40p EVERY WEEK · DEC 22 1984 · No 92

PERSONAL Computer NEWS

40P EVERY WEEK

Things to do with your computer this Christmas

BUILD IT...
Construct your own 16-bit computer - p26

DRAW IT...
Master 3D graphics on the BBC Micro - p12

PLAY IT...
A music maker for the Commodore 64 - p47

FILM IT...
Screen animation for the Spectrum - p20

PCN CHRISTMAS TURKEYS
SEE WHO GETS A ROASTING

POWER UP YOUR ORIC MICRO WITH FOUR BLOCKBUSTERS FROM IJK SOFTWARE FOR THE ORIC-1 AND ORIC ATMOS

DON'T PRESS THE LETTER Q

The first new generation MEGA GAME available for the Oric range of computers, 'Don't Press the Letter Q' is a real time machine code arcade adventure which uses special game generating techniques to incorporate over THIRTY FIVE different video games of over FIVE THOUSAND types. You will need to be quick witted, very dextrous and extremely ingenious. It is also lots of fun. Between one and nine people can play.

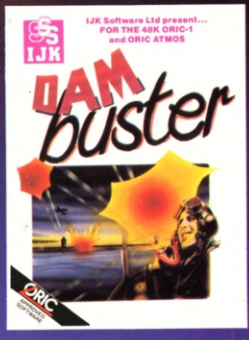
A note from the author...

When I began, the pathways were simple and safe, but soon the program was designing them itself. They became dark and frightening places. I set the computer add 'games' to the pathways, and with sinister efficiency it created thousands.

Survival was an impossibility, and my computer hated me for my weakness. I frantically programmed 30 'beacons' into the pathways, and survival became possible. A surprise at 30,000 points? I never found out - the pathways got me everytime. Someone, somewhere must make it to that 30th beacon, and the pathways shall then be conquered.

Andrew Moore, November, 1984.

FOR THE 48K ORIC-1 & ORIC ATMOS **£8.50**



DAMBUSTER

This superb flight simulator game challenges you to become the pilot of a Lancaster Bomber, whose mission is to destroy 8 dams with the famous 'bouncing bomb'.

The author, Pete Beckett, is a professional flight simulation programmer with an international aerospace company. His program, written in machine code for fantastic action and realism, represents the ultimate in real time interactive flight simulation games for the Oric range of micros.

Avoid the flak and navigate your bomber using the highly realistic three dimensional real time display. When your position,altitude,speed,and direction are correct, release the bomb - if you dare!

To help you on your way are navigational maps, comprehensive instrumentation and ILS, should you need them. Flight control is via keyboard, or joystick (with ORIC/IJK Interface).

FOR THE 48K ORIC-1 & ORIC ATMOS **£8.50**

ZEBBIE

A tremendous new scrolling arcade style game in which you control Zebbie by coiling up his spring and bouncing him from level to level, collecting bonus points, spray cans, oil slicks, etc., etc. as you go. A new concept in game control, Zebbie can be moved along the levels, and can also jump from level to level by pressing the jump button then releasing it when the required jump energy is achieved.

An original 100% machine code arcade game which presents a great challenge to even the seasoned campaigner with over 20 different stages and six bonus stages giving over 70 screens in total. Works with keyboard (or joystick using the ORIC/IJK Interface).

FOR THE 48K ORIC-1 & ORIC ATMOS **£7.50**

CRIBBAGE

The very popular card game faithfully reproduced for your Oric computer. Full instructions are included in the program, which has several skill levels to match anyone from novice to champion.

Excellent programming combine with the computers superb high resolution graphics to present a first class representation of this all round favourite.

FOR THE 48K ORIC-1 & ORIC ATMOS **£6.50**

Our Software has been officially approved by **Oric Products International Ltd.**, and is available from leading chainstores, all good software retailers nationwide and in over 30 countries across the world. You can also order direct from us - all advertised software is in stock now and will be despatched within 48hrs of receipt of order.

ALL PRICES FULLY INCLUSIVE OF VAT and P&P – NO MORE TO PAY!

IJK SOFTWARE LIMITED

ALL OUR CURRENTLY AVAILABLE SOFTWARE WILL OPERATE ON BOTH THE ORIC-1 AND THE ORIC ATMOS

Unit 3c, Moorfields,
Moor Park Avenue, Bispham,
Blackpool, Lancs. FY2 0JY
Telephone (0253) 55282 Telex: 67232 IJKSOF G

24hr ANSAFONE

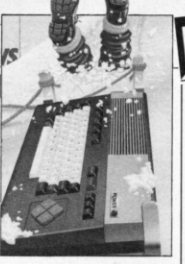
WARNING: All software sold subject to IJK Software's standard conditions of sale and terms of trade, copies available on request.

MENU

COVER STORY

Turkey-shoot 34

It's Christmas Night. The log of the Conqueror crackles in the grate. Old Uncle Clive has crashed after one sherry too many, and cousin Jack from America is flicking acorns at his nose. A new star rises in the east . . . what can it be? Yes, the winners of the *PCN* Golden Turkey Awards of 1984!



OUTPUT

3D BBC 12

Add 3D line drawings to your repertoire of Beeb graphics programs with these annotated routines.

QL headers 16

More kudos to your QDOS with some hints on making better use of headers on the QL.

COMMODORE poker 18

Take on your 64 at cards with this version of Poker Solitaire.

Animated SPECTRUM 20

You can store enough frames to produce some spectacular animated sequences with machine code and Basic routines.

AMSTRAD stretch 22

Print double height characters on the screen in your games or in more serious applications.

ATARI attraction 24

Tap in this game and learn a bit more about some aspects of two programming features.

HARDWARE

CORTEX kit 26

Whether you buy the kit or the ready-built version, the Cortex 2 out-benchmarks the competition. However, the machine is still something of a challenge to take on, says Brendin Lewis.

PERIPHERALS

SHINWA switchability 41

The CPA-80 printer has a range of features that would grace a more expensive machine.

SOFTWARE

64 sound master 47

Music Master turns your computer into an electronic music synthesiser and teaches you about music into the bargain.

REGULARS

Monitor 1

Lynx — fresh tracks discovered, this page; Commodore treads the IBM path, page 2; Toshiba price cuts set cat among pigeons, page 3; Christmas 1984 — the last micro boom? page 4.

***PCN* Charts** 5

Which games will be spilling out of the nation's Christmas stockings?

Random Access 7

Hot views from our readers.

Routine Enquiries 9

Solve your programming problems by consulting our experts.

Microwaves 10

PCN's readers make friends and influence people when they send in their hints and tips. The £10 reward can't come amiss either.

Dungeon 37

On the eighth day of Christmas why not get stuck into an adventure?

Gameplay 43

Billboard 48

Pre-Christmas bargains.

Quit/Datelines 52

PCN signs off for this year, and looks forward to the next.

MONITOR

Lynx starts on the comeback trail

Lynx micros are on the comeback trail.

A Cambridge company called Anston Technology has made a successful bid for the rights to the machines as well as the assets of the failed Camputers Ltd.

According to an Anston press release, the company 'has engaged Dick Greenwood, former chairman of Camputers, to assist with the introduction of the Lynx into its business plans'.

'My purpose is to ensure that the Lynx continues,' he said. 'I'm currently tying up loose ends from a technical and production point of view.'

Further inquires with well placed industry sources turned up a second Cambridge number. A request to speak to Alex Chapman, Anston director, revealed that he was in Newport, Gwent, South Wales.

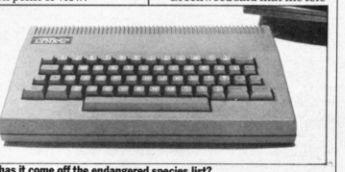
But surely someone else could help? 'Sorry, nobody else knows anything about it. And I'm his right-hand man,' a voice said.

Chapman is already familiar with the Lynx. Another of his companies, Braefield Chapman, was a small sub-contractor used by Camputers to carry out assembly and repair work.

Greenwood said that the telephone number was out of action because of a fault on the line.

Anston is establishing a technical back-up facility for existing users. Also, the Lynx 96, 128, disk drives, peripherals and software will be made available. For further details you could try ringing 0223-62026.

The message for existing Lynx users is hang on in there. We will pass on further news as soon as we can lay our hands on it.

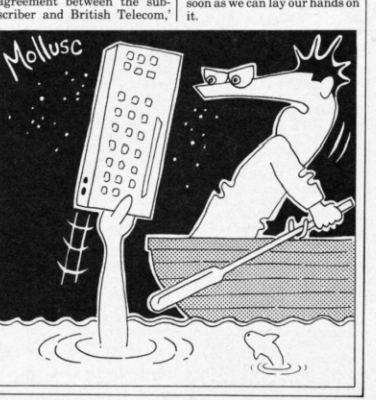


Lynx: has it come off the endangered species list?

But the prospect of future support for the Lynx is lost in a wintry fog.

Greenwood said it would be a month or so before detailed plans are finalised and attempts to contact Anston Technology last week floundered when the number quoted in its historic press release turned out to be unobtainable.

'The number is temporarily unavailable as the result of an agreement between the subscriber and British Telecom,'



HOMEFRONT

Open season again as Lynx hits the fairway

Well, we got it wrong last week, predicting that the Dragon would be the next micro to come off the sick list. It's been beaten to it by the late Camputers Lynx.

There's been no news of the Lynx for several months, which is stretching two minutes' silence — but it gives the lie to the old saying that no news is good news. The Lynx disappeared virtually without trace. Lynx owners didn't even have the comfort of knowing that somebody, somewhere, cared for their micro. Even the Jupiter Ace found a friend in need, and other micros have found a safe haven in Holland and Spain.

That the Lynx may stage a recovery is good enough news in itself, but most encouraging is the way that its resurrection runs straight across the main trend of the micro industry.

This is the trend that would have you believe micros are going to become progressively more useful, on the grounds that as games machines they have a limited life expectancy. It all sounds very dull. Fine and dandy, of course, if the challenge of rigging up a ZX81 to control the microclimate in your window-box is irresistible; but hardly a match for the excitement of a good game.

The Lynx was one of those indeterminate systems that didn't know whether it was a home micro or a business system. Towards the end of its life, with increased memory and disk attachments, it was beginning to make up its mind in the direction of business. Perhaps it would be unseemly to gloat and say this development was the death of it. Besides, it was never a runaway success as a home micro. But it didn't go under until it turned serious . . .

Will the Lynx's Lazarus act mark a rejection of the new wave and a return to the traditional values of home computing — blood, gore, lightning reflexes and preferably a warped mind? Will it fire a broadside at the old sobre-sides who want to clean up? (Whether it's home microcomputing they want to clean up, or whether they just want to clean up generally isn't yet clear.)

It is asking too much to expect the Lynx to shoulder the burden alone. In its last days it was barely capable of shouldering a sack of horse-feathers, let alone the standard of the home micro enthusiasts. If certain other micros — the Texas Instruments 99/4A, for example, or the Jupiter Ace — were to come out of retirement it might be possible to start thinking about a veterans' eleven to take the field against the new breed represented by the QL, the Commodore Plus/4, and the Sharp MZ800, where home use is definitely a secondary consideration. The QL is a particularly regrettable case; not because there's anything wrong with it, of course, but for the fact that it comes from the company that put home micros on the map in this country, a company whose last new home micro was the Spectrum. The Spectrum Plus is a side-show; it's the QL that shows which way the wind is blowing.

TI 99/4A fans will say their micro is still supported if you know where to look, and Jupiter Ace die-hards might argue the same case. But the prospects for the Lynx — and the Dragon, for that matter — are on a different level on the Bobby Robson Scale of Optimism. The Lynx may yet get a result.

Of course there never was much of a software industry where Lynx games were concerned. But the point is that somebody thinks the machine can still sell, against competition so well established that the act of faith takes your breath away.

This being the season of goodwill the Lynx could hardly be re-launched at a better time. If there's a sympathy vote around at this time of year, the Lynx deserves it more than most.

If its new proprietors can organise themselves quickly enough it might even pick up a few sales by default, as anxious shoppers find the shelves empty of Sinclair Plusses and C16 starter packs but healthily stocked with Lynxes.

It could turn out that the Lynx's appeal will be mainly nostalgic. It recalls a style of micro that seems to be passing out of fashion (and a kind of manufacturer that seems to have passed out).

But if it makes a successful comeback, the reasons won't be particularly important to anybody out there who still has one tucked away at the back of a cupboard.

David Guest

MONITOR

Commodore lines up IBM broadside

Commodore is to launch a desktop IBM compatible machine in spring, 1985. The company describes the machine, thought to be a development of the Bytec Hyperion, as the 'opening gambit' in an offensive on the business computing market.

Commodore declined to discuss hardware specifications or pricing, but said the new machine would be previewed at the Which Computer? show on January 15, and would be launched later, possibly in March.

The company's new marketing manager, David Gerrard, said the newcomer was part of 'an evolving, long-term strategy' that should take the company back into its traditional business market.

Gerrard admitted that Commodore's concentration on home computers in the last 18 months had meant a shift away from business users.

The launch arises from two deals that Commodore made earlier this year. The first was a licensing agreement with Bytec-Comterm, maker of the Hyperion/Ajile portable — one of the best IBM-compatible portables. The machine was displayed in Commodore livery at the Hanover Fair in April.

The second deal was an arrangement with chip-maker Intel that allowed Commodore to produce the IBM PC's processor, the 8086.

After Hanover, the portable machine sank without trace and as manufacturers of portables and IBM compats began to fold, speculation mounted that Commodore would have to upgrade the Bytec hardware significantly. It now appears that the speculation has been borne out.

A second business machine was shown at Hanover, a multi-user system based on the Z8000 processor. So far that has been equally conspicuous by its absence.

Help on the way

Spurred into action by a reader's letter (Random Access, issue 91) we have contacted Dealer Deals and sorted out with them the matter of the wayward Magarule perspex magnifying rulers.

Mark Simon of Dealer Deals has promised a speedier turn-round in future. 'We have hundreds in stock,' he said.

So stay glued to your letter box, Mr Johnstone of Colchester, a ruler is on its way to you through the post.

Hewlett-Packard pinches Unix lead

Hewlett-Packard is in line to be the first with a Unix portable.

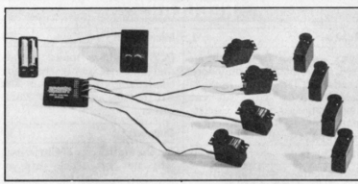
According to reports from the US, HP is planning to launch early in the new year a luggable micro weighing under 25lbs that will run the Unix operating system.

Currently codenamed the Pisces, it is said to cost $5,000 and will use the 68010 chip, 512K of RAM, a 120 column/24 line electroluminescent screen, a pair of 3.5in disk drives and a built-in ink-jet printer.

The machine has already been shown to market research firms and industry insiders who have commented favourably on it. According to those who have seen it, around 50 software packages will be available at launch.

If the final product matches the rumoured specification and price it will put HP in the lead to carve out a large market share as the kind of facilities on offer are normally only available on machines costing around twice the price.

Hewlett-Packard in the UK refused to comment on the existence of the micro on the grounds that it is not its policy to pre-announce products.



THE BEAST BITES BACK — Extending its Beasty family, Commotion's (01-804 1378) latest device is an infra-red remote control system. The infra-red Beasty comes with a manual and software for under £50 and is available for the BBC, Spectrum and Commodore 64. With its eight-channel interface the device is compatible with the Beasty arm and Mobile base (issue 75) and will control up to eight servo motors to a range of six metres. You can see the remote control system in action at the High Technology and Education Show, Barbican Centre, London, from January 23 to 26.

Toshiba drops price of MSX package

Toshiba has upped the stakes in the battle for control of the UK MSX market with a £40 price-cut, making its HX-10 machine one of the cheapest.

The company has also extended its three year guarantee offer (longer than many people own a micro) until March 31.

Add to this the machine's bundled software and the Toshiba looks just about the best MSX deal this Christmas, with only the Goldstar undercutting it (by £10), and the Spectravideo rivalling it with slightly enhanced features.

No other MSX manufacturer seemed to be responding to the Toshiba price-cut as *PCN* went to press, but some outlets are promising to cut Sony and Sanyo prices by £60 soon after Christmas. Equally, the lesser known manufacturers will have to try to maintain a price differential to stop customers flocking to famous names such as Sony and Toshiba who, as far as customers are concerned, have a good track record in electronics.

Aside from price competition among MSX companies, the machines also face stiff competition this Christmas from Commodore, Sinclair and Atari, and it's difficult to see how sales can be anything other than disappointing while the machines remain above the £200 mark.

The JVC is among the pricier machines, and has so far sold only a few thousand. Toshiba has certainly sold more, but the company was unable to say how many. Most of the manufacturers haven't been in the country long enough for their figures to have any great significance.

But the limited impact of MSX so far doesn't seem to be discouraging the companies. The Mitsubishi is now in the UK at £245 for the 32K version or £299 for 64K, although its distribution isn't particularly wide at the moment. Kuma, which produces a number of books and add-ons for MSX machines, says it has already had a fair number of enquiries from Mitsubishi owners. This may be because customers view the 32K version as a cheap alternative.

Panasonic's machine should also be available by Christmas, while Philips will probably sell its MSX machine in the UK early next year. Considering the number of companies now involved it's difficult to visualise the machines staying at their current price level for long.

If prices in Japan are anything to go by there's certainly scope for cuts. Bottom of the market in the land of MSX is the Casio, which is going for £80-£90, and assuming the company is making a profit on this it shouldn't be beyond the wit of the manufacturers to sell MSX for around £150 here. This is a common price forecast inside the MSX fraternity, but its timing is another matter altogether.

PLUS FOURS — Four inches of cable may not sound much for a piece of equipment that calls itself an extension but the Kempston Extender Cable could make all the difference to Spectrum Plus owners. 'We mainly brought it out for people with a Plus to use the single joystick interface,' Kempston says. The cable includes a replaceable edge card and should reduce wear and tear on the machine's edge connector. It is also suitable for the ordinary Spectrum, and 'ideal' for add-on keyboards, according to Kempston (0234-852997). It costs £7.94.

Why MegaWars has Santa all wrapped up

If Santa Claus fails to show up this year, don't worry, it's nothing to do with you. He's too deep in MegaWars III combat to come to his sleigh, along with thousands of other mythical folks, like Muad-Dib, Beowulf and Mithrandir, in any one of hundreds of online, multi-player computer games that are quickly becoming the rage among those with micros, modems and the income to pay the phone bill to hook up to the mainframe that hosts the game.

The live multi-player games are taking on a life on their own evolving far beyond their Dungeons and Dragons origins. MegaWars III is the hottest current game and probably the most complex. Created by Kesmai Corp for Compuserve (one of the biggest online computer service networks in the US), MegaWars III can have more than 1,000 players and each game lasts three months. The action is spread over 2,000 star systems and players vie for control of galactic real estate.

To stay alive in the MegaWars universe players join alliances that shift and change abruptly during the struggle. Individual players can win prizes but the alliances are the real victors.

Recently a group called the Dorsai (after Gordon Dickson's science fiction trilogy) produced a new wrinkle: it's said that the Dorsai planted spies in the ranks of rival alliances and were thus able to win several crucial space battles. As a result the Dorsai have dominated MegaWars III to the point where many other players are getting fed up.

The Dorsai then announced that it was breaking up, but now rumours abound that they've simply reformed under a new name — the Elite — and that as the current game goes on the Dorsai will re-appear to trounce their rivals once again.

Multi-player games are an expensive habit: registration with Compuserve costs $40 and prime time play costs $12.50 an hour at 300 baud, not to mention the phone bills. Less expensive are the role-playing fantasy games that require a player to make only a couple of moves a week. Some players are active in many games, from the live fury of MegaWars to the quieter role-playing games. There is even a monthly magazine, *Computer Gaming World*, devoted to multi-player games.

Watching all this with considerable interest are the phone companies, the makers of modems, and business analysts.

Doomsters see the rapidly expanding volume of personal computer communications over phone lines as producing a monumental headache very soon. The average phone call lasts four or five minutes, but the average data link occupies 25 minutes. Optimists argue that the phone companies will be able to employ packet-switching techniques, and that more local phone companies will step up their fibre-optic installation plans. There are already 1.5 light seconds of fibre-optic links in the US and it's expanding rapidly.

If the phone companies don't take care of the business, they could lose it to cable TV companies. These are in a slump as the US has become saturated with television choices. Many big corporations lost big bucks in the cable market in the last year.

A boom in multi-player games using cable networks as a cheap alternative would give the cable companies a much-needed boost.

Another pointer to the future in multi-player games lies in the introduction of new high-speed dial-up modems. Several 2,400 baud models were on show at Comdex in November, priced between $750 and $1,500.

The current crop of games are not strong on graphics. Indeed, even a black and white full screen graphic with only two bits per pixel takes a 1,200 baud modem four minutes to transmit. (Full colour graphics would take half an hour or more at 1,200.

Since most players in today's games are still using 300 baud, the limitations are severe, however, while a 300 baud modem takes 3.2 hours to download a floppy disk, a 2,400 modem needs only 24 minutes, and a 9,600 unit would have that down to six minutes.

Since a lot of companies are staggering under heavy phone charges due to the use of 300 baud devices, there exists a strong incentive to upgrade to 2,400. That in turn will bring down the cost of new modems and make them an attractive proposition to the Dorsai and their chums; at which point live multi-player games could blossom with the same graphics power as today's games on disks.

Chris Rowley

MONITOR

IN BRIEF

Mastertronic, pioneer of £1.99 games, is now offering adventures at the knock-down price of £2.99. Master Adventurer (01-580 8418), is the name of the new games label that will produce the pocket-money software packages — the first of which will be Se-Kaa of Assiah for the Spectrum and 64. Other adventures in the pipeline are Volcanic Dungeon and Black Crystal.

Donald Duck sounds from the Spectrum are on offer from the Digital Sound Sampler from Datel Electronics (0782-273815). For £49.95 the device plugs into the Spectrum's user port and records any sound digitally into the machine's memory. The captured sound can then be played back in limitless variations.

Let your Beeb take the strain with a weekend break to Cornwall. Arm in arm with your BBC you can stay at the Three Rooms Hotel, for a couple of days and brush shoulders with other BBC users. The weekend trips have been organised by Micro-Aid (0209-831274) with dates in spring and autumn, 1985.

The 4,000-year-old Chinese game called Go is now available for £9.95 for the BBC and Electron. It comes from Games Workshop (01-965 3713), which has Commodore 64 and Spectrum versions in the pipeline.

Fruity Frank is Kuma's latest arcade game for the Amstrad CPC-464 at £6.95. Trying to pick his fruit crop, Frank has to avoid marauding monsters that get in his way.

A floppy disk drive for the Sharp PC 5000 is up for grabs. Costing £516, the CE-513F unit is a double-sided, double-density device with 360K of storage. The drive uses 3.5in disks, called CE-120Fs and is available at £69 for a pack of ten.

The Olivetti M24 computer is now available with integral 5.25in quad-density diskette drives — providing 720K formatted capacity per drive. There are three new models incorporating the new drives costing from £1,355 to £3,137.

Calpac is setting up a hotline to advise harrassed parents on what there is in the education line for Sinclair, Commodore and Acorn micros this Christmas. Although a supplier itself, it will aim to be impartial.

The number to call is 04867-2584, between 9am and 9pm.

A not so merry micro Christmas for shops

Christmas is coming, and the rumour is that the goose that laid the golden egg is about to get the chop.

There have been whispers that this could be the last bumper Christmas for the home micro. We put on our most sobre funeral clothes and spoke to a cross-section of retailers to see whether they're crying all the way to the bank.

'I think this may be the last Christmas in which computers will be sold in vast quantities as the increase is due to peripherals — the number of printers and monitors we've sold has shot up.'

In the past, Christmas has been a difficult time for manufacturers to get their supply act together. As a result some people ended up buying a computer because it was the only one left on the shelf.

The problem has still not been resolved. Both Boots and WH Smith grumbled about supply problems with the Spectrum Plus and Commodore 16. Greengrass said stoically: 'Some manufacturers were late getting their machines out.'

Sale of the century? Dixons lines them up for your inspection.

presents, which implies their use as games machines,' said Michael Litvin of Computers of Wigmore St in London's West End. But Dave Gilbert, marketing manager of Dixons, disagreed: 'We are not experiencing the demise of home computers.'

Others held views somewhere in between these two. WH Smith's spokeswoman Jenny Wallace reported: 'Sales are going quite well in all areas,' but Boots computer group manager John Greengrass was almost reaching for the Kleenex: 'We're a bit disappointed with the level of business — it's a late Christmas.'

His comment will have the software suppliers nodding in agreement. Their sales, according to one software company, didn't start to take off until last week.

If you're buying later, you're also spending in different directions. Of the shops we spoke to, only Woolworth said that micros alone would account for most of their sales this year. The idea of the starter pack has caught on, and chains like Dixons are extending it with their own packaged offerings.

Litvin, despite his gloomy forecasts about home micros, has sales that are 35 per cent up on last year. Part is due to a change of premises, he says, and part to a change in buying patterns: 'I'd say 50 per cent of Litvin said: 'It rather amuses me that manufacturers say that there are no shortages. The Spectrum Plus is in very short supply, Plus/4s aren't that abundant and C16s I'm not keeping. There isn't much software for the C16.'

Even so, the shops have a slightly wider range of computers this year, more software and a host of add-ons to plug into a computer. What you see on the shelves is the survival of the fittest — there are no fire sales of things like the TI 99/4A this time round.

Opinions on individual systems varied. Dixons is euphoric about the Amstrad, but Litvin claims: 'It was hyped up beyond recognition; I couldn't sell it.' And on the QL he added: 'With respect to Sir Clive, he got his marketing wrong. I'd say 75 per cent of buyers are using the QL at home; I've been surprised how many people want it as a first machine.'

Shortage, what shortage? Spectrum Pluses lead the cascade.

With such a variety of opinions about the state of the market, there are, as you might expect, different ideas about how to persuade you to part with your money. WH Smith is offering credit facilities with repayment plans covering 12, 24 and 36 months. Boots is advertising 'guaranteed' prices, most of which can be undercut by a quick scan through a micro paper. Dixons, as noted, is selling packages. Litvin, without the buying power of a chain, is restricting himself to a modest price cut on some of the most reliable sellers in the software field.

'Obviously I can't remain completely uncompetitive,' he said. 'But you can't sell a Commodore 64, for example, at its recommended retail price (£229); you won't find anybody selling it at that price. Some are down to £183. There's no way I'm going to compete with the cowboys who're in for a quick buck because I intend to be here for many years to come, offering support.'

Software — slow on the take-up but gathering speed now.

When you've sorted out the contradictions it doesn't look as though home computers are on their way to any early grave. Even though the retailers give different accounts of what's happening, all retailers are reaping some rewards from micro sales.

But if what some of them are saying is anything to go by, the tail-end of Christmas into the New Year could see a shift to the buying of more add-ons and software rather than computers, and after that a slow down in sales of games machines.

CHARTS

As featured on Radio 1's Saturday morning Chip Shop.

GAMES

TW	LW	TITLE	PUBLISHER	MACHINE	PRICE
1	1	Knight Lore	Ultimate	SP	£9.95
2	2	Ghost Busters	Activision	C64	£9.95
3	7	Elite	Acornsoft	AC	£15.00
4	9	Skooldaze	MicroSphere	SP	£6.95
5	10	3D Star Strike	Real Time	SP,	£5.95
6	3	Staff of Karnath	Ultimate	C64	£9.95
7	5	D T's Decathlon	Ocean	SP, C64	£6.90
8	11	Raid over Moscow	US Gold	C64	£9.95
9	6	Underwurld	Ultimate	SP	£9.95
10	4	Doomdark's Rev.	Beyond	SP	£9.95
11	12	Pyjamerama	MicroGen	SP, C64	£6.95
12	15	Booty	Firebird	SP, C64	£2.50
13	—	Hunchback II	Ocean	C64	£7.90
14	8	Cyclone	Vortex	SP	£6.95
15	14	Blue Max	US Gold	C64	£9.95
16	18	Match Day	Ocean	SP	£6.90
17	17	Select 1	Comp. Records	SP, C64	£12.49
18	—	Manic Miner	Soft Projects	Various	£6.95
19	—	Combat Lynx	Durell/Martech	SP, C64	£7.95
20	—	Airwolf	Elite	SP	£7.95

SPECTRUM

TW	TITLE	PRICE
1	Knight Lore	£9.95
2	Skooldaze	£6.95
3	3D Star Strike	£5.95
4	Underwurld	£9.95
5	Doomdark's Rev.	£9.95
6	Pyjamerama	£6.95
7	Booty	£2.50
8	D T's Decathlon	£6.90
9	Cyclone	£6.95
10	Match Day	£6.90

COMMODORE

TW	TITLE	PRICE
1	Ghost Busters	£9.95
2	Staff of Karnath	£9.95
3	Raid Over Moscow	£9.95
4	Hunchback II	£7.90
5	Blue Max	£9.95
6	Int. Soccer	£9.95
7	DT's Decathlon	£6.90
8	Bruce Lee	£9.95
9	Fighter Pilot	£9.95
10	Select 1	£12.49

MICROS

BELOW £1,000

TW	MACHINE	PRICE
1	CBM 64	£199
2	Spectrum	£125
3	Electron	£199
4	Amstrad	£349
5	BBC B	£399
6	Spectrum Plus	£175
7	CBM 16	£140
8	Atari 800XL	£140
9	MSX (series)	£275
10	Memotech	£199

ABOVE £1,000

TW	MACHINE	PRICE
1	IBM PC/XT	£2,390
2	ACT Apricot	£1,760
3	Compaq	£1,795
4	Olivetti M24	£1,595
5	Televideo TS1603	£2,640
6	Dec Rainbow	£2,359
7	NCR Dec Mate V	£1,984
8	Apple III	£2,755
9	ACT Sirius	£2,525
10	Macintosh	£1,795

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the week up to **December 12**. The games chart is updated every week. The prices quoted are for the no-frills model and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month. PCN Charts are compiled exclusively for us by RAM/C, who can be contacted on 01-892 6596.

£59.95 + £5 (carriage) Prices held for second class post

F. S. ENTERPRISES

compu-desk

THE HOME FOR YOUR COMPUTER

£5 off when you order using this advert

British made

Superbly styled in a rich teak effect finish and brown frame.

And the teak finish is easy to clean. Suitable for use with all leading makes of personal home computers: Spectrum, Vic 20, Commodore 64, Oric, Dragon and the QL.

There's room for a tape-recorder/printer, disk drives, manuals, etc. Cable outlets rear of stand.

36"W × 34"H × 19"D

Twin-wheel castors, for maximum mobility, on tubular steel legs — for that professional look.

It's compact, mobile, attractive and can be moved out of the way with the maximum of ease and efficiency. Therefore the Compu-Desk is ideal for the bedroom or study where space is at a premium.

Easily assembled, just slot together and tighten fittings.

A drawer to fit shelf under work-top is available. Sent as a flat-pack with easy instructions.

Money back guarantee if not satisfied provided the goods are returned undamaged within 72 hours of delivery.

T.V & computer supplied by Curry's.

And please allow up to 21 days for delivery.

Designed for the computer genius in the home

To order send Cheque/PO (made out to F.S. Enterprises) made out for £59.50. Address: 18 Power Court, Church Street, Luton, Bedfordshire LU1 3JJ or £68.49 if "4 into 1" is included. You can also collect at above address.

NAME

ADDRESS

CHEQUE/POs FOR £

"4 into 1" mains connector with fitted 13 amp plug to tidy-up cables and leads from four appliances. Just £8.99 extra when ordered with Compu-Desk.

INQUIRIES Tel. 0582 27663

LOWEST PRICES WORLDWIDE!

SALE! SALE!

BEST PRODUCTS – BEST PRICES

PRINTERS

M. TALLY MT80	£155
KAGA KP810 NLQ	£229
EPSON RX80	£179
EPSON FX80	£299
JUKI 6100	£299

COLOUR MONITORS

MICROVITEC STD	£149
MICROVITEC MED	£199
MICROVITEC QL	£185
KAGA V2	£215
KAGA QL VISION	£215

DISC DRIVES

SINGLE 3 INCH	£99
SINGLE 100K	£75
SINGLE 400K	£125
TWIN 800K	£235

DISCS SSDD	£14
DISCS DSDD	£18
BBC/SPECT. DDFS	£75
ROMAG ANTIGLARE	£12
PRINTER CABLE	£9
ALL SOFTWARE	20% OFF

UK — Please add 15% VAT. Delivery 5%. Europe — Just add 10%. World — Just add 20%. Simply send a cheque/PO now or ask for details of our full range.

