June 12–18 1987 Vol 6 No 23 60p

POPULAR Computing WEEKLY

Mastertronic's Sega system deal – details of software

Full story on page 6

New boss appointed at Commodore UK

Amstrad's PC1640 in UK next year

Hisoft's Devpac 2

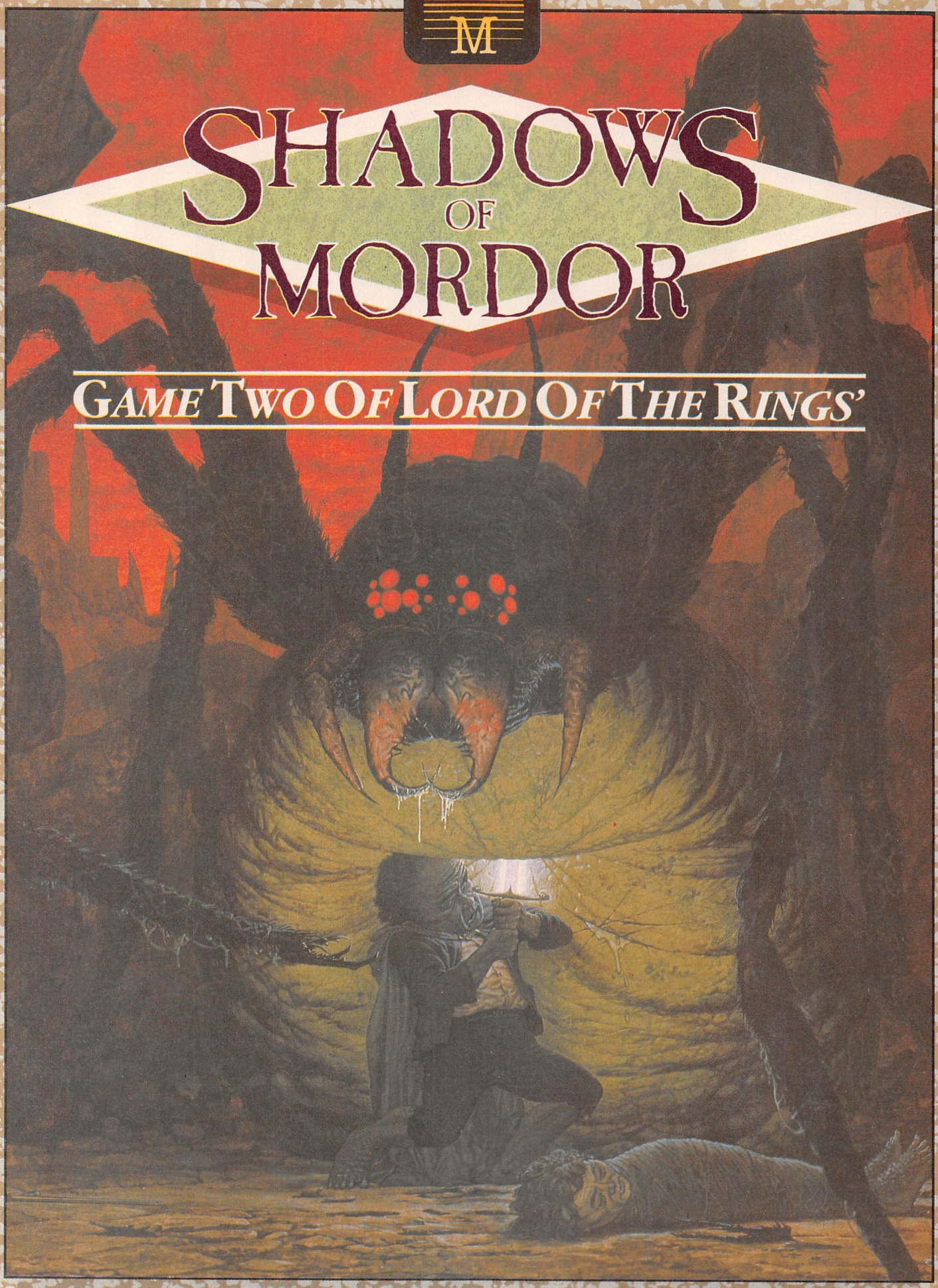
Hard discs – who needs them?

Stifflip & Co In the Popular Hall of Fame



Sega Master System





MELBOURNE HOUSE

AVAILABLE FOR: AMSTRAD CPC, CBM CASSETTE £8.95 – SPECTRUM £7.95 – CBM DISK £14.95

POPULAR Computing WEEKLY

June 12–18

CONTENTS



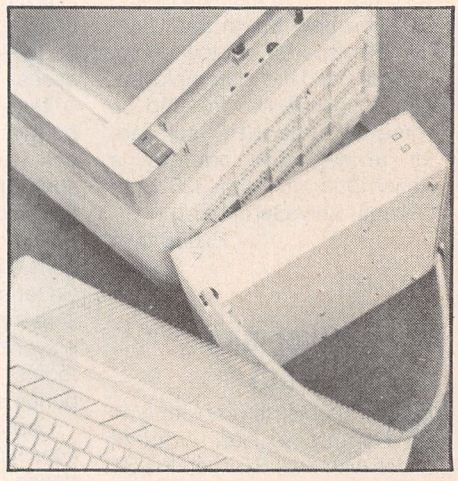
News

6 News Desk Commodore appoints new UK managing director . . . more details on Amstrad's new PC1640 series . . . more on Mastertronic's plans for the Sega games console.

33 Soundcheck Mark Jenkins has news of new packages for Atari 8-bit and BBC owning musicians, including Hybrid Technology's Music 5000, the Music 4000 Keyboard, and 2-Bit System's *Midi Master*.

The Communications column will be back next week.

Features



12 Devpac 2 HiSoft has produced its upgrade to its popular *Devpac* assembler. The sequel is written for any machine with CP/M – Tony Kendle reports.

15 Hard disc drives We look at the advantages of making the big move up to hard disc storage. As a guide to a particular product, Mark Hutchinson takes Eidersoft's Turbo drive for the Atari ST.

Top: The Hybrid Music System.
Above: Eidersoft's Atari ST hard disc.
Below: Killed Until Dead

Programming

20 First steps in machine code Kenn Garroch continues his guide to using machine code, with an explanation of common instructions.

23 Listings This week's selection includes the genuine final instalment of Micromon on the Commodore 64 (our apologies to anyone misled by last week's 'final instalment'); and the continuation of the Popular Election program.

Plus Khandal 2 for the Amstrad CPC, the first part of the follow-up to the arcade adventure Khandal, part two of the QL font designer, and VLabel, a labelling program for the ST.

28 Bytes and Pieces Short programs for you to type in: a scrolling routine for Amstrad CPCs, and how to slow down scrolling on the BBC.

29 Peek and Poke Kenn Garroch answers your programming queries.



Games

40 New releases Your complete guide to all the games released this week, including *Killed Until Dead* from US Gold, Activision's computer version of the coin-op game *Wonder Boy*, and the latest from Ultimate, *Bubbler*.

41 Hall of Fame All the noise and ruction surrounding Palace Software's *Barbarian* has detracted attention away from Palace's other new release, *Stifflip and Co*. It shouldn't have done, because *Stifflip* is worthy of that ultimate accolade, the *Popular* Hall of Fame.

Editor Christina Erskine **News editor** John Brissenden **Technical editor** Duncan Evans **Production editor** Michelle Beauchamp **Supplements editor** Christopher Jenkins **Supplements designer** Barbora Hajek **Marketing and Advertisement manager** David Osen **Advertisement executives** Jon Beales, Athena Peerman **Classified executive** Susannah King **Editorial secretary** Annmarie O'Dwyer **Credit control manager** Gabriella Piscina **Managing editor** Peter Worlock **Publishing director** Jenny Ireland. **Published by** Sunshine Publications Ltd, 12–13 Little Newport Street, London WC2H 7PP. Tel 01-437 4343 Telex 296275 Fax 01-439 0681 **Typeset by** Magazine Typesetters, 6 Parnell Court, East Portway, Andover, Hampshire. **Printed by** McCorquodale Magazines, Andover, Hampshire. **Distributed by** S M Distribution, London SW9, Tel 01-274 8611, Telex 261643.
© Sunshine Publications Ltd 1987. ISSN 0265-0509

ABC

How to submit articles Articles which are submitted for publication should not be more than 2000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here – so please do not be tempted. We cannot guarantee to return your programs – so please do not send your only copy. **Accuracy** *Popular Computing Weekly* cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

Popular Computing Weekly. Tel: 01-437 4343.

LETTERS

A hard case to crack

Blank CF2 discs, as used by Amstrad CPCs and PCWs are now available individually for £2.95 each.

Boots of Bexleyheath sells Maxell discs, but for some reason they're in plastic bags, not cases.

John Lewis in Oxford Street, London, sells Amsoft discs in hard plastic cases. They're probably also available from other branches of these stores in most places.

Does anybody know where I can buy the plastic cases separately?

I'd also like to mention Reach Out, the new South East London Newspaper by the unemployed for the unemployed. Would anyone like to send us some Amstrad CPC software for review? The address is Reach Out, c/o Room 306, Erith College, Belvedere, Kent.

Paul Brown
Sidcup

Over and out

Marcus Marr's problem with using printer control codes with *Fast Basic* on the ST (Letters, May 29) can be overcome by using the OUT command.

The following short program demonstrates this for an Epson:

```
LPRINT "Hello"
OUT 0,27,45,1: REM Sets underline
LPRINT "Underlined"
OUT 0,287,52: REM Sets italic
LPRINT "Italic"
OUT 0,27,45,0: REM Cancels underline
OUT 0,27,53: REM Cancels italic
LPRINT "Back to normal"
```

Laurence Myears
Gloucester

The price of fun

I've been reading about the computer industry for quite a while now and the one thing that mystifies me is the cost of games.

There are, of course, budget games, but they seem to lack something which would make them as good as full price titles.

I admit that there are some good titles, but they seem a little simplistic. Classics like *Spellbound* have mediocre graphics/sound with windimation being a quick way round using a parser.

Codemasters has produced some good games but they are similar: *Red Max, BMX Simulator* and an earlier Darling creation *The Last V8* all have the same controls which seems a bit odd.

Now to the other extreme. The average full price game is about £9 which is a £7 jump. Can this price be justified? The strong answer must be no. In fact, charging nigh on a tenner for a computer game makes no sense at all.

The average 11 year old gets £1–£2 pocket money a week, which means saving up for a month or more for a full price game.

Is a full price game four to five times better in quality than a budget game? Yes, in some cases.

Take the current best selling budget game, *BMX Simulator*. It has nice graphics, a great soundtrack and two player option and good gameplay.

The top selling full price game of this year so far is *Gauntlet*, which has hi res title screens, unique gameplay, two player option, good music, 512 rooms, eight-way scrolling and bonus screens.

Gauntlet is certainly four to five times better, but this doesn't mean the price should be four to five times higher. My personal opinion is that a fiver would be more realistic.

Simon Harrison
St Albans

There is much talk among the software companies at the moment about bringing non-budget software prices down to around £5–£7, although this is unlikely to happen to any great extent until next year.

Xen 3 tapes and discs

Thank you for publishing my Xen 3 program for Amstrad CPC micros (*Popular*, May 22). I would like to add that if readers do not want to type it in I will provide it on tape or disc (with documentation) for £3.00 and £5.50 respectively. The original Xen and Xen Plus are also included. The address to write to is 41 Fountains Drive, Acklam, Middlesbrough, Cleveland TS5 7LW.

Simon T Goodwin
Middlesbrough

The home computer wars

When will Commodore admit defeat to Atari?

To be honest, I think Tramiel is out to kill them off. As for Commodore itself, it needs a dose of Sugar (as in Amstrad).

Don't get me wrong. I've been a devoted C64 owner since paying £350 back in the Middle Ages, and as for an Amiga, I'd just love to have one. But I can't justify the price, let alone against the 520ST.

Commodore has either to drop out of the home market, or (most unlikely) enforce a pricing policy which is second to Amstrad's, which is what Atari has already done.

S V J Perchard
Bristol

Help for TI994/A users

As a regular reader of your excellent journal, I have noticed that Texas Instruments TI994/A users are not all aware of the existence of the International Texas Instruments User Group.

This organisation exists to serve the entire spectrum of user's needs in both the hardware and software fields. It can supply all types of non-commercial software including Forth, C, and Pilot.

Hardware upgrades are available including Ramdiscs, and soon to be implemented is an Eprom module programming service. Regardless of whether they have just the basic console or whether they have an expanded system, the ITUG is there to help. Anyone interested in further details can write to P G Q Brooks, at 96 Banbury Road, Oxford OX2 6JT, or telephone 0865 510822 at any time.

N Bosworth
Southampton

Whose Top 20 is it anyway?

As the happy owner of an Amstrad 6128 I like to take advantage of fast loading programs and files from disc (after all, that was why I changed from the 464).

You have seen the adverts which say, "from Boots, WH Smith and all good computer shops", which implies that if a shop has not got it, then it is not a good computer shop.

I have to report that Kingston Upon Thames, Wimbledon, Slough and Hounslow are not areas with good computer shops selling Amstrad disc games – although, to be fair, in Kingston, both Boots and WH Smith had some. In this Amstrad disc desert, Commodore and Spectrum rule (not OK).

Even if a shop can specially order a game on disc for me, I might as well order it from a mail order source by telephone with a credit card at a discount price.

How realistic can Top 20 software be, if, for example a shop's display is limited to the Top 20? A real 'chicken and egg' situation for browsers.

If shops are not supported, choice will worsen with even fewer chances to try before you buy.

If newsagents can order papers on a sale or return basis why cannot the software houses do the same for games?

After all, if the software houses have faith in their product, why not risk a little more to achieve for their products the exposure and sales they no doubt feel they deserve?

C J Palmer
London SW19

Part of Boots' supply from wholesalers is indeed done on a sale or return basis. However, sale or return is not generally popular with the wholesalers/distributors, which have far more say over which products go into which shop than the software houses themselves.

Singlestep success

After four years of dedication to Basic, I decided that 1987 was going to be the year I would master machine code.

Just as on the previous occasions I had tried, the going started to get really tough. That is, until I bought a copy of Singlestep, by R Wilkinson, on offer in Programming Spotlight, February 12.

Since the day it arrived, my understanding of machine code has increased in leaps and bounds.

Please pass on my thanks to Mr Wilkinson for producing such a professional piece of code.

M Sleight
Doncaster

Wafa support?

I own a Rotronics Wafadrive and as far as I know there is

no support group in existence to help with queries and supplies of much needed Wafas.

If readers with Wafadrives would be willing to contact me at 19 Churchfield Road, Acton, London W3 7LL. I will attempt to co-ordinate a nationwide user group.

Additionally, if any suppliers of Wafas could give written quotations of their stocks and cost per Wafa, I would be grateful and will pass this information on to members.

Tony Merrigan
London W3

End of the debate?

In the recent debate, in your Letters page, concerning the relative merits of the Atari ST and the Commodore Amiga A5000, the availability of software has been discussed. I have not, however, seen any mention of the relative cost of software.

The ST software is usually cheaper than the equivalent A500 software as is amply borne out by your offer for 'C' compilers (*Popular,* May 29). In my opinion this clinches the debate about software in favour of the ST.

The relative merits of the hardware and operating systems will certainly continue to be debated, but it is the software which really counts to the user. After all if the software is not available, and at a reasonable price, you cannot use the hardware to its full potential.

Jon Meredith
London SE25

New Spectrum magazine

Your readers may be interested to hear about Eprom, a dedicated Spectrum based amateur magazine. Issue one is out now, and has been very well received by all its readers.

Eprom features an action packed collection of reviews, hints 'n' tips, maps, interviews, articles, strips, great art work plus loads more. Anyone wishing to obtain a copy should send a PO/cheque for 80p (inc p&p) to Eprom at 328, The Maltings, Penwortham, Preston, Lancs PR1 9FD. Issue two of Eprom will be out at the end of June, at the lower price of 70p (inc p&p), so it must be worth a look.

T Worrall
Editor, Eprom



Hang on! Aren't we all supposed to be on the same side?

Stop all that fighting!

If you are a keen programmer, then obviously you will appreciate the merits of the Memotech, if what you want is to play a good range of games then Spectrums and C64s are great machines for a low budget, and the ST is good for those with more money who don't mind waiting a while for the software base to build up. The Amiga may be better in terms of graphics but the difference is hardly enough to start a fight and both are fine for more serious business uses.

To try to make comparisons across the 8/16 bit boundary is pointless. Of course ST games are 'better' than those for the Spectrum or the C64, but what do you expect? And anyway, they are not (in my humble opinion) that much better, not yet anyway. (OK, I've seen *Gold Runner,* it's very, very good, but not, say, twice as good, as equivalent 8-bit games). I've gone on long enough, can we now assume that the arguments are over?

Incidentally, I own an ST . . . and a Spectrum and a PC compatible, and a Newbrain and I love them all.

Mark Beale
Sussex

We're sorry but *Popular Computing Weekly* cannot guarantee to reply to *all* letters requesting a personal answer. It helps us enormously if readers are prepared to have general queries answered on these pages, so, if possible, please do not send SAEs.

PS. Ten to one there will be a letter next week along the lines of "Mr Beale has a point but why did he not mention xxx computer?"

Not so biased

I enjoyed John Brissenden's item commenting on the new rivalry between Atari's 520STFM and Commodore's Amiga A500.

It did not seem biased to either machine, and before I had even received my copy of *Popular* I had long since decided to purchase the 520STFM.

The following week, however, two people writing in the Letters section appeared to be suffering from tunnel vision.

As far as the capabilities of the A500, which Geoff Hatto thinks are better than the 520STFM, go, one look at the value for money ratio of each machine system will prove the STFM the landslide victor.

Also, W Plummer should try reading a few advertisements – he obviously looks no further than Silica Shop. Nobody will pay £400 when they need only pay £318 (Computer Express, Herts). The cheapest price I've seen for the A500 is £440.

I saw both machines side by side, and I strongly disagree with all those Commodore owners that the Amiga is a "sensible" machine and "not expensive", because Commodore computers are some of the most user unfriendly around (I know – I own one) and the value for money factor.

D A Simpson
BFPO 42
(Letter edited for length)

Correction

Following our review of the Reaktor game *Challenge of the Gobots* (May 29) Ariolasoft has asked us to point out that the "software book" is on the reverse of all the games tapes. It's the music cassette which is only available in a limited edition. Furthermore, if the music sounds suspiciously like Robert Schroeder's *Space Detective,* it has every right to do so; the music is by none other than Robert Schroeder himself. Whoops!

Black goes back

In Game One of our readers' versus *Colossus* chess tournament, the readers have responded as *Colossus* expected at move 19, and developed their bishop, moving it from c8 to f5. *Colossus* has replied by again driving the black queen away. (See diagram for details).

The next move

Which move would you, playing black, make next?

Send your suggested readers' move to *either* Inter-Mediates (*Popular* Chess), Freepost, Sawbridgeworth, Herts CM21 9YA (no stamp needed), *or Popular* Chess, Unit 2, The Maltings, Sawbridgeworth, Herts CM21 0PG (with a stamp). Please note that Freepost is slower than the normal service, so if you want to save stamp money, get your entry off promptly.

Only one vote per person please, and all entries must reach either address by Wednesday, June 17.

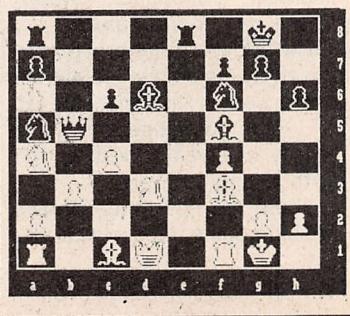
The move which gets the most votes will be entered into the game. Results and *Colossus*'s response will be published in two weeks time.

Next week, we return to Game Two, where the Readers are playing white.

Game One

The moves so far:

1	Pe2–e4	Pc7–c5
2	Ng1–f3	Nb8–c6
3	Bf1–c4	Ng8–f6
4	Nf3–g5	Pd7–d5
5	Pe4xd5	Nc6–a5
6	Bc4–b5+	Pc7–c6
7	Pd5xc6	Pb7xc6
8	Bb5–e2	Ph7–h6
9	Ng5–f3	Pe5–e4
10	Nf3–e5	Bf8–d6
11	Pd2–d4	Pe4–d3 (en passant)
12	Ne5xd3	Qd8–c7
13	Nb1–c3	Ke8–g8 o–o
14	Pf2–f4	Qc7–b6
15	Nc3–a4	Qb6–d4
16	Pc2–c3	Qd4–d5
17	Ke1–g1 (o–o)	Rf8–e8
18	Be2–f3	Qd5–b5
19	Pb2–b3	Bc8–f5
20	Pc3–c4	?



'Upmarket' PC1640: Amstrad's last chance in United States?

AMSTRAD last week announced full details of its PC1640 range, the upmarket successors to the PC1512, which will be launched in the UK next year.

The machine received its launch at the Comdex exhibition in Atlanta (see *Popular Computing Weekly* June 5).

Observers were expecting the machine to be based on the Intel 80286 processor. But all the machines will be 8086-based. Indeed, it is now doubtful whether the company will have an 80286 box scheduled within the foreseeable future.

Amstrad is also clearly making a last, major stab at the US market with the new machines, with a UK and European launch not due until the New Year.

"The breadth of product now offered by the combination of the PC1512 and the upcoming PC1640 models allows us to approach all sections of the marketplace," said Vernon Moore, president of Amstrad's US distributor Vidco.

He added that the new machines would be sold through more specialist dealers than the chainstore retailers used for the PC1512.

All this points to the market position the new machines will occupy here, following their UK launch.

The PC1640 is clearly aimed at a larger business user than the PC1512, and one ramification of this will be pricing.

"We have not yet set our pricing structure for the PC1640 in Europe, but initial indications are that this model will be significantly more expensive than the PC1512 range," said Amstrad marketing director Malcolm Miller.

Mastertronic takes Sega risks

MASTERTRONIC'S Geoff Heath promises a bright future for the Sega games console, for which the company recently acquired UK distribution rights.

"We've had enquiries from multiples, big chains, supermarkets, independent computer stores, CTN's (confectioners, tobacconists and newsagents), mail order," he said.

Exact details of availability still have to be worked out, but Heath did confirm software details. Games will cost between £14.99 and £24.99.

Twelve titles out of the existing 30 will be released initially. So far, only four have been finalised – *Choplifter, Outrun, Space Harrier* and *Zaxxon.*

He added that he was surprised by the amount of interest expressed in the machine so far, and impressed by the quality of Dega's existing and forthcoming software.

There are now three parties pushing games consoles in the UK:

- Mastertronic, which signed the Sega deal two weeks ago, and takes over from Ariolasoft.
- Atari, which has the XE system, with orders rumoured to be worth in the region of £220,000 and rising.
- Mattel, which recently signed a distribution deal for the Nintendo unit (see separate story).

All three will be fighting hard to get the lion's share of what Geoff Heath sees as perhaps the only growth area in the UK home market this year.

"The computer market is now fairly solid, and in terms of hardware, the only new computer is the Plus 3. And that is only a development of the earlier Spectrums.

"Apart from that there's nothing new. 1988–89 should see the explosion of the 16-bit market – but in the meantime, the only hardware growth area is the games console."

He added that 16-bit machines were still too expensive for a lot of people, who would therefore go with a console until the price dropped.

- Mastertronic has sped to the rescue of racing driver Andrew Ratcliffe.

Ratcliffe, 33, was due to drive his 230mph British built Tiga in this weekend's 24-hour Le Mans race. But his sponsors pulled out last Friday morning.

"I was left without any money or any hope of driving at Le Mans," said Ratcliffe.

"But I'd seen Mastertronic's games in the stores, and thought it would be a perfect match. So I rang them up, and within five mintues Alan Sharam had rung back to say yes."

