppy disk drive	Basic II	2.6	5.8	80.4	21.0	39.1	24.1
BBC MODEL B DFS Cumana 800k floppy disk drive	Basic II	2.6	5.8	80.6	13.7	21.5	24.3
	Basic I	2.6	5.8	76.4	13.7	21.5	24.3
	Basic II with 6502 2nd Processor	1.92	3.98	54.32	6.54	10.95	22.91
CITADEL PC/AT 8MHz 80286 processor switched to no wait states. Internal 20MByte hard disk	BasicA	1.8	2.1	7.9	50.5	10.8	4.8
	PC Forth	0.07	—	—	33.6	—	0.9
COMMODORE AMIGA Internal 3½in floppy	Amiga Basic	1.7	2.7	6.7	150.3	25.0	32.7
COMPAQ Deskpro 386 Internal 40Mbyte hard disk, EGA graphics and screen	GWBasic	1.0	0.96	3.85	25.5	4.8	2.6
IBM PC External Ampex hard disk with an Xebec controller, CGA graphics card and screen	BasicA	6.2	8.2	47.0	100.0	49.0	17.2
	Turbo Pascal	0.18	4.0	56.2	76.4	5.0	4.9
	PC Forth	0.3	—	—	67.0	2.4	1.9
IBM PC/AT 20Mbyte IBM hard disk	BasicA	1.01	1.89	4.18	25.4	—	0.93
INTER-ORIENT AT NEC 20 Mbyte hard disk, 80286 at 8MHz, EGA card and screen	Turbo Pascal	0.033	1.4	15.0	19.5	2.6	2.1
JUPITER ACE	Jupiter Forth	6.12	13.64	—	19.42	5.9	—
SANY MBC-550 5¼in 160k floppy MS-DOS 1.25	GWBasic	8.3	10.2	44.9	65.4	72.7	15.7
SINCLAIR SPECTRUM Microdrive storage	HiSoft Pascal	0.55	1.8	22.2	75.0	3.5	—
	Spectrum Basic	—	17.5	226.5	84.0	83.6	45.8
SINCLAIR QL Microdrives	SuperBasic	7.7	6.4	27.7	28.6	149.4	18.8
	Metacomco Pascal	0.8	3.4	11.1	180.0	170.9	82.2
TEXAS T199/4A. T1 floppy disk drive	C99 MyArc Extended Basic Vs2.0	0.48	12.9	154.7	38.7	—	81.0
	Pilot 99	—	31.8	365.0	73.0	268.0	83.0
	TI Basic	—	576.0	1710.0	980.0	3930.0	—
	TI Extended Basic	—	17.7	624.0	260.0	—	166.0
	TI Forth	—	22.0	362.0	117.0	—	131.0
		2.86	—	—	68.0	20.1	—



SCREENTEST

PC File

ShareWare is a form of software that has had an enthusiastic reception in the US, but has been greeted with some hesitation in the UK. Kathy Lang looks at the ShareWare collection's database, PC File.

Among the more intriguing novelties produced by the advent of micros in the US has been the concept of ShareWare (see 'Networks', November PCW). A ShareWare program can usually be given away by any user to another, though not sold or bartered; the program disk generally includes a copy of some rudimentary documentation, which can be printed on pretty well any printer. If the recipient likes the program and wants to go on using it, he or she sends a modest fee to the writer of the software, and receives in return a copy of the most up-to-date version of the program, a manual and a guarantee of notification of new versions of the product as they are produced, obtainable at an equally modest fee. Registered users' queries are usually answered by post, and there may also be some limited hot-line support. The idea has become very

popular in the US, since it enables small programming outfits to distribute their products very widely without a vast advertising budget, while giving users viable software at a very cheap price — usually \$50 or so for a word processor, file manager or communications program.

In the UK, the idea has been slower to catch on; principally, I think, because people are reluctant to believe that anything worth having can be so cheap, and perhaps also because of a reluctance to transmit money to unknown suppliers overseas. Firstly, several user groups have grasped the usefulness of this source of software for their members; the IBM PC User Group, for example, has well over 200 disks of user-supported programs in its catalogue, and many of these are 'ShareWare' programs. Secondly, low-price software has become much more 're-

spectable' with the launch of the Amstrad PC, and the consequent dramatic drop in prices of many established products, at least in cut-down versions. At the same time, many people have become aware that they cannot expect much support at such prices — but for a fair few that will simply be a formalisation of an existing situation, since few dealers actually provide the level of software support that users expect. We thought that these factors made this an opportune time to have a closer look at the major ShareWare contender in the data management stakes, PC File.

PC File is in some respects a relief after the sheer weight of some of the major commercial packages. It is supplied on a single floppy disk, and it would not be out of the question to use it on a single floppy drive machine such as the basic Amstrad PC. Although called PC File, this should not be interpreted as implying 'IBM PC' — it is said to run under MS-DOS on any system which supports an ANSI terminal device. (All that means is that you must have, in the root directory of your system disk, a file called 'ANSI.SYS' — it should be distributed with your official DOS disk — and also an entry in your CONFIG.SYS file reading 'DEVICE=ANSI.SYS'. With the demonstration copy comes a disk file containing enough documentation to get you started; to encourage you to register with Buttonware, the supplier, the document is lavishly interspersed with boxes saying 'Section omitted. Evaluation copy'. But what remains is quite enough to get going and see whether PC File is sufficient for your needs. The package is

Benchmarks

BM1	Add one new record	Inst
BM2	Select record by primary key	Inst
BM3	Select record by secondary key	NP
BM4	Access 20 records sequentially on three-character field (BM2 key field)	Inst
BM5	Access record using wild code	Inst
BM6	Index file on three-character field	NP
BM7	Sort file on five-character field	3mins 59secs
BM8	Calculate on one field per record and store result in record	34mins 10secs
BM9	Total three fields over all records	5mins 2secs
BM10	Add one new field to each record	NT
BM11	Import 1000 records	7mins 20secs

NT=Not Tested; NP=Not Possible; +=inc scrolling

Where two times are given, first is access to first record, second is access to each subsequent record

menu-driven, with a choice between using function keys or entering the first three characters of an option to select it: the main menu is shown in the screendump below.

Constraints

The most serious constraint is likely to be the limit to 65 characters per field for records with up to 21 fields, and to 25 characters over that limit; the absence of date fields will also cause problems for many. There is some limited data validation: apart from testing to see that the data is of the correct type, you can also set up an input mask that specifies the characters valid for a particular field.

Features

Max file size	9999 records
Max record size (chars)	1430
Max no fields	42
Max field size (chars)	65/25
Max digits	Not stated
Max prime key length	65
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Various formats
Data types	Number, char
Fixed rec structure?	Yes
Fixed record length stored?	Yes
Amend rec structure?	No
Link data files?	No
No. data files open	1
No. sort fields	10
No. keys	1
Max key length (chars, fields)	65, 1
Subsidiary indexes kept up-to-date	NA
Data validation	Adequate
Screen formatting	Default given
Unique keys	No
Report formatting	Default given, col/row coords
Store calculated data	Batch update
Totals & statistics	Totals
Store selectn criteria	Permitted
Combining criteria	And, Or
>1 criterion/field?	Yes
Wild code selection?	Any part string
Browsing methods	Any field
Interaction methods	Menus
Reference Manual	Not tested
Tutorial guide (max 5*)	**
Reference card	None
Online help	None
Hot-line?	None

Note: NA=Not Applicable;

File creation & indexing

Only one step is required to set up a file: you enter field names and lengths in a simple grid. A numeric field is distinguished by attaching a hash sign to its name; otherwise, all fields are character. The first field in the file becomes the index, and no secondary indexes are allowed. (This is not, however, a serious drawback unless you need to create complex multi-file indexes — retrieval on any single field is very fast, as the Benchmarks show.)

Data entry & updating

Data can be added, amended or deleted onscreen, and amended or deleted automatically in batches. PC File displays your record as a simple grid of field names and values, allowing you to use normal cursor movements while editing. Records can be selected for updating using any field, and making complete or partial matches (for more on this, see 'Selection & sorting'). When a particular record has been found, you can browse forwards or backwards in the file, in its current order; this will normally be roughly in entry order, but you can sort records into almost any order if you need to — the order is not maintained when sorted fields are edited, though.

Batch updating is very basic. You can delete a set of records by specifying criteria which they must match; you can also update a set of records automatically, but the only change possible is the replacement of a field value by a constant, which would be very limiting in some applications.

Screen display

During data entry and record display, each record occupies a single screen, with each field on one line (see screendump, page 171).

Any report can be sent to the screen as an alternative to the printer, but this does, of course, make it impossible to design data entry screens for particular applications.

Printed reports

PC File provides a basic report format that is essentially a list. Without modification, the simple columnar format would take care of quite a lot of requirements, but there are also some additions to the basic format, such as the inclusion of sub-totals on a pre-sorted field. You can adapt the report layout in order to export data in a number of formats, in addition to those provided by the Export module. A label-printing facility allows you to print labels several-up across the page. Report formats may, if you wish, be saved for subsequent re-use; they are stored in a simple

text form that can be amended using an editor or word processor.

Selection & sorting

When amending a file, or displaying one record at a time, you can find records quickly by entering the value of the key — that is, the first field in the record. (You can also ask to see the next or previous record, the last in the file, or any record by its relative number if you know it.) As an alternative, you can find records by searching on any field; you can request a match on any characters in the field, on the first few characters, or using a 'Soundex' search. For example, if you asked for a match on the word Smith, the first method would find Wordsmith, Smithson and Smith, the second would find Smith and Smithson, while the third would find Smith and Smyth. A good Soundex mechanism can be very useful in applications where small misspellings are common, for example when entering names and addresses. Whichever selection method you choose, you can stay displaying one record per screen, or go into 'browse' mode in which the next or previous 20 records are shown.

While such searches do not use conventional keys they can be very quick, especially for searches of the 'starting characters' type, on files of a thousand records or so.

If you use PC File's reporting capability to list records (for display only), you can use a much wider range of selection facilities, allowing you to use the conventional relational operators, and to specify that all or just some tests must be passed for the record to be selected.

In either case, the file will normally appear in the order in which the records were entered (or roughly so, since the space used by deleted records is re-used as appropriate). Records can also be sorted on up to 10 fields at a time; the authors have put some thought into making this a relatively rapid process, especially for files of a thousand or more records. Sort order is not necessarily maintained over editing sessions, though: to be sure the field is in the right order, you must sort it again before producing further reports.

```
(F1) ADD a record
(F2) MODify a record
(F3) DELete a record
(F4) DISPlay a record
(F5) FInd a record
(F6) LISt or clone
(F7) SOrt the index
(F8) EXPort or other utilities
(F9) alter field NAME or mask
GLO GLObal update or delete
KEY set up the smart KEYS
END END or change database
```

The main menu: FInd a record is the default option

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SCREENTEST

RECORD # 1002

Refnum 992UM
Name Smith, John
Datecre 130686
Type DMS
Descripn PC-FILE
Suppl# 132
Price1# 55
Supp2# 450
Price2# 49
Supp3# 121
Price3# 42.5
Supp4# 210
Price4# 39.50
Sys1 IPC
Sys2 APR
Sys3 OLI
Rating 07
Ref1 PCW86B
Ref2
Ref3
Ref4

KEY, or #n,*,+,-,++,--,0

PC File data displayed in a one-record-per-screen format

Calculations

PC File does not provide the ability to make calculations as data is entered, but you can have calculated fields in reports, and hence create calculated fields in other PC File files or in exported files, using basic arithmetic.

Tailoring

There are no 'programming' facilities as such within PC File, but you do have the ability to store frequently-

used keystroke sequences on 'macro' keys — up to 10 of these may be in use at any one time. These keys are set up simply by entering the keystroke sequence — there doesn't seem to be any editing capability. More basic tailoring, such as specifying the printer, the colours of the screen and the name of a data file to be used when the program is started up, is achieved by modifying a parameter file, stored on disk in text format, which can be amended by an editor or word processor.

Links with outside

PC File can import and export files in several common formats, including the 'mail-merge' format used with WordStar for writing personalised letters, and the DIF format which gives access to many spreadsheet programs. In many packages this is a rather slow process; PC File is not exceptionally fast, but it's faster than many others in this area.

User image

The major facilities of PC File can be invoked through the main menu, or, in most cases, reached directly from DOS by running the appropriate module. Once into a module, the current options are displayed on the 25th line. Occasionally I became confused as to exactly where I was in the package, but by and large I found PC File as easy to use as one would hope would be the case with this kind of product.

In general, my main use of the manual was to find out what the package was capable of, rather than using it to learn how to do things. The typed documentation which comes with the evaluation version is quite straightforward and easy to understand. The pukka manual had not arrived by the time PCW went to press, so I'll add a note on this to a later article.

Conclusion

PC File is definitely in the 'cheap and cheerful' category. The 'flat file' approach, the limitations on field size, and on numbers of fields and records, and the restricted calculation features, would rule it out for more sophisticated applications. But for many basic applications, especially in such areas as mailing lists, membership records and the like, PC File is well worth considering.

Against the extreme cheapness of the package, and the positive features, such as the selection facilities and the speed of straightforward retrieval, must be balanced the lack of support in the UK; but for such a simple database you may never feel the need for it. **END**

Summary

Information handling

PC File is a 'flat file' package — that is, each record in a file must have the same structure and you cannot link records in different files. It would be suitable only for simple types of data structure, such as names and addresses, not for more complex types such as stock records linked to supplier and customer records. And each record takes the same amount of space however much or little it contains, so PC File is not suitable for records of widely varying depth, such as library catalogues containing abstracts.

Processing

PC File provides total and calculated fields in reports, but no other calculations. Selection facilities are flexible and easy to use, including 'Soundex' for 'sounds-like' matching, making it ideal for applications such as mailing lists. Simple processing is very fast, though the more complex tasks are relatively slow.

Housekeeping

PC File's features should be good enough for most requirements. Records can be amended onscreen, being selected by key or on another field, or by browsing in entry order; very simple changes can also be made in batches, for example to change the current vaccination status of a selected group of patients.

Control

Menus are used for overall control, with special keys in context — for example, '+' to move forward one record when browsing. Though you can store frequently-used key sequences, you can't store commands to tailor the use of PC File for novices; but it's so simple to use that such sophistication is unnecessary.

Support

When you are a registered user, Buttonware will answer queries by letter and, if urgent, by telephone. But there is no organised support in the UK. Again, for such a simple package, you should not need it.

Price

\$49 (payable in dollar cheque, or by Access or Visa card).

Supplier

Jim Button, Buttonware, PO Box 5786, Bellevue, WA 98006, USA.

Demo copy

IBM PC User Group, PO Box 830, London SE1 2BQ. Tel: (01) 232 2277; £5 (+£2 P&P) to members only. Or from any existing PC File user, provided the full manual is not copied.

Systems

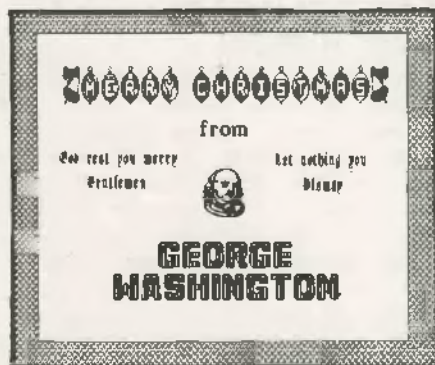
Disk is supplied in IBM PC format, but PC File will run on any MS-DOS system that can support an ANSI terminal driver.



SCREENTEST

Fontasy

Fontasy is a general-purpose package which allows you to create pages of finished text in a wide variety of type fonts – at an affordable price. Simon Williams puts it through its paces.



Desktop publishing seems to have become the buzzword of the moment, but most talk is of comprehensive packages such as the Aldus Pagemaker on the Macintosh. These packages provide professional facilities such as direct connection to typesetting machines, and can handle many pages at once. There are other packages available, however, with smaller capacities and fewer facilities. These programs are designed for the home user who may want to brighten up a club newsletter or add verve to their correspondence. One such package for the IBM PC is Fontasy.

Fontasy from Pro-Soft in California can produce A4 pages of text in a wide variety of typestyles. It offers a library of motifs and sketches (clip-art) for inclusion in your documents, and can draw simple graphics and fill them with any of 95 different patterns.

Fontasy has its roots in earlier programs for the Tandy TRS-80 and has developed through several incarnations to the current product. To some extent, this gives it the appearance of a central core with a number of parasitic modules added to in-

crease the features of the whole product. They've been tied together well, but it has resulted in a haphazard set of key assignments (more of which below).

Full-page editing

Fontasy comes on two disks with a 240-page paperback manual and a catalogue of additional fonts and artwork. The software isn't copy-protected and a chapter in the manual is devoted to making working copies and installation.

When you run Fontasy, you're faced with a blank screen with a flashing vertical cursor in the top left-hand corner. You can start typing straight away and text appears on-screen in the default 'standard' font. Fontasy works in two colours, but this is no problem for text-based software like this. The foreground colour can be changed to any of the standard IBM options.

The cursor varies in size with the height of the selected font, and these are generally divided into one, two, three or four line heights. You can magnify the height and width of any font independently, but as you increase its size there's a corresponding increase in the chunkiness of the characters. If this causes you problems, you can 'round off' large characters by switching to draw mode and filling in the missing pixels.

As well as typing text directly onto the screen, you can read-in an ASCII file from disk. This gives a lot of scope for taking output from word processors, and, as a rule, it is better to use the more comprehensive facilities of a program like WordStar on a long text file. The functions within Fontasy are aimed mainly at the lay-

out of finished text.

The manual goes into some detail on how you can also write notes in Borland's SideKick and then read them straight into Fontasy.

One of the function keys is set up to do this for you. As SideKick's notepad has many of the functions of WordStar, the combination of the two is very effective.

The Fontasy screen pans over a full paper page and can be moved with the cursor keys to work on any part of it. The program supports a mouse and it is much easier to position the cursor with this. The screen flicks from one section of the page to another before you get to the edge, keeping the cursor in a central area of the screen.

As well as entering text in any of the supplied fonts, you can centre and justify lines, insert and delete them, and view a miniature of the complete page to check the overall layout.

This last feature is available via a status display which draws the whole page at about a sixth of the screen size. The text is too small to read, but the display does show you the overall balance of the page. The current settings of many of Fontasy's features are also shown on this screen. It's a shame the page display is not larger, and that you can't move blocks of text or graphics while viewing the whole page. As it is, it can be awkward to position large graphics when you have to guess where the paper edge is on the micro's screen.

Fontasy is full of help screens; so much so that you can work your way around the program with little reference to the manual. There are

screens for general help, help with dot and Alt key commands, and menus for font and fill pattern selection. Each of these are useful in their own areas, but it takes a while to remember which key sequence calls them up.

Lack of consistency with control keys is a general problem in Fantasy, and probably reflects its ancestry as an amalgam of earlier programs. For example, the help menus are called with the F1, F3 and Alt F3 keys (F2 is 'undo'). The font menu is called with Ctrl F7, but if you want to check fonts on drive B: it's Ctrl B. The area fill menu is Alt F. You delete a line with Alt D, but to insert one you use Alt N (New line!). It's a shame more thought couldn't have been put into this aspect of the program. With so many features on offer, it's important to have a consistent command structure.

A lot of control is available via two-character dot commands, rather along the lines of WordStar. Thus, .bf {fontname} begins a new font and .pr starts a print-out. There are over 40 of these commands, some of which can also be given as Alt key sequences. To use the dot version you first press Escape, which brings up a window at the bottom of the screen.

As well as text functions, Fantasy can do quite a lot with graphics. Although intended primarily to support the text facilities, it's easy to construct boxes, ovals and circles to highlight sections of text, and to mark a rectangular block of the screen for moving, copying or deleting. You can also invert, rotate and mirror a block to produce special effects. Circles and ovals are rubber-banded to the right size and shape.

You can also draw freehand with a mouse and rubber-band straight lines. The graphics cursor can be magnified both vertically and horizontally to draw thicker lines, and an undraw facility turns the cursor into a freehand eraser.

An added feature of the latest version of Fantasy is the template. A template is a user-defined layout which may contain rules, boxes and graphics. This is saved to disk as a separate file, and any ASCII text file, which can include Fantasy dot commands for changing fonts or text style, can be merged with it. Fantasy will flow the text around objects and columns in the template, allowing some quite sophisticated designs. The template allows for multi-column pages and can justify each column.

Clip-art supplied with the program can be called up an item at a time and positioned on the screen before fixing it in place. You have to flick through each item in sequence to get to the piece you want: this is quite quick as most of the clips are small.

The only feature missing from the graphics side of Fantasy is any facil-

ity to magnify an area of the screen to edit dot-by-dot. It would be very useful to be able to define and blow-up a block onscreen, to tidy up carelessly dropped pixels, or smooth out chunky characters.

When you come to print out a page from Fantasy, you have a number of choices, including double density, separate vertical and horizontal magnification, and multiple copy printing. The double density mode takes a lot longer, but gives a very good, clear print. Print magnification, as distinct from onscreen magnification, gives a smooth size increase to text, though not to graphics. It's better to magnify text at print time if you want to avoid characters becoming chunky. If you're running a 24-pin printer, you'll probably need to magnify the output to increase the size of some of the smaller fonts.

Fonts and clip-art

Fantasy really excels in the range of fonts and clip-art available. The fonts range from stately Romans and Mod-

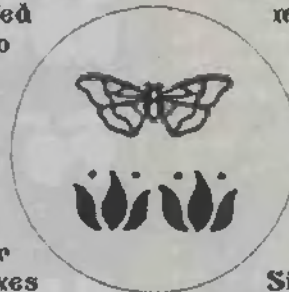
erns to some decidedly unusual display sets such as July 4 (all Stars and Stripes) and Xmas (each character on a Christmas bauble). If anything, the range tends towards the display fonts, and has an American 'feel' to it. Fantasy supports 'kerning' (tucking small letters under the cross-bars of 'T's and other capitals) and allows you to float individual letters to position them accurately or to produce special effects.

The clip-art supplied with the program can be divided into two categories. The first is perhaps best described as whimsical. It consists of the kind of motifs and end pieces for which Thomas Bewick became famous. There are lots of scrolls, birds, dogs and horses as well as a couple of unidentified heads which, I suspect, might belong to George Washington.

The second set is based in the office and includes desks, filing cabinets and various pieces of computer equipment. The artwork is fairly sketchy, but fine for everyday use.

TEMPLATES

Once you've got the hang of using Fantasy, you can try some of its more advanced features. The main one of these is the template. A template is a user defined layout into which you can load an ASCII file. The text from this file can be made to flow around rectangular or circular boxes defined as part of the template.



First place. Pro-Soft recommend SideKick for this, and it does mean you don't have to leave Fantasy to write your text. On my copy, though, you had to make sure you were displaying one of Fantasy's help menus, which switch the screen to text mode, as my version of SideKick is not compatible with the PG graphics mode.

Text Editor Needed

The technique is fairly straightforward but does involve the use of



a text editor to create the ASCII file in the

Multiple Columns

You can define several columns for your text, though the number is fixed for each page, and you can justify each column with microspaces (but only between words). With a bit of patience you can create far more impressive layouts than this!

This template illustrates copy flow around a circular motif and a box, and shows the scope for individual design ideas (original reduced by 60 per cent)

Equipment needed

Fontasy claims to need a PC, or a true compatible, with at least 256k, a single drive, and either an IBM-compatible or Hercules graphics card. It prints on a dot matrix or laser printer.

Realistically, you should have at least twin drives if you don't want a lot of disk-swapping, and 640k if you want to work on a full page at once (each page takes around 90k). The program runs quite happily from a hard disk and the review copy was run on a Digitask PC16 (a clone) with no compatibility problems.

You can install Fontasy for a number of different printers, including the Epson range and the IBM graphics printer and Proprietary. The package also includes drivers for 24-pin letter-quality dot matrix machines and the HP Laserjet/Laserjet Plus. Neither of these types of printer can hold a full Fontasy page, though, so you're restricted to printing part pages.

Fontasy runs alongside SideKick and Prokey, among several others, and it might be possible to reorganise the less memorable Fontasy key sequences with Prokey. It's certainly handy to download text into Fontasy from SideKick's editor, although of course there's a memory overhead.

Documentation

The manual covers most of the things you are likely to want to do with Fontasy. It's clearly written, and details drawing and filling graphics as well as manipulating text.

The style is chatty without being condescending and mixes the part-tutorial, part-reference well. It's thoroughly indexed at the back, and includes details of the extra characters available in the graphic fonts and a print-out of all the clip-art included with the package.

Price

Fontasy costs £70 and is available from Control Alt Deli, 44 Brown Baker Court, Neath Hill, Milton Keynes MK14 6JH. Tel: (0908) 662759.

Optional extras

The basic Fontasy package contains the page composer, 27 fonts, 97 fill patterns and 60 pieces of clip-art.

There are a further 26 disks of fonts available at £20 each, covering over 300 typefaces. An extra two disks of clip-art provide 450 symbols and motifs between them.

Some particular highlights on the optional extra disks include a very nice set of hobbyist fonts (with letters on playing cards, books or a keyboard), some good, big outline sets and some even bigger headline characters. Someone has gone to a



SCREENTEST

lot of time and trouble to create this library, as very few of the fonts are cribbed from well-known sets.

Of the extras in the pipeline, a CADpad will cost £149, and programs to import graphics and filter word processor codes will cost £50 the pair.

Conclusion

Fontasy is a very good font package and page editor at a very reasonable price. With it, you can produce the kind of copy which will improve your party invitations at home, add panache to your society newsletter, or produce semi-professional copy

for advertising your company or its products.

It would be very useful to be able to blow up part of a Fontasy page to tidy up text or graphics at the pixel level, and to have an 'overview' mode for global positioning of large blocks of text or graphics. Perhaps, though, these are the kind of features to expect from a true-graphics package rather than from a text formatter.

The control sequences take a while to get used to, but if you're using the package regularly this shouldn't be a problem. The occasional user, though, may spend a good while searching the keyboard overlay for less frequently used functions.

Where Fontasy really scores is on pricing. There is nothing comparable at the price, and Fleet Street Editor (reviewed in the November issue), at more than twice the cost, doesn't offer nearly as many fonts as this package. If you need a good font tool with a wide range of features, Fontasy should be high on your list. **END**

"You are old Father William", the young hack said,

"And your micro's too slow for its size

And yet you write novels on GordStar in bed!

Do you think, with your kit, that is wise?"

"In my youth" Father William replied to the boy,

I spent time learning classic Chinese

And the training it gave has such personal joy

THAT I HAVE USED CONTROL CODES WITH EASE

"You are old" said the hack, "and your eyes are too dim

TO SEE 80 COLUMNS IN
FOCUS

Yet your documentation's the size of a pin.

DO YOU TYPESET BY SOME HOCUS FOCUS?"

"In my youth" said the old man "I used to print large

as they all took advice and would heed it.

NOW USERS COMPLAIN THAT THE TEXT IS
TOO HARD

So I now print so small they can't read it!"

"You are old" said the hack, "I can hardly recall

That your brain was as nimble as ever,

Yet you understand UNIX and Xenix and all.

What makes you so sickeningly clever?"

"I've answered two questions, and that's all I'll say."

STILL THE OLD MAN WROTE PLAGUE
SOMEONE NEW.

I'M REWRITING ADA IN UNDER
4K

DE DICE DECE DICE DECE DECE DECE

Fontasy allows you to experiment with a wide range of typefaces



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You want to choose a printer that looks after all your paper requirements; tractor, single sheet or multiple copies. The NL-10 has tractor feed as standard for continuous printing and an automatic single sheet feed to make letterheads really easy. There's even the option of a low-cost cut-sheet feeder.

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RTX robot arm

The impressive capabilities of car production line robots come closer to home in the shape of the RTX robot arm from Universal Machine Intelligence. Nick Walker watched it do what it was told.

After the meteoric rise of micro companies such as Apple and Sinclair in the late seventies and early eighties, there was considerable interest in what would be the next boom. Many saw robotics as a possible contender, and subsequently set up small businesses ready to ride on the next wave of success. Unfortunately robotics didn't rise at anything near such a rate, mainly because the mechanics industry is far older and far slower-moving than the electronics industry, and robotics is primarily a mechanical field. Consequently, most of those small businesses were soon out of business.

After much turbulence, the industry seems to have settled down into three main categories. Firstly, there's the industrial control robot designed to automate a manufacturing process, which costs anything from £20,000 to half a million pounds. Secondly, there's the educational robot which is designed to teach the theory of robotics but is incapable of being put to work on serious repetitive tasks. The third area of the market is what can be described as the toy market; this covers a wide range of products, including robot arms and products such as Nolan's Pets and BigTrac.

The robot industry hasn't followed the micro boom because no truly capable robot arm has been made available at a price that micro users can afford. The RTX arm from UMI (Universal Machine Intelligence) looks set to change this, as it's of an industrial quality and retails for £4995.

Before going on to review the RTX, it's worth mentioning UMI company director Tim Jones. In 1981, PCW ran a competition in conjunction with the 'Year Of The Disabled' for readers to submit their ideas on how computers could help the disabled. The winner of this competition was Tim Jones, whose idea was a micro-controlled robot arm attached to the side of a

paraplegic's wheelchair. It's nice to see that he has now produced a robot arm which goes some way to achieving that goal, and at a reasonable price.

Components & set-up

It's obvious from the moment the RTX arrives on your doorstep that this is no toy robot arm. The machine comes in a coffin-sized cardboard box with carrying handles, and weighs in at over 70lbs.

Unpacking the thing is relatively simple, provided you have a second person to help you. Before use, the robot arm must be attached to a supplied base plate, a workbench or a wall. A fixing kit is supplied with the arm for this purpose. Not wanting to drill holes through either the office wall or my desk, I attached it to the baseplate. It took about 15 minutes to set the arm up.

The first thing that strikes you when the arm has been set up is that

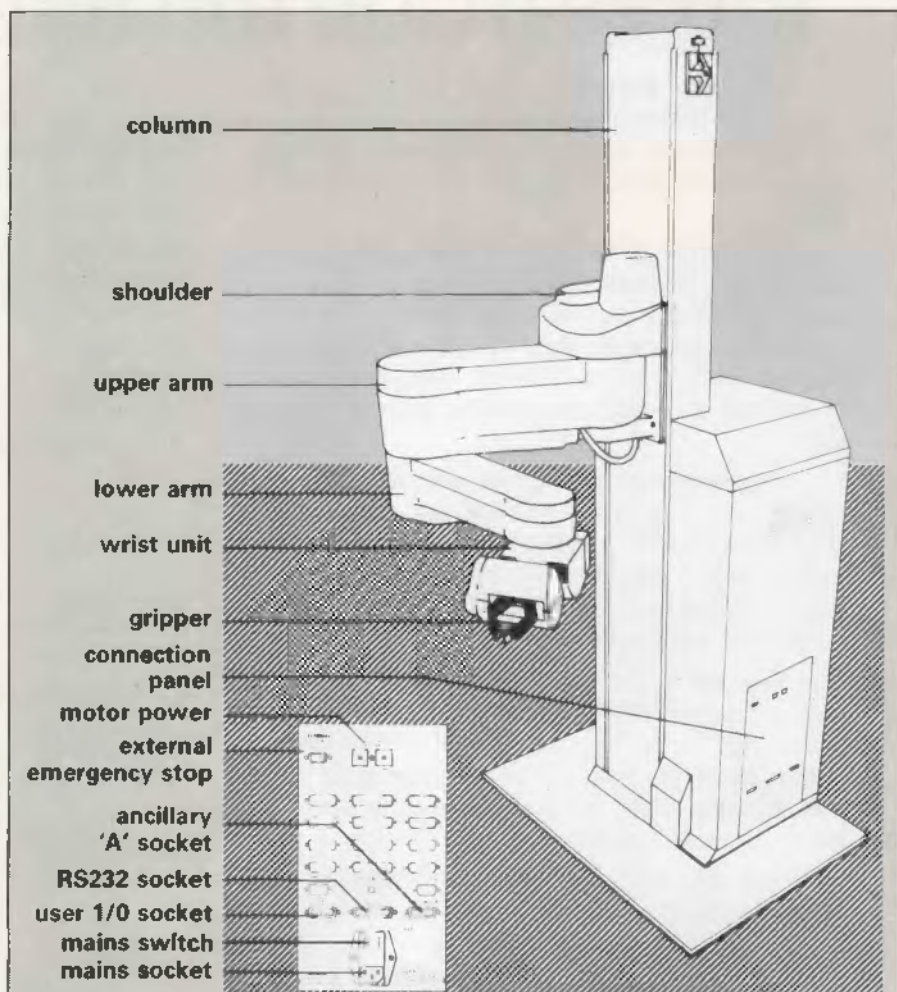
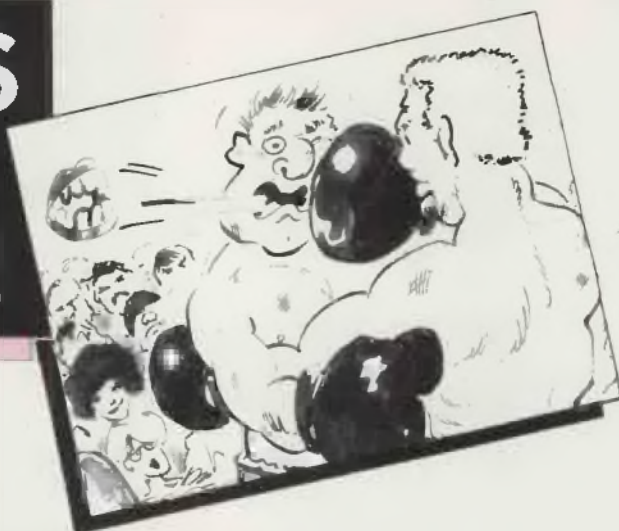


Fig 1 The RTX robot arm components



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UMI has given some consideration as to how it looks. There are no masses of wire, no bits of Meccano and no ugly power transformers. The RTX is finished in the usual office grey, plugs in via a standard three-pin power point, and wouldn't look out of place next to the office photocopier.

An overview of the components of the RTX is shown in Fig 1, and the easiest way to describe them is by analogies with the human arm, wrist and hand. The arm is driven by three motors. The zed motor drives a belt which propels the arm up and down the column. The other motors make the arm swivel from side to side at the shoulder and elbow joints.

There's a motor in the lower arm that drives the wrist from side to side (yaw). Two further motors in the wrist enable the gripper to move up and down (pitch) and rotate (roll). The gripper itself has its own motor which opens and closes the jaw. Fig 2 illustrates the concepts of yaw, pitch and roll.

Having set up the RTX, installation is painless. Connect the 25-way

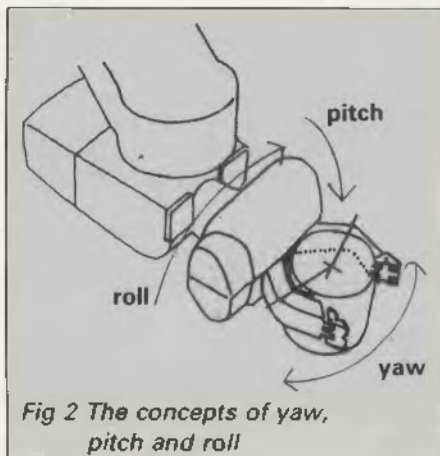


Fig 2 The concepts of yaw, pitch and roll

RS232 cable to the serial port of an IBM PC or compatible, hit the green 'GO' button on the side of the arm, and you should be ready to go.

There are two floppy disks included with the arm which can be copied straight to a hard disk. Before the arm can move at all, you have to install the arm drivers; this is done by running 'START'. Next, you need to initialise the arm. This means getting RTX to run its motors, driving the arm components against their mechanical end stops. Having found these reference points, the arm then moves to its home position — with the arm straight out and the gripper horizontal. Each time the arm is switched on, you must go through this initialisation procedure.

The demonstration program is a solution to the Towers of Hanoi problem, solved in three dimensions using a set of plastic disks supplied with the arm. (The 'Towers of Hanoi'

problem involves stacking disks in three equidistant 'towers', moving no more than one disk at a time.) This demonstration takes about five minutes and exercises all six motors, so it also serves as an indication that everything is working fine.

To familiarise yourself with the control of RTX, a 'Drive' program is included with the arm. This gives manual control of the arm via the numeric keypad and function keys, and reinforces such concepts as pitch, roll and yaw. The program allows you to set the speed of movement as a percentage of full speed, and it also allows the input of arm position in terms of a numeric coordinate of each component of the arm. Fig 3, the Drive program, shows that the position of all the components is displayed and also shows the keystrokes used.

Teach and Replay

A robot arm can be programmed in one of two ways: either 'numerically' by entering numbers into a file/program representing the required position of the arm in terms of some coordinate set; or by 'teaching' the robot to duplicate a manually-driven sequence. The latter has two main advantages over the former. Firstly, the user can be more confident that the positions taught are the correct ones since the arm has to be physically driven to each point, whereas a numerically calculated coordinate may not translate into actual positions and result in positional errors. Secondly, and most importantly, the user needs no specialist knowledge of the coordinate set or the programming language.

The RTX is supplied with a package called Teach and Replay which enables you to drive the arm manually, recording the positions needed

as you go. The package is written in and generates Forth. Each position taught is recorded as a Forth instruction, and a sequence of instructions is saved as a Forth 'word' which, in the Forth style, is added as an extension to the language. When a sequence of movements has been taught, you can single-step through it adding, deleting and generally debugging as required.

It's possible to use Teach and Replay without any comprehension of Forth for simple tasks. One of the most powerful combinations, however, is to combine it with the power of Forth's 'programmability'.

To make a sequence of robot movements that can be subsequently replayed, a word must be defined. An example of the procedure for doing this is shown in Fig 4. The keys used are exactly the same as those used with the Drive program, which makes the transition easy; the difference being that each keystroke generates a Forth command which controls the arm. The robot arm is moved to the required position by any number of axis movements, and the position is 'taught' by pressing the <Ins> key. Fifteen positions are available in any one word, and after each position has been taught, the number of 'steps left' is displayed. 'Steps left' is a clumsy description, as both 'steps' and 'left' are ambiguous as far as the robot is concerned. When all points in the word have been taught, the word is ended by pressing the <End> key.

It's important to realise that the Teach and Replay program doesn't record the actual movements made in getting to a position, so when instructed to go to the position stored with <Ins>, the robot arm will go by the most direct route. You should, therefore, record every intermediate position in any sequence in an action. I discovered this quite spectacularly when trying to program it to press a key on a keyboard. The first position I recorded was that of the key depressed, and the second of it

Position (current)		Key(s)	Movement	Action
Radius.....	-9.7mm	keypad	arm	in/out/ left/right
Theta.....	272.2deg	PgUp/Dn	zed	up/down
Zed.....	715.6mm	F1 F2	pitch	up/down
Pitch.....	198.3deg	F3 F4	roll	left/right
Roll.....	0.0deg	F5 F6	yaw	left/right
Yaw.....	276.0deg	F7 F8	grip	open/close
Grip.....	156.5mm	0..9	all	set speed
Speed.....	10.0% fs	SPACE	ALL	STOP
Speed, Movement, Stop, Numlock or <ESC>				

Fig 3 The Drive program showing components and keystrokes

released. On replay, the arm crashed straight into the side of the keyboard in its effort to get to the right point. Defining an earlier position just above the key depression solves this.



Keyboard input	Computer output	Comments
Learn example	15 steps left	This initiates the 'teach process' and begins teaching a word called EXAMPLE
<PgDn>	Z R ok	Pressing the 'page down' causes the arm to move down. The command issued to Forth is Zed Reverse
<Space bar>	HALT ok	The space bar generates the command HALT to stop the arm
<Ins>	TEACH 14 steps	The Ins key generates the TEACH command to save the position
<End>	END ok	Pressing the End key ends the teach process and saves the word test

Fig 4 Word definition procedure

By using the Forth word %SPEED, a percentage speed in the range 1 to 100 can be selected. Like all Forth commands, this is given in the 'backwards' format 20 %SPEED, which would set all axes to 20 per cent of full speed. Although one per cent of full speed is very slow, it's still continuous, and sometimes it can be very difficult to position the arm where you want it using the 'HALT'

instruction generated from the space bar. To make this easier, you can switch into JOG mode when you are near to the arm position you require. An increment between one and 100 is supplied as a parameter to JOG which specifies the distance of a single jog. My only complaint about JOG is that it isn't possible to teach a point while in this mode.

Four other commands will be of

Group 1 Preparing the arm at the start of an operation

Init Comms — Initialises the communications between computer and arm.

Version — Returns the library version and revision number.

Restart — Resets all the parameters stored in the IPs to their default values.

Define Origin — Zeros each motor's position counter and error so that the present position becomes the home position.

Group 2 Defining how the arm will move

Read — Reads a control parameter associated with the IP, and copies the data into an integer variable.

Write — Writes an integer to the IP associated with a particular motor.

Set Mode — Sets any motor into one of three motor modes.

Group 3 Initiating movement in the arm

Go — Sets one or more motors moving.

Interpolate — Moves each motor by an increment given in an array.

Group 4 Obtaining reports on the arm's current status

General Status — Checks the current arm status and puts the result into the integer variable.

Motor Status — Checks the current status of one particular motor and puts the result into an integer variable.

Group 5 Stopping the arm

Stop — Emergency stop; stops all motors immediately.

Group 6 Using IPC directly

Raw command — Sends a raw IPC command to a particular IP.

Fig 5 Keyword groups and their tasks

interest to users using only the Teach and Replay system. WORDS will list all the words that have so far been defined; RUNS will replay an instruction a specified number of times; HOME will return the arm to its most compact, tucked-away position; and INIT will run the initialisation routine from within the program.

Although in programming terms Teach and Replay is pretty basic, by far the most common use of a robot arm is to perform a simple, repetitive task. For such applications Teach and Replay is excellent, and its interactive nature with direct control of the arm makes it easy for non-programmers to use. My only real criticism is that the editor for defined Forth words is abysmal and might well scare off a computer novice.

Programming RTX

For the hardened programmer or those who require more sophisticated control of the arm, there are three ways in which you can write programs for it.