J.B. International, 15 THE CHESTNUTS, HERTFORD, HERTS. SG13 8AQ. 0992 553184 (24 HRS)

JB|NB|JB|JB|**JBI**|JB|NB|JB|JB

BUGGY BLAST

SPACE MISSION SIMULATION

FIREBIRD
SOFTWARE

A game of distinction from British Telecom.

WELLINGTON HOUSE, UPPER ST. MARTIN'S LANE,
LONDON WC2H 9DL. TEL: 01-379 6755/5626

SPECTRUM 48K

GOLD EDITION £5.95

Firebird and the Firebird logo are trademarks of British Telecommunications plc.

RANDOM ACCESS

Share your words of praise or send us a rocket about *PCN*. We want to hear your views and feelings on the articles we print — and those you feel we ought to. Write to *Random Access, Personal Computer News, Evelyn House, 62 Oxford Street, London W1A 2HG*. You could win £15 for the best letter of the week.

QL prints out — no problem

The letters in the December 8 issue of *PCN* about connecting printers to the QL show up, among other things, the lamentable state of documentation which accompanies most computer products. I have just managed to get Brother's excellent little M-1009 printer working with my QL, but it was a constant struggle against incomplete and sometimes wrong information.

Anyway, here, in the hope that it will save others days of anguish and gnashing of teeth, is what I've discovered.

First the cable. Connect the pins as follows and use SER 1 on the QL:

	PRINTER
GROUND	7
TXD	2
RXD	3
4	BUSY 20
5	CTS (not used) 5
6	+12V 6

No other connections are needed. The vital piece of information missing from the QL handbook is that the numbering of the serial port pins starts at the end opposite the locking lever.

Now on to the dip switches. I've set them up as follows:

Switch 1:
1. OFF Busy polarity low
2. OFF X-On transmit (whatever that means)
3. ON
4. ON } Baud rate 9600
5. ON
6. ON Parity ODD
7. OFF 8 bit word
8. OFF Serial input

Switch 2:
1. ON Form length 11in
2. ON
3. OFF } English character set
4. OFF Selects 0
5. OFF Disables skip perforations
6. ON Not used, apparently
6. OFF Auto line feed
8. ON SLCTIN

A word of warning, there are mistakes in the baud rate table of the amended sheets for the printer, the ones in the original book are correct. Also, no-one tells you that it is necessary to switch off the printer and then on again after changing the dip switches, otherwise the changes will not come into effect.

You should now be able to print using the default printer driver in Quill and get program listings by typing:

OPEN #3, SER[ENTER]
then
LIST #3[ENTER]

The only problem is that the hash and pound signs don't come out properly.

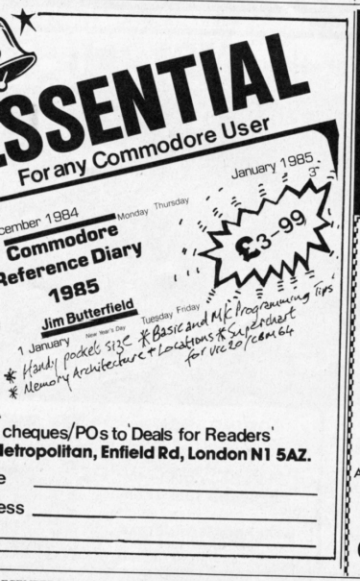
Stephen Horn,
Canonmills, Edinburgh.

'Undulations' smoothed over

I note a change of attitude with regard the Amstrad green monitor, as raised by Simon Williams, (issue 88). I received my monitor in July. It was prone to bouts of violent undulation. After persisting a little, Amstrad agreed to check it over, and while monitor was in the post to them, I received a letter advising that 'gentle undulations' were not a fault.

Well, it arrived back home (eventually), and indeed was now only prone to bouts of 'gentle undulation'. So either Amstrad has come up with some rather effective shielding against mains transformers or Simon Williams must have done as I have done ie, remove transformer to *outside* the casing! It is now rock steady.

H Williams,
Northants.



SUBSCRIBE NOW

SUBSCRIPTION ORDER CARD

I want Personal Computer News delivered to my door every week

☐ 1 year (51 issues) ..... UK £20.00
☐ 1 year Europe £35.00
☐ 1 year airmail £65.00
☐ I enclose my cheque made payable to Personal Computer News
☐ Please charge my Access/Visa/Diners/American Express card (delete where not applicable)
Account No. Expiry date:
Signed
What type of Micro do you use?
Do you use it for home/work/education?

Name
Address

0085

Please use block capitals

LION HOUSE ANNOUNCE THE OPENING OF THE WEST END'S LARGEST CUT-PRICE COMPUTER AND ELECTRONICS STORE

ATARI
VAST PURCHASE OF 20,000 PIECES OF SOFTWARE

AMSTRAD HI-FI
EXCLUSIVE PURCHASE OF EX DEMO STOCK IN PERFECT CONDITION OF STACKS AND TOWER SYSTEMS FULLY GUARANTEED FROM ONLY £100 TO £169 COMPLETE SYSTEMS BEST VALUE IN TOWN!

CBS COLECO VISION
COMPUTER GAMES SYSTEM £39.99 WITH CARTRIDGE (APPROX 14 OF ORIGINAL PRICE) EXTRA CARTRIDGES £4 EACH STEERING WHEELS & ATARI INTERFACES ALSO AVAILABLE

OVER 100 GAMES
£5.95 £6.95 by ATARI & ACTIVISION

400/800 COMPUTER BUSINESS & GAMES SOFTWARE
AT A FRACTION OF ORIGINAL COST

ALL ATARI HARDWARE AT NEW DRASTICALLY REDUCED PRICES + FREE CHOICE OF SOFTWARE

SOFTWARE BARGAINS
100'S OF TITLES - SINCLAIR - COMMODORE - BBC - DRAGON - CRC ETC at 99p - £1.99

FANTASTIC AQUARIUS COMPUTER SYSTEM
THE ONLY FULL COLOUR COMPUTER TO RETAIL UNDER £50. COMPLETE RANGE OF PERIPHERALS & SOFTWARE

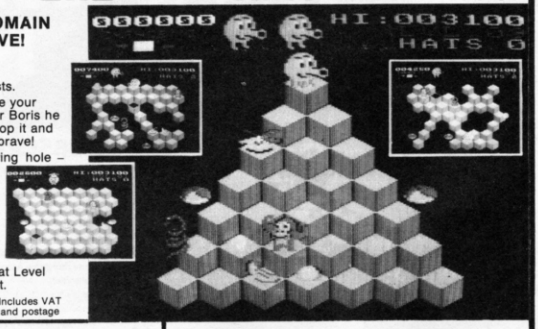
RECORDS & TAPES
ALL OUR LP ALBUMS £1.50
ALL OUR TAPES 99p.
1,000 TITLES TO CHOOSE FROM
VIDEO TAPES £9.99

LION HOUSE CHRISTMAS BARGAIN BAZAAR
232 TOTTENHAM COURT ROAD W1.
3 DOORS DOWN FROM MAIN STORE
OPEN EVERY EVENING TILL 7pm

ER*BERT'S 'ERE For the AMSTRAD CPC 464

IT'S ER*BERT'S CUBIC DOMAIN
FAST – FUNNY – ADDICTIVE!

- Avoid his unwelcome guests.
- Grab the banana – double your scores – but watch out for Boris he will soon want it back! Drop it and run, unless you are very brave!
- Avoid cascading balls and the moving hole – don't let Coily the anaconda give you a cuddle you'll never forget!
- Escape when it gets really tough by transporter disc or rota hat – but only if you've earned one.
- Multiple screens – additional cube colour changing tasks.
- It's fun at Level One – but watch out at Level Ten!! Packed with fun and excitement.



ER*BERT Machine code game **£5.95** Includes VAT and postage

MICROBYTE SOFTWARE (AM1)
18 HILGROVE ROAD, NEWQUAY, CORNWALL, TR7 2QZ.

MICROBYTE SOFTWARE

Available NOW at some retailers – or by fast mail order direct from Microbyte Software.

Dealers: Ask your distributor for ER*BERT.

ACCESS CARD WELCOME
24 HR HOT LINE:
06373 6886

COMING SOON . . .
3D SPACE RANGER

The Space game to challenge your skill!

AVAILABLE FOR AMSTRAD JANUARY 1985

ROUTINE ENQUIRIES

Got your digits in a twist over a problem? Can't decide what micro to buy? Need some sensible advice? Why not try writing to the experts? Remember we cannot reply personally, so no stamped self addressed envelopes, please. Address your questions to *Routine Enquiries, PCN, Evelyn House, 62 Oxford Street, London W1A 2HG.*

Software search for Commodore 16

Q Having just bought a Commodore 16 I would like to know of any software that is available, or forthcoming. Also, is there ever going to be a memory expansion or just a socket for ROM software?
D Hiscoke,
London, E2.

A With the exception of Commodore's own software, we know of only two packages which will be available soon. They are *Flight 015*, from Craig Communications, a flight simulator which will cost £5.95. The other is a package called *Psychodelia* from Llamasoft's Jeff Minter, best known for his Commodore 64 games which have attracted a cult following.

There seems to be little doubt that software support for the 16 will arrive, but as with any new machine, you should allow at least a couple of months before you see very much.

The expansion slot on the 16 may be able to accommodate extra memory although there is no mention of this in any of Commodore's literature, so you shouldn't count on it.

To keep you going in the spell before the software flood arrives, you could try a couple of books. Melbourne House has *The Commodore 16 Games Book*, 30 programs for you to type in.

Or you could brush up your programming with *The Commodore 16/Plus 4 Companion*, published by Sunshine. Both cost £5.95.

The French connection

Q I am going to spend some time in France and will be taking my Atmos. I want to avoid linguistic 'interference' from English magazines, so can you recommend a French counterpart (or several) to *PCN*?
Lorraine (Madame),
Bodmin, Cornwall.

A Mais oui, madame. Probably the best to look for is an all-purpose computer mag called *Votre Ordinateur*. We believe there's a dedicated Oric magazine called *L'Oriciel* too. As for linguistic interference we bet you'll get plenty of that unless the French have gone so far as to insist on Pour . . . Prochaine loops.

No easy way to cut out a Currah

Q I have had a 48K Spectrum for two years and recently bought a Currah speech unit for it. Is there any way to turn the Currah off while leaving it connected so that I can run programs without delving into the wiry wastes at the back of the machine?

Also, does it take up less memory to define numerical constants as a variable store at the start of a Basic program then refer to this store, and which, if either, is faster for the computer to work out?
Rodney Douglas,
Nottingham.

A As far as we know there's no way of switching off the Currah without disconnecting it. This is the case with quite a number of peripherals, although with some you'll find your Spectrum operates as if they were disconnected so long as you haven't accessed them since you powered up.

We're not altogether sure what you mean by your memory saving wheeze, but there are ways to save memory on the Spectrum. For example, if you're using the number '3' INT PI will save you space. You'll also save by storing numeric data as strings, then using VAL to turn it into a number. You could also POKE variable values into a safe area in the memory at the start of the program then PEEK them when you want to use them.

Or even flasher, PEEK system variables that you know are going to hold a certain value at the right time. These last are liable to be slower and trickier to use.

Better still why don't you just write shorter programs?

Making a home into a software house

Q I'm thinking about setting up my own software house. Please could you tell me how to go about this from copyright to duplication?
Stephen Miller,
Halesworth, Suffolk.

A You're going about it the right way — thinking. First advice is to carry on doing that for a while longer. (You may even consider quitting while you're still ahead.)

Our first reaction is that if you have to ask this kind of question, you're far from qualified to set up this kind of enterprise. However, for the sake of an interesting exercise we will take the question seriously.

1 Do you have a product that people want to buy? Sure? Good.
2 Contact a tape duplication house and get a quote for their services.
3 Consider the following question: how many copies should I produce? The answer will depend on the machine you're writing for, what you're writing (games sell more copies than dedicated applications) and how many other versions there are. This is complicated by a further consideration. If you produce too many copies, you'll have paid for them without getting your money back. If you produce too few, you'll gain a reputation for poor service and lose customers.
4 Having arrived at near enough the correct figure, have the duplication done.
5 Have cassette artwork designed and printed to the highest standard you can afford. Since you'll be selling by mail order, it doesn't have to compete with the best-sellers but it should look reasonably professional.
6 Take out a series of adverts in several computer magazines. This will not cost a great deal.
7 Wait for the orders to roll in, but use the time wisely. Have the organisation and cash ready to mail off the software.
8 Start work on your next best-seller.
9 Goto 3.

There are three possible outcomes. First, you may quietly and honestly lose a substantial amount of money. Be a good loser, secure in the knowledge that you are a better and wiser person.

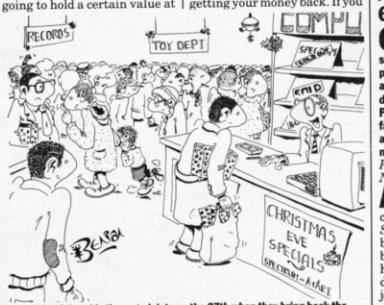
Second, you may dishonestly lose a substantial amount of other people's money. If you do this we trust you will be pilloried in public and face the righteous justice of the courts of the land.

Third, you might just possibly make a success of the venture and make a decent living at it. It is only fair to warn you that the third eventuality is by far the least likely but we wish you good luck.

A good book about 64 control interfacing

Q I am doing an advanced technology course and for this I must submit a project covering an application dealing with electronics and computers combined. I have decided to build a control interface. Please recommend a book on interfacing for a relative beginner and not a moron. My machine is the Commodore 64.
Paul Connally,
Newcastle, Co Down.

A One of the better books on real-time interfacing and control is *DIY Robotics and Sensors for the Commodore 64* by John Billingsley. Published by Sunshine Books at £6.95, it has lots of detail on analogue to digital conversion covering joysticks, stepper motors, and robots with information on both hardware and software.



What I dread is the complaints on the 27th when they bring back the faulty machines.

MICROWAVES

Have you any good answers for Amstrad owners or brainwaves for the Beeb? Share them with fellow computer users by sending them to us. Not only will you get £10 for every tip published, but you could find a bonus of £50 comes your way if you are chosen as the Microwave of the month. Send them to *Microwaves, PCN, Evelyn House, 62 Oxford Street, London W1A 2HG.*

Feeling free to interrupt

Prevent NEW from being entered from the keyboard, and demonstrate the use of keyboard interrupts, with the program below.

When run, it asks for a number between 110 and 255 and the machine code is located in memory at this number multiplied by 256.

In normal operation, *ie* when the Spectrum is in interrupt mode 1 (set by mnemonic IM 1), every 1/50th of a second a jump is made to address 38 hex to temporarily scan the keyboard. To change this address the interrupt mode 2 (IM 2) can be used. Then every 1/50th of a second, the Z80 creates a vector with the I register as the high byte and another byte (usually 255) that it receives from another part of the hardware as the low byte. At the location pointed to by this vector is the low byte followed by the high byte of the interrupts subroutine address. A CALL to this address is then made.

In the example program, lines 10 to 40 can be used to set up any interrupt routine. To put in your own routine, simply change the data in line 50. As the program stands it protects the user from accidentally NEWing a program. To return to normal enter GOTO 9999.

If you set up your own interrupt using this method you must first push all the registers used in your routine off the stack at the end. Next disable interrupts at the beginning of the routine using DI and enable them at the end using EI. Lastly, if you still want the keyboard scanned, RST 38(hex) somewhere in the routine.

In this way interrupts could be set to handle sprites, display a trace of a program, single step, and so on.

Callum Gibson,
Blairgowrie, Perthshire.

```
10 INPUT "Please enter m/c address divided by 256";a
20 LET a=a-1
30 LET f=a*256+248 : REM fastart address of
   initialisation
35 READ s : IF s<>999 THEN POKE f,s : LET f=f+1: GOTO
   35 : REM poke in data for init and actual interrupt
40 DATA 62,a,237,71,237,94,201 : REM set up interrupt
45 DATA 1,a+1 : REM holds address of interrupt routine
50 DATA 243,255,245,58,8,92,222,238,32,3,58,8,92,241,251,
   201 : REM data of actual interrupt routine
60 DATA 999
70 RANDOMIZE USR a*256+248 : STOP
9999 POKE f+1,237 : POKE f+2,86 : POKE f+3,201 :
     RANDOMIZE USR (f+1) : REM return to normal
```

Error-spotting BBC routine

This routine for the BBC will automatically list the line where an error has occured so you can edit the mistake out quickly and easily.

To use the routine, include near the beginning of the line:

ON ERROR GOTO 10000

To see this routine in action, type it in and try this short demonstration:

10 ON ERROR GOTO 10000
20 PRINT"By Jonathan Temple"

The computer will print 'mistake' and then list 20.

Jonathan Temple,
Beeston, Notts.

```
10000 MODE 7: *FX4,0
10010 PRINT' ':REPORT:VDU 10,152
10020 E$="L."+STR$(ERL)+CHR$(13)
10030 FOR L%=1 TO LEN(E$)
10040 A%=&8A:X%=&0:Y%=ASC(MID$(E$,
      L%))
10050 CALL &FFF4:NEXT
10060 END
```

64 screen dump not so squashed

I tried out Simon Taylor's program (issue 79) which provides screen dumps from the Commodore 64 to an Epson printer and found that the dumps produced appeared to be squashed.

The problem is in the choice of 7/72 line spacings. A dump produced with this spacing causes some lines on the printout to contain the data of two screen lines. Changing the spacing to 8/72 line eradicates the problem.

The following alterations need to be made to the Basic loader to sort out this problem:

Line 30 — change the 6th data item to a '7' instead of a '6'. This will allow for the extra control code needed.

Line 80 — change the 13th data item to '199' instead of '198'. This moves the address of the second code table by one byte.

Line 100 should read as follows:

100 DATA 41, 16, 201, 16, 208, 247, 138, 141, 0, 221, 104, 170, 96, 27, 65, 8, 27, 75, 6, 4, 1, 27, 50.

If you have your printer set up to line feed after the carriage return, change the 13th data item on line 70 to '0' instead of '13'. This will print a space.

If all these alterations are made, the checksum on line 210 will need changing to 24936, instead of 24923.

This should make the dumps appear less squashed.

Stephen Platt,
Chorley, Lancs.

Access open to BBC disk sectors

This procedure allows you to access any individual sector on the disk so as to write a copy of a buffer to it, or write a copy of the sector to the buffer. This process is useful when writing programs, such as databases or disk indexes, which are required to access the disk filenames directly or perhaps access the first few bytes of a file for use as a title.

To use the procedure the program must first, on running, initialise an 11-byte control block. This is pointed to by the variable control% and is achieved by including the statement DIM control% in your program. The procedure may then be called at any time by the command PROCsector_access (track, sector, buffer, mode). Buffer is an address which points to a 256-byte buffer for the data. This could be reserved using DIM buffer% 255. The value of mode decides whether the operation is a read or a write. Mode is zero to write, one to read.

The listing is for a single drive system. This can be changed for a multidrive system by altering these lines.

Line 30 change the last number in the brackets to your number of drives

Line 1080 add the parameter drive% after mode%

Line 1100 change to ?control%=drive%

See *Disc System User Guide* (page 74) for further information.

James Bridson,
Culcheth, Warrington.

```
  10 REM Example
  15 REM Save memory for control block and buffer
  20 DIM control% 10,buffer% 255
  25 REM call routine to read track 0 sector 0 to buffer
  30 PROCsector_access(0,0,buffer%,1)
  40 REM The catalogue is now at buffer%.....
  50 REM Try looking at memory from buffer%.....
  60 END
1000 REM
1010 REM This procedure will read/write any single
     sector from/to disk
1020 REM to/from the 256 byte buffer passed as a
     parameter.
1030 REM Format: PROCsector_access( track , sector ,
     buffer address , mode
1040 REM Where mode is zero to write sector and one to
     read sector
1050 REM A control block at control% must have
     previously been reserved
1060 REM by a: DIM control% 10
1070 REM
1080 DEF PROCsector_access(track%,sector%,buffer%,mode%)
1090 REM This sets up a parameter block for the DFS Rom:
1100 ?control%=0
1110 control%?1=buffer%
1120 control%?5=3
1130 control%?6=&48+1:*mode%
1140 control%?7=track%
1150 control%?8=sector%
1160 control%?9=&21
1170 control%?10=0
1180 REM Set pointer to control%, Sec accumulator=&7F
     and call OSWORD:
1190 A%=&7F:X%=control% MOD256:Y%=control% DIV256
1200 CALL&FFF1
1210 REM Test for an error code returned by the DFS:
1220 IF control%?10<>0 THEN VDU7:PRINT '"Disk error in
     PROCsector_access":END
1230 ENDPROC
```

PHILIPS

PHILIPS

INCREDIBLE?

e what comes bundled with ne P2000C at these prices!

For a demonstration post coupon now!

Personal Computer Div.
P.O. Box 4PD, London W1A 4PD.

Name:

Address:

Tel.:

PCN. 28/11/84

£1,990:*

for the P2009/16 – 16 bit, 352K RAM, 1x 640K floppy, MS-DOS 2.11., CP/M 2.2. Built-in 10 MB hard disk possible. Also runs 8 bit software.

£1,690:*

for the P2012 – 8 bit, 96K RAM, 2x 640K floppies and CP/M 2.2., TTY, WordStar, CalcStar, MBASIC, Business Graphics and SAGE "Try-before-you-buy" Accounts Packages.

£1,560:*

for the P2009 – 8 bit, 96K RAM, 1x 640K floppy, and CP/M 2.2., TTY, WordStar, CalcStar, MBASIC. Built-in 10 MB hard disk possible.

£995:*

for the P2010 – 8 bit, 96K RAM, 2x 160K floppies and CP/M 2.2., TTY, WordStar, CalcStar, MBASIC and SAGE "Try-before-you-buy" Accounts Packages.

Vast range of 16 and 8 bit software.

Dealers all over Great Britain.

Service guaranteed.

Easy to use especially for beginners.

Philips – with you every step of the way.

P2000 C **Philips Portable Computer**

The affordable portable.

* plus VAT

the authorized dealer near you contact:
gsway Data Systems, 30 Guildford Street, Chertsey, Surrey, Tel.: (0 93 28) 68 911, Telex: 24667 ·

M is a trademark of Digital Research Inc. p-System is a trademark of Softech Microsystems Inc. MS-DOS is a trademark of Microsoft Inc. WordStar and CalcStar are trademarks of MicroPro Int. Corp.

3D DRAWING

With Ian Wood's Three Dimensional Graphics program you can explore and design your own 3D line drawings on the Beeb.

The BBC's graphics capabilities are excellent, but to take full advantage of them you need the right software. Three Dimensional Graphics for the BBC lets you design a three dimensional line drawing which can then be rotated in any direction. You can also save and load your own programs.

Main menu

1 Rotate shape This brings up the rotation menu.

2 Save shape If this is chosen the program asks for the filename. Be careful not to cause a 'Bad string' error (by using a CHR$ less than 32). If you are using tape, the computer will print 'Record then Return'.

3 Change shape This brings up the shape menu.

4 Move shape This brings up the movement menu.

5 Exit menu This redraws the shape.

6 End program If this is chosen, the computer asks whether you want to start again. If you don't the program ends.

Shape menu

1 Use demonstration shape clears the current shape and loads the built-in demonstration shape.

2 Load new shape from tape/disk clears the current shape and asks for the filename of the program to be loaded. Pressing Return without a filename loads the next program on tape.

3 Create new shape clears the current shape and enters the editor.

4 Edit shape enters the editor.

5 Change title is the only way to change the title, as clearing the shape does not. A null string may be entered. When the shape is saved, the title is saved with it.

6 Exit menu redraws the shape.

Rotation & movement menu

Both these give a choice of six directions plus the 'Exit menu' option. When a direction has been chosen, the program asks how far you want to rotate or move the shape.

The movement menu also has a 'Change camera position' option. This is included in the movement menu because the 'Move' options actually change the camera position.

Editor

The editor is entered from the shape menu simply by selecting either the 'Create new shape' option or the 'Edit shape' option.

Two cursors are displayed, together with their x,y,z coordinates, and can be moved around the screen. If the space bar is pressed a line will be drawn between the cursors and if the Delete key is pressed, the line will be deleted. Note that it's possible to draw up to one hundred lines.

To move the square cursor use the arrow keys, and 'T and 'O' for 'in' and 'out' (away from and towards you). To move the cross cursor, shift the keys.

When the shape is finished, press Return.

Procedure and functions

The procedures and functions appear to be rather disorganised, but in fact they are in chronological order. When I thought of something new to put in the program, I just added another procedure to the end.

FNmovex Works out the coordinate for drawing the shape on the screen from the x and z coordinates, taking into account the camera position.

FNmovey Does the same for the y coordinate.

PROCplot Draws a line on the screen using the x,y,z coodinates of the start and end of the line.

PROCdraw Draws the whole shape and prints the title.

PROCclock Works out the clockwise/anti-clockwise movement of the shape.

PROCupdn Works out up and down movement.

PROCrlft Works out left and right movement.

PROCdemo Initialises the demonstration shape.

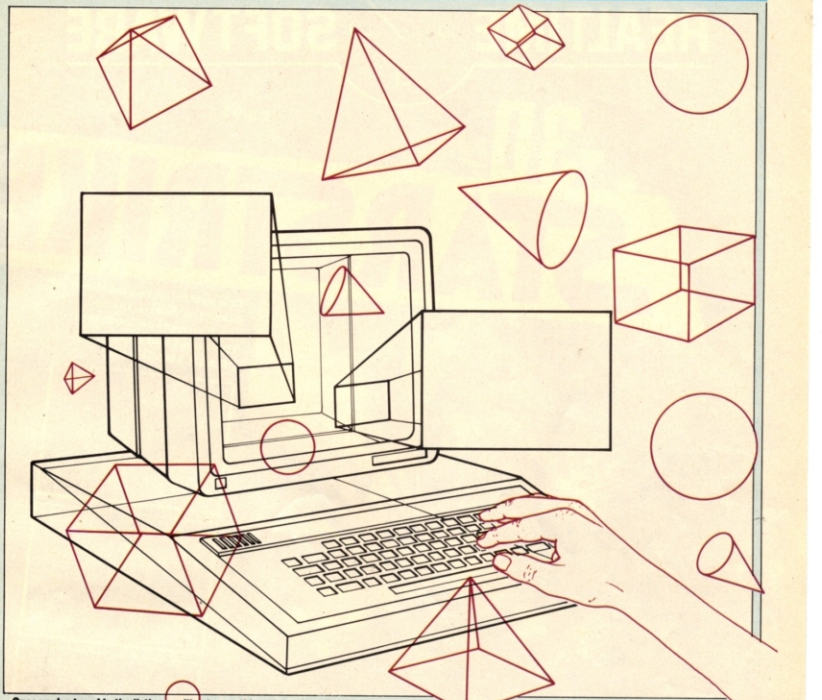
PROCsave Saves the shape and title.

PROCload Loads the shape.

PROCentermain This is the main editor procedure. It initialises variables, reads the the keyboard and then counts the number of lines.

Listing

```
  10REM ----------------------------
  20REM !                          !
  30REM ! Three Dimensional Graphics !
  40REM !                          !
  50REM !        by Ian Wood       !
  60REM !__________________________!
  70REM
  80ON ERROR PROCerror:END
  90MODE4
 100VDU19,1,6;0;12129,639;11123,1,0;0;0;0
;123,224,255,129,153,165,165,153,129,255,
23,225,129,66,36,0,0,36,66,129
 110DIM x%(99,1),y%(99,1),z%(99,1):lines
%=0:cx%=0:cy%=0:cz%=0
 120PROCinfo
 130PROCdemo
 140PROCdraw
 150REPEAT PROCmain_menu:UNTIL key$="6"
 160PRINT"Start again?(Y/N)":IF INSTR("
Nn",GET$)=0 RUN
 170VDU23,1,1;0;0;0;:*FX15 1
 180END
 190REM----------------------------
 200REM
 210DEFFNmovex(v%,w%)
 220v%=v%-cx%:w%=w%-cz%
 230IF v%(cx% v%=v%+INT((v%/511)*w%)
 240IF v%)cx% v%=v%-INT((-v%/511)*w%)
 250=v%
 260DEFFNmovey(v%,w%)
 270v%=v%-cy%:w%=w%-cz%
 280IF v%(cy% v%=v%+INT((v%/511)*w%)
 290IF v%)cy% v%=v%-INT((-v%/511)*w%)
 300=v%
 310DEFPROCplot(x1%,y1%,z1%,x2%,y2%,z2%
)
 320IF x1%=0 AND y1%=0 AND z1%=0 AND x2
%=0 AND y2%=0 AND z2%=0 ENDPROC
 330MOVEFNmovex(x1%,z1%),FNmovey(y1%,z1
%)
 340DRAWFNmovex(x2%,z2%),FNmovey(y2%,z2
%)
 350ENDPROC
 360DEFPROCdraw
 370CLS
 380FOR line%=0 TO lines%
 390x%=x%(line%,0):y%=y%(line%,0):z%=z%
(line%,0):xx%=x%(line%,1):yy%=y%(line%,1
):zz%=z%(line%,1)
 400PROCplot(x%,y%,z%,xx%,yy%,zz%)
 410NEXT
 420VDU17,0,17,129,31,0,31:PRINT"Press
SPACE for main menu":i=0:f=set%*20-LEN(ti
e$DIV2:VDU17,1,17,128,31,0:f=set%,0:PRINT
itle$TAB(0+f=set%)STRING$(LENtitle$,"="
 430ENDPROC
 440DEFPROCroll(degrees%)
 450rads=RAD(degrees%)
 460FOR line%=0 TO lines%
 470FOR point%=0 TO 1
 480x%=x%(line%,point%):y%=y%(line%,poi
nt%)
 490x%(line%,point%)=x%*COSrads-y%*SINr
ads
 500y%(line%,point%)=x%*SINrads+y%*COSr
ads
 510NEXT
 520NEXT
 530ENDPROC
 540DEFPROCpitch(degrees%)
 550rads=RAD(degrees%)
 560FOR line%=0 TO lines%
 570FOR point%=0 TO 1
 580y%=y%(line%,point%):z%=z%(line%,poi
nt%)
 590y%(line%,point%)=y%*COSrads-z%*SINr
ads
 600z%(line%,point%)=y%*SINrads+z%*COSr
ads
 610NEXT
 620NEXT
 630ENDPROC
 640DEFPROCyaw(degrees%)
 650rads=RAD(degrees%)
 660FOR line%=0 TO lines%
 670FOR point%=0 TO 1
 680x%=x%(line%,point%):z%=z%(line%,poi
nt%)
 690x%(line%,point%)=x%*COSrads-z%*SINr
ads
 700z%(line%,point%)=x%*SINrads+z%*COSr
ads
 710NEXT
 720NEXT
 730ENDPROC
 740DEFPROCdemo
 750RESTORE:title$="Demonstration shape
":lines%=9
 760FOR line%=0 TO 8
```



Once you've typed in the listing you'll get something along these lines.

```
  770FOR point%=0 TO 1
  780READx%(line%,point%),y%(line%,point%),z%(line%,point%)
  790NEXT
  800NEXT
  810ENDPROC
  820DATA-200,-200,52,-200,200,52,-200,200,52,200,200,52,200,200,52,200,-200,52,200,-200,52,-200,-200,52,-200,-200,52,-200,-200,52,-200,-52,-200,-200,-52,200,-200,-52,200,-200,-52,200,-200,52,-200,200,52,-200,-200,-52,200,200,52,200,-200,-52
  830DEFPROCsave
  840VDU12,17,0,17,129,31,0,15:PRINT"Enter name of shape:"i:VDU17,1,17,128
  850REPEAT INPUTTAB(20,15)"name$:UNTIL LEN(name$)>0
  860PRINT''Insert tape/disc''
  870channel%=OPENOUT(name$)
  880PRINT£channel%,title$,lines%
  890FORi=1TO10:NEXT
  900FOR line%=0 TO lines%
  910FOR point%=0 TO 1
  920PRINT£channel%,x%(line%,point%),y%(line%,point%),z%(line%,point%)
  930NEXT
  940NEXT
  950CLOSE£channel%
  960VDU7
  970ENDPROC
  980DEFPROCload
  990VDU12,17,0,17,129,31,0,15:PRINT"Enter name of shape:"i:VDU17,1,17,128
 1000INPUT"name$
 1010PRINT"Insert tape/disc''''If using tape,press PLAY on recorder''
 1020channel%=OPENIN(name$)
 1030IF channel%=0 PRINT"That shape is not on this disc":GOTO990
 1040INPUT£channel%,title$,lines%
 1050FOR line%=0 TO lines%
 1060FOR point%=0 TO 1
 1070INPUT£channel%,x%(line%,point%),y%(line%,point%),z%(line%,point%)
 1080NEXT
 1090NEXT
 1100CLOSE£channel%
 1110VDU7
 1120ENDPROC
 1130DEFPROCenter
 1140PROCdraw:VDU17,0,17,129,28,0,31,39,31,12
 1150cx1%=0:cy1%=0:cz1%=0:cx2%=0:cy2%=0:cz2%=0
 1160REPEAT
 1170IF INKEY-1 PROCpoint2 ELSE PROCpoint1
 1180a%=FNmovex(cx1%,cz1%):b%=FNmovey(cy1%,cz1%)
 1190MOVEa%-16,b%+16:VDU5,18,3,1,224
 1200t%=FNmovex(cx2%,cz2%):q%=FNmovey(cy2%,cz2%)
 1210MOVEp%-16,q%+16:VDU225
 1220VDU4,31,0,0,32,32,224:PRINTicx1%;",";icy1%;",";icz1%;"  ";CHR$225icx2%;",";icy2%;",";icz2%;"  "
 1230MOVEa%-16,b%+16:VDU5,224
 1240MOVEp%-16,q%+16:VDU225
 1250IF INKEY-90 PROCedit
 1260IF INKEY-99 PROCline:lines%=lines%+1
 1270UNTIL INKEY-74 OR lines%>99
 1280IF lines%>99 PROCno_room
 1290VDU26,18,0,1,17,1,17,128,29,639;511;4
 1300ENDPROC
 1310DEFPROCpoint1
 1320IF INKEY-26 cx1%=cx1%-4
 1330IF INKEY-122 cx1%=cx1%+4
 1340IF INKEY-42 cy1%=cy1%-4
 1350IF INKEY-58 cy1%=cy1%+4
 1360IF INKEY-38 cz1%=cz1%-4
 1370IF INKEY-55 cz1%=cz1%+4
 1380ENDPROC
 1390DEFPROCpoint2
 1400IF INKEY-26 cx2%=cx2%-4
 1410IF INKEY-122 cx2%=cx2%+4
 1420IF INKEY-42 cy2%=cy2%-4
 1430IF INKEY-58 cy2%=cy2%+4
 1440IF INKEY-38 cz2%=cz2%-4
 1450IF INKEY-55 cz2%=cz2%+4
 1460ENDPROC
 1470DEFPROCline
 1480IF FNcheck ENDPROC
 14900COL0,1
 1500PROCplot(cx1%,cy1%,cz1%,cx2%,cy2%,cz2%)
 1510x%(lines%,0)=cx1%:y%(lines%,0)=cy1%:z%(lines%,0)=cz1%
```


▶ 15

REALTIME SOFTWARE

£5.95

3D STARSTRIKE

The battle run to end them all!
Blast the aliens, invade
the battleplanet and destroy it!
The mean and deadly
CRASH SMASH - 93%.