Ratcliffe couldn't reveal how much money was involved. "Let's just say we're talking telephone numbers – overseas telephone numbers with extension numbers on the back!"

The race takes place this weekend, and runs from 4pm on Saturday to 4pm on Sunday. Ratcliffe will also be appearing at September's PCW Show, so we can expect the Mastertronic connection to continue for some time.

Mattel scores own goal

MATTEL has had its claims about retailers' plans for the Nintendo games console denied by retailers.

Mattel had announced that many large retailers were due to stock the unit, including Argos, Toys 'R' Us, Woolworths and Dixons (see *Popular Computing Weekly,* May 29).

The story was also convered by industry newspaper *Computer Trade Weekly* last week. But when they found out, a number of retailers – including Woolworths and Dixons – contacted CTW to make vigorous denials of Mattel's claims.

A Mattel spokeswoman admitted that the problem was due to an error.

"All I can say is, where we thought things were confirmed, they weren't confirmed. That is the state of play, and until such time as things are confirmed, we can't say one way or another," she said.

"It certainly will never, ever happen again."

Commodore finally picks new UK boss

COMMODORE UK has ended its three month hiatus following the departure of general manager Chris Kaday by finally appointing his successor.

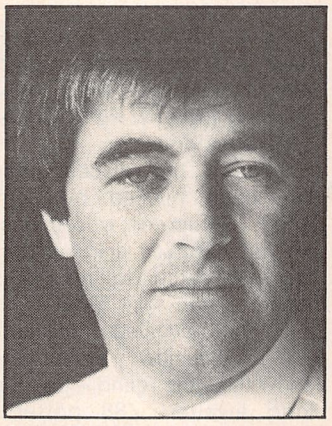
Steve Franklin will take up his position on July 1, moving from Granada Business Centres, where he is sales and marketing director.

There are two big questions hanging over the appointment. First, to what extent will Franklin be a puppet of Commodore UK's masters at Commodore Europe in Frankfurt?

Power has become increasingly centralised with CBM with Frankfurt chief Ernest Tarien reporting to chief executive Irving Gould in the US.

In the current set up, Commodore UK is a minor operation run almost wholly from Frankfurt.

It is doubtful that the situation will change dramatically once Franklin takes up the helm at Maidenhead.



Steve Franklin

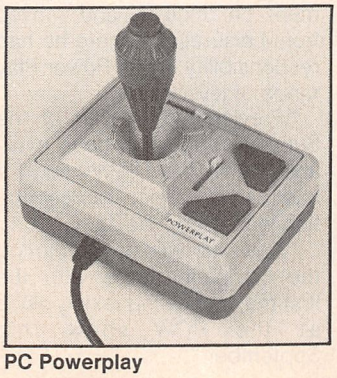
Second, what will be his brief? Has Franklin been drafted as an axeman, to carry on where Kaday left off? The UK operation has been slimmed down considerably over the past year, culminating last month in the closure of Commodore Electronics.

Apple II & PCs get new joystick

CHEETAH has launched a new joystick for the PC and compatibles which can also be used with the Apple II and IIe.

The PC Powerplay has three fire buttons, dual axis sensitivity controls, and comes with a 12 month warranty.

The PC Powerplay costs £24.95. Details from Cheetah Marketing at Norbury House, Norbury Road, Fairwater, Cardiff CF5 3AS, telephone (0222) 555525.



PC Powerplay

SOFTWARE HOTLINES

American software veers from the dire (try asking US Gold why it hasn't published Epyx's *Barbie Doll* dress kit over here yet – it's had the licence for decades) to the tremendous.

From **Microillusions**, California, via **Haba Marketing**, Feltham, Middlesex, comes the latter in the form of *The Faery Tale Adventure* (sounds almost as cutesy as the *Barbie Doll* game).

Faery Tale is a graphic adventure for the Amiga, and the software scene for the Amiga is looking suddenly rosy if there's more like this on the way.

It's a tale of three brothers – Julian, Philip and Kevin. Julian's a bit of a swashbuckler, Philip's a charmer and Kevin is frankly a wimp.

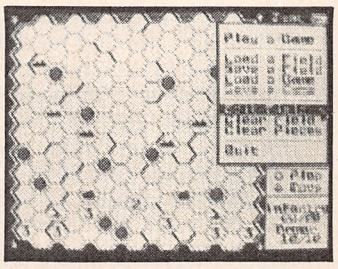
You take their parts as you travel through 17,000 screens of all types of terrain imaginable, doing all those adventurish things, killing monsters, collecting keys, meeting enchanted princesses, slaying a few more monsters . . . party night for butchers, really.

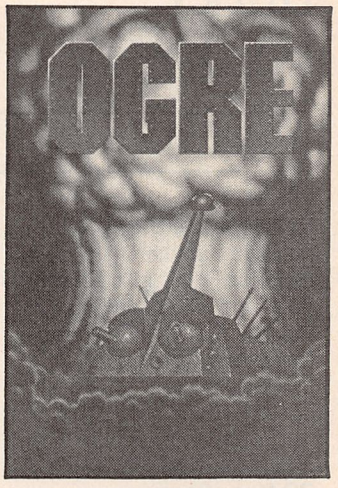
No-one at Sunshine Towers has worked out exactly what the object of the quest is yet, but we're sure it's something pretty exciting.

The hook of *Faery Tale* is its gameplay and atmosphere generated by the graphics and music. The music is continuous and varied – melodic choral chants for those mellow times in between wholesale slaughter, stirring battle themes for the fighting scenes.

The graphics show you the land and action from a slanted bird's eye view, which is brave of the programmers because the top down angle has produced some ghastly unrecognisable stuff in the past.

Given the Amiga's resolution, capabilities, 20 million colours, etc, it succeeds. The effect of the animation is that the three brothers float and lollop rather than striding briskly into daring deeds, which makes Julian look the world's most laid back warrior, and Kevin even more effeminate than he was to start with.





It's one of the most appealing games we've had in the office for a while, and we think there could be an ST version on its way, so there's hope for other micro owners yet.

More from the US and the board games of Steve Jackson in the micro version of *Ogre,* pictured here.

This comes courtesy of **Origins**, which is also bringing Jackson's *Autoduel* to the UK next month.

In *Ogre*, we're light years away from the world of *Faery Tale*. This is battle in the 21st century with tactical nuclear weapons, board game style, with the help of Ogre, a juggernaut of a tank with enough firepower to keep any Geneva talks going until the next Ice Age.

You can either play against the computer (which also gets the Ogre on its side), or another person. Out in September for Commodore 64, Atari (8-bits and STs) and Amiga.

The latest news from the **Firebird** stable is that *Elite* is currently being programmed for the PC and compatible machines.

The word is that the programmers are trying for solid fill graphics rather than the wire-framed ones on the 8-bit machines, and if that's achieved on the PCs, it'll be a sneeze to get filled graphics on to the ST version. Sounds worth waiting for.

DIARY DATES

JUNE

12–14 June
Commodore Show
Novotel, Hammersmith
Details: First public showing of A500 and A2000 Amigas
Price: £3 adult, £2 children
Organiser: Database Exhibitions, 061-456 2991

30 June–2 July
PC User Show
Olympia, London
Details: Hardware and software for all users of IBM PCs and compatibles
Price: £5
Organiser: EMAP International Exhibitions
01-608 1161

JULY

10–12 July
Amstrad Computer Show
Alexandra Palace Pavilion, London
Details: Displays and demonstrations of all latest hardware, software and peripherals for Amstrad computers
Price: £3 adult, £2 children, £1 discount for advance booking
Organiser: Database Exhibitions, 061-456 8835

SEPTEMBER

23–27 September
Personal Computer World Show
Olympia, London
Details: Latest hardware, software and peripherals for business and leisure computing
Price: £3, £2 – (parties over 10)
Organiser: Montbuild
01-486 1951

Prices, dates and venues of shows can vary, and you are therefore strongly advised to check with the show organiser before attending. *Popular Computing Weekly* cannot accept responsibility for any alterations to show arrangements made by the organiser.

Commodore to slog it out with Atari at 10th PCW show

FIRST details emerged last week of some of the major exhibitors at September's *Personal Computer World* show – and there are a few surprises in store.

Arch-rivals Atari and Commodore both have their own 'village' – Atari's has 30 separate stands, with a recording studio and satellite weather receiving system. The Commodore village, in the Addison suite, will be open to everybody, unlike last year. The company will of course be promoting heavily the new Amigas.

So far Amstrad seems to have the next largest stand, and is more than likely to be showing the new PC1640 (see separate story).

Ironically, the adjacent stand has been booked by Cambridge Computer, whose boss Sir Clive Sinclair sold out Sinclair Research to neighbour Alan Sugar in April 1986.

Sinclair revealed that there will be no new products on show this time round – just the long awaited Z88 portable (again).

Acorn will also have a major new development on show, in the shape of its Risc-based machines.

A large stand has been booked by EOA. It will be the first time the company has exhibited here since setting up a UK subsidiary of parent company Electronic Arts.

Further details, and announcements about just what the companies will be exhibiting, are expected shortly.

Three Amigas

ANCO will be demonstrating three new games for the Amiga at the Commodore Show this week.

The three are *Phalanx, Demolition* and *Space Battle,* to be followed by the end of July by *Emerald Mines, Cruncher Factory, Challenger* and *Karate King.*

"We see a considerable growth in the 16-bit market in the next couple of years and especially of the Amiga as the games machine of the decade," said managing director Anil Gupta.

"Therefore the bulk of our efforts will be directed towards the Amiga, although there are a number of releases for the Atari ST and the IBM PC."

Phalanx, Demolition and *Space Battle* will cost £9.95.

Further information from Anco, 35 West Hill, Dartford, Kent DA1 2EL, telephone (0322) 92513/8.

Microprose picks peripherals boss

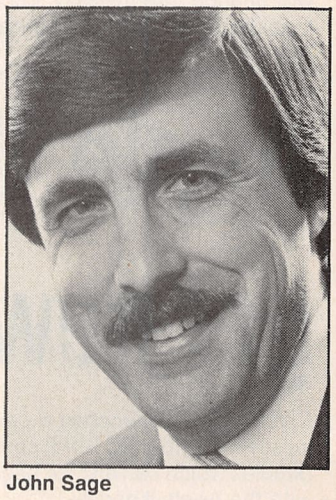
MICROPROSE is extending its hardware operation with the appointment of John Sage as product manager for the Suncom range of joysticks and other accessories.

Microprose recently announced a sales, advertising and promotion contract with the Chicago-based manufacturer, which makes monitor and printer stands and diskette storage cases, in addition to joysticks.

Sage took up his appointment on June 1, and moved from Leisuresoft, where he had responsibility for its Power Play range of joysticks.

"Previously only part of the Suncom range has been available within the UK although it has had stronger representation in Europe," he said.

"Now we will be promoting the complete range with the first major showing taking place at the *PCW* show this September."



John Sage

MORE NEWS ON 10 & 12



THE BIG SLEAZE

An adventure by Delta 4 from Piranha.

The time is the 1930s. The place is New York City. You are Sam Spillade, a thicko private dick operating out of 3024th street. Not a nice part of town. The story starts in Spillade's office and ends as far from New York as you can imagine. What goes on in between is a number of cases for Spillade Investigations. Crack 'em if you can. Stay alive if you're smart enough.

Spectrum, Commodore and Amstrad versions — all £9.95

BONUS

The long awaited electronic mag SCEPTICAL 3 is included free with the game.

DELTA 4

Further information from Helen Holland, Piranha, 4 Little Essex Street, London WC2R 3LF. Tel: 01-836 6633.

NEXT WEEK

SPECIAL supplement

Communications

News from the world of communications, including an update on Spectre and Microtext comms products for the Spectrum, Miracle's QL modem and Stradcom, an internal modem and sophisticated software for PC clones.

Spectrum Plus 3 firmware

More on the Spectrum Plus 3; how the disc operating system works and Plus 3 Basic.

The Psion Organiser

Programs report – where the Psion organiser hand-held computer has found its devotees, and a look at two new software packages for the machine – *Comms Link* and *Pocket Spreadsheet.*

Airball – new from Microdeal

You want 3D style perspective? You want glorious colours? You want smooth animation? You want to cheer up your ST no end? Take a look at *Airball,* from Microdeal.

First steps in machine code

Kenn Garrock continues his series, with an explanation of mnemonics and using assembler programs.

Sharp to launch sub-£1000 laptop PC in September

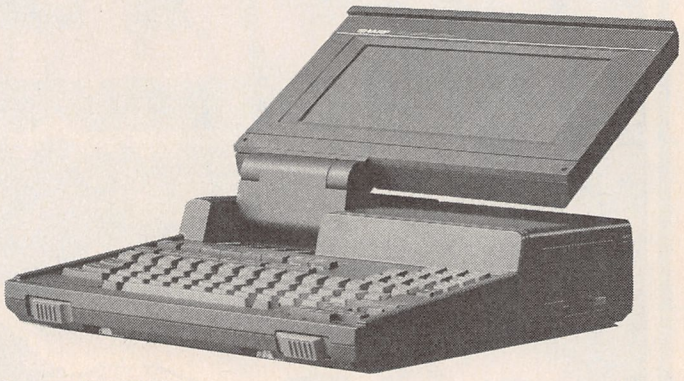
SHARP launched a new IBM compatible portable PC at last week's Comdex show in Atlanta, Georgia. Its UK price should be under £1000 when it reaches UK dealers in September.

The PC-4501 – which makes its UK debut at the *PC User* show at the end of the month – is the entry-level model in a range of new additions to Sharp's PC line-up.

It is a battery-powered machine with a backlit Supertwist LCD screen. Standard Ram is 256K, expandable to 1·6Mb.

The 4501 has a single $3\frac{1}{2}$ inch floppy drive with 720K capacity, and a second floppy drive can be added internally. A twin floppy machine, the 4502, will be available in October.

MSDOS 2·1K is the bundled operating system, and the $3\frac{1}{2}$ inch drive will enhance the machine's IBM compatibility.



Sharp's PC-4501

"It's definitely aimed at a newish market," said national sales manager Tony Hall, commenting on the sub-£1000 price tag.

"And as far as the twin-floppy model's concerned, you know whose market we're aiming at there!"

The PC-4501 and 4502 are two of several new computer-related products which Sharp is releasing between now and the New Year, including printers, scanners and XT-lap-tops.

Peripherals for yer C64

YORK Electronic Research (YER) has announced an RS232 interface for the Commodore 64.

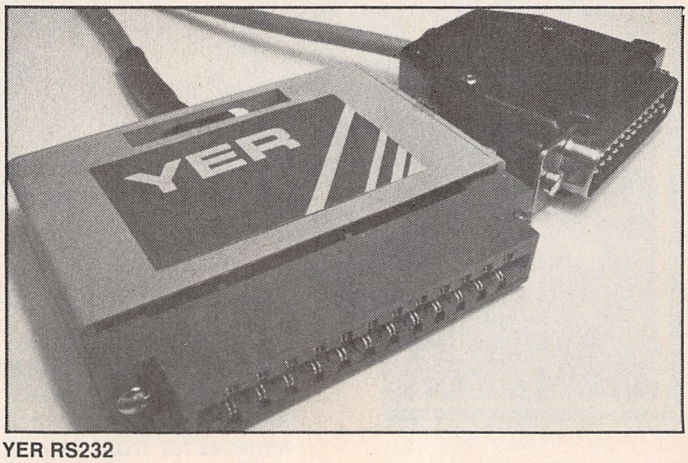
The product enables users to hook up to a wide range of peripherals such as printers and modems.

It features a cable, 4000 word manual including troubleshooting guide and utility software including a terminal emulator.

The support software comes on tape or disc, and the product costs £29.99 inclusive.

Also from YER is a fast editor/assembler for the C64. It enables code to be repeatedly edited, assembled and executed without waiting for file accesses.

Source files can be chained together, so that programs of up to 38k may be assembled in one go. The editor/assembler costs £12.99 inclusive.



YER RS232

Both products are available from York Electronic Research, The Fishergate Centre, York YO1 4AB, telephone (0904) 610722.

ST Election special (yawn)

ELECTION night saw several radio stations and newspapers using an ST election forecasting program to project the results for real.

The Election Program is a dedicated database and statistics program containing majority sizes, opinion poll results, turnout, from the 1983 General Election.

There are, in addition, factors which can take account of tactical voting in favour of any of the four main parties, so that results can be calculated in terms of one particular constituency, a region, the country as a whole, or percentage swing.

The full-colour program was commissioned by Radio Piccadilly for its election night coverage, and a number of regional radio and television stations and newspapers have expressed interest.

Some papers have also been using printouts produced with the program.

"The lastest projection gives a hung parliament with the Tories as the largest single party," said Mike Reynolds-Jones, managing director of distributor Software Express, last week.

He added that the projection was changing daily – one forecast before the election suggested the Ulster Unionists could hold the balance of power.



A politician

The Election Program costs £29.95 from Software Express, 514–516 Alum Rock Road, Alum Rock, Birmingham B8 3HX, telephone (021) 328 2585.

PC1512 books blitz

SIGMA Press has published two new books for the Amstrad PC1512.

WordStar on the Amstrad PC1512 is written by John Hughes, author of the popular *Mastering your Amstrad PCW 8256/8512*. This book is aimed at those just starting out in computing, and details the whys and wherefores of how your Amstrad works with WordStar. The book also includes several chapters on similarities with and differences from other versions of WordStar.



WordStar

The second book, by Paul Davies and Nigel Backhurst, is for both experienced users and newcomers to the MS-DOS/PC-DOS operating systems. *Exploiting MS-DOS on the Amstrad PC1512 and all IBM Compatibles* covers all aspects of MS-DOS usage from getting to grips with the terminology and initial tasks to enhancements such as tape streamers, additional disc drives and CD-ROM.

WordStar costs £10.95, and *Exploiting MS-DOS* will set you back £12.95. Both books are marketed and distributed by John Wiley and Sons, and further information can be obtained from Sigma on 0243-770355.

Activision's new Sierras ready for delivery

ACTIVISION has now sealed its distribution agreement with the U.S. software house, Sierra on Line.

The first two titles to be released under the new arrangement are U.S. chart hits *Kings Quest III* and *Space Quest.*

Kings Quest III is the third in the popular American *Kings Quest* adventure series, and will be available in the UK at the end of June. The price should be around £24.99 for the Atari ST and £29.99 for the Apple II series, Amiga and IBM PC versions.

Space Quest, programmed by the same people who conjured up the *Kings Quest* series, is a humorous action and adventure space game with the usual destroy enemy star ship type plot.

This game will be released in the UK at the end of July at the same prices as *Kings Quest.*

For further information, contact Activision on 01-431 1101.

THE ASSEMBLER'S DREAM

Tony Kendle reviews *Devpac 2,* the latest and most eagerly awaited of the "new wave" assembly language development systems. But does it live up to expectations?

Regular readers will be aware that there is a veritable renaissance underway in the field of assembly language development systems. Suddenly the old reliable standards, familiar in zillions of extremely average programs that have been churned out by almost every software company you could name, have been left behind.

The first of the 'new wave' was *Laser Genius,* written by Oasis for the Spectrum, Commodore 64 and Amstrad CPC. More recently there was *Maxam II* by Arnor for the CPC 6128 and Amstrad PCW. However, the one that has been most eagerly awaited by programmers everywhere has to be the upgrade of the evergreen *Devpac,* the tool that has bred a generation of Z80 machine code experts from the earliest days of the Spectrum.

There can be no disputing that HiSoft is the master of almost every different programming language available on home computers, a sort of British Borland. More than anyone it can claim to know what programmers need, and will find useful, because it has had years of feedback from its customers.

The result of its work, *Devpac 2,* is a programmer's joy, powerful, streamlined and easy to use. It is unquestionably the best thing available on most CP/M computers – Tatung Finstein and MSX owners in particular take note, this is *the* assembler package for those machines.

On the Amstrad range there is more competition from *Maxam II,* and it was the Amstrad version of *Devpac 2* which was sent for review, as much as anything because the PCW, with its fast memory drive is getting a reputation as an excellent program development tool.

Maxam scores through having its own inbuilt file and disc copy and disc formatting routines which make it a complete self-contained package, although as we will see later this also causes problems. *Devpac* comes with a less comprehensive suite of Hisoft disc utilities (including a file conversion routine for CPC AMSDOS *Devpac* files) which allow much more flexible file copying and erasing, etc, than can be achieved with the standard commands. The original *Devpac80* files are also included for anyone who wants to gain familiarity with the new modules one by one.

```
TEST.GEN        LINE:22   COL:1   †QF     INSERT
*List on

*H A Simple Program

;Some equates

BDOS            equ     5
STRING_PRINT    equ     9

;The code, automatically ORGed at #100

        ld      sp,(BDOS+1)
        ld      de,Message              ;print a message
        ld      c,STRING_PRINT
        call    BDOS                    ;by calling the CP/M BDOS
        rst     0                       ;return to calling program or CP/M

;Amy old message

Message
        defm    "HiSoft Devpac80 Version 2!$"




FREE:47452  $                                $
                                                        Drive is A:
```

Devpac 2: **powerful, streamlined and easy to use.**

The *Maxam* editor has the merit of being developed from the superb full featured word processor *Protext,* and therefore is very much better than anything seen before in assembler packages. *Devpac*'s new editor has less features, but conversely the ones that are there are more closely integrated with the other parts of the development package such as a menu driven system that will call up the assembler and monitor and assemble the current edited file, or one stored on disc.

The assembler can return direct to the editor once assembly is completed or aborted – it may not seem much but such small points of logisitics can take on inflated proportions when you are mid-way through an enormous programming project, and this feature is actually very rare.

Best of all is the ability of the program to remember where errors were found on the first or second assembly pass, and return the user direct to the offending line in the source file with suggestions for what is wrong.

Devpac's editor works with a wide selection of *Wordstar* compatible controls. For those who cannot abide *Wordstar* these control keys can be re-defined, but as it stands it will appeal to a myriad of die-hard programmers whose fingers are irredeemably locked into configurations such as *Control-KD.* Like *Maxam,* files much larger than can fit in the spare memory can be edited and assembled by using the disc as virtual memory.

The *Devpac* assembler largely conforms to the usual Zilog standards but also has been designed to work with files produced by the Microsoft M80 assembler. The internal format of the files it produces are much more standard than *Maxam*'s.

Notable features include conditional assembly, a wide range of arithmetical and logical operators, multiple line comments

and excellent printer control. Lines of assembly can be directly typed in at the keyboard and automatically inserted at the beginning, or elsewhere, into a disc file undergoing asssembly. This is designed to let you add options to a program which you want to use for test purposes without having to alter the original source code.

Unlike many assemblers, *Devpac 2* can be installed so that it does not abort on the first pass if errors are found. This allows any second pass errors to be found at the same time ready for editing or listing to the printer. The assembly process can be tested without an object code being produced. Symbol files can be passed to the monitor, or any other standard CP/M program, for symbolic dissassembly.

A very nice touch is an extension of the CP/M plus virtual discing feature whereby different files can be named as being read from, or written to, different discs by specifying them as being on drive, B, C, D, etc, regardless of how many drives you actually do have fitted.

As well as COM programs, *Devpac* produces highly standard CP/M REL (relocatable) object code files. These can then be used by any CP/M linker including those usually supplied on the CP/M system disc, and can also be linked to the code produced by other languages such as Pascal or C. Extremely powerful control is given over such files providing relative and absolute symbols and public symbol definitions, etc.

Devpac can be used under either CP/M 2.2 or CP/M Plus and so memory bank switching commands are supported if the program senses that it is running in the latter environment.

Devpac has always been noted for the quality of its macro handling, but this has now been expanded in various ways to allow the user to be able to define their own pseudo-instruction extensions to the standard Z80 opcodes.