The first is the very powerful combination of Forth and Teach and Replay, using Teach and Replay for the arm movements and Forth to add the sequencing and intelligence. I found this method by far the most productive, and in use similar to the combination of Basic and machine code in straight programming (a quick and powerful combination which is too often overlooked by so-called 'professional' programmers).

The second and third methods of programming RTX involve direct calls to the library of routines installed with the START command. Definition of these library routines is provided in two source code forms, Forth and Turbo Pascal. A complete Forth language system is supplied with the system, but you will have to purchase a copy of Borland's Turbo Pascal if you want to use that.

In use

RTX has seven motors controlled by two 4-bit processors within the arm, known as IP0 and IP1. IP0 has responsibility for the wrist pitch and roll, while IP1 has responsibility for the shoulder, elbow, zed, wrist, yaw and grip. The intelligent peripherals are controlled by a communications protocol called IPC — Intelligent Peripheral Communications. Each routine generates IPC commands to perform its tasks.

There are 14 keywords which give you detailed control over the arm. They can be roughly defined into six groups of tasks, as shown in Fig 5. Rather than describe the vagaries of each individual instruction, I've taken a chunk of a Turbo Pascal program


```

PROCEDURE GO_TO_NEXT_POSITION (P:PRECISION) ;

VAR
  M      : MOTOR_T ;
  STATUS : INTEGER ;

BEGIN ;
FOR M := ELBOW TO YAW DO
  BEGIN ;
  IF POSITION_IP[M] <> POSITION_NEXT[M] THEN
    ARM_WRITE (M, NEW_POSITION, POSITION_NEXT[M], OK) ;
    POSITION_IP[M] := POSITION_NEXT[M] ;
  END ;
REPEAT
  ARM_GENERAL_STATUS (STATUS,OK) ;
UNTIL STATUS AND STAT_TIP = 0 ;
ARM_GO (NUMERIC,$0555,OK) ;
WAIT_UNTIL_DONE (P) ;
END ;

```

Fig 6 An example of the Turbo Pascal interface which drives the arm

written for the arm that gives a basic feel of how the interface works (see Fig 6). This routine initialises the arm for use and then takes it back to the stow position; the idea being that all applications are written as a procedure called from the middle of this routine.

The design of the RTX arm shows that it's not a toy: it stands over two

feet high, weighs in at 77lbs and would look quite at home on the Fiat production line. The design is highly modular, with each motor having its own access cover for easy replacement, and UMI makes no bones about the fact that it was designed with economies of scale in mind. If sales go well, the RTX will soon be available at a cheaper price.

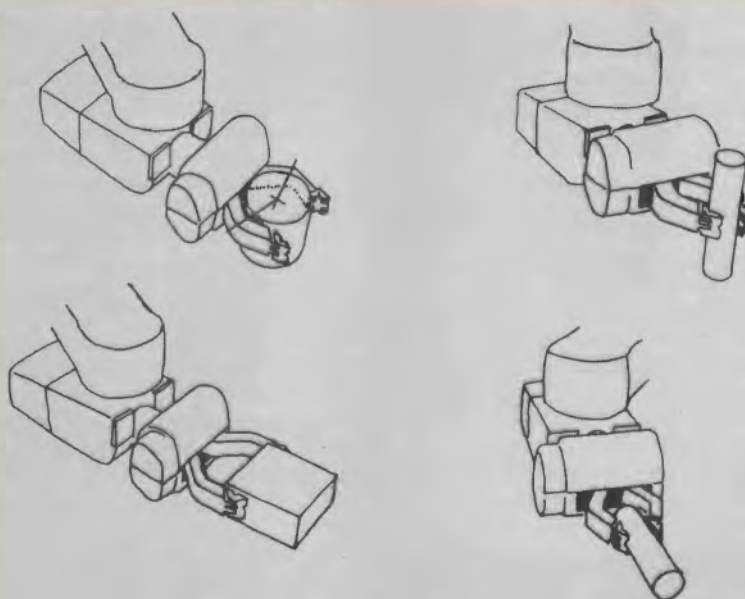


Fig 7 The gripper is designed to hold a wide range of objects

Technical specifications

Operating area:	54ins x 44ins x 50ins (W x D x H)
Weight:	77lbs
Motors:	One 20W for vertical motion, six 3W for all other motion
Zed axis:	39ins total movement, maximum speed 4.1ins/s
Shoulder:	180deg total range, maximum speed 42.8deg/s
Elbow:	331deg total range, maximum speed 85.6deg/s
Yaw:	220deg total range, maximum speed 128.4deg/s
Pitch:	102deg total range, maximum speed 92.7deg/s
Roll:	313deg total range, maximum speed 92.7deg/s
Gripper:	3.6ins total movement, maximum speed 84.9 deg/s
Lifting capability:	4kg on zed, 2kg on wrist
Interface:	RS232C serial

Only three of the seven motors work directly against gravity — the zed motor and the wrist motors, so it will be here that the limitations in lifting ability occur. The zed motor can lift 4kg (9lbs) at 100mm/s (4in/s). The wrist motors also work against gravity, the worst case being when the gripper is horizontal, and they can pitch and roll a 2kg cylinder. Although this doesn't sound a lot in human terms, in robot terms it ranks the RTX with the low end of the industrial robot market. The gripper is an ingenious design capable of lifting a variety of objects in a number of ways — Fig 7 illustrates this.

The wrist and gripper are mechanically linked, so that — unless the yaw motor is driven — they stay in the same yaw orientation as the radial line that passes through the shoulder pivot and the wrist pivot. As a result, if yaw is in the wrong position, it's possible for the wrist to hit its yaw and stop when the arm is being driven in and out. This is useful when extending the arm in order to grip something, but it must be taken into account when programming the arm.

Documentation

The documentation included with a robot arm needs to be comprehensive, and happily the RTX's is. Five manuals are included: *Introducing RTX* describes how to set up RTX and run testing and demo software; *Forth Teach & Replay* is a user manual for the Teach and Replay series; *Programming RTX using the library* describes the library routines; *Using Intelligent Peripherals Communications* describes the protocol for controlling the RTX; and *Inside RTX* is a description of the arm's design, mechanics and electronics.

Conclusion

UMI sees this machine as the robot equivalent of the Apple II circa 1979. The Apple II offered serious computing power at a reasonable price; the RTX claims to offer serious robotics power at a reasonable price. Perhaps I'm jaded, but I don't see things in quite the same light.

True, the RTX does offer unrivalled robotics power for its price, but I still don't believe it has a potential user base of the size generated by the Apple. What the RTX does do is open up the possibility of a robotic solution to a whole new group of potential users. The machine is already in use for medical, chemical and engineering applications. If you have an application that is suited to use with a small-scale robot arm, the RTX is well-suited to the task.

The RTX robot arm is supplied by Universal Machine Intelligence. Tel: (01) 871 1339. **END**

Literary choice

Although computers have made considerable progress over the past few decades with their literary outputs, there is still some way to go before a satisfactory solution is reached. David Levy examines how contemporary computer poets and authors are tackling the problems.

It is said that if a monkey were allowed to use a typewriter for long enough, it would eventually compose a Shakespeare sonnet. This statement may be theoretically justified, but practical considerations make it rather unlikely that either a monkey or a randomising computer program could create a literary work, even a very short one, within an acceptable time frame. William Shakespeare's vocabulary is estimated at approximately 27,000 words, so selecting words completely at random from this vocabulary would require approximately $125^{27,000}$ attempts in order to produce a 125-word sonnet that matched one of the Bard's own efforts.

Poetry

The problem of programming a computer to write poetry can be made considerably less random by applying some of the rules of grammar and creating a model of the poetic form. This idea of modelling was discovered by Louis Milic, an English professor at Cleveland State University, and used by Margaret Chisman and a number of other computer poets in the early 1970s. The concept is so simple that any programmer can emulate it to create their own computer poems. What Chisman did was to write a poem of her own, in the form that she wanted the computer to imitate.

For example:

*My heart looks at life
Thrusting with growth but true
Always giving never having
Agony though softened corrupts.*

Chisman then broke the poem down into distinct components as follows:

MY
(fixed)
(1) HEART
(noun singular subject)
(2) LOOKS AT
(verb present tense singular)
(3) LIFE
(noun singular object)

(4) THRUSTING WITH
(verb present participle)

(5) GROWTH
(noun singular)

(6) BUT
(linking word)

(7) TRUE
(adjective)

(8) ALWAYS
(linking word)

(9) GIVING
(verb present participle)

(10) NEVER
(linking word)

(11) HAVING
(verb present participle)

(12) AGONY
(noun singular)

(13) THOUGH
(linking word)

(14) SOFTENED
(verb past participle)

(15) CORRUPTS
(verb present singular)

In this example, the word 'my' is fixed but all the other words may be replaced by words that fit into the same category. The human author then supplies the program with a number of words or phrases for each category.

For example:

Group 1: head, eye, hand, reason, heart, child, flesh, mood

Group 2: thrives on, quickens with, delights in, shades into, leads to, craves for, yearns for, prepares for and so on, and the program is now able to generate new poems by replacing the original word or phrase in a particular group with a word or phrase chosen at random from the list in the appropriate group. For example, 'heart' may be replaced by any of the other words in group 1 and 'looks at' may be replaced by any of the other phrases in group 2, and so on.

In this way, the program may create an enormous number of completely different poems all derived from the same model. In the above example, if there are eight different words or phrases in each group,

there would be 2^{45} (that is, 8^{15}) possible poems. By modifying the program so that it refrains from using the same word in each group more than once, it is possible to make every one of these poems completely distinct.

In the same way one could take a Shakespeare sonnet, break it down, and then synthesise any number of new sonnets. By programming the randomness within each group in such a way as to match up with the relative word frequencies and the frequencies of word pairs found in Shakespearean concordances, it might even be possible to create sonnets of such quality as would dupe a learned scholar into ascribing them to the pen of Shakespeare himself.

If the expert, and the layman, cannot distinguish between the quality and style of sonnets written by Shakespeare and those churned out by an Amstrad CPC664, are the computer-created sonnets not every bit as 'good' as their sixteenth-century predecessors, and is the program's 'intelligence' really in dispute? Mr Rob Goodwin would no doubt disagree with me (see 'Intelligent Reply', Letters, PCW October), but I am convinced he is wrong. Great 20th century artists have been compelled to produce convincing forgeries of the works of old masters, merely in order to gain recognition for their own genius at the easel, and it is surely ludicrous to argue against the obvious talents of a computer program which is capable of achievements which are considered superlative when exhibited by human beings. In the decades to come, when computers are as able at writing as they are already at chess and backgammon, there will be programs that can write letters as well as Mr Goodwin's.

Will he then claim that in the realm of letter-writing, such programs are less intelligent than he is? If so, what value does he put on intelligence?



A computer program capable of performing this task is a licence to print poems in unlimited numbers. One computer poet, Robert Gaskins, wrote a program to create haiku (Japanese poems containing three lines, split into five syllables, seven syllables and five syllables) and to display them on a video terminal. New haiku would appear on the screen, scroll slowly upwards and then disappear forever (unless Gaskins remembered to turn on his printer).

Richard Bailey, a professor at the University of Michigan who has published a book of computer poems, describes Gaskins and his computer program as ... 'the most prolific poetic collaborators of all time. But there was never any sense of loss in seeing a haiku scroll up into infinity because another one would be along in a moment.' Here are two of Gaskins' haiku:

*Wandering in mist
Reaching out to soft sunlight
Blue-scaled dragons pause*
*Elk in mountain pass
Old man is speaking of snow
Lonely city, pale*

These are not exactly my idea of poetry, but I certainly do not think they can be dismissed as being obviously lacking in content or style.

Story-writing

Following the early work on random selectivity, research began to concentrate on giving programs more involvement in the creative process by requiring them to devise the plot for a story. One of the most successful research projects was at the University of Wisconsin, where Sheldon Klein, a professor of computer science who was also a linguist, collaborated with his students to write a program that could create mystery stories. The stories were 2100 words long and would take only 19 seconds to write. Klein's group then went on to write programs to create Russian folk stories and operas!

Klein devised a simulator to generate the plot of a story. This simulator had three components:

- (a) a special programming language that would generate and manipulate events within the domain of the story;
- (b) a semantic network which consisted of the relationships between various objects in the plot; and
- (c) a mechanism for describing changes in these relationships. Once the simulator had generated the plot in the symbolic language, it was turned into words.

The results of Klein's work may not appear impressive to the casual

reader, but I would argue that they are comparable in quality with the plots which (say) a seven-year-old child might devise. For example:

*The Popoviches live in a distant province.
The father is Vladimir.
The oldest son is Erema.
The younger son is Emelya.
The youngest son is Boris.
Elena is the only daughter.
Vasilisa also lives in the same land.
Vasilisa is of miraculous birth.
The dragon walks into the distant province.
The dragon demands Vladimir.
Elena refuses.
Elena calls for Vasilisa.
Elena announces that the dragon demanded Vladimir.
Vasilisa leaves on a search.*

*Vasilisa meets a devil along the way.
The devil greets Vasilisa.
The devil asks Vasilisa to answer a question.
Vasilisa answers the question.
A magic flint is shown to Vasilisa.
A magic bow, a magic steed and a magic carpet come from the magic flint.
Vasilisa travels to the location of the dragon in another kingdom.
Vasilisa travels on the magic steed.
Vasilisa finds the dragon.
Vasilisa surprises the dragon.
Vasilisa kills the dragon with the aid of the magic bow.
The dragon is seized by Vasilisa.
Vasilisa starts back home.
The dragon's wives attempt to devour Vasilisa.
Vasilisa escapes by flying on the magic carpet.
Vasilisa returns home.*

One of the limitations of Klein's early programs was that they did not capitalise sufficiently on the motivations of all the individual characters in a story. This problem was investigated by Jim Meehan, an AI researcher at the University of California at Irvine, who wrote a program in 1976 called Tale-Spin. The program created stories about animal characters who had names such as George Ant and Irving Bird, and who lived in a simple world.

The human collaborator started the program off by giving each of the characters a motive, such as thirst. The characters then acted in ways that were related to this particular motive and which eventually satisfied a goal that was related to this motive. Finally, a translation routine converted the symbolic goings-on of the characters into natural language for human consumption.

Here is part of one of the stories created by Tale-Spin:

Once upon a time George Ant lived near a patch of ground. There was a nest in an ash tree. Wilma Bird lived in the nest. There was some water in a river. Wilma knew that the water was in the river. George knew that the water was in the river. One day Wilma was very thirsty. Wilma wanted to get near some water. Wilma flew from her nest across a meadow through a valley to the river. Wilma drank the water. Wilma wasn't thirsty any more.

Later on in the story George Ant falls in the river (an idea introduced by the human collaborator), and is rescued by Wilma Bird (an idea derived from the program itself, because in the program the characters are all motivated to rescue other characters who are in danger of dying). The program would note the social relationships between the characters in a story and would ensure that all of them achieved their various goals, so the output stories would have happy endings.

Meehan's stories lacked purpose. Although they consisted of perfectly rational behaviour on the part of the characters, they were generally rather uninteresting. But some more recent work by Natlie Dehn at Yale University, which was the subject of her PhD thesis in 1984, has allowed the human collaborator to specify certain goals. The program, called 'Author', starts with a general idea for a story but then refines this idea or replaces it with a better one, and it can even remember an earlier idea and return to it later in the story.

Conclusion

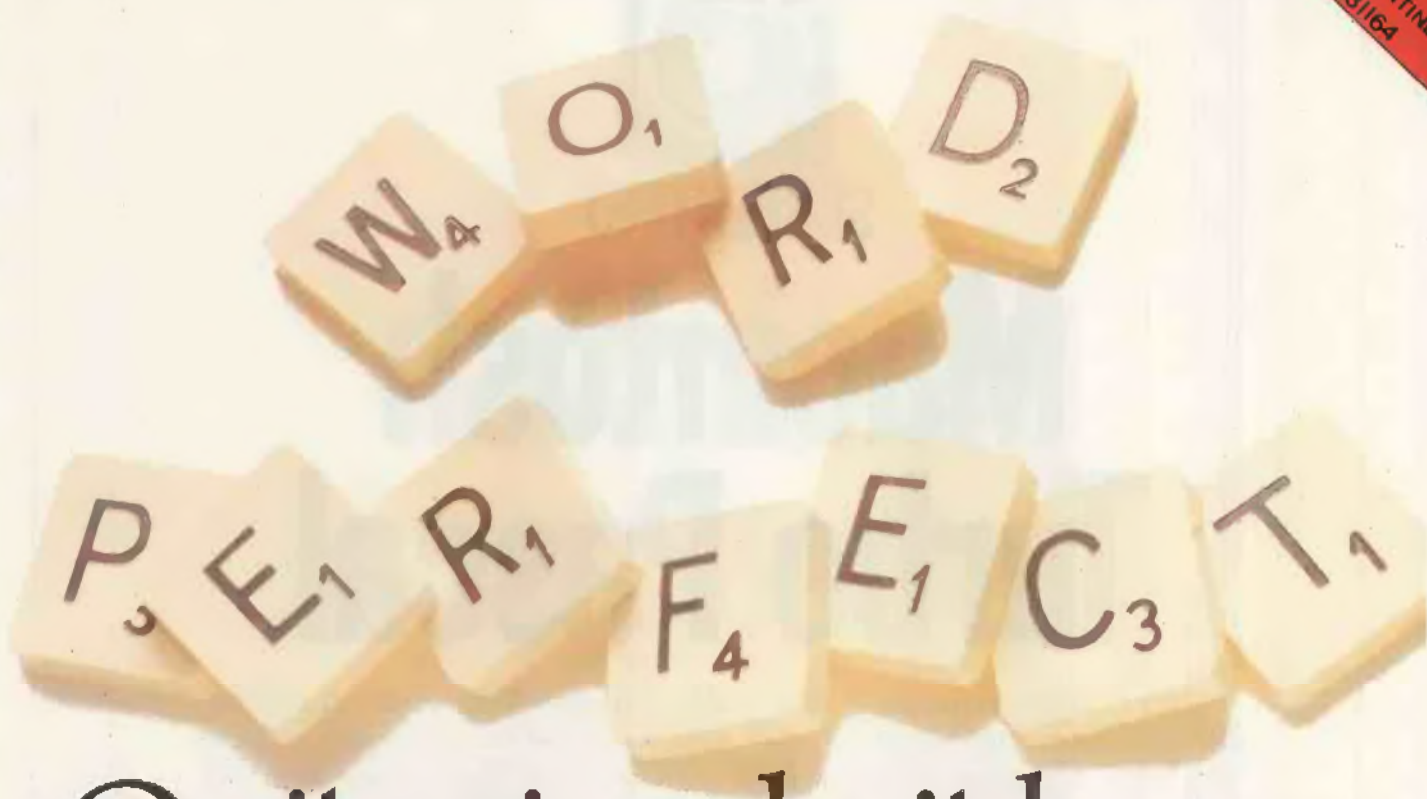
Although the literary efforts of computers are impressive compared with the randomised poetry of the early 1970s, there still remain two important problems to be solved. Firstly, how does a computer decide what makes an 'interesting' story? What one person finds interesting; another may decide is extremely boring, so perhaps this is not the most crucial task that remains to be solved in the field.

This brings me on to the second problem, that of style. It is all very well having something to say, but if one wants to be read and appreciated by a wide audience, one needs to say it in an appealing way. I suspect that computers may not be able to do so for two decades at least.

Bibliography

- Computer Poems* by RW Bailey (Potagannissing Press)
- Modeling Propp and Levi-Strauss in a Metasymbolic Simulation System* by S Klein, (Jason and Segal's *Patterns in Oral Literature*, Mouton).

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SCREENTEST

Macintosh Turbo Pascal

Turbo Pascal's reputation as a cheap but wonderful product will be done no harm by this Macintosh version of the language which uses the original's ease of use to further extend the Mac's programming environment. Owen Linderholm looked it over.

When Turbo Pascal first appeared it was viewed rather sceptically. After all, everyone knew that the only successful way to make money from software was to charge exorbitant prices in order to recoup the enormous development costs. Consequently anything that was cheap had to be nasty, no matter what was claimed. Little did anyone know then that Borland and Turbo Pascal were to turn the software publishing world inside out.

The news slowly trickled out that Turbo Pascal was a good product, then a very good product, and finally the reality sunk home. Here was a highly professional product at a price so low, you might think you were buying a game. From that moment on cheap, good-value software was here to stay, and so was Borland. The company launched several products which all provide important facilities at incredibly low prices.

Recently, though, Borland has begun to show signs of a slight drop in the quality of its software. Turbo Word Wizard was disappointing; Travelling Sidekick was not much more than a gimmick; and a few programs have appeared later than promised. However, more goodies like Turbo Prolog have been produced, and now there's the Macintosh version of Turbo Pascal.

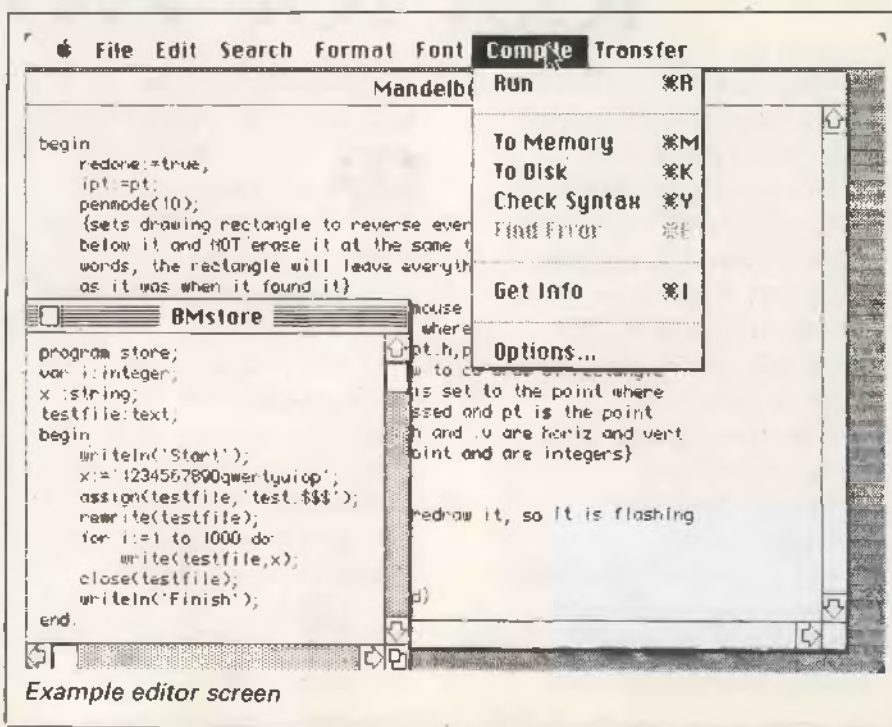
Our version of the program came on two disks: the first disk held the system files and Mac Turbo Pascal itself; the second held demonstration

programs, MacinTalk, RMaker, D/A Mover and Unit Mover. MacinTalk is a software speech synthesiser which has been licensed from Apple for personal use only with Mac Turbo Pascal. There were none of the usual Borland 'READ ME' files, and none of the extra files such as overlays associated with MS-DOS and CP/M versions of Turbo Pascal. Borland has assured me that the final release will have additional documentation

files, additional demonstration programs and 'probably some other bits as well'.

In use

The Mac Turbo Pascal program is represented by a smart icon of a hand holding a chequered flag — double-clicking on this starts up the program as usual. The initial display is in the standard style for Mac text editors: one open window labelled



'Untitled', and a menu bar with the options 'File', 'Edit', 'Search', 'Format', 'Compile' and 'Transfer' (see example). The editor makes use of all the Mac's usual facilities — cut and paste, scroll bars, editing with the mouse, and so on. It also has an auto-indent feature that is very easy to use: simply tab to the next stop and all subsequent lines will be indented by the same amount. If you then start a line nearer the beginning than that, all the following lines will start from the new point. I found this easier to use than any other auto-indent I have tried.

In use, the editor is very friendly. I use a Macintosh fairly frequently and Turbo Pascal is by far my favourite programming language when working on MS-DOS machines. The editor somehow seems to combine the best features of Mac editors and the old Turbo Pascal editor: I simply typed in a test program and ran it. As the editor is similar to most Mac text editors, I can't see any current Mac owners having any problem with it.

Another feature of this version of Turbo Pascal is a 'Check Syntax' option under the Compile menu. This checks the syntax of what's in the editor, providing a message about the first error it comes across. This facility is useful when typing in long programs. Just before ending an editing session, you can check the syntax of what you have typed, thereby eliminating any possibility of typing errors causing trouble when you come to compile the program.

Running programs is also incredibly easy. The usual Turbo Pascal method of compiling to memory and executing has been maintained. Compilation speed is extremely fast, so much so that even long files only take a couple of seconds. While com-

pilation takes place, the pointer is changed to a small, chequered flag which waves back and forth as an indication that something is happening. When compilation has finished, execution proceeds immediately. When the program has finished running, control returns to Mac Turbo Pascal. If a run-time error has occurred, Mac Turbo Pascal recovers and makes an attempt to determine what caused the error, returning to the editor with the offending section marked.

'Turbo Pascal is, in fact, an almost ideal environment for Macintosh program development, since this machine was always intended to be programmed in Pascal.'

Due to this recovery facility and the friendliness of the Macintosh environment, this version of Turbo Pascal seems to be even more interactive than the original. I would even feel confident breaking all the rules for simple programs by typing them in and running them until they're debugged, *without saving to disk.*

The demonstration programs that came with our version were obviously designed to show off the use of as many Mac features as possible. Most impressive were a sound program, developed from an original by Mac guru Andy Hertzfeld; an event-driven programming tutor; and a couple of programs written to demonstrate the 3D routines that Borland has included. Borland tells me that the final

release will have more demonstration programs as examples.

The Macintosh is a very versatile machine, and the environment in which a program runs can vary considerably. The default for all Mac Turbo Pascal programs is a window that emulates a scrolling 80 x 25 character screen. Unfortunately, I could find no easy way, either from the example programs or from the sparse documentation, to produce the graphical equivalent — a 320 x 200 pixel screen with simple point and line commands as in Graph-Mode and Plot (x,y) in the MS-DOS version of Turbo Pascal. The only provision for simple graphics are the extremely complex but powerful QuickDraw routines.

Having said that, it isn't all that difficult to create such an environment, but I was a little disappointed that Borland hadn't included something automatically. What it has done is to include a turtle graphics toolbox with the release version. This toolbox should be a step in the right direction and will also be a very good precursor for further graphical toolboxes.

The language

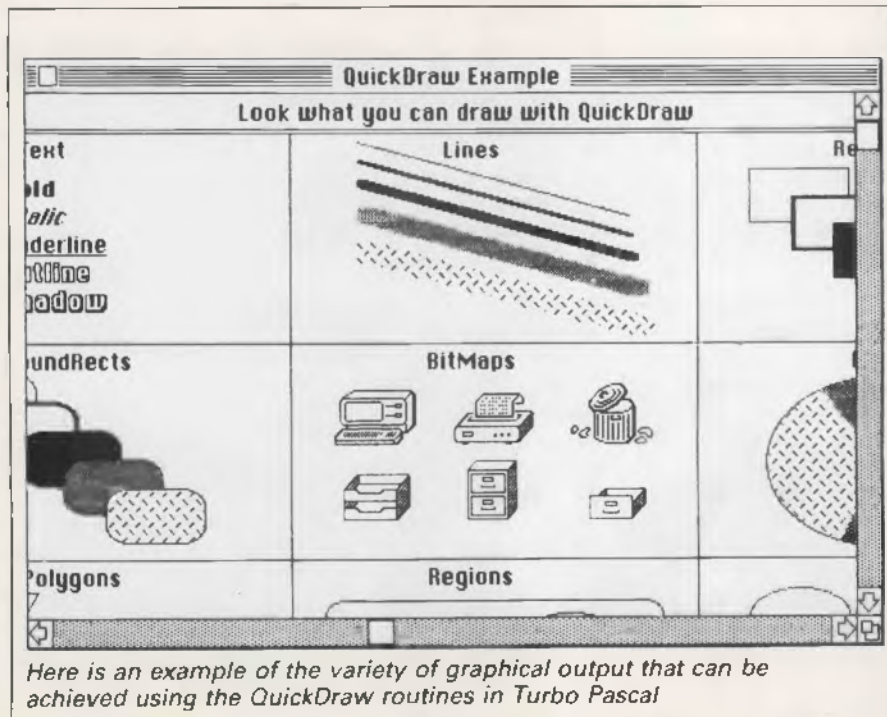
Without the final documentation I can't be sure, but the syntax of this version seems to conform to standard Turbo Pascal. The only differences that I could discover were the addition of a new data type and associated functions, and a slightly different implementation of reals. The new data type is Longint, which is a 4-byte integer value ranging from -2^{31} to $2^{31}-1$. Other similar data types can be converted to this data type, too. This is an extremely useful addition to the language, since the range limitations of standard integers can be an annoying problem.

Reals have been implemented using SANE (Standard Apple Numeric Environment) which is part of the operating system. This introduces two extensions to real numbers: the first is a special value representing infinity, while the second is a value representing something that is not a number.

Turbo Pascal differs from standard (ISO) Pascal in a few areas. These are essentially differences that reflect usage on a micro system, and are concerned with file I/O and buffers. Turbo Pascal also has some extensions to standard Pascal; all these are fully covered, with examples, in the documentation.

The major addition to this Macintosh version of Turbo Pascal is the concept of units, which are like those in UCSD Pascal and are also vaguely similar to modules in Modula-2. Borland informs me that Turbo Pascal 4.0 for other machines will also incorporate units.

A unit, in basic terms, is a pre-





defined extension to the language. Each unit is a selection of constants, data types, variables, procedures and functions that have been previously defined and compiled. When a unit is used by a program, the relevant sections of code are added to the program. Constants, variables and other names go in the symbol table, procedures and functions are added to the code, and so on. Units have significant advantages over 'include' files.

Units consist of two parts — implementation and interface. The interface is made up of the declarations in the unit and shows which data types, constants, variables and names are used and needed by the unit. The implementation is the actual code of the unit and is invisible to the calling program. It can also contain local information that is invisible to the calling program. The idea behind this is that a finished unit can be used by anyone since the procedure names, and so on, are visible to anyone, but the source code is hidden. This is useful when different people are developing an application since it prevents one programmer hacking around with another's code and confusing everyone.

The purpose of units is to keep associated functions together so that it becomes easy to add them in groups or omit things that aren't needed. Several of the units are inter-dependent and require the use of other units.

Mac Turbo Pascal comes with 16 standard units which deal with interfacing the language to the facilities of the machine. Five of these are loaded automatically unless specifically excluded, and provide the standard 80 x 25 text window, low-level support routines, data type conversion, dynamic memory conversion, I/O routines and device drivers. The other units are for interfacing with the Macintosh ROM routines, such as QuickDraw, the Toolbox and other Mac OS routines. Other units implement full 3D graphics operations, an AppleTalk interface and an interface to MacinTalk.

It's also possible to create your own units to provide a sensible, modular way of dealing with programs, especially when developing routines to provide specific facilities. For example, I lamented the lack of simple graphics routines earlier. These could be implemented on top of QuickDraw from a user-defined unit that opened a graphics window and inserted simple point and line-plotting routines from QuickDraw.

Mac Turbo Pascal also allows you to use externally developed assembly language programs, although they must be in MDS (Macintosh De-

velopment System) format. Machine code can also be included from within Mac Turbo Pascal in a similar way to ordinary Turbo Pascal.

Writing applications

This is an area which affords the average programmer some difficulty. Making proper use of menus, icons, windows, events, the mouse, desk accessories, resource files, and so on, involves a considerable amount of knowledge about how such things work, how the Mac works, and even the philosophy behind it all. In practice, most developers start with the book *Inside Macintosh* and then turn to its various alternatives in horror. They end up back with *Inside Macintosh* and try again.

It would be misleading to pretend that anyone could make full use of the Macintosh without reading *Inside Macintosh*, and Borland hasn't made that mistake. The company makes no bones about the fact that if you want to do serious development work on the Mac, then you will have to read *Inside Macintosh*, *Macintosh Revealed*, and other reference works.

However, Borland has tried to make things as easy for you as possible. The documentation I received contained some examples and skeletons for Macintosh applications, and tried to lead you through the various mazes as simply as it could. Borland has also assured me that there will be more examples and more skeleton applications in the final product. The company made it quite clear that it realised the importance of helping users to understand how to control the Macintosh user interface.

I'll be honest and admit that I wasn't able to leap straight in and program in friendly menus and scrolling windows right away, but then not only do I not have *Inside Macintosh*, I didn't have much documentation for the routines either.

But I did manage to get my test program to work — this was a version of the Mandelbrot and Julia set program given in Program File (see page 225). Even the original didn't have all the flashy facilities it could have had, especially with regard to putting the graphical output in a window. I set myself the task of convert-

ing only the Mandelbrot set part of the program to Mac Turbo Pascal, without the additional menu option. I not only managed to get the program going, but I also retained the zoom facility which allows you to zoom in further on the current plot by dragging a rectangle around an area of the plot with the mouse. Not too surprisingly, the Pascal version ran much faster. A finished plot can now take as little as an hour, whereas the Basic version takes about 10 times as long.

I'm convinced that if I'd had the time to do a little research into QuickDraw, for example, I would have had no trouble making the program reasonably friendly. The manual goes to a great deal of trouble to explain the importance of event-driven programming and how it should be done. 'Event-driven' programming is where a program responds to external events rather than trying to control events; the program should respond instantly when the mouse moves up to the menu bar or clicks on window controls. In standard programming practice, this would be done by continually checking up on the mouse, interrupting the other tasks the program has to perform. The Macintosh operating

Type MENU

* the desk accessory menu

,256

\14

* the file menu (11 items)

,257

File

New /N

Open /O

(-

Close

Save /S

Save as...

(-

Page Setup

Print...

(-

Quit /Q

Section of a resource file. This sets up two menus on the menu bar: the first is the Apple menu with desk accessories; the second is the standard file menu. The resource file is compiled by RMaker and used by the compiler directive \$R. Note the '/' convention to denote option key short-cuts

system can, however, keep track of all this for you and only interrupt the main program when a specified event occurs. Event-driven programming makes use of this facility and you are put in charge of a sophisticated multi-tasking system.

The final stage in mastering Macintosh programming is writing a desk accessory. This is also covered in the manual and rounds off a comprehensive tour of programming the Mac's capabilities. My main concern about Mac Turbo Pascal's coverage of programming the more advanced features of the Mac is that most programmers will eventually need to refer to one of the reference works on Mac programming. This isn't the fault of the program, however, but the cost of programming a powerful and sophisticated machine in a powerful and sophisticated way.

Turbo Pascal is, in fact, an almost ideal environment for Macintosh

program development, since it was always intended that this machine should be programmed in Pascal. All the operating system routines were written to interface easily with Lisa Pascal, Apple's original development language.

Borland has included three extra programs to assist in programming in the Macintosh environment. These are: UnitMover which aids in the creation and use of units; Font/DA Mover which helps create desk accessories; and RMaker which creates resource files to control icons, pull-down menus, and so on. These can all be accessed from the Mac Turbo Pascal editor, and files can be transferred back and forth. There are also extra compiler directives to inform the compiler about the existence of such things as resource files.

As an addition to the aforementioned documentation, an appendix gives listings for all the units so that

their detailed workings can be thoroughly understood.

Speed and power

Compilation speed is incredibly fast. Unlike many other powerful compilers, there isn't time to go and have a cup of coffee while the machine churns away — there isn't even time to stand up and stretch.

Execution speed is much harder to judge. I managed to run the new PCW Benchmarks (see page 164 in this issue) and got some pretty impressive results (see the 'Benchmarks' box). Especially impressive is the integer math Benchmark which gives the quickest result of any machine so far tested, with two other machine/language combinations close and the rest nowhere. The other Benchmark results are also pretty quick, though less impressive. (It should be noted that the results may differ slightly in the final version.)

Documentation

I'm confident that the quality of the final documentation will be the same as in all previous Borland products — excellent.

Price

The official price of Mac Turbo Pascal in the UK will be £69.95.

Conclusion

Mac Turbo Pascal has achieved a good balance between the Macintosh and the original Turbo Pascal. The feel of the program is similar to the original, and good use of the Macintosh features has been added. The language has been extended to include units, and it looks as though Borland will extend the CP/M and MS-DOS versions of Turbo Pascal in line with this.

Units will make Turbo Pascal an extremely convenient development language, since standard modules of routines can be created and used in any programs that need them.

A little of the potential success of Mac Turbo Pascal has been lost because the program has been so long in coming. There are already rivals available in the US, and it remains to be seen if Borland's decision to wait until it was happy with the product will pay off. I'm sure it will, in view of Borland's track record.

My biggest disappointment was the lack of simple graphics routines in the copy I reviewed, but I am assured that these will be included in the release copy.

My overall impression was of a very good product offering excellent value for money. Whatever the minor failings of Mac Turbo Pascal, the advantages are far too good to be ignored. If I owned a Macintosh, I'd buy it.

Borland is on (01) 258 3797.

END

Benchmarks

intmath:	0.043secs (timed by doing a loop to 30000 and dividing the result by 30)
realmath:	4.6 secs
triglog:	8.4secs
textscrn:	51.5secs
grafscrn:	15.1 secs (not an ideal Benchmark result — I was unable to set it up properly within a graphics window)
store:	10.4secs

Final version Benchmarks may differ from these review copy results

***** ReSize *****

{ Called on a mouse-down in the grow box, this allows the user to change the size of the window. We change the size, then claim that the whole of the window contents is no longer validly drawn, because we're too lazy to do so for just the scroll bar regions that are actually subject to change. See the Window Manager.)

PROCEDURE ReSize(a_window : WindowPtr; downPt: Point);

VAR w, h : integer; {new width and height of the sized window}
newSize : longint; {the new size}

BEGIN {ReSize}

newSize := GrowWindow(a_window, downPt, growRect); {find new size}
w := LoWord(newSize); {find the width}
h := HiWord(newSize); {find the height}

SizeWindow(a_window, w, h, true); {change to the new window size}

{place whole window into update region to be sure it all gets updated.
This is more than is strictly necessary, but a lot easier than just
invalidating the regions that actually may have changed.)
InvalRect(a_window^.portRect);

END; {ReSize}

A section of code from one of the demonstration programs. It shows how Macintosh functions can be easily accessed from Turbo Pascal and how complicated those functions can be



SCREENTEST

Microsoft Works

Microsoft Works is everything Lotus Jazz should have been — but wasn't. This inexpensive, integrated product for the Apple Macintosh comprises four basic modules and offers power, functionality and ease of use for novices and experienced users alike.

Geof Wheelwright and Yvette Stachowiak put it through its paces.

Life hasn't been easy for experienced Apple Macintosh users.

In the early days, you mastered the free MacWrite word processing pro-

gram which came with the machine, but soon found it so limited that you may well have been forced to splash out an extra few hundred pounds to

buy Microsoft's Word w/p software. No challenge being too great for you, you then may have moved on to try the Microsoft suite of File, Chart and Multiplan.

But the ultimate answer must have seemed just around the corner when you heard about Lotus Jazz, the all-in-one software system which combined word processing, database, spreadsheet, graphics and communications functions in one convenient package. While it did come from the same software stable that produced Lotus 1-2-3 and Symphony and the Jazz approach to 'integrated' applications did seem to be the way to go, Jazz actually turned out to be so complex that it likely left you yearning for the simpler days of MacWrite.

You might then have worked through the vagaries of Apple's Switcher and looked at a number of the other pseudo-integrated packages which appeared for the machine. The problem with those that rely on the Switcher is that memory problems often prevent you getting enough programs into the Switcher rotation for it to really work effectively — particularly on the 512k machine.

The Switcher (especially on floppy-based machines) can also be very slow — unless you set aside even more memory to allow some of the software (assuming it's not copy-protected and will allow you to do so) on a RAM disk.

The Switcher also doesn't get round the problems of different command structures within the applications that are part of a Switcher rotation. So it's easy to get confused between the command structures on a database (where Option S might be

Why integrated software?

Why this great obsession with integrated software? The reasons are relatively simple and have as much to do with the way software is marketed as the way it is used.

Integrated software was first conceived as a way of providing everything you could possibly want in a general business application and tying it all together in one neat bundle — no switching in and out of different packages and only one price to pay for buying it.

Convenience, the ability to transfer data between applications and the need to only learn one common set of commands were the biggest attractions of integrated software. Funnily enough, however, Lotus Development also thought that this type of software would largely appeal to its 'power users' — not beginners.

Thus both Lotus Symphony for the IBM PC and Lotus Jazz for the Macintosh were priced — and pitched — at the upper end of the business market. The company figured that a figure of about £600 was quite justifiable since buying each of those applications separately would cost you at least that much.

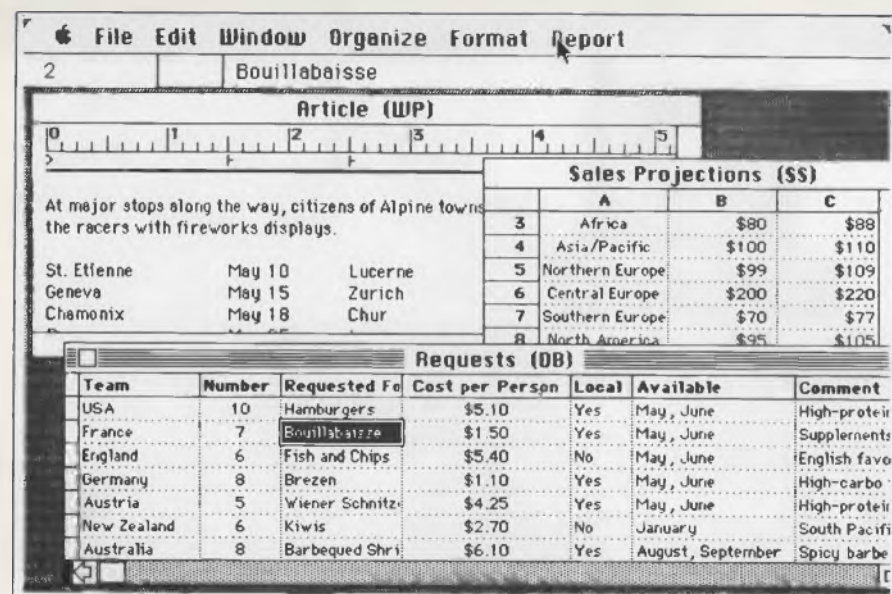
But the problem with Jazz, Symphony — and even Ashton-Tate's Framework — is that they weren't more than the sum of their parts. In most cases, they were rather less.