ZX SPECTRUM 48K
SINCLAIR, KEMPSTON AND CURSOR
JOYSTICK COMPATIBLE

3-D TANK DUEL

You against
enemy tanks, UFOs
and missiles -
A killer of a game!
CRASH Rating 83%.

£5.50

REALTIME SOFTWARE, PROSPECT HOUSE, 32 SOVEREIGN STREET, LEEDS LS1 4BJ

Rush me STARSTRIKE £5.95 ☐ TANK DUEL £5.50 ☐ P&P incl.
BOTH GAMES FOR ONLY £10 ☐

Name _____
Address _____
Postcode _____
Cheque/p.o. payable to REALTIME SOFTWARE

PROCpoint1 Moves square cursor.

PROCpoint2 Moves cross cursor.

PROCline Draws a line. First checks to see if line already exists.

PROCedit Deletes a line. First checks to see if line already exists.

PROCdelete Called by PROCedit. Deletes a line and compacts the list of coordinates (removes empty spaces in list).

PROCcompact Called by PROCdelete. Compacts the list of coordinates.

PROCmain _ menu Prints main menu, reads keyboard and calls a procedure depending on choice made.

PROCrotate—menu As above, for rotation.

PROCinput Inputs the number of degrees that the shape is to be rotated.

PROCshape _ menu As PROCmain menu, for shape menu.

PROCerror Puts colours and cursor back to normal, empties the keyboard buffer and prints an error message.

PROClear Called by PROCshape menu. Clears the shape.

PROCno _ room Called by PROCenter, if the arrays holding the list of coordinates are full. Prints an error message on the screen.

FNcheck Called by PROCline. Checks to see if line to be drawn already exists.

PROCinfo Prints the instructions.

PROCtitle Inputs a new title.

PROCmove _ menu As PROCmain menu but for movement menu.

PROCpoints Inputs the number of points that the shape is to be moved.

PROCout Moves shape out (towards screen). With a negative value, moves shape in (away).

PROCup Moves shape up or down.

PROCleft Moves shape left or right.

PROCc — pos Inputs a new camera position.

Main variables

x%,y%,z%	These three arrays make up the list of coordinates that form the shape.
lines%	The number of lines in the shape minus one.
line%	Used throughout the program. Current line being worked on.
key$	Used in menu procedures. Contains the last key pressed.
cx%,cy%,cz%	The coordinates of the camera position.
title$	The title of the shape.

Listing (cont)

```
  1520:%(lines%,1)=cx2%:y%(lines%,1)=cy2%
:z%(lines%,1)=cz2%
  1530ENDPROC
  1540DEFPROCedit
  1550FOR line%=0 TO lines%
  1560start%=x%(line%,0)=cx1% AND y%(line
%,0)=cy1% AND z%(line%,0)=cz1%
  1570end%=x%(line%,1)=cx2% AND y%(line%,
1)=cy2% AND z%(line%,1)=cz2%
  1580IF start% AND end% PROCdelete
  1590NEXT
  1600ENDPROC
  1610DEFPROCdelete
  1620x%(line%,0)=0:y%(line%,0)=0:z%(line
%,0)=0
  1630x%(line%,1)=0:y%(line%,1)=0:z%(line
%,1)=0
  1640COLO,0:PROCplot(cx1%,cy1%,cz1%,cx2
%,cy2%,cz2%)
  1650IF line%=lines% lines%=lines%-1 ELS
E PROCcompact
  1660ENDPROC
  1670DEFPROCcompact
  1680FOR i%=line%+1 TO lines%
  1690:x%(i%-1,0)=x%(i%,0):y%(i%-1,0)=y%(i
%,0):z%(i%-1,0)=z%(i%,0)
  1700:x%(i%-1,1)=x%(i%,1):y%(i%-1,1)=y%(i
%,1):z%(i%-1,1)=z%(i%,1)
  1710NEXT
  1720lines%=lines%-1
  1730ENDPROC
  1740DEFPROCmain_menu
  1750*FX15 1
  1760REPEAT UNTIL GET=32
  1770 VDU12,17,0,17,129,31,15,3:PRINT"MA
IN  MENU":VDU17,1,17,128
  1780PRINT''''     1 : Rotate shape''''
    2 : Save shape to tape/disc''''     3
 : Change shape''''     4 : Move shape''
''     5 : Exit menu''''     6 : End pro
gram"
  1790VDU31,14,VPOS+3:PRINT"Press 1-6..."
  1800*FX15 1
  1810REPEAT key$=GET$:UNTIL INSTR("12345
6",key$)>0
  1820IF key$="1" PROCrotate_menu
  1830IF key$="2" PROCsave
  1840IF key$="3" PROCshape_menu
  1850IF key$="4" PROCmove_menu
  1860IF key$()"6" PROCdraw
  1870ENDPROC
  1880DEFPROCrotate_menu
  1890LOCAL key$
  1900VDU12,17,0,17,129,31,13,3:PRINT"ROT
ATION  MENU":VDU17,1,17,128
  1910PRINT''''     1 : Rotate clockwise''''
     2 : Rotate anticlockwise''''     3
 : Rotate up''''     4 : Rotate down''''
     5 : Rotate left''''     6 : Rotate
right''''     7 : Exit menu"
  1920VDU31,14,VPOS+3:PRINT"Press 1-7..."
  1930*FX15 1
  1940REPEAT key$=GET$:UNTIL INSTR("12345
67",key$)>0
  1950IF key$()"7" PROCinput
  1960IF key$="1" PROCroll(-deg%)
  1970IF key$="2" PROCroll(deg%)
  1980IF key$="3" PROCpitch(-deg%)
  1990IF key$="4" PROCpitch(deg%)
  2000IF key$="5" PROCyaw(deg%)
  2010IF key$="6" PROCyaw(-deg%)
  2020ENDPROC
  2030DEFPROCinput
  2040VDU12,17,0,17,129,31,0,15:PRINT"How
 many degrees?":VDU17,1,17,128
  2050INPUT"deg%:deg%=deg% MOD 360
  2055PRINT"Working out coordinates"
  2060ENDPROC
  2070DEFPROCshape_menu
  2080LOCAL key$
  2090VDU12,17,0,17,129,31,15,3:PRINT"SHA
PE MENU":VDU17,1,17,128
  2100PRINT''     1 : Use demonstration s
hape''''     2 : Load new shape from tap
e/disc''''     3 : Create new shape''''
     4 : Edit shape''''     5 : Change ti
tle''''     6 : Exit menu"
  2110VDU31,14,VPOS+3:PRINT"Press 1-6..."
  2120*FX15 1
  2130REPEAT key$=GET$:UNTIL INSTR("12345
6",key$)>0
  2140IF key$="1" PROCdemo
  2150IF key$="2" PROCload
  2160IF key$="3" PROCclear:PROCenter
  2170IF key$="4" lines%=lines%+1:PROCent
er
  2180IF key$="5" PROCtitle
  2190ENDPROC
  2200DEFPROCerror
  2210*FX15 1
  2220VDU17,1,17,128,23,1,1;0;0;0;
  2230REPORT:PRINT" at line ";ERL
  2240ENDPROC
  2250DEFPROCclear
  2260FOR line%=0 TO 99
  2270FOR point%=0 TO 1
  2280x%(line%,point%)=0:y%(line%,point%)
=0:z%(line%,point%)=0
  2290NEXT
  2300NEXT
  2310lines%=0
  2320ENDPROC
  2330DEFPROCno_room
  2340VDU4:PRINT"No room for any more lin
es";
  2350TIME=0:REPEAT UNTIL TIME>150
  2360lines%=lines%-1
  2370ENDPROC
  2380DEFFNcheck
  2390result%=0
  2400FOR line%=0 TO lines%
  2410start%=x%(line%,0)=cx1% AND y%(line
%,0)=cy1% AND z%(line%,0)=cz1%
  2420end%=x%(line%,1)=cx2% AND y%(line%,
1)=cy2% AND z%(line%,1)=cz2%
  2430IF start% AND end% result%=-1
  2440NEXT
  2450=result%
  2460DEFPROCinfo
  2470 VDU17,0,17,129,31,0,3:PRINT"
Three Dimensional Graphics
  2480VDU17,1,17,128,31,14,5:PRINT"By Ian
 Wood"
  2490PRINT' This program lets you draw
a three-   dimensional line drawing whic
h can then be edited,rotated or moved in
 any      direction or saved onto tape
or disc.**
  2500PRINT' A shape is designed and edi
ted using  the editor.Two cursors and th
eir        coordinates are displayed.Whe
n the spacebar is pressed a line is draw
n between
  2510PRINT"them.If they are placed over
 the start  and end of an existing line a
nd the     'DELETE' key is pressed,the l
ine will bedeleted,but the cursors must
be in      exactly the right position.**
  2520PRINT' To move the square cursor u
se the     arrow keys and 'I' and 'O' to
r 'in' and 'out'.To move the cross curso
r shift    these keys.When you have fini
shed,press the 'RETURN' key."
  2530PRINT"Press space..."
  2540*FX15 1
  2550REPEAT UNTIL GET=32
  2560VDU12,17,0,17,129,31,0,3:PRINT"
    Three Dimensional Graphics          "':V
DU17,1,17,128
  2570PRINT' As well as designing a shap
e,you can  use the demonstration shape o
r load a   previously saved shape from t
ape or     disc.**
  2580PRINT' The shape can be rotated cl
ockwise,   anticlockwise,up,down,left or
 right.It  can be moved in,out,up,down,l
eft or     right."
  2590PRINT' All of the options availabl
e are      chosen from a menu.There are
four menus,the main menu,the rotation me
nu,the     movement menu and the shape m
enu."
  2600PRINT"Press space..."
  2610*FX15 1
  2620REPEAT UNTIL GET=32
  2630ENDPROC
  2640DEFPROCtitle
  2650VDU12,17,0,17,129,31,0,15:PRINT"Ent
er title":VDU17,1,17,128
  2660INPUT"title$
  2670ENDPROC
  2680DEFPROCmove_menu
  2690LOCAL key$
  2700VDU12,17,0,17,129,31,13,3:PRINT"MOV
EMENT  MENU":VDU17,1,17,128
  2710PRINT''     1 : Move shape in(away)
''''     2 : Move out''''     3 : Move u
p''''     4 : Move down''''     5 : Move
 left''''     6 : Move right''''     7 :
 Change camera position''''     8 : Exit
 menu"
  2720VDU31,14,VPOS+3:PRINT"Press 1-9..."
  2730*FX15 1
  2740REPEAT key$=GET$:UNTIL INSTR("12345
678",key$)>0
  2750IF key$()"7" AND key$()"8" PROCpoin
ts
  2760IF key$="1" PROCout(-p%)
  2770IF key$="2" PROCout(p%)
  2780IF key$="3" PROCup(p%)
  2790IF key$="4" PROCup(-p%)
  2800IF key$="5" PROCleft(p%)
  2810IF key$="6" PROCleft(-p%)
  2820IF key$="7" PROCc_pos
  2830ENDPROC
  2840DEFPROCpoints
  2850VDU12,17,0,17,129,31,0,15:PRINT"How
 many points?":VDU17,1,17,128
  2860INPUT TAB(16,15)p%
  2870ENDPROC
  2880DEFPROCout(points%)
  2890cz%=cz%-points%
  2900ENDPROC
  2910DEFPROCup(points%)
  2920cy%=cy%-points%
  2950cx%=cx%+points%
  2960ENDPROC
  2970DEFPROCc_pos
  2980VDU12,17,0,17,129,31,0,15:PRINT"Ent
er coordinates(X,Y,Z):":VDU17,1,17,128,3
1,25,15
  2990INPUT"cx%,cy%,cz%
  3000ENDPROC
```

INSIDE THE HEADER

Alan Turnbull explains how you can make better use of headers on the QL.

Among QDOS system calls documented in the QDOS manuals is one which reads 'header' details from QL Microdrive files. These headers hold information not listed when you take a simple directory listing of a cartridge. The headers can accommodate file length, file access flag, file type, file-dependent information, file name and date information.

Currently, QDOS uses neither the file access flag nor the date information. Presumably, these would offer file access privilege protection and extended directories including date and time when saved, as provided on 'proper' disk operating systems.

At the moment, QDOS recognises only two types of file: those generated by SAVE (for Basic), SBYTES (for code) or PRINT # (for data), and those which are generated by SEXEC (for 'transient', multi-tasking machine code programs).

In the case of Basic, code and data files, the only information held in the header besides the file name is the length of the file itself, in bytes. For transient programs, the default size of their data spaces is held as well.

The machine code program for the MC68008 processor in Listing 1 reads headers from QL Microdrive cartridges. It has three main parts. First, a channel is opened by calling the QDOS system routine IO_OPEN using TRAP 2 with registers D0 = 1 (to identify which system routine is required); D1 = −1 (to specify the current 'job' — that is, the SuperBasic command processor; D3 = 0 to signal that an old, exclusive file is to be opened and A0 pointing to the channel name in the format "mdv1_somename". The system call opens the channel and returns the channel ID in A0. This channel ID is subsequently held in A0 and used by the following system calls.

Second, the file header is read into a 64-byte buffer in memory so that a SuperBasic program may examine it. This requires a call to QDOS system routine FS_HEADR using TRAP 3 with D0 = 71; D2 = 64 (the memory buffer length); D3 = −1 (the 'time-out' value needed by the serial access routines); the channel ID in A0 and A1 holding a pointer to the memory buffer itself.

Lastly, the channel created by IO_OPEN using the temporary channel ID in A0 is closed by a call to IO_CLOSE usding TRAP 2 with D0 = 2.

To use the machine code routine properly, a SuperBasic program is also needed. The program in Figure 2 uses the machine code (held in DATA statements) to print out the header information for each file found on QL Microdrive 'mdv1'. It uses 'mdv2' as a temporary store for the DIRectory listing from 'mdv1'. This is stored on cartridge and read back, one file name at a time.

The file names are put into the table required by the machine code and the routine is called to read the header for that file direct from the cartridge.

When this is finished (and it is quite fast), the header may be examined as it now lies in memory above the original machine code.

The header, when read into memory, starts at (start of machine code)+96 and the file length is held as a long word (four bytes) at this position. The file type is stored as the sixth byte in the header, so is at an offset 101 bytes from the machine code start.

For transient programs, the default data space size is held as a long word starting at the seventh byte in the header and so is at (start of machine code)+102.

Of course, the routines presented here would be of more use when files are saved with date and file protection information. But you should now know how to write simple utility programs in conjunction with the QDOS Manual.

In Listings 1 and 2, (left) the £ sign should be treated as a #.

Listing 1: MC68008 code

```
7600        MOVEQ £0,D3          ; signal old, exclusive file
72FF        MOVEQ £-1,D0         ; signal 'this job' ID
41FA001A    LEA channel(PC),A0   ; point to channel name
7001        MOVEQ £1,D0          ; signal IO_OPEN system call
4E42        TRAP £2              ; do QDOS system call
343C0040    MOVE.W £64,D2        ; signal 64 bytes for file header
76FF        MOVEQ £-1,D3         ; signal no 'time-out'
43FA004C    LEA buffer(PC),A1    ; point to buffer for header
7047        MOVEQ £71,D0         ; signal FS_HEADR system call
4E43        TRAP £3              ; do QDOS system call
7002        MOVEQ £2,D0          ; signal IO_CLOSE system call
4E42        TRAP £2              ; do QDOS system call
4E75        RTS                  ; return to SuperBASIC
                                 ;
channel     DEFS 64              ; channel name (e.g., mdv1_name)
buffer      DEFS 64              ; buffer for file header read in
```

Listing 2: SuperBasic program

```
100 REMark QL Microdrive File Header Reader
110 REMark (c) October 1984, Alan Turnbull
120 :
130 IF RESPR(0)=262144 THEN
140   LET read_header=RESPR(512)
150 ELSE
160   LET read_header=RESPR(0)
170 END IF
180 RESTORE
190 FOR data_item_number=1 TO 32
200   READ data_item
210   POKE read_header+data_item_number-1,data_item
220 END FOR data_item_number
230 OPEN_NEW £4,mdv2_temp_dir
240 DIR £4,mdv1_
250 CLOSE £4
260 OPEN_IN £4,mdv2_temp_dir
270 INPUT £4,dummy$;dummy$;
280 REPeat read_file_names
290   IF EOF(£4) THEN EXIT read_file_names
300   INPUT £4;file_name$
310   LET file_name$="mdv1_" & file_name$
320   LET file_name_length=LEN(file_name$)
330   POKE_W read_header+32,file_name_length
340   FOR character=1 TO file_name_length
350     POKE read_header+34+character-1,CODE(file_name$(character))
360   NEXT character
370   CALL read_header
380   LET file_length=PEEK_L(read_header+96)
390   LET file_type=PEEK(read_header+101)
400   PRINT file_name$(6 TO)
410   PRINT "File length = ";file_length
420   PRINT "File type: ";
430   SELect ON file_type
440     =0
450       PRINT "BASIC/data/code"
460     =1
470       PRINT "Transient program"
480       LET default_data_size=PEEK_L(read_header+102)
490       PRINT "Default data area size = ";default_data_size
500   END SELect
510   PRINT
520 END REPeat read_file_names
530 CLOSE £4
540 DELETE mdv2_temp_dir
550 :
560 DATA 118,0,114,255,65,250,0,26,112,1,78,66,52,60,0,64
570 DATA 118,255,67,250,0,76,112,71,78,67,112,2,78,66,78,117
```

TOOL® BOX '84

ATARI/CBM/MEMOTECH/ETC.

TOOL BOX'84 is a very helpful tool which is made for you, the serious computer user.

TOOL BOX'84 is specially designed for electronical functions such as:

- -making your own joysticks, paddles, lightpens etc.
- -making ganginginstruments for light, wind, heat and resistance.
- -making electronic alarmsystems.
- -making your own robotsystem.
- -developing your skills in computers and electronics.

TOOL BOX'84 is needed in schools, work or for your hobby.

TOOL BOX'84 is delivered with a informative user's guide with lots of program listings.

TOOL BOX'84 is a necessity for the beginner.

TOOL BOX'84 adds a quite new dimension to your computer-life !

Send for our free: TOOL BOX'84 Information.

DEALER AND DISTRIBUTOR INQUIRIES INVITED

Norbit Elektronikk
DATA • SOFTWARE

P.O. BOX 228, N-7701 STEINKJER
NORWAY
TEL: (NORWAY) (01047) 7765440, 7765310

£ 36.25
Shipping and handling £ 2.50 per order

MasterCard CHARGE CARDS WELCOME VISA

I own the ..... computer and Please send
..... copies of the TOOL BOX'84 £36.25 p.p. and/or
..... free TOOL BOX'84 Information.
Name ..... ☐MC# or ☐Visa#
Address ..... Exp.Date .....
City/St./Zip ..... Signature .....
Chargecardno .....

TOOL BOX'84 is a trademark of Norbit Elektronikk.

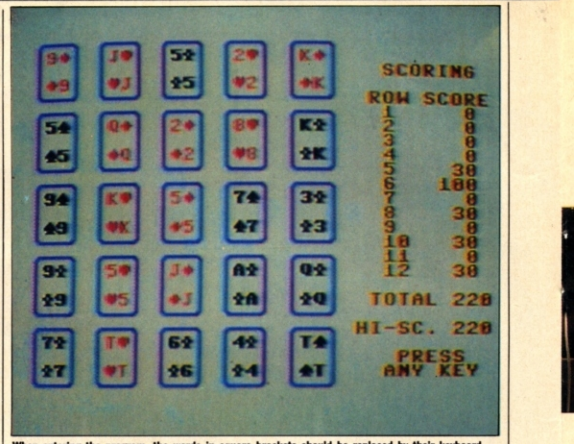
SOLO POKER

It's a tricky hand that your 64 deals in this solitaire card game by Keith Hobley.

A computer has to be the ultimate in poker faces, so you'd expect Poker Solitaire for the Commodore 64 to be tricky. You'd be right.

The game's layout consists of five rows of five face-up cards each, and you place the cards dealt by the computer in any position you choose. You can't move a card after you've placed it so you need to put a bit of thought into this.

Each row, each column and the two diagonals are the equivalent of a poker hand. Your goal is to place the cards in such a way as to produce the best hands possible. Details of scoring are included in the program.



When entering the program, the words in square brackets should be replaced by their keyboard equivalent. An S in brackets indicates the shift key, so [ST] means press shift and T together.

Listing

```
1 REM ************************************
2 REM ********** POKER SOL BY *********
3 REM ************************************
4 REM ********** KEITH HOBLEY *********
5 REM ************************************
6 PRINTCHR$(147)
7 POKE53280,12:POKE53281,12
8 GOSUB165
9 DIMP(25),F(25),FF(25),K(52),
10 PRINTCHR$(142)
11 PRINT"{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{
DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN
}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DO
WN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}"
12 Q1=5427:Q2=0
13 P(1)=1067:P(2)=1072:P(3)=1077:P(4)=10
82:P(5)=1087
14 P(6)=1267:P(7)=1272:P(8)=1277:P(9)=12
82:P(10)=1287
15 P(11)=1467:P(12)=1472:P(13)=1477:P(14
)=1482:P(15)=1487
16 P(16)=1667:P(17)=1672:P(18)=1677:P(19
)=1682:P(20)=1687
17 P(21)=1867:P(22)=1872:P(23)=1877:P(24
)=1882:P(25)=1887
18 FORI=1TO4
19 PRINT"{BLUE} {S U}{S #}{S #}{S I} {S
U}{S #}{S #}{S I} {S U}{S #}{S #}{S I}
{S U}{S #}{S #}{S I} {S U}{S #}{S #}{S I
}"
20 FORI=1TO3
21 PRINT" {S -} {S -} {S -} {S -} {S -}
-} {S -} {S -} {S -} {S -}"
22 NEXTI
23 PRINT" {S J}{S #}{S #}{S K} {S J}{S
#}{S #}{S K} {S J}{S #}{S #}{S K} {S J}{S
#}{S #}{S K} {S J}{S #}{S #}{S K}"
24 NEXTJ
25 PRINT" {S U}{S #}{S #}{S I} {S U}{S
#}{S #}{S I} {S U}{S #}{S #}{S I} {S U}{S
#}{S #}{S I} {S U}{S #}{S #}{S I}"
26 FORI=1TO3
27 PRINT" {S -} {S -} {S -} {S -} {S -
} {S -} {S -} {S -} {S -} {S -}"
28 NEXTI
29 PRINT" {S J}{S #}{S #}{S K} {S J}{S
#}{S #}{S K} {S J}{S #}{S #}{S K} {S J}{S
#}{S #}{S K} {S J}{S #}{S #}{S K}{HOME
}"
30 PRINT"{c 2}{HOME}{DOWN}{DOWN}{RIGHT}{
RIGHT}{RIGHT}{RVSON} AERVSOFF}{RIGHT}{RI
GHT}{RIGHT}{RVSON} BERVSOFF}{RIGHT}{RIGH
T}{RIGHT}{RVSON} CERVSOFF}{RIGHT}{RIGHT}
{RIGHT}{RVSON} DERVSOFF}{RIGHT}{RIGHT}{R
IGHT}{RVSON} EERVSOFF}"
31 PRINT"{DOWN}{DOWN}{DOWN}{DOWN}{RIGHT}
{RIGHT}{RIGHT}{RVSON} FERVSOFF}{RIGHT}{R
IGHT}{RIGHT}{RVSON} GERVSOFF}{RIGHT}{RIG
HT}{RIGHT}{RVSON} HERVSOFF}{RIGHT}{RIGHT
}{RIGHT}{RVSON} IERVSOFF}{RIGHT}{RIGHT}{
RIGHT}{RVSON} JERVSOFF}"
32 PRINT"{DOWN}{DOWN}{DOWN}{DOWN}{RIGHT}
{RIGHT}{RIGHT}{RVSON} KERVSOFF}{RIGHT}{R
IGHT}{RIGHT}{RVSON} LERVSOFF}{RIGHT}{RIG
HT}{RIGHT}{RVSON} MERVSOFF}{RIGHT}{RIGHT
}{RIGHT}{RVSON} NERVSOFF}{RIGHT}{RIGHT}{
RIGHT}{RVSON} OERVSOFF}"
33 PRINT"{DOWN}{DOWN}{DOWN}{DOWN}{RIGHT}
{RIGHT}{RIGHT}{RVSON} PERVSOFF}{RIGHT}{R
IGHT}{RIGHT}{RVSON} QERVSOFF}{RIGHT}{RIG
HT}{RIGHT}{RVSON} RERVSOFF}{RIGHT}{RIGHT
}{RIGHT}{RVSON} SERVSOFF}{RIGHT}{RIGHT}{
RIGHT}{RVSON} TERVSOFF}"
34 PRINT"{DOWN}{DOWN}{DOWN}{DOWN}{RIGHT}
{RIGHT}{RIGHT}{RVSON} UERVSOFF}{RIGHT}{R
IGHT}{RIGHT}{RVSON} VERVSOFF}{RIGHT}{RIG
HT}{RIGHT}{RVSON} WERVSOFF}{RIGHT}{RIGHT
}{RIGHT}{RVSON} XERVSOFF}{RIGHT}{RIGHT}{
RIGHT}{RVSON} YERVSOFF}"
35 PRINT"{c 2}{HOME}{DOWN}{DOWN}{DOWN}{D
OWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}"TAB(3
0)"{s U}{s #}{s #}{s #}{s #}{s I}"
36 FORI=1TO6
37 PRINTTAB(30)"{s -} {s -}"
38 NEXTI
39 PRINTTAB(30)"{s J}{s #}{s #}{s #}{s K
}{s #}{s K}"
40 Z=0:FORI=1TO52:K(I)=0:NEXT
41 X=INT(RND(1)*52+1)
42 IFZ=25THEN75
43 IFK(X)=1THEN41
44 K(X)=1
45 IFX/4=INT(X/4)THENS=83:SS=2
46 IFX+1/4=INT((X+1)/4)THENS=98:SS=2
47 IFX+2/4=INT((X+2)/4)THENS=88:SS=0
48 IFX+3/4=INT((X+3)/4)THENS=65:SS=0
49 FORI=1TO3:IFX(14THEN51
50 X=X-13:NEXT
51 IFX=1ØTHENX=38:GOTO57
52 IFX=11THENX=18:GOTO57
53 IFX=12THENX=1:GOTO57
54 IFX=13THENX=11:GOTO57
55 IFX=1THENX=11GOTO57
56 X=X+66
57 POKE1455,X:POKE1456,S:POKE1455+Z1,SS:
POKE1456+Z1,SS
58 POKE1658,X:POKE1659,S:POKE1658+Z1,SS:
POKE1659+Z1,SS
59 PRINT"{HOME}{DOWN}{c 3}"
60 PRINTTAB(29)"{RED}INPUT CARD{DOWN}{LE
FT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}{L
EFT}{LEFT}POSITION"
61 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{DOWN}"
TAB(32);"";
62 GETAA$:IFAA$=""THEN62
63 PRINTAA$
64 AA=ASC(AA$)-64
65 IFAA<1ØRAA>25THENGOTO57
66 Z1=PEEK(P(AA));IFZ1<>32THENGOTO59
67 POKEP(AA),X:POKEP(AA)+1,S:POKEP(AA)+Q
1,SS:POKEP(AA)+Q1+1,SS
68 POKEP(AA)+40,32:POKEP(AA)+41,32
69 POKEP(AA)+81,X:POKEP(AA)+80,S
70 POKEP(AA)+81+81,SS:POKEP(AA)+81+80,SS
71 Z=Z+1
72 POKE1455,32:POKE1456,32
73 POKE1658,32:POKE1659,32
74 GOTO41
75 PRINT"{HOME}{c 2}{DOWN}{DOWN}"TAB(28)
" SCORING {DOWN}{LEFT}{LEFT}{LEFT}{LEF
T}{LEFT}{LEFT}{LEFT}{LEFT}{LEFT}
"
76 PRINTTAB(32)" "
77 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{DOWN}{
DOWN}{DOWN}{DOWN}{DOWN}"TAB(30)"
"
78 FORI=1TO6
79 PRINTTAB(30)" "
80 NEXTI
81 PRINTTAB(30)" "
82 FORI=1TO25
83 F(I)=PEEK(P(I)):FF(I)=PEEK(P(I))+1)
84 NEXTI
85 WW=1
86 FORI=1TO5
87 FORJ=1TO5
88 C7(I)=F(A7):C6(I)=FF(A7)
89 NEXTJ
90 FORI=1TO5
91 IFC7(I)=1THENC7(I)=49
92 IFC7(I)=2ØTHENC7(I)=50
93 IFC7(I)=1ØTHENC7(I)=59
94 IFC7(I)=17THENC7(I)=60
95 IFC7(I)=11THENC7(I)=61
96 C7(I)=C7(I)-48
97 IFC6(I)=65THENC6(I)=1
98 IFC6(I)=83THENC6(I)=2
99 IFC6(I)=98THENC6(I)=3
100 IFC6(I)=88THENC6(I)=4
101 NEXTI
102 S=0
103 FORI=0
104 FORI=1TO6
105 C5(I)=100
106 NEXTI
107 FORI=1TO5
108 XX=5
109 IFC7(I)>C5(XX)GOTO113
110 C5(XX+1)=C5(XX)
111 XX=XX-1
112 IFXX>0GOTO109
113 C5(XX+1)=C7(I)
114 NEXTI
115 IFC5(1)=1THENC5(6)=14
```

How it works

6-7 clear the screen and set the screen and border colours to grey.