The monitor represents one of the most important advances over the old version. It can of course be used as a symbolic debugger and the disassembly can then be written to a disc file ready for editing etc.

On the large PCW screen a very useful display of information can be presented, 29 lines of disassembly, a command line and an 80 byte hex and Ascii memory display. A range of the standard monitor commands are available such as fill memory range, compare memory with a given entry, set the memory bank, search for a given mnemonic etc. All of these are extended by a powerful range of arithmetic and logical operators for use in your expressions.

Several types of breakpoint exist – hard breakpoints that terminate the code execution when reached, warm boot breaks that trap any attempt by the code to restart CP/M, watchpoints which count the number of times a certain piece of code is executed, and conditional breakpoints that cause a break when a certain condition is met.

The most notable aspect is that all of this has been accomplished in just 12K and with the aid of some memory switching you are left with a hefty 54K free for your program files (under CP/M plus). It is something like a third as large as *Maxam*'s monitor which possibly is too user friendly, providing the full range of disc management commands instead of preserving every spare byte of memory for the user. Indeed the whole *Devpac* package is so compact that all three modules easily fit within the memory disc of an unexpanded PCW.

There is no question that Amstrad owners now have two comparable and unprecedentedly good assemblers to choose from. Each has its own strengths, but in the end most people are likely to vote with their pocket. It is inevitable that the vast majority of potential customers already have assemblers of some sort.

Whilst anyone with an ounce of sense will see the value of upgrading to one of these excellent releases it is hard to imagine that they will ignore the fact that *Devpac* is almost half the price of *Maxam II*.

Product *Devpac 2* **Micro** Any CP/M – Tatung, MSX, Amstrad 464, 6128, PCW, **Price** £39.95 **Supplier** HiSoft, The Old School, Greenfield, Bedford.

```
GEN80 2.00 Copyright (C) HiSoft 1987
Pass 1 errors: 00

0100                1 *List on
0100                2


0100                3 *H A Simple Program
0100                4
0100                5 ;Some equates
0100                6
0005                7 BDOS       equ    5
0009                8 STRING_PRINT equ   9
0100                9
0100               10 ;The code, automatically ORGed at #100
0100               11
0100 ED7B0600      12              ld     sp,(BDOS+1)
0104 110D01        13              ld     de,Message ;print a message
0107 0E09          14              ld     c,STRING_PRINT
0109 CD0500        15              call   BDOS       ;by calling the CP/M BDOS
010C C7            16              rst    0          ;return to calling program or CP/M
010D               17
010D               18 ;Any old message
010D               19
010D               20 Message
010D 4869536F      21              defm   "HiSoft Devpac80 Version 2!$"
Pass 2 errors: 00

Symbol Table used: 00K out of 15K.

Hit any key for menu                                        Drive is A:
```

On the large PCW screen, a very useful range of information can be presented.

```
012C            SBC  HL,DE          PC 0100   00E0 00 00 00 00 00 00 00 00 ........
012E            LD   (#01C3),SP     SP E755   00E8 00 00 00 00 00 00 00 00 ........
0132            LD   SP,HL          IY 0000   00F0 00 00 00 00 00 00 00 00 ........
0133            PUSH HL             IX 0000   00F8 00 00 00 00 00 00 ED B0 ......m0
0134            LD   DE,#0104       HL 0000 > 0100 18 23 C5 00 00 50 4D 4F .#E..PMO
0137            LD   C,#0F          DE 0000   0108 4E 20 20 20 20 4D 4F 4E N    MON
0139            CALL #0005          BC 0000   0110 00 06 80 64 1F 20 21 22 ...d. !"
013C            INC  A              AF 0000   0118 23 24 25 26 27 28 29 2A #$%&'()*
013D            JR   NZ,#0152                 0120 2B 00 00 00 64 2A 06 00 +...d*..
013F            LD   HL,#0214        Alts     0128 11 00 32 B7 ED 52 ED 73 ..27mRms
0142            LD   A,(HL)         HL'0000
0143            OR   A              DE'0000        ProMON 2.0 (C) HiSoft 1987
0144            JP   Z,#0000        BC'0000   Break          Condition/Scale Count
0147            LD   E,A            AF'0000
0148            LD   C,#02
014A            PUSH HL             IR 0014
014B            CALL #0005          Ints ON
014E            POP  HL
014F            INC  HL              Flags
0150            JR   #0142
0152            POP  HL
0153            PUSH HL             Bank: 01
0154            EX   DE,HL
0155            PUSH DE
0156            LD   C,#1A
0158            CALL #0005
015B            LD   DE,#0104
015E            LD   C,#14
0160            CALL #0005

Command:
                                                            Drive is A:
```

Screen dumps are easily achieved with *Devpac 2*.

SOFTWARE EXPRESS

514-516 Alum Rock Road, Alum Rock, Birmingham Tel.: 021-328 3585

THE ELECTION PROGRAM

FROM

SOFTEX

by I. A. Skelly

- ★ Mouse driven
- ★ Help screens
- ★ Colour maps
- ★ Analysis by region
- ★ Full print-out facilities
- ★ Four types of "swingometer"
- ★ Graph or tabular display
- ★ Turnout statistics
- ★ Edit facility

Conservative	**?**
Labour	**?**
Alliance	**?**
Others	**?**

- ★ Displays by maps and constituency colours
- ★ Evaluates impact of tactical voting
- ★ Identifies constituency of any M.P.
- ★ Identifies and forecasts results in marginal seats
- ★ and many other features

Invaluable aid to politicians, schools, colleges, pollsters, political pundits, researchers and ANYONE with an interest in election results and statistics

A complete database of opinion polls and election results since 1900

520/1040 ST (Colour only)

£29.95 (inc. VAT)

Update discs available after each major election . . .

Phone for details

I enclose a cheque/PO for £ .....

OF PHONE FOR

Access or VISA

Name.....

Address.....

.....

Dealer and Overseas Enquiries Welcome

514-516 Alum Rock Road, Alum Rock, Birmingham

HOTLINE 021-328 3585

HARD AND FAST

Eidersoft is one of three companies currently producing hard disc drives for the ST. Their Triangel 20Mb Turbo Drive, to use it's full name, is a real step up for ST owners, as Mark Hutchinson discovered.

The 1Mb floppies available for the Atari ST can store a lot of files and, after a few years, you will probably find that you have collected several dozen discs. The problem then arises of finding a particular file amongst the collection. Using a language such as Modula-2, which covers two discs, and trying to find that elusive file to compile with it can become time consuming. One answer is to invest in a hard drive.

Eidersoft, aided and abetted by Computer Concepts, is one of three producers of hard drives for the ST (the others being Atari itself and Supra).

Strangely, even with Eidersoft's liaison with Computer Concepts, the *Fast Basic* cartridge icon cannot be displayed on the desktop. Computer Concepts came to the rescue with FASTART.PRG (part of its bundled software), so the cartridge and drive will work together.

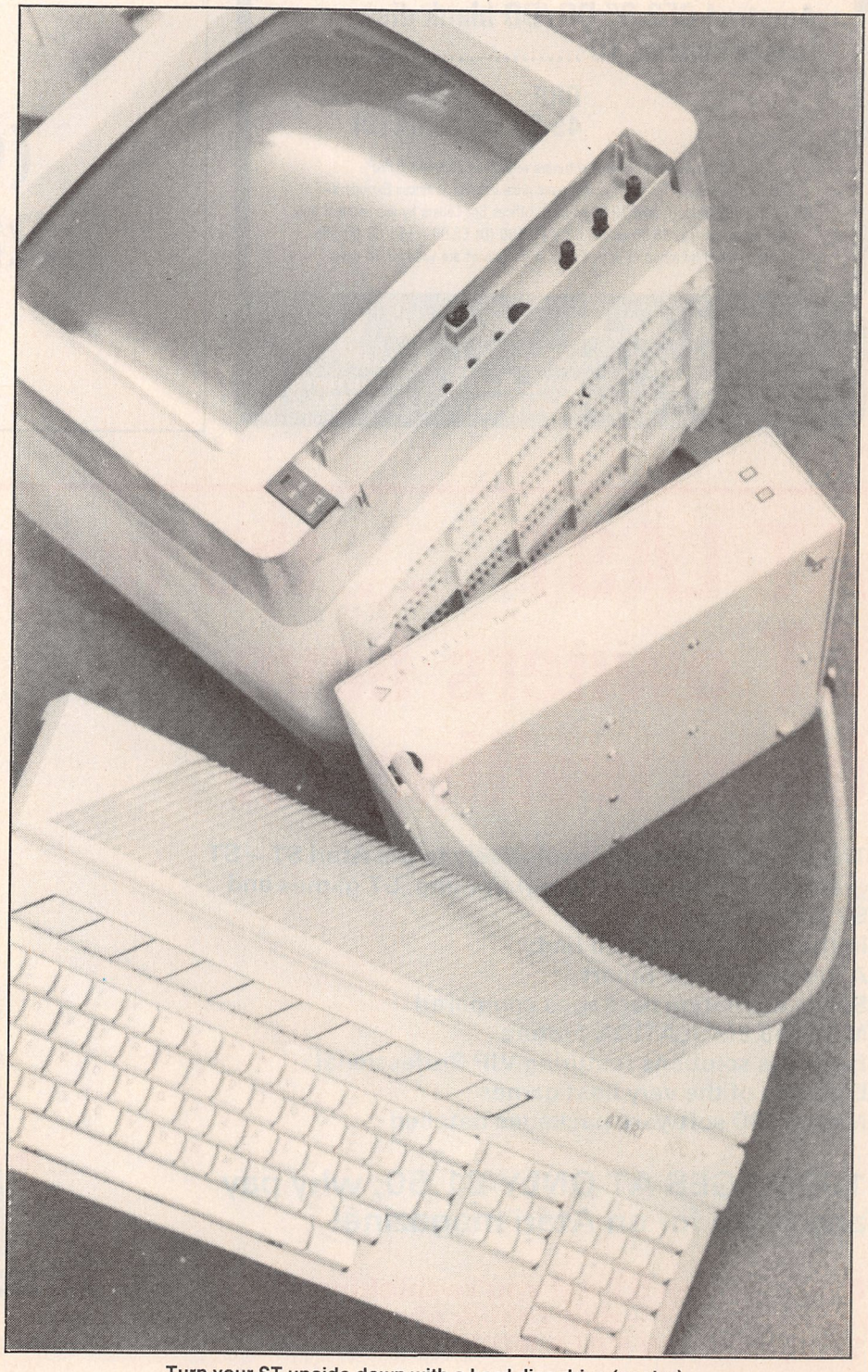
The drive is a grey metal box, about 11 × 11 × 3 inches. The power cable and switch are at the rear and the LEDs and data cable at the front. This can make it awkward to position the unit. I would prefer both cables at the rear and the switch at the front. I would also have liked an additional six inches of data cable.

Turbo drives can be daisy chained using the SCSI interface from Eidersoft. The company now has a second version of the hard disc, with an inbuilt 1Mb floppy, which can be obtained for £872.85.

The drive takes about seven seconds to come up to speed and, apart from the fan, is very quiet. The instructions come in an A5, 24 page ring bound booklet. It has plenty of illustrations, and strangely, for UK producers, a sense of humour. I was sent two discs, one containing the turbo boot programs and the other *Flash-Bak* and *Flash-Cache*. The included *Flash-Bak* program will not work with other drives, but the commercially available version will. I recently received the latest update, version 1.7. I also found that the boot program will not work with the Atari drive (new model).

The first thing I did was to try out the drive to see if any goodies had been left there. No such luck. I went on to format the disc and check for bad sectors. None, which is a great start. Next thing was to partition the disc.

A hard drive of 20 Mb takes a long time to access a program, even with a cache (an area set aside to quickly access often used



Turn your ST upside down with a hard disc drive (centre)

Continued on page 17 ▶

A MUCH BETTER DEAL – WEEK AFTER WEEK

Amstrad PCW 8256 Computer/Word Processor + Monitor + Printer .....

RRP	WAVE
458.85	355.65 (A)

Amstrad PC1512 Business Pack including PC1512 double drive mono + DMP3000 printer + Supercalc 3 + Wordstar 1512 .....

RRP	WAVE
977.10	598.50 (ANC)

Amstrad CF2 3″ DG/DD blank disc (cased) box of 10 .....

RRP	WAVE
49.50	18.64 (D)

All current chart games software retail less 25% + £1 P&P
Send 3 18p stamps for fast moving items price list. Wave Prices Exclude VAT.
ANC 3 day £9.00. Next day £12.00. Admin. Offices 5p. Callers by appointment only.
UK Post & Ins. (A) £5.00 (B) £4.00 (C) £3.00 (D) £2.00 (E) £1.00 (F) 50p.
Despatched by return of post. Prices in this advert are valid for 14 days.

W.A.V.E. (Dept. PCW 1206)
Walney Audio Video & Electrical
53 Shearwater Crescent, Barrow-in-Furness,
Cumbria LA14 3JP. Telephone: 0229 44753

For
Atari ST
and
Amstrad
call
(0268) 282308
now

AT LAST . . . the magazine ST owners have been waiting for

The magazine devoted exclusively to the Atari ST – ST graphics, ST music, ST programming, ST games and ST software.
In the June issue you'll find:
A full Atari Show report
Sprite animation packages compared
MS-DOS EMULATION feature
Business solutions featuring VIP Professional
Eighteen of the very best games
Nearly 300 software packages detailed

100 PAGES AT ONLY £1.50, why pay any more for an Atari magazine!

If you own an ST – if you're thinking about owning an ST – don't think about missing ST Update. ON SALE NOW!



◀ continued from page 15

files), so it is a handy option to section (partition) the drive into separate logical units. The partition scheme gives nine options of two, three or four drives.

I had worked out before the drive arrived which material I was going to store on it, which made life easy when it came to partitioning; in fact I used the standard 4×5Mb units.

This configuration is easily changed after a back up so there is no need to panic during this option.

I found the drive more reliable than the Atari (old version) yet it seemed slower than the Supra drive. However, I have not rested the Supra drive, but seen it accessing about 20 *Neochrome* pictures and this may have been all that was on the disc. I have over 200 pictures, all in a condensed form, plus drawing programs and associated files on a logical unit, thus access time would be slower.

The use of folders has always been limited on floppies, but really comes into its own when used on a hard drive. Unfortunately, the current version of TOS limits the computer to accessing 40 folders. This means that, although you can have as many folders as you wish, the ST can only record the use of 40 folders, even if they are now closed.

HARD AND FAST RULES

The limitation is caused by the inability of the system to clear out the memory used by the folder access routine. However, *Flash-Cache* will allow you to extend the folder-use memory to around 400. If you suddenly find that you have lost directories or have a sudden system crash, then the folder routine is at fault, not your drive. I have experienced this, and all I can say is that panic is a mild variation of what I felt.

System reboot settled the fault, if not my nerves! One point of interest, if you use a cold start give the ST time to settle otherwise no icons are loaded and the boot drive is not accessed.

One of the nice things to come along with the drive was a program called *Autoboot*. This allows you to set up an Auto folder on the hard drive where you can store necessary programs, eg, spooler, time set, etc. The program will then load and run the programs in the order they are stored.

Many years ago, I started out on an 8-bit system using tape. I remember the astonishment when I first used a floppy drive. I experienced this feeling again when I tried out the Turbo drive. For speed and ease of use a hard drive is ideal, and the Eidersoft Turbo drive lives up to expectations.

Product *Triangle 20Mb Turbo Drive* **Micro** Atari ST **Price** £688.85 inclusive **Supplier** Eidersoft, The Office, Hall Farm, N Ockendon, Upminster, Essex RM14 3QH.

Why a hard disc?

Every computer owner has a wish list of improvements they'd like for their machine.

If you're a Spectrum or Commodore 64 owner you might have your eye on an ST or an Amiga, and it may be hard to imagine those machines being flawed. But talk to owners of those machines and you'll find they have wish lists of their own.

Most users would head up their list with enhanced colour and graphics, or perhaps more memory, or better sound because those things are obvious and tangible. But if you really use your system, probably the most significant addition is a hard disc drive.

Anyone who has experienced the wondrous changes that accompany a move from tape to floppy disc will have an inkling of what a move from floppy to hard disc entails. Except that the improvements are an order of magnitude greater.

Essentially, a hard disc offers enhanced performance in two areas: speed, and storage capacity. But these features in turn allow other changes for the better.

What differentiates the hard disc from its floppy counterpart is physical construction:

- The floppy disc is made of flexible plastic, coated with a thin layer of magnetic particles. The hard disc is usually made of a light metal alloy, such as aluminium.
- Because floppy discs are capable of holding only a few hundred kilobytes of data, they are designed to be removable. Hard discs are usually enclosed in sealed units.
- Since the hard disc can be permanently calibrated, the disc works to much finer tolerances. This means it can be spun very quickly.
- Furthermore, spinning a floppy disc at high speed causes the disc itself to flutter with the risk of the disc smashing into the read/write head. Since the hard disc is rigid, this fluttering is eliminated. Hard discs generally spin at speeds greater than 3,600 rpm.
- The faster speed means that the drive can read and write data much more quickly.
- Finally, the speed improvement also means that far more information can be held on the disc.

In meaningful terms, all of this means that programs and data will load many times faster than from floppy discs (roughly five to 20 times faster), and one hard disc can hold from five to more than 100 megabytes of data, or the equivalent of around 15 to 30 floppy discs.

As attractive as these advantages are, hard discs also offer improvements in another way. Because they are very fast, software can use them as virtual memory, shuffling data from real memory to disc quickly and relatively painlessly.

So, just as a Ram disc can reduce a pressing need for an extra floppy disc drive, so a hard disc can virtually eliminate the need for extra memory over and above the minimum requirement for a program and a reasonable amount of data.

However, there are prices to pay for this power, and not just in financial terms.

Above all is the fact that hard discs are fragile things. The read/write head travels above the disc at a distance measured in thousandths of an inch – less than the thickness of a human hair. While the disc is spinning at thousands of revs per minute, the slightest fluctuation in the head can cause it to nose dive into the disc, eliminating masses of data and doing the head itself no good at all.

This means that you can't shove the drive to one side while it's in operation, and even the passing of the Number 39 bus can be cause for tension.

Second, important data – as with all discs – should be backed up regularly. With a 360K floppy this is not a problem. With 20Mb of data, it can be a time-consuming affair, but one that shouldn't be avoided.

Finally, the dread question of software protection. As with buying a disc drive for a tape-based system, so with a hard disc for a floppy-based system: the usefulness of the hard disc is obviously greatly reduced if you can't get your favourite programs on there.

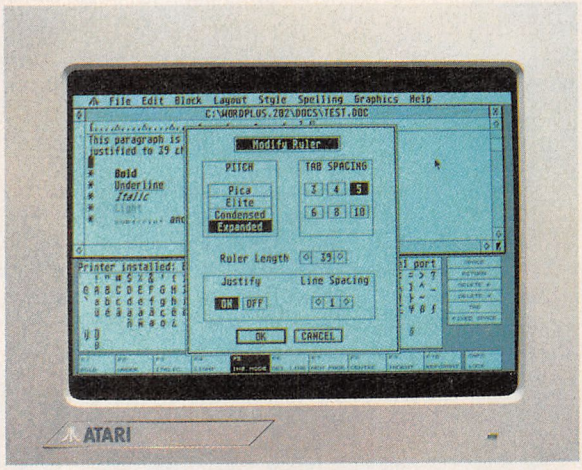
But protection schemes can thwart you, even if you're in possession of an effective disc copier (some protection methods defy all copying software, and some copiers won't work with a hard disc).

The answer to this is in the hands of the software companies. Unprotected software is obviously favourite, followed by external protection, like dongles or entering keywords from a vast manual. Another possibility is the key disc system, where you can work from the copy but at the start of each session you must insert the original floppy disc.

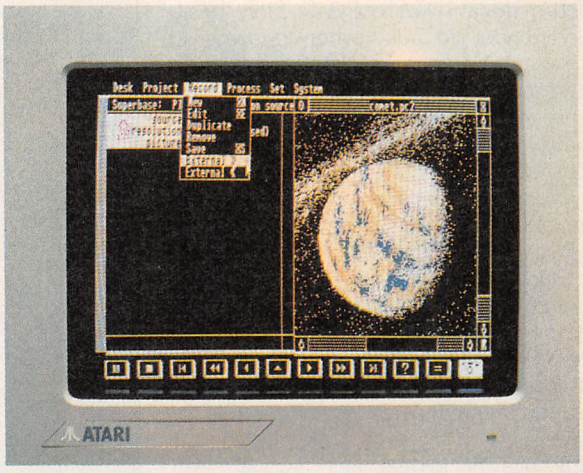
If software houses insist on integral protection methods, it is up to them to provide a hard disc installation program.

As hard discs become more common, a process of natural selection will work against obstructive software companies. Until then you should choose your software with care.

Taxmen, bank managers and accountants are easy to defeat.



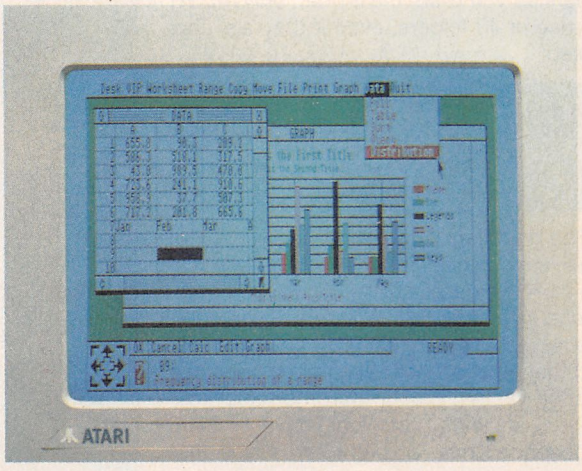
1st Word Plus – G.S.T. Professional word processor featuring U.K. spellings and integration of graphics including 1st Mail for full control of form letters etc.



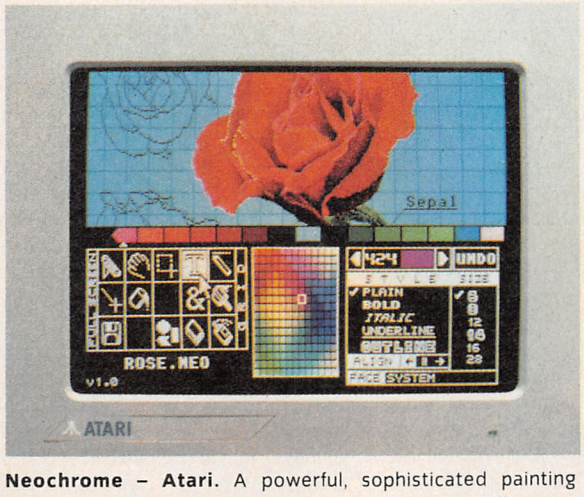
Superbase Personal – Precision Software. All the features of GEM combined with full relational database power. Easy to set up, flexible, plus unique picture index facility.



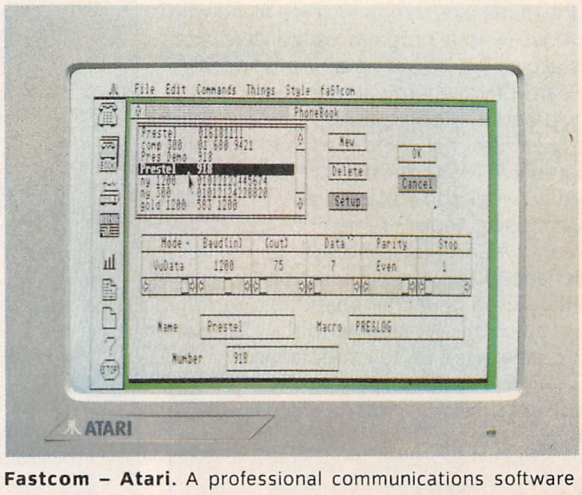
Fleet Street Publisher – Mirrorsoft. The complete desk-top publishing package. Gives you page make-up combining text and graphics for sophisticated, professional looking documents.