Simply put, the word processor and database in Symphony were not up to the standard of the best stand-alone PC word processors, while the spreadsheet and graphics ability of Jazz could not give the same performance as more single-purpose calculation applications such as Microsoft Excel.

In short, integrated software was not for the 'power user'. The very fact that so much code — to do so many things — had to be fitted into the same space inevitably made the integrated application look sparse when compared to its stand-alone predecessors.

Oddly enough, one of the first companies to recognise this was not a software company. It was Apple Computer, which launched its Appleworks product for the Apple II line of computers at the same time as it launched the portable Apple IIc.

Appleworks was a low-cost integrated package designed with the aim of providing maximum power in each of its applications at the lowest possible cost. While the package never made much of an impact in the UK (largely because of the dearth of Apple IIc machines), it did become one of the hottest-selling business applications Apple had ever had for the Apple II in the US.



You can work on several documents at once in Microsoft Works and switch data easily between the various modules so that spreadsheet, database and graphics data, for example, can be incorporated into a Works word-processing document

used to issue to the Sort command) and a word processor (where Option S is far more likely to be the Save command).

Given the limitations of Apple's Switcher, you're still probably looking for the perfect Macintosh 'all-in-one' application.

Enter Microsoft with its new integrated product for the Apple Macintosh, offering low-cost, a fair degree of functionality and a great deal of ease of use.

Known as Microsoft Works, the package contains word processing, spreadsheet, database and communications software. And unlike Jazz, it doesn't try to compete in the 'mega-spreadsheet' wars (as Microsoft's own Excel is already supreme in that area) and thus can devote almost equal power to all parts of the program.

But unlike many integrated suites, it is not a software throwback (that is: the individual components do not look like throwbacks to earlier versions of stand-alone software). It epitomises the axiom 'the simpler it is, the harder it is to get it right.' And Microsoft Works gets it right.

Microsoft not only gets it right for experienced Mac users, but also for novices eager to take advantage of the Mac's easy-to-use facilities. A quick glance through the tutorial lessons which accompany this package will undoubtedly ease any first-time user nerves.

The hardware you need to run this suite consists of a Macintosh Plus, a Macintosh 512k with at least a single 800k floppy drive or a Macintosh 512k with two disk drives. A hard disk would not go amiss here, but the program can run nicely without one — albeit somewhat slower.

Unlike Jazz with its proliferation of disks, the Beta copy of Works that we tested came with just two disks — a program disk to be inserted in an external drive and the start-up disk for the internal drive. On a Mac with 800k drives, that would be reduced to a single disk — with room left over for data files!

Our Beta copy was also not copy-protected (and no, you can't have a copy), but Microsoft advises us that the final production version will be copy-protected.

The copy protection issue seems to

form part of a schizophrenic policy in major software houses such as Microsoft and Ashton-Tate. Both have decided to remove copy-protection on all the IBM PC applications software, yet maintain it on the Macintosh programs.

Getting started

To start using Microsoft Works, you need only 'double-click' on either the 'Works' icon or the 'Resume Works' icon (the former will merely start the program while the latter will actually reload all the documents you were working on when you last used Works). When the program has loaded — with almost all of it in memory, rather than on disk — you are presented with a screen that offers you a view of all your Works files, or a selection of files defined by application.

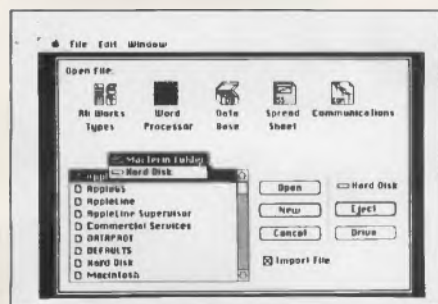
Using this opening 'menu', you can select any existing document, open a new document or import a data file from another program. The latter task is handled via a discrete 'import file' box, which will then show both the 'importable' as well as the existing document files in the folder directory at the left-hand side of the screen.

All the usual options for changing your data drive, ejecting a disk and opening a file are available in the opening dialog box — and Microsoft Works fully supports the new Mac Hierarchical Filing System (HFS), so that full use is made of 'folders' and sub-directories.

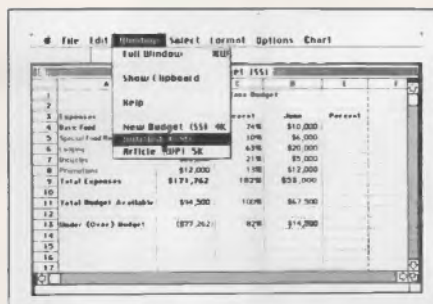
Word processing

Works combines the best features of MacWrite and Word to make this word processor simple to use. In addition to the standard commands on the Works' word-processing pull-down menu, there are a few new variations which make life easier for the Mac owner.

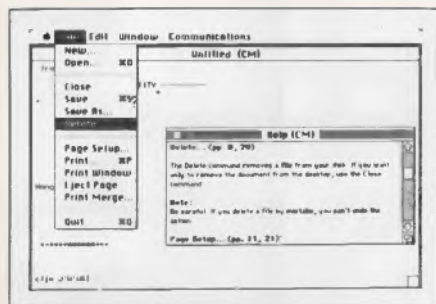
The introduction of a 'Delete File' command, for example, is something which should have been added a long time ago. This command brings up a dialog box which allows you to delete a file while you are working on another file, rather than the old-



This is the opening screen of Microsoft Works. Note the onscreen support for the Hierarchical Filing System (HFS) and the ease with which 'importable' files are shown



Even when you're using three documents at once, it's relatively easy to swap between them by accessing this comprehensive pull-down menu



The 'Help' menu in Works is context-sensitive and comes up in a resizable box, so that it only occupies as much of the screen as you want it to

fashioned method of returning to the desktop, throwing a file into the trash-can, then re-entering your program again.

There is also an 'Eject Page' command which advances the paper in your printer by one page. This may not be a spectacular innovation, but at least you don't have to constantly stretch over to your printer to push the 'form feed' button.

Moving over to the 'Edit' pull-down menu, the new 'Draw' command affords a small selection of drawing patterns. They include three thicknesses of lines, circles, hexagons and squares. The program is obviously not capable of giving the spectrum of choices available on MacPaint or MacDraw, but you can create your version of Picasso on MacPaint and import it to Microsoft Works. And unlike almost any other word processor we know of for the Mac, you can type not only beside — but directly through — imported or Draw-command-generated graphics (see screenshot).

Like most of the better word processors you can work on several documents at once in Microsoft Works. These documents can all be shown on the screen at once (if you 're-size' each of the document windows to accommodate them) or you can keep them all full-size and 'flip-through' them using the 'Window' pull-down menu command.

The Window pull-down menu in Works keeps a list of all the documents you have opened, including memory size. To open another window, therefore, you simply click on the title of the document you want from the pull-down menu.

The Window menu also includes access to the 'clipboard' (where you can 'paste' data to be swapped between applications) and access to the 'help' function (which is context-sensitive and shows itself as a small

SCREENTEST

'read-only' document at the bottom of the screen).

Another interesting item is in the 'Search' pull-down menu. A 'go to page?' command brings you quickly to the top line of the page in question, rather than aimlessly scrolling up and down using the slide bar or cursor keys (included on the Mac-Plus). The only point of contention is that you have to remember the page number you are scanning for.

Formatting functions, however, are relatively consistent with other Mac word-processing programs — but Works does omit Word's myopic and frustrating standard of using 'equals signs' as page breaks and the need to use the accursed repagination command. Standard MacWrite-style page breaks are used instead — with dynamic repagination.

Font and 'style' management commands are also accessible from the word-processing pull-down menus, offering eight typefaces — available in seven sizes and eight styles.

Tabs are incredibly easy to set — you simply click on the ruler at the top of your onscreen page where you would like to position your tab breaks. No longer do you have to drag a tab stop out of an arrow set in the ruler — as in Word — and hope for the best.

The only real drawbacks we could see to the word-processing module are the lack of a word count, a spelling checker and any form of 'outline processing'. Also, the longer your file is, the slower it will perform editing

functions such as 'cut', 'copy' and 'paste'.

The size of document files is limited only by the amount of memory you have — as Works is a memory-based program. Like Lotus Symphony on the IBM, the main section of the program is loaded entirely into memory so that it's not slowed down by constant disk-accessing. Unlike Sidekick, however, it is not memory-resident in the sense that it's designed to run alongside other stand-alone programs.

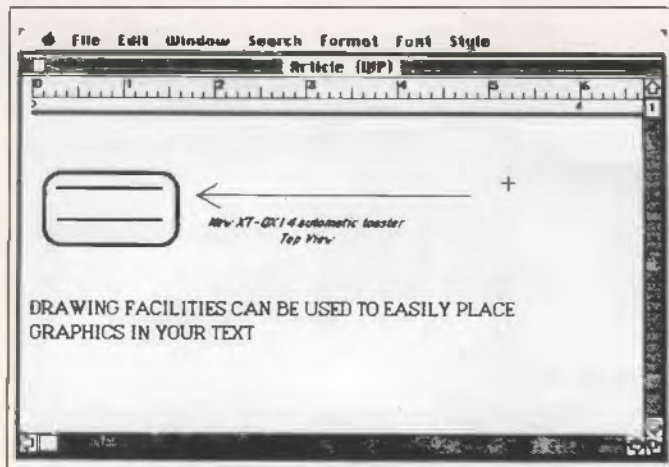
With a 512k Macintosh, you can thus store 60-80 pages in a file, while with the Mac Plus (and its 1Mbyte of RAM) the number is upgraded to 180-240 pages.

If, however, you use a large variety of RAM-hungry fonts and include lots of bit-mapped graphics, the capacity will be reduced. You can always keep track of exactly how much RAM you've got left through the 'About MS-Works' option.

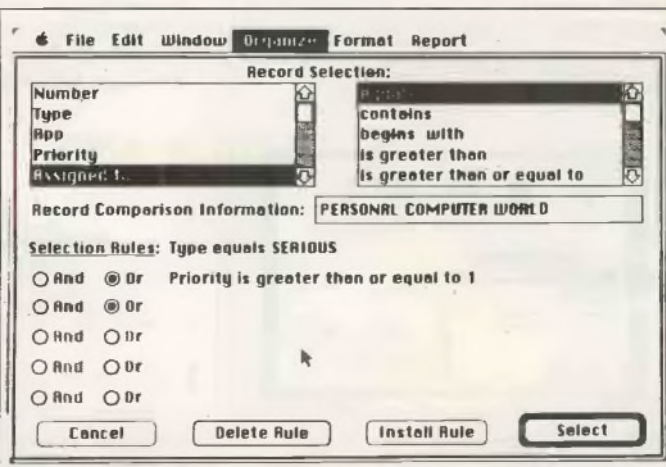
Database

Works does not offer a sophisticated database, but rather a simple 'flat-filing' system with no real 'relational' ability between database files. It is very much like Microsoft's own File database software for the Mac. It would, in fact, be fair to call it more of an 'electronic filing system' than a true database.

Surprisingly, however, Microsoft has not used many elements of File within the Works database. In fact, to begin with, we couldn't directly import records from Microsoft File (particularly as File allows for the use of graphics data in records and Works doesn't) — as data formats are different in the two programs (they could be imported as ASCII files, but that requires some messing about), so we had to create a number of sample databases from scratch.



Once you've used the Draw command to create graphics, you'll notice that Works allows you to place text and graphics beside one another



Record selection is accomplished by installing 'rules' under which you can select a series of criteria for collecting together specific information



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Having learned the 'ins and outs' of it, however, the database was actually quite impressive. The simple statistics are that it allows 60 fields in a record, up to 248 characters in any given field, 64 characters in a field name and 200 characters in a computed field formula. And that gives you pretty good scope for a wide variety of databases.

A 512k Mac can store up to 2000 records in a database (100 characters per record), while the Mac Plus can handle up to 6000. This capacity is obviously affected by the number of characters per record.

Once you understand how to set up the Works' database, it is very easy to use. Like most of the popular PC databases, you can view your database record-by-record (forms view) or as a window onto the entire database field-by-field (list view).

We could see the 'forms' view being particularly useful for people conducting surveys or filling in large volumes of information, as it approximates a 'file-card' extremely well. Moving entry fields around on the basic database form is quite simple. You merely select the field with a MacPaint-style 'hand' and then move the field to its new position.

There is a good collection of searching and sorting tools in the Works database — including commands for finding information in a given field, selecting specified records (using up to six selection rules and a series of operators) and sorting by numeric value, alphabet or chronology.

Record selection is accomplished via the application of 'rules' (see screenshot). These rules are derived from selecting a field on which the rule is to operate, then the operator and, finally, the record comparison information.

Reporting — often a weak spot on databases — is nicely tied into the record selection processes so that records can not only be printed in an

attractive report format easily, but can also be formatted for insertion into a word-processed document without a great deal of trouble.

For those whose primary use of the database will be to provide data to send to the word processor, you'll be relieved to know that mail-merge is supported in Microsoft Works. Merging database records into the word processor to write form letters is accomplished by inserting 'placeholders' (showing the name of the database document from which you are getting the data and the field name you want to go in that spot — ie: Addresses: First Name) at the appropriate place in the document and then using 'Print Merge'.

Spreadsheet

Along with the database, the Microsoft Works spreadsheet is the most complex and powerful of all the applications modules. Since Microsoft produces the best-selling standalone spreadsheet (Excel) for the Mac, this should perhaps come as no surprise.

What is a surprise is that Microsoft hasn't knee-capped the power of the Works spreadsheet in order to steer potential Excel users away from it. The Works spreadsheet is a full-blown financial modelling tool that should provide you with most of the calculation and planning power you need for most jobs.

The program's specifications state that the Works spreadsheet can hold up to 238 characters in the entry bar,

200 characters in a formula, 80 columns in a series chart (except the bar chart) and 15 rows in a pie chart. A 512k Mac can cope with 7500 filled cells while the Mac Plus will deal with up to 22,500 filled cells. The length of your formulae and the amount of text in labels will obviously reduce the capacity of the spreadsheet.

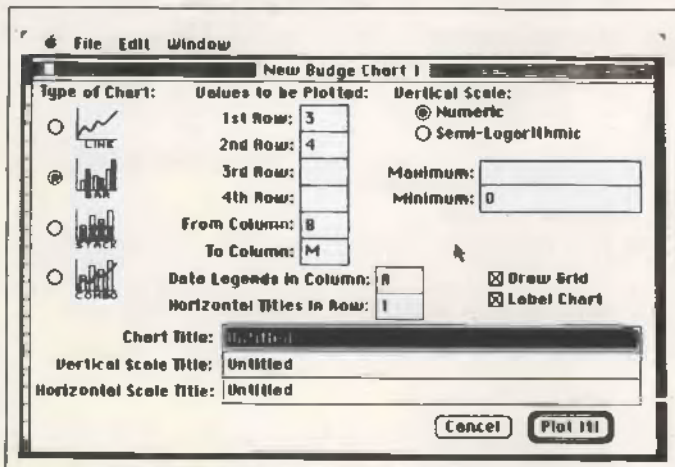
The Works spreadsheet has a capacity of 256 columns by 9999 rows and 54 calculation functions — but that, of course, would take up a lot of memory. Like most other Microsoft spreadsheet products, the company says that Works also uses 'sparse memory management' techniques so that placing a number in the last cell in the spreadsheet will take up no more room than placing one at the start.

On all our (Beta versions 4.3 through 7.0) review copies, however, the use of this technique was not in evidence. Placing a single entry in a cell at the far bottom right-hand corner of the spreadsheet caused it to immediately reserve 42k for that spreadsheet. Microsoft says this is a bug that will be fixed in UK release versions — but we suggest you check for yourself before buying.

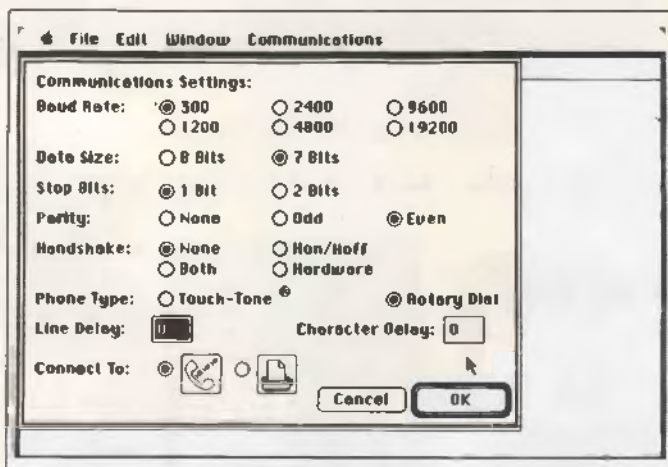
Though the spreadsheet's File and Window pull-down menus are identical to other Works' applications, the Edit pull-down menu includes the 'Paste' functions, Absolute Cell Reference, Fill Right, Fill Down and Sort.

The 'Select' pull-down menu concentrates on cell manipulation, while the 'Format' menu deals with common spreadsheet standards, such as per cent, general and decimal choices. Calculation functions, indications of formulae and values, data protection and use of a grid are all part of the 'Options' pull-down menu.

Unfortunately, like most other applications imported from the US, Works will not initially support UK or



Spreadsheet 'Chart' box — to chart a spreadsheet, you describe the rows you wish to plot and the columns that they are in



This communications 'setting sheet' is automatically presented every time you open a 'new' communications document within Works

European currency — and thus you'll have to work without pound signs for the few months until Microsoft has its UK-specific version of Works ready.

Last, but not least, is a highlight of the spreadsheet application — the 'Chart' pull-down menu. This is one of the easiest and fastest ways possible to plot charts relating to your spreadsheets (see screenshot).

You simply set the parameters for your chart, click the 'Plot it' box and a chart appears. Four different types of charts are on offer — line, bar, stack and combination. Up to eight charts can be saved for each spreadsheet file.

However, before you paste your chart to another application — word processing, for example — make sure you have space cleared for it in your document. If you don't, the chart will be copied onto text already there. You can easily 'undo' the overwriting, but it's best to have a blank space where you can then manipulate your chart until you achieve the desired position.

Communications

Microsoft Works provides a simple-to-use, but quite flexible, communications application within its range of capabilities. Both the lessons for this 'module' and the main Works manual are well-explained and guide the inexperienced communications user through parity settings, baud rates and hand-shaking. The module offers default settings for a Hayes or Hayes-compatible modem, but we found that a UK Apple modem worked quite satisfactorily.

The dialog box for the communications settings is quite straightforward (though a command to provide a carriage return-line feed at the end of each line would have been nice). Among the other choices in the same pull-down menu for sending or receiving information are 'Echo' 'On/Off', 'Dial' or 'Hang-up', 'Answer Phone' and 'Capturing or Receiving Text or Files'.

Dual access — being able to work on another application while dialling a number through the communications package — is a particularly attractive feature. You will have to adjust the size of your windows, but you can keep an eye on the dialling procedure while you work on something else. Eight telephone numbers can be stored per communications 'document', with a simple 'dial' box to click when you make a call.

Like most US communications modules, however, Works does not offer support for the Viewdata dual-speed graphics standard used by the UK's popular Prestel database. If you want to access Prestel from the Works communications system, you'll have to use the 300/300 baud

phone number and forego the graphics offered at the regular 1200/75 speed. (The UK's Vicom is so far the only popular software manufacturer to offer this Viewdata support).

Desktop publishing

Although Works supports a laser printer and its documents are intended for use in desktop publishing systems, there are a few issues to bear in mind when doing so.

As Works is being released at about the same time as the new version of the popular Aldus Pagemaker desktop publishing software, it is not entirely compatible with the old version of Pagemaker. Pagemaker 1.0 cannot read Works files which use bold face or underlining features — a problem which Microsoft says you should solve by getting the new version of Pagemaker.

General comments

There is an extensive context-sensitive onscreen 'Help' facility which runs through all the applications in Works — allowing you to scroll through a series of Help topics in a resizable box at the bottom of the screen — or use a '?' icon to point at the command on which you need help (see screenshot).

The ability to see both the text you need help about and the answer at the same time gives Works an added advantage over other online help systems that take over the whole screen.

Perhaps one of the largest benefits of Works is its ability to transfer files from other programs, such as Microsoft Word, MacWrite and Excel, without difficulty.

You simply open the File dialog box and choose the word-processing icon. You then just choose the folder or drive containing the files to be transferred and click on the Import File box.

The file or files which can be read will be displayed in a scroll-down box. Double-clicking on your file name will open it, though it will be initially untitled.

The database application allows the import of File, Jazz, Appleworks or III E-Z Pieces (the precursor to AppleWorks originally offered on the old Apple III) files. SYLK files from Multiplan or Excel, or text files from spreadsheet programs can also be transferred to Works. AppleWorks files will, of course, need to be transferred using the Apple Access communications software and the communications module in Microsoft Works.

The exporting procedures are just as easy. We had no difficulty in sending a Works file to both MacWrite and Word. You simply click the 'save as' command on the file pull-down menu, click the export box, then save your file. It is now ready to be used

by another word processor.

Transferring a Works' spreadsheet's SYLK files to Multiplan or Excel is a more complicated procedure, but is clearly documented in the manual. An extensive chart explains the different functions between these three programs and any adjustments you may have to make.

And, of course, it is quite easy to transfer data between the various modules in Works, so that spreadsheet, database and graphics, for example, can be incorporated into a Works word-processing document.

We have already outlined how you can merge database files to accomplish 'mail-merging' in the word processor, but you can also copy from the database data in List mode, and vice-versa.

The only 'one-way' import/export is from the graphics module — which can only be pasted into the word processor (but then where else would you want it?).

Documentation

The documentation included a 390-page manual, a quick reference guide and a 142-page lessons guide. The manual itself assumes no prior knowledge on the part of the user and is thorough in explaining the Mac's procedures. If, however, you are an experienced user, you should just boot up the system and try it. You should only have to refer to the manual for 'fine-tuning'.

Conclusion

One disappointment with Works is the lack of printer spooling — you cannot print one document while working on another one. Any files you have opened up, in addition to the one you are printing, sit in RAM and are completely inaccessible.

It's also a shame that you can't put graphics in the 'flat-file' database — and that it's not relational — but it should do the job for most simple applications. We would also like to see how the sparse memory management on the spreadsheet works out, as this could be crucial in such a RAM-based product.

We were very pleasantly surprised — by both the power of the software and the price. At £250, it is inexpensive for a dedicated single-task application. But for an integrated package with as much power as this, it is unprecedented value.

Even if you need only the word-processing and perhaps the mail-merge facility of the database, Works can probably be cost-justified. This is particularly true now that Apple has 'unbundled' the MacWrite and MacPaint software from the Macintosh Plus.

In our opinion, it's got to be high on every Mac user's wish list.

Microsoft is on (0734) 500741

END

Fractal sets

The mathematical and graphical world of Mandelbrot and Julia sets is explored in a two-in-one article by Dr MM Novak and Jack Weber.

This feature consists of two articles about the Mandelbrot and Julia sets. The first, by Dr MM Novak of Bristol University, explains the background and mathematics of Julia sets very clearly. It then goes on to describe in general how to explore this wonderful mathematical world on your computer. The second article, by Jack Weber, describes a fully-fledged program to explore Julia sets and Mandelbrot sets. It also describes an innovative algorithm to produce accurate intermediary results. This is a great improvement on previous programs and is a great time-saver, since all such programs require immense amounts of number-crunching.

The two articles are complementary and provide an ideal introduction to some of the more interesting parts of the world of fractals. Though the articles assume some knowledge of mathematics, the listing 'MacMand' which appears in Program File on page 225 does not.

Julia sets

by Dr MM Novak

The fascination that came over me during my first encounter with the striking world of fractals has never left me. In fact, if anything, the grip became even tighter as I delved deeper into the realm of amazing forms that kept unfolding on my monitor. The visual representation of apparently mundane mathematical ideas resulted in stunning displays. The wealth of underlying imagery could not be conceived in the absence of computers, and it is only recently that this field has acquired a high-profile status. In this article, I aim to explain the essential concepts behind fractals.

Down to basics

The basic elements of geometry are characterised by an integral dimension. For instance, a line has a dimension of 1, while a plane is a two-dimensional entity. No other objects with an intermediate dimension — for example, (1.7) — are possible in classical geometry.

However, more recently, the exist-

ence of objects with fractional dimension has been postulated. The name 'fractal' has been coined to describe such an entity. As this concept goes against our intuition, let us clarify its meaning by an example. Suppose we wish to measure the length of the coastline of an island. Clearly, as such a shape is very irregular to be measured directly, it is replaced by a series of straight line segments. Using a map, the determination of the length is, in principle, straightforward. We simply measure the island's circumference, along the bays and peninsulas, note the scale of the map and calculate the length of the coastline. If the scale on the map is large, the length that we obtain is approximate, as only the largest shapes are present. By choosing a more detailed map, additional bays and peninsulas become visible, hence increasing the circumference. Selecting a still finer map, yet smaller bays and peninsulas appear, and the overall length increases further.

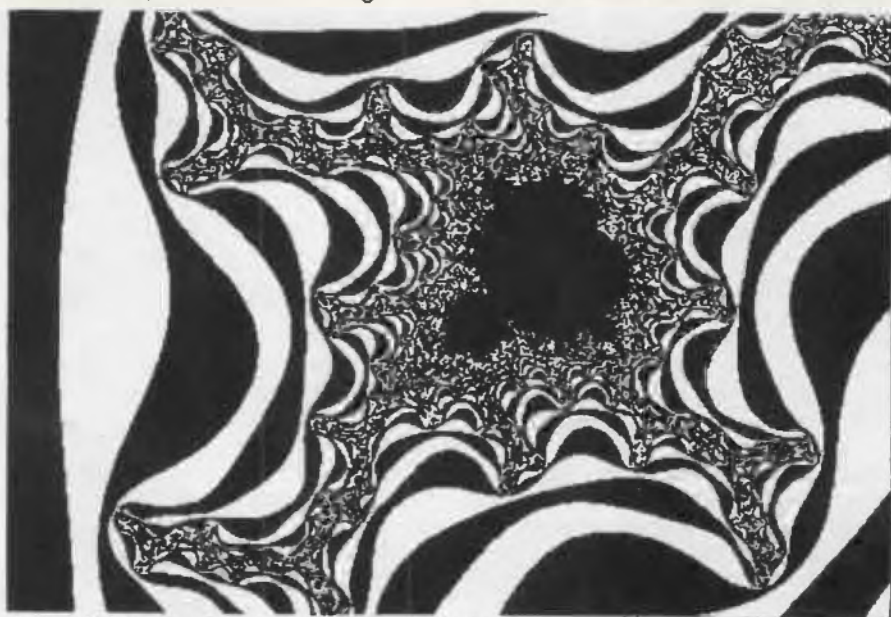
This process can be carried out *ad infinitum*, and it is found that the coastal length is not well-defined and increases without a bound. Note that such a measurement is not restricted to an atlas, but can also be performed directly on the island itself. For instance, select a fixed length in-

terval, say, with the dividers, and walk them along the coast. The total length can then be determined by multiplying the number of steps needed to cover the distance by the separation between the dividers. Now, if the interval between the arms of the divider is reduced and the whole process repeated, the circumference of the coastline becomes longer. Thus, as the interval gets smaller, the emergence of a more detailed structure increases the total length of the island.

Fractals are thus special, irregular objects that defy description in terms of classical mathematics. These objects commonly appear in nature, and their description led to a new field known as fractal geometry. An imaginative book dealing with this matter was written by BB Mandelbrot. Very effective fractal curves can also be generated on a micro. This article is devoted to a more complex fractal set, often referred to as the Julia set. Such an entity appears during an iteration process in the complex plane. Let us clarify this notion by first introducing the concept of a complex number.

Complex concepts

The oldest and simplest number system ever known to man consists en-



A detail from one part of the Mandelbrot set

tirely of positive integers. Addition of signed numbers and zero forms a complete integer set. The first three arithmetic operations — namely addition, subtraction and multiplication of two numbers from this set — yields a number which is also an integer. However, division of two integers may produce a number that does not belong to the integer set, as it contains a fraction. A set of numbers containing all the fractional numbers that can be written as the ratio of two integers is known as the rational set.

Apart from rational numbers, other numbers exist in mathematics. One such number is the square root of 2 ($\text{SQR}(2)$) ($=1.414213 \dots$). As this cannot be expressed in terms of rational numbers (or simple fractions), it belongs to an irrational set of numbers. Together with the rational set, they are known as real numbers. The 'real' is in fact a misnomer, as there is nothing more real about this set than about, say, integers.

Within the realm of real numbers, we can solve any equation of the form $x^2 = A$ providing A is a positive number. The solution is then simply $x = \text{SQR}(A)$. However, to solve the same equation when A is negative, another system of numbers, known as complex numbers, must be introduced.

The complex number is defined as consisting of an ordered pair of real numbers, subject to certain rules. It is normally written as $c+id$, where c and d are real numbers and i is a tag. We call c the real part and id the imaginary part of a complex number $c+id$. Complex numbers are often written as ' z ', as in the standard formula $z=x+iy$ where x and y are real numbers.

To follow the idea behind the Julia set, we must now introduce some rules concerning operations with complex numbers. Consider, then, two complex numbers, $p=p_1+ip_2$ and $q=q_1+iq_2$. The sum of the numbers p and q is again a complex number whose real part is equal to the sum of the real parts of p and q , and whose imaginary part is equal to the sum of the imaginary parts of p and q . That is, the sum of p and q is: $p+q = (p_1+q_1) + i(p_2+q_2)$

The product of two complex numbers p and q is given by $p \cdot q = (p_1q_1 - p_2q_2) + i(p_1q_2 + p_2q_1)$ once again containing the real and imaginary parts. In deriving this expression, we have cross-multiplied each part of p and q and used the fact that $i^2 = -1$.

How can we visualise a complex number? The most common representation is known as an Argand diagram. In this scheme, a complex number is identified with a vector whose x-coordinate is equal to the real part and whose y-coordinate is

identified with the imaginary part of a complex number. The absolute value (or the size) of a complex number is then equal to the length of an associated vector and can be expressed as:

$$|x+iy| = \text{SQR}(x^2 + y^2)$$

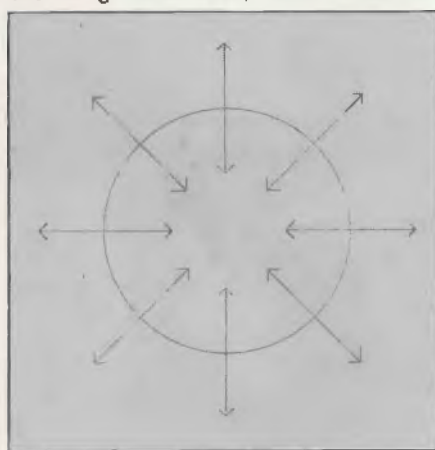
That is, the absolute value of a complex number is equal to the square root of the sum of its real and imaginary parts.

Iteration

First of all, what is an iteration? This concept is best explained by an example. Denote a function of x by $f(x)$, where x is called an argument. Now, repeat this procedure by treating $f(x)$ as an argument and find a function f that is $f(f(x))$. In the next step, consider $f(f(x))$ as an argument and obtain $f(f(f(x)))$, and so on. An iteration can thus be described as a repeated evaluation of a function, whereby functional values of one step become arguments of the next.

For the moment, consider only the real numbers and choose a function to be a squaring function. That is, for every real number x , the functional value of x is x^2 . By iteration, we find a sequence $x^2, (x^2)^2, ((x^2)^2)^2$, and so on. Repeating the squaring of every real number, we find that, depending on the initial argument x , the function either remains unity or tends towards one of two values — zero or infinity (depending on whether the absolute value of x is greater or less than 1). By increasing the number of iteration steps, a point is attracted closer and closer until it finally reaches one of these values. The points of attraction are known as attractors; thus, there are two attractors, separated by a boundary, for a squaring function in the realm of real numbers.

Let us now include the complex numbers and square them repeatedly. We find that, following the iteration process, all complex numbers are attracted either to zero, infinity, or lie on a circle with unit radius. Here, the circle represents the boundary between two dynamically different regions. That is, all points that are outside this boundary (see the diagram below) move towards



infinity, while all the points on the inside migrate towards zero when squared repeatedly.

The graphical representation of the iteration process, just described, is not very imaginative. However, a dramatic change takes place when a constant complex number is added at each iteration step. The process that describes the Julia set can now be expressed as $x \Rightarrow x^2 + c$ where c is, in general, a complex number and the sign $\Rightarrow$ means 'replaced by'. The addition of c to the iteration changes the position of the inner attractor — it is no longer equal to zero. Further, the circular boundary is also deformed and forms an irregular shape. A closer examination of this boundary reveals, in fact, that any minute part is just as irregular, bearing a remarkable similarity to other parts along the curve. Such a boundary is another example of a fractal structure.

How can this iteration process be visualised using a micro? Consider a complex number $z = x + iy$ and a constant $c = c_r + ic_i$. The iteration process $z \Rightarrow z^2 + c$ can be decomposed, in view of the operations with complex numbers outlined earlier, into real and imaginary parts as:

$$x_{n+1} = x_n^2 - y_n^2 + c_r$$

$$y_{n+1} = 2x_ny_n + c_i$$

This prescription tells us how to find the next term (denoted by subscript $n+1$) in the sequence, from the current term (represented by subscript n). In other words, the real part of the next number is found by subtracting the squares of the real and imaginary parts of the current term and adding the real part of the constant. The imaginary part of the next number is equal to twice the product of the real and imaginary parts of the current term increased by the imaginary part of the constant.

Suppose that we wish to look at all complex numbers in a specified area. To define such an area, it is convenient to associate the bottom left-hand corner of the screen with one complex number, say, $z_{\min} = (x_{\min} + iy_{\min})$, and the top right-hand corner with another, $z_{\max} = (x_{\max} + iy_{\max})$. On the Commodore 128, for example, the resolution of the multi-colour screen is 160 pixels in the x-direction and 200 pixels in the y-direction. Therefore, we define the x-increment as $dx = (x_{\max} - x_{\min})/160$ and the y-increment as $dy = (y_{\max} - y_{\min})/200$. The first x value in each line is equal to $x_{\min}$. The next two x values are $x_2 = x_1 + dx$, $x_3 = x_2 + dx$, and so on, until the last x-value in the line is $x_{160} = x_{159} + dx$. Similar relations apply to y-values. To implement the iteration process, execute the following loop for the complex number z corresponding to each pixel:

- 1) Replace z by $z^2 + c$, as shown in the example above.

- 2) Find the absolute value of this new z .
- 3) If the absolute value of z is greater than or equal to 2, exit the loop.
- 4) Adjust the iteration counter.
- 5) If count is larger than preset value, exit the loop.

The value of the counter, on leaving the loop, shows how quickly a given number (corresponding to a pixel under examination) is being attracted to infinity. The smaller the count, the stronger is the attraction. Obviously, it isn't possible to iterate each initial z a fixed number of times, as the absolute value of many of them would grow so rapidly as to exceed the capacity of a computer after only a few repeated squarings. Instead, it suffices to check whether the size of the number exceeds 2. If the answer is positive, then the number will definitely reach infinity in the limit of the iteration sequence.

The colour assigned to the corresponding pixel is determined from the value reached by the counter. The colour coding depicts how fast a given point approaches infinity. The range of the counter values can be divided into smaller groups, each of which is represented by one of the available colours. Or, each value of the counter can be represented by another colour, continually cycling through the available colours. Or, each value of the counter can be represented by another colour, continually cycling through the available colour spectrum. All the points whose magnitude remain less than 2 after a large number of iterations, say 500, belong, for all practical purposes, to the Julia set, and are unlikely to cross the boundary even if the number of iterations increases.

From the information presented here, it is straightforward to write a Basic routine that will examine the range of complex numbers undergoing repeated squaring. However, such a program suffers from one major disadvantage — it is very slow. To obtain fine detail it may take several days of continuous execution, and this timescale is bound to discourage even the most patient and determined computer addicts!

Mandelbrot sets

by Jack Weber

Considering its simplicity, the formula $z^2 + k$ (where $z = x + iy$) opens a window into a world of enormous complexity. Iterated over and over again it creates the, by now very familiar, Mandelbrot set. Many programs have been written to plot the Mandelbrot set and its surroundings,

but what is often ignored is that, lurking as it were behind the Mandelbrot set, is an infinite number of Julia sets. Whereas there is but one Mandelbrot set, created by initialising z to 0 and plotting the function for different values of C , there are an infinite number of Julia sets, each corresponding to a different initial value of z . More delicate than the Mandelbrot set but every bit as intricate, these Julia sets come in many forms with names like Fatou dust, Cantor set and San Marco fractal. The program 'MacMand' in Program File (page 225) plots them all, as well as the Mandelbrot set which gives birth to them. Although written for the Macintosh with its monochrome display, MacMand can be adapted to any colour or monochrome computer.

Mandelbrot algorithms

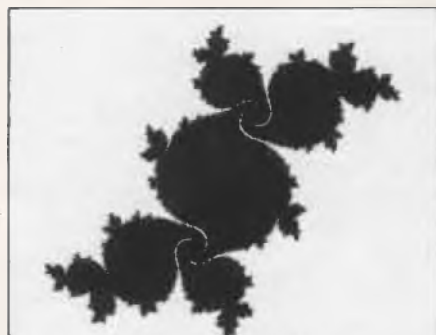
The basic operation behind all these fractals is iteration. That is, we work out the formula $z^2 + k$ for certain values of z and k , then use this result as our new value of z and do the same again. And again, and again, and again... Repeated many times in this way, the formula gives a sequence of numbers which will do one of two things: either get bigger and bigger, rushing off towards infinity; or move about within a fairly small range of low values, perhaps jumping about quite violently, but never getting big enough to be sucked away. The only complication is that both z and k are complex numbers — that is, numbers which have a real part and an imaginary part containing the square root of minus one. This complicates the arithmetic because Basic does not include functions for handling complex numbers, but, on the other hand, it is well-suited to screen display because x and y axes can represent the real and imaginary values of the numbers.

In order to generate the Mandelbrot set, we always begin by setting $z = 0$ and specifying a value for the constant k . Our first result is therefore $z^2 + k = 0^2 + k = k$. Putting this back into the formula gives $k^2 + k$ which, at the next stage, becomes $(k^2 + k)^2 + k$, and so on. If this series never grows towards infinity, then our value of k is a member of the Mandelbrot set. To plot this set we treat the screen as representing a range of k values: each pixel corresponds to a unique value of k with its combination of real part (x coordinate) and imaginary part (y coordinate). Using a pair of nested loops we can scan every point on the screen, find its corresponding value of k , substitute it into the formula, iterate it, then plot that pixel according to

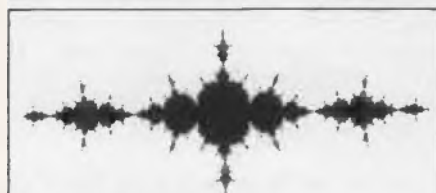
the result.

As it is plotted over a range of k values, the Mandelbrot set can be thought of as lying in the k plane; the Julia sets, on the other hand, lie in the z plane. We specify in advance the constant k that we are using, then scan the screen to give a range of z values which will be the starting points of the iterations. In most respects the process is very similar to plotting the Mandelbrot set, except that k is unchanged over the whole screen and our starting value of z is not 0 but the value given by the point to be plotted.

While relatively simple to describe and to program, all these processes are very demanding of computer power because, for every point on the screen, a complicated calculation needs to be done many times over — producing a complete plot may take hours or even days. The first



Julia set for $k = .11 + i.6557$



Julia set for $k = -1.25$

priority, therefore, is to make the computation as efficient as possible and to minimise the time spent waiting for output to appear.

Most processor time is spent in one of the two routines — Mandcalc and Juliacalc — which perform the iterations for each pixel within a WHILE...WEND loop. The maximum number of iterations to be done is preset by the user through the variable, level %, but the loop tests also for the value that has been reached in the iteration. If the modulus of the result (given by the square root of the sum of the squares of the real part and imaginary part) exceeds two, then the result will inevitably continue to grow towards infinity; so, there is no point in iterating any further beyond this threshold value. To avoid wasting time, though, the square root is not calculated; instead, the sum of the squares is compared against four.

When iteration has been completed we have, in the loop counter $i\%$, a measure of how many iterations (up to level %) were needed to reach the threshold. This provides the basis for two alternative modes of plotting: either we can use the value of $i\% \text{ MOD } 2$ to select white or black pixels for odd and even values of $i\%$, which maps how fast points outside the Mandelbrot set are attracted to infinity. Or, we can choose to plot only those pixels which reached level % without exceeding the threshold; this gives a plot that approximates to the Mandelbrot set. The higher we set level %, the more accurately we find the Mandelbrot set, but it does take longer to do.

Waiting for the display to build up pixel by pixel can be very frustrating, particularly if it becomes apparent towards the end that one of the parameters was not properly set. MacMand uses a tessellation technique to provide almost instantaneous output over the whole screen at low resolution, then gradually increases the resolution up to the maximum.

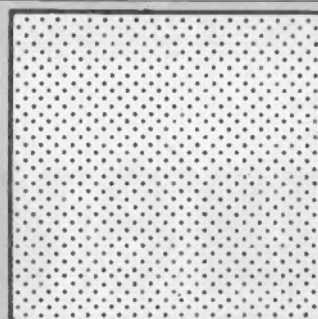
Tessellation routines

The program begins by stepping across a fairly coarse grid of points, plotting large squares on the basis of these points. Then it scans the screen again and again with successively finer grids, drawing smaller squares each time until just single pixels are being plotted. The basic idea is not new, but it has usually been done by taking grid sizes which are powers of two (128, 64, 32 ..., 2, 1) and plotting squares which have the calculated pixel as one of their corners. This is easy to program but, at coarser scales, destroys the shape of many patterns because each square is so unbalanced. MacMand plots squares that have the calculated pixel at the centre, which retains any symmetry in the pattern but requires a more complex algorithm based on powers of three.