8 calls the title page at line 165.

9-17 set the variables for the screen locations.

19-39 print the cards to the screen.

40-58 choose a card at random and print it to the screen.

42 checks that if 25 cards have been dealt you go to line 75.

59-73 ask you where you wish the card to be placed, and print it there.

74 sends you round for the next card.

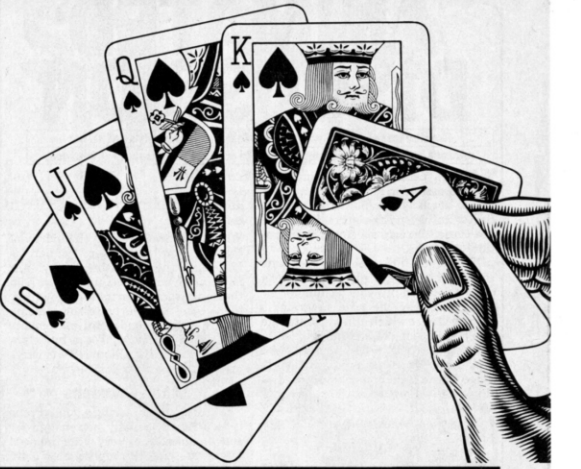
75-154 score the 12 rows. Variable SC = accumulative score, SX = score for each individual row.

155-161 print the total score, high score (the maximum is 6,000 — 1,500 or more is excellent) and ask if you require another game.

162-164 hold the data for the scoring routine.

165-174 are the opening pages, and ask if you require instructions.

175-288 instructions on how to play the game.



```
116 S1=0
117 FORI=1TO4
118 IFC6(I)=C6(I+1)THENS1=S1+1
119 NEXTI
120 IFS1=4THENS=5
121 S1=0:FORI=1TO4:IFC5(I)+5-I=C5(5)THEN
S1=S1+1
122 NEXTI
123 IFS1=4THENS=S+3:IFS=3THENS=4
124 IFS1=4THEN128
125 S1=0:FORI=2TO5:IFC5(I)+6-I=C5(6)THEN
S1=S1+1
126 NEXTI
127 IFS1=4THENS=S+3:IFS=3THENS=4
128 IF(S=0)AND(C5(5)=13)THENS=S+1
129 S1=0
130 FORI=1TO4
131 IFC5(I)=C5(I+1)THENS1=S1+1
132 IFC5(I)=C5(I+2)THENS1=S1+1
133 NEXTI
134 IFS1>3THENS1=S1+2
135 IFS1>5THENS=S1
136 SX=0
137 IFS=1THENSC=SC+30:SX=30
138 IFS=2THENSC=SC+70:SX=70
139 IFS=3THENSC=SC+100:SX=100
140 IFS=4THENSC=SC+300:SX=300
141 IFS=5THENSC=SC+150:SX=150
142 IFS=6THENSC=SC+200:SX=200
143 IFS=7THENSC=SC+250:SX=250
144 IFS=8THENSC=SC+400:SX=400
145 IFS=9THENSC=SC+500:SX=500
146 WW=VW+1:IFVW>2THEN148
147 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{DOWN}
"TAB(28)"ROW SCORE"
148 PRINTTAB(29)WW-1
149 S5=32
150 IFSX<10THENS5=33
151 IFSX<10THENSX=34
152 PRINTAB(S5)"{UP}"SX
153 IFWW=13THEN155
154 GOTO86
155 PRINT"{HOME}{DOWN}{DOWN}{DOWN}{DOWN}
{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOW
N}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{D
OWN}"TAB(29)"TOTAL"SC
156 IFSC>HSTHENHS=SC
157 PRINTTAB(27)"{DOWN}HI-SC."HS
158 PRINTTAB(28)"{DOWN}PRESS"
159 PRINTTAB(29)"ANY KEY"
160 GETA$:IFA$=""THEN160
161 RESTORE:GOTO10
162 DATA1,2,3,4,5,6,7,8,9,10,11,12,13,14
,15,16,17,18,19,20,21,22,23,24,25
163 DATA1,6,11,16,21,2,7,12,17,22,3,8,13
,18,23,4,9,14,19,24,5,10,15,20,25
164 DATA1,7,13,19,25,5,9,13,17,21
165 PRINTCHR$(14)
166 PRINT"{c 21}{DOWN}{DOWN}{DOWN}     {
5 THE GAME OF {5 PJOKER {5 SIOLITAIRE.{
DOWN}"
167 PRINTTAB(19)"BYE{DOWN}"
168 PRINTTAB(14)"{5 KJEITH {5 HJOBLEY"
169 PRINTTAB(14)"{5 #}{5 #}{5 #}{5 #}{5
 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5 #}{D
OWN}{DOWN}"
170 PRINT"{BLUE}   {5 DJO YOU REQUIRE IN
STRUCTIONS ({5 Y}/{5 N})."
171 GETA$:IFA$=""THEN171
172 IFA$="N"THENPRINT"{CLEAR}{DOWN}{DOWN
}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DO
WN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{
DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN}{DOWN
}{DOWN}{DOWN}{DOWN}":RETURN
173 IFA$="Y"THENGOTO175
174 GOTO171
175 PRINT"{CLEAR}{DOWN}{DOWN}"TAB(11)"{c
 2}{c A}{5 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5
 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5
 #}{c 5}"
176 PRINTTAB(11)"{5 -}{BLUE}{5 PJOKER {5
 SIOLITAIRE{c 2}{5 -}"
177 PRINTTAB(11)"{c 2}{5 #}{5 #}{5 #}{5
 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5 #}{5
 #}{5 #}{5 #}{5 #}{c 3}"
178 PRINT"{BLUE}{DOWN}{5 PJOKER {5 SIOLI
TAIRE IS A CHALLENGING GAME"
179 PRINT"THAT NEEDS A MIXTURE OF LUCK,J
UDEMENT,"
180 PRINT"AND PRACTICE TO SCORE WELL."
181 PRINT"{DOWN}{5 THE LAYOUT FOR POKER
 SOLITAIRE COMPRISES{"
182 PRINT"FIVE ROWS OF FIVE FACE-UP CARD
S EACH."
183 PRINT"{DOWN}{5 THE CARDS ARE DEALT
AT RANDOM BY THE"
184 PRINT"COMPUTER.{5 EJACH CARD MAY BE
PLACED ON ANY"
185 PRINT"POSITION BY PRESSING THE APPRO
PRIATE"
186 PRINT"KEY.{5 OINCE IN POSITION A CAR
D MAY NOT BE"
187 PRINT"MOVED{ ITS PLACING ON THE LAYO
UT IS"
188 PRINT"THEREFORE OF GREAT IMPORTANCE.
"
189 PRINT"{c 21}{DOWN}{DOWN}     {5 PJR
ESS ANY KEY TO CONTINUE.{BLUE}"
190 GETA$:IFA$=""THEN190
191 PRINT"{CLEAR}{DOWN}{DOWN}{DOWN}{c 21
{5 O}BJECTIVE.{BLUE}"
192 PRINT"{DOWN}{5 EJACH ROW AND EACH CO
LUMN PLUS THE TWO"
193 PRINT"DIAGONALS ARE THE EQUIVALENT O
F A POKER"
194 PRINT"HAND (IE. THERE'S A TOTAL OF 1
2 HANDS.)"
195 PRINT"{5 TJHE PLAYER TRIES TO PLACE
THE CARDS OF"
196 PRINT"EACH 'HAND' TO GIVE THE HIGHES
T POSSIBLE{"
197 PRINT"SCORING POKER COMBINATIONS."
198 PRINT"{DOWN}{5 AJCE CAN RANK EITHER
HIGH OR LOW,BUT MAY"
199 PRINT"NOT FORM PART OF A 'ROUND THE
CORNER'"
200 PRINT"SEQUENCE(IE. KING,ACE,2 IS NOT
 ALLOWED)"
201 PRINT"{c 21}{DOWN}{DOWN}     {5 PJR
ESS ANY KEY TO CONTINUE.{BLUE}"
202 GETA$:IFA$=""THEN202
203 PRINT"{CLEAR}{DOWN}{c 2}{5 SJCORING.
{BLUE}"
204 PRINT"{DOWN}{5 THERE ARE NINE POSSI
BLE SCORING          COMBINATIONS."
205 PRINT"{DOWN}     {5 NJOYAL {5 FJLUSH
     = 500 POINTS"
206 PRINT"{DOWN}     {5 SJTRAIGHT FLUSH
  = 400 POINTS"
207 PRINT"{DOWN}     {5 SJTRAIGHT RUN
  = 300 POINTS"
208 PRINT"{DOWN}     {5 FJOUR OF A KIND
  = 250 POINTS"
209 PRINT"{DOWN}     {5 FJULL HOUSE
  = 200 POINTS"
210 PRINT"{DOWN}     {5 FJLUSH
  = 150 POINTS"
211 PRINT"{DOWN}     {5 TJHREE OF A KIND
  = 100 POINTS"
212 PRINT"{DOWN}     {5 TJWO PAIRS
  =  70 POINTS"
213 PRINT"{DOWN}     {5 OJNE PAIR
  =  30 POINTS"
214 PRINT"{c 21}{DOWN}     {5 PJRESS ANY
KEY TO CONTINUE.{HOME}{BLUE}"
215 GETA$:IFA$=""THEN215
216 PRINTCHR$(147)
217 PRINT"{DOWN}{DOWN}{5 TJHE 12 POKER H
ANDS ARE SCORED BY ROW 1"
218 PRINT"BEING THE 1ST HORIZONTAL, ROW
 2 BEING"
219 PRINT"THE 2ND HORIZONTAL AND SO ON."
220 PRINT"{DOWN}{5 RJOW 6 IN THE 1ST VER
TICALLY, ROW 7 IS"
221 PRINT"THE 2ND ROW VERTICALLY ETC."
222 PRINT"{DOWN}{5 RJOW 11 IS THE DIAGON
AL FROM TOP LEFT TO"
223 PRINT"BOTTOM RIGHT. {5 RJOW 12 IS TH
E DIAGONAL"
224 PRINT"FROM TOP RIGHT TO BOTTOM LEFT.
"
225 PRINT"{c 21}{DOWN}     {5 PJRESS ANY KE
Y TO START THE GAME.{HOME}"
226 GETA$:IFA$=""THEN226
227 PRINTCHR$(147)
228 RETURN
```

ANIMATED DISCUSSION

Breathe fresh life into your graphics. With Alan Mynett's animation routines, you can store enough frames to produce some superb sequences.

With careful programming it is possible to increase the number of whole screen frames on a 48K Spectrum beyond the normal five and use these to create spectacular animation sequences.

You can do this either by using part screens or more generally by the use of a simple data compression technique.

A short machine code program is described here which allows the storage of a large number of animation frames and permits their successive replay. An accompanying Basic program is provided for use with the machine code. And things are followed by a simple demonstration program which creates a 32-frame animated sequence.

Animation

The 48K Spectrum, with its 40K of user available memory, can hold five full screens, including attributes, at any one time. This allows for a Basic driver and the necessary machine code routine to do the copying of bytes into the display file.

Program 1 is a loader program for a general purpose byte-moving routine. Although Program 1 loads it into the UDG area above RAMTOP, it could go anywhere. It is called from a Basic program by the line:

RANDOMIZE FN m(from, to, bytes)

The function is defined with:

DEF FN m(a,b,c)=USR address

The *address* is the location of the machine code. The variables *from*, *to* and *bytes* are the locations of the stored bytes, the display file address (16384) and the number of bytes (6912) respectively.

The function is used to pass parameters to a machine code routine. Remember that when you include a DEF FN command in a program, storage space for the parameters is set up *in the Basic line*. When the program then encounters the use of the function, the values of the parameters (either numbers, variables or expressions) are temporarily stored, in five byte numerical form in the Basic line containing the function definition. The address of this storage area is kept in the system variable DEFADD at 23563.

The assembly language version is:

```
LD IX (DEFADD)
LD L (IX+4)
LD H (IX+5)
LD E (IX+12)
LD D (IX+13)
LD C (IX+20)
LD B (IX+21)
LDIR
RET
```

When the routine is called, the address of the function parameter location is loaded into the IX register. The bytes at four and five locations further on hold the first parameter in the order low byte, high byte. Similarly, displacements 12,13 hold the second and displacements 20,21 hold the third. These bytes are loaded into the HL, DE and BC registers prior to a block move instruction.

Storing screens

The problem with storing whole screens is that five is usually not enough for smooth animation. Very often the need arises to scroll through many more screens. One simple solution is to restrict the animation to just one third of the screen area. Again the function call of Program 1 can be used. The relevant values for the variables *to* and *bytes* are shown in Figure 1. Since we can keep three part-screens in the space occupied by one whole screen, the number of frames rises to 15.

Remember, however, that because of the parallel attribute file this can only be done in colour by making two function calls for each frame — one for the pixel information and the second for the attribute information.

Suppose though, we can't restrict our animation to just one third of the screen. Is it still possible to increase the number of frames? The answer is yes — if we store, not the whole screen, but the differences between successive screens.

The key to how this can be done is the exclusive-or (XOR) operation. An example should make this clear. Let's assume that we have two screens in the computer's memory. Let's call them A and B. We can compare two equivalent bytes in the two screens by XORing the byte in screen A with the byte in screen B.

If the two bytes are the same then the result of this operation will be zero and we need take no further action. If the bytes are different then the result is a byte which is, in effect, a measure of the difference between the two screens.

Suppose

```
    screen A byte  = 10010011
    screen B byte  = 01110000
then  XOR result   = 11100011
```

Now, if we have screen A in the display file and the XOR result in memory, then a second XORing will reconstruct the

Program 2

```
  10 REM ************************
  20 REM |   MACHINE CODE for
|
  30 REM |    SCREEN SQUEEZE
|
  40 REM |   A.Mynett 1984      |
 100 REM ************************
 110 REM |      HEX LOADER
|
 120 REM ************************
 130 RESTORE 1000
 140 READ address,datalines
 150 PRINT TAB 10; BRIGHT 1;"LOA
DING CODE"
 160 FOR n=1 TO datalines
 170 READ a$: LET b$=a$(18 TO ):
LET check=0
 180 FOR m=1 TO 15 STEP 2
 190 LET h$=a$(m TO m+1): GO SUB
 8290
 200 POKE address,byte
 210 LET address=address+1: LET
check=check+byte
 220 NEXT m
 230 IF check<>VAL b$ THEN BEEP
.5,24: LET line=1000+n*10: LET h
=INT (line/256): POKE 23626,h: P
OKE 23625,line-h*256: PRINT "ERR
OR at line ";line: PRINT "Type E
DIT and correct line.": STOP
```

Program 3

```
   9 REM ************************
  10 REM ** SCREEN COMPRESS **
  11 REM **    A.Mynett       **
  12 REM **      Oct 1984     **
  13 REM ************************
  20 CLEAR 26754: LOAD ""CODE
  25 LET screen1=VAL "26864": LE
T data=VAL "33776": LET squeeze=
VAL "26755": LET unsqueeze=VAL "
26810": LET move=VAL "26840": LE
T bytes=VAL "6912"
  30 CLS : PRINT AT 1,2; INVERSE
1;" SCREEN COMPRESSION PROGRAM
"
  40 PRINT : PRINT : PRINT TAB 8
;"1 Compress screens"''TAB 8;"2
View animation"''TAB 8;"3 Finish
"
  50 INPUT "   Choose option (1
- 3) "; LINE z$: IF CODE z$<49 O
R CODE z$>51 THEN GO TO 50
  60 GO SUB 1000*VAL z$: GO TO 3
0
 999 REM **************
1000 REM ** compress **
1001 REM **************
1010 DEF FN h(x)=INT (x/256): DE
F FN l(x)=x-256*FN h(x)
1020 INPUT "ENTER total no of fr
ames "; LINE z$: LET frames=VAL
z$
1040 CLS : DIM a(frames+1): LET
a(1)=screen1: LET a(2)=data
1050 POKE 23296,FN l(data): POKE
 23297, h(data)
1065 FOR n=1 TO frames
1070 PRINT #1;AT 1,0;"LOADing "i
n
1080 POKE 23659,0: PRINT AT 22,0
1: LOAD ""CODE screen1,bytes: PO
KE 23659,2: IF n=1 THEN RANDOMIZ
E USR move: GO TO 1120
1085 PRINT #1;AT 0,0;,,,
1090 LET a(n+1)=USR squeeze
1095 LET space=65535-a(n+1): IF
space<1000 THEN LET n=frames
1100 RANDOMIZE USR move
1110 PRINT #1;AT 0,0;n;" Stored
in "a(n+1)-a(n);TAB 21;"Space="
;space
1120 NEXT n
1125 PRINT #1;AT 1,5;"Press ENTE
R to continue": PAUSE 0
1130 CLS : PRINT AT 2,5;"All scr
```

```
 240 PRINT AT 2,3;"Line ";1000+1
0*n;" is correct.": NEXT n
 250 STOP
 260 REM **********************
 270 REM |   HEX to DEC
|
 280 REM **********************
 290 LET byte=0
 300 FOR o=1 TO 2: LET byte=byte
*16+CODE h$(o)-48-7*(h$(o)>"9"):
 NEXT o
 310 RETURN
 970 REM **********************
 980 REM |   MACHINE CODE DATA
|
 990 REM **********************
1000 DATA 26755,13
1010 DATA "2100401100680100=459"
1020 DATA "1B1AAE2812D5E52A=749"
1030 DATA "005BD1732372372=718"
1040 DATA "2322005BD5E1D123=842"
1050 DATA "130B79B020E32A00=628"
1060 DATA "5B2323360232200=284"
1070 DATA "5BED4B005BC9002A=737"
1080 DATA "005B5E2356237EFE=721"
1090 DATA "002807EBAE77EB23=845"
1100 DATA "19F8232200505BC900=625"
1110 DATA "0000000000110040=81"
1120 DATA "21F86801001BEDB0=818"
1130 DATA "C9000000000000=201"
```

```
eens compressed":AT 4,2; INVERSE
 1;"Reload screen 1 into memory.
"
1140 LOAD ""CODE screen1,bytes
1145 INPUT "Hard Copy? (Y/N) "; 
LINE z$: LET dev=2: IF z$="y" TH
EN LET dev=3
1150 INPUT "ENTER filename "!f$:
 CLS : PRINT #dev;TAB 11;f$
1170 FOR n=1 TO frames
1180 PRINT #dev;n;TAB 6;a(n);" t
o ";a(n+1)-1;" = ";a(n+1)-a(n)
1190 NEXT n
1200 PRINT #1;AT 0,0; INVERSE 1;
"Press any key when ready to SAV
E": PAUSE 0:
1210 SAVE f$CODE screen1,a(frame
s+1)-screen1
1220 PRINT #dev;"SAVEd as ";f$;"
 CODE 26864,"1a(frames+1)-screen
1
1240 RETURN
1999 REM **************
2000 REM ** animate **
2001 REM **************
2010 REM : INPUT "Filename ?";f$
2020 REM : LOAD ""CODE
2030 INPUT "How many frames alto
gether? "!frames
2040 INPUT "  Press ENTER to run
 animation  "; LINE z$
2050 RANDOMIZE USR move
2055 POKE 23296,FN l(data): POKE
 23297,FN h(data)
2060 FOR n=1 TO frames-1
2065 PAUSE 10
2070 RANDOMIZE USR unsqueeze
2080 NEXT n
2085 IF INKEY$="" THEN GO TO 205
0
2090 INPUT " Rerun or Finish (R/
F) "; LINE z$: IF z$="r" THEN GO
 TO 2040
2100 RETURN
2999 REM *********
3000 REM ** end **
3001 REM *********
3005 INPUT "ENTER Y to reset com
puter "; LINE z$: IF z$<>"Y" THE
N RETURN
3010 RANDOMIZE USR 0
9999 SAVE "squeezer" LINE 1: SAV
E "squeeze"CODE 26755,100: VERIF
Y "": VERIFY ""CODE
```

Program 1

```
  1 REM ** MOVEBYTES **
  5 RESTORE 100: LET sum=0
 10 FOR n=USR "a" TO USR "a"+24
 20 READ byte
 30 PRINT n;" ";byte
 40 POKE n,byte: LET sum=sum+by
te
 50 NEXT n
 60 IF sum<>2921 THEN PRINT "ER
ROR IN DATA": STOP
100 REM ** DATA **
110 DATA 221,42,11,92,221,110,4
,221,102,5,221,94,12,221,86,13,2
21,78,20,221,70,21,237,176,201
```

Program 4

```
  10 REM **********************
  20 REM *** ANIMATION DEMO  ***
  30 REM **********************
  40
 100 LET x=250: LET y=5: LET r=1
0
 110 FOR n=1 TO 31
 120 CLS : LET theta=n*PI/40
 125 GO SUB 1200
 130 IF n<=25 THEN GO SUB 1000
 140 IF n=26 THEN PLOT 0,140: DR
AW 0,-48,-5.5
 150 IF n=27 THEN PLOT 0,165: DR
AW 0,-100,-4
 160 IF n>27 THEN GO SUB 1500
 170 GO SUB 2000
 180 LET r=r+n/100: LET x=x-r*SI
N theta: LET y=y+r*COS theta
 190 NEXT n
 200 STOP
 999
1000 CIRCLE x,y,2*n
1010 PLOT x,INT (y+2*n): IF n>2
AND n<25 THEN DRAW 0,-4*n+.5,PI-
(2*PI*n)/25
1020 RETURN
1199
1200 FOR m=0 TO 25 STEP 4: PLOT
0,m: DRAW 255,0: NEXT m: FOR m=0
 TO 255 STEP 5: PLOT m,0: DRAW 0
,24: NEXT m
1210 RETURN
1499
1500 PLOT 0,167: DRAW 0,-4*n,-1.
3*PI+(n-27)
1510 RETURN
1999
2000 POKE 23736,181: SAVE ("demo
"+STR$ n)SCREEN$
2010 RETURN
```

screen B byte as we can see from:

screen A byte = 10010011
XOR result = 11100011
second XOR result = 01110000 = screen B byte

So, in order to achieve an animated sequence the computer needs to contain the starting frame in full, but for each successive frame only a list of display file addresses and the XOR result of each byte which has to be changed.

Provided that the changes to be made are less than one third of the total screen bytes (each difference is stored as two address bytes and one resultant byte), a considerable increase in the number of frames is usually possible.

Program 2 contains the necessary machine code routines to implement these ideas. CLEAR 26754 and then type in the program and run it. Once the program runs satisfactorily the machine code can be saved using:

SAVE "squeeze" CODE 26755,97

This machine code contains three routines. The routine at 26755 performs the XOR on the display file and a screen in memory at 26864. It stores the display file address of any non-zero result together with the result in a file from 33776.

The routine at 26810 reads this memory store and carries out the reconstruction of successive screens. The routine at 26840 is a move bytes routine to shift the screen at 26864 into the display file.

Program 3 is a Basic control program which allows the construction of files of compressed screen data using the routines in Program 2. Type it in, run and load in the previously saved machine code. The Basic and code can be saved together by a GOTO 9999.

Animated behaviour

To use the program, you will need a tape containing all your animation frames one after the other. Run the main program and when asked to load the first screen start the tape and let it run.

One word of warning — to prevent damage, headers are printed on line 24. This is made possible by the poke in line 1080. Do not try to break during the load or you will crash the program. Once completed the whole file can be saved.

To see the completed animation use Menu option 2. Option 2 is written as a subroutine so that it can be easily removed for use in any other program by removing REMs at lines 2010/2020.

For a demonstration, Program 4 produces 32 frames for an animated sequence. Type the program into the computer and place a C60 tape into the cassette recorder. Start the tape recording and run the program. It is not necessary to press any keys since the POKE 23736,181 bypasses the 'Start Tape' message.

It takes about 25mins to generate and save the 32 screens. This tape can then be used with program 3 to make the animation file.

Figure 1

Display and attribute file addresses for each third of the screen.

	Display file		Attributes	
	to	bytes	to	bytes
Top	16384	2048	22528	256
Middle	18432	2048	22784	256
Bottom	20480	2048	22940	256

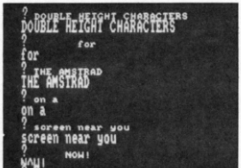
STRETCH YOUR CHARACTERS

Stretch your letters to their full height with this easy routine for the Amstrad from John Keneally

This machine code program for the Amstrad CPC464 allows you to print double height characters on the screen, for use both in games and serious software. The characters can be printed in windows and can be user defined using SYMBOL as normal. Used for headings, they give a professional look to your software.

As well as providing a useful facility to the Basic programmer, the assembly language listing demonstrates the use of many of the Amstrad's powerful features, including some ROM routines.

To get it running, type in the Basic Loader listing, taking particular care with the DATA statements (don't confuse 8's with B's), and then save it onto



This is double height output.

tape. When run, the screen should clear and the program is ready to use.

There are no messy calls to machine code from now on. All that is required is to type PRINT CHR$(254) to turn on double height printing, and PRINT CHR$(255) to revert back to normal printing. These characters no longer print and are used as control codes by the software — so redefining these will have no useful effect.

Obviously, by mixing these characters in a print string, it is possible to print double and normal height characters on the same line. The only restriction is that double height characters cannot be printed via the TAG command.

The program will work in all three modes as the short demo program listing shows. In Mode 0 you get double size characters, in Mode 1 you get double height characters, similarly in Mode 2.

The program operates by intercepting the operating system's character output routine. The character codes 254 and 255 are used to turn the routine on and off, and internally these are used to print a double height character as follows. If the routine is turned off, then the character to be printed is sent to the normal ROM routine.

If the routine is on, then the matrix for the particular character is looked up in the ROM (or RAM if it is user defined) via an OS routine at BBA5, which returns the start address of the matrix for the character in the 'A' register in the HL register pair. This matrix is then copied to reserved RAM, but each line is copied twice — giving 16 lines in all.

Character 254 is defined as the top eight lines, and character 255 is defined as the lower eight lines, by loading the ASCII code into the A register and the address of the matrix into HL and calling the OS routine at BBA8.

Having defined these characters, the cursor position is obtained by calling BB78 and moved up a line, the top of the character is printed — code 254, and then the cursor position is restored and the bottom half of the character — code 255 is printed.

Control codes are always printed as normal whether or not double height is on or off (so that they are not printed twice which could cause havoc). The exception to this is the line feed character; if this is printed, an extra line is skipped to account for the extra height of the characters.

Although the software will work in direct mode, it is advisable to use it only from programs where you know where the output is being sent. Also note that lines input by the user will always be printed in normal height, regardless of whether the routine is on or off.

Listing

```
10 ' Double height Basic loader program
20 MEMORY 41999
30 FOR i=42000 TO 42189:READ a$:v=VAL("&
"+a$):csum=csum+v:POKE i,v:NEXT i
40 IF csum <> 26226 THEN PRINT CHR$(7):P
EN 2:PRINT"DATA Checksum ERROR - check l
isting!":PEN 1:STOP
50 CALL 42000:PRINT CHR$(255):CLS
60 DATA 2A,5B,BB,22,E1,A4,21,27,A4,22,5B
,BB,3E,C3,32,5A,BB,3E,CF,32
70 DATA E0,A4,C9,F5,E5,D5,C5,32,E4,A4,FE
,20,38,35,FE,FF,20,07,3E,00
80 DATA 32,E3,A4,18,25,FE,FE,20,07,3E,FF
,32,E3,A4,18,1A,3A,E3,A4,FE
90 DATA 00,28,08,3A,E4,A4,CD,79,A4,18,0B
,C1,D1,E1,F1,3A,E4,A4,CD,E0
100 DATA A4,C9,C1,D1,E1,F1,C9,FE,0A,20,E
C,3A,E3,A4,FE,00,28,E5,3E,0A
110 DATA CD,E0,A4,18,DE,47,CD,A4,A4,CD,7
8,BB,CD,87,BB,22,CE,A4,7D,FE
120 DATA 01,20,04,2C,22,CE,A4,2D,CD,75,B
B,3E,FE,CD,5D,BB,2A,CE,A4,CD
130 DATA 75,BB,3E,FF,CD,E0,A4,C9,CD,06,B
9,F5,78,CD,A5,BB,06,08,11,D0
140 DATA A4,7E,12,13,12,23,13,10,F8,F1,C
D,0C,B9,3E,FE,21,D0,A4,CD,A8
150 DATA BB,3E,FF,21,D8,A4,CD,A8,BB,C9
160 END
```

Softlife

NUMERIC KEYPAD

for the

BBC MICRO

Any BBC user will be aware that entering numeric data on the BBC keyboard, whether for business, educational or scientific purposes, is a slow and inefficient process. The Softlife Numeric Keypad changes all that. Speedy entry of numeric data is now possible — as on many more expensive computers.

Features
- N-Key rollover
- Only connection to user port
- High quality keys
- Hand held, or free standing
- Software provided on eprom
- Simple selection command
- Standard mode uses no user RAM — optional fully programmable mode also available
- Maximum software compatibility

£59 + £1.25 p&p + VAT

Also available

Softlife's much acclaimed EPROM PROGRAMMER ("I'd buy one" — Acorn User) with software on Eprom and documentation — **£56 + £1 p&p + VAT**. 2764 Eprom (250ns) — **£5.50 + 50p + VAT**. 27128 Eprom (250ns) — **£17.25 + 50p + VAT**. UV Eprom eraser — **£19.95 + £1 + VAT**. User port extension — **£9 + 75p + VAT**. 1MHz Bus extension — **£11 + 75p + VAT**.

All products and data available from:

SOFTLIFE LTD
7 Rose Crescent, Cambridge CB2 3LL
Tel: (0223) 62117

3D COMPUTERS

THE HOME COMPUTER SPECIALISTS

BBC 'B' + DFS with 200k disk drive	**£589**
BBC 'B' with cassette recorder Plus 5 software packs	**£399**
SINCLAIR QL	**£379**
COMMODORE 64 with cassette recorder	**£234**
ACORN ELECTRON with Plus 1 interface	**£234**
ACORN ELECTRON with joystick and interface	**£209**
COMMODORE 1520 Printer Plotter	**£57-50**
BBC 200K Disk drive	**£120**

FRIENDLY ADVICE & SERVICE AT EVERY BRANCH

230 TOLWORTH RISE SOUTH, SURBITON	01-337 4317
30 STATION ROAD, BELMONT, SUTTON	01-642 2534
114 GUNNERSBURY AVE, EALING	01-992 5855
26 STANLEY ROAD, NEWBURY	(0635) 30047
1 MANOR ROAD, CADDINGTON, LUTON	(0582) 458575

£1000 instant credit

The largest computer store in the county!

KENT COMPUTER CENTRE

FOUR FLOORS FOR COMPLETE SERVICE

13 MILITARY ROAD, CHATHAM

ALL POPULAR MAKES OF COMPUTERS IN STOCK for the hobbyist and businessman.

AND THE LARGEST RANGE OF
- **Dot Matrix and Daisywheel Printers**
- **Disk Drives**
- **Colour and Mono Monitors**
- **Data Recorders**
- **Modems**
- **Books**
- **Magazines**
- **Stationery and Cables.**

For the 'games' player we have thousands of adventures, aliens, planets, racing cars, burgers, ghosts and things that go bump in the night on both cassette and disk.

For the businessman we have software for bought ledgers, sales ledgers, stock control, word processing, communications, diaries, cash flow forecasts and price lists.