VIP GEM – Silica Distribution. VIP Professional is an integrated spreadsheet, database, and graphics package. GEM environment plus Lotus 1-2-3 compatibility.



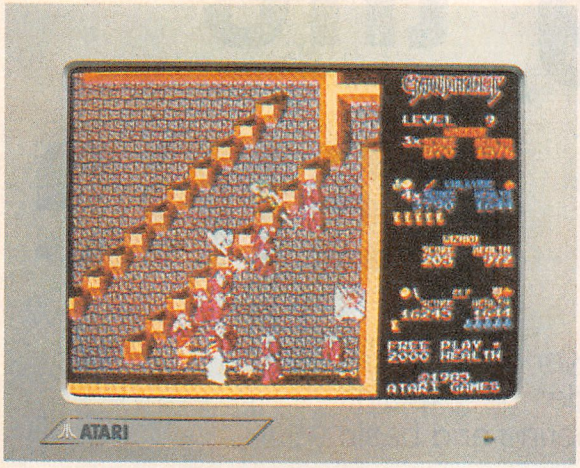
Neochrome – Atari. A powerful, sophisticated painting program for unsurpassed graphics. Work boldly on full screen canvas or in minute detail using Neochrome's magnifier.



Fastcom – Atari. A professional communications software package giving access to most major databases worldwide. (Integrated ASCII/Viewdata package).

*Screenshots are fro

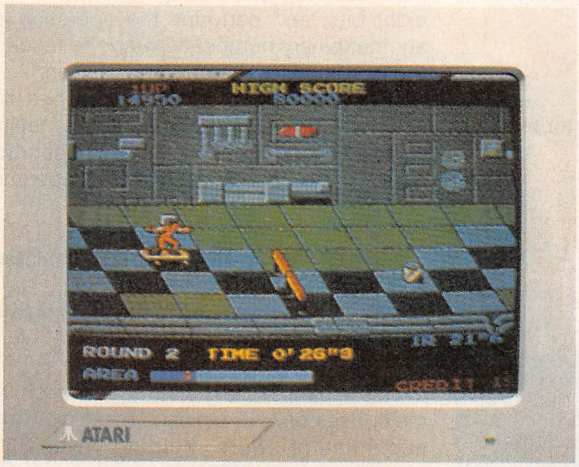
These other fiends may be a bit trickier.



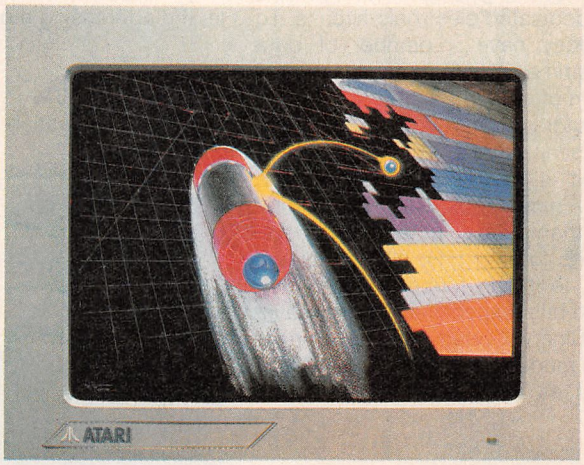
Gauntlet – U.S. Gold. Enter a world of monsters, mazes, mystery and combat in the ultimate role-playing fantasy game.



Tai Pan – Ocean. Voyage to 19th Century Hong Kong for action and excitement with pirates, smuggling and mutiny.



Metrocross – U.S. Gold.* It takes lightning reflexes to get past the potholes, obstacles and forbidden zones to reach the other side. And that's just the beginning!



Arkanoid – Imagine.* The latest smash-hit coin-op game! Are your reactions quick enough to handle 33 different play screens?

Mixing business with pleasure is no problem with an Atari 520 ST. Not when you've got over 1,000 software titles to choose from.

You'll find all the latest games and a huge range of business titles from the top business software houses. And the range is growing all the time.

You won't be short of power, either. The Atari 520 ST is twice as powerful as most business micros.

So you'll be able to create spectacular colour graphics. Even animate them to make your own films. If you're musically minded, you can compose and play a full symphony.

Or, for those who'd rather write programs than music, the 520 ST supports over thirty programming languages.

In fact, whatever you're looking for in a computer, you'll find it in the Atari 520 ST.



ATARI 520 ST
WORKS HARD · PLAYS HARD

*from the original Arcade game. If you require any further information concerning software featured please write to: PO Box 555, Atari House, Railway Terrace, Slough, Berks SL2 5BZ.

Playing the numbers game

In this, the second part of Kenn Garroch's introduction to machine code, he explains the principles of binary numbering and basic machine code operations

The idea behind microprocessors is that they can perform functions that would take a great deal of time and effort with dedicated electronic circuits. To this end, they have a number of data handling commands simply for the logical manipulation of data.

All computers work with binary numbers due to the simplicity of designing an electronic circuit to handle on and off as one and zero. All microprocessor commands therefore manipulate binary numbers, usually in the form of bits, nibbles, bytes, and words, ie in the format of one, four, eight and 16 bits respectively. There is also the BCD (Binary Coded Decimal) format which most modern processors can handle with almost as much ease as the other formats.

Internal registers

The instructions that handle these numbers are pretty much the same on all processors. In fact, processors generally have the same core of instructions, it's the knobs and whistles that make them different. All processors have load and store commands to move data from memory to internal registers and back, eg,

```
LDA $OF12    ;6502 instruction to load
             the accumulator from
             memory location F12 (hex)
             or 3858 decimal.

LDA,(SOF12)  ;is a Z80 instruction that
             does the same thing.
```

The only difference between the two processors, as far as load and save go, are the addressing modes available (see last week). These differences can sometimes be major but the ideas are the same.

Another common feature of microprocessors is their ability to manipulate data. In general, they all do it the same way. They can AND, OR, rotate, shift, add, and subtract. Again, the differences lie mainly in the way in which the information is accessed, ie, the addressing modes.

Truth table

The AND operation is defined for two bits a and b as:

a	b	a AND b
0	0	0
0	1	0
1	0	0
1	1	1

"All computers work with binary numbers due to the simplicity of designing an electronic circuit to handle on and off as one and zero"

This is what is known as a truth table. It gives all the possible combinations of values of a and b, and the result of the operation on each combination. So looking at the AND truth table, the only time a 1 is produced is when both a and b are 1. Otherwise, the result of the AND is 0.

The OR operation is:

a	b	a OR b
0	0	0
0	1	1
1	0	1
1	1	1

Here, whenever one of the inputs is 1, the output is 1. Expanding things a little, the processor takes a binary number, usually eight bits, and performs the operation on another binary number, leaving the result in the accumulator (for most processors).

So the instruction AND # 15, when the accumulator holds 195, works by taking each bit and performing the AND operation on the corresponding bit in the operand. Therefore:

```
11000011 is the 195 in the accumulator
00001111 is the 15 to be ANDed
00000011 is the result in the accumulator
```

after the operation.

This example demonstrates one of the major uses of AND which is masking. If the accumulator were holding two BCD numbers, to get at the lower one, simply ANDing with 15 sets all of the top four bits to zero, and leaves the bottom four alone. Check the AND truth table to see how this works.

Masking

AND can also be used to turn specific bits off, ie set them to zero. 255 AND 247 makes bit 4 (bits always counted from 0 to 7) zero, ie, it masks it out.

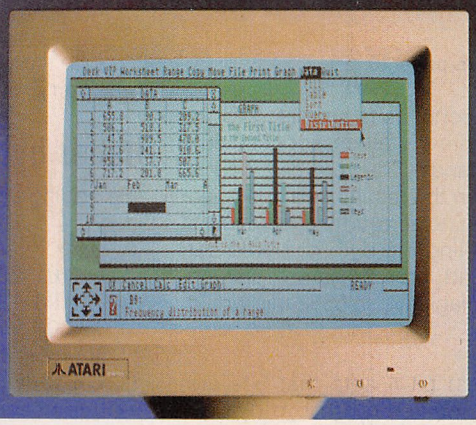
The OR instruction can be used to perform the opposite and turn bits on 240 OR 2 gives 242 since (1 OR 0 gives 1).

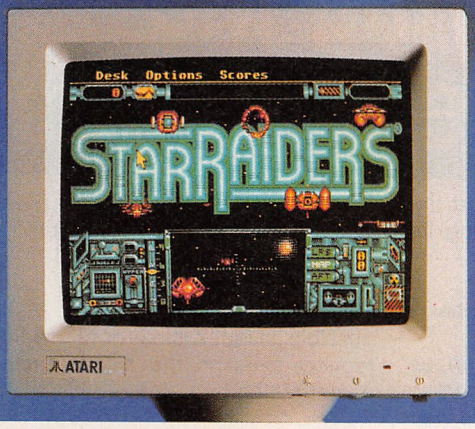
```
  11110000   240 (FO in hex which is more
             compact)
OR 00000010  2
  =11110010  242 (F2 in hex, note the easy
             conversion from binary simply split into sets of 4 and
             assign hex digits to them)
```

The AND instruction can also be used as

continued on page 22 ▶

To help you defeat the taxman





and destroy the aliens,

we've massacred the price.



For a limited period, the Atari 520 STM is even more of a knockout than usual.

We're offering it for just £449.95 (inc. VAT) complete with SF354 disk drive, SM125 mono monitor,* a mouse worth £24.95 and 1st Word, worth £49.95.

So as well as saving you from the enemy, the 520 STM will also save you £184.

You'd better hurry though, because it won't be long before our stocks are wiped out.

ATARI 520 STM
WORKS HARD · PLAYS HARD

*Offer includes mono monitor. The 520STM plugs into a standard colour T.V.

◀ continued from page 20

a test to see if certain bits are set within a byte. This is where the processor condition flags come in handy. The zero or Z flag is set (to one) when the result of an operation is zero, and reset (to zero) when the result is non-zero, eg to find if a byte has bit 2 set AND with 4 and branch, jump, call on whatever the Z flag says. In 6502 this would be:

```
AND #2     ;test bit 4 note that bits are
           numbered b7b6b5b4b3b2b1b0
BEQ label  ;branch somewhere if the re-
           sult is zero ie Z=1
```

The carry flag

Addition and subtraction are just as easy and the use of the carry flag allows numbers to be as large as necessary. Some processors have simple add commands that ignore the current status of the carry, others, like the 6502, use the carry all the time.

The carry flag is set to one when the number in the accumulator is to big to fit, ie, it is more than 8 bits. The ninth bit is stored in the carry.

Higher byte

So adding 253 and 12 produces 265 – in binary:

```
11111101  253 or FD in hex
00001100  12 or OC in hex
00001001  which gives 9 plus the carry
          set – here C=2^8 or 256
```

To represent this as a two byte number between 0 and 65535 just add 0 and the carry into the higher byte (presuming its zero) giving:

0000000100001001 or 265 (0109 in hex)

The use of extra bytes is known as multiple precision and allows processors to manipulate very very large numbers. For instance, a 4 byte number (32 bits) allows values in the range $0–2^{32}–1$ (bigger than my calculator will represent correctly). So a 2 byte multiple precision add in 6502 is:

```
n1 .DS 2          ;DS is the define space
                  command
n2 .DS 2          ;the 4 following it sets
                  aside 4 bytes
r .DS  2          ;32 bit numbers are
                  placed in n1 and n2
ADD2  LDA n1      ;get least significant
                  byte (LSBt)
      CLC         ;set carry flag to zero
      ADC n2      ;add LSBt of n2 plus the
                  carry (=0 now)
      STA r       ;put the result of the
                  add in LSBt of r
      LDA n1+1    ;get next byte of n1
      ADC n2+1    ;add next byte of n2
                  plus carry
      STA r+1     ;store this
      RTS         ;return to main program
```

In this routine, the carry flag is initially set to zero, since the 6502 add command always adds the two values plus the carry (as one or zero).

Immense numbers

At the second add, adding the carry is good since it automatically works out results over 256 from the previous add. The above example can be extended as far as you like to cope with truly immense numbers.

The Z80 version is:

```
n1 .DS 2  ;set aside memory space for the
          numbers
n2 .D2 2
r .DS 2
ADD2  LD HL,n1    ;address of LSBt n1
                  into HL
      LD A,(n2)   ;LSBt of n2 into
                  Accumulator
      ADD A,(HL)  ;Add the LSBt on n1
                  using address in HL
      LD (r),A    ;Store LSBt result at
                  r
      INC HL      ;HL points to next
                  byte of n1
      LD A,(n2+1) ;gei next byte of n2
                  to A
      ADC A,(HL)  ;Add n1 plus carry
      LD (r+1),A  ;store at r+1
      RET         ;end
```

This is as close to the 6502 method as possible. In fact it is easier to use the 16 bit register pairs on the Z80 to provide the neater method:

```
ADD2  LD HL,(n1)  ;Get two byte num-
                  ber n1 to HL
      LD BC,(n2)  ;same for n2 into BC
      ADD HL,BC   ;16 bit addition ig-
                  nore carry
      LD (r),HL   ;store result (HL) at
                  two bytes starting
                  at r
      RET         ;end
```

"The thing to remember when programming different processors is to have a good look through their manuals beforehand"

This is shorter and hence faster. For multiple precision, the Z80 is better moving up in double bytes or words (16 bits) since there is an ADC HL,rp (where rp is a register pair BC DE, etc). The thing to remember when programming different processors is to have a good look through their manuals beforehand. Some things are easier, some are harder but they can always be done.

Kenn Garroch continues this series next week.

Binary and hex

Binary is a method of representing numbers to base two. Normal decimal numbers are to base ten and work as:
123 is $(1*100)+(2*10)+(3*1)$ or $(1*10^2)+(2*10^1)+(3*10^0)$
and each digit is one of ten symbols ie 0123456789.

Similarly, binary is to base two so:
1011 is $(1*8)+(0*4)+(1*2)+(1*1)$ or $(1*2^3)+(0*2^2)+(1*2^1)+(1*2^0)$
and each digit can be one of two symbols, ie 01

Hexadecimal is to base 16 so:
A32F is $(10^84096)+(3*256)+(2*16)+(15*1)$ or $(10*16^3)+(3*16^2)+(2*16^1)+(15*16^0)$
Here there are 16 symbols needed for each digit so A–F are used for the extra 6 ie 0123456789ABCDEF

The other number system sometimes used with computers is octal which is to base 8 so:
3172 is $(3*512)+(1*64)+(7*8)+(2*1)$ or $(3*8^3)+(1*8^2)+(7*8^1)+(2*8^0)$
and the symbols for each digit are 01234567

BCD (Binary Coded Decimal) is a method of coding decimals so that they fit, two to a byte. This is straightforward since 0–9 fits within 4 bits (0–15). The processor automatically performs the carry from the low nibble to the high nibble after a BCD operation that produces more than 9. For example 12 in BCD is represented as;
00010010 binary = 00010010 or 12
Adding 9 in BCD mode gives

```
 00010010 12
+00001001  9
=00100001 21
```

Playing the numbers game

Khandal 2

Ian Grainger

Khandal returns in the sequel to Khandal, called *Khandal 2* staggeringly enough. Okay, this is going to be a two listing, four week effort so get your camping bags out now.

The plot: After collecting the scroll of eternal life in *Khandal 1* and reciting the spell, Khandal himself was teleported to a parallel universe called Kluto because of a coffee stain on the parchment. Your task now is to collect the teleport pass and present it to the teleport officer.

```
10 REM Khandal II (return of a legend)
20 REM Written by Ian Grainger
30 REM Copyright 1987
40 :
50 CLEAR:SYMBOL AFTER 32
60 MEMORY &7FFF:LOAD "!data",&9000
70 GOSUB 1650
80 GOSUB 1740
90 GOSUB 940
100 GOSUB 1990:oni=-1
110 WHILE 1=1
120 GOSUB 1070:LOCATE 1,12:PRINT STRING$
(25,32):LOCATE 1,13:PRINT STRING$(25,32)
:icn=13:pa=3:col=1:GOSUB 3440
130 room=12:dir=1:anim=1:wlk=1:carry=0
140 icon=0:scr=&C1AC:dat=&921B
150 lum=0:heat=0:door=0:shad=0:dead=0
160 starv=100:score=0
170 WHILE dead=0
180 REM Main Loop
190 CLS#2:fst=0:exit=0:starv=starv-1:GOS
UB 2770
200 PAPER 0:PEN 1:LOCATE 9,10:PRINT STRI
NG$(12,131)
210 left=VAL(LEFT$(rm$(room),1))
220 right=VAL(RIGHT$(rm$(room),1))
230 up=VAL(MID$(rm$(room),2,2))
240 down=VAL(MID$(rm$(room),4,2))
250 IF up+down THEN GOSUB 810
260 PAPER 0:PEN 1
270 IF left THEN LOCATE 6,10:PRINT STRIN
G$(3,131)
280 IF right THEN LOCATE 21,10:PRINT STR
ING$(3,131)
290 GOSUB 2770
300 lscr=&C000:IF left=0 THEN lscr=&C1A0
310 rscr=&FFFF:IF right=0 THEN rscr=&C1B
3
320 GOSUB 2770
330 ctr=0:FOR f=1 TO 5
340 IF ch((f-1)*5+3)=room THEN ctr=f:CAL
L &8000,ch((ctr-1)*5+1),ch((ctr-1)*5+4),
ch((ctr-1)*5+5),ch((ctr-1)*5+2)
350 NEXT
360 GOSUB 2770
370 GOSUB 720
380 obj=obrm(room)
390 IF obj>0 AND obj<100 THEN col=3:GOSU
B 3390
400 IF starv=98 THEN mess$="khandal is v
ery strong and healthy.":CLS#1:GOSUB 261
0
410 IF starv=50 THEN mess$="you are very
 strong.":CLS#1:GOSUB 2610
420 IF starv=70 THEN mess$="khandal is g
etting weak.":CLS#1:GOSUB 2610
430 IF starv<60 THEN mess$="khandal is e
xhausted.":CLS#1:GOSUB 2610:dead=1
440 IF dead=1 THEN exit=1
450 IF room=7 AND shad=0 THEN CLS#1:dead
=1:mess$="ahh glasshopper, the light is
 so blite in here. khandal's eyes have be
en burned out, and he has died of pain."
:GOSUB 2610
460 IF room=16 AND lum=0 THEN CLS#1:dead
=1:mess$="you silly billy! it is too dar
k to see a thing. you reach for a light
switch but put your finger into a 100 00
0V power supply. you die in e/vi seconds
!":GOSUB 2610
470 IF room=19 AND heat=0 THEN CLS#1:dea
d=1:mess$="brr...f..f..f..freezing in he
re. arghh, you have frozen to a space ag
e snowman.":GOSUB 2610
480 WHILE exit=0
490 REM Keyboard Scan
500 press=0
510 IF INKEY(34)<>-1 AND scr>lscr THEN G
OSUB 780:scr=scr-2:dat=spwk(2,anim):anim
=anim+wlk:GOSUB 720:press=1:GOSUB 2770
520 IF INKEY(27)<>-1 AND scr<rscr AND pr
ess=0 THEN GOSUB 780:scr=scr+2:dat=spwk(
1,anim):anim=anim+wlk:GOSUB 720:press=1:
GOSUB 2770
530 IF anim<1 OR anim>3 THEN wlk=-wlk:an
im=2
540 IF press=0 THEN GOSUB 2770
550 IF INKEY(67)<>-1 AND oni=1 AND icon>
0 THEN icon=icon-1
560 IF INKEY(69)<>-1 AND oni=1 AND icon<
3 THEN icon=icon+1
570 IF icon=3 AND carry=0 THEN icon=2
580 IF scr<&C19B THEN GOSUB 780:room=roo
m-1:exit=1:scr=&C1B9
590 IF scr>&C1B9 THEN GOSUB 780:room=roo
m+1:exit=1:scr=&C19B
600 IF INKEY(47)<>-1 THEN ON (icon+1) GO
SUB 2860,2950,3130,3290
610 IF INKEY(18)<>-1 AND up+down>0 AND s
cr>&C1A8 AND scr<&C1AC THEN GOSUB 3470
620 IF dead=1 THEN exit=1
630 WEND
640 WEND
650 IF magic=1 THEN CLS#1:mess$="magic k
night pushes a button in the floor and y
ou are sent off to your home in milton k
eynes.":GOSUB 2610:GOSUB 1870
660 mess$="you scored "+STR$(score)+"%":
GOSUB 2610
670 mess$="press space to play":GOSUB 26
10
680 WHILE INKEY(47)=-1:GOSUB 2770:WEND:C
LS#1
690 IF oni=-1 THEN GOSUB 2770
700 oni=1:WEND
710 END
720 REM Print Sprite
730 POKE &803D,&7E:POKE &803F,&12
740 CALL &8000,scr,4,32,&96B0
750 POKE &803D,&1A:POKE &803F,&FF
760 CALL &8000,scr,4,32,dat
770 RETURN
780 REM Remove Sprite
790 CALL &8000,scr,4,32,&96B0
800 RETURN
810 REM Print door
820 GOSUB 2770
830 PAPER 0:PEN 1:LOCATE 13,5
840 PRINT CHR$(176)STRING$(2,177)CHR$(17
8)
850 FOR f=1 TO 3
860 LOCATE 13,f+5
870 PRINT CHR$(179)STRING$(2,32)CHR$(179
+f)
880 NEXT
890 LOCATE 13,9
900 PRINT CHR$(183)STRING$(2,32)CHR$(184
)
910 IF up=1 OR down=1 THEN FOR f=1 TO 4:
LOCATE 14,f+5:PRINT STRING$(2,143):NEXT
920 GOSUB 2770
930 RETURN
940 REM Initialise
950 ENV 1,1,15,2,5,-3,4
960 ENV 2,1,15,1,4,-2,2,7,-1,4
970 ENV 3,1,15,1,15,-1,2
980 ENV 4,7,2,1,14,-1,4
990 ENV 5,7,-1,1
1000 ENV 6,5,2,1
1010 ENV 7,15,-1,5
1020 ENV 8,50,-1,40
1030 ENT 1,1,-100,1,5,25,3
1040 ENT 2,1,-75,1,4,25,3
1050 DIM in(9,4),tune(2,249),ic(12),ob$(
3,12),ch(25),rm$(25),obrm(25),spwk(2,3)
1060 :
1070 REM Renew all variables
1080 RESTORE 3530
```

continued on page 24 ▶

◀ continued from page 23

```
1090 FOR f=1 TO 9
1100 FOR n=1 TO 4
1110 READ in(f,n)
1120 NEXT n,f
1130 RESTORE 3730
1140 FOR f=1 TO 2
1150 FOR n=1 TO 249
1160 READ tune(f,n)
1170 NEXT n,f
1180 RESTORE 4990
1190 FOR f=1 TO 12
1200 READ ic(f)
1210 NEXT
1220 RESTORE 4680
1230 FOR f=1 TO 3
1240 FOR n=1 TO 12
1250 READ ob$(f,n)
1260 NEXT n,f
1270 RESTORE 5020
1280 FOR f=1 TO 25
1290 READ ch(f)
1300 NEXT
1310 RESTORE 5050
1320 FOR f=1 TO 25
1330 READ a
1340 rm$(f)=BIN$(a,6)
1350 NEXT
1360 RESTORE 5080
1370 FOR f=1 TO 25
1380 READ obrm(f)
1390 NEXT
1400 RESTORE 5110
1410 FOR f=1 TO 2
1420 FOR n=1 TO 3
1430 READ spwk(f,n)
1440 NEXT n,f
1450 RESTORE 5150
1460 FOR f=1 TO 5
1470 READ ch$(f)
1480 NEXT
1490 RETURN
1500 REM Play away!
1510 REM channel 1 (melody)
1520 en=5:IF tune(1,note)=0 THEN en=0
1530 SOUND 49,tune(1,note)*2+1,20,0,en
1540 REM channel 2 (drums)
1550 d=tune(2,note)
1560 SOUND 42,in(d,1),10,0,in(d,2),in(d,
3),in(d,4)
1570 REM channel 3 (backing)
1580 en=6:IF tune(1,note)=0 THEN en=0
1590 SOUND 28,tune(1,note),10,0,en
1600 SOUND 4,tune(1,note)*efct,10,0,en
1610 note=note+1
1620 IF note=250 THEN note=1:efct=(efct+
1) MOD 3
1630 RETURN
1640 REM Machine code loader
1650 RESTORE 3590:add=&8000:li=3600
1660 FOR f=1 TO 12:READ a$:c=0
1670 FOR n=1 TO LEN(a$) STEP 2
1680 b$=MID$(a$,n,2):c=c+VAL("&"+b$)
1690 POKE add,VAL("&"+b$):add=add+1
1700 NEXT:READ a$
1710 IF c<>VAL("&"+a$) THEN PRINT"DATA E
RROR in line";li:PRINT CHR$(7):END
1720 li=li+10:NEXT
1730 RETURN
1740 REM Get new character set
1750 RESTORE 4340
1760 s=48:l=10:GOSUB 1820
1770 s=65:l=26:GOSUB 1820
1780 s=240:l=12:GOSUB 1820
1790 s=186:l=52:GOSUB 1820
1800 s=176:l=9:GOSUB 1820
1810 RETURN
1820 FOR ch=s TO (s+l)-1
1830 READ a,b,c,d,e,f,g,h
1840 SYMBOL ch,a,b,c,d,e,f,g,h
1850 NEXT
1860 RETURN
1870 REM Finish game
1880 FOR f=1 TO 300
1890 da=INT(RND*1000)
1900 CALL &8000,scr,4,32,&9000+da
1910 NEXT
1920 CALL &8000,scr,4,32,&921B
1930 FOR f=1 TO 32
1940 CALL &8000,scr,4,f,&7000
1950 NEXT
1960 CLS#1
```


Popular Election

Duncan Evans

More of the listing in a minute. First the rest of the instructions.