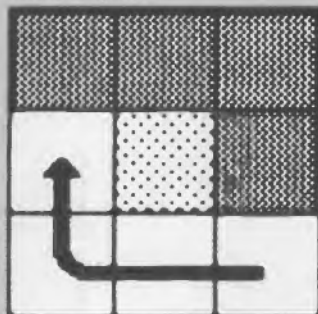
On the first pass we plot squares with 81 pixels on a side, using the centre pixel to define the colour. Subsequent scans divide each of the previous squares into nine smaller ones and plot the other eight of these, again using the centre pixel of each one to define the new squares (see figure).

The result is not only that we retain symmetrical features of the pattern throughout all stages, but, more importantly, the algorithm automatically avoids recalculating any pixel that has already been done. This means that very little is added to the execution time and, unlike the powers of two tessellations, there is no need to test each pixel to see whether it has already been calculated in a previous stage.

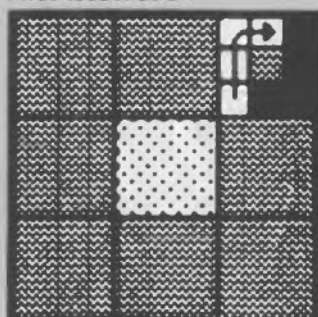
The two routines which perform



Initial square



First tessellation



Second tessellation

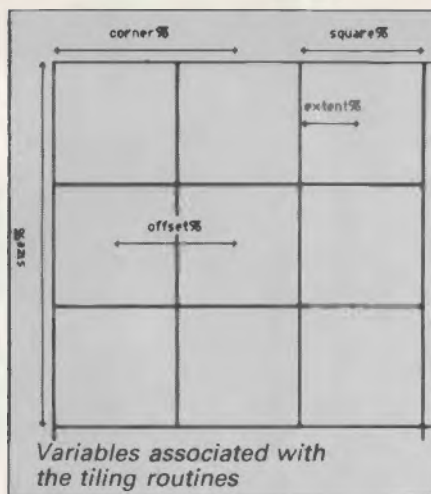
Defining new squares

the tiling are called Scan and Tessellate. They use a number of variables to define the size and position of the squares as shown opposite.

At any point during the plotting process, the menu bar offers a number of choices through a pull-down menu called Fractal. The first is Zoom-in which allows any part of the plot to be selected by dragging with the mouse and expanded to fill the screen.

Whatever the proportions of the selected region, MacMand will include the whole rectangle and add to it to bring it up to 3:2 aspect ratio of the display window. The second menu choice is offered only when plotting a Mandelbrot set; it allows the user to point with the mouse to any point of the k -plane which is displayed on the screen, and will plot the Julia set defined by that point. A little experience with this facility will soon show that certain forms of Julia set are associated with particular regions of the Mandelbrot set.

Finally, there are two menu options which allow a partially completed plot to be saved to disk at any time and later reloaded so that plotting picks up from the point where it was interrupted. Any number of plots



Variables associated with the tiling routines

may be saved, up to the capacity of the disk. The computer will automatically ask for a filename for each one being stored, and will display a scrollable list of available plots when resuming. When a partially completed plot has been reloaded, the routine Firststage is used to complete the current level of tessellation before going back into the main Scan routine.

Conclusion

Clearly, fractals like these can benefit a great deal from the sensible use of colour, but there is also a great clarity in seeing them in black and white. The program could quite easily be adapted to other computers, colour to monochrome; the plotting routines in particular should be easy to convert, allowing just for differences in screen resolution. Most of the rest of the program is concerned with the input of parameters and, because it relies heavily on the Macintosh user interface, is very machine specific. However, nothing more complicated than a number of INPUT statements is needed to get the necessary values into the computer. Obviously the routines for zooming-in and picking a point from the Mandelbrot set to form a Julia set are designed to operate with a mouse, but they could also be adapted to make use of cursor control keys.

Bibliography

Anyone wanting to study these complex fractals with anything more than a passing interest should consult the following publications:

Computer Recreations by AK Dewdney (Scientific American, August 1985)

The Fractal Geometry of Nature by BB Mandelbrot (WH Freeman, 1982)

The Beauty of Fractals by HO Peitgen and PH Richter (Springer Verlag, 1986)

Advanced Graphics with the Commodore 128 by Dr MM Novak (Macmillan, 1986)

END

A future vision

The final part of Mike James's data structures series looks at the evolving nature of programming and how programming languages, as we know them today, must eventually become extinct.

This is the final part of a six-part series on programming methods and the creation of programs. Parts one to five appeared in the July to November issues respectively, copies of which are available from the Back Issues department.

Looking into the far future is an easy occupation, as is any pronouncement on the unknowable. A more risky venture is looking for the seeds of tomorrow's commonplace among today's new ideas. When it comes to programming, 'risky' is something of an understatement. Who would have guessed 10 years ago that Basic would not only be still in use but the first language on most computers. On the other hand, the fact that Fortran, the first high-level language, is still important should warn against making predictions of rapid change! In fact, change is even slower than you might imagine because even though different languages have been introduced over the years, we still program in exactly the same way we did using the first assembly language. What is important for the future is not which *language* we code our ideas in, but the type of ideas that are natural and easy to express in a programming *environment*.

Most developments in programming take the form of improvements to existing languages or methods. As Fortran was an improvement on assembly language, so Basic derived from Fortran, Pascal from Algol, and so on. You could see some of these changes as being important new revolutionary steps — Fortran was the first high-level language and introduced the idea of translating one line of a program into perhaps many lines of machine code. Algol introduced structured control statements that took us yet another step away from assembly language and machine code, and so on — but they are all developments of procedural languages.

In the current view a program is a list of instructions concerning what should be done with a number of

objects, usually referred to as the data, and a programmer's job is to create such a list of instructions and appropriate data types to solve a given problem. If you start from this point of view, then you will slowly construct the whole of computing as we know it today.

'It has often been said in the past that the trouble with our programming methods is that they concentrate too much on describing how to do something...'

The only real progress since the days of machine code and assembly language has been the gradual move away from the shortcomings and idiosyncrasies of the underlying hardware. In other words, computer languages are becoming more and more machine independent and abstract. (Surprisingly, although most programmers would agree that machine independence is a worthwhile advance, it is still a widely held belief that efficiency of implementation is something that languages should take into account — efficiency of implementation is about hardware.)

You might think that machine independence and abstraction were relatively easy goals — just forget about the machine and create a pure language. In practice, it is almost impossible to forget the underlying machine — anyone who knows enough about computing to be able to design a language also knows too much about computers to ignore the hardware. Even one of the most up-to-date languages, Ada, contains a new programming construct, the exception (see part four, 'Righting wrongs', October 1986). Although this appears to be abstract and machine independent, it is in fact no-

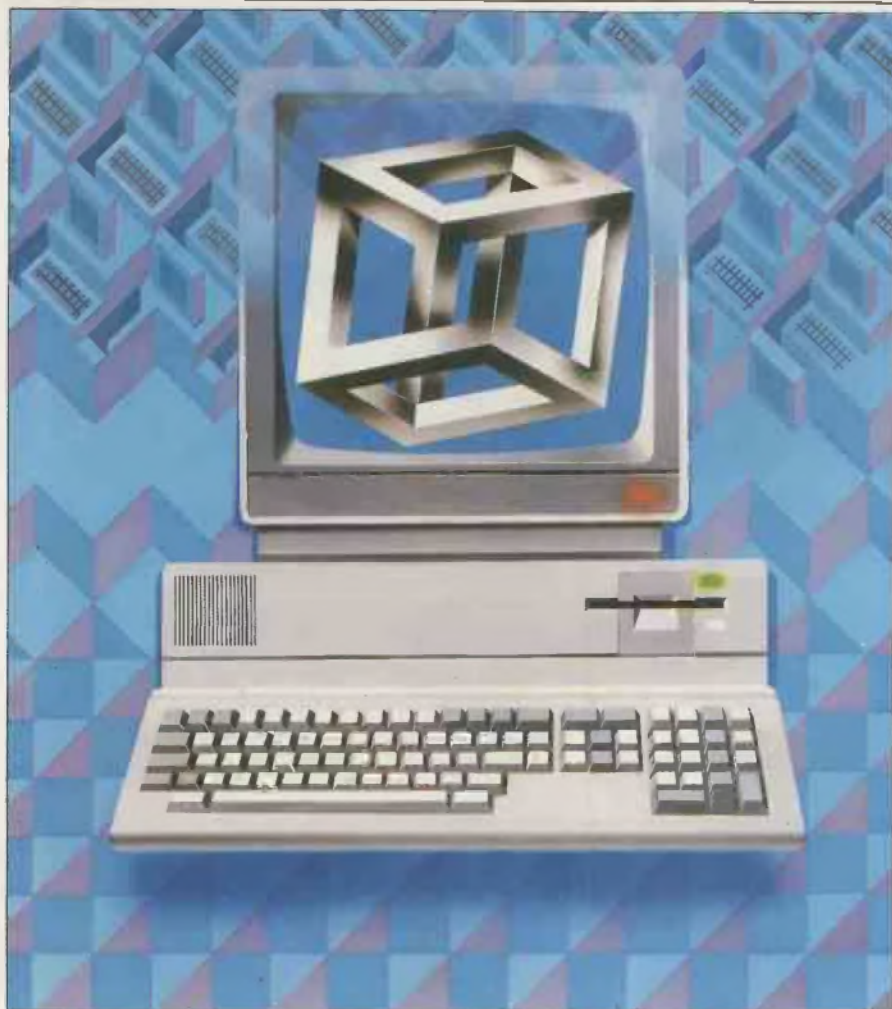
thing more than a high-level language version of a hardware idea called a 'trap'. This isn't to say that a language construct that is close to the hardware is necessarily wrong, it's just that the hardware remains the starting point and only time will tell if the construct will evolve away from this position.

New approaches

There are two new approaches to programming that seem to be trying to break away from the confines of the hardware-based model — logic (or declarative-programming) and object-orientated programming. The first of these approaches is typified by the language Prolog and the second by the programming environment Smalltalk. Although these will be used as examples, it is important to separate criticisms of these particular products from any difficulties of the methods and philosophies that they represent. In other words, although you may like Prolog, this doesn't necessarily make all declarative languages a waste of time.

It has often been said in the past that the trouble with our programming methods is that they concentrate too much on describing *how* to do something rather than on describing *what* should be done. Until recently the only example of the 'what rather than how' principle would have involved appeals to the yet unfulfilled promise of artificial intelligence research. In the future computers might be able to take descriptions in English of what is required and generate their own programs to satisfy our requirements (after all it's *what* we do, isn't it?) but at the moment such machines are science fiction.

The first real practical approach to the 'what' style of programming can be found in declarative languages, and Prolog in particular. In a declarative language the programmer makes a lot of statements that summarise what is known and then a statement that is either in doubt or incomplete, and the system then checks its validity or completes the statement. Obviously if we allow the type of



statement to be of arbitrary complexity, we need nothing less than an intelligent machine to work out the answer. In practice, some restrictions are required on the language used to express the statements of what we know. In Prolog, the language is essentially classical predicate logic, in which statements are either true or false.

As an example of the difference between declarative languages and traditional procedural languages, consider the simple problem of adding two numbers together. In a procedural language you would write something like

$X=2+5$

which means take 2, add it to 5, and then store the result in the variable X. You can tell from the English description of what is going on that this single statement is a recipe for doing something.

By contrast the Prolog equivalent is almost tranquil! Prolog has access to an infinite number of predicates like (SUM123) which is a statement that (SUM 1 2 3) is true. Prolog doesn't have any understanding of this statement, but we humans find it quite natural to read it as '1+2=3 is true' and Prolog has access to a similar predicate for every correct addition of two numbers. If you type in SUM 1 2 3 to Prolog, then it checks its store of knowledge to find out if

the addition is true (correct) or not. If it is, then it is accepted; if it isn't, then Prolog will let you know. (In more complicated examples Prolog can reject a statement either because it is false or because it doesn't know enough about the subject to prove it true.)

'The question of what sort of applications Prolog is good at is something to which a lot of people would like to know the answer.'

This testing of arithmetic statements for truth or falsity is interesting but this is a silly way to work out, say, 10+45. You could do it by trial and error, typing in possible answers until Prolog accepts the correct answer but, fortunately, there is an easier way. If you type in SUM 10 45 X

Prolog will search for a value of X that makes the predicate true. Now although this looks like the usual procedural way of adding two num-

bers together, all the activity is hidden in the machine and not in the program. This idea of Prolog searching for a value of a variable to make a predicate true is completely general. For example:

SUM 2 Y 3

will find a value, an instantiation of the variable Y, that makes the predicate true — that is, 1 — and this is clearly the Prolog way of subtraction!

The above example of addition and subtraction is a good one because it is simple and familiar, but it is bad from the point of view of showing Prolog doing what comes naturally. In this case Prolog doesn't really have an infinite set of predicates telling it all about the truth of arithmetic — it uses a computational algorithm just like any ordinary language; but there is nothing wrong with the occasional computational predicate. A better example from the point of view of simple but more typical Prolog is the 'A is connected to B' type of problem. If you enter the predicates

(Connected London Sheffield)

(Connected Sheffield Leeds)

(Connected Paris Lisbon)

which are clearly meant to summarise the way towns are connected without the need for a sea crossing.

Then entering the predicate

Connected London X

would cause Prolog to find a value of X that made the predicate true — that is, Sheffield. If you also add a predicate which lets Prolog know that 'X connected to Y and Y connected to Z implies that X is connected to Z', then it will also let you know that London is connected to Leeds, and so on. In other words, Prolog is capable of making deductions based on its store of knowledge to either discover that something is true or to find values of unspecified variables. It is this power of deduction that makes it possible for the Prolog programmer to ignore the problem of how something is to be achieved and concentrate on specifying the problem and asking the appropriate questions.

After this brief description you are either impressed by the potential of Prolog or feel that it is a fuss about nothing. I suspect that what you think depends on whether or not you have a suitable problem in mind. The question of what sort of applications Prolog is good at is something to which a lot of people would like to know the answer. All I can say is that a lot of people think that Prolog is worth trying and there are good reports about its performance from simulation to artificial intelligence.

Declarative programming seeks to replace the procedural imperative by automatic methods of deriving results. An alternative approach is to place more emphasis on the role of data in the construction of a pro-

ram. The object-orientated method achieves this by making it explicit that the purpose of a program is to model reality.

The best-known example of an object-orientated programming language is Smalltalk but referring to Smalltalk as a programming language is considerably underrating what it offers. Smalltalk is a programming environment. You don't so much write a program using Smalltalk, rather you add your contribution to the Smalltalk system. The difference between a traditional procedure and a Smalltalk object is that a procedure is mainly a description of what to do (the data that it works on is more or less incidental) but a Smalltalk object is an indivisible mixture of data and procedure. It is difficult to describe the power of the object-orientated method without giving a large example. However, a simple example, coupled with a description of the philosophy behind it, should give you a flavour of the idea.

An object is a collection of data structures and methods which are descriptions of the allowable operations on the object. This definition fits in well with the ideas of data structures introduced in part two (see 'Data representation', August 1986). The difference here is that it is the data structure's responsibility to do things rather than have things done to it.

To make an object do something, you send a message to it that selects one of its methods. For example, if you were constructing an electronic mail system using traditional procedural methods, you would write a print routine that accepted as its input the data structure that held the text of a letter. In Smalltalk a letter would be an object and one of its methods would be a description of how to print itself! In a procedural system adding a new type of letter would mean altering all the print and similar procedures to accommodate the new data type, but in the Smalltalk system all you would have to do is introduce a new object complete with its methods and the rest of the system would remain unchanged. Notice also that each letter is an example of the same type of object in the same way that the array A(1) is a particular example of the general class of things called arrays. In general Smalltalk allows you to define classes of objects and then generate as many particular instances of the object that you need.

Object-orientated methods introduce one or two additional ideas for making the creation of objects easier, but it is the association of data and procedure within the object that is the most important idea. If what we



are trying to do when we create a program is model the world, then why not model each of its objects as objects! In this sense creating a program becomes a matter of creating the right objects with the right

'The only real progress since the days of machine code and assembly language has been the gradual move away from the shortcomings and idiosyncrasies of the underlying hardware.'

properties and then letting them interact. One of the biggest problems with the object-orientated method is getting programmers to think of a program in terms of chunks consisting of objects. It is difficult enough to convince some programmers that modules are a good idea without trying to get them to organise both data and the procedures that operate on it together!

New methods for what?

Before you read the rest of this section, try making a list of all the programs that you can think of that do something directly useful — that is, don't include things such as operating systems, compilers, and so on, which are concerned with the process of supporting the computer, only programs that are concerned with real applications. I would be very surprised if you can make a list that includes more than 10 programs (most people only manage five or six)! If you do come up with more than 10 programs, my guess is that you are including process control programs as well as standard application programs — this isn't cheating, it's just a reflection of the fact that using computers to control other machines is a bigger field than simple information processing. Even so the total number of program categories is very limited when you think of the size of the industry that their production supports.

So are programmers making a living by continually reinventing the wheel? No, it's more than that; as yet, they have never managed to invent a satisfactory wheel! All the programs that we write are in some

Answer to creative challenge 5

The iterative solution to the Towers of Hanoi problem given below was inspired by the thought that if the monks of Hanoi were busy moving disks from peg to peg, it was unlikely that they were running a recursive algorithm. (Human thought may be generated by recursive processes, but most humans have great difficulty in following a recursive list of instructions without making mistakes.) After playing with three different-sized plastic cups, I formulated the following heuristics:

- (1) Do not consider moving the disk that you have just moved; and
- (2) If there is a choice of legal moves, always make a move to a peg closest to the destination peg.

The program given here implements these heuristics and they work. (The array T(I) is used to record the position of the top of the stack on peg I.) A little more investigation quickly shows that almost any replacement for rule 2 that avoids infinite loops of moves solves the Towers of Hanoi problem; in fact, I have a feeling that any heuristic that avoids infinite loops will solve the problem. Thus the Towers of Hanoi problem that initially looks complex and in need of a recursive solution is so constrained that as long as moves are making progress, a solution is inevitable.

There is one advantage to the recursive solution in that it is easy to prove that it is correct for all N. I have demonstrated that the iterative solution works for reasonable values of N, but so far I haven't (mainly because of laziness) proved that it works for all N.

```

10 INPUT "number of disks ";N
20 DIM PEG(3,N),T(3)
30 GOSUB 1000:REM initialise
40 REM make moves loop
50 GOSUB 2000:REM print towers
60 GOSUB 3000:REM find move
70 IF HALT=TRUE THEN GOTO 100
80 GOSUB 4000:REM do move
90 GOTO 40
100 PRINT "finished"
110 STOP

1000 REM initialise
1010 FOR I=1 TO N
1020 PEG(I,I)=N-I+1
1030 NEXT I
1040 FOR I=1 TO 3
1050 PEG(I,0)=999
1060 T(I)=0
1070 NEXT I
1080 T(1)=N
1090 TRUE=1=1
1100 FALSE=NOT TRUE
1110 HALT=FALSE
1999 RETURN

2000 REM print towers
2010 FOR J=N TO 1 STEP -1
2020 FOR I=1 TO 3
2030 IF PEG(I,J)=0 THEN PRINT ".", ELSE PRINT PEG(I,J).
2040 NEXT I
2050 PRINT
2060 NEXT J
2070 PRINT:PRINT
2999 RETURN

3000 REM find a move
3010 FOR I=1 TO 3
3020 FOR J=1 TO 3
3030 IF PEG(I,T(I))<PEG(J,T(J)) AND OMX<>I THEN M1=I:M2=J
3040 NEXT J
3050 NEXT I
3060 IF OMX=M1 THEN HALT=TRUE
3999 RETURN

4000 REM do move
4010 PEG(M2,T(M2)+1)=PEG(M1,T(M1))
4020 PEG(M1,T(M1))=0
4030 T(M1)=T(M1)-1
4040 T(M2)=T(M2)+1
4050 OMX=M2
4060 M1=M2
4999 RETURN

```

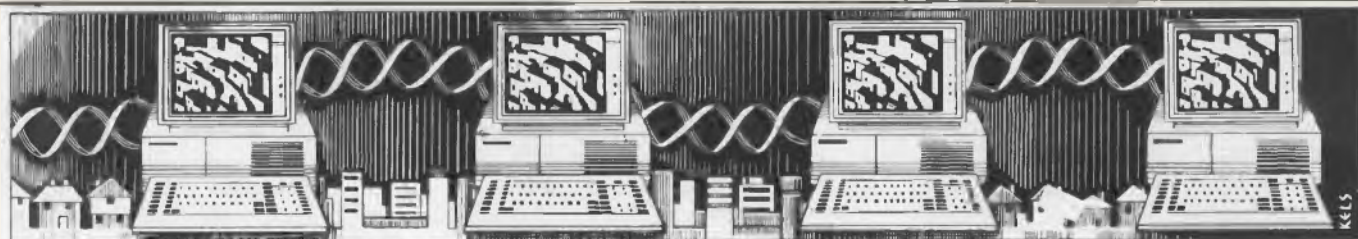
way provisional and the need to do better keeps us writing new versions. In the main what we have used computers for has set the pattern for what we want to use computers for, and so new categories of program are slow to emerge. (Perhaps the last new application category was the spreadsheet and this also introduced a programming method that certainly deserves further study — but that is another story.)

What this means for the two new programming methods described above, and any others, is that programmers tend to judge them by how well they would cope with their current type of problems without asking the important question of whether they might actually extend the range of problems that a computer can tackle. For example, I can easily say that I wouldn't use Prolog to implement a word processor but I would find it much more difficult to make a list of the sort of things I would use it for. With Turbo Prolog being a best-seller I can't help wondering what all those people are doing with it. Are they wondering too? When it comes to Smalltalk, it is much easier to see what it is good at because it is good at all the traditional computer applications as well as having the potential to take us into new territory. I think that Smalltalk, is important now and for the near future but I think that declarative languages like Prolog are important for the long-term future. Perhaps 'declarative object-orientated programming' is what we need.

Conclusion

Programming is a vast subject and all I have tried to do in this series is cover some of the topics that are either current or interesting. There are so many more topics that could be included that I am sure to have missed something that someone will regard as a major omission. If you have followed this series I hope that I haven't taken too much of the fun out of programming for you; in programming there are no rules, just opinions. **END**





Modem magic

Peter Tootill provides a seasonal summary of what to look for in a modem, plus a round-up of what's currently available.

With Christmas approaching, you may well be treating yourself to a modem or expecting one in your stocking. To help you and Santa choose the right one, here's a round-up of budget-priced modems. I had intended the top limit to be £150 including VAT, but I have stretched it slightly to include the budget-priced Hayes-compatible modems from Miracle and Pace. The round-up here shows modems to suit every pocket starting at under £40.

Assess your needs

You will certainly derive a lot of enjoyment from using online systems such as Prestel, Micronet, PCW Online and bulletin boards (BBS), the first and the last of which will amount to little more than the cost of a local phone call. (For the record, a local phone call lasting an hour costs only 43 pence.)

Whether you seek entertainment or information, diversion or education, you can find it on the various online systems that are available. However, before you can connect a modem to your micro and start using these systems, there are a few points to consider. You need a serial port, if your micro doesn't already have one; the right cables, to connect it up; and some software, all of which can add quite a bit to the cost of your modem, if you're not careful. Let's look at each briefly.

A serial port is often referred to as an RS232 or V24 interface. Many micros have one built-in as standard, while others, such as the IBM PC, Commodore 64, and Spectrum, need an add-on to allow them to be connected up. The alternative is to buy a modem dedicated to the particular micro in question. A plug-in modem card for the IBM PC, for example, makes the RS232 interface unnecessary.

The cable to connect the RS232 in-

terface to the modem is usually a simple matter but, because they can vary, you need to ensure that you have the right one. The safest thing to do is to buy everything, including software, from one supplier — preferably one who is familiar with your micro and who understands the world of communications. This is easier than it used to be as more and more dealers are learning about this area.

One thing you will have to decide is whether you want a V21 or V23 modem — or, indeed, one that covers both standards. This is determined by the sort of systems you want to call and what you want to do on them. The V21 standard is the most common and allows data to be sent and received at 300 bits per second (about 30 characters per second). Most BBSs and commercial systems (such as PCW Online) can be used with a V21 modem. A V23 modem works at 1200 bytes per second (about 120 characters per second) in one direction (usually from the system you have called to you) and 75 when you respond. Prestel uses V23 and most other commercial systems will accept this standard.

The advantage of V23 is that data is sent four times faster than V21, thus cutting down on phone bills. The problem comes when you want to send something to the system you are calling — a message you have prepared offline with a word processor, for example. It has to go at 7.5 characters per second. In this situation V21 would be better as you can send your message four times as quickly. There isn't room here for a full discussion of modem standards, but I hope I have given you some help in choosing what you want. If you can afford it, it is worth getting a dual-standard model that will handle both V21 and V23.

There is one other complication (isn't there always?). Some computers cannot use a standard V23 modem because they cannot work at different speeds simultaneously. This applies, for example, to most American micros (they don't use V23 in the US). The easiest way to deal with the problem is to buy a modem with what is called a 'buffered interface'. This simply means that it will talk to the computer at 1200 bits per second in both directions and to the telephone line at the usual 1200 and 75 bits per second rates. Unfortunately, this feature is found only on the higher priced modems (see the table opposite). There are other ways round the problem but these are usually machine-specific, such as the Commodore 64/128 modem or plug-in cards for the IBM PC. Sometimes clever software can overcome the problem also.

If you want a modem that will dial the telephone numbers for you, there are several that will do so. Some modems even have the intelligence to understand simple commands. The ways of controlling auto-dial modems vary, the most common being a set of protocols originally devised by an American modem manufacturer called Hayes. Another is the V25bis standard, but this is not very common. It is vital to ensure that the software is compatible with the modem if you want to see the auto-dial facility.

Software

Which brings me on to software. Here you have to decide whether you want to see viewdata systems such as Prestel (which transmit graphics in pages using special codes), or ordinary systems. The latter are often called scrolling systems because they operate like an ordinary computer screen — new text appears at the bottom of the screen and old text

scrolls off the top. Some software will do both. Software of American origin is unlikely to handle viewdata codes. You may come across references to things like VT100 or ADM3 emulation, but these are not normally needed for standard online systems in the UK.

Conclusion

This isn't a review and not all the modems given in the table have been tested. The list itself is not in-

tended to be comprehensive and you will find that there are many other modems on the market. But do make sure you buy a modem with BABT approval — BABT approval means that it is legal to connect the modem to the telephone line (and is shown by a green sticker). It also means that the manufacturer has enough commitment to invest a fair bit of money in getting it approved. If he hasn't, then can you be sure that he has the commitment to stay around to sup-

port it if you start to have problems?

I would also recommend you to avoid acoustic couplers. They work less well than modems connected directly to a telephone socket.

Finally, if you have one of the more common home micros, you can get a Prism VTX5000 or Modem 1000 absolutely free if you pay for a full year's subscription to Micronet in advance. This will cost you £66.

Enjoy communicating with your micro — thousands certainly do. **END**

Name	Manufacturer	V21	V23	AA	AD	Price	Comments
V23	Prism	X				£34	Acoustic coupler
Modem 1000	Prism		X			£50	
Modem 2000	Prism		X			£57	
AC-3	Tandy	X				£68	Acoustic coupler
Datachat 1223	GEC		X	†	†	£80	Line-powered
Minimodem	Answercall	X				£86	
Voyager 7	Modem House	X	X	X		£92	AD with special software
AM0101*	Astec	X				£98	Very compact, line-powered
V21	Modular Technology	X		X		£113	
Tm110	Tandata		X		X	£114	Stores up to eight phone numbers and log-ons, loudspeaker
Magic Modem	Kirk Automation	X	X			£114	
Voyager II	Modem House	X	X	X		£115	
CP 2123	Tandy	X	X	X	X	£115	This modem used to sell at £450! Also Bell 103
WS2000	Miracle Technology	X	X	†	†	£125	
Nightingale	Pace	X	X	†	†	£137	
Buzzbox AA	Dacom	X		X		£137	
Prospect	Interlekt	X	X	†		£144	
Linnet*	Pace	X	X	X	X	£160	Hayes-compatible, buffered interface
WS 4000	Miracle Technology	X	X	X	X	£171	Hayes-compatible, buffered interface
Machine Specific — most include Prestel & scrolling software							
QL package	Tandata		X	X	X	£80	
64 Multimodem	Miracle Technology	X	X	X	X	£113	Fits onto cartridge port
LeModem (BBC)*	Watford Electronics	X	X	X		£89	
BBC Master*	Pace	X	X			£137	Internal card fitting
64/128 modem	Commodore		X	X		£80	Includes subscription to Compunet
Spectrum VTX5000	Prism		X			£50	

Notes: AA=auto-answer; AD=auto-dial; X=Yes; †=available as optional extra, or with a higher-priced version of modem; *=BABT approval pending, should be available by Christmas 1986.

All the above details are correct at the time of writing; but it would be wise to check before you buy.

Prism, Modem House, 70 Longbrook St, Exeter, Devon EX4 6AP Tel: (0392) 213355 Prestel 219992691	Tandata, Albert Road North, Malvern, Worcs Tel: (06845) 68421 Telecom Gold 81: TAN001 Prestel *799#	DaCom, 26 Heathfield, Stacey Bushes, Milton Keynes MK12 6HR Tel: (0908) 675511
Tandy, Tandy Centre, Leamore Lane, Bloxwich, Walsall, West Midlands WS2 7PS	Kirk Automation, Bridge Works, St White's Rd, Cinderford, Glos GL14 3HB Tel: (0594) 22084	DCE Interlekt, DCE House, Bessmer Crescent, Aylesbury, Bucks Tel: (0296) 32971
Answercall, Kangley Bridge Rd, London SE26 5AH Tel: (01) 659 1133	Miracle Technology, St Peter's St, Ipswich IP1 1XB Tel: (0473) 216141 Telecom Gold 79: KEY001 Prestel 919992265	Watford Electronics, Cadiff Road, Watford, Herts Tel: (0923) 40588
GEC, PO Box 53, Coventry CV3 1HJ Tel: (0203) 452152/446331	Pace, Juniper View, Allerton Road, Bradford BD15 7AG Tel: (0274) 488211 Telecom Gold 79: PCE001 Prestel: 274729306	
Astec, 8b Portman Road, Reading, Berks RG3 1EA Tel: (0734) 509411		

The list of UK public online systems is being updated and will be back in revised form in its new spot in 'End Zone', starting in the January 1987 issue.



Classroom computing and the history of computers are just two of the subjects under discussion in this month's book round-up by David Taylor.



Easy does it

Title: Computer Programming
(Made Simple)
Author: J Maynard
Publisher: Heinemann
Price: £5.95 (paperback)

More than 100 years ago, Charles Babbage lashed together his Analytical Engine, a mechanical number-cruncher which is now acknowledged (*ad nauseam*) to have pioneered the principle of computing.

Babbage had this to say about its limitations:

It is desirable to guard against the

possibility of exaggerated ideas that might arise as to the powers of the Analytical Engine. In considering any new subject, there is frequently a tendency, first, to overrate what we find to be already interesting or remarkable; and secondly, by a sort of natural reaction, to undervalue the true state of the case when we do discover that our notions have surpassed those that were really tenable. The Analytical Engine has no pretensions whatever to originate anything. It can do whatever we know how to order it to perform.

The style of writing may now strike us as a bit archaic, but you cannot fault the level-headed sentiments.

Certainly Mr Maynard takes them as his watchword as he prefaces this quite excellent book with some sanguine reflections on how the public tends easily towards a starry-eyed view of what computers can do. Yet at the same time he shrinks away from the task of trying to fathom how they do it.

Computers aren't nearly as smart as they're often made out to be, he asserts. They're immensely useful, of course, but not by any means a match for the human brain, either now or in the foreseeable future.

Clear away such *cor-blimey* mystique, he insists. Grasp that 'a computer cannot tell its user how to solve a

problem but can only perform those calculations which it has been instructed to do.' Then you'll be in the right frame of mind to start learning how to program, bit by logical bit.

Developers of 'expert systems' or AI enthusiasts aren't going to warm to such a no-nonsense approach, but it should strike a chord with experienced programmers who scarcely need to be reminded that 'the preparation of work to be run on a computer can be one of the most mind-bending exercises encountered in everyday life.'

Now programming, of course, isn't everybody's idea of everyday life. You can use computers without much of a foggiest on how to do more than boot-up a ready-to-run application. On the whole, I'd sooner drive a car than build it from a thousand bits; sooner use computers as tools than fiddle about feeding them line-by-line instructions.

But if you feel in all conscience that you *should* know more about the innards, or if you'd like at least to explore whether you have the patience and aptitude to program, then a jargonless and authoritative all-in-one primer on getting to first grips with Cobol, Fortran and Basic would be handy.

This is it: a new edition of an old stand-by, still a snip at £5.95. It's a lot more like a school textbook than a rattling good yarn but it's lucid, well-structured, paced and supplied with exercises. It's very general, not tied to any micro — more about the big wide world of computers by the professional roomful.

It does indeed make programming seem easy. Well, fairly easy. Let's just say it's interesting. Up to a point.

Once upon a time

Title: Introduction to Computers
Author: Keith London
Publisher: Faber & Faber
Price: £6.50 (paperback)

This book says it's for the curious. And it's a bit of a curious book, if only because it's now been around for the best part of 20 years. The umpteen revised editions are now superseded by this complete overhaul.

Alas, it still kicks off with the gormlessly portentous statement: 'Computers are machines created by man.' And then witters on with more guff like: 'Early man used variations on pictorial records, utilising media such as stone and wood.'

As a rule of thumb, I'm driven up the wall by anyone who adopts this tone of *long, long ago, the Earth was all primordial soup*. I couldn't cope with 2001 — *A Space Odyssey* because of all those grunting monkeys at the start.

Nor do any of us need too many clumsy phrases like 'utilising media'. And to hell with the blindingly obvious insight: 'Hardware and software are inseparable components in the world of the modern computer.'

A well-rounded appreciation', this book is meant to provide, for anyone who to date knows nothing about, erm, gosh, well, computers and that. It is pretty well-rounded, too: tackles the concept of what the things are for, then describes their bits and pieces, summarises basic techniques and, finally, ponders a few specific roles.

As a *précis* for perhaps reluctant initiates of what's what, it's good. It's the bolt-on hick philosophy that's so wretchedly irritating. Just because some people don't fully understand computers should *not* mean that they're obliged to thumb through Leibniz or contemplate what cave-men did.

You'd think anyone who has been revising his work for nearly 20 years would have tumbled to that by now. If this book were thoroughly 'subbed' and reduced to its essentials, it'd be a good general introduction to computers. As things are, it's regrettably over-stuffed with peripheral bunk.

Another one along in a minute

Title: IBM PCs and Compatibles: A Business User's Guide
Author: Colin Lewis
Publisher: Blackwell
Price: £9.95 (paperback)

A seasoned cynic (*who, me?*) might mischievously suggest that any paperback under a tenner which grabs attention with the magic words 'IBM', 'Business' and 'Guide' on the cover, will shift copies even if it does no more than paraphrase the IBM DOS and *Guide to Operations* manuals.

This slim paperback doesn't do that. In fact it doesn't do much at all, really, except list boggling specifications and scoot through the barest of essentials on some popular applications packages. It's only 150 pages in all and it's set in nice big type.

Nine pages in, a baffled business tyro who's wondering what an IBM PC is for, is supposed to digest this sentence: 'Whilst processing at 16-bits, the 8088 relies on the 8-bit pathway to read and write data to its memory, and so compatibles such as the Advance 86b, Compac (*sic*) Deskpro, ITT Extra and Olivetti M24 and M21, which offer the 8086 chip which uses a true 16-bit pathway and thus reads and writes to memory more quickly, are able to improve overall processing speeds.'

Remember that for your next din-

ner party, folks. It's pretty straightforward if you know your way round the PC's motherboard to start with, but meaningless if you don't.

Chapter Two, oh Gawd, is a potted guide to DOS. Then you get a 'General Concept of word processing', explaining esoteric things such as 'page numbering', a chapter on popular spreadsheets, another on databases and — wait for it! — a squint at the wonderful world of PC Communications.

If it sounds familiar, it is. I've tried to stay awake through *hundreds* of books which hold hands around IBM PCs. They have got to be *really* good now to make an impression in this jam-packed corner of the market. This book isn't, so it doesn't.

Pay attention, class

Title: The Future of the Microcomputer in Schools
Author: Nick Evans
Publisher: Macmillan
Price: £7.95 (paperback)

Hard-pressed teachers haven't time to fiddle about with a temperamental micro. In theory, a computer in every school is terrific, the greatest teaching aid since they invented printing, as Mr Evans puts it. But in practice, he cautions, the dream has too often proven a lamentable let-down.

But that was only to be expected. There were bound to be teething troubles with hardware and software standards. It was obvious that money was (and still is) tight. And most of all, teachers were being asked to revolutionise both their pupils' and their own ways of thinking and working. Some of them took to it eagerly. And some didn't.

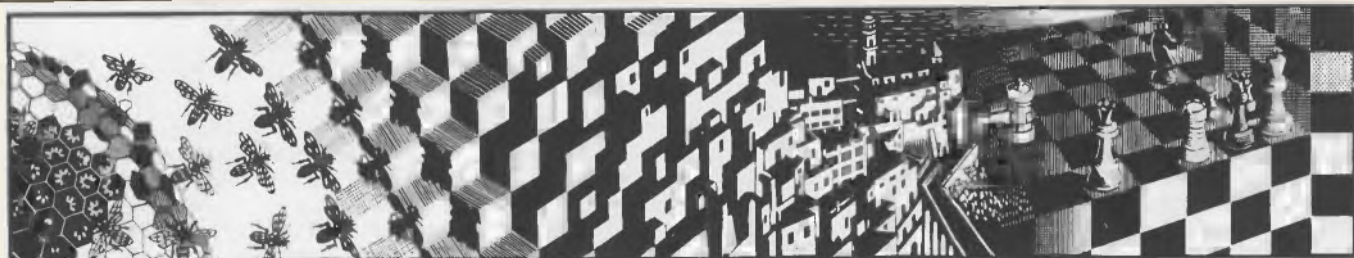
The experiment has had its difficult moments, but don't let the dream fade, Mr Evans is saying. It is remarkable we have come this far. The challenge is to maintain momentum.

The worst that can happen is that schools might get fed up with trouble-shooting the experiment's bugs and fall back on absorbing computers into schools as they are. The tougher option is to tap the computers' potential to change schools fundamentally. And Mr Evans proposes some radical ways to do just that.

This book is primarily for educational specialists of one sort or another, but Mr Evans argues his case well and certainly knows his subject inside out, so that anyone can take an interest without getting bogged down in professional shop-talk.

When the subject is as important as how children are being taught to use computers, it goes without saying that anyone should. **END**

SCREENPLAY



When he's tested his general knowledge and commanded a submarine through nasty Japanese waters, Stephen Applebaum takes refuge in a haunted house. Well, you would, wouldn't you?



Any questions?

Title: Trivial Pursuit
Computer: Commodore 64; BBC; Amstrad PCW8256; IBM PC; Atari 8-bit machines
Supplier: Domark
Format: Disk; cassette
Price: £14.95 (cassette); £19.95 (disk)

One of the problems software houses face when they write a computerised version of a board game, is how much licence they can take with its looks and rules before losing the feel of the original. It isn't enough to just copy a game: people expect something more, even an improvement, simply because a computer is involved. On the other hand, it's difficult to know what to add or even alter slightly, without inciting the dissatisfaction of people familiar with the game in its paper-and-plastic format.

Monopoly and Cluedo have both suffered at the hands of programmers to different degrees. Now Domark, whose last game Split Personalities earned a certain notoriety, has tackled the most hallowed of all contemporary board games, Trivial Pursuit.

For those who haven't heard of Trivial Pursuit, and there can't be many, it's a game where players proceed around a six-spoked wheel, answering questions from the following six categories: Art & Literature; History; Science; Sport; Entertainment; and Geography. A player's turn lasts until a question is answered incorrectly.

The subject area that a question



comes from depends on the colour of the space that a player lands on after throwing a die. If a player gives a right answer while occupying a space forming a conjunction between one of the six spokes and the rim, then they not only get another throw, as normal, but also a 'wedge' in the colour of the subject category.

Players collecting wedges from all six categories proceed towards the wheel hub, where they are asked a question selected by the other players. The first person answering that correctly is declared the winner, leaving the rest to battle it out for the minor places, if they're so inclined.

That, in a nutshell, is Trivial Pursuit the board game. Although extremely simple, its concept cleverly exploits the latent pedant in us all; which is probably why coin-operated Trivial Pursuit machines do very well in pubs, where they've become another device individuals can use to impress their peers, having replaced arm wrestling with mental wrestling.

Domark's Trivial Pursuit maintains all the gameplay and design of the table-top archetype, but has so many nice little touches, you'd almost think the game had been designed for a computer in the first place.

The central playing screen accurately recreates the Trivial Pursuit board, except that the numbers 1 to 6 now reside in the spaces between the spokes. These represent the six faces on a die. To the right of the board is a representation of the playing token belonging to the player whose go it is; a status board, showing the progress of each player; and TP, an animated character who per-



forms the role of question-master.

Eschewing the trite, animated dice favoured by many software houses, Domark has implemented the novel idea of having TP throw a dart at the numbers printed on the Trivial Pursuit board as the method of deciding how many spaces a player can move.

Unlike any other board game I've played, Trivial Pursuit's rules allow players to move in any direction, so there are often occasions when you can choose your question from several categories. Exactly the same is true in Domark's spin-off. But to make it easier for players to survey the options open to them, a cursor has been added to highlight the spaces that can be reached with the number hit by TP's dart.

Trivial Pursuit's question screen takes the form of a drawing room, and is one of the most inventive and beautifully detailed displays I've seen (note that I was looking at the Commodore 64 version).

In the room there's a bookcase; a stereo system; a burning candle, used to indicate how much time is left to answer the question; a fireplace; a grandfather clock that shows users how long they've been playing Trivial Pursuit; and a pull-down projection screen.