COME IN, LOOK ROUND, TAKE YOUR TIME.

Our staff are there to help you, not just to sell.

FREE! Software worth £10 with every single purchase of hardware over £100

OPEN: MON, TUES, WED, SAT — 9.00-6.00
THURS, FRI — 9.00-8.00

The Kent Computer Centre for competitive prices PLUS advice, choice and excellent after-sales service. Come to the store that cares about you and your computer, when you buy and afterwards.

©Carlton Advertising Ltd 01-930 7612

VERTICAL TAKEOFF

Orrall Cornelius blasts off a game that demonstrates two of the Atari's special features.

Listing

```
10 DIM A1$(20):DIM B2$(20):DIM C3$(20)
20 OPEN #1,4,0,"K:"
100 DIM UP$(21),DOWN$(21):UP=ADR(UP$):DOWN=ADR(DOWN$)
110 FOR LOOP=UP TO UP+20:READ BYTE:POKE LOOP,BYTE:NEXT LOOP
120 FOR LOOP=DOWN TO DOWN+20:READ BYTE:POKE LOOP,BYTE:NEXT LOOP
130 DATA 104,104,133,204,104,133,203,160,1,177
140 DATA 203,136,145,203,200,200,192,11,208,245,96
150 DATA 104,104,133,204,104,133,203,160,10,177
160 DATA 203,200,145,203,136,136,192,255,208,245,96
161 POKE 53248,255:POKE 53249,255:GOSUB 20000
162 POKE 53248,255:POKE 53249,255:SOUND 0,0,0,0:GOSUB 10000
163 GRAPHICS 0:? "}":POKE 755,1:SOUND 0,0,0,0
164 IF AU=1 THEN POSITION 5,5:? "AUTO PLAY.JOYSTICK NOT USED."
165 POSITION 10,7:? "PLEASE WAIT!!"
170 PAGE=PEEK(106)-8
180 POKE 54279,PAGE
190 BASE=PAGE*256
200 POKE 53277,0:POKE 559,46
210 POKE 704,175:POKE 705,175
220 FOR I=BASE+512 TO BASE+768:SOUND 0,I/10,10,10:SETCOLOR 2,1,I/10:
    SETCOLOR 4,1,I/10-5
230 SOUND 0,I/11,10,10:POKE I,0:NEXT I
235 SOUND 0,0,0,0
240 X=100:Y=50
250 POKE 53248,X:POKE 53278,0
255 RESTORE 280
260 FOR I=BASE+512+Y TO BASE+519+Y
270 READ DA:POKE I,DA:NEXT I
280 DATA 146,186,254,186,16,124,56,16
290 X1=X-10:Y1=112
300 POKE 53249,X1:POKE 53257,3
310 FOR I=BASE+640+Y1 TO BASE+646+Y1
320 READ DA:POKE I,DA:NEXT I:POKE 53277,3
330 DATA 255,129,255,129,255,129,255
340 POKE 53278,0
350 SE=150
370 A1$=" ":B2$=".":C3$=" "
380 FOR T=1 TO 15:SOUND 0,1,24,T:FOR I=1 TO 20:NEXT I:NEXT T
400 A=STICK(0):IF PEEK(53252)=4 THEN 1000
402 SE=SE-1:IF SE<0 THEN 1000
405 RN=INT(RND(0)*40):POSITION RN,23:? A1$;B2$;C3$
408 IF PEEK(53260)=2 THEN 2000
410 IF A=14 THEN U=USR(UP,BASE+511+Y):Y=Y-1:GOTO 400
415 POKE 705,X
417 IF AU=1 THEN A=INT(RND(0)*14):IF A<6 THEN A=13
420 IF A=13 THEN D=USR(DOWN,BASE+511+Y):Y=Y+1:GOTO 400
440 IF A=7 THEN X=X+2:POKE 53248,X:POKE 53249,X-10
450 IF A=11 THEN X=X-2:POKE 53248,X:POKE 53249,X-10
460 IF PEEK(53252)=4 THEN 1000
470 IF PEEK(53260)=2 THEN 2000
480 IF A=5 THEN D=USR(DOWN,BASE+511+Y):Y=Y+1:X=X+2:POKE 53248,X:POKE 53249,X-10
490 IF A=9 THEN D=USR(DOWN,BASE+511+Y):Y=Y+1:X=X-2:POKE 53248,X:POKE 53249,X-10:
    GOTO 400
500 IF A=15 THEN POSITION 7,3:? "SECONDS LEFT=";SE
```

This simple game demonstrates two of the Atari's programming features — Player Missile Graphics (PMGs) and Display List Interrupts (DLIs).

The program is best understood if it's broken down into its three main parts: PMG, DLI and sound. Two parts of the program may be new to you — vertical positioning and DLI/mixed modes.

You've probably seen articles explaining PMGs and their usefulness in collision detection, priorities and movement of players and missiles.

The program here covers some of this territory, but it details another aspect of PMGs— vertical positioning and movement. On the Atari, vertical movement from Basic is slower than horizontal movement because there are no vertical positioning registers for PMGs, so the program incorporates a machine code routine for moving PMGs vertically.

It will move players up to nine pixels deep, but if you want larger players the number 11 in line 140 should be changed to two larger than the number of vertical lines the player uses. Then change the 10 in line 150 to one greater than the number of additional lines.

USR calls

You can move any player by changing the number 511 in the USR calls in the joystick routine to one less than the start address of the object to be moved. If player 1 was to be moved the USR command would look like this:

```
U=USR(UP,PMBASE+639+Y):Y=Y+1
```

and for player 2:

```
U=USR(UP,PMBASE+767+1):Y=Y-1
```

The Y represents the variable used to move your players down the screen. You should note that the PMBASE variable

Variables

SE	seconds remaining
RN	random positioning of the stars
X	horizontal positioning of player 0
Y	vertical positioning of player 0
X1	horizontal positioning of player 1
Y1	vertical positioning of player 1
A1$, B2$, C3$	stars
T	timer
I	mainly used as a variable in the FOR NEXT loops
DLIST	display list
SCREEN	mainly used for postition of GR.0 in display list

Listing (cont)

```
510 GOTO 400
1000 FOR I=BASE+512+Y TO BASE+519+Y
1005 SOUND 0,A,2,15
1006 SETCOLOR 2,1,A
1010 READ A:IF A=1 THEN 1060
1020 POKE I,A:NEXT I
1030 DATA 129,255,128,45,87,33,67,96,22,68,85,35,35,35,75,82,66,36,129,255,88,
     56,89,55,33,56,89,34,65,23
1040 DATA 23,109,58,97,159,98,255,12,16,24,15,129,199,100,24,16,33,93,17,4,27,
     15,60,90,62,150,55,79,42,69,1
1050 GOTO 1000
1055 FOR T=1 TO 200:NEXT T
1060 RESTORE 1130:POKE 53277,0:SOUND 0,0,0,0:GRAPHICS 2+16:POKE 53248,255:POKE
     53249,255
1080 POSITION 1,4:? #6;"YOU FAILED TO DOCK"
1090 X=INT(RND(0)*4)+1:ON X GOSUB 1130,1140,1150,1160
1100 POSITION 2,8:? #6;"HAVE ANOTHER GO!"
1110 FOR I=1 TO 240:SETCOLOR 4,1,I:SETCOLOR 1,1,I+15:SOUND 0,I,I,10:NEXT I
1120 SOUND 0,0,0,0:FOR T=1 TO 500:NEXT T:GOTO 161
1130 POSITION 0,6:? #6;"AT LEAST YOU TRIED!!":RETURN
1140 POSITION 4,6:? #6;" NICE TRY!!":RETURN
1150 POSITION 2,6:? #6;"COULD BE WORSE!!":RETURN
1160 POSITION 2,6:? #6;"WHAT CAN I SAY?":RETURN
2000 POKE 53277,0:GRAPHICS 18:RESTORE 2050:SOUND 0,0,0,0:POKE 53248,255:POKE
     53249,255
2010 FOR I=0 TO 63:READ R
2020 POKE 1664+I,R:NEXT I
2040 REM COLORS++
2050 DATA 173,36,2,141,193
```

may change from program to program—it sometimes appears as MYPMBASE or BASE, depending on the programmer's preference. Missiles are more difficult to move vertically with this routine since it moves an entire byte, not bits. It would come in handy when moving all four missiles vertically if you needed to do so, but they can still be moved horizontally individually.

Next week As Orrall Cornelius completes his games listing, you'll see a demonstration of display lists in action, with three modes on the screen at once.

Listing (cont)

```
2060 DATA 6,173,37,2,141,194
2070 DATA 6,160,180,162,6,169
2080 DATA 7,32,92,228,238,192
2090 DATA 6,173,192,6,141,10
2100 DATA 212,141,26,208,174
2110 DATA 252,2,232,240,238
2120 DATA 172,193,6,179,194,6
2130 DATA 169,7,32,92,228
2140 DATA 104,96,206,200,2
2150 DATA 173,200,2,141,192
2160 DATA 6,76,98,228
2170 POSITION 5,3:? #6;"AT LAST!!!"
2180 POSITION 1,6:? #6;"YOU'VE MADE IT!!!"
2185 RESTORE 2200
```

ZIPPY KIT

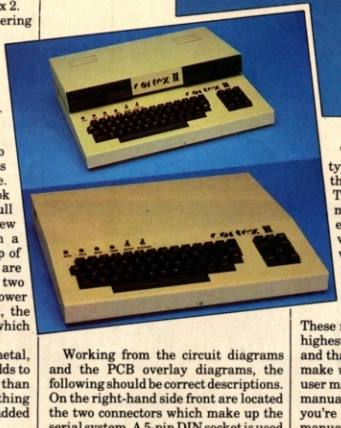
Buy the Cortex 2 in kit-form or ready-built and you've got a micro with great specifications, says Brendin Lewis.

Most, if not all electronics enthusiasts will have heard of Powertran Cybernetics (previously Powertran Electronics). Over the past few years they have produced many high-quality kits.

In 1982 Powertran released the Cortex, a low cost 16-bit micro with a real sting in the tail. On specifications alone, the system is up there with the best. Based on the Texas 9995 microprocessor, running at an astonishing 12MHz, the Cortex out-benchmarks almost all the popular microcomputers. Other features include 64K of RAM, high-resolution colour graphics with sprites, a floppy disk interface, serial and parallel ports, and an expansion bus known as the Ebus.

A few months back the Cortex was withdrawn for a refit, now the system is sold with a new smarter, slimline look and has been christened the Cortex 2.

For those of you adept with a soldering iron, good eyesight and a great deal of patience, the system comes as a kit. For those more prone to melt the table top rather than the solder, a ready-built and tested version is also available.



First impressions

The changes made to Cortex 1 to produce Cortex 2 are apparent as soon as you set eyes on the machine. The new model has a slimline look solely due to the removal of the full height floppy disk drives. The new model has half height drives in a separate cabinet which sits on top of the main unit. These drives are connected to the computer via two leads. The first is the low voltage power lead which plugs in at the back, the second is the 34-way ribbon cable which plugs in the side.

The cabinet is made of sheet metal, sprayed in light grey. The metal adds to the weight but still leaves it lighter than some so-called portables. The one thing to be said for metal cases is the added strength it provides.

Hardware

Towards the front of the machine are situated the keyboard, a number of LED indicators and two push button switches. The LEDs are marked; RUN, IDLE, MAP, and TIME and are dealt with in the 'In use' section as are the two switches marked RESET and RESTART.

The keyboard itself is of a simple construction with the minimum of frills. The main section contains all the standard alphanumeric keys, 55 in total. There is also a nine-key keypad containing cursor keys and various editing keys which are used by the Basic line editor.

Various connectors are apparent around the outside of the case but, unfortunately, there are no markings on the case itself to describe their function.

Working from the circuit diagrams and the PCB overlay diagrams, the following should be correct descriptions. On the right-hand side front are located the two connectors which make up the serial system. A 5-pin DIN socket is used to communicate with the cassette recorder (Powertran recommend a WH Smith model).

A 25-way 'D' type connector is used to interface the unit with any standard RS232 serial device. A 34-pin IDC conncetor is used to connect the new disk unit. This connector should really be on the rear of the system with the power supply connector and not in its current position on the right-hand side. Powertran supplies two types of disk unit for the Cortex with 125K or 1Mb unformatted capacities offered on single sided single density or double sided double density drives respectively.

At the rear of the unit are located the video outputs for both the UHF (a TV set) and RGB (optional extra) displays, in addition to the disk power supply connector.

The only other connector is the 'D' type for the Ebus and is situated this time on the left of the machine. This allows the machine to communicate with standard Eurobus expansion boards. On previous versions of the Cortex, the Ebus was not available due to design problems but I am assured that this one works properly.

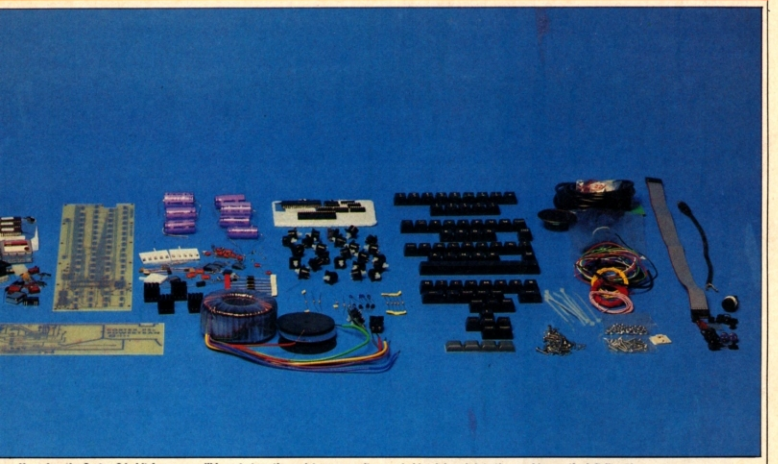
Documentation

These manuals are certainly not of the highest standard but they are readable and that's what counts. Three manuals make up the system documentation: a user manual, the disk operating system manual, and a construction manual if you're buying in kit-form. The user manual is written on the assumption that you actually built the system. No mention is made of the connectors or indicators which is a shame because some people will buy the ready-built version and will not be familiar with the system. What it does have is an in-depth description of Cortex Basic.

The construction manual is a photocopy of the original article which appeared in *Electronics Today International* as appears to be the norm with Powertran kits. This is quite adequate as it not only deals with descriptions and construction but also has an item on 'how it works' for each section of the project.

Construction

There is no reason why a system built from a kit should look any different from a professionally built machine. All components supplied to make up the



If you buy the Cortex 2 in kit-form, you will have to turn the resistors, capacitors and chips (above), into the machine on the left (inset).

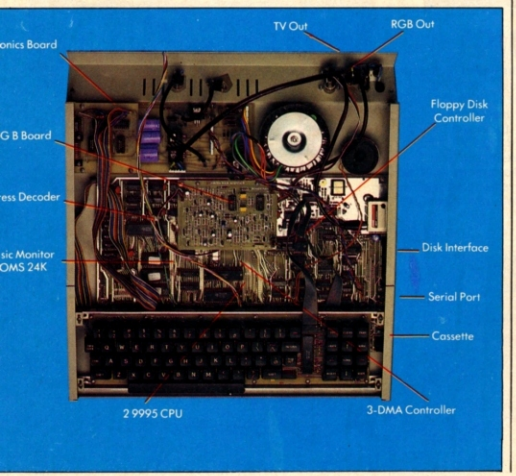
Cortex are of a high standard and if constructed properly give the desired high-quality appearance.

But taking on the task of actually building a kit that's as complex as the Cortex involves certain skills not normally associated with the average computer end user. The most important of these is the ability to use a soldering iron; though identifying and handling of components is also important. Another factor, almost as important as the soldering skills, is patience. Don't expect to sit down and build the system in one session; it is possible but not recommended. A simple rule of thumb to follow is that the more time you spend on building the system, the more likely you are to have a finished product that works.

One of the first things you notice when looking at the Cortex PCB is that all the integrated circuits are socketed. There are two schools of thought on this subject (ignoring the obvious increase in cost) for it can be argued that sockets don't provide a good electrical contact for long periods. This is true, but in this case, matters such as ease of construction, repair and modification of the board far outweigh the disadvantage of having to re-seat a chip occasionally.

While building a project from a kit, it's surprising how much one learns about that project. This knowledge then builds confidence to take on the task of taking on a hardware modification. A socket system gives such an option and is a facility rarely available to the average user.

The construction of the review system was excellent except for one small detail. Whoever built this system broke one basic rule of assembly, *ie* to make sure all cables which connect between the main unit and the lid of the system are long enough for the lid to be removed and placed to one side. Of course the system must still be able to operate with the lid removed. In this case, only the LEDs, reset buttons and two power supply regulators are mounted on the lid and it was the cables running to the LEDs that was cut too short.



Processors

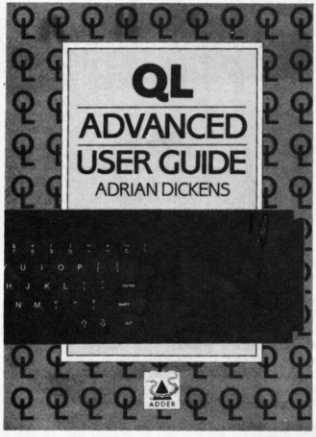
The system itself is based on the Texas

29▶

ASSEMBLER

The ADDER 68K Assembler is a professional, fully integrated editor/MACRO assembler development package for the QL. Providing a quick turn-around on the *editing, assembling, debugging* cycle, it assembles Motorola format source files to produce multi-tasking programs, additional Super BASIC facilities plus much more. Features include:

* FULL 68000 MACRO Assembler
* Integrated full screen editor
* Conditional assembly
* External library file inclusion
* Complete error checking diagnostics
* Comprehensive manual
* MACRO ASSEMBLER only £29.95*



THE BOOK

The QL Advanced User Guide (£12.95*) has been written by Adrian Dickens in collaboration with Tony Tebby (QDOS System designer). It is the complete guide to QDOS and the Sinclair QL, covering multi-tasking, transient programs, resident procedures, heaps and stacks, traps and utilities, 68008 assembler programming plus much more. All of these features are illustrated by practical examples, and the powerful QDOS experimentor program allows many facilities to be tried out from BASIC. All of the programs from the book are available on a microdrive cartridge which can be purchased with the book (£9.95*).

ORDER FORM

☐ Assembler development package **£34.95** incl. VAT and p&p
☐ QL Advanced User Guide Book **£14.45** incl. p&p (no VAT)
☐ QL A.U.G. programs from book **£11.95** incl. VAT and p&p
☐ **SPECIAL CHRISTMAS OFFER**
All three items from above (normally £61.35) **£55.95** ALL inclusive

I enclose cheque/PO for £.....

Name .....

Address.....

.....

City..... Postcode .....

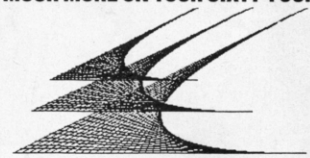
Send to: **ADDER PUBLISHING LIMITED,** PCN1
P.O. Box 148, Cambridge CB1 2EQ
Dealer enquiries welcome

QL and QDOS are trademarks of Sinclair Research Limited
** Price excluding VAT and p&p*

ADDER

GÖRLITZ COMPUTERBAU

MUCH MORE ON YOUR SIXTY-FOUR



Print your heart out using EPSON printers and GÖRLITZ interfaces – over 10.000 sold in West Germany. Definitively THE BEST connection between VIC-64 and EPSON printers is our VIC-EPSON-INTERFACE:

Plugs right into any EPSON (board 8422) • 2K Buffer (8K option) • Z80 processor • lots of additional control functions • brings you the original CBM character set with all graphics in up to 40 sizes • including double height and double width printing of CBM characters • precise HARDCOPY from SIMON's BASIC • BUS connector doubled like 1541 • DIL-switch for device address • printer remains unchanged • Interface can be switched off if Centronics port is used • No. 8423 for external use with EPSON-compatible printers like STAR etc. • Prices include DIN cable (im) and manual.

VIC-EPSON Interface type 8422 (board) ..... £ 78.50
VIC-Centronics-Interface type 8423 (external) ..... £ 79.50

prices do not include VAT. This is just one GÖRLITZ product. We are looking for dealers in UK. Our Phone: (01049)-261-27500. Mailbox for letters, queries and orders starting October: (01049)-261-2044.

GÖRLITZ COMPUTERBAU • P.O.BOX 852 • D-5400 KOBLENZ, WEST GERMANY

LIGHT TO THE POINT

SPECTRUM 48K/COMMODORE 64
£17.25
DRAGON/TANDY
£11.50
inclusive
NO INTERFACE REQUIRED

Discover the exciting world of creating your own graphics on screen.

The Trojan Light Pen will draw boxes, circles, lines, freehand pictures, save and load pictures with full erase facility.

All in Hi-Res screen in any of 4 colours for the Dragon/Tandy, 8 colours for the Spectrum, and 16 colours for the Commodore 64.

For educational or leisure use.

DEALER ENQUIRIES WELCOME

TROJAN

Micro Computer Software & Accessories

Send cheque/P.O. to.
TROJAN PRODUCTS
166, Derlwyn, Dunvant, Swansea SA2 7PF
Tel: (0792) 205491.

◀ 27

Instruments TMS9995, probably an unfamiliar microprocessor to most users. It was in fact one of the first true 16-bit microprocessors. It has one main drawback which is a limited memory addressing range. It can only address 32Kwords (16-bit) which is the equivalent of 64K bytes. These days, this seems a very small amount when compared with the 8086 (IMb) and the 68000 (16Mb) though it is still the same as the Z80 and the 6502.

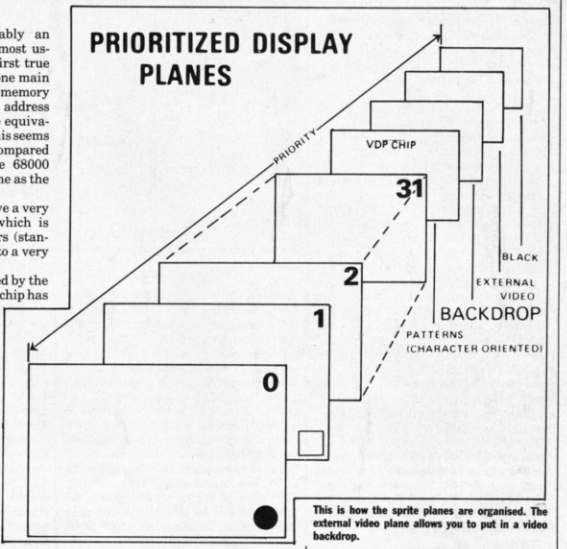
It does on the other hand, have a very high clock speed of 12MHz which is faster than all these processors (standard models only) which leads to a very fast machine.

Video on the Cortex is handled by the TMS9928 video processor. This chip has its own 16K of memory leading to a graphics resolution of 256×192 with 16 colours on the screen at one time.

Also implemented on the 9928 is a sprite capability with up to 256 being allowed. These sprites can be defined as an 8×8 or 16×16 (64 sprites only) pixel grid. An option to magnify these is also available. The command MAG0 maps each sprite pixel to one pixel on the screen, while the command MAG1 maps each sprite pixel on to a 2×2 grid on the screen thus allowing a single sprite to fill a 32×32 grid on the screen. As is usual with sprites, software is available to check for collision between sprites while hardware within the video processor takes care of which sprite is 'in front' of any other when displayed.

One very interesting feature of the graphics processor is that one colour is defined, not as a colour, but as transparent. This allows the background colour to be seen 'through' the sprite.

The idea of one image being in front of another is possible because of the way in which the 9928 implements its graphics.



This is how the sprite planes are organised. The external video plane allows you to put in a video backdrop.

The screen can be thought of as 36 planes on top of each other — rather like placing 36 photographic slides on top of each other and looking through them. Thus a sprite placed on plane 8 would cover an image of a sprite on plane 9.

One of the 36 planes is set aside for an external video expansion board. This board mixes a video signal from, for example, a video recorder with that of the computer. Thus it is possible, albeit difficult, to do things such as make a car in a video game hit a real wall.

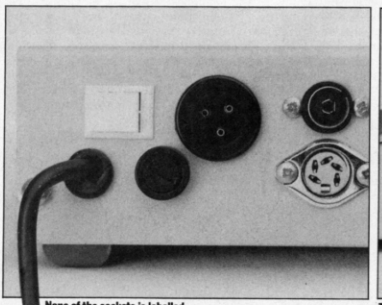
Because the graphics memory is separate from the user memory the system still provides the full 64K bytes for use. Well, nearly all, as a small area of memory is set aside for memory mapped I/O allocation.

Firmware

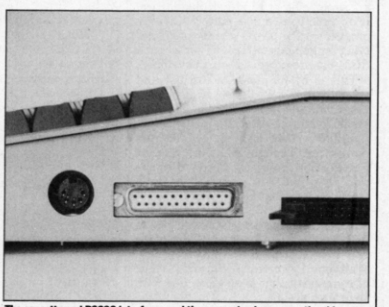
Basic comes as standard on the system and is stored in ROM along with the system monitor. All firmware is held in 3×8K EPROMs which, again, are not part of the main memory map. Instead, these EPROMs are known as phantom memory.

When the system is first powered up, the dynamic RAMs are checked for

30 ▶



None of the sockets is labelled.



The cassette and RS232 interfaces and the expansion bus are on the side.

correct operation and then the contents of the EPROMs are copied into RAM. This allows far greater system flexibility because Basic can be overwritten if the system is running 9995 machine code only.

Though Basic is the language fitted with all new systems, it is possible to change the language simply by replacing the EPROMs. Two other languages are presently available for the Cortex. The first is fig-Forth (available from Lombard Systems of Bedford). The language comes on two 8K EPROMs, which replace the first two Basic ROMs. To enhance the Forth package, a utilities disk is also available containing an editor and various I/O utilities.

For those who don't wish to replace the Basic ROMs permanently, Forth is also available on an auto run disk with all the utilities included. With this version, the Basic 'boot' command is used to load Forth on top of the Basic interpreter. UCSD Pascal P-code system is also available. This includes the operating system, full screen editor, assembler, compiler and debugger. Further extensions allow multi-tasking and support for extended addressing via the Ebus which will allow a full megabyte of memory to be accessed. All very nice, I hear you P-code followers thinking. True, except that it weighs in at £535. With the standard Cortex kit at £300, it does seem a bit excessive.

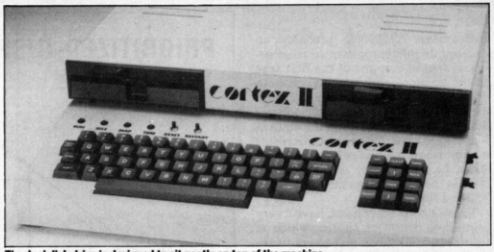
Software

A number of companies are now offering software which will run on the Cortex, and Powertran itself has commissioned an independent software house to write a new disk operating system.

Microprocessor Engineering (0703-775482) offers a number of software packages which run on the Cortex. MDEX is a disk operating system with a disk-based version of Basic which is similar to Microsoft Basic. EDIT is an editor based upon a number of mainframe-based editors including SOS. RESCUE is a set of three programs for processor, memory and disk diagnostics. It also includes a disk editor/ recovery program. SPL is a systems programming language similar to 'C' for which a ROM-based nucleus is being developed.

This is by no means a full list and needless to say, a number of games are also available. No doubt, more will be made available after the competition that Powertran ran in its August newsletter. Though this was the first Cortex user group newsletter it seems that they will run about every three months, as the next was due in December.

Topics include all the latest updates in both hardware and software, plus hints and tips from present Cortex owners. Well done, Powertran — I'm all in favour of companies that keep close ties with their user groups.



The dual disk drive is designed to sit neatly on top of the machine.

In use

There should be few problems with using Cortex Basic For the first time user. But those familiar with standard Microsoft Basic may take a little time to get used to it. Contained within the Basic is a line orientated editor which is initiated whenever a syntax error is encountered. Being brought up on a version of Basic totally devoid of editing facilities, I normally retype the whole line automatically so using this type of editor is quite a luxury.

The Basic itself is excellent allowing auto line numbering, renumbering, definition of sprites and allowing 16 parameters to be passed to a machine code routine, to name but a few of its many facilities.

On the system disk supplied by Powertran were three simple demo programs, all using sprites. The sprite moving sections of the demos were smooth and fast considering that they were in Basic, obviously another pointer to the overall speed of the system.

When coming out of a program I noticed that the text on the screen was different to that displayed when I loaded it. This is because the Cortex works in two distinct modes, text and graphics. When in text the normal 24 × 40 display is used, but when in graphics mode the characters are actually plotted onto the screen, thus allowing only 24 × 32 characters on the screen. Typing the command 'text' is all that's required to swap back to text mode.

Though the system itself is fast, the disk drives themselves are quite slow. Together with this, the disk operating system is cumbersome and long-winded to use. I won't delve any deeper into the workings of this particular DOS as it is in the process of being replaced.

As mentioned previously, there are a number of LED indicators on the top of the case. The first two show how much of the time the system is actually running code and how long it is sitting idle. The MAP LED shows when memory mapped I/O is taking place. The final one, marked TIME, flashes continually and I could find no details about it. None were given in the construction manual so I assume this was not available on the Cortex 1.

Verdict

Building from a kit, in this case, offers a cheap way to obtain a powerful and versatile micro, but it must be said that it is not just putting pieces together jig-saw fashion.

Buying the Cortex 2, in whatever form, must be looked on as something of a challenge. The reason for this is that a lot of software development has to be done by the user because it cannot be bought off the shelf. Incompatibity is the main cause. Though there are a small number of other 9900 series machines on the market, each is a small fish in a large ocean compared with the likes of Commodore, Acorn and Sinclair. So don't expect a new game or package to appear every week, because it won't. Software is being written, but not in vast quantities.

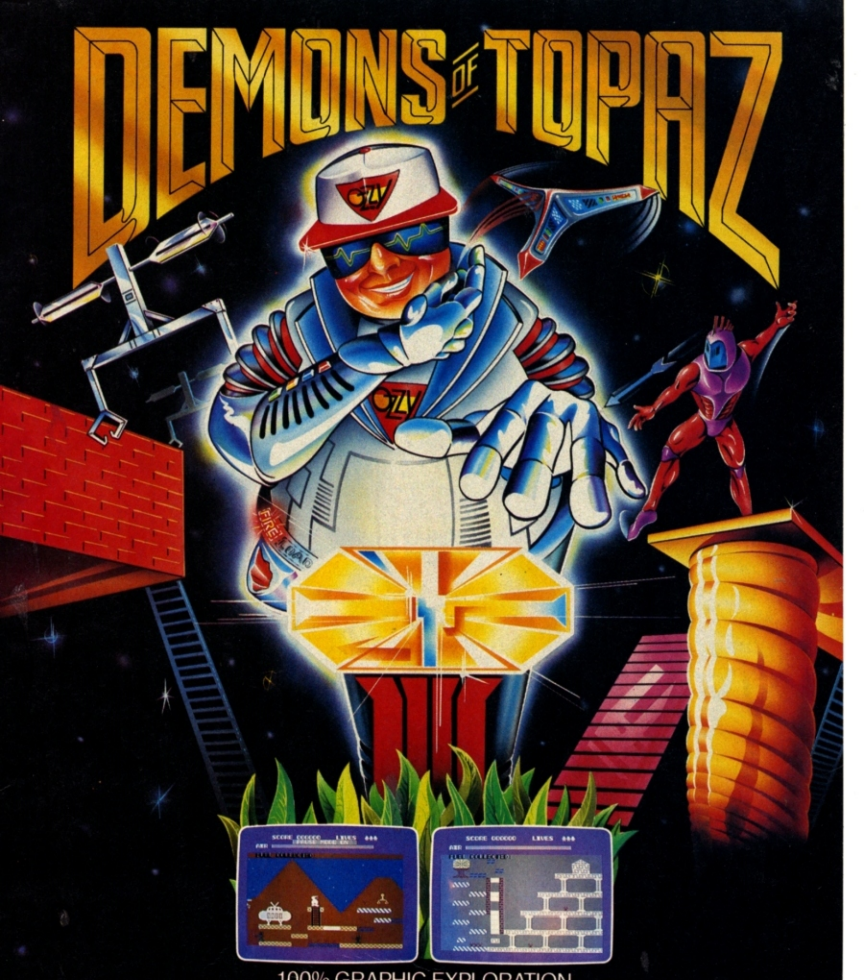
Though the Cortex is primarily a home computer, there is no reason why it should not become a small business micro if relevant software were to become available.