Defence:
1 – Unilateral disarmament.
2 – Multi-lateral disarmament.
3 – Keep Polaris, scrap Trident.
4 – Scrap Polaris, order Trident.

Health:
1 – Ban private medicine altogether.
2 – Large increase in NHS spending.
3 – Moderate funding for NHS.
4 – Make cutbacks and save money.
5 – Demolish NHS. Private clinics only.

A party's standing in the polls is based on the populations like or dislike of their policies and also the level of goodwill felt towards the party. This figure starts out at 50, sort of average. It can plummet to –100 which means the populace hate your guts personally, and soar to 150 which means they love you. Many of the incidents on the board affect this rating, especially owning newspapers and appearing on TV.

If you're paying attention you'll realise that there's a slight overlap between listings two and one. Listing two is the right one where these clashes occur. There are also a couple of bugs about but I'll have the corrections ready by the time we get to the last piece of code, which should be next week. See you then.

```
1000>LET week=0:LET part
y=1
1050 FOR z=1 TO 3
1100 GO SUB panel: GO SUB dicey
1110 PRINT AT 10,7;"You rolled ";dice
1120 GO SUB 8000+(b(party)*10)
1125 INK 0
1130 LET b(party)=b(party)+dice: IF b(pa
rty)>16 THEN  LET b(party)=1
1140 IF b(party)>6 THEN  GO TO 1190
1150 PRINT AT 17,b(party)*5-4;
1190 IF b(party)<7 OR b(party)>8 THEN  G
O TO 1210
1200 IF b(party)=8 THEN  PRINT AT 5,26;
1205 IF b(party)=7 THEN  PRINT AT 11,26;
1210 IF b(party)<9 OR b(party)>14 THEN
GO TO 1230
1220 PRINT AT 0,71-(b(party)*5);
1230 IF b(party)=15 THEN  PRINT AT 5,1;
1240 IF b(party)=16 THEN  PRINT AT 11,1;
1250 IF party=1 THEN  PRINT  PAPER 1; IN
K 7; FLASH 1;"TORY"
1260 IF party=2 THEN  PRINT  PAPER 2; IN
K 6; FLASH 1;"LAB"
1270 IF party=3 THEN  PRINT  FLASH 1; PA
PER 6; INK 2;"ALL"
1290 PAUSE 25: GO SUB panel
1300 REM  GO SUB 16 board sectors
1310 GO SUB 3000+(b(party)*100)
1320 PAUSE 150: BEEP .2,3
1330 LET party=party+1
1340 IF party<4 THEN  GO TO 1100
1350 LET party=1: GO SUB poll: NEXT z
1360 LET week=week+1
1370 LET party=4: GO SUB panel
1380 PRINT AT 9,6;"In week ";week;" :"
1390 PRINT AT 10,6;"Tories   ";toryp;"%"
1400 PRINT AT 11,6;"Labour   ";labp;"%"
1410 PRINT AT 12,6;"Alliance ";allp;"%"
1420 PRINT AT 15,6;"Press any key"
1430 LET a$=INKEY$: IF a$="" THEN  GO TO
 1430
1440 LET party=1: IF week<6 THEN  GO TO
1050
1490 REM ELECTION TIME !
```

```
1500 PAPER 3: CLS : BORDER 0: INK 7
1510 PAPER 0: FOR f=1 TO 20: PRINT AT f,
1;"                         ": NEXT f
1520 PRINT AT 20,23; PAPER 5; INK 0;"
     ";AT 21,23; PAPER 1;"   "; PAPER 2
;"   "; PAPER 6;"   "
1530 PRINT AT 1,1; FLASH 1;"   ELECTION
 NIGHT   ": FOR f=0 TO 19: PRINT AT f,23
;"          ": NEXT f
1540 LET seat=650
1545 PRINT AT 4,1;"VOTES CAST -";AT 6,1;
"CONSERVATIVE ";AT 8,1;"LABOUR";AT 10,1;
"ALLIANCE"
1550 LET tory=0: LET lab=0: LET all=0
1560 IF RND*100<toryp AND seat>0 THEN  L
ET seat=seat-1: LET tory=tory+1
1570 IF RND*100<labp AND seat>0 THEN  LE
T seat=seat-1: LET lab=lab+1
1580 IF RND*100<allp AND seat>0 THEN  LE
T seat=seat-1: LET all=all+1
1600 LET count=INT (tory/32.5)
1610 FOR f=19 TO (19-count) STEP -1: PRI
NT AT f,23; PAPER 1;"   ": NEXT f: PRINT
 AT 20,23; PAPER 5; INK 0;INT (100*tory/
650);"%"
1620 LET count=INT (lab/32.5)
1630 FOR f=19 TO (19-count) STEP -1: PRI
NT AT f,26; PAPER 2;"   ": NEXT f: PRINT
 AT 20,26; PAPER 5; INK 0;INT (100*lab/6
50);"%"
1640 LET count=INT (all/32.5)
1650 FOR f=19 TO (19-count) STEP -1: PRI
NT AT f,29; PAPER 6;"   ": NEXT f: PRINT
 AT 20,29; PAPER 5; INK 0;INT (100*all/6
50);"%"
1660 PRINT AT 6,14;tory;AT 8,14;lab;AT 1
0,14;all
1670 IF seat>0 THEN  GO TO 1560
1680 IF tory>lab AND tory>all THEN  PRIN
T AT 16,1; PAPER 1; INK 6; FLASH 1;"CONS
ERVATIVE VICTORY ": STOP
1690 IF lab>tory AND lab>all THEN  PRINT
 AT 16,1; PAPER 2; INK 6; FLASH 1;"A LAB
OUR VICTORY !!!!": STOP
1700 PRINT AT 16,1; PAPER 6; INK 2; FLAS
H 1;"AN ALLIANCE VICTORY !": STOP
1750 REM dicey
1760 LET dice=INT (RND*6+1): RETURN
1765 REM pcheck
1770 FOR y=1 TO 3: IF p(y)<-100 THEN  LE
T p(y)=-100
1780 IF p(y)>150 THEN  LET p(y)=150
1790 NEXT y: RETURN
1800 REM Data for cd
1801 DATA 45
1802 DATA 25
1803 DATA 15
1804 DATA 10
1805 DATA 5
1811 DATA 55
1812 DATA 30
1813 DATA 15
1821 DATA 50
1822 DATA 30
1823 DATA 15
1824 DATA 5
1831 DATA 45
1832 DATA 25
1833 DATA 15
1834 DATA 10
1835 DATA 5
1900 REM gosub get
1910 LET a$=INKEY$: IF a$<"1" OR a$>"5"
THEN  GO TO 1910
1920 LET a=VAL a$: RETURN
2000 REM Poll display
2010 PAPER 7: INK 0: FOR f=6 TO 15: PRIN
T AT f,21;"   ": NEXT f
2020 LET tory=u(e(1))+n(c(1))+f(d(1))+p(
1)
2030 LET lab=u(e(2))+n(c(2))+f(d(2))+p(2
)
2040 LET all=u(e(3))+n(c(3))+f(d(3))+p(3
)
2050 LET toryp=INT (tory*100/(tory+lab+a
ll))
2060 LET labp=INT (lab*100/(tory+lab+all
))
2070 LET allp=INT (all*100/(tory+lab+all
))
2080 LET count=INT (toryp/10)
2090 FOR f=15 TO (15-count) STEP -1: PRI
NT AT f,21; PAPER 1;" ": NEXT f
2100 LET count=INT (labp/10)
2110 FOR f=15 TO (15-count) STEP -1: PRI
NT AT f,22; PAPER 2;" ": NEXT f
2120 LET count=INT (allp/10)
2130 FOR f=15 TO (15-count) STEP -1: PRI
NT AT f,23; PAPER 6;" ": NEXT f
2140 RETURN
3000 REM Board options and decisions
3100 LET m(party)=m(party)+15
3110 PRINT AT 9,6;"You're at";AT 10,6;"C
entral Office";AT 12,6;"15k goes into";A
T 13,6;"election fund"
3120 RETURN
3200 PRINT AT 8,6;"Do you want to";AT 9,
6;"spend #5k on";10,6;"personal PR ?"
3210 IF g(party)=0 THEN  GO TO 3240
3220 LET a$=INKEY$: IF a$<>"y" AND a$<>"
n" THEN  GO TO 3220
3230 IF a$="n" THEN  PRINT AT 12,9;"NO !
": RETURN
3240 PRINT AT 12,9;"YES !": PAUSE 25
3250 IF m(party)<5 THEN  PRINT AT 14,6;"
NOT ENOUGH";AT 15,6;"MONEY !": RETURN
3260 LET m(party)=m(party)-5
3270 LET p(party)=p(party)+5+INT (RND*6)
3280 GO SUB pcheck: RETURN
3300 PRINT AT 10,6;"Sunday respite";AT 1
2,6;"No exposure": RETURN
3400 PRINT  FLASH 1;AT 8,6;"!! DISASTER
!!"
3410 PRINT AT 10,6;"Party Chairman";AT 1
1,6;"gay affair";AT 12,6;"shock horror"
3420 LET p(party)=p(party)-30-INT (RND*1
5)
3430 GO SUB pcheck: RETURN
3500 PRINT AT 8,6;"Discover what";AT 9,6
;"the nation";AT 10,6;"favours in -"
3510 PRINT AT 12,6;"(1) Education";AT 13
,6;"(2) Economy";AT 14,6;"(3) Defense";A
T 15,6;"(4) Health"
3515 IF g(party)=0 THEN  GO TO 3570
3520 LET a$=INKEY$: IF a$<"1" OR a$>"4"
THEN  GO TO 3520
3525 GO SUB panel: IF a$>"1" THEN  GO TO
 3540
3530 PRINT AT 9,6;"Massive  - ";u(1);"%"
;AT 10,6;"Large    - ";u(2);"%";AT 11,6;
"Moderate - ";u(3);"%";AT 12,6;"Small
 - ";u(4);"%";AT 13,6;"Squeeze  - ";u(5)
;"%"
3540 IF a$<>"2" THEN  GO TO 3550
3545 PRINT AT 9,6;"Huge     - ";n(1);"%"
;AT 10,6;"Moderate - ";n(2);"%";AT 11,6;
"Stringent- ";n(3);"%"
3550 IF a$<>"3" THEN  GO TO 3560
3555 PRINT AT 9,6;"Unilat   - ";f(1);"%"
;AT 10,6;"Multilat - ";f(2);"%";AT 11,6;
"Polaris  - ";f(3);"%";AT 12,6;"Trident
 - ";f(4);"%"
3560 IF a$<>"4" THEN  GO TO 3570
3565 PRINT AT 9,6;"All NHS   - ";l(1);"%
";AT 10,6;"Large NHS - ";l(2);"%";AT 11,
6;"Modrt NHS - ";l(3);"%";AT 12,6;"Cut N
HS   - ";l(4);"%";AT 13,6;"No NHS    - "
;l(5);"%"
3570 BEEP 1,3: RETURN
3600 PRINT AT 10,6;"A mysterious";AT 11,
6;"benfactor";AT 12,6;"gives #30K !"
3610 LET m(party)=m(party)+30: RETURN
3700 PRINT AT 9,6;"How much money";AT 10
,6;"to spend on";AT 11,6;"canvassing ?"
3710 IF m(party)<5 THEN  PRINT AT 12,8;"
NONE !": RETURN
3720 IF g(party)=1 THEN  INPUT "#";a: IF
 a>m(party) THEN  LET a=m(party)
3730 IF g(party)=0 THEN  LET a=INT (m(pa
rty)/2)
3740 LET m(party)=m(party)-a
3750 LET p(party)=p(party)+INT (RND*1.5*
a): GO SUB pcheck: RETURN
3800 PRINT AT 9,6;"TV Debate !";AT 10,6;
"Do you attend?"
3810 IF g(party)=0 THEN  GO TO 3830
3820 LET a$=INKEY$: IF a$<>"y" AND a$<>"
n" THEN  GO TO 3820
3825 IF a$="n" THEN  PRINT AT 12,10;"NO"
: RETURN
3830 BEEP .2,5: BEEP .3,15: BEEP .2,9: L
ET a=INT (RND*3)+1
3840 IF a=1 THEN  PRINT AT 12,6;"TORY WI
N !": LET p(1)=p(1)+10: LET p(2)=p(2)-5:
 LET p(3)=p(3)-5
3850 IF a=2 THEN  PRINT AT 12,6;"LABOUR
WIN !": LET p(2)=p(2)+10: LET p(1)=p(1)-
5: LET p(3)=p(3)-5
3860 IF a=3 THEN  PRINT AT 12,6;"ALLIANC
E WIN !": LET p(3)=p(3)+10: LET p(1)=p(1
)-5: LET p(2)=p(2)-5
3870 GO SUB pcheck: RETURN
3900 PRINT AT 9,6;"Good write ups";AT 10
,6;"in the press"
3910 LET p(party)=p(party)+INT (RND*12):
 GO SUB pcheck: RETURN
```

PROGRAMMING: QL

Font Designer

Steve Turner

This week features the second half of Steve Turner's Font Designer program. All the instructions were given in last week's issue but if you missed out, back orders can be ordered through Ann Marie Allan at the *Popular* offices, 12–13 Little Newport Street, London WC2H 7PP.

```
1250 pos=10:FOR x=3 TO 0 STEP -1
1260 FOR y=1 TO 0 STEP -1
1270 CSIZE #3,x,y:CURSOR #3,pos,100:PRINT #3;CHR$(cde);
1280 pos=pos+20
1290 END FOR y:END FOR x
1300 END DEFine
1310 :
1320 :
1330 REMark * DRAW A BOX (CURSOR) IN THE GRID
1340 DEFine PROCedure box
1350 OVER -1:BLOCK 8,8,xpos,ypos,7:OVER 0:cond=cond^^255
1360 END DEFine
1370 :
1380 :
1390 REMark * PRINT CHARACTER ON SCREEN IN A POSITION DEFINED BY IT'S CODE
1400 DEFine PROCedure p_char (x)
1410 lne=INT((x-32)/18):col=((x-32)-(lne*18))*24:lne=lne*10:CURSOR #3,col,lne:
PRINT #3;CHR$(x):CSIZE #3,2,0:CURSOR #3,col+9,lne:PRINT #3;CHR$(x):CSIZE#3,0,0
1420 END DEFine
1430 :
1440 :
1450 REMark * FIND VALUE OF EXISTING BYTE IN FONT FROM CODE OF CHAR.
1460 DEFine FuNction VAL_
1470 IF cde>127 THEN cpos=(cde-128)*9:cpos=cpos+char_start+911:ELSE cpos=(cde-
32)*9:cpos=cpos+char_start+11
1480 temp=2^(7-(xpos/8)):RETurn PEEK((cpos+(ypos/8)))
1490 END DEFine
1500 :
1510 :
1520 REMark * DRAW CHARACTER GRID
1530 DEFine PROCedure grid
1540 CLS
1550 FOR x=8 TO 63 STEP 8:BLOCK 1,72,x,1,4
1560 FOR y=8 TO 71 STEP 8:BLOCK 63,1,1,y,4
1570 END DEFine
1580 :
1590 :
1600 REMark * LOAD EXISTING FONT IF NECESSARY
1610 DEFine PROCedure OLD
1620 CSIZE #2,3,0:CLS#2
1630 INPUT #2;\'Load an existing set ?    {Y/N} ';a$
1640 IF a$='' THEN GO TO 1630 :ELSE in=CODE(a$)
1650 SELect ON in
1660 =89,121
1670 CLS#2:INPUT #2;\' Enter Device_Filename     ';a$
1680 LBYTES a$,char_start
1690 =78,110
1700 FOR x=char_start TO char_start+1996 STEP 4:POKE_L x,0
1710 =REMAINDER
1720 GO TO 1620
1730 END SELect
```

```
1740 CSIZE #2,0,0:CLS#2
1750 END DEFine
1760 :
1770 :
1780 REMark ******************************************************
1790 REMark *              STANDARD UTILITY SET                    *
1800 REMark ******************************************************
1810 REMark * MAKE 'LOADed' PROG AUTORUN
1820 DEFine PROCedure autorun
1830 LOCal a$,B$:start:PRINT\\'PROGRAM AUTO RUNNER'\\
1840 INPUT 'ENTER'!'THE'!'COMPLETE'!'FILENAME'!'OF'!'THE'!'PROGRAM'!a$
1850 OPEN #15,a$
1860 REPeat ALOOP
1870 IF EOF(#15) THEN EXIT ALOOP
1880 B$=INKEY$(#15):PRINT #2,B$;
1890 END REPeat ALOOP
1900 PRINT #15,'RUN':CLOSE #15:CLS:CLS#2:CLS#0:PRINT #0,'AUTORUN COMPLETE'
1910 END DEFine
1920 :
1930 :
1940 REMark * DEFAULT SCREEN FOR PROG DEVELOPMENT
1950 DEFine PROCedure start
1960 MODE 4
1970 OPEN #3,scr_512x256a0x0:PAPER #3,0:CLS #3
1980 CLOSE #3
1990 WINDOW #1,235,256-48,20,0:colour (1)
2000 WINDOW #2,235,256-48,256,0:colour(2)
2010 WINDOW #0,470,48,20,256-48:colour(0)
2020 CLS #0
2030 END DEFine start
2040 :
2050 :
2060 REMark * SET BLACK WINDOW AND RED BORDER
2070 DEFine PROCedure colour(chan)
2080 PAPER #chan,0
2090 INK #chan,7
2100 BORDER #chan,1,2
2110 END DEFine
2120 :
2130 :
2140 REMark * SAVE TO M'DRIVE 1 OR 2
2150 DEFine PROCedure totape
2160 LOCal a$,a1$,a2$
2170 start:FLASH 1:PRINT:PRINT 'Drive 1 or 2?'
2180 FLASH 0
2190 INPUT \a$:CLS:PRINT 'DRIVE ';a$\\"Prog name?":INPUT \a1$:
2200 IF a$<>'1' AND a$<>'2' THEN GO TO 2150
2210 CLS
2220 a2$="mdv"&a$&"_"&a1$
2230 DELETE a2$:SAVE a2$
2240 END DEFine totape
```

PROGRAMMING: C64

Micromon

P A Fairclough

At last, the concluding instalment of Micromon, the machine code monitor/utility. There follows a chart giving some of the more interesting address locations used.

Useful address locations.

Address	Function.
$0002	Program counter lo.
$0003	Program counter hi.
$0004	Status Register.
$0005	Accumulator.
$0006	X register.
$0007	Y register.
$0008	Stack Pointer.
$0009 - $0046	General Purpose locations.
$C000	Monitor entry point.
$C045	BRK handler routine.
$C097	Routine to get a command.
$C0E2	Routine to output a carriage return.
$C0E7	Routine to output a character.
$C166	Routine to display one of the messages.
$C19C	Compare/Transfer routine.
$C239	Fill routine.
$C278	Hunt routine.
$C2D0	Disassemble routine.
$C311	Disassemble a single address.
$C3FE	Interpret routine.
$C420	Interpret address.
$C442	Interpret character - converts it to a displayable form.
$C46C	Memory input.
$C48B	Character memory input.
$C4C9	Assemble routine (the big one).
$C63B	Breakpoint routine.
$C658	Routine to handle J command in Walk.
$C676	NMI handler. Used by Go, Quick and Walk.
$C722	Quick routine.
$C726	Walk routine.
$C72a	Go routine.
$C7B3	Number routine.
$C842	Out routine.
$C855	Print routine.
$C93C	Kill breakpoint routine.
$C94D	Display registers routine.
$C972	Output a binary number.
$C985	Change registers routine.
$C9FB	IRQ handler.
$CA1C	Check for instant commands.
$CBA6	Scrolls the screen down by one line.
$CCFC	Exchange bases routine.
$CDBC	Tape handler routine (Save, Load & Verify).
$CFB6 - $CFFF	Vectors to text, IRQ, BRK and NMI.

```
10467 DATA08,40,09,10,22,44,33,D0,458
10468 DATA08,40,09,62,13,78,A9,00,487
10469 DATA21,81,82,00,00,59,4D,91,603
10470 DATA92,86,4A,85,9D,2C,29,2C,773
10471 DATA23,28,24,59,00,58,24,24,360
10472 DATA00,1C,8A,1C,23,5D,8B,1B,488
10473 DATAA1,9D,8A,1D,23,9D,8B,1D,845
10474 DATAA1,00,29,19,AE,69,A8,19,699
```

```
10475 DATA23,24,53,1B,23,24,53,19,360
10476 DATAA1,00,1A,5B,5B,A5,69,24,675
10477 DATA24,AE,AE,A8,AD,29,00,7C,890
10478 DATA00,15,9C,6D,9C,A5,69,29,753
10479 DATA53,84,13,34,11,A5,69,23,608
10480 DATAA0,D8,62,5A,48,26,62,94,920
10481 DATA88,54,44,C8,54,68,44,E8,976
10482 DATA94,00,B4,08,84,74,B4,28,804
```

```
10483 DATA6E,74,F4,CC,4A,72,F2,A4,1268
10484 DATA8A,00,AA,A2,A2,74,74,74,980
10485 DATA72,44,68,B2,32,B2,00,22,726
10486 DATA00,1A,1A,26,26,72,72,88,492
10487 DATAC8,C4,CA,26,48,44,44,A2,1006
10488 DATAC8,0D,0D,48,45,58,20,3D,548
10489 DATA20,24,0D,44,45,43,20,3D,378
10490 DATA20,0D,42,49,4E,20,3D,20,387
10491 DATA25,0D,43,48,52,20,3D,20,396
10492 DATA22,0D,20,20,20,50,43,20,322
10493 DATA20,4E,56,2D,42,44,49,5A,538
10494 DATA43,20,41,43,20,58,52,20,465
10495 DATA59,52,20,53,50,0D,4D,49,529
10496 DATA43,52,4F,4D,4F,4E,20,56,580
10497 DATA33,20,28,43,29,20,27,38,358
10498 DATA37,20,50,41,46,0D,09,07,331
10499 DATA08,08,1D,18,41,42,43,44,335
10500 DATA45,46,47,48,49,4B,4C,4D,583
10501 DATA4E,4F,50,51,52,53,54,56,653
10502 DATA57,58,2C,3A,3B,27,C9,C4,772
10503 DATA3B,C6,9C,C1,D0,C2,FC,CC,1464
10504 DATA39,C2,2A,C7,58,C2,FE,C3,1223
10505 DATA3C,C9,BC,CD,FE,C3,B3,C7,1481
10506 DATA42,C8,55,C8,22,C7,4D,C9,1062
10507 DATABC,CD,9C,C1,BC,CD,26,C7,1372
10508 DATAC1,C9,C9,C4,6C,C4,85,C9,1429
10509 DATA8B,C4,FB,C9,76,C6,45,C0,1364
10510 DATA1C,CA,58,C6,41,CF,4A,CF,1069
10511 DATA51,CF,59,CF,61,CF,7E,CF,1221

READY.
```


VLabel

David Gristwood

When a disc is first formatted an optional label consisting of eleven characters, can be written to the disc. This name is that one which appears when Show Info is used from the desktop.