Domark's Trivial Pursuit questions are far wider-ranging in the form that they can take, because unlike those of its cardboard counterpart, they are not confined to being written on cards. A computer has both sound and graphic capabilities, so why not use them? Questions about music often involve several bars

of a mystery tune being played, while simple outline diagrams of well-known land masses crop up frequently in questions from the geography category.

The advantage that board games have over computer-based ones is their ability to draw several people together in friendly competition and conversation. Unfortunately, the same cannot be said for most video games. Even so, Domark has been astute enough to design its Trivial Pursuit so that the answer to a ques-

tion is not displayed until the joystick's fire button has been pressed, giving people time to discuss the question. When the answer's finally revealed, the player whose turn it was to answer the question must then tell the computer whether he got it right. By doing that, Domark has invested the game with some phases where discussion is possible, rather than eliminating the human aspect altogether.

Trivial Pursuit, the computer game, captures nicely the feel of the origin-

al. As a representation of a classic board game, it ranks second only to Spectrum Scrabble. My only reservation is over the number of times that the same questions seem to be asked, even after stopping a game and starting a new one. If you do run out of questions, Domark is selling additional question packs in line with those currently available for the board game.

The Young Players' version of Trivial Pursuit should be available by the time you read this.



Under pressure

Title: Silent Service

Computer: Atari ST; Commodore 64;

Amiga; IBM PC

Supplier: US Gold

Format: Disk

Price: £14.95

During World War II, American submarines were used in the Pacific to attack the Japanese Navy on its own doorstep and cripple the Japanese Merchant Marine. Their activities earned them the title of the Silent Service — they could come within shooting distance of a surface vessel before being detected, and then remove it with surgeon-like precision.

The pressures that a submarine captain and his crew were exposed to called for a breed of man who could not only withstand the intensity of the chase, but also the potentially demoralising effects of being confined in a small space over long periods of time.

Crew members needed to be able to keep their heads in a tight spot, and required the cool 'get the job done' attitude of John Mills rather than the 'act now, pay the consequences later' philosophy of John Wayne. As for the captain, he required immense technical acumen and a sound knowledge of the potential of his submarine and crew.

It's impossible to appreciate the psychological battle that raged inside the heads of the people involved in undersea warfare during World War II. But we can, by way of Micropose's Silent Service submarine simulation, get some insight into the tactical methodology employed by a submarine captain.

Silent Service uses a wealth of historically accurate data to produce 'convoy action' scenarios that recreate actual submarine attacks on Japanese convoys. You, therefore, have the opportunity to equal the successes of several real-life submarine captains, without the risk of being consigned to Davy Jones' locker.

Besides convoy action scenarios, there are the far more dangerous 'war patrols' where you lead an entire patrol through heavily guarded straits near the Japanese mainland. War patrols are the ultimate test of a captain's mettle.

All the scenarios can be made suitable for a newcomer, as it's possible for you to select your own skill level. There are four in all, ranging from Midshipman at the bottom of the ladder, to Lieutenant and Commander, and finally Captain at the top. The thing that differentiates the ranks is their levels of historical accuracy: that is, the higher your rank, the more realistic a game will be. Playing a scenario as a Midshipman, for instance, is far easier than playing the same one as a Lieutenant.

As you become more experienced, you can heighten your game by introducing new and dangerous elements, grouped together under the general heading of Reality Levels. These so-called Reality Levels can be set before you start a game, and are used to add such niceties as limited visibility, convoy zig-zags, dud torpedoes and expert destroyers, to name but a few.

The skill level and reality levels you select combine to produce an overall difficulty factor from 1 to 9. At the end of a game, the difficulty factor, together with the tonnage that

you sank during your mission, determine your ranking in the Submariners' Hall of Fame. Wow!

When you have set everything to your satisfaction and have been given a difficulty factor, you can move off into either a convoy action scenario or a war patrol. The latter is the more interesting because it uses virtually all of Silent Service's facilities. For that reason, I'll use a war patrol to illustrate the game in play.

The first thing that you see in a war patrol is a full-screen map showing the whole of the western Pacific Ocean. Your submarine, which is initially positioned at one of three allied ports, is indicated, somewhat unimaginatively, by a black dot.

Using either a joystick or a mouse, depending on which machine you are using, you can guide your dot out of port toward the archipelago off the Japanese coast. The distance covered between the port and the islands is vast, so a border around the map flashes from light to dark blue to indicate day and night. When the border changes to red, it's the signal that an enemy convoy has finally been spotted.

When a sighting is reported, it's time for you to move to the conning tower. The conning tower is the hub of a submarine, or at least it is in Silent Service, from where all the other important sites in the vessel can be accessed.

The conning tower is one of several well-drawn screens. Centre stage is taken by a periscope, flanked on either side by a chart table and a wall of dials. The most notable feature is a large, animated figure, representing yourself. By moving this figure to various specified positions, you can enter Silent Service's battle-station screens. As you have probably gathered, the conning tower is, in effect, little more than a stylishly-designed menu.

Battle-station screens are your means of obtaining vital information from members of your crew during combat. A maps and charts battle-station, for instance, provides you with data from your navigator. Although most of the battle-station screens are there simply as sources of information, there are those which

allow you to actively take part in actions against the enemy. Two such battle-stations are the bridge and periscope options.

Using the periscope is much the same as being up on the bridge, except that it can be brought into operation while you are submerged. Instead of a deck-gun, which would be most inappropriate underwater, you have a stash of torpedoes at your disposal.

A problem that has often dogged submarine simulations is speed. Underwater warfare, by its very nature, is slow, so programs based on it tend to be likewise. Microprose has got around the problem of speed by implementing time-scaling. Under normal conditions, all ship movements, sightings, torpedo runs and dive rates are recalculated every two seconds of simulated game time. This, however, is quite slow, so it

has been made possible for you to increase the speed of the action while maintaining the game's accuracy.

Silent Service ranks as one of the best computer simulations around, whether it be flying, driving, or whatever. Microprose has hit upon a formula that should appeal to both arcade games players and tacticians alike, ensuring itself of another winner.



Things that go bump in the night

Title: Uninvited
Computer: Macintosh
Supplier: Mirrorsoft
Format: Disk
Price: £26.95

Do you believe that a house can be evil, and that it can influence the people living there to do evil? If you scoff at such things, read on. For I have seen and experienced happenings far beyond your wildest imaginings, deeper than your dearest fear; I have looked upon the grim face of death and survived. Reader, the time for levity is passed: the house at 666 Blackwell Road, Loch Ness, Scotland, owned by Master Crowley, must be destroyed.

To you, I give Uninvited — a temporal simulacrum of the crepuscular world that forms the house. Study it ... Map it ... Learn from your mistakes, then ... Well, it's up to you. Perhaps you'll feel confident enough to face the real thing. Or perhaps you'll dismiss Uninvited as just another game. But whatever you do, don't forget that the house exists and grows stronger every day. Without immediate action, its evil will engulf us all.

To test your skill I have hidden my brother somewhere in the house and left him there for you to find, as I had to do on that fateful night. Before you take the challenge, however, let me relate some of my experiences to you.

My brother and I came across Master Crowley's house quite by acci-



dent. We were motoring along a country lane when our car went out of control and slew off the road into a ditch. I passed out. When I awoke, my brother was gone.

Stumbling from the car, I managed to drag myself to the front door of Crowley's house, but by this time I was caught in the midst of an electric storm. Lightning blinded me temporarily, and deafening claps of thunder sent waves of panic through my heart. Together, the thunder and lightning seemed to be heralding the arrival of the Devil himself. In the distance, dogs wailed mournfully.

Please note that I have reproduced the scene from Uninvited down to the finest detail. You see and hear everything. You can even manipulate objects as if they were in your hands: this you can do via a menu placed at the top of the display. There you'll find eight options: Examine, Open, Close, Speak, Operate, Go, Hit and Continue.

To explain how these commands work, I'll take the example of opening a letter-box which stands in front of the Crowley house. First of all you move the pointer to Open, using the mouse. Then you click on one of the device's buttons.

Next, you do the same to the letter-box. The result is the appearance of a small window containing objects inside the letter-box. Just as in real life, these artefacts can be procured by dragging them into your inventory window and used — if they're things that can be operated in some way.

After knocking on the front door to no avail, I decided to enter the house unannounced to see if my brother had slipped in, looking for a tele-

phone. I became suspicious when I couldn't find anyone, and downright scared when the front door swung shut of its own accord.

The floor of the room in which I found myself was covered with a large rug embroidered with a pentagram. To the right, a door led off into a vast library. There, bookcases formed vistas lined with dusty tomes about black magic. Another door led off into a short passageway.

Here I must warn you about a female ghost who guards the ground floor of the house. When you enter the passageway you'll see three doors — it's impossible to get anywhere in Uninvited without going through them. None can be passed through, however, unless the dark sentinel which lurks there is destroyed. And to do that, you have to find a special potion hidden away in another part of the house.

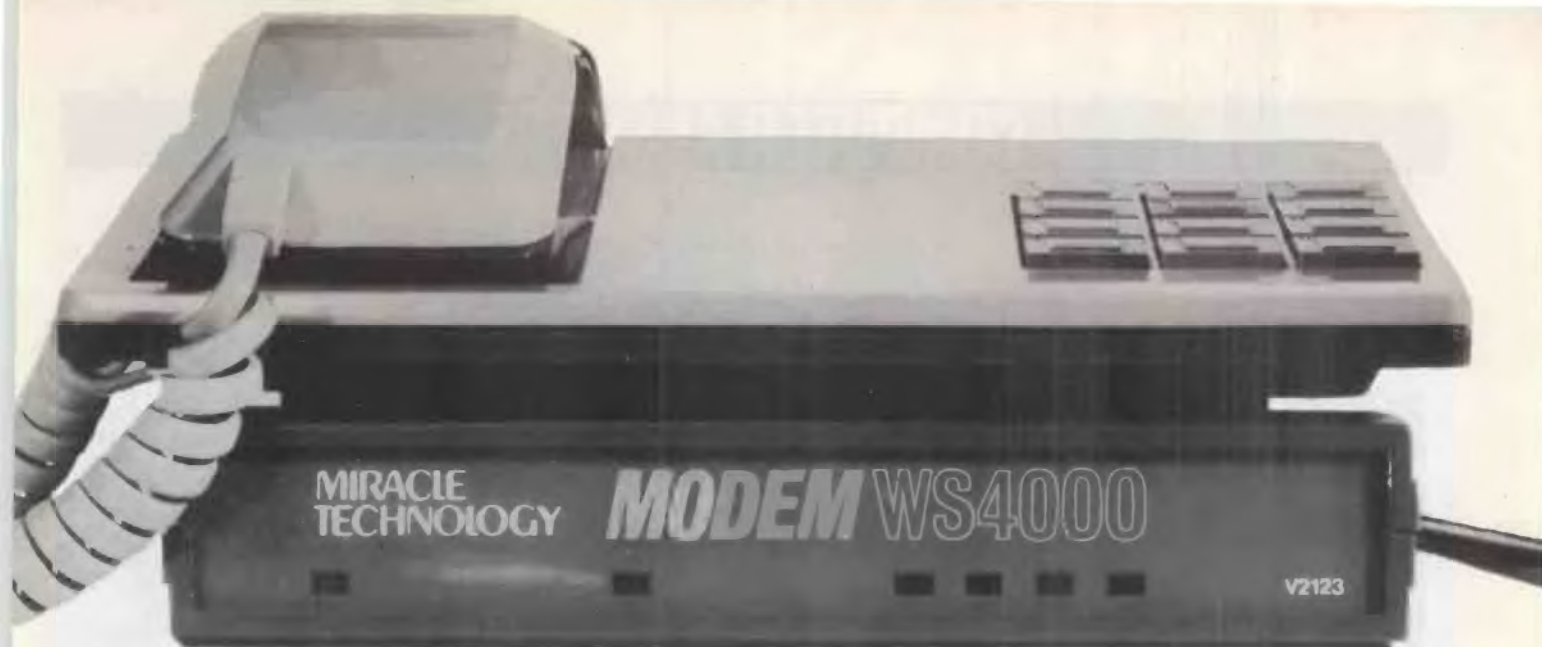
Some of the things that you'll find on the ground floor, such as a phonograph which actually plays, albeit for a short time, might seem rather odd and out of place. Don't be put off. Touch everything, try to make objects work. You never know when a paralysed spider might come in handy.

When you have searched the house, there are several outdoor locations needy of investigation. A strange building with the word 'MAGISTERIUM' over the door, and two hungry dogs outside a chapel, might perplex you, but never give up. Time is against you, so work quickly.

The most dreaded of all the locations in Uninvited is a maze which has been erected on an ancient burial ground. There, the dead have risen and wander aimlessly along the fetid aisles. Only with the aid of a special amulet will you survive the horrors there.

Uninvited is the most atmospheric graphical adventure you will play. Some of the scenes are so real, it's almost as if you can feel the damp of the walls and smell the rancid flesh rotting beneath the floorboards. If you like your adventures to have a bit of meat, Uninvited will certainly suit you.

END



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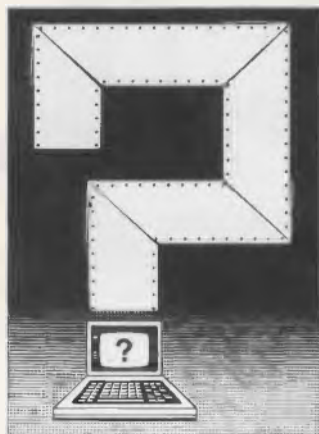


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COMPUTER ANSWERS

Simon Goodwin takes his toolkit to your problems. The address to write to is Computer Answers, PCW, 32-34 Broadwick Street, London W1A 2HG.



Computer Answers is PCW's help column. We offer advice about all kinds of specific hardware and software problems through the pages of the magazine. We also welcome further information in response to published queries.

The 64k question

The Amstrad 8256 with 256k of RAM uses the Z80 processor which cannot address more than 64k of RAM. What good is the other 192k? Is it just a con to make people think they are getting 256k of usable RAM? If not, how is the 256k useful? Is the Amstrad 8512 with 512k of RAM an even bigger con? Can Mallard Basic handle more than 64k of programs and data? If so, how is it done? Tell me, please.

DAH Brown, Malvern, Worcs

This question must get the Computer Answers 'Spanish Inquisition' award for 1986!

The Amstrad range of computers have more memory than the processor can address directly, but this doesn't make them a 'con'. They use a technique called 'bank switching' to allow them to access large amounts of memory in sections, or 'banks'. The same trick is used by many other Z80 machines such as the Spectrum 128, the Memotech, the Einstein and the Enterprise.

The principle is fairly simple. Besides 64k of

memory, the Z80 can also read and write information from several 'ports'. Normally these ports are used to connect external devices — keyboards, sound chips, and other peripherals — but one or more of these ports can be used as a control, to select between several banks of memory.

This is how it works. Imagine that someone has 16 railway timetables, but only has room on his or her desk to open four at a time. The person could still use all 16 volumes, but would have to swap them around to make them fit on the desk.

A computer works similarly. Imagine that 256k of memory is sub-divided into 16 banks, each of 16k. The Z80 processor can only access information in 64k of memory at any time, so it can only use four of the 16 banks. However, it is fairly simple to arrange electronics to swap 16k banks around, so that the processor can select any bank by writing an appropriate value to the control port. It only takes a few bytes of code and millions of a second for a processor to switch between banks of memory.

In these examples I've talked about 16k banks, but other sizes are quite possible. There's almost no theoretical limit on the number of banks that can be accessed in this way, but most machines restrict themselves to 256 or fewer, as you'd need several ports to select between more than 256 banks. The Amstrad 8512 just has twice as many banks as the 8256.

Newer processors such as the Motorola 68000 can access eight megabytes directly: this is part of the reason why they are faster than old designs. In fact the 68000 design allows 32-bit addresses, giving a maximum address space of 4000-odd Mbytes, but the 32-bit 68032 chip is still very expensive and most people settle for the 24-bit, 8Mbyte 68000.

The Intel chips used in many business computers use a hybrid scheme. Intel processors can access more than 64k but programs work with several 64k areas, called

'segments'. Special instructions are needed to switch between segments. In effect, the 8088 and 8086 have built-in bank-switching hardware.

A large address space brings problems as well as advantages. You need large variables and pointers to keep track of code and data. Thirty-two bit addresses can make Motorola 68000 machine code very verbose by comparison with Z80 code.

Most Basic interpreters use 16-bit pointers, so they can only handle 64k of code and data. To avoid constant switching back and forth, the interpreter program is usually squashed into the same space. Further space is needed for file buffers and information about the state of the system.

The Memotech and the Sinclair QL are the only small computers I know of that let you carry on writing Basic programs up to the limit of your system's memory. Even Microsoft BasicA on the IBM PC restricts you to about 36k on a 640k computer! Acorn has a version of its BBC Basic which keeps the interpreter and program in separate pages, but it uses 16-bit addressing so you're still confined to 64k for your program and data.

Amstrad's Locomotive Basic leaves just 31.5k free for programs and data when the interpreter, system variables and file buffers are set up. The rest of the memory is used to hold the display and CP/M system code, with 112k left over on an 8256 for 'drive M' — a very fast memory-based simulation of a disk. The 8512 uses the same scheme, but gives you 368k of space on drive M.

You can access drive M from Locomotive Basic very quickly, because there are no mechanical delays involved in reading from a bank of memory. You are allowed direct access to data, so you can wind quickly back and forth through files and treat them almost like arrays. As a side effect, this discipline will make it easy to adapt your code to use real disk files, albeit slowly, if

you fill up drive M.

Locomotive Basic also lets you load Basic programs in 'overlays' — sections can be swapped with others on disk or drive M — so you can use more than 31k of program code in an application as long as you divide it up sensibly.

Many 'modern' computers use processors and software which are only designed to handle 64k, and it is worth bearing this in mind when comparing machines.

However, there are lots of bodes which make extra memory useful, even if it is tacked onto components designed for a 64k system.

Monitors and upgrades

In the near future I hope to purchase a new Atari 1040STF. However, before I do so, I would like to know how to interface my Microvitec Cub 653 medium resolution colour monitor to the Atari. Currently this monitor is giving very good results with my BBC Model B system.

Secondly, would I have any problems using my Taxan KP810 printer with the Atari?
John David Mason, Runcorn, Cheshire

There's a myth about 'standard' video monitors. There's lots of scope for variation between the output of one computer and another, even if the same vague description is used in each case. I've often written about the differences between composite and separate syncs, RGB linear and RGB TTL, and sundry variations, so I'll leave out the background information this time — suffice it to say that Microvitec makes 165 different varieties of monitor!

The Atari ST produces linear RGB outputs at up to one volt into 150 ohms, with separate synchronisation signals. The BBC machine squirts out RGB at TTL levels — on or off, zero or four volts — with composite synchronisation pulses, and prefers a load impedance of

about 1500 ohms. So there's a big difference between 'RGB' on one machine and 'RGB' on the other, and you won't be able to connect the Atari without making quite a few changes to your monitor.

It is not company policy for Microvitec to convert one type of monitor into another, but the company can sometimes be persuaded to do one-off conversion jobs. Prices vary, but it could cost as much as £130 — plus VAT — to upgrade a monitor to use 'dual standards', so that you can plug in either computer at will. You might be able to find a good TV or video engineer who could do this for you more cheaply, but it won't be easy whatever you do.

I asked Microvitec what it would advise people to do if they wanted a 'compromise' monitor that would give reasonable results on most systems. The company suggested the 1451AP — a monitor that works from a single composite video signal. This won't give quite such good results as a purpose-made RGB monitor, where the computer can control each gun of the display separately, but it should work much better than a TV display. Most micros can produce a composite video output, but some only generate a monochrome composite signal.

The good news is that your KP810 printer should work fine with the ST, as long as you use an appropriate lead.

QL tape interface

Can the QL, through its network ports or otherwise, be connected to a domestic cassette recorder to allow programs to be recorded? The supply of microdrive cartridges is erratic here and I have heard that they are prone to data loss.

Alijiz Haider, Karachi, Pakistan

It's certainly possible to connect a cassette recorder to the QL's network ports, but your recorder will have to produce a fairly high output level because the electronics expects a five-volt signal from Spectrums or QLs on the net.

The problem would be getting appropriate software. The network data rate is about 100 times higher than a normal

cassette interface; it is far outside the bandwidth of a cassette recorder so you wouldn't be able to record normal network traffic. The QL user group did consider writing software to access cassettes at a lower data rate, but I think it gave up this idea.

Even if you wrote such software, it would load and save a lot more slowly than the microdrives; at the common cassette speed of 1200 baud it would take about six minutes to load QL Quill, whereas microdrives take 30 seconds. Cassette file-handling is pretty rudimentary, even compared with microdrives, because you can't re-read sections or wind from one file to the next unless the user intervenes to read the tape counter and press appropriate buttons.

Despite all the moans about microdrives, I've used them extensively and found them as reliable as disks, although much slower. They're certainly much more reliable than cassettes.

The best way to escape QL microdrive shortages is to add a disk interface. There are half a dozen models available, costing about £70-£80. These work with almost all drives and software packages. Quill loads from disk in about five seconds.

Upgrading the 6128 keyboard

I am the owner of an Amstrad 6128 which I am very impressed with. Perhaps my only complaint is about the membrane keyboard. Is it possible to fit a remote keyboard on the lines of the Amstrad PCW 8256's, but preferably of higher quality?

R Sidsaff, Stamford, Lincs

I've not seen anyone advertising remote keyboards for the 6128, and I doubt if they'd be viable commercially. Maybe a manufacturer will write in and prove me wrong.

A do-it-yourself modification is possible. A computer keyboard is just a job lot of keys arranged in a grid, with wires from the computer connected along two sides of the grid at right angles. Remote keyboards use special-purpose chips to combine all the signals into a serial data-stream, so that you can connect the computer and the keyboard with a telephone lead rather

than a rope of wires. The combined signal is also less likely to carry interference into the computer — keyboard wires often come straight out of the board on an all-in-one computer and you could run into reliability problems if you extended these across a room without buffering them in some way.

It is easy enough to get unwired keyboards — switches on a grid — from electronics suppliers and DIY computer firms. Alternatively you could buy a cheap or second-hand computer and try to wire the keyboard into your Amstrad. If you replace the keyboard yourself the layout and labelling won't match that on your Amstrad, even if your chosen replacement has the correct number of keys. One person I know bought an Atmos when Oric went bust and wired the keyboard into his QL, but only dedicated hackers do that sort of thing.

The keyboard of the 6128 uses a similar mechanical layout to that of the 8256, so I don't think there would be much point replacing one with the other, even if you could track down a 'spare' 8256 keyboard and a decoding circuit for the computer end of the link. I have noticed that the feel of Amstrad keyboards tends to vary from one machine to the next, even if the models are ostensibly the same.

Soap story

We are looking for a simple program to print small decorative labels for our own-brand shampoo bottles. We use a BBC computer and Epson FX80 printer. Can you suggest a suitable supplier? *JG Woods, Ashton-under-Lyne, Lancashire*

Any program that allows you to design graphics on the screen and then print them out should suit your purposes — you'll have to experiment with the placement of the graphics on the screen so that they fit over the sheets of labels you use in the printer. The FX-80 printer is a popular and versatile model, so you should have no trouble finding a package that can drive it.

One snag of this approach is that you may have to load a design program every time you want to print some labels. Printing will be slow because the software will be set up to copy an entire display, not just a few areas

matching the position of the labels.

You might prefer to track down a programmer to do the job. Professional micro programmers are rare and expensive, but you should be able to find someone with the appropriate skills at your local computer club. It's a small job — perhaps a weekend's work for someone competent — and you should be able to get a purpose-made program for a price similar to that of a commercial graphics package.

Choosing your programmer is obviously tricky; insist on someone with the same computer and printer as yourselves, and then rely on your own judgement of character. I'd be tempted to choose someone who could show me the results of previous graphical experiments. You can find your local club by contacting the ACC, which has its own column in 'End Zone'; I'd be grateful if budding label designers would *not* write to Computer Answers offering their services.

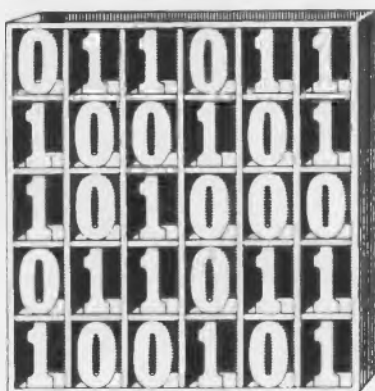
Read all about it!

I have just received an Atari 800XL computer. I have looked out for magazines for this computer, and even tried Commodore and Spectrum programs but they have not worked. Is there an Atari 800XL magazine? *KD Wittin, South Yardley, Birmingham*

The Atari 800 is best known as a games machine rather than a programmer's computer — the Basic is slow and rather non-standard, as you have found out. Database Publications publishes a magazine called *Atari User*, which you should be able to find in large newsagents.

The Atari is much more popular in the US than in the UK, and it would be worth looking out for back issues of American magazines; in particular, *Antic* and *Compute!* have carried a lot of Atari 800 features. Much of the Atari 800-specific material from *Compute!* has been re-published in books. Look out for *Compute!'s first book of Atari*, *Compute!'s first book of Atari Graphics* and similar titles. You should be able to order these from a good bookshop, or see your dealer for Atari's own 800XL books.

END



David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to SubSet, PCW, 32-34 Broadwick Street, London W1A 2HG.

CPM PRINTER SETTING

Datasheet 1 from Jon Tarrant and Rachel Braverman of Croydon is a straightforward routine to initialise a printer by sending control codes through an 8080 CPM-based system.

The routine is quite adaptable and allows entry direct from CPM (PRINTSET), or from any user program (PSETSUB).

The printer is accessed indirectly through BDOS and the routine should work on any compatible system, although with changes to the device number and system entry address. Some systems could require different register use for input —

always the first point to check when you are adapting any software.

PRINTSET is designed for the Taxan Kaga printer which is Epson-compatible. Not all printers work to this standard and you should assemble the routine with the correct codes. Any different setting will mean inserting the correct command strings in the codes list and assembling PSCBYTES to the correct byte length of the list.

Jon and Rachel have terminated each command with a carriage-return byte 0DH. This is unnecessary as far as either the computer system or printer are concerned. It is, however, good programming practice since it clearly delimits each command.

DATASHEET 1

PRINTSET.COM Printset command file direct from CPM.
CALL: PSETSUB Printsetting subroutine, giving MLQ, USASC11 and 255 character width.

CONCEPT (System & language independent description)
Prog. Structure FOR codes bytes count
Read code byte.
Output byte via system.

SYSTEM (System implementation requirements)
Processor 8080 (Z80 compatible code).
Hardware need Written for use on Amstrad CPC series computers.
Compatible printer (Epson, Taxan Kaga, Canon PW1000A).
Software need CPM, BDOS.

PROGRAM (Specific coding and operation details)
Input state Printer must be online.
Output state Printer set to MLQ, USASC11, 255 column width.
ML addresses last byte of codes list.
A = 0, C = 5. Flags changed.
Other registers not altered by routine.
255 character right margin may be ignored by some printers if greater than maximum.
Program will hang if printer not online.
Misuse Errors None.
Optimisation A C HL Flags.
Register need .COM file should be assembled at ORG 0100H.
Location need 43 (CPM routine 6, subroutine 24, codes list 13).
Program Bytes 6 + BDOS use.
Stack Bytes Not given.
Clock Cycles Not given.

SUBSET CLASS (Environmental hazard guide)
Discreet: NO Interruptable: YES Promable: YES
Reentrant: YES Relocatable: NO Robust: NO

...System addresses and parameters.

```

; CPM EQU 0000H ; CPM entry address.
; BDOS EQU 0005H ; BDOS entry address.
; PRINTER EQU 05H ; Direction to list device.
; PSCBYTES EQU 00H ; Number of command bytes.
; ...CPM entry. Calls subroutine then returns to CPM.
PRINTSET CALL PSETSUB ; Do printer set and ; C0 to hi
; JMP CPM ; return to CPM. ; C3 00 00
; ...Printer set subroutine - called from anywhere, any program.
PSETSUB MVI A,PSCBYTES ; A = count of printer codes bytes. ; 3E 00
; LXI H,PSCODES ; Address printer codes list. ; 21 to hi
; PLOOP MOV E,H ; Read next byte. ; 5E
; MVI C,PRINTER ; C = printer number for BDOS. ; 0E 05
; PUSH H ; Save codes list address ; E5
; PUSH PSW ; and codes bytes count. ; F5
; CALL BDOS ; Output to printer via BDOS. ; C0 05 00
; POP PSW ; restore codes bytes counter ; F1
; POP H ; and pointer. ; E1
; DCR A ; Count one byte sent and ; 30
; JZ PSEXIT ; end if finished. ; CA to hi
; INX H ; Else address next codes byte ; 23
; JMP PLOOP ; and repeat until finished. ; C3 to hi
; PSEXIT RET ; Exit to calling program. ; C9
; ...List of printer command code blocks.
PSCODES DB 0DH,0AH ; Carriage-return, line-feed. ; 00 0A
; DB 1BH,51H,FFH,0DH ; Set column end = 255. ; 1B 51 FF 0D
; DB 1BH,52H,0DH,0DH ; Select USASC11. ; 1B 52 0D 0D
; DB 1BH,2BH,0DH ; Select MLQ. ; 1B 2B 0D
    
```

Z80 WORD RECOGNITION

WORDREC (Datasheet 2) is from John Hardman of Welling, Kent and concludes his set of diary routines. The five other routines were printed in last month's SubSet.

The routine attempts to match an input abbreviation against a list of complete words and will flag different

possible conditions. Ideally, it would be used in a program dealing with different types of limited input, such as dayname or monthname in a date-seeking section.

The program would prompt key input then call WORDREC, giving the address of the appropriate list, after each letter typed until a single match or a definite no-match. In dayname matching no more than two letters need be typed-in to identify any day.

DATASHEET 2

CALL: WORDREC Compare input abbreviation to list of complete words, returning address of any single word matched to extent of abbreviation or no-match/multiple-match information

CONCEPT (System & language independent description)
Data Structure STRING. Header: none.
Element: byte, non-null (00H).
Length: variable > 0.
Terminator: null (00H).
LIST. Header: none.
Element: STRING.
Length: variable > 0.
Terminator: null (00H).
Prog. Structure match-flag = F.
repeat-flag = F.


```

; IF (abbr-start) = EOS
; [
; null-string-flag = T.
;
; null-string-flag = F.
; list-point = list-start.
; UNTIL (list-point) = EOS OR repeat-flag = T
; <
; IF match-flag = F
; [
; match-address = list-point.
;
; abbr-point = abbr-start.
; UNTIL char-match-flag = F
; <
; char-match-flag = F.
; IF (abbr-point) = EOS
; [
; IF match-flag = F
; [
; match-flag = T.
;
; repeat-flag = 1.
; ]
; ]
; IF (abbr-point) = (list-point)
; [
; char-match-flag = T.
; abbr-point = abbr-point + 1.
; list-point = list-point + 1.
; ]
; ]
; IF repeat-flag = F
; [
; WHILE (list-point) < EOS
; <
; list-point = list-point + 1.
; ]
; list-point = list-point + 1.
; ]
; ]

```

SYSTEM (System implementation requirements)
Processor Z80
Hardware need Memory for abbreviation string and word list.
Software need None.

PROGRAM (Specific coding and operation details)
Input state HL addresses 1st byte of abbreviation string.
 DE addresses 1st byte of word list.
Output state A changed. DE, HL, abbreviation & word list unchanged.
 Z=0: Cy=0: Single match, BC addresses matched word.
 Cy=1: Multiple match, BC addresses first.
 Z=1: Cy=0: Null abbreviation, BC unchanged.
 Cy=1: No match, BC changed.
Misuse Errors None.
Optimisation A "define data byte" is used to prevent an extra "POP" saving 4 clock cycles on the obvious "PUSH".
Register need AF BC DE HL
Location need Not specific.
Program Bytes 59
Stack Bytes 10
Clock Cycles Not given.

SUBSET CLASS (Environmental hazard guide)
 Discreet: NO Interruptable: YES Pronable: YES
 Reentrant: YES Relocatable: YES Robust: YES

```

WORDREC SUB A ;Set A=0 and 97
CP (HL) ;test abbreviation string BE
RET Z ;exit immediately if null. C8

;
; PUSH DE ;Else save list point, D5
; PUSH HL ;abbrev. string point E5
; PUSH AF ;and A=0 = no match yet. F5

; ...Start of (next) list word.
;
; WRNEXTW LD B,D ;Set BC = start of list-w for 42
; LD C,E ;exit pointer if match. 48
; PUSH HL ;Save abbrev. start address. E5

;
; ...Test for characters match in current list word.
;
; WRTESTC LD A,(DE) ;Get list-w char and compare 1A
; CP (HL) ;to abbrev. char. BE
; JR Z,WRNEXTC ;Address next char if match. 20 27

;
; ...Characters don't match.
; ...If end of list word, then abbreviation longer than list word.
;
; OR A ;If list-w end then no match, B7
; JR Z,WRLASTW? ;so try next list-word. 20 12

;
; ...If end of abbreviation, then a match found.
;
; LD A,(HL) ;Get abbrev. char and test 7E

```

```

OR A ;if end of abbrev. If not then B7
JR NZ,URENDLW ;no match, so try next list-w. 20 09

; ...Match found. Error if second list-word found to match.
;
; WRGOTW POP HL ;Restore abbrev. start addr. E1
; POP AF ;and match flag, A. F1
; OR A ;Test if previous match and B7
; JR NZ,WRGOT2 ;exit with error flag if so. 20 16

;
; PUSH BC ;Else save matched list-w addr. C5
; INC A ;Set match found flag and 3C
; PUSH AF ;save match flag F5
; PUSH HL ;and abbrev. start address. E5

;
; URENDLW INC DE ;Bump list point, 13
; LD A,(DE) ;reading and testing list-word 1A
; OR A ;characters until end of B7
; JR NZ,URENDLW ;current word found. 20 FB

; ...End of current list-word, check if end of list.
;
; WRLASTW? POP HL ;Restore abbrev. start address. E1
; INC DE ;Bump pointer to next list-w. 13
; LD A,(DE) ;Test 1st char of next list-w. 1A
; OR A ;for 2nd null (= list end) and B7
; JR NZ,WRNEXTW ;go compare if not list end. 20 DE

; ...End of list. Match address on stack only if AX0.
;
; POP AF ;list end. Restore match flag F1
; POP BC ;and match address (?). C1
; OR A ;If match flag > 0 then BC is B7
; JR NZ,UREXIT ;match address, so exit Cy=0. 20 04

; ...No match address. Abbreviation address popped to BC, so re-save
; ...and miss next "POP BC" by cycle miser trick preserving stack.
;
; PUSH BC ;Save abbrev. address for HL. C5
; DEFB 6 ; + "POP BC" = "LD B,0C1H" 06

;
; WRGOT2 POP BC ;Restore 1st match address. C1
; SCF ;Set error flag. 37

;
; UREXIT POP HL ;Restore abbreviation address E1
; POP DE ;and list start address. D1
; RET ;Exit with correct information. C9

; ...Abbrev. character matches list-word character.
;
; WRNEXTC OR A ;If terminator then abbrev. is B7
; JR Z,WRGOTW ;full length, match found. 20 DD

;
; INC HL ;Else bump both abbrev. and 23
; INC DE ;list-w pointers to next char 13
; JR WRTESTC ;and go compare them. 18 CE

```

6502 LARGE DIVISION

Adrian Taylor, whose 1-256 bytes x 4 bytes division routine DINVAR was printed in July, has since investigated the routine's timing behaviour in some detail. His results show that even a deceptively simple re-

ordering of instruction sequence can have a dramatic effect on performance.

DINVAR (Fig 1) compares the divisor with the current remainder, one byte at a time, beginning at the most significant byte. Three different actions are taken on the comparison results for each byte by a 'CMP cascade' ordered BCC, BEQ, BCS. **END**

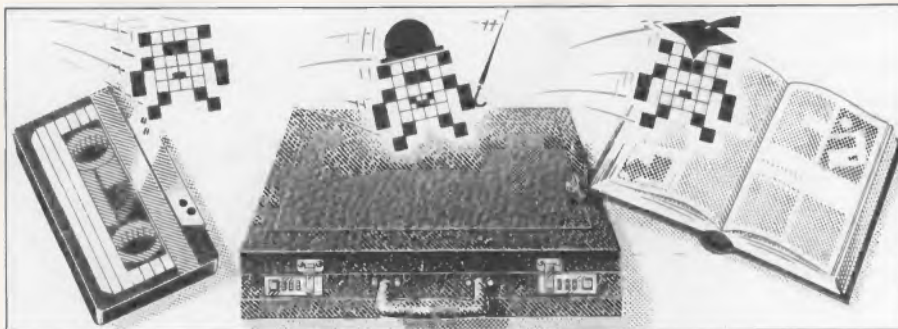
Timings by 6522 VIA Timer 2 in single-shot mode averaged over 10,000 divisions of pseudo-random arguments. Cross-checked over identical pseudo-random sequence by free-running Timer 1 interrupt driven clock with 1000 CPU-cycle compensated period. 6502 processor at 1 MHz nominal clock frequency.

Random number generator: 40-bit shift register (Acorn Atom Basic)
 Random number seed: 7868230600H. Re-seeded after 20,000 generations to give even bit frequencies for all 32 bit position range.
 Dividend generation (1st): 32-bit.
 Divisor generation (2nd): 32-bit truncated for 24-, 16- & 8-bit.
 Zero divisor replaced by divisor = 1.

Method	Average clock cycles per division				Total
	32/32	32/24	32/16	32/8	
DINVAR (CMP, BCC, BEQ, BCS)	1646	2141	2640	3092	9519
DINVAR (CMP, BEQ, BCS, BCC)	1770	2180	2592	2900	9442
"Subtract first"	3976	3849	3716	3584	15125

Fig 1 Comparative timings of division algorithms

PROGRAM FILE



-  Games
-  Scientific/mathematic
-  Business
-  Toolkit/utilities
-  Educational/Computer Aided Learning

*Owen Linderholm selects the best of readers' programs
For details on submitting your own, see the box below.*

PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer.

Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

Check through the previous Program Files to see the kind of programs we prefer. As a rough guide, original ideas are always welcome, as are good implementations of utilities and applications.

Obviously the programs should be well-written, easy to understand, and preferably not too long (remember that other readers have to type them in).

All programs should be fully debugged and your own original, unpublished work.

We prefer to receive programs with a maximum 80-column width printed in emphasised typeface.

We will try to return submissions if they are accompanied by a stamped, addressed envelope of the appropriate size, but please keep a copy of everything.

Programs are paid for at the rate of £50 per page of published listing, plus a £50 bonus for the Program of the Month. Send your contributions to Owen Linderholm, Program File, PCW, 32-34 Broadwick Street, London W1A 2HG.

Program File has given in — we finally went out and bought an Amstrad PCW8256. Negotiations about borrowing a QL are still going on. The controversy has grown to the extent that I have received an anonymous note saying 'BRING BACK QL PROGRAMS!' If it had been composed of bits of newsprint pasted together, I might have been tempted to call the police! This sort of response is what is needed to convince the powers that be that we have a serious problem on our hands.

Due to the arrival of the PCW8256, I am at last in a position to evaluate programs for this machine. This month's column, therefore, heralds the return of PCW8256 programs, but due to technical difficulties (some programs had already been earmarked for inclusion) I will have to

hold most of them for next month.

Blunders

Before I get on to the programs, a few Blunders do occasionally creep into Program File. Here are a couple. In the June issue, the program Spectrum Globeplotter had an incorrect checksum within it. The checksum should have been 369280. Another reason people thought the program wasn't working is that the calculation to map a screen onto the surface of a sphere is very long, so the program spends about 10 minutes thinking before plotting out a sphere.

The other problem is more severe: we managed to mix up a bit of the 'hints and tips' part of Program File in the October issue. Two segments of code are mentioned in Commod-

ore 64 IRQ Programs and Memory Saving. The first of these is in the text, but the second has been inadvertently added to the next piece on tips for WordStar. Once this confusion and the resultant mix-up in the text is known, it's fairly easy to follow the programs and explanation.

I received a letter while writing this from the author of the Commodore program, Justin O'Brien, pointing out another couple of mix-ups. In the listing given, the number 225 in line 30 should be 255. Also, a section of Basic program to put the machine code listing into memory was omitted. The program is:

```
10 FOR x=49152 TO 49182
20 READ a
30 POKE x,a
40 NEXT x
100 DATA 169,1,162,160,255
```


110 DATA 32,186,255,169,15,162
120 DATA 0,160,4,32,172,255
130 DATA 169,251,166,253,164,254
140 DATA 32,216,255,76,174,167

Something different

An anomaly within this month's Program File is that a program from the fractals feature on page 196 of this issue has been included. This will not be regular practice, but the program was originally destined for Program File, and by a happy coincidence fitted in very well with a fractals feature we had already commissioned. The program is for the Apple Macintosh, and displays the Julia and Mandelbrot sets using an intelligent and innovative technique to produce intermediary results very rapidly.

Although I don't want to make a habit of putting programs from features into Program File, I would like to be able to put whole features in Program File itself. Very few of the programs I receive have any commenting and documentation, let alone adequate amounts. Ideally, programs should be so well-documented that other users would be able to modify them for their own ends without having to spend five years tracing the logic involved. What I would like to see is Program

File kick off with two, three or four useful, well-written and well-documented programs. The rest of the column could then be devoted to hints, tips and the kind of quick and dirty utilities that are useful for one machine only.

Now that I've got my monthly dose of hectoring about Program File submissions off my chest, here are this month's programs.

This month's programs

The Program of the Month is very unusual. It's based on an article which describes how to set up a simple multi-tasking system for CP/M-80 computers. Competent programmers should be able to make use of it for similar systems such as other varieties of CP/M, or even MS-DOS or PC-DOS. The program is preceded by a long, explanatory article.

Next comes MacMand; this is the program that accompanies the article on fractals on page 196. The program is a perfect example of programming ingenuity overcoming a difficult programming problem. All standard Mandelbrot set or Julia set programs work by plotting the full resolution display a pixel at a time, or by plotting a section averaging an area, in order to produce a display that provides some information quickly.