The disk capacity is large enough, the speed is more than ample, and printer ports and high-resolution graphics are also included.

Specifications

Price	Basic kit £299, built £399, £1,195 with all the options
Processor	TMS9995 12MHz
ROM	24K for Basic and Monitor
RAM	64K plus 16K for graphics
Screen	24 × 40 text, 256 × 192 graphics
Keyboard	64 keys including nine key keypad
Interfaces	RGB, Centronics, Ebus, Floppy disks external video input
Distributor	Powertran Cybernetics 0264-64455

DEMONS OF TOPAZ



100% GRAPHIC EXPLORATION

firebird
SOFTWARE

A game of distinction from British Telecom.

WELLINGTON HOUSE, UPPER ST. MARTIN'S LANE,
LONDON WC2H 9DL. TEL: 01-379 6755/5626

COMMODORE 64
GOLD EDITION
£5.95

Firebird and the Firebird logo are trademarks of British Telecommunications plc.

64K User RAM
and not a bit less...

New Prices!
MTX 512
£275.00 inc VAT

The MTX512 comes with 64K RAM, expandable to 512K. Add to this another 16K VideoRAM dedicated solely to handling the screen memory, and you've got 80K. But how much user RAM is left when you're running high resolution graphics programs? Unlike other machines, the answer is still 64K, because the MTX512 uses the 16K VideoRAM plus a second processor – the Texas TMS9929A – to take care of screen graphics. The main processor used in the MTX512 is the Zilog Z80A, which gives the MTX Series CP/M compatibility – CP/M was written around the Zilog Series. And the Z80A inside the 512 operates at 4MHz.

Expansion is no problem with the MTX Series, because it is designed as an interlocking system – from the MTX512 up to the powerful Memotech Silicon Disc Systems.

MEMOTECH MTX512 MAJOR FEATURES

STANDARD I/O PORTS
- *Variable rate cassette port (up to 2400 baud)*
- *Two joystick ports using Atari configuration*
- *Centronics-type parallel printer port*
- *ROM cartridge port*
- *Uncommitted parallel input/output port*
- *Internal ROM board port*
- *Hi-Fi output port*
- *4-channel sound through TV speaker*
- *PAL composite video colour Monitor port*

THE RS232 COMMUNICATIONS BOARD
(required for disc expansions)
- *Two independent RS232 ports*
- *80-way Disc Drive Bus supporting up to four 5.25 and/or 8 inch floppy disc drives, Memotech Silicon Discs, and Hard Discs*

USER RAM
- *Expandable to 512K in increments of 64, 128, or 256K*

24K OF ROM *which includes:*
- *MTX BASIC*
- *Noddy, a simple, text-handling language*
- *A powerful Assembler/Dissassembler – sections of machine code can be created and run by calling the Assembler from within BASIC*
- *The sophisticated Front Panel, which displays the contents of all registers (including the F flag register) and pointers during program execution*
- *All four languages can be used interactively with each other, and with the user*

ROM EXPANSIONS
- *MTX NewWord, a 32K word processing package*
- *Hisoft PASCAL, written specially for the MTX Series*

THE KEYBOARD
- *Full size, 79-key, full-stroke professional quality keyboard incorporating:*
- *Main Block with typewriter-style layout*
- *A separate 12-key numeric/editor keypad*
- *Eight programmable function keys (16 with shift)*

GRAPHICS FACILITIES

HI-RES GRAPHICS MODE
- *256 × 192 pixel resolution plus*
- *32 × 24 Text in 16 foreground and background colours*
- *All 16 colours (i.e. 15 colours plus transparent) are available on the screen together*
- *32 user-definable easily controllable sprites*
- *128 separate GENPAT statements providing a huge range of user-defined characters*

TEXT MODE
- *Text resolution is 40 × 24 characters plus*
- *128 user-defined characters*
- *Eight user-definable virtual screens or "windows"*

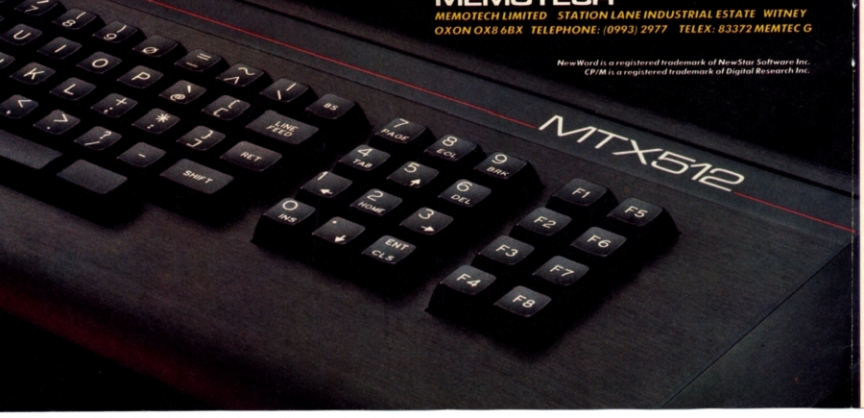
SINGLE 5.25" DISC DRIVE – £399.00 inc VAT
Comprising one Qume double-sided, double-density 500K drive, plus the Memotech Floppy Disc Controller Board, with power supply, expansion sockets, and sturdy aluminium case.

Single Disc System Software: MTX Single Disc BASIC extensions on ROM, plus Renumber, 40 Column Text and Graphics Screen, Binary to Hex to Decimal Converter, Data save and load plus five games.

For further information, please contact:

MEMOTECH
MEMOTECH LIMITED STATION LANE INDUSTRIAL ESTATE WITNEY OXON OX8 6BX TELEPHONE: (0993) 2977 TELEX: 83372 MEMTEC G

NewWord is a registered trademark of NewStar Software Inc.
CP/M is a registered trademark of Digital Research Inc.



NEW HORIZONS

8 ASHBURNHAM ROAD
BEDFORD
MK40 1DS
TEL: 0234 53816

AGENT BUYERS

IMPORT and EXPORT COMPUTERS

HOME COMPUTERS and PERSONAL COMPUTERS

CHRISTMAS SPECIAL

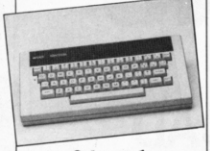
GOLDEN TURKEY AWARDS

Everybody's doing it — giving awards that is. Oscars, Grammys, Emmys. Nobody can beat showbiz for people telling other people how wonderful they were.

At *PCN* we thought the computer industry had done a number of wonderful things so we've instituted an awards scheme of our own. But computing being what it is, we've spurned excellence and turned to the heart of the computing scene — the blunders, the ill luck and the occasionaly sheer incompetence.

At *PCN* we're big enough to own up to our mistakes. So it is in that spirit that we announce the first annual Personal Computing News Christmas Turkeys presentation.

The judging took place at a glittering ceremony in the back room of a pub where the judges cast their gaze far and wide in search of deserving winners. Ladies and gentlemen, The Turkeys . . .



Category 1

We kick off with awards for marketing and image-making.

Shirley Temple Award

For the most photogenic abuse of a juvenile, Ericsson wins the prize for its recent TV advertising campaign.

Dumbo Award

A clear winner — Commodore for the most photogenic abuse of an elephant.

Oliver Cromwell Award

This goes to the company showing greatest abuse of royalty. Another clear winner — Bad Taste Software for *Di's Baby*.

Saatchi and Saatchi Gilded Mirror

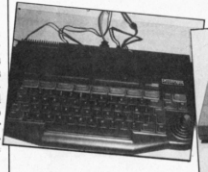
This magnificent prize for image manipulation was closely contested, but finally the judges plumped for Apple UK for its recent campaign. Apple narrowly defeated ACT which had gone to staggering lengths to look good. The decisive factor was Apple's failure to sell computers.

Attila the Hun Award

A walkover here for IBM as the company most likely to take over the world. Commodore indicated a desire to enter, but was ruled out for not having what it takes. IBM has long since established a near monopoly on essentials such as ruthlessness and money.

Tin Bushel

A utilitarian trophy, beneath which the winners can hide their light. For the company doing the least to promote its products, the bushel goes to Memotech. Enterprise Computers staged a late challenge on the grounds that it couldn't do less to promote a computer than not make one, but the judges ruled the entry out of order.



Most Promising Newcomer

To Acorn for the Electron, because any machine that can remain 'promising' over a year after launch deserves special recognition. Another entry by Enterprise was disqualified on the grounds that while it has promised more than anyone, it can't be classed a newcomer until it sells a machine.

The Golden Boot

Awarded for the best own goal of the season. The two finalists, Acorn and Sinclair, fought into extra time when Acorn took a decisive lead. Sinclair possibly scored the larger number, but flair and style counts for more. The way Acornsoft let the Spectrum rights to *Elite* slip through its fingers had the judges chanting on the terraces.

Category 2

The next group is the heart of the Christmas Turkey Awards. In an industry renowned for such clichés as 'cutting edge', 'state of the art' and 'fast-moving', competition was fiercest for the following awards.

Big Ben Trophy

Awarded to Psion for the *Organiser*, deemed to be 'the largest ever multi-function wristwatch.

Arnold Schwarzenegger Award

For contributions to portable computing. A closely contested category which resulted in several judges receiving physiotherapy after testing. The eventual winner was Sperry for its entry which weighed in at a dislocating 39lbs.

Torrey Canyon Trophy

For the most spectacular crash, the judges did not hesitate to name Imagine, despite strong competition from Camputers' Lynx and Jupiter Cantab. Dragon Data also featured, but was felt to have put in too much practice and peaked too early.

Ford Model T Award

This valuable trophy for technical innovation is shared among the manufacturers who participated in MSX.

Blooper Prize for Fiction

A difficult decision since the judges were overwhelmed with entries. However, most turned out to be fact and the decision finally went to famous software house Joe the Lion for its Spectrum emulator for the QL. Announced at the QL's launch, the emulator has yet to appear.

Channel Tunnel Award

This is the premier award of the Christmas Turkeys, presented to the company getting most mileage out of a product that doesn't exist. A shock result here as hot favourite Enterprise was disqualified after a stewards' inquiry following allegations that *Personal Computer World* had seen an Enterprise computer. Although the claim was hotly disputed, the judges ruled that the Enterprise may exist on some other plane of reality. This left the field clear for Legend to romp home with The Great Space Race. The trophy itself, a stretch of water with a hole in it, will be presented at a ceremony timed to coincide with the opening of the Channel Tunnel.

Finally, a special award.

Pinnochio Trophy

This goes to Sinclair Research for its denial of Spectrum developments 48 hours before the Spectrum Plus launch. The prize is a nose job by a top plastic surgeon.

TÍR NA NÒG

NOMINATED For C.T.A. GAME OF THE YEAR award

GARGOYLE GAMES

£9.95 **48K ZX SPECTRUM**

Tir Na Nòg – the land of youth, the other world.

Tir Na Nòg – the kingdom of the sidhe, the home of dagda's cauldron.

Tir Na Nòg – a vast and complex adventure, in a magical celtic landscape.

Tir Na Nòg – a most stunning visual experience, with state-of-the-art film animation.

Tir Na Nòg – a true computer movie.

ALSO FROM GARGOYLE:
THE STUNNING SPACE GAME,
***AD ASTRA* - £5.95**

GARGOYLE GAMES, 74 KING STREET, DUDLEY, WEST MIDLANDS. TEL: DUDLEY 238777

GAMES WORKSHOP

The New Force in Software

BATTLECARS: "Go out and buy it today!"
Personal Computer News

D-DAY: "...an excellent wargame with graphics to match—at last!"
Crash Micro

TOWER OF DESPAIR: "Fantasy fans will love this game"
Crash Micro

Spectrum versions £7.95 C64 £8.95 From all good shops or direct from:
Games Workshop, Mail Order Department, 27-29 Sunbeam Road, London NW10 6JP

BBC ELECTRON

LEAVE REALITY BEHIND YOU WITH...

MP ADVENTURE GAMES

A new range of REAL-TIME ADVENTURES we believe the most advanced available for the BBC & Electron: intelligent characters that will move around independently, multiple command statements, advanced text compression methods allow even more detail.

*****NEW*** SADIM CASTLE** It is said that those who enter the haunted estate of Sadim Castle do not return! Long ago tragedy struck here and since then many people have died in mysterious circumstances. Can you uncover the secret and break a terrible curse!!

*****NEW*** VALLEY OF THE KINGS** Far away across the desert lie the lost pyramids of Kaculud, rumoured to contain fabulous treasure and a legendry golden mask. The pyramids may now have been discovered although strange happenings have caused the archaeologists to abandon their camp. Your task is to find the golden mask.

Further titles coming shortly: CROWN OF MARDAN, THE FALLEN EAGLE.

Our original and popular text adventures are also available: **FIRIENWOOD, WOODLAND TERROR, BLUE DRAGON, SURVIVOR.** Please send for full details.

Text Adventure Prices £7.50 (Cass) £10.50 (Disc) including VAT & postage with UK. State which machine when ordering. Dealer enquiries welcome

VISA

MP SOFTWARE LTD.
165 Spital Road, Bromborough, Merseyside L62 2AE.
Tel: 051-334 3472

SIX FROM EIGHTH

Mike Gerrard is left breathless after playing this latest batch of adventures.

It's been quite a day, let me tell you. Fortified by just a bowl of cornflakes I had to start by saving America which had been devastated by a bacteriological disaster. Then, after a short break for coffee, I was wrestling with Stirling, the international terrorist, who was threatening to wipe out New York if he didn't get his billion dollar ransom.

As this exceeded my limit at the NatWest Service till I left him to it, only to find that one of Britain's early warning attack satellites had gone missing. Of course I had to step into the breach and deal with that before I felt I'd earned my lunch time pie and pint.

The afternoon, if anything, was worse. I had to battle with the might of the evil corrupt Empire on behalf of the Federation, though this was as nothing compared to doing battle with the might of my nanny in order to break out of the playpen and find a new arm for tattered old teddy.

Finally, I entered a magical world of fairies and grottoes in the traditional hunt for treasure, without which no adventurer's day is complete.

The blame for my day of mayhem and monsters lies fair and square with 8th Day Software, which has just released the first six in its series called 'Games Without Frontiers', all written with *The Quill* for the 48K Spectrum and all selling at the incredible price of £1.75 (including postage, from 8th Day Software, 18 Flaxhill, Moreton, Wirral, Merseyside L46 7UH).

Cheap but good

As with the recent batch of cut-rate arcade software, cheap prices don't necessarily mean inferior quality. It was heartening to load these adventures up and discover that the general standard was very high indeed, catering for a range of preferences and ability levels.

Don't expect glossy packaging for that price, though the cassette covers look smart with their uniform black background and silver lettering. Another standard feature is the inclusion on the B-side of each cassette of the storyline for the adventure you've bought, and of the others in the series, with a few pages on the playing of adventure games in general. Each adventure is graded as beginner's, moderate or advanced, and hint sheets or individual clues are available from 8th Day.

This thorough and professional approach would be wasted, of course, if the adventures themselves were dismal efforts, but they're far from being that. Even the beginner's game proved pretty tough going in places.

Floe and the kids

This is *Ice Station Zero*, whose loading screen for some reason shows a pterodactyl flying over an iceberg. I could understand a polar bear, huskies and even a Yeti in the icy wastes, but a pterodactyl? This is the one with mad Stirling and the billion dollar ransom, and you have to cross the Arctic ice-cap to get to him.

You begin outside a small snow-covered tent on the western edge of an immense ice-field with a pack of wolves howling across the frozen plains. Though there are a few items in the tent, the means to defend yourself against the wolves (and their newly acquired striker) is carefully hidden away somewhere for you to find.

Little graphics touches are possible when using *The Quill*, such as when you EXAMINE GUN which shows you the number of bullets remaining, while FIRE GUN produces a couple of bullet-holes either side of the screen.

Can you escape the polar bear and the Yeti, what happens if you remove your clothing (known as losing your Kagool) and how do you make the air turn blue? The storyline of this one is full of healthy nonsense but the standard of the text is very high, as with most of this series.

From Yeti to Nanny and the moderately difficult *Cuddles*, described as an adventure for big kids. Pack the nappies, examine the potty and plot your route for finding a new arm for teddy, who you thoughtlessly left up a tree.

As you move round the nursery you find coloured building blocks, each with a different letter on it — and no, they don't spell out a rude word. But woe betide the player who searches the nappy cupboard without nasal protection.

In Ice Station you leave your tent to fight hungry wolves.

Nuclear 'n naughty

From the nursery to nuclear war with *Four Minutes to Midnight*, which opens in dramatic style. 'You are on the forecourt of a small gas station beside several neglected gasoline pumps. There is a small road running to the east while the garage fronting is west. You can also see a dusty mini-bus. A car is careering down the road towards the station.' Needless to say you don't have many turns before 'The car hits the pumps! With a massive explosion the station erupts in a ball of flames!' You too, of course.

Unfortunately a slight lack of care over the inputs means that it's virtually impossible to get through the first few moves properly. You can stop the car exploding but it still burns, and you have to respond to the driver's pleas for help by somehow rescuing him.

You're told his name is Dave, but GET DAVE, CARRY DAVE, HELP DAVE and so on all fail to work. Eventually my patience ran out and I cheated to discover I should have typed RECRUIT DAVE. Hmmmm . . . bit naughty, that.

Also naughty is a routine in *In Search of Angels*, an espionage thriller. You very soon find yourself at an airport where the girl on the desk asks you for your destination. Only by looking at the Hint Sheet can you discover your possible destinations of exotic locations — such as Rio, Casablanca, Berlin, Tokyo and London.

Once you know where you can go, however, you can move around the world trying to piece together clues about the lost early warning satellite and the dead CIA agent floating in the River Thames.

Space 'n Faeries

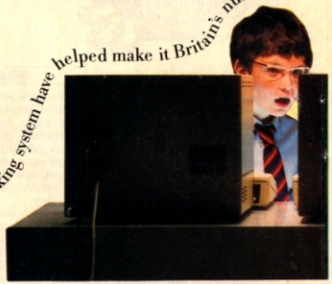
Naturally there had to be a sci-fi story in this batch. *Quann Tulla* is vaguely in the *Snowball* tradition of space ships, robots, security doors, secret manuals and so on. 'The fate of the Universe is in your hands!' My reaction to that was blunt and brief, and I was promptly told: 'Hygiene Clone II appears from nowhere with a bar of soap to clean out your mouth!'

Finally *Faeri*, an advanced difficulty game whose plot twists and turns so much that it's hard to describe. You're in a fantasy world, looking for treasure, with the guardians of the Underworld and Overworld out to prevent you from doing that. There are 30 main treasures and an additional three Sacred Treasures.

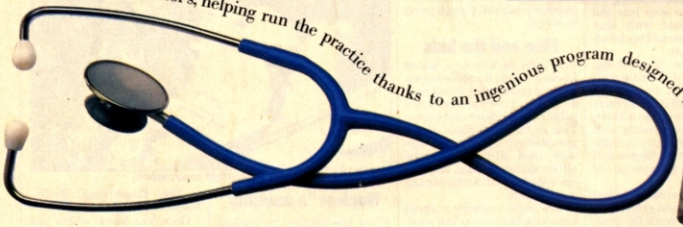
8th Day reckons this one will keep you busy for the next six months.

The BBC Micro is only 16" long. But it stretches indefinitely.

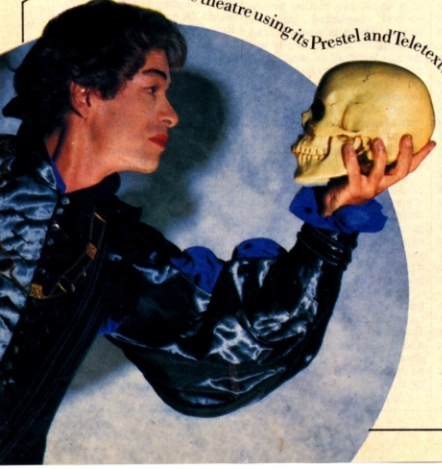
It stretches into schools where BBC Basic and the Econet networking system have helped make it Britain's number one

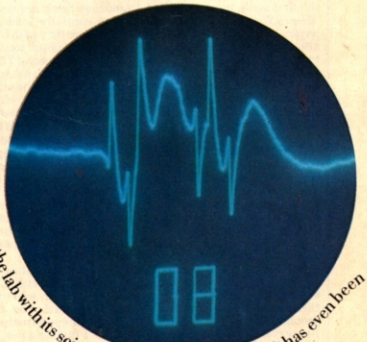


It's down at the doctor's, helping run the practice thanks to an ingenious program designed by two GPs. You'll catch it

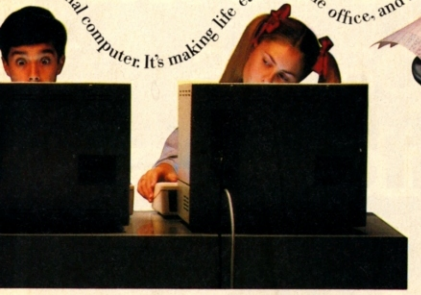


It can take you to the theatre using its Prestel and Teletext adaptors. While helping out at the lab with its scientific monitoring interface. It has even been





educational computer. It's making life easier in the office, and has grown into the country's top micro for small businessmen.



on TV, the star of a series of computer literacy programmes. Its colour graphics and new Bitstik make it welcome in design studios.

working in space, tracking a satellite it also helped design. Meanwhile, back on Earth at 49 Acacia Avenue, Kingsbridge, Middx...

The BBC Microcomputer System. The world's best. And still growing.

The BBC Microcomputer System is designed, produced and distributed by Acorn Computers Ltd.

BBC MICRO · SINCLAIR ZX SPECTRUM · ORIC 1 · DRAGON 32
VIC 20 AND COMMODORE 64 · AMSTRAD · ATARI

Computer books with pages of possibilities for your micro.

The Pan/Personal Computer News Computer Library is available through all good bookshops including major branches of

WHSMITH

Pan

PERSONAL COMPUTER NEWS LIBRARY

Pan Books Ltd., Cavaye Place, London SW10 9PG. Registered in England. Registration No. 389691

SWITCHABILITY FROM SHINWA

Despite her tussles with the manual, Leah Batham still admires the CPA-80 printer's dozen dip switch options and its price — just £229.

When the CPA-80 (Compute Mate 100) arrived in *PCN*'s office the standard comment was: 'Ah, another Shinwa Epson lookalike.' From its original CP-80, Shinwa CTI has developed another possible winner, especially with a £228.85 price-tag. It does, however, face stiffer competition than its predecessor.

The printer ribbon is encased in a large cassette that slips into place relatively easily. The one provided with the machine was a carbon ribbon which still hasn't run out, despite innumerable test-runs.

A flap on top of the machine, with the CPA-80 logo on it, conceals a collection of 12 dip switches. With the first seven switches it is possible to select normal or emphasised printing mode, form length, 1/8in or 1/6in line spacing, 80 or 142 character line length (the latter is for condensed mode), and a normal or slashed zero. The option to hardware select emphasised print is a particularly appealing feature.

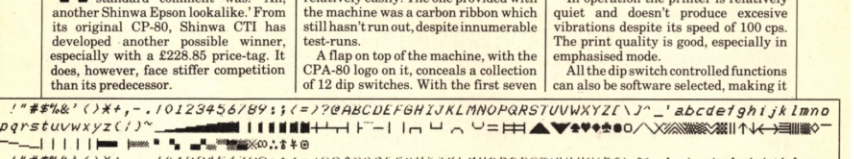
Switches 8 to 12 determine the character set, which can be selected for a variety of languages. These can be combined with a range of graphics characters, the Japanese Kana symbols, the Greek alphabet or italic letters.

Like other printers, the default is on-line rather than off-line.

In operation the printer is relatively quiet and doesn't produce excesive vibrations despite its speed of 100 cps. The print quality is good, especially in emphasised mode.

All the dip switch controlled functions can also be software selected, making it possible to use several of the options in one document. In addition a vast array of different functions are available via control codes including: line spacing in increments of 1/216in; text format such as vertical and horizontal tabulation; enlarged, condensed, double-strike, Elite, Pica, underlined and proportional printing modes; superscripts and subscripts; and much more.

Both 8-bit and 9-bit dot image modes can also be selected, so graphics created on screen can with the right software be dumped to the printer. The 8-bit dot image mode can easily be switched from single density to double density. Unfortunately the sample programs in this section of the manual were slightly ambiguous and I couldn't get all of them to work.

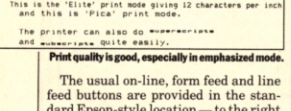


In addition to coping with several different languages — and symbols — the Shinwa CPA-80 can also handle everything from the Greek alphabet to graphics.

Setting up

The printer itself is a beige and brown plastic box about 5in high with an almost square footprint. It isn't small, but it is light. A semi-transparent 'smoked' plastic cover conceals the printing area. The paper feeds in the back from the wire paper guide and out through a slit in the top.

The review model had a parallel interface which accepted an Epson connector. A serial interface model is also available for an additional £23. Detailed specifications and circuit diagrams for both interfaces are contained in the manual.



Print quality is good, especially in emphasized mode.

The usual on-line, form feed and line feed buttons are provided in the standard Epson-style location — to the right of the printing area.

The CPA-80 takes single sheet or fan-fold paper. The tractor feed is unusual in that it feeds paper to the platen from behind rather than pulling it out from above. After the initial surprise, this proved easy to use and reliable. It also has the advantage that you can tear off a sheet without having to run the perforation through the tractor feed first, so you save on paper.

Documentation

This is the CPA-80's weakest point though it could easily have been its strongest. The manual contains everything the user could possibly wish to know about every aspect of the printer, but it suffers severely from the common Japanese problem of inadequate grasp of the English language.

However, the fun stops when you try to wrestle some sensible information out of the gobbledegook. If it wasn't for the excellent diagrams I would never have been able to load the paper, let alone print out an article.

Almost every application described is accompanied by example programs in Basic. They must be adapted to the machine, but this usually isn't too difficult. Where language fails, these programs make up the deficit — an example others should follow.

In use

Turning on the CPA-80 I noticed that the on-line light came on immediately.

Verdict

The range of features on the CPA-80 would be impressive on a more expensive printer. At £229,it is good value.

A prospective buyer should, however, store up a good deal of patience beforehand for debugging the manual.

REPORT CARD: 1 TO 5

Features	●●●●
Documentation	●●●
Performance	●●●●
Overall value	●●●●

Price £228.85 parallel interface, £251.85 serial interface **Manufacturer** Creative Technology International **Distributor** Microperipherals, Intec Unit 3, Hassocks Wood, Wade Road, Basingstoke, Hants. 0256-473232 **Outlets** Retail.

Cash & Carry COMPUTERS

TOP SHOWROOM SERVICE

ROCK BOTTOM PRICES

PERSONAL CALLERS WELCOME AT OUR EXTENSIVE SHOWROOMS
MOST EQUIPMENT ON DEMONSTRATION

The UK's Best Printer Prices

Only a sample of our massive range of printers shown here — phone for further details

DAISYWHEEL LETTER QUALITY

Juki 6100 (P)	£395.00 + VAT =	**£373.73**
Brother HR15 (P and S)	£329.00 + VAT =	**£378.35**
Daisystep 2000 (P)	£239.95 + VAT =	**£275.94**

PRINTER/TYPEWRITERS

Brother EP22 Dot Matrix (S)	£109.00 + VAT =	**£125.35**
Brother EP44 (S)	£189.00 + VAT =	**£217.35**
Modems available for Easylink and Telecom Gold		
Juki 2200 Daisywheel (P or S)	£245.00 + VAT =	**£281.75**

DOT MATRIX PRINTERS

Brother M1009 (P and S)	£169.00 + VAT =	**£194.35**
Brother HR5 (P or S)	£125.00 + VAT =	**£143.75**
Canon 1080A NLQ (P)	£289.90 + VAT =	**£332.35**
Canon 1156A NLQ (P)	£379.00 + VAT =	**£435.85**
EPSON RX80 (P)	£195.00 + VAT =	**£224.25**
EPSON RX80 F T PLUS (P)	£220.00 + VAT =	**£253.00**
EPSON FX80 (P)	£324.00 + VAT =	**£372.60**
EPSON RX100 F T (P)	£339.96 + VAT =	**£390.95**
EPSON FX100 F T (P)	£430.00 + VAT =	**£494.50**
Seikosha GP100A (P)	£129.90 + VAT =	**£149.39**
Seikosha GP50A (P)	£79.90 + VAT =	**£91.89**
Seikosha GP50S (Spectrum)	£79.90 + VAT =	**£91.89**
Seikosha GP500A (P)	£139.90 + VAT =	**£160.89**
Seikosha GP550A (P)	£179.90 + VAT =	**£206.89**
Seikosha GP700A Colour (P)	£279.90 + VAT =	**£321.89**
Shriwa CT80 (P)	£175.00 + VAT =	**£201.25**

(P)=Parallel-Centronics (S)=Serial RS232

Smith Corona range of printers Now in Stock — Phone or write for details

INSTANT CREDIT Up to 36 months to pay

All items over £150 available on our easy credit terms. Written details available on request.

12" MONITORS – GREEN SCREEN

Sanyo 3112 Med Res	£65.00 + VAT =	**£74.75**
Sanyo 8112 High Res	£88.00 + VAT =	**£101.20**

14" MONITORS – COLOUR

Commodore 1701 Composite/Sound	£173.00 + VAT =	**£198.95**
Fidelity CM14 RGB/Comp/Sound	£178.00 + VAT =	**£205.65**
Microvitec 1431DS Norm Res RGB	£173.09 + VAT =	**£198.95**
Microvitec 1431DZ for ZX Spectrum	£199.00 + VAT =	**£228.85**
Microvitec 1451DS Med Res RGB	£229.00 + VAT =	**£263.35**
Microvitec 1451DQ for Sinclair QL	£234.74 + VAT =	**£269.95**
Microvitec 1441DS High Res RGB	£379.00 + VAT =	**£435.85**
Sanyo 3126 Norm Res RGB	£173.00 + VAT =	**£198.95**
Sanyo 3117 Med Res RGB	£295.00 + VAT =	**£339.25**
Sanyo 3115 High Res RGB	£396.00 + VAT =	**£458.85**

Commodore

Plus 4 NEW 64K Computer	£243.43 + VAT =	**£279.95**
1 1531 Starter pack inc. cassette deck	£113.00 + VAT =	**£129.95**
Commodore 64	£165.17 + VAT =	**£189.95**
5X64 Portable inc D. Drive and Col. Monitor	£478.22 + VAT =	**£549.95**
C2N Cassette	£237.61 + VAT =	**£27.50**
1541 Disk Drive	£182.57 + VAT =	**£209.95**
DPS1101 Daisywheel Printer (by Juki)	£309.56 + VAT =	**£355.44**
801 Tractor Printer	£156.48 + VAT =	**£179.95**
802 Friction Tractor Printer	£295.83 + VAT =	**£269.95**
1520 Colour Printer Plotter	£60.83 + VAT =	**£69.95**
1701 Colour Monitor	£173.00 + VAT =	**£199.00**

Amstrad

Amstrad CPC464 Green Monitor	£509.00 + VAT =	**£340.35**
Amstrad CPC464 Colour Monitor	£301.00 + VAT =	**£346.15**

SANYO MBC 555 Business Computer

128K including Wordstar, Calcstar, Infostar ..... £795.00 + VAT = **£914.25**

Acorn/BBC

Acorn Electron plus Software	£167.78 + VAT =	**£192.95**
BBC Model B	£339.09 + VAT =	**£389.95**
Model B Disk I F	£399.96 + VAT =	**£459.95**
Cumana 1x100K DD CSX100	£109.57 + VAT =	**£126.75**
Cumana 1x400K DD CSX200	£191.26 + VAT =	**£219.95**
Cumana 2x100K DD inc PSU	£321.70 + VAT =	**£369.95**
Cumana 2x200K DD inc PSU	£347.78 + VAT =	**£399.95**
Cumana 2x400K DD inc PSU	£434.74 + VAT =	**£499.95**

All above Cumana Disk Drives include Cable, Manual + form. disk

Sinclair

QL 128K Computer	£334.74 + VAT =	**£384.95**
NEW Spectrum 48K PLUS inc. 6 Free Programs	£147.78 + VAT =	**£169.95**
Spectrum 48K + 6 Free Games (worth £56)	£106.91 + VAT =	**£122.95**
Microdrive + Interface 1 + 4 Free Programs	£68.60 + VAT =	**£78.90**
16K-48K Upgrade	£21.70 + VAT =	**£24.95**

Apricot Computers — Fantastic Prices — Phone NOW!