The problem is that once a disc has been formatted you cannot change the label, unless you use VLabel of course.

The volume label is stored on the disc in the same way as a file or directory entry. However, it contains a special attribute which marks it as a volume label, so that it does not appear on a normal directory search.

VLabel checks that a disc is present by first reading the BIOS Parameter Block (BPB), which contains information describing the layout and use of all the sectors on the disc. The root directory, which is where the volume label is stored, starts immediately after the second copy of the File Allocation Table (FAT). On both the 360K and 720K disc the root directory occupies sectors 11 to 17.

The second part of the listing follows next week.

```
/*************************************************/
/* Program  : VLABEL.C for Atari ST.             */
/* Function : Change/add (disk) volume label.    */
/* Written  : 4 May 1987.                        */
/* Author   : David Gristwood                    */
/* Version  : 1.0                                */
/* Amended  :                                    */
/* Copyright (C) David Gristwood and             */
/*            Byline Software Limited, 1987.     */
/*************************************************/


#include    "h\stdio.h"
#include    "h\osbind.h"
#include    "h\gemlib.h"


#define     ON              1           /* boolean true */
#define     OFF             0           /* boolean false */

#define     ESC             27          /* ASCII escape */

#define     SECTOR_SIZE     1024        /* max sector size */

#define     RWABS_READ      0           /* rwabs() read flag */
#define     RWABS_WRITE     1           /* rwabs() write flag */

#define     RW_VIRGIN       0xE5        /* virgin marker */
#define     RW_LABEL        0x08        /* label attribute */


typedef     unsigned char   byte;
typedef     int             boolean;

typedef     struct
{
      short       recsiz;           /* sector size (bytes) */
      short       clsiz;            /* cluster size (sectors) */
      short       clsizb;           /* cluster size (bytes) */
      short       rdlen;            /* root directory length (sectors) */
      short       fsiz;             /* FAT size (sectors) */
      short       fatrec;           /* sector # of second FAT */
      short       datrec;           /* sector # of first data cluster */
      short       numcl;            /* # of data clusters on disk */
      short       bflags;           /* flags */
}     BPB;                          /* Bios Parameter Block */


BPB         *bpb;                   /* active BPB */

short       contrl[12];
short       intin[128];
short       ptsin[128];
short       intout[128];
short       ptsoutp[128];

short       handle;
short       phys_handle;

short       work_out[57];
short       work_in[12];
```

```
/*************************************************/
/* main ()                                       */
/*    Read BPB of disk in default drive. If      */
/*    new volume label specified, search root    */
/*    directory for old entry, and replace.      */
/*************************************************/
main()
{
      int         drive, sect, slot, rd_start;
      short       dummy;
      char        rw_b[SECTOR_SIZE], name[80];

      /* start */
      /*********/

      gem_startup();

      /* print copyright message */
      /***************************/
      v_hide_c(handle);
      v_clrwk(handle);

      vst_height(handle, 18, &dummy, &dummy, &dummy, &dummy);
      vst_effects(handle, 2);
      v_gtext(handle, 250, 75, "Volume LABEL");
      v_gtext(handle, 75, 125, "Copyright (C) David Gristwood and");
      v_gtext(handle, 230, 150, "Byline Software Limited, 1987.");

      vst_height(handle, 16, &dummy, &dummy, &dummy, &dummy);
      vst_effects(handle, 2);
      v_gtext(handle, 240, 330, "'RETURN' to exit");

      /* get BIOS parameter block */
      /****************************/

      drive = 0;  /* default drive - 0 = A, 1 = B, etc. */

      v_show_c(handle, 0);  /* show incase of disk I/O error */
      if ((bpb = (BPB *) Getbpb(drive)) == NULL)   /* bios(7, drive) */
            error("unable to get BPB");
      v_hide_c(handle);     /* hide again */

      if (bpb->recsiz > SECTOR_SIZE)
            error("sector size too big");

      /* get new volume label */
      /************************/

      printat(20, 14);
      printcurs(ON);

      printf("Enter volume label : ");
      if (gets(name) == NULL)
            error("gets failed");

      printcurs(OFF);

      /* has user specified a new volume label ? */
      /*******************************************/

      if (name[0] != 0)
      {
            /* change / add label */
            /**********************/

            name[11] = 0;  /* terminate to max length of 11 chars */

            /* search for label */
```

Scroll Clear

Paul Hutchison

This routine for the Amstrad CPC clears the screen by scrolling the entire display off the top of the screen. Use *Call &AB00*.

```
10 MEMORY &AAFF
20 A=43776
30 READ B$:IF B$="-1" THEN END
40 POKE A,VAL("&"+B$)
50 A=A+1
60 GOTO 30
70 DATA 00,3E,19,32,00,AB,06,01
80 DATA 3E,00,CD,4D,BC,3A,00,AB
90 DATA 3D,C8,32,00,AB,C3,06,AB,-1
```

Type

Alastair Scott

This Amstrad CPC routine provides the missing CP/M command, Type. The syntax is *Type, filename.*

While the Ascii file being listed to the screen, pressing *Tab* will pause the listing.

```
100 'TYPE command
110 'by Alastair Scott
120 MODE 1:MEMORY &7FFF
130 FOR a=&8000 TO &8052
140 READ b$:POKE a,VAL("&"+b$):c=c+PEEK(a)
150 NEXT:IF c<>9787 THEN PRINT CHR$(7)"ERROR
    IN DATA!":END
160 CALL &8000:PRINT"|TYPE,<filename>
    command initialised.":PRINT:END
170 DATA 01,09,80,21,53,80,C3,D1,BC,0E,80,C3
180 DATA 13,80,54,59,50,C5,00,3D,20,38,DD,6E
190 DATA 00,DD,66,01,46,23,5E,23,56,EB,11,57
200 DATA 80,CD,77,BC,30,24,CB,67,28,20,CD,FF
210 DATA BB,CD,4E,BB,CD,80,BC,30,12,CD,5A,BB
220 DATA AF,CD,1B,BB,FE,FC,28,07,FE,09,CC,18
230 DATA BB,18,E9,C3,7A,BC,3E,07,C3,5A,BB,00
```

Slow Text

Malcolm Sargent

This BBC routine will make all output to the screen scroll up slowly giving you a chance to examine it before it whizzes past.

```
10 REM SLOW PRINT  BY M. SARGENT
20 SPEED=10
30 JUMP =(!&20E AND &FFFF)
40 ?&70=SPEED
50A=&B00
60FOR P=0 TO 3 STEP 3
70P%=A
80[OPT P
90PHP:PHA:TXA:PHA:TYA:PHA
100LDA &70:BEQ salo
110TAX:LDY£0
120.LOOP NOP:DEY
130BNE LOOP:DEX
140BNE LOOP
150.salo  PLA:TAY:PLA:TAX:PLA:PLP
160JMP JUMP
170]
180NEXT
190?&20E=A MOD 256
200?&20F=A DIV 256
```

We want your programs!!

Yes, this is your chance to get rich and famous. Well, famous anyway, as *Popular Computing Weekly* is looking for contributions to the Programming pages.

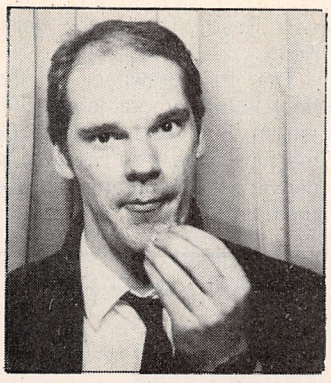
What sort of thing are we looking for? You name it – anything original from games to utilities, applications and the like, written in Basic, machine code or anything else you can think of.

Programs for any computer will be considered, not just the old faithfuls (Spectrum, Amstrad, QL, Commodore, etc), so send those listings in. What we need is a working copy of the program on tape or disc, plus an accompanying article or documentation that you would anticipate going with the piece, normally not over 2000 words.

Alternatively, send in your short programs to the Bytes and Pieces page – what could be easier?

In return, we'll pay the princely sum of £25/page for the main programming pages and £10 for each Bytes & Pieces contribution we publish. Plus the fact that your name will be indelibly carved in the *Popular* Programming Hall of Fame till time immemorial. What more could any true programmer ask?

Just send your masterpieces in to **Duncan Evans, Technical Editor, Popular Computing Weekly, 12–13 Little Newport St, London WC2 7PP** and he'll assess them post haste.



with Kenn Garroch

C for confusion

E J Searle, of Exeter, writes:

Q Some six months ago I decided, after purchasing an Atari 520 STM, that I would attempt to learn the C language in the hope that it would give me more access to the power of the Atari.

I purchased a GST C compiler on grounds of cheapness and having read a review in your magazine which said that it was ideal for beginners. Since then I have been trying to access the libraries, ie, AES, VDI, SUPER & TOS LIB. I wrote to GST but all it suggested was that I should purchase its Fractal generator which includes full C access including Gem library access. I also enquired whether updates to the compiler were provided but I didn't get an answer. Can you help?

A The GST C compiler appears to use run time libraries, ie, the libraries contain preassembled code. The drawback with this is that you cannot root around inside the library files themselves to see what the various functions do.

However, the library functions should be documented in the form of what they do, what arguments should be passed to them, and what they return.

For more details about what the functions do, a book such as *The Concise Atari 68000 Programmer's Reference Guide* by Katherine Peel, published by Glentop Publishers, Standfast House, Bath Place, High Street, Barnet, Herts, 01-441 4130, or *The Anatomy of the Atari ST No. 2* by K Gertis, L Englisch, and R Bruckmann, published by First Publishing, 20B Horseshoe Park, Horseshoe Road, Pangbourne, Berks, 07357 5244, contains the C bindings for the functions.

For example:

```
scrn=logbase();
```

Where *scrn* is a long *int*, gets the logical screen base address. All you have to do is include the XBIOS library in the C program. This is done with the *include* command although you will have to check how to use *include*, as you may already be using it for *stdio.h* and *stdio.lib*.

A magazine such as *Popular*'s sister magazine *ST Update* will also be of use since it contains example C programs as did *Popular*'s own series on C a few weeks back. Not having used GST C, I don't know the full details about how to access GEM, AES, etc. However, you might try the following demo:

```
include GEMVDI.LIB
/*use the gem vdi library name included
with GST C */
int contrl[12];
int intin[128];
int ptsin[128];
int intout[128];
int ptsout[128];
main()
{
int handle,i,pxyarray[12],work_in[11],
work_out[57];
int x,y,term;
for (i=0 ; i<10 ; i++)
 work_in[i]=1;
work_in[10]=0;
v_opnvwk(work_in, &handle, work_out);
/* open workstation */
pxyarray[0]=12000;
pxyarray[1]=12000;
pxyarray[2]=12000;
pxyarray[3]=20000;
pxyarray[4]=16000;
pxyarray[5]=20000;
pxyarray[6]=16000;
pxyarray[7]=12000;
pxyarray[8]=12000;
pxyarray[9]=12000;
/* set up poly line array of verticies you
may have to reduce these*/
 v_pline(handle,5,pxyarray);
 /* draw a polyline */
 vrq_locator (handle , 16000 , 16000 ,
&x , &y , &term);
 /* pause for button or keypress*/
v_clsvwk(handle);
/* close workstation */
}
```

Spectrum crashes

Les Rothera, of Leeds, writes:

Q My set-up is a Spectrum Plus, Interface 1, two microdrives, Alphacom 32 printer, Tasman B Interface, Silver Reed 1/F44 Interface, Silver Reed EX44 Daisywheel typewriter/Printer, and a Taxan K-12 Monochrome monitor.

Using *Tasword III* for wordprocessing etc. I find that having got everything ready to boot to the EX44, when I do go to print, a couple of lines will be printed and then the system locks up. Sometimes I can get a complete run through the print sequence without any bother, and at other times it is a stop-go situation all the way through.

I have had the Spectrum Plus, Interface I, Microdrives, and Tasman B interface checked out locally and pronounced fit and well. The Silver Reed and its I/F44 interface were checked out some twelve months ago and also given a clean bill of health.

I am at my wits' end as to what to do next. Can you supply an answer to my problem?

A There are a couple of possibilities, but from your description it sounds like a crash.

The Spectrum Plus could well be suffering from a power failure, or possibly is being overloaded. Try waggling the power plug on the Spectrum. If this is loose, it will give the crash you describe. Make sure that you waggle the whole length of the cables including the plugs at both ends. If this has no effect then try the interfaces where they connect to each other.

Alternatively, vibration from the printer may be the cause of the problem, so try moving this to a different position (say the floor) where it cannot affect the rest of the equipment. Presumably it has worked before and so will work again.

If there is an overload problem, try running the printer with as little other equipment attached to your Spectrum as possible, such as only the printer and its interface, and see what happens. If things work correctly, add more of your gadgets until problems occur. This should give you a pointer to the problem and its solution.

If all else fails you will have to resort to carting the whole lot to your local Mr. Fixit and have him check out the whole kit and kaboodle. The individual parts of your hardware may be fine but when put together, there may be a problem that doesn't appear on the individual pieces.

Hair tearing on Spectrum

John E Wells, of London E7, writes:

Q Though a middle-aged computer moron, I may be able to help Sean of Westmeath (Peek & Poke, May 15).

I suspect that my setup is similar to his – except that I have an issue three Spectrum.

One of the problems with the Opus is the dreaded 'i/o error' which tells you nothing except that it doesn't work.

After much hair tearing and changing the stepping Rom to little effect, I have found a system that, so far, has generally proven effective, though why I know not.

Simply format a disc. I keep a spare disc handy, formatted or not, since the act of formatting seems to 'kick start' the Opus, and the error report disappears: FORMAT "m";1;"Hail Mary" ENTER

I kid you not.

A Some say sticking your tongue out of the corner of your mouth works just as well – and for some it does. Try anything is the rule in this sort of situation.

Isolation ward

John Mitchell, of Wishaw, Scotland, writes:

Q I am retired and have a DAI computer for a hobby. I wish to experiment and control stepper motors via the computer's RS232 or DCE outlets.

Please can you help me with clear information or a source of information on how to completely isolate my computer from any external circuit mistakes while experimenting?

I am keen to experiment but I do not want to do any damage as a result of my ignorance.

A I am no expert on the DAI but I presume that one of the outlets you mention is able to put out controllable signals between 0 and 5 volts as

continued on page 30 ▶

◀ continued from page 29

on and off. If this is the case, an opto-isolator will isolate the computer from any voltage surges that might arise during the course of your experiments.

To isolate the computer, you will have to attach the isolation circuits directly to the machine. However, these are pretty straightforward and so should not cause any problems.

An opto-isolator is a chip containing a light emitting diode (LED) and a photo-transistor. When the diode is off, the transistor is off and no current flows between the collector and the emitter (the lead with the arrow on it is the emitter – the arrow pointing out means NPN). When the diode is turned on, the transistor comes on, and current can flow from the collector to the emitter.

It is necessary to include resistors in the external circuit to limit the amount of current flowing through the device. For the LED, a resistor with a value of about 1000Ω gives a current of 5mA which is enough to turn it on. Incidentally, the current is worked out with the formula:

V=Rx1 where V is the voltage, R the resistance, and 1 the current.

In the first diagram, the output circuit is wired so that when the LED is off, ie, 0V input, the output transistor is off and consequently, the output is 0V. When input voltage goes to 5V, the LED comes on, the photo-transistor conducts, and effectively connects the resistor to the 5V power line, pulling the output voltage up to 5V.

The only problem with using this circuit to connect to a stepper motor is that the photo-transistor is only capable of conducting about 100mA before it melts – a stepper motor would probably require more power than this.

The solution is to use the photo-transistor to drive another, higher power, transistor as in the second diagram. Here, the situation is a little different from the first circuit since the resistor for the photo-transistor is connected from the power supply line to the collector (the one without the arrow).

Now, when the LED is off, the photo-transistor is not conducting and the output is connected to the power supply line via the resistor giving a high output. This output is fed to the input of the power transistor, which is turned on pulling the output to the stepper motor down to the 0V line, giving a zero volts output.

Turning the LED on causes the photo-transistor to conduct pulling the voltage input to the power transistor down. This turns off the power transistor and makes the output to the stepper motor equal to the power supply voltage.

The power transistor also needs a current limiting transistor which is Rm. The value of this depends on the amount of current that power transistor can conduct. Again, the formula V=R1 is used. If the power transistor is capable of 500mA then the value of Rm is:

Rm=Power supply voltage/Collector to emitter current

Rm=5/0·5=10Ω

Also make sure that the resistor and external power supply can handle this amount of current. The current that flows through the transistor from collector to emitter, following the arrow, is known as the collector emitter or CE current (sometimes shown as Ic). Check the maximum power consumption of the motor before deciding on the transistor.

When you know which Ic you need, get the cheapest NPN transistor with Ic that fits the bill. With transistors, switching speed (the time taken to go from on to off) is what you pay for and in this situation, the switching speed is quite slow so, you don't need to get anything too flash.

The only part of the circuit that is connected to your computer is the LED, everything else is separate, including the power supply for the stepper motor, photo-transistor, etc.

The maximum voltage that the opto-isolator can stand before it breaks is about 1500V which is more than you are likely to use so whatever you experiment with (as long as its not high energy physics) should not be able to harm the DAI.

I don't know of any books specifically for the DAI. However, there is quite a good book for the BBC micro which will give you a lot of information on the hardware side. Try *Interfacing and Robotics on the BBC Micro* by Ray Bradley from Micropress, Castle House, 27 London Road, Tunbridge Wells, Kent.

The only drawback of the book is that programs are written in BBC Basic and 6502 machine code. You will have to convert the programs to use them.

Diagram one

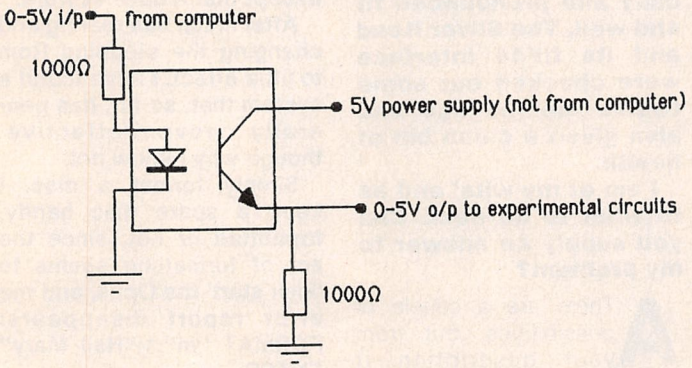
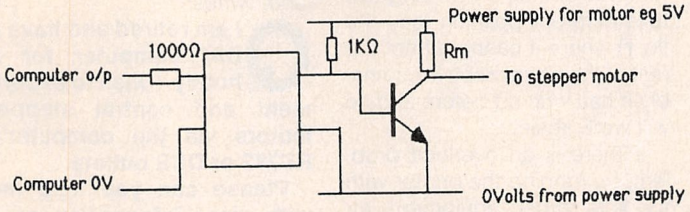


Diagram two



Parts for the opto-isolator diagram 2

Opto isolator WL 35Q
1000Ω resistor M1k
Power transistor Ic 15A MJ2955
Rm 1Ω P1Ω – gives 5 Amps output current approx

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Kenn Garroch and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW*, 12-13 Little Newport Street, London WC2H 7PP.

The other half

Ron James, of Ribbleton, Preston, Lancs, writes:

Q Having been involved in radio communications for many years with simplex (single frequency) walkie talkies and duplex (double frequency) walkie talkies, I am trying to formulate in my mind where the 'half duplex' used in computer terminology fits in with my understanding of radio communications. It is a term I had never come across until becoming involved with computers.

A As far as I can see, half duplex is more or less the same as simplex. With full duplex, there are two frequencies, allowing both communicators to transmit and receive at the same time. With computer communications, full duplex is the same as with radio except that the transmission speeds are taken into account, ie, the baud rate (changes in state per second or sometimes bits per second).

The difference arises when you look at the medium through which the computers are communicating, ie, telephone lines.

Here, unlike radio communications, there is a set bandwidth in which all signals have to fit. For normal BT lines, the limitations are such that normal full duplex is limited to 1200/75 baud (transmit and receive). Unless you use a special phase shifting equalising modem, these two speeds are the limit.

To get higher speeds on both transmitter and receiver, half duplex is used. Here, only one communicator talks at once allowing speeds such as 1200/1200 baud to be used. Since these are both the same speed, this is effectively simplex.

The phrase 'half duplex' covers situations where the speeds are different but there is only one transmitter at a time, eg, it is possible to have 300/1200 half duplex, or 300/75 half duplex.

Once Bytten

59 SWANLEY ROAD
WELLING, KENT DA16 1LL
Tel: 01-304 2631
(Callers by appointment only)
Cheques and P.O.s to AMTEN LIMITED please

FACTORY FRESH FLOPPIES — AT GIVEAWAY PRICES

Yes, we've reduced our Disc prices even further!!!
And it's all your fault!! The more you buy the cheaper they get

5¼" Discs are supplied with envelopes, labels and write-protects and are all hub-ringed. They are all individually checked and certified 100% Error Free.
Our 3½" discs are made in the USA or the EEC and are actually less expensive than those made to less stringent specifications. They, like our 5¼" product, are individually checked and certified 100% Error Free. They are of course Warranted for Life under our No Quibble Replacement Scheme. They are all supplied with labels. They are simply the *best*. They are of course supplied with our usual Lifetime Warranty–No Quibble Replacement Scheme.

10 3½" SSDD 135tpi in Case £14.50
10 3½" DSDD 135tpi in Case £15.95

	25	50	100	200
3½" SSDD 135tpi Bulk Pack....	£31.35	£58.90	£110.20	£209.76
3½" DSDD 135tpi Bulk Pack ...	£35.00	£65.00	£120.00	£225.00

10 5¼" SSDD 96tpi in Case £6.95
10 5¼" DSDD 96tpi in Case £7.95

	25	50	100	200
5¼" SSDD 96tpi Bulk Pack.....	£11.50	£21.50	£39.95	£87.50
5¼" DSDD 96tpi Bulk Pack	£13.95	£24.95	£44.50	£99.95

10 3" Amsoft DS Discs £22.50

NOTHING MORE TO ADD!!! ALL PRICES INCLUDE VAT AND P.&P. (UK ONLY)

YOU BREAK 'EM WE MEND 'EM DEPARTMENT:
We offer a speedy repair service for most computers and disc drives.
Ring Keith McGovern on 01-407 8447 Mon–Fri 9am–6pm or 01-304 2631 Mon–Sat 8pm–10pm

YOU CHUCK 'EM WE CATCH 'EM DEPARTMENT:
We want to buy your computer, your printer, your disc drive, your modem, your monitor, your software, your spilling chocker, FOR CASH!!! WE WILL GIVE EVEN MORE IN PART EXCHANGE . . . Against the latest micros from AMSTRAD, ATARI, COMMODORE et al.