These displays are then updated as the program calculates detail more and more accurately. MacMand manages to do this without the inaccuracies and loss of time that previous techniques caused.

MacMand is easily converted to machines other than the Apple Macintosh. This is a great boon because it would be a pity if the 'tessellation' technique used could not be converted for other machines.

Other programs this month include BBC Interrupt-Driven Clock, Amstrad CPC Trace In Windows and BBC Extended Trace. The first of these is a simple real-time clock and alarm that keeps itself updated and displayed in a corner of the screen. The second is a program to put the output from a program trace in a window so that it won't interfere with the display on an Amstrad CPC machine. The final program provides extended program trace facilities on a BBC.

Besides these programs, there's a version of Backgammon for the Amstrad PCW8256 which is easily converted to other computers. There are also a few hints and tips, including a good piece on the prompt commands available on MS-DOS or PC-DOS machines.

Remember: all submissions should be accompanied by an sae.



Program of the Month CP/M-80 Simple Multi-tasking System

by Roland Eriksson

Although the vast majority of today's computer software is geared towards pure data manipulation in various kinds of business applications, there are still a few control system designers around who make their living producing software for machine control systems in the productive part of the industry. A couple of applications from Roland's own technical field are DC-motor speed regulators and furnace temperature controller systems for rolling mills, and various types of material-handling and transport systems.

The most characteristic thing about an industrial control system is that one single computer has many different and sometimes interrelated input and output channels to take care of, in order to make the production line operate properly. Writing software for such a system using the traditional single-task approach, ends up in a program consisting of one main routine which in turn calls a set of subroutines containing the actual control algorithms for each part of the machine. Using a modular approach for the software layout would probably result in a program

that does the job, but also suffers from at least two problems which will make the computer perform less than optimally and be difficult to support in the long-run.

I will give the headlines of the problems first and then specific explanations.

- The need for routine transparency.
- Loss of system resolution from unnecessary execution of code.

Let's discuss the need for transparent routines first.

In the real world, it will be necessary to keep a more or less continuous guard on all the input channels in order for the program to decide when to activate/deactivate which outputs. As no computer has an unlimited amount of interrupt inputs for connection to external equipment, you are forced to use a polled I/O system that creates a need for a program which does not stop and wait for a specific external event to occur, but instead always continues with the next logical part in sequence, possibly skipping some part of the code by means of a GOTO statement (horrible thought). This rules out any use of REPEAT-

UNTIL, DO-WHILE and FOR-TO-NEXT constructs, as all three cause the CPU to re-execute a small part of the code over and over again, and the necessary I/O polling in other parts of the program is thereby inhibited.

The only type of program flow control that's acceptable is the IF-THEN-ELSE construct which is always transparent, and having such a restraint imposed upon you must be regarded as a serious limitation.

Now for unnecessary execution of code. A main program that calls subroutines in successive order (Hen and Chicken programs) always puts the CPU at the same entry point in a routine each time the routine is called, regardless of whether the beginning part of the routine needs execution or not at this particular call. As most things that take place in an industrial piece of machinery can be seen as sequences of events, the ideal program design should reflect this, and re-executing code for events that have already been taken care of is just a waste of valuable CPU time. To illustrate the fact, here's a short example.

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PROGRAM FILE

ated forward and backward by a computer via a magnetic valve. The cylinder has limit switches, connected to the computer, at each end of its travel. Whenever the computer receives a start signal from some other place (an operator, perhaps) the cylinder should be moved to the opposite position. A subroutine written to control this cylinder would logically begin with a check for the start signal, and as soon as it's received, start the cylinder in a direction towards the inactive limit switch. When that switch is activated, the magnetic valve is deactivated to make the cylinder stop. If this subroutine is always entered at the same point, you'll end up checking for the start signal and starting the cylinder over and over again, once for each program cycle, and all of these checks and starts are unnecessary except for the very first one that makes the physical start of the cylinder movement.

You are, therefore, spending valuable CPU time on parts of code that don't need execution, and this in turn degrades the system's capability to detect rapid external events in other parts of the program, thereby lowering the whole system's time resolution.

The solution to both of the problems discussed above is to base your application on a system with multi-tasking capabilities. In a multi-tasking system, the computer's CPU is treated as a sharable resource that is available to a number of separate programs which reside in main memory. The application is divided into smaller parts (tasks), and a separate program is written for each task in such a way that each task could be run alone with a minimum of interaction with other tasks. As each task is designed to run in its own environment, this also means that each task should have its own stack. Someone unfamiliar with the multi-tasking approach for design of a specific application might wonder what criteria to use to split the application into tasks. Judging from my own experience, I would say as a rule of thumb that each separate function in the external equipment would be a candidate for its own task.

If we take an industrial robot as an example, it would probably (but not necessarily) need one task for each of its drive motors, complemented with a small number of tasks for specialised math calculations.

The specific system that I will describe later has its roots in a design that I have used for a couple of years in my industrial work based on Intel Multibus hardware and Intel's ASMB0 and PL/M-80 programming languages. For this article I have

used the basic ideas behind my Multibus designs and created a similar system based on a CP/M-80 computer with BDS — C compiler version 1.50a and the CP/M assembler as programming tools. To make it possible to use another language when implementing this system, I have also included a pseudo code listing of all the kernel routines, so all you should need is a high-level language with a precisely defined assembler interface and the possibility to generate re-entrant code with its variables on stack.

The main purpose of the multi-tasking 'kernel' routines is to maintain a number of data structures where the state of all tasks are stored, and to switch the CPU from one task to the next. The actual form and declaration of these structures is given in the program example. As you can see, the data area consists of a number of stacks, one for each task in the system.

Each element of the stack is declared as a 'pointer to a void function', meaning a function that doesn't return anything of value. (That should be correct, as the primary function of each task is not supposed to return to anything at all.) When a task is active it uses the stack in a normal way for passing parameters, allocating local variable space, and storing return addresses, but as soon as a task surrenders the CPU, the top of the stack will be filled with the current CPU register contents and the address where the task should be reactivated next time it gets hold of the CPU.

A kernel routine named 'nexttask()' is responsible for this status save action, and it also reactivates the next task in sequence from where it last left off. The question of stacksize to reserve for each task is answered by manual labour, meaning that you have to do your own calculations of the task's function nesting depth and corresponding allocation of variables. Don't forget to take into account any recursive routine that may gobble up stack space. In order to keep track of the stacks and active/inactive tasks, there's another data structure on top of it all with the name 'task_tab'. It has two integer elements, where the first one is static and contains the total number of defined tasks in the system. The second integer is updated dynamically by the 'nexttask()' routine and always contains the number of the currently active task.

Next there's an array of pointer elements declared as 'pointers to pointers to void functions' which are used to store the contents of CPU register SP (stackpointer) when a task surrenders the CPU. The net effect is that the array elements, all

but one for the active task, point to the corresponding task's stacktop in memory. It's therefore possible for any task to have its register SP restored, and further, by the help of SP, restore the rest of the task's state before next reactivation. All this is done by the 'nexttask()' routine.

Tasks in the system are identified by a number ranging from 0 to (n-1) where 'n' is the total number of tasks defined in the system. Tasks are placed in a circular ring and the CPU is switched to the next task number in the ring when a task requests suspension by a call to 'nexttask()'. When the highest task number requests suspension, the 'nexttask()' routine will restart a new cycle by reactivating 'task 0'. When a task is resumed after suspension, the CPU will always start at the next instruction following its last call to 'nexttask()'.

This action described above takes care of both of the problems previously discussed, as it makes the following code sequence fully possible:

```
while limit_switch_x_is_inactive
{
    nexttask(&task_tab); /* let all
                           other task's go */
}
```

(Here you place the code to execute when limit_switch_x goes active)

This code sequence will effectively stop the task in a wait for an active limit_switch_x, but will still allow all the other tasks to run. Periodically, the CPU will come back to this task (provided that all other tasks also execute a call to 'nexttask()') at the end of the 'while' loop, and that implies a new test of limit_switch_x leading to a break of the loop only if the switch is active. Suspension calls can be placed anywhere in a task and even in any of the functions called by a task. At least one such call must be present in every task in order to let all tasks use the CPU.

Another nice feature is that any specific functions in the system can be used by more than one task: at least that's true for the BDS-C compiler as it generates code that uses the current stack exclusively to pass parameters and allocate space for local variables. So, even if the function code only exists in one place in memory, the actual parameters it receives when called and its local variables will exist on different stacks depending on which task called the function. It's also possible to let the function make a call to 'nexttask()' to suspend the task that called it, and then have the same function promptly reactivated in a new environment as a result of an earlier call to 'nex-

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task() in the same function, but called from another task.

By using the variable 'task_tab.act_no' in the main data structure (which should be treated as a read-only variable) the function can decide which environment it's currently active in, and from that make selections on what to do next. You should study and try to understand the program example in this article to get a better understanding of the possibilities that this will give you when writing compact code for your future applications.

From time to time you'll need a method for synchronisation between tasks. In 'big' real-time operating systems like Intel's RMX-80, RMX-86 or Digital Equipment's RSX-11M or VMS, that usually means using the operating system's built-in 'mailbox' or 'semaphore' system. Naturally this simple system will not give you any of these facilities, so you are forced to use globally-declared variables for signalling instead. The 'big guys' will tell you that this method is no good as it makes certain parts of the variable area accessible to tasks that are not supposed to know about them (avoid program bugs by hiding data), but I think it's OK in a small system like a CP/M computer, as the task communication variable area will not be that large anyway. If you manage to split your application into tasks in the most logical way, you will not need more than two to three signal variables per task and you should have no problem keeping track of them. Remember that most of the data used by a task will be allocated space on the corresponding stack, and in that way be protected from other tasks (I'm still talking in terms of the C languages).

Another problem area that must be discussed in connection with a multi-tasking system is the question of system deadlock. In a multi-tasking environment, all external equipment is regarded as resources that can be shared by different tasks; and to avoid access conflicts to these resources, you must implement a method to check if the resource is available or not. The easiest way to accomplish this is to define a global signal flag for each resource, and no task will be allowed to use the resource unless that flag is cleared. A task locks out other tasks from the resource by setting the flag as it gets hold of it. When several tasks use the same resources, the following situation may arise if you aren't careful when you write your code.

Imagine two tasks that each need two resources — a printer and an analogue-to-digital converter channel. One task requests the printer

first and then the A/D converter; the other task needs the A/D converter first and then the printer. If the first task gets hold of the printer and sets the flag to lock out the other task, and at the same time the other task takes the A/D converter and sets the lockout flag for that one, then you're in trouble because when the second task is done with processing on the A/D converter and needs the printer, it must wait for it because it's held by the other task which in turn is waiting for the A/D converter as soon as it's done with the printer. Both tasks are in a deadlock position, waiting for the resource they need which is held by the other task. A system that's coded like this example may well be running well for a relatively long period of time, but according to Murphy's Law you're assured that the deadlock position for these two tasks will arrive at a time when you least want it to. You can use either or both of the following methods to avoid the problem:

- Never let a task have access to more than one resource at a time.
- Let all tasks that share resources request them in the same order.

To help you understand the nature of a sharable resource, here's a couple of examples of items that can be defined in terms of a resource:

- Almost all kinds of command-driven I/O interfaces like A/D and D/A converters, parallel and serial devices, and so on;
- Co-processors like a math processor or an I/O processor; and
- Globally-defined memory areas used for sending messages from several tasks to a specialised driver routine and that routine itself.

All items mentioned above are candidates for a stop/go access flag.

CP/M is, as standard, a single-user, single-task system, and all its BDOS and BIOS interface routines are designed to finish their work before they return to the caller. If you make a call to the function 'getchar()', as an example, in order to fetch a character from the console, that function will not return before someone hits a button on the keyboard. Used in our multi-tasking application that would be a disaster, as it stops all tasks until someone hits that key.

The solution is to always use the BDOS or BIOS status routines to decide if there's anything to fetch or to see if the printer can accept output before you make the actual transfer call. When it comes to the file I/O routines you are stuck with BDOS and its behaviour, and if you need them, you can only rely on your own capability to put the calls in time gaps where they hopefully don't do any harm to the system.

PROGRAM FILE

Pseudo code definitions and function manual

Array and structure definitions.

```
struct    env_save          /* environment structure template */
```

```
    int    max_no;
```

```
    int    act_no;
```

```
    void (*sptr_tab[MAXTASK])();
```

```
};
```

```
void      (*stack_n[STKLEN])(); /* typical stack declaration */
```

```
struct    env_save task_tab; /* environment save area declaration */
```

KERNEL function definitions.

```
FUNCTION    void install(stack_bas, task, env_ptr)
```

```
void (*stack_bas)(); (*task)();
```

```
struct    env_save *env_ptr;
```

PSEUDOCODE move argument values to a safe area;

save the callers CPU reg. SP in a safe area;

set CPU reg. SP to stack_bas;

push pointer to task on stack;

push a dummy value for CPU reg. BC; (BDS-C request)

get current value of CPU reg. SP and save it in

location task_tab.sptr_tab[task_tab.act_no];

increment the value of "task_tab.act_no";

restore the callers CPU reg. SP;

and return to caller; (i.e. main();)

```
FUNCTION    void start_sys(env_ptr)
```

```
struct    env_save *env_ptr;
```

PSEUDOCODE get hold of the argument value; (pointer to task_tab)

check to see if current value of "task_tab.act_no"

is less than "task_tab.max_no" else set it to 0;

use "task_tab.act_no" as index to "task_tab.sptr_tab"

and get that value into CPU reg. SP;

pop the dummy value for CPU reg. BC; (BDS-C request)

return to (start) the selected task;

```
FUNCTION    void nexttask(env_ptr)
```

```
struct    env_save *env_ptr;
```

PSEUDOCODE get hold of the argument value; (pointer to task_tab)

push CPU reg. SP on stack; (BDS-C request)

use "task_tab.act_no" as index to "task_tab.sptr_tab"

and save CPU reg. SP in that location;

increment "task_tab.act_no" and check if it's equal

to "task_tab.max_no", if so set "task_tab.act_no" = 0;

use "task_tab.act_no" as index to "task_tab.sptr_tab"

and get that value into CPU reg. SP;

pop value for CPU reg. BC; (BDS-C request)

return to next task in the ring;

```
MODULE
kernel.asm
```

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PROGRAM FILE

CONTENTS

install(), startsys(), nexttask()

DESCRIPTION

This three functions makes up the kernel routines in a "Simple Multi Tasking System for CP/M-80"
 Parts or all of this code may be used by anyone without restrictions of any kind

DESIGN

Roland Eriksson
 Arbetshuset 58 A, 802 24 Gefle, SWEDEN

COMPILER

BDS C Vers 1.50a copyright Leor Zolman
 BD Software, Inc. P.O. Box 2368 Cambridge, MA 02238 U.S.A.

PREPARATION

oasm kernel.asm ;asm preprocessor
 asm kernel ;actual assembly
 cload kernel ;CRL file generator

INCLUDE <bds.lib>

spsave equ uroom ;temp storage for register SP
 act\$no\$ptr equ uroom + 2 ;temp storage for pointer to "task_tab.act_no"
 tmp\$act\$no equ uroom + 4 ;temp storage for "task_tab.act_no"

; Install task data in the multitasking structures

FUNCTION install

call argbak ;stuff arguments away somewhere safe
 lxi h,0 ;and save callers stackpointer
 dad sp ;for the duration of this function
 shld spsave

lhd arg1 ;set up register SP to bottom
 sphl ;of current install stack

lhd arg2 ;get address of current install task
 push h ;and put it on the stack
 lxi h,0 ;push a dummy value for register BC
 push h ;at activation time

lhd arg3 ;get pointer to task_tab structure and
 inx h ;skip to "task_tab.act_no"

inx h
 shld act\$no\$ptr ;save a pointer to "task_tab.act_no"
 mov e,m ;get current value for "task_tab.act_no"
 inx h ;to register DE
 mov d,m
 inx h ;finally point to "task_tab.sptrtbl[0]"
 dad d ;and use "task_tab.act_no" as offset to
 dad d ;correct instance of "sptrtbl"
 xchg ;put new pointer in register DE
 inx h ;and increment "act_no"
 shld tmp\$act\$no ;store new "act_no" temporarily

lxi h,0 ;get current value from register SP
 dad sp ;and save it in the previously calculated
 xchg ;instance of "task_tab.sptrtbl"
 mov m,e
 inx h
 mov m,d

lhd tmp\$act\$no ;get saved value for "act_no"
 xchg ;to register DE
 lhd act\$no\$ptr ;get saved pointer to "task_tab.act_no"
 mov m,e ;and the new value in that location
 inx h
 mov m,d

lhd spsave ;retrieve callers value for register SP
 sphl ;and return to caller
 ret

ENDFUNCTION install

; Start the system at tasknumber according to "task_tab.act_no"
 ; or at tasknumber 0 if "act_no" is out of range

FUNCTION startsys

call maltoh ;get argument pointer to "task_tab"
 mov e,m ;and copy "task_tab.max_no" into
 inx h ;register DE
 mov d,m
 inx h ;point to "task_tab.act_no"

shld act\$no\$ptr ;and save that pointer for a while

mov a,m ;copy "task_tab.act_no" into
 inx h ;register HL
 mov h,m
 mov l,a

call cmphd ;check if "act_no" is less than "max_no"
 jc hld ;and in that case JUMP


```

lxi h,0 ;else restart from tasknumber 0
hld: xchg ;put "act_no" in register DE
lhld act$nosptr ;and get the saved pointer
mov m,e ;store the next value for "act_no"
inx h
mov m,d
inx h ;and point to "task_tab.sptrtbl[0]"

dad d ;use "act_no" as an index into the
dad d ;"sptrtbl" vector
mov e,m ;and fetch the value for register SP
inx h ;to register DE
mov d,m
xchg ;and further into register HL and
sphl ;finally into register SP

pop b ;pop the dummy value for register BC
ret ;and start the selected task

ENDFUNCTION startsys

; Context save and switch routine when a task surrenders the CPU

FUNCTION nexttask

call maltho ;get argument pointer to "task_tab"
push b ;save register BC (Leor says so)

mov c,m ;copy "task_tab.max_no" to register BC
inx h
mov b,m
inx h ;point to "task_tab.act_no" and save
shld act$nosptr ;that pointer temporarily

mov e,m ;get "task_tab.act_no" to register DE
inx h
mov d,m
inx h ;and point to "task_tab.sptrtbl[0]", then
dad d ;use "act_no" as an index into the
dad d ;"sptrtbl" array
xchg ;exchange pointer and "act_no"
inx h ;increment "act_no"
shld tmpact$no ;and store the new value for a while

lxi h,0 ;get hold of the current value of
dad sp ;register SP and store it in it's
xchg ;proper position until next time we
mov m,e ;want to reactivate the current task
inx h
mov m,d

mov d,b ;copy "task_tab.max_no" to register DE
mov e,c
lhld tmpact$no ;and get the new "act_no" into HL
call cmphd ;check if the new tasknumber is less than
jc gonext ;"max_no" and in that case JUMP

lxi h,0 ;else start allover from tasknumber 0
gonext: xchg ;put next "act_no" in register DE
lhld act$nosptr ;get the saved pointer to "task_tab.act_no"
mov m,e ;save new value for "act_no"
inx h
mov m,d
inx h ;and point to the stackpointer table again
dad d ;use the new "act_no" as an index to the
dad d ;next SP value to reactivate
mov a,m ;get that new value into register HL
inx h
mov h,a
mov l,d
sphl ;and further into register SP
pop b ;restore register BC and run the
ret ;new task from where it last left off

ENDFUNCTION nexttask

; EOF for "kernel.asm"

/*
* MODULE
*
* multisk.h
*
* CONTENTS
*
* global data definitions for "demo.c"
*
* DESCRIPTION
*
* Data declarations for the demonstration program "demo.c"
* in PCW article "A Simple Multitasking System for CP/M-80"
* Parts or all of this code may be used by anyone without
* restrictions of any kind.
*
* DESIGN
*
* Roland Eriksson
* Arbetshusgatan 58 A, 802 24 Gefle, SWEDEN
*
* COMPILER
*
* BDS C Vers 1.50a copyright Leor Zolman
* BD Software, Inc. P.O. Box 2368 Cambridge, MA 02238 U.S.A.
*
* PREPARATION
*
* include this file at compile time for "demo.c"

```

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PROGRAM FILE

```

/*
#define   FOREVER   while(1)   /* just for some beauty */

#define   MAXTASK   3         /* total no. of defined tasks */

#define   STKLEN_0   1000     /* stack size definitions */
#define   STKLEN_1   1000
#define   STKLEN_2   1000

struct env_save
{
    int     max_no;
    int     act_no;
    void    (**spttr_tab[MAXTASK])();
};

void (*stack_0[STKLEN_0])(); /* actual stackspace declarations */
void (*stack_1[STKLEN_1])();
void (*stack_2[STKLEN_2])();

struct env_save task_tab; /* house keeping and stackpointer save area */

/* EOF for multitask.h */
/*
* PROGRAM
*
* demo.c
*
* CONTENTS
*
* main(), task_0(), task_1(), task_2(), testfunc()
*
* DESCRIPTION
*
* Demonstration program for the principles described in
* the article "A Simple Multitasking System for CP/M-80"
* Parts or all of this code may be used by anyone without
* restrictions of any kind.
*
* DESIGN
*
* Roland Eriksson
* Arbetshusgatan 58 A, 802 24 Gefle, SWEDEN
*
* COMPILER
*
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* 80 Software, Inc. P.O. Box 2368 Cambridge, MA 02238 U.S.A.
*
* PREPARATION
*
* cc demo.c      (compile the source code)
* clink demo.kerl (link source to kernel library)
*/

#include <bdscio.h> /* standard header file */
#include "multitask.h" /* multitasking definitions */

void main()
{
    void task_0(), task_1(), task_2(); /* external functions */

    /* Initialize max no. of tasks and hereafter this item is READ-ONLY */
    task_tab.max_no = MAXTASK;

    /* Initialize this item to zero to start the installation
    /* at the beginning of the "spttr_tab" array */
    task_tab.act_no = 0;

    /* do the installation of each task in the order You decide, there is
    /* no connection between the task name and the order of installation
    /* but the internal task identity number is assigned by the order of
    /* installation You choose.
    install(&stack_0[STKLEN_0], task_0, &task_tab);
    install(&stack_1[STKLEN_1], task_1, &task_tab);
    install(&stack_2[STKLEN_2], task_2, &task_tab);

    /* before You start the system You may assign a value of Your own
    /* to "task_tab.act_no" to make the system start at a specific task

    /* but if You leave it as is after installation then the first in-
    /* stalled task will automatically be the one that runs first.
    startsys(&task_tab); /* finally start the system

    /* this main routine is not used hereafter */
}

void task_0() /* You may choose any valid name You like */
{
    do
    {
        printf("\nI'm in task_0, delay.....");
        sleep(30);
        printf("going to next task\n");
        nexttask(&task_tab); /* here this task surrenders in favor of
        /* the other two, soon to be back here
        FOREVER; /* this is an infinite loop.....
    }

void task_1()
{
    do
    {

```


PROGRAM FILE

```

puts("\ntask_1: in delay... ");
sleep(30);
testfunc("I'm reactivated in ");
}
FOREVER; /* this is also an infinite loop..... */
}

void task_2()
{
do
{
puts("\ntask_2: in delay... ");
sleep(30);
testfunc("I'm reactivated in ");
}
FOREVER; /* as is this */
}

void testfunc(s)
char *s;
{
nexttask(&task_tab);
puts("\ntestfunc: ");
puts(s);
printf("the environment of <task_3d> ", task_tab.act_no);
sleep(30);
}
/* EOF for demo.c */

```

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Macintosh MacMand

by Jack Weber

This program accompanies the article on page 196 on fractals and Julia sets. A comprehensive explanation of how the program works is given in the text of the article and it's essential reading, particularly as it gives an

insight into Jack Weber's excellent programming techniques.

The program is fully commented to aid translation to other computers, and a variable description list is included at the end.

MacMand

© Jack Weber - September 1986

- Plots the Mandelbrot Set and its surroundings in the k-plane
- Plots the Julia Set in the z-plane for any complex value of k
- drag mouse to select any region for zooming-in
- point to select any spot in the k-plane to be mapped as a Julia set
- automatically adjusts extent of map to fill screen
- variable level of iteration
- plots rate of divergence as alternate bands (MOD 2) or max value only

This program runs on any Apple Macintosh under MS BASIC

GOSUB Initialise

restart:

GOSUB Parameters

GOSUB Displaywindow

IF oldmap%1 THEN GOSUB Mapload: GOSUB Firststage

GOSUB Scan

IF again%1 THEN GOTO restart

GOSUB Finished

GOTO restart

END

Initialise:

Provide default parameter settings

map%1: dimftx%3: plot%5: level%100: adfield%1: again%0: oldmap%0

Dimension arrays to save part & whole of display window

DIM small%(405), screen%(10015)

Put display options in menu bar

MENU 6,0,0,"Fractal"

MENU 6,1,0,"Zoom-in"

MENU 6,2,0,"Create Julia set"

MENU 6,3,1,"Resume plot"

MENU 6,4,0,"Save plot"

ON MENU GOSUB Menuhandle

MENU OFF

ON DIALOG GOSUB Dialoghandle

RETURN

Paramwindow:

WINDOW 2,,(6,27)-(504,334),2

RETURN

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PROGRAM FILE

Displaywindow:
WINDOW 1,,(13,20)-(499,342),3
RETURN

Smallwindow:
WINDOW 3,,(300,20)-(500,50),3
RETURN

Menuhandle:
A menu selection has been detected - find what it is
menunumber%=MENU(0)
IF menunumber%<>6 THEN RETURN
menuitem%=MENU(1)
ON menuitem% GOSUB Zoom, Julia, Reload, Remember
MENU
RETURN

Parameters:
GOSUB Paramwindow
Offer user Mandelbrot or Julia Set. Default is:- Mandelbrot
BUTTON 1,1,"Mandelbrot Set", (20,20)-(195,40),3
BUTTON 2,1,"Julia Set", (20,45)-(195,65),3
BUTTON map%,2
IF map%=2 THEN GOSUB Createconstant
LINE(5,5)-(200,130),b
Offer choice of deciding extent of Real/Imaginary dimension
Default is:- Real to be entered, Imaginary automatically adjusted
CALL MOVETO(20,166): PRINT "Fix"
BUTTON 3,1,"Real", (45,140)-(130,160),3
BUTTON 4,1,"Imaginary", (45,165)-(130,185),3
BUTTON dimfix%,2
CALL MOVETO(140,166): PRINT "dimension?"
CALL TEXTFONT(1): CALL TEXTSIZE(9)
CALL MOVETO(245,150): PRINT "Extent of the other dimension"
CALL MOVETO(245,165): PRINT "will then be adjusted to fit the"
CALL MOVETO(245,180): PRINT "display aspect ratio of 2 : 3"
LINE(5,135)-(390,302),b
LINE(5,190)-(390,190)
CALL TEXTFONT(0): CALL TEXTSIZE(12)
CALL MOVETO(140,210): PRINT "Area To Be Mapped"
CALL MOVETO(65,230): PRINT "Real"
CALL MOVETO(255,230): PRINT "Imaginary"
CALL TEXTFONT(1): CALL TEXTSIZE(9)
LINE(30,240)-(175,290),b
LINE(225,240)-(370,290),b
CALL MOVETO(35,260): PRINT "Low"
CALL MOVETO(35,285): PRINT "High"
CALL MOVETO(230,260): PRINT "Low"
CALL MOVETO(230,285): PRINT "High"
CALL TEXTSIZE(12)
EDIT FIELD 4,STR\$(yhi), (255,270)-(365,285)
EDIT FIELD 3,STR\$(ylo), (255,245)-(365,260)
EDIT FIELD 2,STR\$(xhi), (65,270)-(170,285)
EDIT FIELD 1,STR\$(xlo), (65,245)-(170,260)
Offer two plotting options. Default is:- number of iterations MOD 2
CALL TEXTFONT(0)
CALL MOVETO(225,30): PRINT "Plot pixel if ..."
BUTTON 5,1,"number of iterations is even", (225,50)-(480,70),3
BUTTON 6,1,"maximum iterations reached", (225,80)-(480,100),3
BUTTON plot%,2
LINE(205,5)-(492,130),b
Offer field to enter max. number of iterations. Default=100
CALL MOVETO(402,155): PRINT "Max. level of"
CALL MOVETO(416,170): PRINT "iteration"
EDIT FIELD 5,"100", (420,185)-(465,200),1,3
LINE(395,135)-(492,210),b
EDIT FIELD 1: edfield%=1: box%=3
BUTTON 7,1,"OK", (410,255)-(476,275)
MENU 6,0,1
MENU ON
GOSUB Enterparam
WINDOW CLOSE 2
RETURN

PROGRAM FILE

```

Enterparam:
  DIALOG ON
  done%=0
  Allow parameters to be entered or changed until OK button is pressed
  But skip parameter input if this is an old map being loaded from disk
  WHILE done%=0
    action%=DIALOG(0)
    WHILE action%=0: WEND
    IF oldmap%=1 THEN GOTO skip
    IF action%=1 THEN GOSUB Findbutton
    IF action%=2 OR action%=6 OR action%=7 THEN GOSUB Findfield
    ON box% GOSUB Changemap, Changedim, Changerange, Changeplot, Changelevel,
    Complete, Changeconstant
    skip:
  WEND
  DIALOG OFF
  IF map%=1 THEN MENU 6,2,1 ELSE MENU 6,2,0
  IF oldmap%=1 THEN RETURN
  Read parameter values from edit fields
  xlo=VAL(EDIT$(1)): xhi=VAL(EDIT$(2))
  ylo=VAL(EDIT$(3)): yhi=VAL(EDIT$(4))
  ON dimfix%-2 GOSUB Reelfix, Imfix
  level%=VAL(EDIT$(5))
  IF map%=2 THEN c=VAL(EDIT$(6)): d=VAL(EDIT$(7))
RETURN

```

```

Findbutton:
  A button has been pressed - find which group it belongs to
  IF press%<3 THEN box%=1
  IF press%=3 OR press%=4 THEN box%=2
  IF press%=5 OR press%=6 THEN box%=4
  IF press%=7 THEN box%=6
RETURN

```

```

Findfield:
  Something happened in an edit field - find what and select required field
  IF action%=2 THEN EDIT FIELD edfield%
  IF action%>5 AND box%=3 THEN EDIT FIELD ((edfield% MOD 4)+1): edfield%=(edfield%
MOD 4)+1
  IF action%>5 AND box%=7 THEN EDIT FIELD (7-(edfield% MOD 2)):
edfield%=(7-edfield% MOD 2)
  IF edfield%<5 THEN box%=3
  IF edfield%=5 THEN box%=5
  IF edfield%>5 THEN box%=7
RETURN

```

```

Changemap:
  User selected type of Set - find which one
  map%=press%
  lobutton%=1
  hibutton%=2
  GOSUB Setbutton
  ON map% GOSUB Clearconstant, Createconstant
RETURN

```

```

Createconstant:
  Julia Set selected so allow entry of the constant - k
  CALL TEXTSIZE(9)
  CALL MOVETO(20,93): PRINT "k Real"
  CALL MOVETO(20,118): PRINT "k Imaginary"
  CALL TEXTSIZE(12)
  LINE(15,75)-(190,125),b
  EDIT FIELD 7,STR$(d),(80,105)-(185,120)
  EDIT FIELD 6,STR$(c),(80,80)-(185,95)
  box%=7
RETURN

```

```

Clearconstant:
  Mandelbrot Set selected so get rid of fields for entering k
  EDIT FIELD CLOSE 6
  EDIT FIELD CLOSE 7

```

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001

PROGRAM FILE

```

LINE(15,75)-(190,125),30,bf
RFTIIRN
Changeconstant:
  User changed value of k - update it
  c=VAL(EDIT$(6))
  d=VAL(EDIT$(7))
RETURN

```

```

Changedim:
  User selected dimension to be fixed by input - find which one
  dimfix%=press%
  lobutton%=3
  hibutton%=4
  GOSUB Setbutton
RETURN

```

```

Changerange:
  User changed value of plot extent - update it
  xlo=VAL(EDIT$(1)): xhi=VAL(EDIT$(2))
  ylo=VAL(EDIT$(3)): yhi=VAL(EDIT$(4))
  ON dimfix%-2 GOSUB Realfix, Imfix
RETURN

```

```

Changeplot:
  User entered type of plot - find which one
  plot%=press%
  lobutton%=5
  hibutton%=6
  GOSUB Setbutton
RETURN

```

```

Changelevel:
  Level of iteration changed - update it
  level%=VAL(EDIT$(5))
RETURN

```

```

Complete:
  OK button pressed
  done%=1
RETURN

```

```

Setbutton:
  Toggle buttons within the current group
  FOR i%=lobutton% TO hibutton%
    IF press%=i% THEN BUTTON i%,2 ELSE BUTTON i%,1
  NEXT
RETURN

```

```

Realfix:
  Adjust extent of Imaginary axis to suit extent of Real axis as input
  yhi=ylo+(xhi-xlo)*2/3
  EDIT FIELD 4,STR$(yhi),(255,270)-(365,285)
  EDIT FIELD (edfield%)
RETURN

```

```

Imfix:
  Adjust extent of Real axis to suit extent of Imaginary axis as input
  xhi=xlo+(yhi-ylo)*1.5
  EDIT FIELD 2,STR$(xhi),(65,270)-(170,285)
  EDIT FIELD (edfield%)
RETURN

```

```

Dialoghandle:
  Decide if user pressed a button or did something in an edit field
  action%=DIALOG(0)
  IF action%=1 THEN press%=DIALOG(1)
  IF action%=2 THEN edfield%=DIALOG(2)
RETURN

```


PROGRAM FILE

Scan:

```
Find the difference between adjacent pixels
g=(xhi-xlo)/486
MENU 6,1,1: MENU 6,3,0: MENU 6,4,1
Draw preliminary large blocks unless this is an old plot loaded from disk
IF oldmap%=1 THEN GOTO tile
corner%=40: size%=81: extent%=40: square%=80: again%=0
FOR y%=corner% TO 324 STEP size%
  FOR x%=corner% TO 486 STEP size%
    GOSUB Calculate
    IF again%=1 THEN GOTO finish
  NEXT
NEXT
Now start tiling those blocks with successively smaller blocks
offset%=27: extent%=13: square%=26
tile:
WHILE size%>1
  FOR ybase%=corner% TO 324 STEP size%
    FOR xbase%=corner% TO 486 STEP size%
      GOSUB Tessellate
      IF again%=1 THEN GOTO finish
    NEXT
  NEXT
  size%=size%/3: offset%=size%/3: corner%=corner%-size%
  extent%=INT(offset%/2): square%=extent%*2
WEND
MENU OFF
finish:
MENU 6,0,0
RETURN
```

Firststage:

```
g=(xhi-xlo)/486
MENU 6,1,1: MENU 6,3,0: MENU 6,4,1
Complete tiling from last point reached to end of current line
ybase%=ystart%
FOR xbase%=xstart% TO 486 STEP size%
  GOSUB Tessellate
  IF again%=1 THEN GOTO finito
NEXT
Then tile remaining complete lines to bottom of screen
FOR ybase%=ystart%+size% TO 324 STEP size%
  FOR xbase%=corner% TO 486 STEP size%
    GOSUB Tessellate
    IF again%=1 THEN GOTO finito
  NEXT
NEXT
size%=size%/3: offset%=size%/3: corner%=corner%-size%
extent%=INT(offset%/2): square%=extent%*2
finito:
RETURN
```

Tessellate:

```
Move around and plot the 8 outer segments of the current block
x%=xbase%-offset%: y%=ybase%-offset%: GOSUB Calculate
x%=xbase%: GOSUB Calculate
x%=xbase%+offset%: GOSUB Calculate
y%=ybase%: GOSUB Calculate
y%=ybase%+offset%: GOSUB Calculate
x%=xbase%: GOSUB Calculate
x%=xbase%-offset%: GOSUB Calculate
y%=ybase%: GOSUB Calculate
RETURN
```

Calculate:

```
ON map% GOSUB Mandcalc, Juliacalc
ON plot%-4 GOSUB Modplot, Mexplot
RETURN
```

Mandcalc:

```
a=0: b=0: i%=0: c=xlo+x%*g: d=ylo+y%*g: m=0: n=0
```

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PROGRAM FILE

```

• WHILE i%<level% AND m+n<4: i%=i%+1: zreal=m-n+c: zimag=2*a*b+d: a=zreal:
• b=zimag: m=a*a: n=b*b: WEND
• RETURN

```

Juliacalc:

```

• a=xlo+x%*g: b=ylo+y%*g: i%=0: m=a*a: n=b*b
• WHILE i%<level% AND m+n<100: i%=i%+1: zreal=m-n+c: zimag=2*a*b+d: a=zreal:
• b=zimag: m=a*a: n=b*b: WEND
• RETURN

```

Modplot:

```

• IF i% MOD 2=0 THEN colour%=33 ELSE colour%=30
• LINE(x%-extent%,y%-extent%)-STEP(square%,square%),colour%,bf
• RETURN

```

Maxplot:

```

• IF i%=level% THEN colour%=33 ELSE colour%=30
• LINE(x%-extent%,y%-extent%)-STEP(square%,square%),colour%,bf
• RETURN

```

Zoom:

```

• redo:
• Wait until mouse is dragged
• hold%=MOUSE(0)
• WHILE hold%=-1: hold%=MOUSE(0): WEND
• Make pen invert current pixels to see rectangle over black & white
• Draw rectangle twice (draw/erase) to animate rectangle by mouse
• CALL PENMODE(10)
• hold%=MOUSE(0)
• WHILE hold%=-1
• hold%=MOUSE(0)
• r%(0)=MOUSE(4): r%(1)=MOUSE(3): r%(2)=MOUSE(6): r%(3)=MOUSE(5)
• IF r%(1)>r%(3) THEN SWAP r%(1),r%(3)
• IF r%(0)>r%(2) THEN SWAP r%(0),r%(2)
• CALL FRAMERECT(VARPTR(r%(0)))
• CALL FRAMERECT(VARPTR(r%(0)))
• WEND
• Drag finished - draw final rectangle
• CALL FRAMERECT(VARPTR(r%(0)))
• GOSUB Intention
• Erase rectangle
• CALL FRAMERECT(VARPTR(r%(0)))
• IF press%=2 THEN GOTO redo
• IF press%=3 THEN again%=1 ELSE again%=0
• IF press%=3 THEN GOSUB Newview
• RETURN

```

Intention:

```

• Find what user wants to do with selected zoom rectangle
• First save area of plot to be overlapped by dialog window
• GET (286,0)-(486,30),small%
• GOSUB Smallwindow
• BUTTON 1,1,"Cancel",(10,5)-(65,25)
• BUTTON 2,1,"Change",(75,5)-(130,25)
• BUTTON 3,1,"OK",(140,5)-(190,25)
• DIALOG ON
• action%=DIALOG(0)
• WHILE action%=0: WEND
• DIALOG OFF
• Close small window and replace area of plot that was masked
• WINDOW CLOSE 3
• PUT (286,0),small%,PSET
• RETURN

```

Newview:

```

• Find co-ordinates of the zoom rectangle and adjust to display format
• xhi=xlo+g*r%(3): xlo=xlo+g*r%(1)
• yhi=ylo+g*r%(2): ylo=ylo+g*r%(0)
• xmid=(xlo+xhi)*.5: ymid=(ylo+yhi)*.5
• xrange=xhi-xlo: yrange=yhi-ylo
• zoomscale=xrange/yrange
• correction=1.5/zoomscale

```


PROGRAM FILE

```
IF zoomscale<1.5 THEN xlo=xmid-xrange*correction*.5: xhi=xlo+xrange*correction
IF zoomscale>1.5 THEN ylo=ymid-yrange*correction*.5: yhi=ylo+yrange*correction
RETURN
```

Julis:

```
top:
  Wait until mouse button is clicked
  MOUSE ON
  click%=MOUSE(0)
  WHILE ABS(click%)<>1: click%=MOUSE(0): WEND
  pointx%=MOUSE(1): pointy%=MOUSE(2)
  MOUSE OFF
  See if user approves the point selected. If so, read value of k
  GOSUB Intention
  IF press%=1 THEN again%=0: RETURN
  IF press%=2 THEN GOTO top
  c=xlo+g*pointx%: d=ylo+g*pointy%
  again%=1
  map%=2
RETURN
```

Reload:

```
Offer choice of available saved incomplete plots
"TEXT" is filetype of any file created by MS BASIC
map%=FILES$(1,"TEXT")
IF map%="" THEN RETURN
Open chosen file and input all parameters
OPEN map$ FOR INPUT AS #1 LEN=1000
INPUT #1,map%,dimf: x%,plot%,level%
INPUT #1,xlo,xhi,ylo,yhi,c,d
INPUT #1,xstart%,ystart%,offset%,extent%,square%,size%,corner%
done%=1: oldmap%=1
RETURN
```

Mapload:

```
Load screen% array with saved plot
FOR i%=0 TO 10015
  INPUT #1,screen%(i%)
NEXT
CLOSE #1
Transfer contents of screen% array to display window
PUT (0,0)-(486,322),screen%,PSET
RETURN
```

Remember:

```
Transfer whole of display window into screen% array
GET (0,0)-(486,322),screen%
Ask user for a file name. Save parameters followed by screen% array
map%=FILES$(0,"Save map as ...")
IF map%="" THEN PUT (0,0)-(486,322),screen%,PSET: RETURN

OPEN map$ FOR OUTPUT AS #1 LEN=1000
WRITE #1,map%,dimf,x%,plot%,level%
WRITE #1,xlo,xhi,ylo,yhi,c,d
WRITE #1,xbase%,ybase%,offset%,extent%,square%,size%,corner%
FOR i%=0 TO 10015
  WRITE #1,screen%(i%)
NEXT
CLOSE #1
END
RETURN
```

Finished:

```
MENU 6,0,1
MENU ON
menunumber%=MENU(0)
WHILE menunumber%=0: WEND
RETURN
```

```

a      Temporary variable holding Real part of z during iteration
action% Number returned by Dialog function showing type of last user action
again%  Flag - set to 1 if this is modified plot (initialisation already done)
b      Temporary variable holding Imaginary part of z during iteration
box%   Number of box containing buttons/edit fields currently selected in
```

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PROGRAM FILE

Parameter window

c	Real part of constant k
click%	Number returned by Mouse function indicating if mouse button pressed
colour%	30=white, 33=black
corner%	Co-ordinate of centre pixel in current top-left square
correction	Correction factor to adjust zoom rectangle to screen format
d	Imaginary part of constant k
dimfix%	Dimension to be entered by user - 3=Real, 4=Imaginary
done%	Flag - set to 1 when OK button is pressed in Parameter window
edfield%	Currently selected edit field in the Parameter window
extent%	Half-size of current tiles
g	Step in value between adjacent pixels
hbutton%	Number of highest button in current group
hold%	Number returned by Mouse function to show state of mouse button
l%	General purpose loop counter
level%	Maximum number of iterations to be done
lobutton%	Number of lowest button in current group
m	Temporary variable holding square of Real part of z during iteration
map%	Type of plot - 1=Mandelbrot set, 2=Julia set
map\$	Filename for saved plot
menulitem%	Number of item in menu selection
menunumber%	Number of menu bar selection
n	Temporary variable holding square of Imaginary part of z during iteration
offset%	Distance from centre pixel of current square to centre pixel of current tile
oldmap%	Flag - set to 1 if this is a partially completed plot loaded from disk
plot%	Plotting mode - 5=odd/even, 6=max value
pointx%	X co-ordinate where mouse button was clicked
pointy%	Y co-ordinate where mouse button was clicked
press%	Number of button last pressed
r%	Array holding co-ordinates of rectangle dragged with mouse
screen%	Array to hold whole of screen when saving/loading from disk
size%	Size of current squares
small%	Array to hold part of screen obscured by small window
square%	Size of current tiles (= 2*extent%)
x%	X co-ordinate of centre pixel in current tile
xbase%	X co-ordinate of centre pixel in current square
xhi	High value of Real dimension displayed
xlo	Low value of Real dimension displayed
xmid	Value of Real dimension at centre of zoom rectangle
xrange	Extent of Real dimension of zoom rectangle
xstart%	X co-ordinate of centre pixel in square where plot was interrupted to save to disk
y%	Y co-ordinate of centre pixel in current tile
ybase%	Y co-ordinate of centre pixel in current square
yhi	High value of Imaginary dimension displayed
ylo	Low value of Imaginary dimension displayed
ymid	Value of Imaginary dimension at centre of zoom rectangle
yrange	Extent of Imaginary dimension of zoom rectangle
ystart%	Y co-ordinate of centre pixel in square where plot was interrupted to save to disk
zimag	Temporary variable holding new value of Real part of z
zoomscale	Ratio of Real:Imaginary extent of zoom rectangle
zreal	Temporary variable holding new value of Imaginary part of z



BBC Extended Trace

by Jonathon Temple

This program works on an A/B machine or an Acorn Electron, and overcomes some of the problems of the BBC's limited TRACE facility. The BBC TRACE quickly messes up any programs with screen output, making the program's output and the trace unreadable. This program prints the current line number in the top-left corner of the screen, after which pressing the space bar will step the program on one line. This allows the screen display to be unaffected, and

promotes single-stepping through the program to locate bugs quickly.