MSX Computers — In Stock Now

Toshiba HX10 64K	£217.35 + VAT =	**£249.95**
Sanyo MRC10 64K	£234.74 + VAT =	**£269.95**
Sony HB75B 64K	£252.13 + VAT =	**£289.95**
JVC HC7GB 64K	£226.04 + VAT =	**£259.95**

Full range of MSX accessories available

SUPERDISKS

LONDON'S LOWEST PRICES ON FLOPPY DISKS

Prices per box of ten ex VAT

	SSDD 40TR	DSDD 40TR	SS96TP1 80TR	DS96TP1 80TR
BASF 5¼"	**£10.95**	**£18.20**	**£19.80**	**£22.50**
3M 5¼"	**£13.55**	**£19.50**	**£20.05**	**£24.00**
VERBATIM 5¼"	**£15.50**	**£23.50**	**£22.50**	**£30.50**
DYSAN 5¼"	**£16.80**	**£24.90**	**£24.90**	**£32.00**
TDK 5¼"	**£17.50**	**£25.50**	—	**£33.00**

3M/BASF 3½"	**£34.90**

Add 70p for P&P per box of 10 disks

CASH & CARRY COMPUTERS
53-59 High Street, Croydon, Surrey CR0 1QD.

Mail Order + Export + Trade
Hot Line Phone 01-686 6362

Delivery by Securicor (3 day) please add £5.00 + VAT per item. Delivery by T.N.T. (overnight) please add £9.50 + VAT per item.

Send off the coupon or order by 'phone quoting your Access, Barclaycard No. 'Phone 01-686 6362. Immediate despatch on receipt of order or cheque clearance.

Or you can Telex your order on: 946240 Attn 19001335

We accept official orders from PLC's, Government Departments and Educational establishments.

These prices correct until superceded by next advertisement.

To: Cash & Carry Computers, 53-59 High Street, Croydon, Surrey CR0 1QD.

Please supply _____

_____

I enclose my cheque for £_____ including delivery by Securicor/T.N.T.*

or charge my Access/Barclaycard No. _____

Name _____ Signature _____

Address _____

_____ PCN 19/12

*Please Delete (Vision Technology Ltd)

SPECTRUM

GHOSTBUSTERS

STAR GAME

In the words of the soundtrack hit 'Bustin makes me feel good'. The film in question is *Ghostbusters* and in this instance we're talking about the game of the film of the book of the . . .

Copies often don't work, but Activision has done a great job on this. The game sticks closely to the plot of the film, the music programming is simply brilliant, and there's even a few snatches of software-created speech. Add all that to some colourful, creative and slick graphics and it's a winner.

If you haven't seen the film yet, here's the story. As the operator of a Ghostbustin' franchise you have to clear the city of a variety of spooks. To help, you have a ghostmobile, a team of three busters, and a variety of equipment including the marshmallow detector.

After buying your choice of hardware, you move to the main game screen — a bird's-eye view of the city centre. As you cruise the streets your detectors will alert you to the presence of your enemy.

You need to plot the shortest route to the scene, preferably passing a few roaming spectres on the way. The view switches to a close-up of your ghostmobile. If you've bought a vacuum cleaner you can suck up the stunned roamers on the way.

When you arrive at your destination, the view changes again, this time to a 3D screen of the action where you confront the spook and — hopefully — ensnare it in your ghost trap. In doing so you earn a bounty. Miss the ghost and you'll be slimed . . . a fate worse than death.

The aim of the game is to earn more than your starting allowance of $10,000, but there's more to it than that. The ghosts that evade you congregate at a particular building. When enough of them get there they form . . . the marshmallow man, a sort of King Kong of confectionery. He stomps on large buildings and the damage he does is deducted from your bank balance.

If, however, you can drop some ghostbait in time, the spooks ignore the call of the marshmallow and you earn a handsome bonus for averting the catastrophe.

The time measurement in the game is the city's PK (psychokinetic) energy. Each spook you fail to bag increases the PK level by 300 points.

As the level rises, the rate of increase rises too, and eventually the action becomes fast and furious as you race to stun the roamers, trap the slimmers and avert marshmallow destruction all at once.

You also have to keep an eye on your equipment. Often you'll have to return to GHQ to replenish supplies.

The single flaw in the game is that the final confrontation, instead of being a fitting climax, is a flop.

However, the sheer fun of getting there more than makes up for this.

There's no doubt that *Ghostbusters* (the film) will be one of the cinema smashes of this Christmas. I don't doubt that *Ghostbusters* (the game) will be an equal hit in the software stores. It's worth buying for the soundtrack alone — it will make owners of machines other than the 64 weep with envy.

'Who you gonna call? . . . Ghostbusters!' **Peter Worlock**

Price £9.99
Publisher Activision 0628-72448

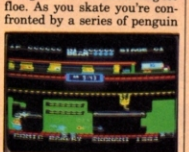
MSX

You remember the old gag about the Japanese being no good at writing software? Well, if the first batch of MSX games to arrive in this country is anything to go by, the Japanese are going to have the last laugh. At just under £19 per cartridge, buying the stuff is liable to be a painful exercise, but most of it is good enough for distributor Micro Peripherals to end up with a winner.

The ten games I saw were all produced by Konami, and each sported a handy Japanese-only instruction sheet. The names of the games are in English, as is any on-screen writing, and you also get the odd tantalising bit of English on the packaging, on the lines of '(bit of Japanese here) Great! Farout!' and 'I love (more Japanese) Comic Bakery'. Fortunately you can work out most of the controls by a bit of trial and error.

There are several notable pieces in the collection, my personal favourite being *Antarctic Adventure*. It's not an adventure as such, unless you happen to be a penguin. I've noted that very few of *PCN*'s readers are penguins (their stubby little wings can't turn the pages).

The idea of the game is to skate around the edge of Antarctica within a time limit. You get a screen display showing you, the penguin, skating along a downward scrolling ice floe. As you skate you're confronted by a series of penguin



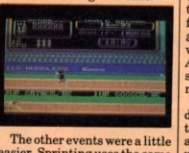
perils — crevasses, black ice, polar bears, etc, which you can skate round, jump over or bashfully bump into.

In the latter case it just slows you down, as this is a blood-free game, but it's worth falling down the odd crevasse so you can observe the animation of the penguin scrabbling back up. I'm not sure about the difficulty level of this one, but I found it so funny to watch I didn't really care.

But enough of this frivolity — come with me through the pain barrier, to an Olympic effort of Wagnerian proportions (or vice versa). The pain barrier in question is what happens when you spend around £70 for *Track and Field 1* and *2*, *Hyper Sports 1* and the peculiar little two-button joystick thingummy that goes with them.

These are *Decathlon* writ large, and again the animation is superb. The idea is to score a qualifying time in a number (a large number, I suspect) of Olympic events. I say 'suspect' because I ran into a little bit of bother in the gymnastic event.

This consists of a short run up, a mat then a horse (gymnastic, hay-stuffed rather than hay-eating variety). The two button joystick thingummy (TBJT hereafter) has Run marked on one button and Jump on the other, but no matter how I ran and jumped the little figure always stopped at the mat, scratching his head, and the word 'foul' appeared on the screen. Next time I play I'll look to see if someone in the crowd's throwing beer cans.



The other events were a little easier. Sprinting uses the same techniques as *Decathlon*, where you waggle the joystick to move your leg, but the TBJT means this is a lot easier, as you just have to rattle the run button. I was particularly taken with the high diving, where you bounce up and down on the board then twirl your way into the water. A bad dive has your athlete surfacing rubbing his head (concussion?) while after a good one he waves his arms in triumph.

But overall I'd be dead chuffed if I got this lot in my stocking this Christmas — note to Micro Peripherals: please phone for my stocking size.

You might think *Athletic Land* came out of the same mould, but it doesn't. It's actually a neat implementation of the one where you control a small boy jumping over barrels, hopping over crocodiles and swinging on creepers through a dangerous park.

Circus Charlie is more original, but uses similar techniques to hop through fiery hoops and the like. *Comic Bakery* is not in fact misleading — that's actually what it's called, and is worth a look, while *Monkey Academy* is an entertaining stab at educational programming.

Finally, we come to the golden turkeys. *Time Pilot* is a tedious and relatively slow arcade game — it wouldn't be worth paying a fiver for a tape, never mind £18 for a cartridge. *Super Cobra* is also pretty naff — *Defender* in a helicopter, basically — but these two apart, Konami looks like a company worth watching.

John Lettice

Price £18.98 **Publisher** Micro Peripherals 0256-473232

IF YOU WANT THE BEST THIS CHRISTMAS

THEN LET US SUPPLY YOU WITH A **SPECTRUM 48K**
FITTED WITH A **SAGA 1 EMPEROR KEYBOARD**

£177.50

FULL WARRANTY
FREE '6' PACK SOFTWARE INCL.
SUPERB PROFESSIONAL QUALITY AT YOUR FINGERTIPS

- DUST COVER £4.95
- CARRY CASE £26.95
- EXTENDED CABLE £9.50

PLEASE SEND ME

☐ Spectrum 48K with SAG 1 Emperor keyboard fitted.

☐ Dust cover ☐ Carry case

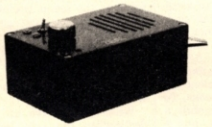
☐ Extender cable ☐ Sound booster.

I enclose cheque/P.O. for .....

ZEAL MARKETING LIMITED
Vanguard Trading Estate,
Storforth Lane,
Chesterfield S40 2TZ. Tel: 0246 208555

LET OUT THOSE SOUNDS WITH A ZEAL SOUND BOOSTER FOR SPECTRUM

£14.50



JUST PLUG IN ALL CONNECTIONS EXTERNAL. FULL VOLUME CONTROL LOAD/SAVE SWITCH

ALL PRICES INCLUDE VAT/CARRIAGE.

GAMEPLAY

COMMODORE 64

FRENZY

If you've always wanted to leap on a Lepton then this could be just the game you've been looking for, though don't be misled by the frantic title as it's a slightly more sedate game than *Frenzy* might suggest.

Leptons are deadly sub-atomic particles that have escaped from a high security research lab. There they are, bouncing around in the middle of your screen . . . or at least, one of them is.

The game is a kind of cross between *Snake* and *Breakout*, where the little line that is a Lepton hits the walls of the screen and bounces back at the appropriate angle.

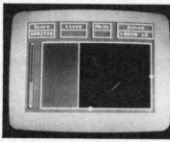
You control a robot craft that can glide around the sides of the screen and then, when you press the fire button, travels around inside the screen. It leaves a trace behind it, and if the Lepton hits this trace you lose one of your three lives.

If you reach another edge, or simply move round to meet up with your own trail, the enclosed area is painted in. By this means you can gradually edge in on the bouncing Lepton and hope to trap it in one part of the screen.

You kill a Lepton by closing it in like this, or simply by filling in 95% of the total screen area. Once you start filling the screen in, however, it gradually becomes more and more difficult to predict which way the Lepton is going to bounce, and the likelihood of a collision increases.

There is a joystick option as well as keyboard control. Your craft has two speeds at which it can move, slow or fast, and you switch between the two by pressing the fire button or space bar when stationary.

The game becomes more complicated as you progress up through the different levels



(you have to start on Level One each time) because higher levels introduce the problem of Chasers, which move around the edges and along the trails that you create . . . I imagine you can guess what happens if you meet up with one of the Chasers.

On later levels there are also more Leptons, up to a maximum of five Chasers and five Leptons, though as far as I was concerned this remained a theoretical maximum.

The game becomes quite absorbing after a while, but I think it would have been improved if the option to play at an even faster pace were included. The fast speed of your own robot is still quite slow.

There are also too many very lengthy waits between games. Even though the graphics on these interludes are beautifully smoothly done, they have you tapping your finger in impatience for the next game.

Not a bad game, but only fairly frenzied.

Mike Gerrard

Rating 8/10
Price £7.95
Publisher Micro Power 0532-434006

COMMODORE 64

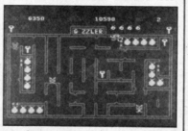
GUZZLER

Take care, the frobblies are out to get you. Yes, frobblies, and if you want to know what they are you'll have to play the game.

You are the *Guzzler* who has to move round a maze, collecting keys which will gain you entrance to cells which are full of food. Once you've eaten the food you need the assistance of Deflator Denis to help you slim down otherwise you won't get through the narrower areas of the maze.

You can only meet Denis on the border, but do take care as he's a little two-faced and if you should bump into him while you are slim he kills you.

Unfortunately, as with all these games, your life isn't meant to be easy. The frobblies have an obvious dislike for



guzzlers and will do all they can to prevent you filling up.

If you manage to eat your way through four food cells a 'letter on legs' called Bonus Barry will appear, and yes, you've guessed, he will give you bonus points if you can reach him before Denis does.

As an aid you are given five time bombs to blow up the frobblies, and yourself if you're not quick enough. The idea is to drop a bomb with the fire button and then run. Hopefully, the bomb will halt the pursuing frobbly and allow you to run past him. Extra bombs are gained every three screens.

You can earn extra lives throughout the game depending on the number of points you have gained. There is a facility to change the points needed before you gain a life and you can also change the time lapse on the time bombs, and the number of guzzlers you start with.

The maze alters after every screen, making the game less monotonous than it would be otherwise. The number of frobblies alters after every three screens and they also tend to get a little more energetic.

The graphics and music are only average for the Commodore, though you do get a short rendering of 'Nobody does it better' if you get on the score table.

Those of you who enjoy Pac-man may find it difficult to put away.

Susan Cooke

Rating: 7/10
Price £7 **Publisher** Interceptor Micros 07356-71145

AMSTRAD

ER*BERT

I was just beginning to think that good graphics in Amstrad games weren't possible, when along came *Er*Bert*. I don't know why no-one has yet produced more than rather chunky graphics, but it's obviously possible, and the figures in *Er*Bert* are in fact quite sprite-like.

As you can guess from the title, it's basically *Q*Bert*. You control Erbert on his pyramid of cubes, and hop him about the cube tops to change their colours and, of course, avoid the bouncing balls, Coily the snake and, in this version, Boris the ape. There are two rotating disks which you can use for transport from level to level, but take care not to leap off into the void.

Erbert is a large, purple, trumpet-nosed creature who can jump up or down and left or right. It takes a little while to get used to the controls and this isn't helped by the fact that you can't choose your favourite keys.

At the top left of the display there's a message which shows you the colour you're aiming for and extra points can be gained by nicking Boris's banana.

There are ten levels, each of which can be played at fast or slow speed, and you can select your starting level.

The colours are well-chosen,

the figures move very nicely indeed and there are no attribute problems. Let's hope the quality of the graphics will inspire other programmers to make more of the Amstrad's undoubtedly good facilities.

There isn't really very much to the game — mind you, there never was. But it's a pity Microbyte didn't add a few extras to take the game beyond its basic format. Even so, *Er*Bert* is a competent version of the game which, old-fashioned and crude by today's standards, still deserves a place in your games collection.

Bryan Skinner

Rating 6/10
Price £5.95
Publisher Microbyte 06373-6886

SPECTRUM

CURSE OF THE FLYING PYGMIES

Let's make one thing quite clear straight away. *PCN* does not discriminate in any way against pygmies. Good luck to 'em, we say. Fair shakes for pygmies is our watchword.

Flying pygmies are another

matter. And flying pygmies that masquerade as Portuguese Men O' War in crass low-budget software productions are beyond the pale.

There are four screens to cross to reach the Diamond of Death; each is seeded with lethal obstacles, and if you hit anything stationary, that costs you a life as well. The provision of lives is generous, which is more than you can say about the provision of points of interest in this game.

Enough said.

David Guest

Rating 4/10
Price £5.95 **Publisher** Electric Abacus 0372-376072

★ ★ ★ NEW ★ ★ ★ FROM ★ ★ ★

LET'S GET DOWN TO BUSINESS

ALL PROGRAMS ARE NOW SINCLAIR MICRODRIVE™ COMPATIBLE AND, PLUS 80 VERSIONS WORK WITH 15 DIFFERENT CENTRONICS/RS232 INTERFACES AND PRINTERS

COMPATIBLE WITH sinclair ZX Microdrives

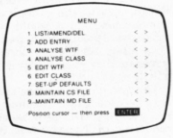
★ VAT MANAGER ★ £8.95

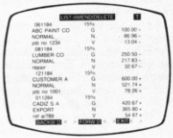
★ 'PLUS 80' VAT MANAGER ★ £19.95

★ 'PLUS 80' STOCK MANAGER ★ £19.95

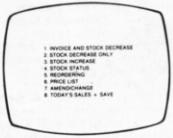
Write to us for a quotation for the software, the interface and printer — you will find our prices very competitive.

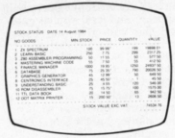
VAT MANAGER is available in standard form which works with ZX™ and Alphacom 32 column printers, and the Plus 80 version works in conjunction with most Centronics/RS32 printers which are menu selected from software. ***VAT MANAGER*** is a welcome aid to the businessman faced with the completion of VAT 100 returns. Provides calculation and checking facilities for any combination of Gross/Net values input. VAT can be analysed under defined classifications.





STOCK MANAGER — (Available in Plus 80 form only) — provides a controlled stock accounting environment for up to 600 different product lines. Full facilities exist for the production of Invoices, Price Lists, with the facility to show Stock Status and Value, Stock Adjustment and Re-order requirements.





Also available ***ADDRESS MANAGER*** and ***FINANCE MANAGER*** in standard 32 col. versions £9.95 and 80 column **PLUS 80** versions £19.95.

★ ★ ★ ★ UTILITIES £9.95 ★ ★ ★ ★

★ MACHINE CODE TEST TOOL ★
★ EDITOR ASSEMBLER ★
★ MASTER TOOL KIT ★

sinclair ZX MICRODRIVE COMPATIBLE

(Existing users wanting latest versions will receive a £3.00 rebate on return of old cassette)

From **WHSMITH** and other outlets or send cheque or telephone details to 0753 889055.
Replacement tapes only available from OCP direct.
OXFORD COMPUTER PUBLISHING LTD., 4 High Street Chalfont St. Peter, Bucks. SL9 9QB.

OCP SOFTWARE ★ ★ ★ ★ SIMPLY THE BEST

SOUND SHOW

Music Master claims to turn your 64 into a synthesiser. How easy is it to use, asks Russell Jones?

Sound production may be one of the Commodore 64's most powerful features, but realising the computer's potential as an electronic music synthesiser is notoriously difficult. The Sound Interface Device (SID), precisely because of its sophistication, is complicated to use. *Music Master* is the latest of several programs which help you make the most of the 64's sound.

Features

The program uses a screen-based keyboard, so users are likely to learn something about music as they work through it. Packages such as *Musicalc* tend to use more complex displays, so the music learning in these may be confined to more abstract aspects of sound.

Musical information is entered with just a few keystrokes, using a form of musical notation which can be easily learned and understood — even by the least musical. This basic information is extended with parameters which control the frequency, volume, waveform and enveloping of the notes.

Music Master allows you to enter reasonably long pieces of music — up to about 1500 notes — using all three voices. Naturally, you can save such sequences to tape or disk for future playing or editing. They can also be stored in a way that allows inclusion in your own Basic programs. The manual has a section on Basic interfacing, with an example program. Data is saved in a sequential file, but only a reading list is given for getting polyphonic sound.

Special effects include synchronisation, ring modulation, gate control, filtering, and detuning. Voice three can be used to modulate notes by disconnecting it from the sound path while still generating its waveform and envelope. Modulation is achieved by copying the contents of voice three's SID registers into the frequency, pulse width and cut-off registers for voices one and two. Such techniques give access to a wide range of tonal qualities and you can spend hours experimenting.

Presentation

The tape-based package comes with a couple of sample tunes, but the disk version has over ten complex pieces of music.

There's a fairly comprehensive, 31-page booklet, which details all *Music Master's* features and their use. The four appendices include a summary of commands and options, background rhythms, a glossary and suggestions for setting up sound effects. However, the booklet doesn't really do justice to the power of the program. For instance there's no index and some readers may think there's too much detail, too soon. There's nothing on music theory, and too little on converting sheet music to *Music Master* data.

In use

The heart of the program is the keyboard display. This is a standard piano layout and allows you, for instance, to select the octave for each note.

All you do to enter the notes is press the keys which correspond to the notes shown. A mark appears on the relevant piano key and the note is played and stored. The display is clearly laid out and easy to grasp, even in black and white.

The useful help facility directs you to the features available. One such is the ability to load already-defined musical sequences for playing and/or editing.

Each note can be produced through any of the 64's voices and there are ten preset sounds, such as flute, electric piano, clarinet and drum. These may be altered to create different sounds and the new preset values saved to disk. There are options which allow you to test out the effects of varying such aspects as its attack, frequency, or decay. Voices two and three can be used to play background music for auto-rhythm accompaniment.

There are 17 preset sounds for each of the two channels, including 8-beat hi-hat and snare, Rock/Latin bass drum triplet arpeggios and Samba snare. Tempos may be altered and the 18th accompaniment may be configured according to taste.

Verdict

An awful lot of thought and work has been put into *Music Master*. The impressive examples on disk give a good idea of its power and scope. But what a pity the documentation doesn't match the same high standard. It plunges beginners in at the deep end and its generous detail can just make it hard to find information.

REPORT CARD: 1 TO 5

Features	●●●●
Documentation	●●
Performance	●●●●
Overall value	●●●●

Name Music Master **System** Commodore 64 **Price** £19.95 **Publisher** Supersoft 01-861 1166 **Format** Disk/Tape **Other versions** None **Language** Machine code **Outlets** Retail.

PCN Billboard

Acorn

BBC B software for sale includes Frak, Football-Manager, Jet-Pack, Legion and The-Hulk. (All original.) All for £27.50. Send SAE to: Terry B., 52 Eastdown House, Amhurst Road, Hackney, London E8 2AT.

BBC original software large range at good prices. Games include Elite, Millionaire, Bug Blaster, Arcadians etc. Tel: 0966 32830 for list and prices.

Wanted joystick for BBC B. Also Multi Standard Modem required 1200/75 300/300 1200/1200. Tel: 0833 50307 anytime.

BBC disk drive, single sided 200K 80T, inc case, leads, £85. Tel: 01-699 3426 evenings or 01-486 5811 X6535 daytime.

Electron software for sale: Killer Gorilla, Croaker, 737 Flight Simulator, £3 each; Elite £6 and others. Tel: Isle of Wight 296417 weekdays before 5pm.

BBC B DFS, Acorn disk drive, View ROM chip. Software £60, books £30, only used once. Total value £890. Bargain price £550 ono. Tel: 01-952 3891.

BBC Model B software for sale or swap. Titles include Elite, Frak!, Pole Position, Robotron, Aviator, Blagger and Son of Blagger. Tel: Canterbury (0227) 58529.

Wanted BBC welcome cassette tape, also information on DFS and FNS ROMs. Tel: 0705 327940 or Prestol Mailbox No 705 327.

BBC Model B 32K O/S 1-2, unused, new in box, no manual. Tel: Terry 01-670 4006 and make me a sensible offer. (With tape recorder.)

Acorn Atom 12K, floating point, ROM books plus software. Tel: 01-648 5508, any offers?

Swap BBC software tape or disk. Elite, MrWiz, Wallaby, Pole Position, Frak plus many top titles. Tel: 041-334 2166 after 6pm, Steven.

Acorn 100K disk drive. Cables + utility disc + software, £100. East Sussex. Tel: 0435 882540 evenings. Ask for David.

HCCS Pascal-T ROM for the BBC micro with manual and instructions. Half price, £25. Also Acorn DFS ROM, £15. Tel: Martyn on 01-670 1984 evenings.

Electron Plus 1 interface and voltmace 3B joystick, still boxed, £55 ono. Tel: George 0436 6336.

BBC Model B, 1.2OS. Good condition, £280 ono. Cumana 100K disk drive + PSU + cables, etc, £90 ono. Tel: Jason on 091-273 9558.

BBC B Acorn DF5, TEAC 40/80T disk. Raven 2D, Solidisk 16K sideways RAM, Speech synthesiser, accoustic modem, Wordwise, graphics ROM + lots more, £750 ono. Tel: 01-505 0083.

BBC "B" for sale, 1.2O/S, also shado cassette deck and complete set "Home Computer Course" in binders, vgc, £320 ono. Tel: (0245) 357492 after 6pm

BBC B O/S 1.20 (Wordwise) ROM, 3 joysticks (professional) type, loads of software, data recorder, interface for printer etc, books, mags, exchange for best Commodore 64 outfit. Tel: Keith 0900 65614.

BBC Adventure Helpline. Have you problems to be solved or solved problems? Write to: 112 Stockley Road, Barmston, Washington, Tyne and Wear enclosing SAE.

BBC Acorn DFS 0.9 chip for sale, £15 ono. Please note this is not the full interface, just the DFS. Tel: 01-654 6522 (evenings).

Watford DFS ROM (original), £20. Prism modem 1000 plus BBC cables and software, £55 ono. Tel: 0227 751100 (Boughton, Kent).

Commodore

CBM 64 software originals for sale. Black Hawk, Caesar, Manic Miner, etc. Most half price. Wanted: The Quill, will swap Hobbit, Solo Flight, etc. Tel: 061-682 5024 after 7.

Commodore 64, Pixatik light pen + game cassette, £18. Introduction to Basic Part I, £10. Tel: Keynsham (Avon) 68616 eves.

Commodore 64 software Zork I, Suspended, Ultisynth 64, £7 each. Planetfall £20, no swaps. Tel: Doncaster (0302) 61672 after 6pm.

Commodore 64 software wanted to swap, many titles available. Write with program list to Mick at 146 Andover Road, Bestwood, Nottingham NG5 5GA.

VIC-20, boxed, hardly used, plus "Introduction to Basic" Part 1 book and database, £45 only. Tel: Peterborough 241943 evenings or weekends.

Commodore 64. I'm a Swedish boy who wants to swap games. I've got over 500 programs. Send a list to Nils Genell, Tenngjutarevagen 6, 24 500 Staffanstorp, Sweden.

Commodore 64 software includes word processor, database, bank manager, Space Shuttle, Fruit Machine, Tank Atak plus others, £27 the lot. Tel: Nottingham 383722.

VIC 20 C2N cassette, joystick, intro to Basic 1 & 2, dustcover, 16K switchable RAM, 2 books, mags, over 100 games boxed, £110 ono. Tel: Derek 950 0685.

Commodore Vic 20, C2N cassette, 6-slot expansion module, Turbo Basic Part 1 and dustcovers, £80 ono. Tel: Slough 71169 evenings and weekends.

Commodore 64, C2N cassette deck, over £100 of original software, lots of mags and a games programming book, all boxed, only £200. Tel: 01-207 1806.

CBM/Pet 3032, computer, integral screen, typewriter keyboard, easily upgraded to 4032 if required, C2N cassette unit, software, etc. Bargain at £195. Tel: 0244 675717 (Chester).

Commodore Joysticks. Le Stick £10, Suncom Starfighter £7, including postage, all as new. Suitable Commodore 64, Vic 20, Atari computers, VCS. Tel: 01-341 0464 evenings.

Commodore 64 software to swap. Write to: Hans Persson, Hyacintvagen 9, S 590 92 Linghem, Sweden. All letters answered.

Commodore 64 educational software wanted urgently for my children, ages 3-9. Tel: Peterborough (0733) 61685.

CBM 64 plus Simons Basic, joystick, over £320 software, £50 books, C2N cassette, mags, etc., 2 months' guarantee left, £290 ovno. Tel: 01-863 5113, ask for Deepak.

CBM 64 Zaxxon, Arabian Nights, Pole Position, BC's Quest for tires, and many more to swap or sell. Tel: (Manchester) 061-445 1126.

VIC 20, as new, cassette deck, joystick, four cartridges, numerous cassettes, manual, all boxed, plus magazines, £70. Tel: Ascot 26786 after 6pm.

Vic 20 original software for sale: Matrix, Ski-run, Space Phreeks, Night Crawler, Jungle, Scramble, £3.50 each. All less than half price. Tel: 0227 458529.

Software for CBM 64 to swap. Games are Arabian Nights, Spriteman and Arcadia. Also CBM 64 games book, £3. Tel: 01-808 4684 after 4pm, ask for Errol.

Eureka for CBM 64 to sell or swap. Sell for £10 or swap for Hammer Games. Tel: 01-808 4684 after 4pm. Ask for Errol.

Commodore 3032 computer with 3040 dual disk unit and 3022 printer. All vgc, assembler software, bargain, £600. Tel: Brighton (0273) 771577 after 7pm.

CBM 64 games for sale or swap. Please send your lists of games to Neil Reynolds, 55 Leam Crescent, Solihull, West Midlands B92 8PB.

Commodore 64 games to swap, over 350 titles. Tel: 01-904 0667 or write to Sanjeev Shah, 17 Windsor Crescent, Wembley Park, Middlesex HA9 8AV.

Vic 20—£55. Recorder—£25. £120 Software—£85. 16K—£25. Programmers aid—£25. Introduction to Basic—£10. Quickshot I—£7. Books—£7. Whole lot £199. Tel: 021-454 0234.

CBM 64 software to swap, well over 100 titles, send your full list to Geoff Lord, 50 Mossley Road, Burnley, Lancs BB11 2RF.

Vic 20, C2N, switchable RAM, joystick, software, books, magazines, £150 ono. Apply to Paul Fraser, 186 Norwood Road, Norwood Green, Middlesex UB2 4JT.

CBM 64 Busicalc II disk and manual, £40. Tel: 0932 241242.

Vic 20, cassette unit, 32K RAM (switchable) intromodore and Quickshot II joystick, books, games worth £150, all worth more than £450. Tel: 01-452 2716 for details and price, ask for Barrett.

Commodore 64, as new with C2N cassette recorder and six games and joystick, £175. Tel: 01-672 3795.

CBM 64 software sale, Hover Bower, Chinese Juggler, Purple Turtles, Falcon Patrol, Blackhawk, Quintic Warrior, Crossy the Cat, £3.95. Not copies. Tel: Greg on 01-736 9914 or 01-731 3017.

CBM 64 software, swap/sell, American + British. Send your list for mine to Jeffrey Batty, 29 St. Martins Close, Clacton-on-Sea, Essex. Tel: Clacton 431067 evenings.

CBM 64 software for sale, 14 original tapes, 3 cartridges and 4 books. Cost £170, sell for £110 ono. Tel: 0790 53161 after 6pm.

CBM 64 software to swap, choose from over 120. Send list to Neil Reynolds, 55 Leam Crescent, Solihull, West Midlands B92 8PB.

Disk software: One on One Sports, £15. Zork I, £5. Aztec Challenge, £5. Wheeling Wallie, £5. Quick sale. Tel: 01-533 2001, after 4pm, ask for Jason.

Scope 64 for sale, 'The Games Designer', perfect for the games programmer, excellent condition, sell for £8. Tel: Cannock (Staffs) 78633 after 4pm.

CBM 64, C2N cassette, two good joysticks, user manual and £60 worth of software, virtually unused, £180. Tel: Nick on 01-323 3211 ext. 305.

Dragon

Dragon 32, plus B/W monitor, joysticks, books, mags and software. All vgc for sale, £140 ono. Tel: 01-802 3971 after 7pm.

Dragon plus Dream Assembler, Dreambug Basicode and Dreambug Buginver for only £65. Tel: 01-986 2658 after 5pm or weekend.

Dragon 32, single disk drive, Epson RX80F printer, black and white TV and software and books, £500 ono. Tel: 01-805 3326.