For a QUICK QUOTE (or a slow lingering one) ring Keith McGovern on 01-407 8447 Mon–Fri 9am–6pm or 01-304 2631 Mon–Sat 8pm–10pm
N.B. We will be closed from 20th June to 11th July inclusive.

Access **ORDER LINE 01-304 2631** 9am to 10pm VISA

See you at the Commodore Show, Stand 39

COMMODORE + SPECTRUM

£1.99 EACH

Fassem, Whirlnurd, Tony Hart's Art Master, Twin Kingdom Valley, Jumpman, Basildon Bond, Lunar Outpost, Rock 'n' Bolt, Doughboy, Master of Lamps, Web Dimension, Dark Tower, Star Trooper, Quake Minus 1, Dummy Run, Suicide Strike, Juice, Drelbs, Moebius, Ghost Chaser, Imhotep, Outlaws, Questprobe, Galaxion, Thunderbirds, Chimera, The Staff of Karnath, Spiderman-Hulk.

£2.95 EACH

Matchfishing, Ark Pandora, Potty Pigeon, Crazy Comets, Monty Mole, Zaxxon, Kong Strikes Back, Tapper, Spiderman/Hulk, Bombo, Who Dares Wins II, Gyroscope, Fighting Warrior, Flak, Motocross, Jet Set Willy, Monty on Run, Beachhead, Starion, Rock 'n' Wrestle, Mugsy's Revenge, Zorro, BC's Quest for Tyres, Manic Miner, Journey, Eddie Kidd, Geoff Capes, Frak, Blackwytch, Dragonskulle, Henry's House Vol. I & II, Mermaid Madness, Space Shuttle, Critical Mass, William Wobbler, Redhawk, Combat Lynx, World Series Baseball, Surf Champ, Grogs Revenge, Dead, David's Midnight Magic, Skool Daze, Paradroid, The Rat, Entombed, Yabba-Dabba-Doo, Football Manager, Adrian Mole, Tubular Bells, Pilgrim, Split Personalities.

£3.95 EACH

Chuckie Egg II, Sherlock, Fight Night, Tigers in Snow, Knights of Desert, Law of the West, Congo Bongo, Wizardry, Moon Cresta, Amazon Women, Ball Blazer, Red Arrows, Macadam Bumper, Thing on a Spring, Zoids, Bounder, Hampstead, Time Tunnel, Bounces, Adventureland/Secret Mission, Pirate Adventure/Voodoo Castle, Elektraglide, Sherlock, Thai Boxing, Bulldog, Johnny Reb II, Super Zaxxion, Highway Encounter, Devs Ex Machina, Little Computer People, Jet Set Willy II, Adventure Quest, Lords of Time, West Bank, Zap Sizzler II, Nexus, Uchi-Mata.

£4.95 EACH

The Force, Mig Alley Ace, Forest of Doom – Book & Tape, Kettle, System 1500 Second Ed., Evil Crown, Donkey Kongs (Cart.), Robotron 2084 (Cart.), Lord of The Rings, Howard the Duck.

£5.95 EACH

Winter Games, White Lightning, America Cup, Dragons Lair, Golf Construction Set, Leaderboard, Superbowl, Touchdown Football, Q-Bert (Cart.), Trail Blazer, Future Knight, Avenger, Jack the Nipper, Hacker II, Sports 4, Battalion Commander.

COMMODORE 64 DISCS £3.95 EACH

Master of Lamps, Decathalon, River Raid, Rescue on Fractalus, Park Patrol, Pitfall, Pitfall II, Thing on a Sprng, Pastfinder, William Wobbler, The Tracer Sanction, Designers Pencil, Ballblazer, Sigma 7, Galactic Controller, Nexus, Zork I, Zork II.

SPECTRUM SOFTWARE £2.95 EACH

Adrian Mole, Contact Sam Cruise, Merlock The Mede, School Days, Yabba-Dabba-Doo, Football Manager, Tournament Snooker, Indoor Soccer, Who Dares Wins II, Jet Set Willy, BC's Quest for Tyres, Manic Miner, Match Fishing, Hacker, Potty Pidgeon, Ghost Busters, Pole Position, Gyroscope, Fighting Warrior, Alien 8, Spiderman-Hulk, Star Strike II, Enduro, Robin of Sherlock, Winter Sports, Hurg.

£3.95 EACH

Fat Worm, Thanatos, Deep Strike, Saboteur, River Raid, Zoids, Cyberun, Adventure Land/Secret Mission, Whams Music Box, Super Chess 3.5, Rescue on Fractalus, Valkyrie 17, Skyfox, Lord of The Rings, Ballblazer, Quatzatron, Nightgunner, Spy Vs Spy, Sherlock, International Karate, Jet Set Willy II, Johnny Reb II, The Plants, Stainless Steel, Cop out, Battle of The Planets, Chuckie Egg II, Mini Office, Pacman (Atari Soft), Masters of The Universe.

£5.95 EACH

Trail Blazer, Future Knight, Avenger, Crash Smash II.

p&p 1–3 titles 85p
3 or more £1.00
Overseas £1.20 per tape
CHEQUES PAYABLE TO

LOGIC MAIL ORDER LTD

17 Leofric Square, Eastern Industry, Peterborough, Cambs. Tel: 0733 313870



Micronet and Prestel *
invite you to an eye-opening display of database facilities
'Bring a 1200/75 Baud Modem'

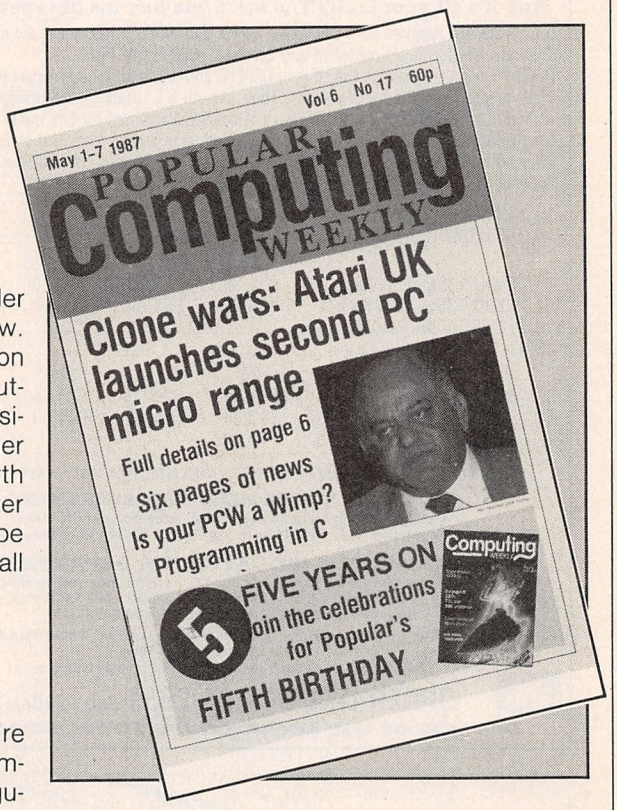
MICRONET/PRESTEL – beating the competition!

MICRONET, DURRANT HOUSE, 8 HERBAL HILL, LONDON EC1R 5EJ TEL: 01–278 3143

* Prestel & the Prestel symbol are registered trademarks of British Telecommunications Plc.

YOUR NAME IN LIGHTS

Have you ever thought of writing articles for Popular? It's a sure fire passport to fame, if not fortune, and we always welcome contributions from readers for features and articles in the magazine.



Programs

Technical editor Duncan Evans relies on you for the programs section. It needn't be that machine code masterpiece that NASA was promising you vast sums for, what we're looking out for is handy routines, utilities, anything that you've concocted that makes your life easier as a programmer that you'd like to pass on to others.

Don't make your programs too long, please – it's best if we can print the full listing in one week, and a four part listing is probably the largest we can accept. If they're very short, then so much the better, they'll fit neatly into our Bytes and Pieces page.

Features

We're also particularly interested in articles about programming, which should be sent to Christina Erskine. If you think you could explain technical areas of computing to a wider audience then do let us know.

We also welcome articles on any aspect of home computing, although we cannot feasibly accept anything longer than 2000 words. It's worth checking by phone or letter first that your piece will be suitable, but we're open to all ideas.

Money no object?

If it's not the money you're interested in so much as simply having your say, the Ziggurat slot is where anyone can get up on a soap box and air their opinions. Your article should be 600–650 words long. We pay £15 per Ziggurat published.

For even less money, we'd like to hear your views, comments and opinions on our Letters page, and our columnists are always on the look-out for hints and tips and comments on their own areas of the magazine.

Mark Jenkins welcomes correspondence of a musical nature for Soundcheck, Martin Bryant is interested in any queries or views regarding computer chess, and our communications correspondents will be happy to answer questions about modems and networks (mark your envelope 'Comms').

Any technical or programming problems you're encountering can be addressed to Kenn Garroch. Kenn tries to help as many people as possible in Peek and Poke, but cannot undertake to give personal replies.



How to submit

For features, it is almost always better if you write or telephone first to discuss your ideas with us. Your articles should be typed or word processed, preferably in double spacing, using one side of the paper only.

Please don't write more than 2000 words for an article. Program notes should explain what your program achieves and how it works, but, again, please keep them concise.

Payment

Listings will be paid at a rate of £25 per published page, Bytes and Pieces at £10 each. For feature articles, we pay £40 per published page, which is about 800 words.

Your payment should arrive six weeks after publication date.

Where to send them

All submissions should be sent to *Popular Computing Weekly*, 12–13 Little Newport Street, London WC2H 7PP. If you mark which department your letter is destined for on the envelope it will help us process them much more quickly.

We will make every attempt to acknowledge receipt of your submission.

Ample new software on the BBC

The BBC Micro/Master series has been churning forth musical software since the Hybrid Music 500 system was upgraded. Here, Mark Jenkins reviews some of the new products.

Mr F G Smith of Newcastle-upon-Tyne has written in explaining that he's a confirmed Commodore 64 fan but recently got hold of an Atari 130XE outfit very cheaply in a Lasky's clear-out sale. He has several music add-ons for the 64 and would like some similar units for the XE.

As far as I know, the only products available at the moment come from 2-Bit Systems, who have a drum sampler and a useful Midi control system. The most professional packages come from Hybrid Arts in the States, but these aren't being imported at the moment, although you could ask Syndromic Music (the importer of Hybrid's 16-bit packages) for more information.

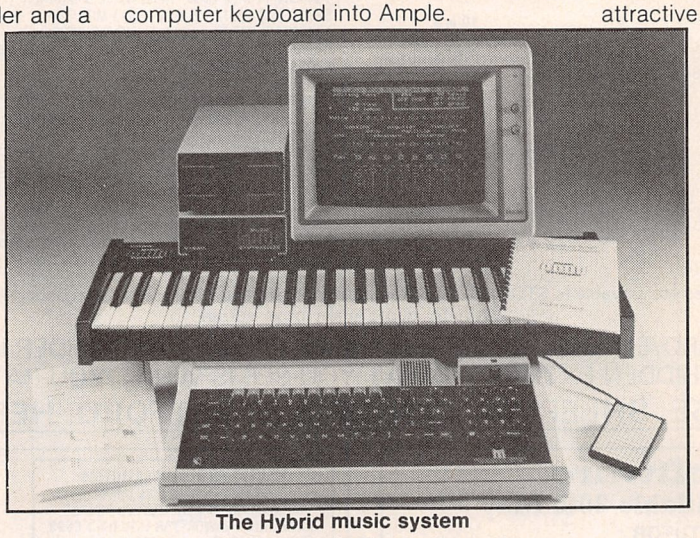
2-Bit markets *Midi Master*, which comes complete with a very simple Midi interface (just a multi-pin connector leading to DIN in and out plugs) and offers an eight-track polyphonic sequencer plus sound editors for the Casio CZ-101 and Yamaha DX-100 synths. The system is available on tape or disc for £27.50 including p&p. If any other companies have 8-bit music products perhaps they'd like to send them in for review.

Now on to the BBC Micro/Master series, which is putting on a spurt in musical terms following the upgrading of Hybrid Technology's Music 500 system to the Music 5000 specification, their release of the Music 4000 keyboard, and Peartree's introduction of the Music 7000 system.

The Music 5000 (£161 or £69 as an upgrade) boasts many software changes over the original 500 system and is compatible with the Music 4000 keyboard (£169 with software). Music 5000 has 16 voice channels (although the sounds themselves are generated in software) and many preset sound parameters which can be combined to create new voices.

The language used, Ample, allows you to define any set of parameters or any pattern of notes under a single name using the command MAKE. Ample is in some ways similar to Forth so is quite capable of creating computer games and text adventures with music as well.

It's now possible to create music in real time using the real-time sequencer page and to mix it (controlling stereo pan, volume and tone of each sound) using the mixer page. You can still compose using Ample though, and in fact you can convert Ample files into real time music, real time music into conventional musical notation on the screen, and notated music entered from the computer keyboard into Ample.



The Hybrid music system

The sounds are similar to those from a reasonably expensive Casio keyboard with the added advantage of various stack and detuning modes to make terms such as BigModg seem entirely justified.

The new Music 4000 keyboard is similar to the Symphony released a few years ago, and in fact it's possible to upgrade a Symphony to use it with the Music 5000 for £47. A multicore cable connects keyboard to micro and a footswitch carries out various functions.

The four-octave, full-sized keyboard isn't velocity-sensitive but responds pretty well to all playing techniques. Performance parameters such as microtonal or reversed scales are set on the screen and you can program in a chord or a whole sequence of notes to be played with a single finger.

In Split mode each key produces a different sound, repeated in each octave; this is ideal for playing a 'kit' of drum sounds while you're programming a piece, and in fact the drum sounds available are surprisingly powerful. At the moment it's difficult to link up an external drum machine without some fiddling with the RS432 port, so the drum kit has to be good.

Music 5000 is multi-tasking so you can make a lot of changes while the music is playing, although this doesn't include loading a new "module" from the program disc. Overall the 5000 system is a very flexible and impressive alternative to the sort of extended Midi system some users may find attractive.

It's equally well suited to educational purposes, serious composing, part-time dabbling and composing for games. It will be a more serious proposition for the ambitious when Midi and better drum synchronisation are added using the Music 2000 interface to be shown at the Acorn User show.

Peartree's Music 7000 has little connection with what Hybrid is doing now; it's basically an old Music 500 with a version of Ample on cassette (Hybrid refused permission to market it on Proms) and separate software offering a modified mixing desk page, a sound shaper page for creative synthesis (rather more visual than the Music 5000 approach), the ability to print out the music stave (Music 5000 can do this too if you have a print Rom), lightpen and mouse compatibility, and so on.

An existing Music 500 (now being given away free with the Master series micros by some dealers) can be updated to a Music 7000 for £39.95, or you can buy both hardware and software for £79.95, although deliveries aren't expected until after the Acorn User show at the end of July.

Hybrid Technology, Unit 3, Robert Davies Court, Nuffield Road, Cambridge CB4 1TP, 0223 316910.
Peartree Computers, Peartree House, No. 1 Blackstone Road, Stukeley Meadows Industrial Estate, Huntingdon, Cambs PE16 6EF, 0480 50595.
2-Bit Systems, 44 Morcom Road, Dunstable LU5 4EG.
Syndromic Music, 24–26 Avenue Mews, Muswell Hill, London N10 3NP, 01-444 9126.

MICRO-FILE

SOFTWARE

STORT SOFT

ATARI MAIL ORDER SPECIALISTS

INCREDIBLE LOW PRICES!

ALL DISKS CARRY A NO QUIBBLE REPLACEMENT GUARANTEE, ARE CERTIFIED 100% ERROR FREE & COME WITH LABELS, 5¼" ALSO HAVE SLEEVES & WRITE PROTECTS.

BLANK 5 1/4" DISKS

DISK NOTCHER FREE WITH EACH 100 DISKS PURCHASED

UNBRANDED	TRIAL 10	25	50	100	10 in a plastic lib. case
SS48 TPI	£4.50	£9.00	£17.00	£33.00	£5.50
DS48 TPI	£5.50	£11.00	£19.00	£35.00	£6.50
DS96 TPI	£6.50	£13.00	£21.00	£37.00	£7.50
DS96 TPI FLIP SIDED	£7.00	£14.00	£22.00	£38.00	£8.00
TRACKER SS48 TPI	£6.00	£13.00	£24.00	£44.00	£7.00
TRACKER DS48 TPI	£7.00	£14.00	£26.00	£46.00	£8.00
TRACKER SS96 TPI	£7.00	£14.00	£26.00	£46.00	£8.00
TRACKER DS96 TPI	£7.50	£15.00	£28.00	£48.00	£8.50
MIMIC FLIP SIDED DS96 TPI	£8.95	£20.00	£38.00	£70.00	£9.95
MIMIC HIGH DENSITY 1.6meg	£23.00	£52.00	£100.00	£180.00	£24.00
COLOURED – mix & match or all one colour					
SS48 TPI	£6.50	£12.00	£22.00	£42.00	£7.50
DS48 TPI	£7.50	£14.00	£24.00	£44.00	£8.50
DS96 TPI	£8.00	£16.00	£28.00	£50.00	£9.00
SPECIAL PRICE!! Dysan DS48TPI BOX OF 10 ONLY					£10.95

BLANK 3 1/2" DISKS

	10	25	50	100	10 in a plastic lib. case
MF1DD (SS/DD)	£12.95	£30.00	£58.00	£115.00	£13.95
MF2DD (DS/DD)	£14.95	£35.00	£63.00	£125.00	£14.95

BLANK 3" DISKS

	10	25	50	100
CF2	£25.00	£60.00	£110.00	£200.00
CF2DD	£33.00	£80.00	£150.00	£280.00

LOCKING DISK BOXES

5 1/4" HOLDS 50	£7.95	5 1/4" HOLDS 100	£9.95
3 1/2" HOLDS 40	£7.95	3 1/2" HOLDS 80	£9.95
60/90 HOLDS 60 3" or 90 3 1/2"	£9.95		

COMPUTER ACCESSORIES

5 1/4" DISK NOTCHER (Double your disk capacity on a single sided drive)	£3.95
DISK CLEANING KITS Liquid non-abrasive type – protect your valuable software	
5 1/4" DCK £3.95 3 1/2" DCK	£4.95
ST/IBM/AMSTRAD 1512 TO CENTRONICS PRINTER LEAD (2 metres)	£8.95
ST TO RS232 MODEM LEAD (2 metres)	£8.95
BATTERY POWERED MINI-VAC – for keyboards, printers etc.	£9.95
QUICKSHOT II+ (microswitch) joystick	£8.95

COMPUTER STATIONERY

PRINTER PAPER – Continuous fan fold, sprocket fed.

SHEETS	11"× 9.5" 60gsm	A4 70gsm	11" × 9.5" 90gsm	A4 90gsm
500	£4.95	£6.95	£9.00	£9.95
1000	£8.95	£10.95	£14.00	£15.00
2000	£13.95	£16.50	£24.00	N/A

LABELS – Continuous fan fold, sprocket fed.

	70mm × 36mm	89mm × 36mm	102mm × 36mm	89mm × 49mm
1000	£4.15	£4.25	£4.50	£5.75
2000	£7.50	£7.90	£8.40	£10.50

Please specify number of labels across (1, 2 or 3)

ATARI ST HARDWARE

520STM (½ MEG RAM)	£249.95
520STM+ (1 MEG RAM)	£349.95
520STFM (½MEG RAM, ½ MEG DRIVE & MOUSE)	£379.95
520STFM+ (1 MEG RAM, ½ MEG DRIVE & MOUSE)	£479.95
1040STF (1 MEG RAM, 1MEG DRIVE & MOUSE)	£559.95
520STFM & SM125 HI-RES MONO MONITOR	£479.95
1040STF & SM125 HI-RES MONO MONITOR	£659.95
* * * STAR VALUE * * *	
520STM125 SF354 ½ MEG	£344.95
520STM125 SF354 1 MEG	£379.95
520STM, SM125 MONO MONITOR, SF354 ½ MEG DISC DRIVE, MOUSE & 1st Word WORD PROCESSOR	£434.95
520STM125 MONO MONITOR 1 MEG	£459.95
520STM, SM125 MONO MONITOR & SF354 ½ MEG DISC DRIVE, MOUSE, 1st Word WORD PROCESSOR & SMM804 DM PRINTER	£599.95
1040STF, SM125 MONO MONITOR & SMM804 DM PRINTER	£819.95
520STFM & ADDITIONAL ½ MEG DRIVE (SF354)	£499.95
520STFM, ADDITIONAL ½ MEG DRIVE (SF354) & SM125 MONITOR	£599.95

All Hardware comes with free dust covers!! All STs come with 5 public domain disks including CPM emulator and the arcade game Megaroids, 5 blank disks to get you going. Basic language disk and manuals.

Just write for more information. Cheques etc. payable to STORT SOFT (International orders add 10% and remit in pounds Sterling by bank draft or intl. money order. Write for quote in any other currency.)

ACCESS/MASTERCARD/EUROCARD/VISA accepted. CREDIT CARD ORDER LINE – 0279 89509

NO HIDDEN EXTRAS – WHAT YOU SEE IS WHAT YOU PAY

18 CROWN CLOSE, SHEERING, BISHOP'S STORTFORD, HERTS CM22 7NX

ESCape Software

****** New Release – Available 30th May ******

QL MATHS TUTOR

A menu-driven package that teaches basic arithmetical, geometrical and logical concepts. Aimed at the 5 to 13 age group, but so user-friendly that even an adult could use it! Also included are Nim and Hi-Lo games.

****** Available Now!! Still at Offer Price ******

QL SPELLING TUTOR

Learn to spell using built-in vocabulary of over 3100 words or build up your own word lists. Suitable for 5 year olds to adults. Includes Hangman, Anagram and Word-Search games.