Type in the program as listed and then run it; you will be instructed how to save it. From now on, when you want to use the extended trace facility, type "RUN STEP" to reload and activate the code. From then on, the usual TRACE ON and TRACE OFF commands will control the extended trace facility.

If BREAK is pressed, the extended trace is deactivated. To reactivate it,

PROGRAM FILE

tape users should type CALL &D02 and disk owners CALL &A00.

Due to the way the program works, listing programs containing square-bracket characters can produce strange results. Don't attempt to run the trace on the program, as this will lock up the machine.

The program works by intercepting the machine's VDU output routine (OSWRCH) at &FEE4, using the vector at &20E (WRCHV). The new routine checks for square brackets,

as printed before the line number under the normal TRACE operation. If a bracket is found, the cursor position is stored, the line number following the bracket is printed in the top-left corner, and the cursor is restored to its original position.

Using a combination of OSBYTE (&FFF4) calls, the routine also handles such things as VDU 5 operation correctly, making it ideal for such things as debugging games.

```

10 REM RBC EXTENDED TRACE FACILITY
20 REM By Jonathan Temple
30 :
40 :
50 PROCfilevs
60 PROCassemble
70 CLS
80 PROCinfo
90 END
100 :
110 :
120 DEFFROCCassemble
130 REM *****
140 REM Assemble code at address
150 REM set by PROCfilevs
160 REM *****
170 WRCHV=&20E:OSRDCH=&FEE4
180 OSBYTE=&FFF4:NVWRCH=&FFC8
190 buff=&B8
200 waits=""
210 :
220 FOR out=0 TO 2 STEP 2
230 Px=base
240 IDP1 out
250 \ Set WRCHV to point to
260 \ our new routine
270 LDA #start MOD 256
280 STA WRCHV
290 LDA #start DIV 256
300 STA WRCHV+1
310 \ Clear line-number flag
320 LDA #0:STA buff+1
330 \ Return to Basic
340 RIS
350 .start
360 \ Store character
370 STA buff
380 \ Store registers on the stack
390 PHF:TXA:PHA:LYA:PHA
400 \ Now check for left bracket
410 LDA buff:CMF #91:BNE check
420 \ is the Vdu queue empty?
430 LDA #218:LDX #0:LDY #255
440 JSR OSBYTE
450 TXA:BNE print
460 \ Check cursor status
470 LDA #117:JSR OSBYTE
480 \ Cursor & edit cursor solit?
490 TXA:AND #64:BNE print
500 \ Stores VDU 5 flag
510 TXA:AND #32:STA buff+4
520 \ Store cursor position
530 LDA #134:JSR OSBYTE
540 STX buff+2:STY buff+3
550 \ Set VDU 4 cursor operation
560 LDA #4:JSR NVWRCH
570 \ Send cursor to top of screen
580 LDA #30:JSR NVWRCH
590 \ Set line-number flag and exit
600 STA buff+1:BNE print
610 .check
620 \ Check for line-number flag
630 LDX buff+1:BEQ print
640 \ Check for space character
650 CMF #32:BNE print
660 .out
670 \ Wait for space bar or escape
680 JSR OSRDCH:CMF #27:BNE notesc
690 LDA #0:STA buff+1:BEQ exit
700 .notesc
710 CMF #ASC(waits):BNE det
720 \ Restore cursor position
730 LDA #31:JSR NVWRCH
740 LDA buff+2:JSR NVWRCH
750 LDA buff+3:JSR NVWRCH
760 \ Restore VDU 5 if necessary
770 LDA buff+4:BEQ tab
780 LDA #5:JSR NVWRCH
790 .tab
800 \ Reset line-number flag
810 LDA #0:STA buff+1
820 BEQ exit
830 .print
840 \ Print character
850 LDA buff:JSR NVWRCH
860 .exit
870 \ Restore registers from stack
880 PLA:LAY:PLA:PLP
890 \ Return from routine
900 RIS
910 :
920 NEXT
930 :
940 ENDPROC
950 :

```

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PROGRAM FILE

```

960 :
970 DEFPROCfilevsv
980 REM *****
990 REM Set address for code
1000 REM depending on current
1010 REM filing system
1020 REM *****
1030 LOCAL AZ,Y%
1040 '370=USR(8FF0A):AZ=7870
1050 IF AZ=0 THEN END
1060 IF AZ<3 THEN base=&D02
1070 IF AZ>2 THEN base=&A00
1080 ENDPROC
1090 :
1100 :
1110 DEFPROCInfo
1120 REM *****
1130 REM Perform quick checksum
1140 REM on assembled code, and
1150 REM give details on saving
1160 REM *****
1170 total%v
1180 FOR MZ=base TO base+80F
1190 total%total%+MZ:NEXT
1200 IF total%<&49F1 AND total%>&49F6 PRINT "Checksum error" "Please check t
branch program":END
1210 PRINT "Code seems correct"
1220 PRINT "Now save it using:"
1230 PRINT "SAVE "STEP" ":"base:" ":"base+$A0
1240 PRINT
1250 ENDPROC
    
```



Amstrad CPC Trace in Windows

by Jeffrey Weaver

This program allows the user to display the line numbers produced by the tracer to be printed in certain text windows or dumped to a printer. When the Control and Tab keys are pressed, the program being executed is halted until the keys are released.

To use the program, type it in as listed and save it; then run it. The program will set HIMEM and then POKE-in the machine code. It will ask

for a stream number in the range 0-8. 0-7 are text windows and 8 is the printer. The computer then asks for the size of the window and its position. When the window size has been entered, the Basic program deletes itself and the computer can be used as normal; but when TRON or TROFF are typed, they act on the new trace program.

```

10 PAPER 0:OPEN 1:MODE 1:INK 0:0:BOARD 0
20 MEMORY 39999:RESTORE:FOR F=40000 TO 40255:READ A$:POKE F,VAL("0"+A$):NEXT F
30 PRINT "PLEASE SELECT WINDOW NUMBER (0-8)":PRINT:PRINT"0-7 ARE TEXT WINDOWS AN
0 8 SENDS THE":PRINT:PRINT"LINE NUMBERS TO THE PRINTER.":PRINT:INPUT "NUMBER "S
T
40 IF ST=0 OR ST=8 THEN ST=8
50 PRINT:INPUT "LEFT COLUMN OF WINDOW "L
60 PRINT:INPUT "RIGHT COLUMN OF WINDOW "R
70 PRINT:INPUT "TOP ROW OF WINDOW "T
80 PRINT:INPUT "LOWER ROW OF WINDOW "W
90 POKE 40248,ST:POKE 40189,L:POKE 40191,R:POKE 40193,T:POKE 40195,W
100 CLS:CALL 40000:PRINT "NEW TRACE ROUTINE IS NOW READY.":INKEY
110 DATA 3E,C3,21,4C,9C,32,5A,BB,22,5B,BB,C9,CD, 0F,9C,CD,9E,9C,CA,B1,9C,3A,3D,9
D,FE,0,C2,8E,9C,3A,31,9D,FE,5B,C2,B1,9C,3A,3B,9D,FE,8,D2,07,9C,3A,3A,9D,4F,CD,11
BC,09,CA,FS,9C,CD,7B,BB,22,3B,9D,3A,3B,9D,CD,B4,BB,32,39,9D,3E,11,32,3D,9D,C3,A4
9C,32,31
120 DATA 9D,ED,43,32,9D,ED,53,3A,9D,22,36,9D,C9,3A,3B,AE,FE,0,C9,3A,31,9D,ED,32
9D,ED,34,9D,2A,36,9D,C9,3A,31,9D,CD,BA,9C,C3,A4,9C,CF,0,9A,C9,3A,3A,9D,FE,8,D2,1
2,9D,3A,31,9D,FE,5D,C2,B1,9C,3E,20,32,31,9D,CD, 81,9C,3A,39,9D,CD,B4,BB,2A,3B,9D
CD,75
130 DATA BB,3E,0,32,3D,9D,3E,44,CD,1E,BB,2B,4,CB,79,20,FS,C3,A4,9C,3A,3B,9D,CD,B
4,BB,FS, 26,1,16,14,2E,1,1E,3,CD,6C,BD,F1,CD,B4, BB,CD,11,BC,32,3A,9D,C9,3A,31,9
D,FE,5D, 2B,8,3A,31,9D,CD,2B,8D,3D,F8,C3,A4,9C,3E,20,CD,2B,8D,3E,0,32,3D,9D,C3,A
4,9C,0,0
140 DATA 0,0,0,0,0,7,0,3,0,0,0,0,0
    
```



BBC Interrupt-Driven Clock

by Alan Potton

This program provides a real-time clock and alarm facility on the BBC Micro. The program should be typed-in as it stands, substituting all pound signs (£) for hashes (#). There are four possible alterations. The user could change the loop in line 1040 to run from 1 to 3 rather than 0 to 2, in order to check for errors in the

assembly language the first time the program is run, and then change it back when all is OK. Secondly, the machine code can be relocated by changing the value of P% in line 1050 and the two old values in line 2740. The current setting of &1700 is for use with a disk system; for a cassette system, use &B00. Thirdly, the

PROGRAM FILE

coordinates on the screen where the time is to be printed may be altered in line 1350. Finally, if the user has other events enabled, remove the two slashes in line 1880.

When the program has been typed-in, save it then run it. The machine code will be installed and a prompt for the time will be given: it should be entered in the format hh:mm. Then the alarm time is requested and given in the same format. The Basic program is erased using the NEW command. There are three * commands to use the new clock:

*ZINITCL — this *must* be entered to initialise and start the clock running. It need only be typed once, and to ensure correctness, must be typed at the time entered at the prompt.

*ZDISP ON/OFF — this command switches the display of the clock onscreen on and off.

The default is off.

*ZALM ON/OFF — this command switches the alarm on and off. If it's on and the alarm time is reached, it will ring. When off, the alarm will not sound.

The program is made up of two parts of machine code and one of Basic. The first machine code routine in lines 1080 to 1840 adds three new OS commands. Lines 1080 to 1190 provide the new service routine to access the new commands.

The clock works using the count-down timer (using the OSWORD routine with A=4) on a one-minute cycle. When the interrupt signal is produced, control jumps to the User Interrupt Service Routine. The routine increments the clock, displays the time and checks for the alarm. The address of the routine is given to the operating system in lines 1330 and 1340.

```

1000 MODE3
1010 w=%FFF1
1020 b=%FFF4
1030 a=%FFE3
1040 FOR L%=0 TO 2 STEP 2
1050   P%=&1700
1060   foot L%
1070
1080   .cli
1090   pha:txa:pha:txa:pha
1100   stx %80:stx %81
1110
1120   ldy %1:lda (%80),Y:ora %32:tax
1130   ldy %2:lda (%80),Y:ora %32:tax
1140   cpx %ASC"z":bne mark0
1150   cpy %ASC"i":beq zinitcl
1160   cpy %ASC"d":beq zdisp
1170   cpy %ASC"a":beq zalm
1180   mark0
1190   jmp zdef
1200
1210   .zalm
1220   jmp za
1230
1240   .zinitcl
1250   lda %0:sta %75
1260   lda %0:sta %78
1270   lda %86:sta %79
1280   lda %8B:sta %7A
1290   lda %8F:sta %7B
1300   sta %7C:sta %7D
1310   lda %4:ldx %79:ldy %0:jsr w
1320   lda %14:ldx %5:jsr b
1330   lda %int MOD 256:sta %220
1340   lda %int DIV 256:sta %221
1350   lda %70:sta %7E:lda %00:sta %7F
1360   lda %01:sta %88
1370   lda %00:sta %89
1380   lda %8F:sta %8A
1390   lda %8F:sta %8B
1400   lda %8C:sta %8C
1410   lda %00:sta %8D
1420   lda %80:sta %8E
1430   lda %00:sta %8F
1440   jmp ex
1450
1460   .zdisp
1470   ldy %8:lda (%80),Y:ora %32
1480   cmp %ASC"n":bne dpoff
1490
1500   .on
1510   lda %1:sta %78
1520   jsr print
1530   jmp ex
1540
1550   .dpoff
1560   lda %0:sta %78
1570   lda %134:jsr b:stx %76:stx %77
1580   lda %31:jsr a
1590   lda %7E:jsr a:lda %7F:jsr a
1600   lda %32:jsr a:jsr a:jsr a:jsr a:jsr a
1610   lda %31:jsr a
1620   lda %75:jsr a
1630   lda %77:jsr a
1640   jmp ex
1650
1660   .za
1670   ldy %7:lda (%80),Y
1680   cmp %ASC"f":beq aloff

```

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PROGRAM FILE

```

1690
1700 .alon
1710 lda f1:sta &75
1720 jmp ex
1730
1740 .aloff
1750 lda f0:sta &75
1760 jmp ex
1770
1780 .zdef
1790 pla:tay:pla:tay:pla
1800 jmp ?&208+&100*?&204
1810
1820 .ex
1830 pla:tay:pla:tay:pla
1840 rts
1850
1860 .int
1870 pha:txa:pha:tva:pha:php:clc
1880 \cmp f5:\bne exit
1890 lda f4:ldx f&79:ldv f0:jsr w
1900 lda &74
1910 clc:adc f1
1920 cmp f58:beq incmt
1930 sta &74
1940
1950 .cont
1960 lda &78
1970 cmp f1:beq co
1980 .cont2
1990 lda &75
2000 cmp f1:beq sound
2010
2020 .exit
2030 plp:pla:tay:pla:tay:pla
2040 rts
2050
2060 .cp
2070 jsr print
2080 jmp cont2
2090
2100 .sound
2110 jsr sdal
2120 jmp exit
2130
2140 .incmt
2150 lda f48:sta &74
2160 lda f73:clc:adc f1
2170 cmp f54:beq inch
2180 sta &73
2190 jmp cont
2200
2210 .inch
2220 lda f48:sta &73
2230 lda f71:clc:adc f1
2240 cmp f52:beq hu4
2250 .mark
2260 cmp f58:beq hu10
2270 sta &71
2280 jmp cont
2290
2300 .hu4
2310 lda f70:cmp f2:bne mark
2320 lda f48:sta f71:sta &70
2330 jmp cont
2340
2350 .hu10
2360 lda f48:sta f71
2370 lda f70:clc:adc f1:sta &70
2380 jmp cont
2390
2400 .print
2410 lda f134:jsr b
2420 stx f76
2430 stv f77
2440 lda f31:jsr a
2450 lda f7E:jsr a
2460 lda f7F:jsr a
2470 ldv f0
2480 .loop
2490 lda f70.Y:jsr a:inv
2500 cpv f5:bne loop
2510
2520 lda f31:jsr a
2530 lda f76:jsr a
2540 lda f77:jsr a
2550 rts
2560
2570 .sdal
2580 lda f70:cmp f82
2590 bne ret
2600 lda f71:cmp f83
2610 bne ret
2620 lda f73:cmp f85
2630 bne ret
2640 lda f74:cmp f86
2650 bne ret
2660 .snd
2670 lda f7:ldx f&88:ldv f0
2680 jsr w
2690 .ret
2700 rts
2710
2720 J
2730 NEXT LX

```


PROGRAM FILE

```

2740 ?%208=&1700 MOD 256:??%209=&1700 DIV 256
2750 PROCINST
2760 END
2770 DEFPROCINST
2780 CLS
2790 INPUT "Clock Time: ",TMS
2800 FOR CTX=&70 TO &74
2810 7CTX=ASC(MID$(TMS,CTX-&6F,1))
2820 NEXT
2830 PRINT:PRINT"      *ZINITCL - Initialise and start clock*"
      - Switch display on/off"
2840 PRINT
2850 INPUT "Alarm Time: ",TMS
2860 FOR CTX=&82 TO &86
2870 IF CTX=&84 THEN GOTO 2890
2880 7CTX=ASC(MID$(TMS,CTX-&81,1))
2890 NEXT
2900 PRINT:PRINT"      *ZALM ON/OFF - Switch alarm on/off*"
2910 ENDPROC

```

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Amstrad PCW8256 GSX Graphics Shell

by J O'Regan

This program allows you to make use of GSX graphics within a Basic program. To use the program, you must have the GSX extension installed with Basic. This loads into memory along with Basic and displays a message saying so. The program itself allows easy use of GSX graphics without having to use complex codes.

The program installs a set of graphics subroutines which are then available to the Basic program. Before the routines can be used, a disk must be set up containing the various drivers and Basic with the GSX extension. Details of this are given in an article about GSX graphics published in the May issue of PCW.

A demonstration program to make use of the subroutines is also included so that users can see how to incorporate the routines into their own programs. One half of the routines are necessary in all programs to set up the GSX workstations. These routines are essential and must appear in all programs before the graphic routines can be used. The short control program is also

necessary to initialise variables.

The rest of the routines are the graphics routines themselves. These perform the following: PLOT, DRAW, CIRCLE, BOX, TEXT, PRINT AT. All the graphics shapes can be filled in a wide variety of shades and styles: these 'colour' attributes are given in the fill style and index routine at line 1500. TEXT places text on the graphic screen and PRINT AT simulates a PRINT AT command. Output from the routines can go to the screen or various printers. The printers have a better resolution than the screen and can produce plots in a wider range, and so on. This facility is controlled by the workstation routines which define the capabilities of the display to be used.

When running the demonstration program, you are prompted for the output device — this should be the screen.

To see the example program, type-in and save the graphics routines (first listing) and the example program (second listing) separately. Then load the graphics routines, merge the demo program and run.

```

1 CLSA=CHR$(27)+CHR$(69):HOMES=CHR$(27)+CHR$(72):ATS=CHR$(27)+CHR$(69):BELLS=CHR
  $(7)
2 PRINT CLSA+HOMES:PRINT "(S)CREEN OUTPUT, (H)IGH RES PRINTOUT OR (L)OW RES PRI
  NTOUT"
3 AS=UPPER$(INKEY$):IF AS<"S" AND AS<"H" AND AS<"L" THEN 3
4 IF AS="S" THEN PTR=1:DEVICE=1
5 IF AS="H" THEN PTR=0.5:DEVICE=21
6 IF AS="L" THEN PTR=0.5:DEVICE=22
9 DIM C$(6),X$(126),OUT$(12),I$(64),OUT$(45)
10 GOSUB 9000:GOSUB 9330
15 DIM J(64),K(64)
20 REM
30 REM PLACE MAIN PROGRAM FROM HERE ONWARDS
40 REM
900 PRINT CLSA+HOMES:GOSUB 9430:END
1000 REM
1010 REM CIRCLE O1,O2,R
1020 REM SET FILL USING ROUTINE AT 1500
1030 REM
1040 PI=22/7:PII=2*PI
1050 STP=PII/63
1060 C=1
1070 FOR A=0 TO PII STEP STP
1080 J(C)=(O1+40)+((R*SIN(A))*40):X(C)=(O2+80)+((R*COS(A))*80)+0.7*PTR
1090 C=C+1
1100 NEXT A
1110 FOR P=1 TO 127 STEP 2
1120 C=INT((P/2)+1)
1130 I$(P)=J(C):X$(P+1)=K(C)
1140 NEXT P

```


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PROGRAM FILE

```

1150 X%(127)=X%(1):X%(128)=X%(2)
1160 EC=64
1170 IF FILL=1 THEN 1200
1180 GOTO 2500
1200 REM POLYGON FILL ROUTINE
1210 REM COORDS IN X% ARRAY
1220 REM NO OF POINTS SET TO MC
1230 REM
1240 C%(1)=9:C%(2)=MC:GOSUB 9230
1250 RETURN
1500 REM
1510 REM SET STYLE AND INDEX
1520 REM
1530 C%(1)=23:C%(2)=0:IN%(1)=STYLE
1540 GOSUB 9230
1550 C%(1)=24:C%(2)=0:IN%(1)=INDEX
1560 GOSUB 9230
1570 RETURN
2000 REM
2010 REM BOX - LOWER LEFT = X1,Y1, UPPER RIGHT = X2,Y2
2020 REM SET STYLE AND INDEX IF TO BE FILLED
2030 REM FOR FILL SET FILL TO 1
2040 REM
2050 X%(1)=40*X1:X%(2)=80*Y1:X%(3)=40*X1:X%(4)=80*Y2:X%(5)=40*X2:X%(6)=80*Y2:X%(7)=40*X2:X%(8)=80*Y1:X%(9)=40*X1:X%(10)=80*Y1
2055 EC=5
2060 IF FILL=1 THEN GOSUB 1200
2070 GOSUB 2500
2080 RETURN
2500 REM
2510 REM POLY LINE FACILITY
2520 REM COORDS IN X% ARRAY
2530 REM SET MC TO NUMBER OF POINTS
2540 REM
2550 C%(1)=6:C%(2)=MC:GOSUB 9230
2560 RETURN
3000 REM
3010 REM PLACE TEXT AT X1,Y1
3020 REM TEXT IN STRING VARIABLE MES$
3030 REM SET SIZE AS SIZE AND DIRECTION AS DR
3040 REM
3050 C%(1)=12:C%(2)=1:X%(1)=0:X%(2)=SIZE:GOSUB 9230
3055 C%(1)=13:IN%(1)=DR*10:GOSUB 9500
3060 C%(1)=8:C%(2)=1:C%(4)=LEN(MES$):X%(1)=40*X1:X%(2)=80*Y1
3070 FOR T=1 TO LEN(MES$)
3080 IN%(T)=ASC(MID$(MES$,T,1))
3090 NEXT T
3100 GOSUB 9230
3110 RETURN
7500 REM
7510 REM PRINT AT X,Y;
7520 REM
7530 PRINT AT+CHRS(Y*32)+CHRS(X*32);
7540 RETURN
8000 REM
8010 REM MOVE X1,Y1: DRAW X2,Y2
8020 REM
8030 X%(1)=X1*40:X%(2)=Y1*80:X%(3)=X2*40:X%(4)=Y2*80
8040 C%(1)=6:C%(2)=2:GOSUB 9230
8050 RETURN
8100 REM
8110 REM PLOT X1,Y1
8120 REM
8130 X%(1)=X1*40:X%(2)=Y1*80:C%(1)=7:C%(2)=1:GOSUB 9230
8140 RETURN
8200 REM
8210 REM DRAW BOX UR=X2,Y2 LL=X1,Y1
8220 REM
8230 C%(1)=9:C%(2)=4:X%(1)=X1*40:X%(2)=Y1*80:X%(3)=X1*40:X%(4)=Y2*80:X%(5)=X2*40:X%(6)=Y2*80:X%(7)=X2*40:X%(8)=Y1*80
8240 GOSUB 9230
8250 RETURN
9000 REM
9010 REM SET UP
9030 REM
9040 GSX%=&H30
9050 POKE GSX%+0,&H50
9060 POKE GSX%+1,&H59
9070 POKE GSX%+2,&H8E
9080 POKE GSX%+3,&H15
9090 POKE GSX%+4,&H3C
9100 POKE GSX%+5,&H5
9110 POKE GSX%+6,&H0
9120 RETURN
9200 REM
9210 REM CALL GSX
9220 REM
9230 CALL GSX(GSX%,GSX%,C%(1),IN%(1),X%(1),OUT%(1),POUT%(1))
9240 RETURN
9300 REM
9310 REM OPEN WORKSTATION
9320 REM
9330 C%(1)=1:C%(2)=0:C%(4)=10
9340 RESTORE 9360:FOR I=2 TO 10:READ IN%(I):NEXT I
9345 IN%(1)=DEVICE
9350 GOTO 9230
9360 DATA 1,1,1,1,1,1,0,1,1
9400 REM
9410 REM CLOSE WORKSTATION
9420 REM
9430 C%(1)=2:C%(2)=0:C%(4)=0:GOTO 9230
9500 REM
9510 REM CALL GSX WITH ONE PARAMETER
9520 REM
9530 C%(2)=0:C%(4)=1:GOTO 9230
10000 REM
10010 REM CLEAR SCREEN
10020 REM
10030 C%(1)=3:C%(2)=0:GOSUB 9230:RETURN
100 REM
110 REM DEMO PROGRAM OF GRAPHICS ROUTINES
120 REM
130 REM (C) JAMES O'REGAN 1986
140 REM
150 PRINT CLS+HOME$
160 MES$="WITH THESE ROUTINES VARIOUS EFFECTS CAN BE PRODUCED":X1=20:Y1=360:SIZE
~1:DR=0:GOSUB 3000

```


PROGRAM FILE

MICROMART

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```

170 MES$="FOR EXAMPLE...":X1=20:Y1=340:GOSUB 3000
180 MES$="A SINE WAVE":X1=100:Y1=300:GOSUB 3000
185 X1=4:Y1=125
190 FOR X=0 TO ((22/7)*2) STEP 0.1
200 X2=X2+4:Y2=125+(120*(SIN(X))):GOSUB 3000:X1=X2:Y1=Y2:REM PLOT X1,Y1 AND DRAW
    TO X2,Y2
210 NEXT X
220 MES$="OR A COSINE WAVE":X1=400:Y1=300:GOSUB 3000
230 X1=404:Y1=125+120:X2=400:Y2=125+120
240 FOR X=0 TO ((22/7)*2) STEP 0.1
250 X2=X2+4:Y2=125+(120*(COS(X))):GOSUB 3000:X1=X2:Y1=Y2
260 NEXT X
270 MES$="PRESS ANY KEY TO CARRY ON THE DEMONSTRATION":X1=150:Y1=20:GOSUB 3000
280 AS=INKEY$:IF AS="" THEN 280
290 PRINT CLS$+HOME$
300 MES$="YOU CAN ALSO DRAW CIRCLES OF VARYING SIZES...":X1=20:Y1=360:GOSUB 3000
310 O1=400:O2=200:R=140:FILL=0:GOSUB 1000:REM UNFILLED CIRCLE AT O1,O2 WITH RADI
    US R
320 O1=100:O2=100:R=80:GOSUB 1000
330 O1=260:O2=300:R=30:GOSUB 1000
340 O1=680:O2=110:R=100:GOSUB 1000
350 O1=500:O2=190:R=130:GOSUB 1000
360 MES$="PRESS ANY KEY TO CARRY ON THE DEMONSTRATION":X1=150:Y1=20:GOSUB 3000
370 AS=INKEY$:IF AS="" THEN 370
380 PRINT CLS$+HOME$
390 MES$="A BOX DRAWING ROUTINE IS ALSO AVAILABLE...":X1=20:Y1=360:GOSUB 3000
400 X1=20:Y1=20:X2=500:Y2=330:FILL=0:GOSUB 2000:REM UNFILLED BOX FROM X1,Y1 TO X
    2,Y2
410 X1=100:Y1=120:X2=660:Y2=160:GOSUB 2000
420 X1=750:Y1=10:X2=790:Y2=340:GOSUB 2000
430 X1=80:Y1=220:X2=480:Y2=320:GOSUB 2000
440 X1=300:Y1=30:X2=730:Y2=280:GOSUB 2000
450 MES$="PRESS ANY KEY TO CARRY ON THE DEMONSTRATION":X1=150:Y1=20:GOSUB 3000
460 AS=INKEY$:IF AS="" THEN 460
465 PRINT CLS$+HOME$
470 MES$="YOU CAN ALSO DRAW LINES ANYWHERE ON THE SCREEN...":X1=20:Y1=360:GOSUB
    3000
480 FOR T=1 TO 100
490 X1=RND(1)*800:Y1=RND(1)*350:X2=RND(1)*800:Y2=RND(1)*350:GOSUB 8000:REM DRAW
    LINE BETWEEN TWO RANDOM POINTS
500 NEXT T
510 MES$="PRESS ANY KEY TO CARRY ON THE DEMONSTRATION":X1=150:Y1=20:GOSUB 3000
520 AS=INKEY$:IF AS="" THEN 520
525 PRINT CLS$+HOME$
530 MES$="INDIVIDUAL POINTS MAY ALSO BE PLOTTED...":X1=20:Y1=360:GOSUB 3000
540 FOR T=1 TO 200
550 X1=RND(1)*800:Y1=RND(1)*350:GOSUB 8100:REM PLOT RANDOM POINTS
560 NEXT T
570 MES$="PRESS ANY KEY TO CARRY ON THE DEMONSTRATION":X1=150:Y1=20:GOSUB 3000
580 AS=INKEY$:IF AS="" THEN 580
590 PRINT CLS$+HOME$
600 MES$="AND ALL THE ROUTINES CAN BE COMBINED...":X1=20:Y1=360:GOSUB 3000
610 X1=0:Y1=0:X2=800:Y2=350:GOSUB 2000:REM DRAW BOX
620 FOR N=0 TO 800 STEP 40
630 X1=N:X2=800:Y2=N/2.285714:GOSUB 8000:REM DRAW LINE
640 X1=N:Y1=0:X2=0:Y2=350-(N/2.285714):GOSUB 8000
650 X1=N:Y1=350:X2=800:Y2=350-(N/2.285714):GOSUB 8000
660 X1=N:Y1=350:X2=0:Y2=N/2.285714:GOSUB 8000
670 NEXT N
680 O1=400:O2=175:R=140:GOSUB 1000:REM DRAW CIRCLE
690 FOR T=1 TO 50
700 X1=400+((RND(1)*150)-75):Y1=175+((RND(1)*150)-75):GOSUB 8100:REM PLOT RANDOM
    POINTS INSIDE CIRCLE
710 NEXT T
720 MES$="PRESS ANY KEY TO REPEAT OR SPACE BAR TO EXIT":X1=150:Y1=20:GOSUB 3000
730 AS=INKEY$:IF AS="" THEN 730
740 IF AS=" " THEN 990
750 GOTO 100
970 XX=0:YY=0:GOSUB 7500:PRINT CHR$(7):
980 AS=INKEY$:IF AS="" THEN 980
990 PRINT CLS$+HOME$:GOSUB 9430:END
    
```



Amstrad PCW8256 Backgammon

by Chris Gregory

This backgammon program plays a fairly direct game. I tried it at quite a low level (15 seconds thinking time) and got beaten in a close contest. The program also includes a facility to change the program's style of play, from defensive to aggressive.

The main thing left out of the program is the doubling facility. It shouldn't be too hard to add this.

The program contains a simple and short machine code routine; this is used to transfer the contents of the board array for processing.

```

10 DEF FNchr$(y,x,text$)=CHR$(27)+"Y"+CHR$(32+x)+CHR$(32+y)+text$
20 DEF FNpos$(y,x)=CHR$(27)+"Y"+CHR$(32+x)+CHR$(32+y)
30 cls=CHR$(27)+"E"+CHR$(27)+"E"
40 bdc$=CHR$(27)+"f"
50 ebc$=CHR$(27)+"e"
60 bel$=CHR$(7)
70 PRINT cls
80 DEFINT a-y
90 titles$=" B A C K G A M M O N "
100 PRINT FNchr$(20,1,titles$)
110 PRINT FNchr$(16,3,"Copyright Chris Gregory 1986")
120 WHILE x$<>"end"
130 PRINT xs
140 READ xs
150 VEND
160 PRINT
170 INPUT "Please enter a random number"
180 RANDOMIZE x
190 INPUT "Please enter the maximum thinking time (secs) : "
200 resp.time = resp.time + 2
210 INPUT "Please select computer style of play (1-5) : "
220 IF agg > 5 OR agg < 1 THEN 210
    
```


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PROGRAM FILE

```

230 INPUT "Do you want to move first ?
240 IF xs="Y" OR xs="y" THEN p.first=1
250 OPTION RUN
260 GOSUB 410 : REM print board
270 WHILE men.offp < 15 AND men.offc < 15
280 IF p.first = 0 THEN p.first = 1: GOTO 300
290 GOSUB 1090 : REM players move
300 IF men.offp < 15 THEN GOSUB 1750 : REM computers move
310 VEND
320 IF men.offp=15 THEN PRINT FNscr$(2,24,"Vell done, you won"+SPACE$(40))
330 IF men.offc=15 THEN PRINT FNscr$(2,24,"Bad luck, I won"+SPACE$(40))
340 PRINT ahea
350 PRINT FNpos$(2,26):
360 INPUT "Do you want another game (y/n) ? " , xs
370 IF xs="Y" OR xs="y" THEN RUB
380 PRINT clea
390 PRINT "Bye.....!"
400 END
410 PRINT bde3
420 PRINT clea
430 PRINT CHR$(150);STRING$(21,154);titles;STRING$(46,154);CHR$(156)
440 FOR i=1 TO 27:PRINT CHR$(149);NEXT i
450 PRINT CHR$(147);STRING$(89,154);
460 FOR i=2 TO 28:PRINT FNscr$(90,1,CHR$(149));:NEXT
470 PRINT FNscr$(90,29,CHR$(153));
480 PRINT FNscr$(13,4,"Y X V U T S R Q P O N M K")
490 READ no.lines
500 WHILE no.lines < 999
510 lines=""
520 READ i
530 WHILE i < 999
540 READ char
550 FOR n = 1 TO i
560 IF char=20 THEN lines=lines+SPACE$(1) ELSE lines = lines + CHR$(char):
570 NEXT n
580 READ i
590 VEND
600 FOR n = 1 TO no.lines
610 PRINT CHR$(149);SPACE$(15);lines
620 NEXT n
630 READ no.lines
640 VEND
650 PRINT FNscr$(18,21,"A B C D E F G H I J K L")
660 DIM posn(25),posn1(25),posn2(25),posn3(25),posn4(25),move(4),dice(4),pv(25)
670 FOR i = 0 TO 25
680 READ posn(i)
690 READ pv(i)
700 GOSUB 830
710 NEXT i
720
730 REM load machine code block copy routine
740
750 MEMORY HIMEM-6
760 FOR i = 1 TO 6
770 READ n
780 POKE HIMEM+i,n
790 NEXT i
800 zcopy=HIMEM+1
810 RETURN
820
830 REM print board subroutine
840
850 IF posn(1) > 9 THEN char = 187:n=posn(1)/10:no=posn(1)/10 ELSE char=188:n=p
860 aea(1):no=posn(1)
870 IF posn(1)=0 AND posn(1)>9 THEN no=posn(1)/10
880 high=MAX(1,n,no)
890 IF i < 13 THEN inc = -1 ELSE inc = 1
900 IF i > 12 THEN row=5: col=16+2*(25-i) ELSE row=20:col=16+2*i
910 IF i > 6 AND i < 19 THEN col = col + 6
920 IF i = 0 OR i = 25 THEN col = 13
930 FOR a = 1 TO high
940 IF a > n THEN char = 32
950 IF a = 1 AND n=0 AND col < 13 THEN char = 144
960 row = row + inc
970 PRINT FNscr$(col,row,CHR$(char))
980 NEXT a
990 RETURN
1000 REM throw dice and print them
1010
1020 dice(1)=INT(6*RND(1))+1
1030 dice(2)=INT(6*RND(1))+1
1040 PRINT FNpos$(55,13);dice(1)
1050 PRINT FNpos$(63,13);dice(2)
1060 IF dice(1)=dice(2) THEN num.moves=4:dice(3)=dice(1):dice(4)=dice(1) ELSE nu
1070 moves=2
1080 RETURN
1090 REM players move
1100
1110 WHILE INKEY$<>"":VEND : REM empty buffer
1120 GOSUB 1020 : REM throw dice
1130 PRINT FNscr$(2,24,"Your move.....Please enter your move below each die.");
1140 IF bna<>" THEN PRINT FNscr$(2,26,"( My move was : "+bna+" )")
1150 PRINT ahea
1160 FOR i = 1 TO num.moves
1170 IF i=1 THEN row=15:col=56
1180 IF i=2 THEN row=15:col=64
1190 IF i=3 THEN row=17:col=56
1200 IF i=4 THEN row=17:col=64
1210 PRINT FNpos$(col,row);
1220 xs=""
1230 WHILE xs=""
1240 xs = INKEY$
1250 VEND
1260 IF xs=CHR$(27) THEN 350
1270 move(1)=UPPER$(xs)
1280 PRINT move$(1)
1290 IF move$(1)="" THEN move(1)=0 ELSE move(1)=ASC(move$(1))-64
1300 IF move(1) < 0 OR move(1) > 25 THEN inv.move=1
1310 NEXT i
1320 IF inv.move=1 THEN PRINT FNscr$(2,26,"You must enter A-Y or space."+SPACE$(40))
1330 PRINT bde3
1340 CALL zcopy(posn(0),posn(0))
1350 men.offc = men.offp
1360 s=0
1370 FOR i = 1 TO num.moves
1380 IF move(i)=0 THEN 1400
1390 IF move(i) < 0 OR move(i) > 25 THEN 1610

```


PROGRAM FILE

MICROMART