Swapping Dragon software. Many popular games available including Chuckle Egg, Touchstone, Donkey King, etc. Over sixty titles. Tel: Matthew or Simon at Studley 2576.

Dragon 32, cassette unit, magazines, games, boxed as new. Worth over £287, swap for CBM 64 and C2N. Tel: Chris on 01-387 2553 eves.

Dragon original software for sale. Kriegspiel, Ugh!, £3 each. Juniors Revenge, £5. 8 Ball Pool, Chuckie Egg, £3.50 each. Tel: Richard on Ramsbottom (070682) 2025.

Dragon 32 excellent condition, one owner. Over £150 of software, Dustcover, joysticks, magazines, six books, all leads. Complete with cassette recorder, £170 ono. Tel: 01-648 8545.

Dragon 32, excellent condition, two joysticks, 40 games, 20 Dragon magazines + books, £130 ono. Phillip Bradbery, 17 Phelps Close, West Kingsdown, Nr. Sevenoaks, Kent. Tel: West Kingsdown (047485) 3192.

Sharp

Sharp MZ700, built in cassette, 18 assorted tapes, 10 months old, £160 ono. K. Watts, 9 Cross Road, Oxhey, Herts. 0923 22578.

Sharp MZ80A software for sale: Kuma, Forth, Zen, Freezer, Defender, Asteroids, new £112, asking £40 ono. Write to P. Dalby, 18 Bradwell Fold, Gamesley, Glossop, Derbyshire.

Sharp MZ80A including screen and cassette deck plus manuals, Basic, assembler, games etc, vgc, only £300. Tel: Plymouth (0752) 25362.

Sharp MZ80K, 48K RAM, converted 80-column, Xtal CP/M version 2.23, Xtal Basic version 3.1c. Includes double precision Basic, single disk drive, software, books etc, £450. Tel: 0793 824345 after 5.30pm.

Sharp MZ80A, hardly used, various programs, books, user notes, £220 ono or swap for BBC B printer, disk drive. Tel: Neil on 051-424 4938 evenings.

Sharp MZ700, extended Basic, Zen assembler/disassembler, Chess, database, games, only 4 months use, £130 ono. Tel: 01-749 1165.

Sharp MZ80A, built-in printer plotter, 4-colour, plus Pascal, Zen editor/assembler plus software, £150 ono. Tel: 0742 471160.

Billboard Buy & Sell Form

Free forever — from now on you can advertise your second-hand equipment and (almost) anything else you want for free in *PCN*. To place your Billboard ad, fill in the form on the left with a maximum of 24 words. Send the completed form to:

Billboard, Personal Computer News, 62 Oxford Street, London W1A 2HG.

Note that we cannot guarantee that your ad appears in any specific issue, and that we cannot accept ads from commercial organisations of any sort.

Your name: .....

Address: .....

.....

Telephone: .....

Is the Information Revolution Passing You By?

If you use an Apple, IBM, BBC or ACT micro then you could be missing out on the information revolution of the decade. Today there are literally hundreds of databases worldwide, which can be accessed by a microcomputer fitted with a Nightingale modem and using appropriate software. These data bases include Prestel, Micronet, Homelink, Telecom Gold, various 'Bulletin Boards' and massive American Databases such as 'DIALOG' and 'The Source'. Micros can also be used to send telex messages.

A world of information is available to you now when you install the Nightingale modem from Pace. There are hundreds of thousands of 'pages' of data available on Prestel, free computer software on Micronet, homebanking facilities available with Homelink, Company facts, Educational information, magazine and news articles available with Knowledge Index and the ability to communicate with other micro users direct, or via 'bulletin boards'.

The Nightingale modem is only £136.85 inc. VAT. If you do not already have suitable communications software Pace can supply this complete with a manual and full installation instructions.

NIGHTINGALE-The Modem

By far the most versatile modem available, at the price, for either home or business use, Nightingale will enable your micro computer to send and receive data utilising an ordinary P.O. Telephone Line. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) alongside 300/300 baud full duplex for communication between computers.

The state-of-the-art modem chip technology employed in Nightingale requires minimum support circuitry resulting in low power consumption, low cost, high quality and extreme reliability. It also features a simple self test facility for easy installation.

Nightingale complies with the vigorous specifications laid down by British Telecom and is fully BABT approved.

"INFORMATION SHEETS AVAILABLE ON REQUEST"

SPECIAL INTRODUCTORY OFFER

For a limited period, when you order the Nightingale modem you will receive discount vouchers entitling you to the following:-

KNOWLEDGE INDEX

20% discount off standard enrolment fee (normally £25)

This remarkable collection of databases includes over 22,000,000 items covering Agriculture, Books, Business, Electronics and Computing, Corporate and Company News, Education, Engineering, Government Publications, Legal Information, Magazine Articles, Mathematics, Medicine and News/Current Affairs (The enrolment fee also includes 2 hours of free access time).

ONE TO ONE

50% discount off standard enrolment fee (normally £50)

One to one is an electronic message service designed to give you the communications capabilities of a telex at much lower cost. By using your micro fitted with a Nightingale modem you can produce telexes, letters, reports and contracts, and send them in seconds to any destination. Courier delivery, priority mail and radio paging are also included in this highly efficient communications service.

To Pace Ltd., 92 New Cross Street, Bradford BD5 8BS

Please supply:

- ☐ modems at £136.85 inc. VAT & carriage
- ☐ modems & software pack for BBC micro at £159, inc. VAT & carriage
- ☐ modems & software pack for Apple II/IIe at £279 inc. VAT & carriage
- ☐ modems & software pack for IBM PC* at £269 inc. VAT & carriage
- ☐ modems & software pack for ACT at £269 inc. VAT & carriage

Name .....

Address .....

Cheque enclosed £..... or please debit my Access ☐

Barclaycard ☐ ——————— (Please tick)

If you require further information on the above communications products for other computer systems, please write enclosing a stamped addressed envelope.

*Assumes IBM micro fitted with RS 232 interface.

Please allow up to 28 days delivery.

PACE

"Bringing tomorrow a little closer"

PACE SOFTWARE LTD.
92 NEW CROSS STREET,
BRADFORD. BD5 8BS
Tel. (0274) 729306
Telex 51564

MICROSHOP

Rates: £12 per single column cm. Minimum size 3cm. Series discount available. Also spot colour available. **Mechanical Data:** Column width, 1 column 57mm. 2 column 118mm. 3 columns 179mm. **Copy Dates:** 10 days prior to publication.
Contact: Andy Flint or Anita Stokes.

CHRISTMAS PERIOD OFFER

ZX Spectrum, MAestro-ASM and Ultimon. The best editor/assembler and monitor package around. **£6.95 each, £12.50 the two. Amstrad CPC464 MAestro-ASM.** Full feature editor/assembler. **Only £6.95.**

Microholics Anonymous

Lord Nelson House
21 High Street, Yarm
Cleveland TS15 9BW
0642-787389
0642-785825

S.A.E. for details

ATARI AMAZING OFFERS

SAVE £30 Atari 800 XL Computer plus Atari 1050 disk drive only **£299.95**

SAVE £30 Atari 1050 disk drive plus 10 blank disks (worth £20) for only **£189.95**

All prices include VAT

For FREE fast delivery — please send cheques/PO to:

S.J.B. DISK SUPPLIES (Dept. 03)
11 Oundle Drive, Nottingham NG8 1BN

SAVE £££'s!!

Amazing prices on Spectrum, Q.L., Commodore, BBC, Monitors, Printers, etc.
E.g. Q.L. £379.00
(Inc. p+p, VAT)

Dove Communications
Tel: 0621 891715

PROVE TO YOUR FRIENDS THAT YOUR COMPUTER IS REALLY USEFUL

Plan their garden with our data bank on plants. Send £9.95 for data bank on **Sinclair QL** microfine cartridge from:

Llangeitho Nurseries, Llangeitho, Tregaron
Dyfed SY25 6DG or for details phone 097-423 223
Plus £2.00 for VAT & P&P

CP/M FOR MICROS???

Now your personal computer can run CP/M. That's right! Any micro with an RS232 port and a Terminal Emulation Package can now run CP/M. The OMEGA opens up a new world to you and enables you to run any of hundreds of Business and Recreational software packages, from both commercial and user group sources. Your micro is no longer restricted to one or two languages, the Omega is sold with basic and one other language of your choice. (Cobol, Fortran Pascal, Forth). WHAT IS THE "OMEGA"? The "Omega" is a single board module which will allow a micro with an RS232 port to plug in and run CP/M. OMEGA has a 4MHz Z80A CPU, 64K of RAM, 2 software-controllable RS232 ports, a Centronics Port, 4K Monitor Eprom. The OMEGA can support four disc drives, single or double sided, single or double density, 48 or 96 TPI. OMEGA runs under CP/M 2.2. It has a set of utilities for formatting and copying data. A disk translation facility lets OMEGA read, write and execute programs and data from Kaypro, Morrow Decision, IBM PC and others.

Hard Disk Expansion for any Z80 base micro £99.

OMEGA (BARE BOARD W/SOFTWARE SUPPORT) £300.00
ALL PRICES QUOTED EX-VAT AND IN STERLING
SECURICOR DELIVERY IF REQUESTED (C.O.D. ONLY)
CARRIAGE (U.K. MAINLAND) £15.00 + VAT

Send cash, to:

QUANT SYSTEMS
111 Thorpe Road,
London E7 9DE
(Please allow 28 days for delivery — guaranteed)

---

c-ram
COMPUTER REPAIRS

COMPUTER REPAIRS AND MAINTENANCE
82 MEADOWCROFT
BILTON
HARROGATE
NORTH YORKSHIRE
HG1 3LH
TEL: (0423) 65270

SPECTRUM ALL INCL. £18.50
UPGRADES (SPECTRUM)..... £32.00

OTHER MAKES ALSO REPAIRED
SEND SAE FOR LATEST PRICE LISTS

A&P CALPIN Please enclose Cheque or P/O
GOOD SERVICE COSTS LESS THAN BAD SERVICE

(S) TOP SECRET (S) II
Commodore 64-Spectrum 48K-Vic 20

CONTROL YOUR **MICRO.** UNIQUE, relocatable, m.code routine gives **extra BREAK/STOP key. STOP** most **BASIC/M.CODE/ HEADERLESS** Programs. LEARN SECRETS-LIST/CONVERT/ MODIFY/ REVEAL hidden lines. Ideal MICRODRIVE/DISK DRIVE companion. **PLUS** Mach.Code **DISASSEMBLER,** lists M.Code/ ROM etc. **PLUS HEADER READER** — full info about programs. **PLUS HEX/DEC DEC/HEX converters. PLUS SECRET INFORMATION** how professionals keep secrets/hidden-program SECURITY trick — how to reverse them: CASS — £9.95 DISK-£9.95 MICRODRIVE — £11.95 ASH BYPRODUCTS, P.O. Box 510 BIRMINGHAM B179ES

PLAY THE GUITAR THE VDU WAY

The easiest way to learn the guitar!!
FOR THE ACORN ELECTRON/BBC
£5.00 including post and packing to:

LAKESIDE SOFTWARE
42 TEIGNMOUTH COURT,
SCUNTHORPE, SOUTH HUMBERSIDE

EPSON TX/80B

Dot matrix printer
Traction feed. 80-col. 125 cps. Prints graphics and double width characters.

Our price £179.

M. K. MUSIC & COMPUTERS
17, BRIDGE STREET, LEIGHTON BUZZARD, BEDS
Tel (0525) 376622 closed Thursdays

3½" or 5¼" WINCHESTERS

FOR
GEMINI/NASCOM, SUPERBRAIN, IBM, APRICOT, SIRIUS AND EPSOM COMPUTERS

★ ★ **INTRODUCTORY SPECIAL OFFER** ★ ★
5¼" 10 MB VERSION **£999** + VAT

★ OTHER CAPACITIES/SIZES AVAILABLE

★ FACILITIES FOR MOST COMPUTERS ON REQUEST

TEL (0245) 57575

For further details. Securicor delivery, back up support and HP terms available.

CIRTRIK

29 Beeches Road, Chelmsford, Essex
CM1 2RX
VAT No. 407 0905 74

C.B.M. 4:000 — 8.000 SERIES EUSTOM EPROM

Let us put your own special software routine, company name, security code, I/O handler or look-up table in the unused area in block F starting at FD5E (max 564 bytes). ROM Ref 901465-22. Disable STOP KEY but retain real time clock if required. Code to be in HEX or decimal list form with start location if not FD5E. Hash total would assist code checking. Software confidentiality assured. State if STOP KEY disable required.

Send code details with SAE and payment of £14.95 inc VAT. Extra copies (at time of order only) with or without STOP KEY disable or STOP KEY disable only version. £10.00 each inc VAT. Any bugs in the routine are the customers problems, but we will test if details are supplied.

ATT. CUSROM DEPT: Newtronics
6 Tancred Road
Luton, Beds. LU2 7XA
0582 29874
VAT NO 354-0718-64
DEALER ENQUIRIES WELCOME

BLANK DISKS SPECIAL OFFERS

5¼" BLANK DISKS (40 track)
Prices for box of 10
All prices include VAT, P&P is FREE

VERBATIM	single sided/double density	£18.95
SCOTCH 3M	single sided/double density	£16.95
DYSAN	single sided/double density	£21.95

SJB SUPER SAVERS

50 single sided/double density 5¼" blank disks perspex storage box only **£69.95**

* * * * *

50 double sided/double density 5¼" blank disks in a perspex storage box only **£79.95**

FOR FREE FAST DELIVERY — Please send cheques/PO to:
SJB DISK SUPPLIES (DEPT 03)
11 Oundle Drive, Nottingham NG8 1BN
Tel: (0602) 782310

WDSoftware

Utilities for the QL (£10 on Microdrive)

This package offers single-key loading, running or deletion of files, multiple formatting of cartridges, and auto backup of files from one or more cartridges to another with optional over-writing of namesakes. In addition, a directory of 60+ files can be viewed without screen overflow. NB a VERIFY program is unnecessary — QDOS does this automatically. Now includes directory print-out and "qprint" to print any or all files on a cartridge with optional dated titles. Owners of the earlier package can update by sending OUR cartridge and 25p.

Current Spectrum Software
Tradewind (£5 Cassette)

Buy a ship, provisions and cargoes to trade between the harbours of the Coral Islands. Make a fortune if the weather and pirates let you live long enough to master seamanship and economics. A strategy/adventure game with graphics for 48K.

Jersey Quest (£5 Cassette)

Following an accident, you are stranded in the labyrinth of time and must find your own way back to the present with the aid of persons and objects from Jersey Folklore. Meet the Black Horse of St Ouen, the Dragon and Knight of La Hougue Bie, the Black Cat of Carrefour a Cendre, the Witches of Rocqueburg and many others. A text-only adventure for 48K in machine code (Quill).

Morse Tutor (£4 Cassette)

This one has it all! 4-15 words/minute, variable spacing, variable number of groups of random letters numbers or mixed, random groups, own message, single characters (including punctuation), variable pitch, FEEDBACK via screen, printer or SPEECH (phonetic alphabet via Currah uSpeech on 48K version only), and repeat facility. Takes you to and beyond RYA and Amateur Radio receiving standards. 16K and 48K versions on one cassette, 48K only on Microdrive cartridge.

Spectrum Programs on Microdrive

All the above are available on Microdrive cartridges at a price of £4.50 for one cartridge + the price of each program as shown above. E.G. a cartridge with Tradewind and Morse Tutor would be £13.50. As a bonus, Gavin Monk's Indexed Loader is included free with each cartridge.

available from
WDSoftware,
Hilltop, St Mary, Jersey, C.I.
Tel (0534) 81392

MICRO COMPUTER EXHIBITION
SATURDAY JAN 12th
GREAT HALL, CIVIC CENTRE, BROMLEY
Rochester Ave, off Widmore Road
All the popular home and business micros and much more too. Details: 01209 5299

NEW BRAIN USERS JOIN OPEN # STREAM £10 FOR 5 MAGS TO:
26 COLLEGE RD, BROMLEY BR1 3PE
B.R. trains to Bromley North or South. Lots of parking

LIFEBOAT
Menu-driven database of lifeboat stations and their boats. Selection by station, county, boat type, boat details. Also simulation of service call out. All royalties to the RNLI.
BBC, ELECTRON; TAPE: £4.00
DISK, BBC AND TANDY 3/4: £6.00
JRM COMPUTING SERVICES
104 Bassett Street, Leicester LE2 3FA

BLANK CASSETTES AND DISKS
C10s 10 for £3.85, 100 for £25.00
C15s 10 for £3.85, 100 for £27.00
C20s 10 for £4.00, 100 for £27.00
C30s 10 for £4.15, 100 for £29.00

5¼" DISKS, DOUBLE SIDED/DOUBLE DENSITY 10 for £18.00

- All goods fully guaranteed and inc. p&p.
- C.O.D. orders add 60p.
- Immediate dispatch.

UK HOME COMPUTERS
82 Churchwood Ave., Swindon, Wilts.
24hr order phone 0793 695824

Memotech 500/512
The new adventure game *Tumble down Tower*
The arcade game *CHARNKAPZ* now available £4.00 per cassette or £7.00 for the two prices inc. post.
please send S.A.E. for further details:
SOLWAY SOFTWARE
13 HENSINGHAM ROAD
WHITEHAVEN, CUMBRIA CA28 8PS
Access card holders please call our 24hr service on
TEL: 0946 3846

BBS SOFTWARE for 32k BBC
Exam Preparation & Applications
COMPUTERSTUDIES—6 part Series
Multiple choice questions.
Discs £2 per title Tapes £5.95 each part
USING BAL and the BMC (Disc) Assembly prog.
COMPUTER PIONEERS (Disc) names, datesetc.
STOCK CONTROL (Disc) Random access files
B-SPREAD (Disc) Spreadsheet program
B-WORD (Disc) Word Processing 40 & 80 col
BBC 40 track Discs £11.50 each ballyinc

BOWKER BUSINESS SERVICES
4 Chapmans, LETCHWORTH, Herts., SG6 3UB
Tel. 0462 674457

WANTED
PERSONAL COMPUTERS
all models bought for cash
Morgan Camera Company
160 Tottenham Court Road,
London W1. Tel: 01-388 2562

MONITOR QUALITY PICTURE
Plug the modem 3 between television and any computer for a sharper steadier picture
Send £29.95 + £1.75 P&P to
Solar Computer Products
PO Box 4, Monmouth, Gwent NP5 4QG
Tel: 0600 860661
Allow 28 days for delivery

R B S
MAGICSTAR— A crazy criss-cross fruit machine where the nudge and hold functions let you make the decisions. An interesting quality game for the Commodore 64. Price £3.99 on tape. Send cheque or P.O. to:
RBS, 3 Woodside, Gretna CA6 5ES

BANISH LOADing PROBLEMS

We are now the exclusive sellers of the **ELINCA Tapeloader.** Can only be obtained from us.
It is now available for the following computers:—
Spectrum, ZX81, Oric-1, Atmos, BBC, Electron, Dragon and Atom and still only £14.99 inclusive
Please state computer *Post Free*
We also sell the ELINCA Loudmouth. A Spectrum sound amplifier for only **£12.99 inclusive** Post Free

CELINA Software
Business Help Series for the SPECTRUM
FILECAB The only program you will ever need for that filing job. **£15.00 incl.**
STOCK Keeps tabs on all your stock, with a running total of cash value of all stock. Add and remove stock at will. **£15.00 incl.**
PRODCOST Ever wondered how to calculate the selling price of an item, this program does just that, taking into account your overheads and how much profit you want to make. **£15.00 incl.**
For details send S.A.E. to:—
Celina Ltd
Diasy Walk, Sheffield S3 7PY, England
Tel: 756728 (SDT 0742)

AMSTRAD CPC464
ARNOLD BLACKWOOD — ADVENTURER EXTRAORDINAIRE
THE TRIAL OF ARNOLD BLACKWOOD
A very worthwhile addition to the Adventurers' library… CPC464 USER: Oct '84
ARNOLD GOES TO SOMEWHERE ELSE!
THE WISE AND FOOL OF ARNOLD BLACKWOOD
Entombed in Rochdale!!!
A healthy sense of the ridiculous and plenty of fun ..... PCN Oct '84
Each Adventure £6.50 inc. By Return Post. CQs/POs to
NEMESIS
10 CARLOW ROAD, RINGSTEAD, KETTERING, NORTHANTS NN14 4DW.
Tel: 0933 623967

SINCLAIR COMPUTER REPAIRS
Fast, reliable repairs by experienced engineers, having serviced Sinclair computers since the introduction of the ZX80. Our price is inclusive of all parts, labour, postage and VAT irrespective of fault. *No hidden charges. *While-you-wait service available. Spectrum £18.75. ZX81 £11.50. 16K Ram £9.95. Call or send with cheque or P.O. to: T V Services of Cambridge Ltd, French's Road, Cambridge CB4 3NP. Tel (0223) 311371.

Now available
SPECTRUM 'XK' MEMORY EXPANSION SYSTEM
XK System Kit £15.95 inc. VAT
XK System Factory fitted £20.95 inc. VAT

SPECIAL CHRISTMAS BARGAIN
(UNTIL JAN 31st)
SOLUTION 2:
SERIAL — 4-WAY SERIAL £50.95 £42.95
(inc. VAT. P&P)
For owners of computers with RS232 outputs who wish to talk to four different devices without swopping leads. Needs NO POWER. Supplied with any mix of sockets and leads. Especially suitable for EPSON HX20, NEWBRAIN, SINCLAIR SPECTRUM INTERFACE 1, QL, ETC . . .
For other solutions, watch this space, or contact us at . . .
TYEPRO LIMITED
30 Campkin Road
CAMBRIDGE CB4 2NG
Tel: Day 0255 422087 Evening 0223 322394

LIQUIDATION STOCK IN FULL WORKING ORDER
TWO COMPLETE APPLE PACKAGES
APPLE II EUROPLUS
APPLE II TWIN DISK DRIVE
QUME SPRINT 5 DAISY WHEEL
ITT SP20 VDU
at £950

APPLE II EUROPLUS
APPLE TWIN DISK DRIVE
DIGITAL DEC WRITER IV
ITT SP20 VDU
at £650

Phone now
on 01-254 4281 (Daytime)
for full details

BASIC COMPILER
Now supports around 90 key words. Turns Basic Programs into really fast Machine Codes. Its very easy to use and comes complete with full instructions. Suitable for the Model B or Model A
with 32 K
Enquire at your local computer store or order direct (post free) from:
Cassette Cheque/P.O. or SAE for details to **£17.95**
Disk **ACK Data** **£19.95**
(40/80 TRACK)
DEPT PCN
21 Salcombe Drive, Redhill, Nottingham, NG5 8JF
Tel: (0602) 262498
DEALER ENQUIRIES WELCOME

COMPUTER SOFTWARE:
BUSINESS AND GAMES FOR MOST COMPUTERS.
Commodore 64, Vic 20, BBC, Atari, Dragon, Spectrum, ZX81, Amstrad.
Special offer on Commodore 64
New Releases for CBM 64, Spectrum, BBC, Atari, Dragon, Spectrum, ZX81.
New releases for CBM 64, Spectrum, BBC. Every 2 weeks — just send S.A.E. and we send you a new list every 2 weeks.
Altai C10 data cassettes 40p each. 5 C15 data cassettes £2.40 5¼" floppy discs D/sided — DL density. £2.30 each or 5 for £10.
TRADE SUPPLIED
Send to: M J Seawood, St. Olaf's Road, Stratton Nr. Bude, Cornwall EX23 9AF. Tel: (0288) 4179

SPECTRUM REPAIRS
We expertly repair Spectrums for £15 inclusive of parts, labour and return postage. Spectrums upgraded to 48K for £28 including post.
R. A. ELECTRONICS,
50 Kimberley Road, Lowestoft, Suffolk.
TEL: (0502) 66289

EVERY MAN HOUSE
77 OXFORD STREET, LONDON W1
3000 sq ft-28,000 sq ft
£5 per sq ft
Tel: 04868 29009-29991-23386
R.E.C.
116 HIGH STREET, GODALMING, SURREY

LYNX
Over 50 arcade games, adventures and utility programs, including software projects.
JET SET WILLY
List available from:
Phoenixx Software
Unit 70, Marsh Lane Site, Marsh Lane, Frodsham, Cheshire WA6 7BX.
Phone: 0928 35525

MERRY CHRISTMAS
TO ALL OUR READERS

QUIT

Over at budget games specialist Mastertronic, rehearsals for the company Christmas pantomime are underway. Our picture highlights a surprise guest appearance by Nick Alexander, Guild of Software Houses supremo, as an Ugly Sister. True to its thrifty image, Mastertronic is using only one Ugly Sister to keep production costs down.

Probably because you realise that postmen are overworked at this time of year, you thoughtfully didn't send micro Christmas Carols in by the hundred after our suggestion two weeks ago.

In fact, only Kevin Millyard responded, so we send particularly warm Season's Greetings to him and tepid ones to the rest of you, with a vote of thanks from the Post Office workers.

Here, to the tune of The First Noel, is a sample of his work.'It should be sung up and down the country, preferably in the privacy of a bathroom.

Your new QL Sir Clive did say,
Will be with you by the twenty-eighth day.
But that day came and that day went
And still no micro Sinclair sent,
QL, QL, QL, QL,
Where, oh where is my QL?
On that high note we'll sign off for the year. Happy Christmas. See you in 1985.

Here's something to turn your mind to when the National Anthem has finished at the end of the Queen's Speech. Princess Anne, agog at Microvitec's latest product, is clearly on the point of saying something memorable. What will it be? We invite you to send in suggestions to *PCN* at 62 Oxford Street, London W1A 2HG, and there will be £20 in it for the funniest. The winner will be announced in issue 95.

SYNTAX ERRORS

OEL, maker of the Prism VTX 5000 modem, has suggested a better way round problems when using it with a Spectrum and Interface 1 (issue 90). The company says you should connect all the equipment then power on from the mains socket, not by plugging the power lead jack into the Spectrum socket.

NEXT YEAR

Next year? What is this next year? In response to the staff's cries of 'Give us a break, guv,' the publishers of *PCN* have decreed that there will be no issue to distract you from the Boxing Day football programme on December 26. We'll be back on January 2, 1985 with...

Father time
Age shall not wither it . . . the Sinclair defies time's winged chariot by still going strong. We take a retrospective look at this great survivor.

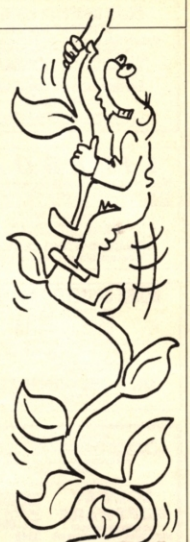
High office
Database Software offers a Lotus equivalent on the BBC for just £5.95 — could it possibly not give you your money's worth?

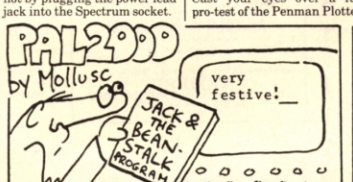
BBC among apples
Kick-off the new year with this fresh-fruit cocktail of a game for the BBC micro.

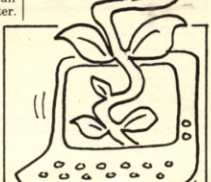
Amstrad at the double
Give your Amstrad a character-building exercise with a utility to double their height.

Spectrum break
Guard your Spectrum programs against those inconvenient interruptions with this anti-break device.

Penpal
Cast your eyes over a full pro-test of the Penman Plotter.







PCN DATELINES

Event	Dates	Venue	Organisers
CADCAM Intl Show	Jan 8-10	NEC, Birmingham	EMAP Intl Exhibitions, 01-837 3699
Mini/Micro Computer Exhbn Conf	Jan 13-16	Stockholm, Sweden	Sollentuna Massan, Box 174, S — 191 23 Sollentuna, Stockholm
Which Computer?	Jan 15-18	NEC, Birmingham	Clapp & Poliak 01-891 5051
High Technology & Computers Education	Jan 23-26	Barbican, London	Computer Marketplace Exhibitions, 01-930 1612
Computer Exhbn — Computer Thai	January 23-26	Bangkok, Thailand	Conf & Exhbn Management Services, Ltd, 61/5 Langsuan Soi 2, Ploenduit Road, Bangkok 10500
Intl Microcomputer Fair	Jan 29-Feb 3	Frankfurt, Germany	Collins & Endres, 01-734 0543
Apricot & Sirius Computer Show	Feb 5-7	Kensington Town Hall, London	Paradox Group, 01-241 2354
Intl trade show for home comps, software, etc — LET	Feb 17-19	Olympia, London	Turret-Wheatland, 0923-777000
Intl Computer Graphics User Show and Conference	Feb 19-21	Barbican, London	Mountbuild, 01-486 1951
MEXCOM	Feb 25-28	Mexico City, Mexico	AESI Ltd, 01-379 7628

EDITORIAL: Editor Peter Worlock **Deputy editor** David Guest **Production editor** Lauraine Turner **Deputy production editor** Harriet Arnold **Editor's assistant** Karen Isaac **News writers** Ralph Bancroft, Sandra Grandison **Features editor** John Lettice **Software editor** Bryan Skinner **Peripherals editor** Kenn Garroch **Hardware editor** Stuart Cooke **Programs editor** Nickie Robinson **Art director** Jim Dansie **Art editor** Dave Alexander **Assistant art editor** Tim Brown **Layout artist** Bruce Preston
PUBLISHER Cyndy Miles **Publishing assistant** Tobe Bendeth
ADVERTISING: Group advertising manager Peter Goldstein **Advertisement manager** Bettina Williams **Assistant advertisement managers** Laura Cade, Claire Rowbottom **Sales executives** Claire Barnes, Phil Benson, Mike Blackman, Steve Corrick, Tony Keefe, Andrew Flint, Christian McCarthy, Isabel Middleton, Sarah Musgrave, Tony O'Reilly Anita Stokes **Production** Richard Gaffrey **Advertisement assistant** Jan Moore **Subscription enquiries** Gill Stevens **Subscription address** 53 Frith Street London W1A 2HG 01-439 4242 **Editorial address** 62 Oxford Street London W1A 2HG, 01-636 6890 **Advertising address** 62 Oxford Street London W1A 2HG 01-323 3211 **Published by** VNU Business Publications, Evelyn House, 62 Oxford Street London W1A 2HG © VNU 1983. No material may be reproduced in whole or in part without written consent from the copyright holders. Photoset by Quickset, 184-186 Old Street, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, 01-733 4444. Registered at the PO as a newspaper

THE THRILLING 2nd GENERATION RACING CAR SIMULATION FROM LIMBIC SYSTEMS UK LTD.

TURBO 64

COMMODORE 64

DAZZLING 3D COLOUR GRAPHICS
THRILLING SOUND EFFECTS
100% MACHINE CODE
FAST LOAD

AVAILABLE FROM GOOD RETAILERS

&

LIMBIC SYSTEMS UK LTD.
HENSINGTON ROAD, WOODSTOCK, OXFORD OX7 1JR
TEL.(0993) 812700

£7·95

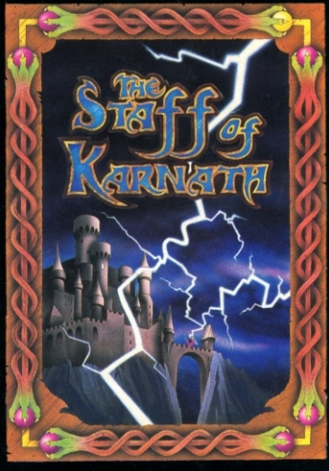
ULTIMATE
PLAY THE GAME

48K SINCLAIR ZX SPECTRUM

48K SINCLAIR ZX SPECTRUM

BBC MODEL B 1·2 OS
48K SINCLAIR ZX SPECTRUM

COMMODORE 64



"KNIGHTLORE", "UNDERWURLDE", "SABRE WULF", and "STAFF OF KARNATH" recommended retail price £9.95 inc VAT. Available from W.H.SMITH, BOOTS, J.MENZIES, WOOLWORTHS and all good software retail outlets. Also available from ULTIMATE PLAY THE GAME, The Green, Ashby-de-la-Zouch, Leicestershire LE6 5JU (P&P are included) Tel: 0530 411485