```

1400 IF posn(move(1)) < 10 THEN 1610
1410 pto=move(1)-dice(1)
1420 IF pto < 1 THEN GOSUB 1650
1430 IF inv.move = 1 THEN inv.move=0 :GOTO 1610
1440 IF pto < 1 THEN 1470
1450 IF posn(pto) > 1 AND posn(pto) < 10 THEN 1610
1460 IF posn(pto)=1 THEN posn(0)=posn(0)+1:posn(pto)=10 ELSE posn(pto)=posn(
pt)+10
1470 posn(move(1))=posn(move(1))-10
1480 IF pto < 1 THEN men.offp=men.offp+1
1490 NEXT 1
1500 IF posn(25) = 0 THEN 1560
1510 inv.move=0
1520 FOR a=1 TO num.moves
1530 IF move(a)>25 AND move(a)<0 THEN inv.move=1
1540 NEXT a
1550 IF inv.move=1 THEN PRINT FNscr(2,26,"You must move men from the bar first.
"+SPACES(40)):inv.move=0:GOTO 1640
1560 FOR i=0 TO 25
1570 GOSUB 830
1580 NEXT i
1590 IF num.moves=4 THEN PRINT FNscr(56,17,SPACES(9))
1600 RETURN
1610 IF i=1 AND e=0 THEN SWAP move(1),move(2):SWAP dice(1),dice(2):a=1:GOTO 1400
1620 IF e=1 THEN SWAP move(1),move(2):SWAP dice(1),dice(2)
1630 PRINT FNscr(2,26,"Illegal move ..... please re-enter. ")
1640 CALL zcopy(posn(0),posn(0))
1650 men.offp=men.offp
1660 GOTO 1150
1670
1680 REM check that bearing off is valid
1690
1700 IF pto = 0 THEN from=7 ELSE from=move(1)+1
1710 FOR a = from TO 25
1720 IF posn(a)>9 THEN inv.move=1 :a=26
1730 NEXT a
1740 RETURN
1750
1760 REM computers move
1770
1780 GOSUB 1020
1790 PRINT FNscr(2,24,"My move ..... thinking ..... "+SPACES(50))
1800 PRINT FNscr(56,15,SPACES(10))
1810 PRINT FNscr(2,26,SPACES(70))
1820 FOR i=1 TO 4
1830 move(i)=25
1840 NEXT i
1850 max.score=-9999
1860 vm=0
1870 CALL zcopy(posn(0),posn(0))
1880 bms=""
1890 max.vm=0
1900 s=0
1910 eval.count=0
1920 FOR m1=0 TO 24
1930 PRINT FNscr(2,26,STR$(m1))
1940 IF posn(m1)=0 OR posn(m1)>9 THEN 2200
1950 pto=m1+dice(1)
1960 IF pto>24 THEN high=m1-1:GOSUB 3220:IF inv.move=1 THEN inv.move=0:GOTO 2
200 ELSE pto=25:GOTO 2000
1970 IF posn(pto) > 10 OR posn(pto)=9 THEN 2200
1980 IF posn(pto) = 10 THEN posn(pto)=0:posn(25)=posn(25)+10
1990 posn(pto)=posn(pto)+1
2000 posn(m1)=posn(m1)-1
2010 vm=1
2020 CALL zcopy(posn(0),posn(0))
2030 FOR m2 = 0 TO 24
2040 IF m2>0 AND posn(0)>0 THEN 2160
2050 IF posn(m2) = 0 OR posn(m2) > 9 THEN 2160
2060 pto=m2+dice(2)
2070 IF pto > 24 THEN high=m2-1:GOSUB 3220:IF inv.move=1 THEN inv.move=0:G
OTO 2160 ELSE pto=25:GOTO 2110
2080 IF posn(pto) > 10 OR posn(pto)=9 THEN 2160
2090 IF posn(pto) = 10 THEN posn(pto)=0:posn(25)=posn(25)+10
2100 posn(pto)=posn(pto)+1
2110 posn(m2)=posn(m2)-1
2120 vm=2
2130 IF num.moves = 4 THEN GOSUB 2920 ELSE GOSUB 2450
2140 CALL zcopy(posn(0),posn(0))
2150 IF eval.count > resp.time AND max.score > -9999 THEN m2=25
2160 NEXT m2
2170 IF vm<num.moves AND num.moves=2 THEN GOSUB 2450
2180 CALL zcopy(posn(0),posn(0))
2190 IF eval.count > resp.time AND max.score > -9999 THEN m1=25
2200 NEXT m1
2210
2220 REM if not a double swap the dice and try again
2230
2240 IF s=0 AND num.moves=2 THEN e=1:SWAP dice(1),dice(2):GOTO 1920
2250
2260 REM update the table with the best move found
2270
2280 FOR i=1 TO num.moves
2290 IF move(i)=25 THEN 2350
2300 posn(move(i))=posn(move(i))-1
2310 pto=move(i)+dice.save(i)
2320 IF pto>24 THEN men.offp=men.offp+1:GOTO 2350
2330 IF posn(pto) = 10 THEN posn(pto)=0:posn(25)=posn(25)+10
2340 posn(pto)=posn(pto)+1
2350 NEXT i
2360 PRINT bms;
2370
2380 REM print the new board
2390
2400 FOR i=0 TO 25
2410 GOSUB 830
2420 NEXT i
2430 IF bms="" THEN bms="I couldn't move"
2440 RETURN
2450
2460 REM evaluate position
2470
2480 IF va(max.va THEN 2880 ELSE max.vm=vm :REM must move as many as possible
2490 IF posn(0)=0 AND ((m1>0 AND m1<25) OR (m2>0 AND m2<25)) THEN 2880
2500 men.count=0
2510 eval.count = eval.count+1
2520 point.count=0
2530 blot.danger=0
2540 FOR i=1 TO 24
2550 IF posn(i)>9 OR posn(i)=0 THEN 2630
2560 men.count=men.count+posn(i)

```

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PROGRAM FILE



IBM Prompt Tips

by M McDonald

The PROMPT command enables the user to change the DOS prompt from the conventional and unhelpful A>. However, IBM doesn't document another very useful facility of the PROMPT command; this undocumented facility enables you to redefine any character on the keyboard and change colours on the screen. The format these two functions take is shown below: the first is that used to redefine keyboard characters; the second to change colours.

- (1) PROMPT \$E[0;68;"DIR"p
(2) PROMPT \$E[33;44M

The first function shows how to set up F10 for directory, the number 68 being the code for that key followed by the string you want to attach to

the key; this in turn is followed by a lower-case 'p' which gives a return.

The second function sets up a colour screen with a yellow foreground (code 33) and a blue background (code 44). Being undocumented, there's much room for exploration and problems. Redefining function keys tends not to go well with non-booted programs; also, none of this works without an uncorrupted ANSI.SYS. This driver can easily be corrupted, so if these ideas don't work, try a fresh, untouched copy of ANSI.SYS.

There are a number of uses for this tip, such as converting your keyboard to the Dvorak layout or just making DOS less time consuming.

ASCII codes

ALT-A	30	ALT-N	49	CTRL-A	1	CTRL-N	14
ALT-B	48	ALT-O	24	CTRL-B	2	CTRL-O	15
ALT-C	46	ALT-P	25	CTRL-C	3	CTRL-P	16
ALT-D	32	ALT-Q	16	CTRL-D	4	CTRL-Q	17
ALT-E	18	ALT-R	31	CTRL-E	5	CTRL-R	18
ALT-F	33	ALT-S	31	CTRL-F	6	CTRL-S	19
ALT-G	34	ALT-T	20	CTRL-G	7	CTRL-T	20
ALT-H	35	ALT-U	22	CTRL-H	8	CTRL-U	21
ALT-I	23	ALT-V	47	CTRL-I	9	CTRL-V	22
ALT-J	36	ALT-W	17	CTRL-J	10	CTRL-W	23
ALT-K	37	ALT-X	45	CTRL-K	11	CTRL-X	24
ALT-L	38	ALT-Y	21	CTRL-L	12	CTRL-Y	25
ALT-M	50	ALT-Z	44	CTRL-M	13	CTRL-Z	26

Function keys

F-1	59	SHIFT F-1	84	ALT F-1	104	CTRL F-1	94
F-2	60	SHIFT F-2	85	ALT F-2	105	CTRL F-2	95
F-3	61	SHIFT F-3	86	ALT F-3	106	CTRL F-3	96
F-4	62	SHIFT F-4	87	ALT F-4	107	CTRL F-4	97
F-5	63	SHIFT F-5	88	ALT F-5	108	CTRL F-5	98
F-6	64	SHIFT F-6	89	ALT F-6	109	CTRL F-6	99
F-7	65	SHIFT F-7	90	ALT F-7	110	CTRL F-7	100
F-8	66	SHIFT F-8	91	ALT F-8	111	CTRL F-8	101
F-9	67	SHIFT F-8	92	ALT F-9	112	CTRL F-9	102
F-10	68	SHIFT F-10	93	ALT F-10	113	CTRL F-10	103

Colour codes

0 ALL ATTRIBUTES OFF	1 HIGH INTENSITY ON
4 UNDERSCORE ON	5 BLINKING ON
7 INVERSE VIDEO ON	8 INVISIBLE VIDEO ON
30 FOREGROUND BLACK	31 FOREGROUND RED
32 FOREGROUND GREEN	33 FOREGROUND YELLOW
34 FOREGROUND BLUE	35 FOREGROUND MAGENTA
37 FOREGROUND WHITE	41 BACKGROUND RED
40 BACKGROUND BLACK	43 BACKGROUND YELLOW
42 BACKGROUND GREEN	45 BACKGROUND MAGENTA
44 BACKGROUND BLUE	47 BACKGROUND WHITE
46 BACKGROUND CYAN	

Programs

The following routine sets up all 10 function keys:

```
PROMPT $E[0;59;"A:";13p
PROMPT $E[0;60;"B:";13p
PROMPT $E[0;61;"C:";13p
PROMPT $E[0;62;"DIR";13p
PROMPT $E[0;63;"DIR/P";13p
PROMPT $E[0;64;"DIR/W";13p
PROMPT $E[0;65;"MODE CO 80";13p
```

```
PROMPT $E[0;66;"MODE
MONO";13p
```

```
PROMPT $E[0;67;"BASICA";13p
PROMPT $E[0;68;"PROMPT";13p
```

The following routine sets the colour screen with cyan background and blue foreground:

```
mode co 80
PROMPT $E[34;46M
CLS
```

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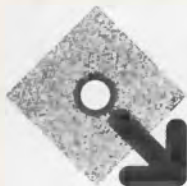
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A chess game where neither program really knows what it is doing is the subject of this month's column, annotated by Kevin O'Connell.

This month's game is somewhat different, in that it is what might reasonably be described as a typical encounter between two programs; that is to say that neither program really knows what it is doing but nonetheless each manages to play remarkably well in patches.

The provenance of each of the two programs is quite interesting. Vaxchess is an English program which is basically a mainframe implementation of a microcomputer program. To my knowledge, this is the first time that a micro program has been converted to run on a mainframe.

The Lachex program, meanwhile, emanates from work at the research laboratories in Los Alamos (which are better known for work on nuclear weapons' research and, in particular, the development and testing of the first atomic bomb).

There is certainly more than one move in the game that explodes with a force not dissimilar to that original Los Alamos test. The game was played in the third round of the 5th World Computer Championship in Cologne earlier this year.

White: Vaxchess. Black: Lachex.
Opening: Queen's Gambit Declined.

1	d2-d4	d7-d5
2	c2-c4	e7-e6
3	Nb1-c3	Ng8-f6
4	Bc1-g5	Nb8-d7
5	e2-e3	c7-c6
6	Ng1-f3	Qd8-a5
7	c4xd5	Nf6xd5
8	Qd1-d2	Bf8-b4
9	Ra1-c1	h7-h6

So far, so much book theory. Now 10 Bg5-h4 is the normal move.

10 ... Nd5xf4 gives Black at least equality, although the way the game goes he gets a lot more.

11 Bf4-g3 c6-c5

With a very useful pin against the white knight on c3, Black proceeds to free his game and take the initiative.

12	Bf1-d3	f7-f5
13	O-O	
13	...	c5xd4
14	e3xd4?	

This loses a piece. 14 Nf3xd4 was necessary. Then 14 ... e6-e5 (intending f5-f4) would not succeed in winning anything because of 15 Nd4-b3 when White, threatening Bd3-c4, stands much better.

14	...	f5-f4
15	Qd2-e1	Nd7-f6!

It is important to hang on to the e-pawn.

16	Bg3-h4	g7-g5
17	Bh4xg5	h6xg5

18	Qe1-e5	
18	Nf3xg5 is weaker: 18 ...	
Nd5xc3	19 b2xc3	Qa5xg5!
20 c3xb4	f4-f3	21 g2-g3
Qg5-g4	and there is	no good answer to the threat of
Qg4-h3-g2.		

18	...	Nd5xc3
19	b2xc3	Bb4xc3
20	Qe5xa5	Bc3xa5
21	Rc1-c5	Ba5-b4

White, though he will get a pawn for it, is a whole piece down.

22 Rc5-e5
A strange decision, since 22 Rc5xg5+ immediately regains one pawn and starts to build some real pressure against the black king.

22	...	g5-g4
23	Re5-g5+	Kg8-f7
24	Nf3-e5+	Kf7-e8
25	Rf1-c1	

Now 25 Ne5xg4 Nf6xg4 26 Rg5xg4 e6-e5 would let Black regain the pawn.

25	...	Ke8-d8
26	Rg5-g7	Bb4-a3

This just loses time. I much prefer 26 ... Bc8-d7, intending Ra8-c8. Having an extra piece is only useful if you can actually use it.

27	Rc1-b1	f4-f3
28	Rb1-b3	Ba3-c1

The bishop does nothing here and would be much more usefully planed on d6.

29	g2xf3	g4xf3
30	Ne5-f7+	Kd8-e7
31	Bd3-g6	Nf6-d5

31 ... b7-b6, trying to get the pieces moving, must be better.

32	Nf7-e5+	Ke7-f6
33	Rg7-h7	a7-a5

Again, this does not help.

34	Rb3xf3+	Bc1-f4
35	h2-h4	

At this point I walked up to the board, glanced at the position and congratulated White's programmer on having such a tremendous position. He looked flabbergasted and pointed out that he was a piece down. I then counted the pieces and had to agree that his arithmetic was correct but stuck to my assessment that the white program had the better chances. He looked at me disbelievingly as I walked back to my own game.

35	...	Ra8-a6
36	Kg1-f1	Ra6-c6
37	Bg6-e4!	

37 Ne5xc6 would be a dreadful blunder — simply 37 ... Kf6xg6 leaves all White's pieces in trouble. Now Be4xd5 is a very serious threat.

37	...	Rc6-c1+
38	Kf1-e2	Rc1-g1

39	Be4xd5	Kf6-f5
39...	e6xd5 loses horribly to 40	Rf3xf4+ Kf6-e6 41 Rf4xf8.
40	Rh7-h5+	Kf5-f6
41	Bd5-e4?	

After all the good work (or, alternatively, after all Black's horrible moves), White reciprocates! Simply 41 Rf3xf4+, followed by Rf4xf8 and then retreating the bishop would have won easily.

41	...	Kf6-g7
42	Ne5-d3??	

This is the real blunder, since 42 Rh5-h7+ Kg7-g8 43 Ne5-g6 would still win (for example, 43 ... Kg8xh7 44 Ng6xf8+ and 45 Rf3xf4).

42	...	Bf4-d6
43	Rf3xf8	Kg7xf8

Black is crawling out of the hole. True he is a pawn down and is objectively lost, but he has avoided being the extra piece down and he even has the two bishops.

44	Rf5-g5	
----	--------	--

Good. When ahead, exchange pieces. It is also a very good idea to reunite split pawns.

44	...	Rg1xg5
----	-----	--------

Had White taken the a-pawn last move, then Black would now have been able to play Rg1-g4.

45	h4xg5	b7-b6
46	g5-g6	

This is premature, but, as it happens, does no great harm.

46	...	Bc8-a6
47	a2-a4	e6-e5?

It is remarkably generous of Black voluntarily to grant White two united passed pawns.

48	d4xe5	Bd6xe5
49	Ke2-e3	Be5-c7
50	f2-f3	Ba6-c8
51	Nd3-f4	Bc7xf4+?

Black should retain the two bishops.

52	Ke3xf4	Bc8-d7
53	Be4-c2	Kg8-g7
54	Kf4-g5	b6-b5
55	a4xb5	Bd7xb5
56	f3-f4	Bb5-c4
57	f4-f5	Kg7-g8
58	f5-f6	

White's win is clear for all to see.

58	...	Kg8-f8
59	Kg5-f4	Kf8-e8
60	Kf4-e5	Ke8-f8
61	Ke5-d4	Bc4-a2
62	g6-g7+?	

62 Kd4-c5 soon wins: for example, 62 ... Kf8-e8 63 Kc5-b5 Ke8-d7 64 Bc2-f5+ Kd7-d6 65 Kb5xa5 and the rest is trivial.

62	...	Kf8-f7
63	Bc2-h7	Kf7xf6
64	g7-g8B	Ba2xg8
	1/2-1/2	

END

Rupert Steele keeps you informed about the ACC calendar.

As regular readers will know, the ACC exists to help computer clubs around the country by providing insurance, publicity and a national organisation. Among the major projects run by the ACC is ClubSpot 810, operated by the Association's Electronic Publishing committee. This is a large area on the Prestel database, which you can get into by keying *810#, and which contains information about a variety of computer topics and hobbies.

Reorganisation

The ACC is also taking advantage of the new year to reorganise its calendar more effectively. The Association's financial year, membership year, and years for its various insurance policies are dotted around the calendar, according to when the particular scheme was set up. After the reorganisation, everything will run from 1 January to 31 December (although we are not planning to hold our annual meeting of clubs at the exact year end in Trafalgar Square). To set up this remarkably sensible new arrangement, the ACC Council will be convened in early December (either Saturday 6 or Sunday 7 — call Andy Purkiss on (0376) 515609 for details).

All qualifying computer clubs which are affiliated to the ACC are automatically covered by its third-party liability policy, and for a small additional premium clubs can get 'all risk' insurance cover on equipment brought to club meetings (and in transit). This cover is unusual in that it applies to 'unspecified items' — that is, whatever people bring along, rather than specific machines. For full details of both policies, contact Andy Purkiss.

All these benefits are only available to clubs which contact us, so please remember to drop a line to the ACC and I'll send you a pack full of information — you may also get a mention in this column.

Club news

This month, I'm starting in the south-west of England. Mark Fugatt has written to tell me of his group for the SuperBrain. For more details, why not drop him a line at 4a Bodowen Close, Burton, Christchurch, Dorset?

Moving into Gloucestershire, I have had a note from the Cheltenham Amateur Computer Club. This meets in the YMCA in Vittoria Walk, off Oriel Road, on the third Thursday of each month at 7.30pm in the Lecture Room. For more information, contact Steve Smith on Cheltenham 576043.

I've also had a letter from Mr FS

Cartwright who is interested in a group for Apricot computer users, particularly the now withdrawn F-series, the Portable and the basic Apricot PC. If you're interested in Mr Cartwright's group, please send an *sae* to him at 'Rockside', 13 Worley Ridge, Nailsworth, Gloucs GL6 0PD.

Next up is Chris Bryant from Devon, whose club is called *Amstrad Computing Newsletter*. The club, as you may guess, is largely focused on home users of the Amstrad machines, through the medium of a regular newsletter. Recent issues have included features about the game Adventure and reviews of various add-on hardware. Chris is offering a free issue in return for an *sae*, so send yours to him at 11 Havenview Road, Seaton, Devon EX12 2PF.

And, finally, from the south-west area is the Bournemouth Area Computer Club which welcomes people of any age and computer experience. It meets on the third Wednesday of each month, with special user groups for Commodore and Atari which meet on the first Wednesday and first Friday of the month respectively. The club also has considerable interest in the various Amstrad machines, as well as running computer competitions. Two months ago, it ran its own Computer Fayre at the Kinson Community Centre, Millhams Lane, Kinson, Bournemouth, which is where the meetings are usually held. For further details, contact Alan Dyer on (0202) 579973, or write to him at 6 Mayfair Gardens, Kinson, Bournemouth BH11 8LB.

Moving east to Southampton, I have had a note from Phil Eyres who runs the Memotech Owners' Club. The club is anxious to trace any Memotech dealers around the country so that it can inform its members about them. The club publishes a regular, detailed newsletter which includes software information and advice for those contemplating their own hardware work (for example, A/D converters), as well as details of special prices for club members from certain dealers, a program library, and much more.

For further information (and perhaps a sample newsletter if Phil is feeling generous), contact Phil Eyres at 23 Denmead Road, Harefield, Southampton SO2 5GS — with an *sae*, please.

Also on the south coast is the Eastbourne Computer Club. It meets on the second Tuesday of each month from 6.45pm to 9pm in room D12 at the Eastbourne College of Arts of Technology, St Annes Road, Eastbourne. The club is a general one, catering for a variety of machines.

For more information, phone Keith Scott on (0323) 30316 or Dennis Keen on (0323) 31463, or you can write to the club, c/o Mr R Cooke, 5 New Coastguard Cottages, Buckle Drive, Seaford, East Sussex BN25 2QJ.

Moving on to East Grinstead, I have received a note from Rod Smith who runs the Public Domain Software Interest Group (PDSIG to its friends). Public domain software has no restrictions on its copying and use (that is, the copyright owner has relinquished his/her rights). PDSIG has a library of over 1200 disks of CP/M and MS-DOS software, and says that in the last 12 months it has distributed some 1400Mbytes of software. Some of the material is 'shareware'; if you like the program, you are requested to send a small sum to the author. PDSIG is also looking at expanding its libraries to include Commodore, BBC, and so on, and Rod has asked that anyone who could help provide the starting material for these libraries should get in touch with him. The charge for each disk copied is £2 plus postage of 50p (preferably supplied in stamps). For full details of this enormous library, send an *sae* to Rod Smith, PDSIG, 138 Holtye Road, East Grinstead, Sussex RH19 3EA, or contact one of the group's bulletin boards: FIDO — (0342) 315636; CBBS — (0895) 420164; TBBS — (0895) 52685; or for those with a low-tech mind, on good-old voice on (03422) 313883.

And, finally, this month, from the London area, I have had a newsletter from my colleagues at the Kensington & Chelsea Computer Society. The club has changed its meeting day to Saturday, and it now meets on the second and fourth Saturday of each month, from 2.30pm to 5pm at the Parish Room, St Philips Church, Earls Court Road, London W8. The two meetings before Christmas will be November 22, when club deputy chairman Mark Knight will be displaying some of his mind-bending machine code graphics programs, and December 13 which is entitled 'Bring-a-micro-and-a-mince-pie'. For more details, write to me or call me on (01) 370 0601.

To tell the ACC about your computer club, to request a mention in this column, or to obtain labels for mailing to the ACC's register of computer clubs, contact: Rupert Steele, 12 Philbeach Gardens, London SW5 9DY. Tel: (01) 370 0601.

*For any other enquiry, including the details of your local computer club, send an *sae* and details of the enquiry to: John Dale, 12 Poplar Road, Newtown, Powys SY16 2QG. END*

Mike Mudge looks at the importance of the Fermat Quotient.

Definition. Two integers a and b are said to be congruent modulo a third integer c if, and only if, c is a factor of $a-b$.

This is written $a \equiv b \pmod{c}$ or $a \equiv b(c)$.

For example:

$23 \equiv 17 \pmod{3}$ since $23-17=6=2 \times 3$,
 $16688 \equiv 96 \pmod{17}$ since
 $16688-96=16592=976 \times 17$.

Consider the congruence:

$$a^{N-1} \equiv 1 \pmod{N^2} \dots (1)$$

This was investigated, for odd N and $a=2,3,4 \dots 99$ by DH and Emma Lehmer from 1960 to 1967. Their investigation extended earlier work including that of Fröberg, Kravitz, Pearson, Riesel, Hausner & Sachs and Kloss.

There are found to be two distinct problems; the first in which N is restricted to prime values, $p=3,5,7,11,13,17 \dots$ while the second considers composite(non-prime) values of N .

Readers should be aware that the Fermat Quotient is closely connected with Fermat's Last Theorem — through the criterion of Wieferich (1909)—and with Catalan's Conjecture through the work of Inkeri (1964); for these reasons alone it is worthy of both theoretical and empirical study.

(i) Some results when $N=p$ a prime

In 1962 the highest published search limit for $a=2$ was 200183 due to Pearson; by 1963 the Lehmers had searched to 2^{22} for $2 \leq a \leq 10$ and found the new solutions $p=1006003$ for $a=3$ and $p=534851$ for $a=6$, also $p=3152573$ for $a=6$.

In 1964 Riesel extended a to 150 finding all solutions $p < 500000$ for $2 \leq a \leq 10$ and $p < 10000$ for $11 \leq a \leq 150$.

In 1965 Kloss published solutions including $p=1747591$ for $a=13$, $p=2481757$ for $a=23$ and $p=1025273$ for $a=41$.

The latest results known to the author are due to Brillhart, Tonascia and Weinberger and include the search limits shown in Fig 1.

a	2	3	5	6,7,10,11,12,13	14,15,17,18,19,20	21,34	29,47,50
p	$3 \cdot 10^9$	2^{30}	2^{29}	2^{28}	2^{27}	2^{29}	2^{28}

Fig 1

a	p	a	p
2	1093, 3511	3	11, 1006003
15	29131	17	3, 46021, 48947

Fig 2

a	N	a	N	a	N
26	15, 1065	68	133	80	9
82	9, 45	99	35, 65	146	91
			1729	148	451

Fig 3

Their discoveries include: $p=53471161$ for $a=5$, $p=56598313$ for $a=10$, $p=1284043$ for $a=18$ and $p=63061489$ for $a=19$.

The totality of known solutions to $a^{p-1} \equiv 1 \pmod{p^2}$ where p is prime are shown in Fig 2.

(ii) Some results when N is composite (non-prime)

There are theoretical results providing a strong characterisation of the primes which divide a composite solution of congruence (1) above.

These are to be found in AOL Atkin's and BJ Birch's *Computers in Number Theory*, Academic Press 1971; but they are beyond the scope of this article.

Known solutions of $a^{N-1} \equiv 1 \pmod{N^2}$, N odd and composite are shown in Fig 3.

Readers are invited to investigate the Fermat Quotient, above, determining all possible solutions for N both prime and composite for a specified set of values of a : reproducing as many as possible of the particular results quoted. It is hoped that such investigations will lead to some statement regarding the prime factors of composite N solutions.

The results of these investigations, which must arrive by 1 March 1987, may be submitted to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffordshire WV4 5NF, tel (0902) 892141. It would be appreciated if such submissions contained a brief summary of results; together with thoughts relating to this problem, in a form suitable for future publication in PCW.

Submissions will be judged using suitably vague criteria, and a prize will be awarded to the 'best' contribution received. Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

Mike Mudge welcomes correspondence on any subject within the areas

of number theory and other computational mathematics. Particularly welcome are suggestions for future 'Numbers Count' articles: all letters will be answered after a sufficient length of time!

Isolated readers can be put in contact with others sharing common interests: however, greater efficiency regarding published problems should result from contacting the prize-winner directly.

June review: PAPs

The state of the art regarding Primes in Arithmetic Progression (PAPs) is to be found in the paper by Paul A Pritchard, *Mathematics of Computation*, volume 45, number 171, July 1985, pages 263-267, 'Long Arithmetic Progressions of Primes: Some Old, Some New'. This contains the results of 14000 hours of computer time on a DEC VAX-11/780 (or rather two such systems) at Cornell University, and reports that no PAPs of length greater than 19 are known. There is also an interesting comparison of statistically predicted and experimentally observed PAPs of given length.

Tables 1, 2 and 3 are reproduced from the above paper in the hope of encouraging interested readers to experiment in this field.

The June prize-winner, in a problem which attracted an encouraging and varied response, is Hugh Spence of 22 Orissa Road, Plumstead, London SE18, who programmed his Tatung Einstein in Pascal. Hugh presented detailed flow charts in addition to his Pascal coding, run times and output; I feel sure that he would be happy to discuss his work in detail with any interested readers. Furthermore, I am convinced that Hugh, together with fellow PAP enthusiasts would benefit from a sight of the paper referred to above.



NUMBERS COUNT

AND
ONE

<i>m</i>	PAP of length <i>m</i> with minimal last term (<i>k</i> =0,1,2,..., <i>m</i> -1)	last term	estimated last term
2	2,3	3	2
3	3,5,7	7	2
4	5,11,17,23	23	2
5	5,11,17,23,29	29	29
6	7+30 <i>k</i>	157	92
7	7+150 <i>k</i>	907	497
8	199+210 <i>k</i>	1669	1406
9	199+210 <i>k</i>	1879	5086
10	199+210 <i>k</i>	2089	24310
11	110437+13860 <i>k</i>	249037	177300
12	110437+13860 <i>k</i>	262897	829800
13	4943+60060 <i>k</i>	725663	5582000
14	31385539+420420 <i>k</i>	36850999	2.332×10^7
15	115453391+4144140 <i>k</i>	173471351	1.137×10^8
16	53297929+9699690 <i>k</i>	198793279	6.793×10^8
17	3430751869+87297210 <i>k</i>	4827507229	5.774×10^9
18	4808316343+717777060 <i>k</i>	17010526363	3.303×10^{10}
19	8297644387+4180566390 <i>k</i>	83547839407	2.564×10^{11}
20	?	?	1.261×10^{12}

Table 1 The known PAPs with minimum last term

<i>n</i>	common difference	first term	last term	discovery
12	30030	23143	353473	VA Golubev, 1958 (see [8])
12	13860	110437	262897	E Karst, 1967 ([8])
13	60060	4943	725663	VN Seredinskij, 1963 (see [8])
14	223092870	2236133941	5136341251	SC Root, 1969 (see [7])
14	420420	31385539	36850999	PA Pritchard, 1983
15	223092870	2236133941	5359434121	SC Root, 1969 (see [7])
15	4144140	115453391	173471351	PA Pritchard, 1983
16	223092870	2236133941	5582526991	SC Root, 1969 (see [7])
16	9699690	53297929	198793279	S Weintraub, 1976 ([12])
17	87297210	3430751869	4827507229	S Weintraub, 1977 ([13])
18	9922782870	107928278317	276615587107	PA Pritchard, 1981 ([11])
18	717777060	4808316343	17010526363	PA Pritchard, 1983
19	4180566390	8297644387	83547839407	PA Pritchard, 1984

Table 2 Some PAPs and their discoverers

length	first term	common difference	last term
18	4808316343	717777060	17010526363
19	8297644387	4180566390	83547839407
18	64158606367	2735312580	110658920227
18	2518035911	7536659130	130641241121
18	115936060313	3103900800	168702373913
18	98488875263	5169934770	186377766353
18	170263333103	5063238180	256338382163
18	107928278317	9922782870	276615587107
18	51565746467	13889956080	287694999827

Table 3 The known PAPs of length at least 18

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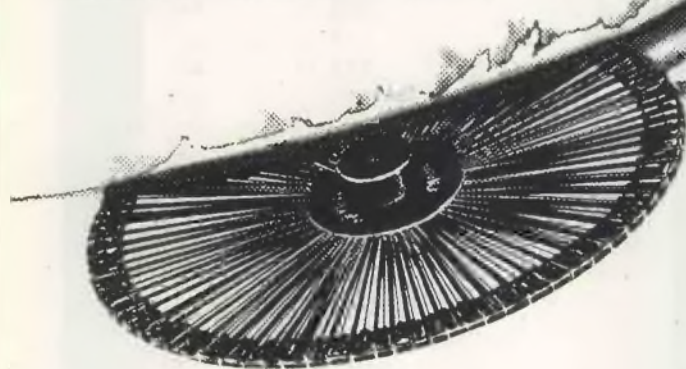
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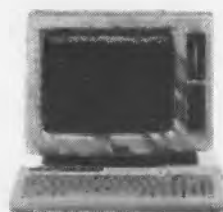
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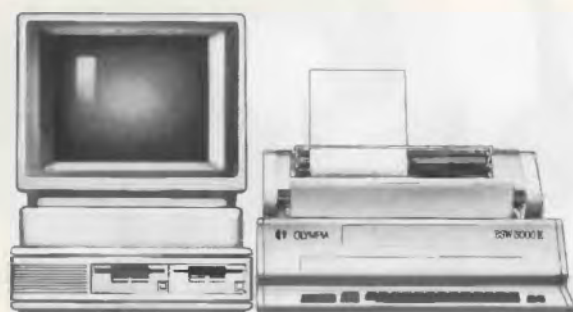
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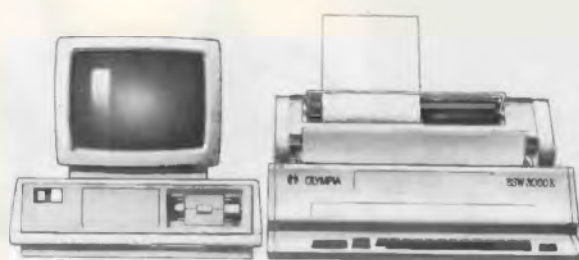
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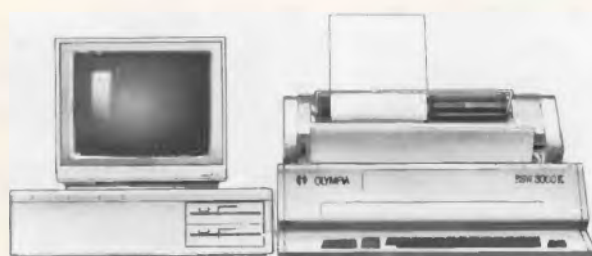
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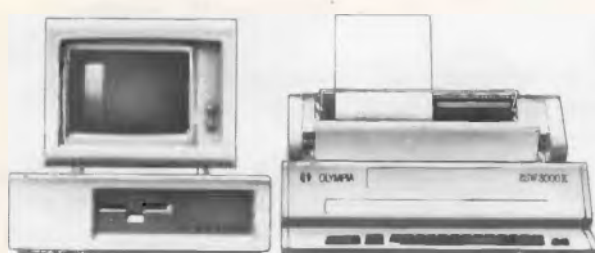
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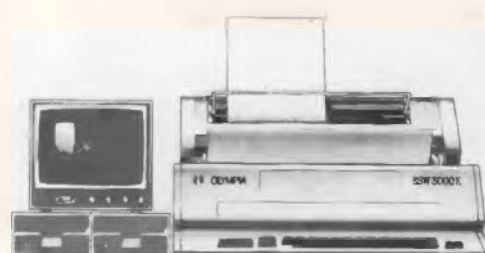
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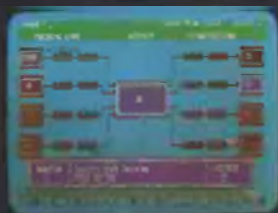
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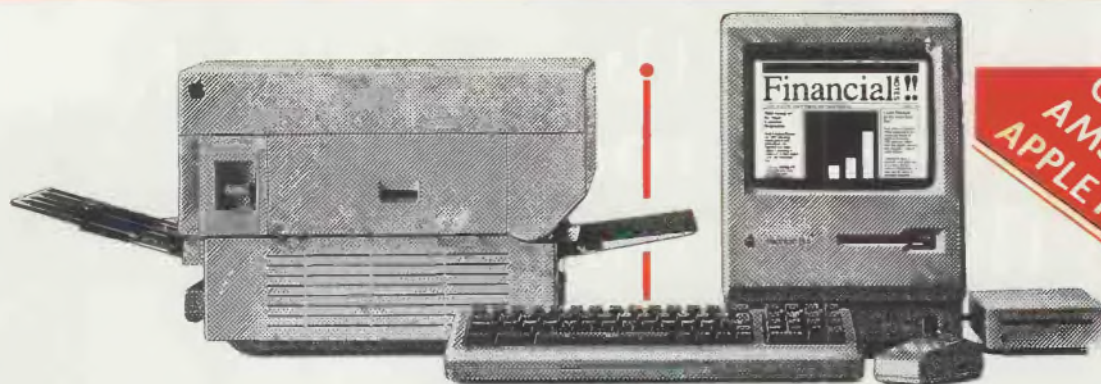
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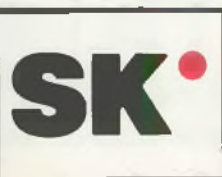
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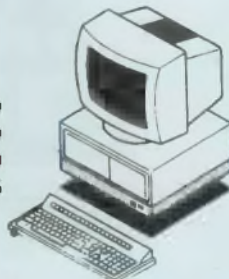


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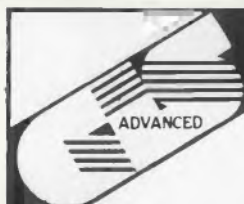
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You may have read reports of a trial by writ engaged between PCW's publisher, Tony Harris, and Focus Publications which has brought out a new mag called *Which PC?*

It seems that a number of the mistakes which appeared in the listings in one of Harris's other mags — *What Micro?* — have also appeared in *Which PC?*

Readers of a news service — Newsbytes — which appears on the US electronic information service The Source have had the gory details relayed to them by UK writer Steve Gold under the title 'Another Magazine — Another Plagiarism?'

But Gold too seems to have followed Focus' path. His story about the new head of Atari UK describes the background to Bob Gleadow's move, although Gold seems to think the new man's name is Geddow.

Hang on, where have we seen that mistake before?

Why, in none other than *MicroScope*, computer trade paper and former haunt of PCW's new editor, Derek Cohen. Just the week before *MicroScope* ran a front page story about someone called Bob Geddow.

But there'll be no High Court writs in that case...

Einstein manufacturer Tatung went out of its way to curry favour with PCW's publisher Tony Harris (who rides a BMW K100) and editor Derek Cohen (Kawasaki GT750). Tatung held its Einstein User Show at the National Motorcycle Museum in Birmingham.

Well, there can't have been any other reason...

We'd love to tell you more about an amazing new integrated accounts package for PC compatibles called Amfacs that sells for only £10.

The product includes purchase and nominal ledgers and an on-disk tutorial. And it runs in 128k RAM and needs only one disk drive. The initial system can handle 50 supplier and customer accounts, 150 purchase transactions and 500 nominal transactions.

But we daren't tell you the name of the people producing it as you might trace them through the telephone book and give them a ring to order one — which is the last thing they want.

To quote from consultant J A Gaeth's letter to PCW: 'The very low margin on this product means that we cannot spend time on the telephone discussing its



'Cadbury's Drinking Chocolate to Heinz Baked Beans, your turn to transmit, over.

Distributor Silicon Express has been circulating its customers with novel reminders of its product range. The Acme Interoffice Communicator was intended to remind dealers of the Dowty modern range that Silicon Express carries. But we thought the tins were far better: need no BABT approval; no baud rate problems — you can talk as fast as you like; truly international — work in any country in the world; portable — need no external power supply; easily repaired — spare tins available at any corner shop.

We could go on but there's an urgent message coming through on the Spam...



Shocked to discover that her newly keyed-in 20,000-word thesis has somehow gone missing from her disk, this enraged Beeb owner is taking her revenge by pouring her vending machine brew into the ageing micro's innards.

Luckily for the Beeb, its keyboard is protected by a Viziflex Seal — a sort of prophylactic for programmers — marketed by Ceratech Electronics. The company will even make them to your own design if such retributions are a common occurrence in your office.

As for that missing file, it's obvious that some joker has connected the woman's monitor to a neighbouring PC. Why else would the Beeb be displaying the contents of a standard PC-DOS distribution disk?

merits with potential purchasers.

So you'd better leave them alone and go buy something else...

If you've been to any computer show within the past six months you're bound to have seen the 'THINGi'. It looks like one of those old-fashioned indicators that used to stick out of the side of cars to tell the driver behind when you were turning right or left.

Attached to your computer monitor by a velcro strip, the flat piece of plastic and its bright orange clip provide a handy place to hang your copy while you type it into your programs.

Good idea or not, one can't help wondering what possessed the sponsors of the award to name it 'Business Idea of the Year'. British Telecom, Marconi and the Midland Bank are three companies that Micronet names as supporters of the product.

We'd like to pour cold water on the whole idea, but experience in the PCW editorial office shows that within two minutes of

unpacking the items, they get fixed to monitors and used.

PS: We've been told they're also good for spreading royal icing on Christmas cakes, so there's hope yet...

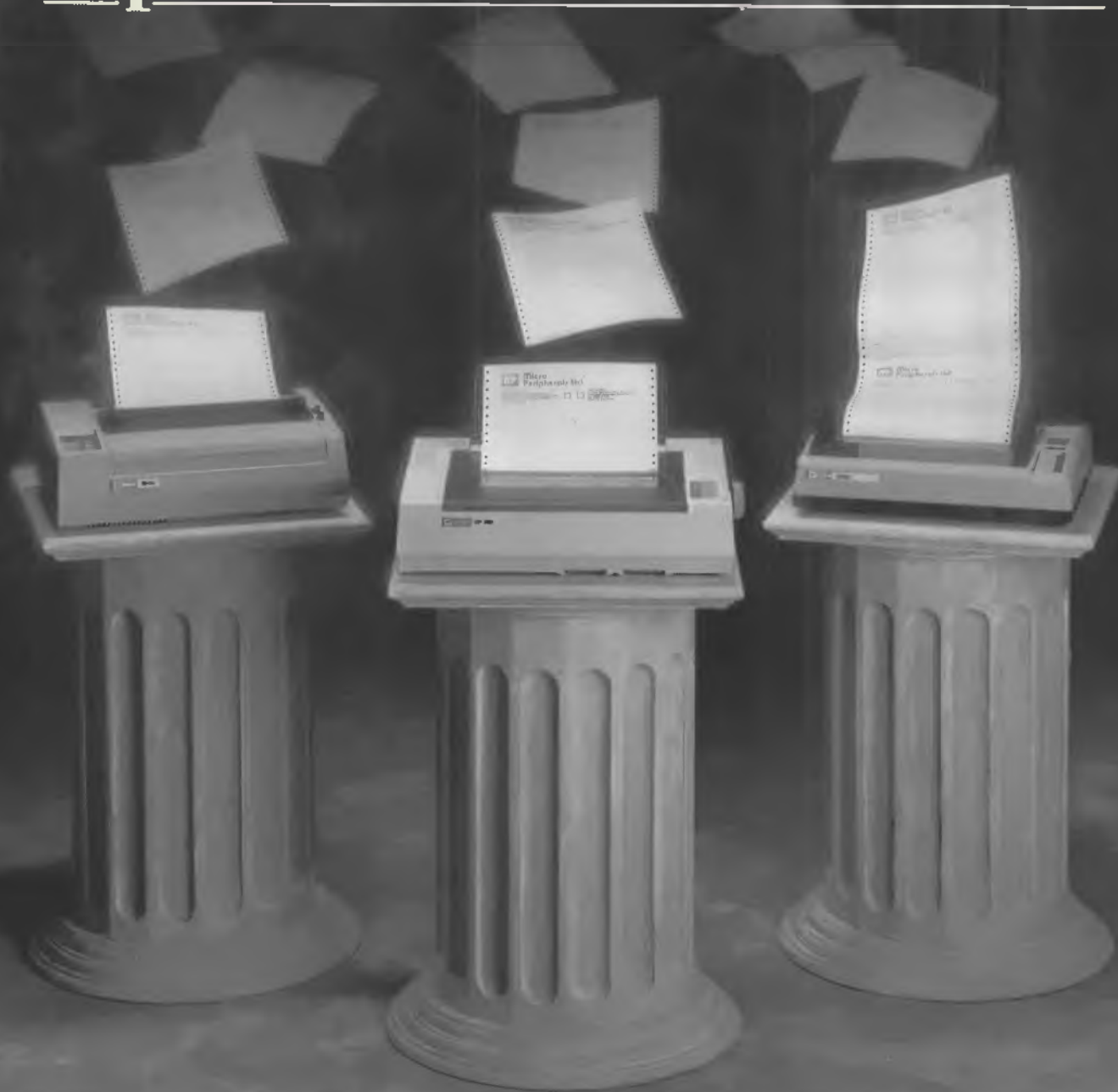
Users of Gem Write who have migrated from WordStar or NewWord may care to try out some of their favourite control codes, including two-letter combinations such as ^QR and ^KB.

Found to work so far are all the commands to move the cursor around the text, including top and bottom of document, search, replace and repeat search/replace codes, block markers and insert and delete codes.

Trouble is that using them tends to make the package fall over more than usual. You can end up with a highlighted block created using ^KB and ^KK that the program seems to have no knowledge of.

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