****** See our demonstration at the ZX Microfair ******

QL SPELLING TUTOR and QL MATHS TUTOR were compiled using Q–LIBERATOR

★★ *Introductory offer price: £11.50 each inclusive* ★★

★★ *Save 10%: buy both for £20.70!!* ★★

Overseas orders add £1

Send cheques or P.O.s to:

ESCape Software (Dept. PCW),
2 Henley Road, Ilford, Essex IG1 2TT
Telephone: 01-478 8281 (250)

PC 1512 SUMMER PROMOTION

PC1512 DOUBLE DISC DRIVE MONO MONITOR WITH DMP300 PRINTER, SUPER CALC 3 & WORSTAR 1512 ONLY **£699**

(Price inc. VAT. Please add £18 for data post)

CPC 6128 COLOUR ONLY £339.95

(Price includes VAT. Please add £15 for data post)

Amstrad PC1512 SDMM	£470.00
Amstrad PC1512 DDCM	£740.00
Amstrad PC1512 HD20MM	£930.00
Amstrad PC1512 HD20CM	£1100.00
Amstrad PCW 8256	£412.00
DMP 2000 (printer)	£152.00
DMP 3000 (printer)	£172.00
FD-1 (disc drive)	£90.00
3" Floppy discs (box of 10)	£25.99
Printer Ribbon for DMP 2000/3000	£5.30
JY-2 Joystick	£9.00

AMSTRAD CPC SOFTWARE

Mini Office II (disc)	£14.50
Protext (disc)	£17.85
Tasword 6128 (disc)	£18.35
Masterfile III (disc)	£28.90
Tas-Spell (disc)	£13.45
Mastercalc 128 (disc)	£27.50
Plan It (disc)	£14.50

AMSTRAD PCW SOFTWARE

Supercalc 2	£38.95
Dr Draw/Dr Graph	£34.00
Protext w/p (+6128)	£53.95
Tasword-8000	£18.75
Masterfile-8000	£33.95
Tas-Spell-8000	£12.50
Touch-n-Go	£19.00
Maxam II (Assembler) by Arnor	£63.00
Popular Accounts (Sagesoft)	£64.90
Tomahawk	£15.35
Trivial Pursuit	£15.35
Fair Light	£11.50
Jewels of Darkness	£15.35
Prospell	£18.00
C Basic Compiler (Arnor)	£56.00

AMSTRAD PC1512 SOFTWARE

Supercalc 3 (ele. spreadsheet)	£55.50
Wordstar (word processor)	£55.50
Reflex (database)	£55.50
IBM Volkswriter, deluxe	£35.99
PC Four (Psion)	£63.50
Sidekick (utility)	£22.95
Touch 'n' Go	£19.00
Trivial Pursuit	£15.35
Infiltrator	£19.99
World Games	£19.99
Balance of Power	£23.95

All prices include VAT and delivery in U.K. only. We specialise in Amstrad hardware and software. Please ring for details or send an S.A.E. for our catalogue. Customers please make cheques payable to:

CHILTERN COMPUTER CENTRE
100 HIGHTOWN ROAD, LUTON, BEDS LU2 ODQ (UK)
TEL: (0582) 400305 (142)

ADVERTISING RATES FOR MICRO-FILE

Semi Display	£8 per single column centimetre (+VAT)
Lineage	35p per word (+VAT)

CALL SUSANNAH KING on 01-437 4343 FOR SEMI DISPLAY ADVERTISING

G–TEN LIMITED

THE Mail-Order Software House

AMSTRAD	Tape	Disc
DESERT FOX	4.25	N.A.
GREEN BERET	6.50	11.25
TOP GUN	6.50	N.A.
STALLONE COBRA	6.50	N.A.
GHOSTS 'N' GOBLINGS	6.50	11.25
MIAMI VICE	6.50	N.A.
HIGHLANDER	6.50	N.A.
WOW GAMES 3	6.75	N.A.
REVOLUTION4.25		N.A.
INFILTRATOR	6.75	11,65
MARBLE MADNESS	6.75	N.A.
GAUNTLET	6.75	11.75
STRIKE FORCE HARRIER	7.25	N.A.
THE SOLD A MILLION 3	7.25	11.25
HUMAN TORCH	3.25	N.A.
OBSIDIAN	4.25	N.A.
BEACHEAD	4.25	N.A.
ALIEN HIGHWAY	4.25	N.A.
BOMB JACK 2	7.25	12.75
NEMESIS	7.25	N.A.
EXPLORER	N.A	12.75
THE STOLE A MILLION	8.25	N.A.
SAILING	6.50	12.25
SUPER CYCLE	7.50	12.20
MGT	7.50	N.A.
STRIKE FORCE COBRA	7.50	12.25
SENTINEL	7.50	12.25
HEAD OVER HEELS	6.50	12.25
SHADLINS ROAD	6.50	12.25
PAPERBOY	6.50	11.25
EXPRESS RAIDER	7.25	11.25
SPY V SPY II	7.25	11.25
MAG MAX	6.50	11.25
PROHIBITION	7.25	11.25
KINETIC	6.50	10.75
BARBARIANS	7.25	N.A.
WORLD GAMES	7.25	N.A.
COMMODORE 64/120		
PAPERBOY	7.25	11.25
GHOSTS 'N' GOBLINS	8.75	11.25
STALLONE COBRA	8.50	N.A.
GAUNTLET	7.25	11.25
GREEN BERET	6.50	11.25
LEADERBOARD	6.75	10.75
TERRA CRESTA	6.50	N.A.
*TOP GUN	6.50	N.A.
ROCKY HORROR SHOW	6.75	N.A.
INFILTRATOR	6.75	11.25
HOT WHEELS	6.75	11.25
DEACTIVATORS	6.75	11.25

STARGLIDER	11.75	15.60
SUPERSTAQR PING PONG	4.25	N.A.
SKYRUNNER	6.75	10.50
ALIENS	6.75	11.75
STAR RAIDER II	6.75	11.75
1942	6.75	11.75
THEY SOLD A MILLION 3	6.75	11.57
GUNSHIP	11.75	14.50
POWERPLAY	76.25	11.25
SENTINEL	7.25	11.25
KNUCKLEBUSTERS	7.25	11.25
XEVIOUS	7.25	11.25
MOVIE MONSTER GAME	5.75	11.25
AMAZON WOMEN	4.25	N.A.
HUMAN TOURCH	4.25	N.A.
HIGHWAY ENCOUNTER	6.25	N.A.
BOMB JACK 2	6.25	12.75
DESTROYER	N.A.	12.75
SCOTT ADAMS SCOOPS	7.50	N.A.
U.S.A.A.F.	N.A.	26.25
STAR GAMES	76.50	12.25
INTO THE EAGLES NEST	6.75	10.50
ELEVATOR ACTION	6.75	12.25
ARKANOID	6.75	N.A.
HITS PACK	7.50	12.25
DELTA	7.50	12.50
MARBLE MADNESS	7.50	12.50
JAILBREAK	7.50	12.50
SHOCKWAY RIDER	6.50	N.A.
NEMESIS	6.50	12.25
FIRETRACK	7.50	12.25
ROMULUS	6.50	N.A.
5 STAR GAMES 2	7.50	N.A.
TEMPE OF APSHAI	7.50	N.A.
SIX PAK (HITS PAK)	7.50	12.25
TEMPLE OF TERROR	7.25	11.25
HEAD OVER HEELS	6.50	10.75
METRO CROSS	7.25	11.25
TROOPER	7.25	11.25
WAR GAME GREATS	11.25	17.25
MAG MAX	6.50	10.75
BARBERIANS	76.25	11.25
EAGLES	7.25	11.25
BBC MICRO		
COMMANDO	6.75	11.26
AIRWOLF	6.76	11.25
REPTON 3	7.25	9.75
KONAMI COIN-OP HIT	7.25	11.25
STRIKERS RUN	6.75	N.A.
RAVENSKULL	6.75	9.50
CRYSTAL CASTLES	6.75	9.50

DODGY GEEZERS	6.75	N.A.
YIE AR KUNG FU	6.75	11.25
FOOTBALL FORTUNES	8.25	12.75
ACORNSOFT X	5.25	9.75
QUEST PROBE	4.25	N.A.
RESEL PLANET	4.25	N.A.
FIRETRACK	7.50	12.25
SENTINEL	7.50	12.25
PAPER BOY	7.25	11.25
ATARI ST		**Our Price**
THE PAWN		23.25
HACKER		23.25
STAR GLIDER		23.25
SUPER HEUY		17.75
STRIP POKER		17.75
THUNDER		27.20
SILENT SERVICE		22.75
STRIKE FORCE HARRIER		17.20
PRO SPRITE DESIGNER		27.25
KARATEMASTER		10.50
MGT		19.25
TRAIL BLAZER		19.25
ULTIMA III		19.25
BALANCE OF POWER		24.25
PROHIBITION		17.25
ARKANOID		11.25
TURBO GT		12.20
AMIGA		
MOON MBT		22.25
ARCHON		25.50
ARCHON II		25.50
ARTIC FOX		25.50
SKYFOX		25.50
THE PAWN		23.00
SEVEN CITIES OF GOLD		23.00
GRAPHICRAFT		60.00
TEXT CRAFT		55.00
HOLLYWOOD HI JINX		20.25
SILENT SERVICE		19.25
WORLD GAMES		19.25
PERIPHERALS (P&P add £1.50 p/item)		
QUICKSHOT II		6.50
QUICKSHOT II PLUS		9.25
PHASER ONE		10.25
QUICKSHOT II TURBO		12.00
AMX MOUSE/Stop Press/ DP (c64)		65.25
AMX MOUSE/Superart/OP (BBC)		76.25

***Game not released. Will be sent on release date**

Please specify machine. Please allow 14-26 days delivery. Please add 75p P&P per item (UK or BFPO)

Overseas add £1.50 P&P per item. Please make Cheques/Postal Orders (sterling only) made payable to G-Ten Limited.

UK or BFPO orders, please send to: G-TEN LTD, DEPT. C+PCW, FREEPOST (no stamp require) London E1 6BR

Overseas orders send to: G-Ten Ltd, Dept C+PCW, 1st Floor, 146/150 Commercial Street, London E1 6NU

BRADWAY SOFTWARE (PW)

The specialists in Really Useful Utilities for the Spectrum 128 and +2

LETTA-HEAD PLUS. Design you letterhead, poster or label on screen, add text from the library of 25 different fonts, select the required output format and print all the copies you need. Price only £9.

DUMPY 3. Produces over 100 different size, shape, density and shaded screendumps. Price less than 1p per dump!! £8.50.

LIN-O-TYPE. Print out any ASCII wordprocessor file in high density NLQ in a choice of 25 fonts, or turn your Spectrum into a full WYSIVYG electronic typewriter. Price £8.50.

ASTRUM+. The very best Z80 assembler and monitor package. Full wordprocessor style editor, unlimited source code on microdrives or Opus Discovery. Command driven monitor with multiple breakpoints, single stepping, slow run etc. Price £13.50 (state microdrive or Opus version).

DISC MANAGER. Discovery disc sector editor and file management program. Erase, rename, copy groups of files, examine, modify and understand disc directory, recover damaged data. Price £10.50 on 3½in. disc only.

All programs drive all printer interfaces and are compatible with Microdrive, Wafadrive and Disc. Letta-Head, Dumpy and Lin-O-Type require an Epson compatible printer. Prices are for cassettes, include full instructions. P.&P. within Europe; please add £2 per program worldwide airmail postage, £1.50 for microdrive cartridge or disc. Send for further details!

(264)

33 Conalan Avenue, Sheffield S17 4PG

CRIBBAGE

The popular pub game six card cribbage is now available for the 48K/128K Spectrum

Features:

FULL PLAYING CARD GRAPHICS
100% MACHINE CODE
TWO LEVELS OF PLAY
AUTOMATIC SCORING

Suitable for both beginners and experts.

Send £5.50 to:

ESEM SOFTWARE
112 Wrington Close, Little Stoke, Bristol BS12 6EJ
Tel: 0454 612811

(260)

ATARI ST PUBLIC DOMAIN

Why reinvent the wheel? We have a large selection of languages, demo's, utilities, comm's and games etc, available. A stamp for our list will save you hours of frustration.

Discs from £3.50 to £4.50

MCSOFT
9 Abingdon Gardens, Bath, Avon BA2 2UY (178)

PUBLIC DOMAIN SOFTWARE FOR IBM PC COMPATIBLES

Massive selection of discs available from only £3.00 per disc.
NO MEMBERSHIP FEES
Send 18p stamp for free catalogue.
PC-STAR
P.O. Box 164, Cardiff CF5 3YB. (220)

K & M COMPUTERS

DISCOUNT SOFTWARE

All prices shown are Amstrad prices. Spectrum and Commodore prices are available on request.

★ ADVENTURE ★	CASS	DISC
Doomdark's Revenge	£9.50	—
The Pawn 6178 Only	—	£15.95
Fourmost Adventures	£4.95	—
Vera Cruz Affair	£8.50	£11.95
The Hobbit	£8.50	—
Lord of the Rings	£12.95	£15.95
Silicon Dreams	£11.95	£15.95
Jewels of Darkness	£11.95	£15.95
Mandragons	£11.95	£15.95
★ COMPILATIONS ★		
Comp. Hits 4 Vol. I	—	£10.95
Comp. Hits 5 Vol. II	—	£11.95
Comp. Hits 6 Vol. III	—	£11.95
Elite Six Pack	£9.50	£11.95
5 Star Vol. 2	£6.50	£11.95
Comp. Hits 10 Vol. III	£8.50	£11.95
Sold a Million I	£8.50	£11.95
Sold a Million II	£8.50	£11.95
Sold a Million III	£8.50	£11.95
Amtix Acolades	£8.50	£11.95
Hit Pack	£8.50	£11.95
Konami Coin Op Hits	£8.50	£11.95
5 Star Games	£8.50	£11.95
Amstrad Academy	£8.50	—
Durrell Big 4	£8.50	£10.95
★ STRAGEY/SIMULATION ★		
Footballer of the Year	£7.50	—
Leaderboard	£8.50	£11.95
Hardball	£8.50	£11.95
Silent Service	£8.50	£11.95
Ace	£8.50	£11.95
Acrojut	£8.50	£11.95
Strike Force Harrier	£8.50	£11.95
President	£7.50	—
TT Racer	£8.50	—
Annals of Rome	£10.95	£14.95
Battlefield Germany	£10.95	£14.95
Trivial Pursuit	£11.95	£15.95
Brian Clough F.F.	£11.95	£14.95

★ ARCADE ★	CASS	DISC
Sold a Million	£7.50	£11.95
Academy	£8.50	—
Spy v Spy II	£8.50	—
Dr. Livingstone	£7.50	—
Tai Pen	£7.50	—
Prohibition	£8.50	£11.95
Hydrpfoil	£7.50	—
World Games	£8.50	—
Kinetate	£6.95	£11.95
Slap Fight		Phone
Army Move	£7.50	£11.95
Metro Cross	£8.50	£11.95
Into the Eagles Nest	£7.50	£11.95
Sigma 7	£6.95	£10.95
Top Gun	£7.50	—
Short Circuit	£7.50	—
Elite	£12.50	£15.95
Starglider	£11.95	£15.95
10th Frame	£8.50	£11.95
Impossiball	£8.50	£11.95
Hive	£8.50	£11.95
Donkey Kong	£7.50	—
Rana Rama	£7.50	£11.95
Saboteur II	£6.95	£10.95
Paperboy		Phone
Trap		Phone
Arkanoid	£7.50	£11.95
Bomb Jack II	£7.50	£11.95
Ballbreaker	£6.95	£11.95
Auf Wied. Monty	£8.50	£11.95
★ ACCESSORIES ★		
Amsoft 3" Discs each		£2.99
Ribbons DMP2000 or PCW each		£5.75
Cover Set PCW		£11.95
Cover Set DMP 2000		£4.50
MP2 Modulator		£28.95
★ JOYSTICKS ★		
Cheetah 125+		£7.95
Koniz Speedking		£11.75

★ BUS/UTIL. ★	DISC
Art Studio .6128 only	£15.95
Mini Office II	£15.95
Plan-It	£15.95
Music System	£15.95
Adv. Music System	£24.95
Protext	£21.95
Masterfile III	£34.95
Tasprint	£10.95
Tascopy	£10.95
Graphic Adv. Creator	£21.95
Pagemaker	£42.95
★ PCW GAMES ★	
Bounder	£12.95
Fairlight	£12.95
Batman	£12.95
Cyrus II Chess	£13.95
Tau Ceti	£13.95
Tomahawk	£16.95
Strike Force Harrier	£16.95
Jewels of Darkness	£16.95
Silicon Dream	£16.95
Gr. Gooch Test Cricket	£16.95
Scrabble	£16.95
Trivial Pursuit	£16.95
The Pawn	£22.95
★ PC1512 GAMES ★	
Cyrus II Chess	£15.95
Winter Games	£15.95
Summer Games	£15.95
Jewels of Darkness	£15.95
Pitstop II	£15.95
Silent Service	£15.95
Mons 18 Golf	£15.95
F15 Strike Eagle	£15.95
Spitfire Ace	£15.95
Solo Flight	£15.95
Dambusters	£15.95
Alex Higgins Snooker	£15.95

★ All prices include post and packing ★ In stock items sent by return ★
★ All budget titles stocked at normal price ★
★We also have an extensive range of Amstrad CPC Software for hire – Free Membership – Send for details ★
★ Cash with order or send for full lists ★ EEC & Europe at no extra charge ★
★ Other overseas add £2 to order ★ British postal orders or sterling cheques ★
★ 24hrs phone 0695 29046 ★ All new releases on day of release ★
★ ★ NEW ★ ★ DIGITISING SERVICE ★ ★ PHONE FOR DETAILS ★ ★ NEW ★ ★

K & M COMPUTERS, 40 FAIRSTEAD, BIRCH GREEN, SKELMERSDALE, LANCS WN8 6RD (266)

QL ZITASOFT WARE

MDV TOOLCHEST toolkit to read and write sectors etc. About 40 FNs with hex Ascii display formatting. Write your own doctor, Mem or other ED prog in basic easily! On line manual with extensive mdv info. Watch for reviews.....NEW
LOCKSMITHE a VERY fast mdv copier with 3 copiers in one. Deals with more than just "most software", it "keys" for all without exception.
4MATTER copies mdv to flp with as much success as most mdv only clones. The best available.
SHRIVEL shrinks expanded machine for naughty software.....NEW
MULTISPOOL tasks behind Quill etc (expanded machine) giving up to 32000 doc's from 1 disc access.
LOCK = £10; 4MAT + LOCK = £18; MSPL = £10; SHRIV = £5; MDV TOOLCHEST = £8
Prices inc. P.&P. Cheques/POs to:
Steve Jones, ZITASOFT UK, 93 FOXBOURNE ROAD, LONDON SW17 8EN.
Outside Europe add £1 (267)

COVERS

CONCEPT COVERS

Dust covers for all computers

Atari ST range, 4-piece set	£10.50
PC1512, 3-piece set	£9.00
PCW range, 3-piece set	£8.95
CPC range, 2-piece set	£8.00
Commodore C64, 1-piece	£3.50
Spectrum +2	£4.00
BBC master range	£10.50

Also covers made to your specification.
For details write or phone:

Concept Covers 24 Wolstenbury Rd, Rustington, West Sussex BN16 3LB. Tel: 0903 782945 (258)

FOR SALE

MICRODRIVE AND INTERFACE OFFERS

Express Service – order by phone
'87 prices include post, packing and C.O.D. over £20 in U.K.

STARTER PACK 1

Microdrive unit, Interface 1 (to connect RS232, network and Microdrives to your Spectrum) plus a demonstration cartridge.
Delivered for only **£57.50**

STARTER PACK 2

Two Microdrive units, Interface 1 plus a demonstration cartridge.
Delivered for only **£83.50**

EXTENSION PACK

Second (or third or fourth . . .) Microdrive unit(s).
Delivered for only **£27.50**

CARTRIDGE PACK

Five blank cartridges to get you started.
Delivered for only **£9 each**

Make cheques payable to Applied Technology.

Export orders outside Europe: add £4 for Australia and countries bordering Pacific Ocean, elsewhere add £2. Where insured parcel service is not available goods are sent at customers' risk.
Delivery ex-stock at time of going to print, all units carry manufacturers' 1987 serial number.

AT **APPLIED TECHNOLOGY**
64 Tannery Drift
Royston, Herts SG8 5DE AT
Tel: 0763 41754

(265)

THE COMPUTER DEPOT

205 Buchanan Street
Glasgow G1 2JZ
041-332 3944

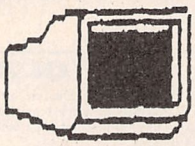
USED GOODIES

Amstrad 8256	£300
BBC	£225

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

Timex Printer for Spectrum
£14.95
Paper Rolls 95p

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆



SCOOP PURCHASE

12" Green Monitor
Ferguson MM02

★ **ONLY** £49.95 ★

Suitable for Commodore, BBC, Electron, IBM, Amstrad PC, Spectrum, Atari, etc. (specify type of lead)

A veritable Aladdin's cave for the computer lover. Visit or telephone.

(268)

DISCS

CENTRAL MEDIA

3.5 INCH DISCS
DATATECH S/S D/D £14.00
UNBRANDED S/S D/D £12.00
5.25 INCH DISCS
DATATECH D/S D/D 96tpl £8.00
DATATECH D/S D/D 48tpl £8.50
TDK S/S D/D 48tpl £7.50

TRADE ENQUIRES WELCOME

ALL CHEQUES & PO'S PAYABLE TO CENTRAL MEDIA
9 COLTMAN ST. HULL HU3 2SG
TEL: (0482) 26380

Atari 800 XL / 130 XE
Essential Utilities

Transdisk Version 3.0
The most powerful tape to disc system for the Atari now made even better. Transfers commercial, machine code, "boot" cassette games or any other software to disc. Single, multi-stage and now even non-standard format tapes present no problem to Transdisk. Plus, enjoy the convenience of loading and running your newly transferred software from an autorun disc menu. No other tape to disc utility for the Atari is as powerful or successful as this! £19.95 inc. Supplied on disc with instructions.

The Freezer!
An amazing new utility for the Atari! "Freeze!" programs while they are RUNNING on your computer. The Freezer then takes over control and allows you to make a back-up copy of the frozen program. The back-up copy will load, and restart from the frozen point, on ANY Atari XL/XE computer, independent of The Freezer! Freezes disc OR tape programs even those that are heavily protected! Easy to use – hit one key to freeze the program in memory then insert a blank disc and hit another key to save it – that's it! £19.95 inc.
Send an S.A.E. or phone for more details of these utilities.
Special offer order both programmes for £35.00
Make Cheque or P.O. payable to DIGICOMM and send your order to:

DIGICOMM
170 Bradwell Common Boulevard, Milton Keynes, Bucks MK13 8BG. Tel: 0908 663708. (121)

BLANK CASSETTES

WITH LIBRARY CASES

	C10	C15	C20	C30
20	7.50	7.70	7.90	8.70
50	16.00	16.20	16.90	18.50
100	29.00	30.00	31.00	35.00

Fully Inclusive (C.O.D. £1 extra)

DISCS

3" per 10		
AMSOFT CF2		£26.95
AMSOFT CF2 IN PROTO BOX		£31.95
3·5" per 10		
MAXELL MF1DD	SSDD	£22.43
MAXELL MF2DD	DSDD	£32.63
SONY D3440	SSDD	£19.99
SONY D4440	DSDD	£32.95
VERBATIM MF350	SSDD	£19.98
UNBRANDED (GUARANTEED)	SSDD	£15.95
UNBRANDED (LIFETIME)	DSDD	£19.95
5·25" per 10		
MAXELL MD1D	SSDD	£12.95
MAXELL MD2D	DSDD	£14.95
VERBATIM MD250-01	DSDD	£12.95
VERBATIM MD525-01	SSDD	£12.95
VERBATIM MD550-01	DSDD	£16.49
GOLDSTAR/RPS	DSDD	£8.99

All discs cert. 100% error free and are guaranteed for life
Educational and official orders are welcome
All prices inc. VAT and P&P. NO HIDDEN EXTRAS!

(66)

RUGBY MICRO SPARES
30 OXFORD ST, RUGBY
CV21 3NF (0788) 71643
Telex 312242 MIDTLXG

DISKS

10 5¼ DS/DD
£6·50 inc. case
10 3½" SS/DD
£16 inc. case
10 3" AMSOFT
£26 inc. case

MEMOTECH COMPUTERS AND ACCESSORIES

MTX 512 COMPUTER	£65.00
DMX 80 PRINTER	£150.00
RS232	£35.00
PASCAL ROM	£35.00
SPECULATOR ROM	£35.00
½ mb. DISK DRIVE & INTERFACE	£170
1 mb. DISK DRIVE & INTERFACE	£175

All the above prices are fully inclusive. We stock the entire Memotech Range. Order/Enquiries to:

UK HOME COMPUTERS
82 CHURCHWARD AVE, SWINDON, WILTS SN2 1NH
24-hr Phone Service 0793 695034

COMPUTER SWAP

Computer Swp entries are limited to 30 words. All entries cost £5.00. Please enclose a cheque or portal order or give Access or Barclaycard No. in the box provided. Only text appearing in the grid will be printed. Send the form to: Computer Swap, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2H 7PP.

PLEASE NOTE. All software offered through computer swap must be in original condition and for private sale only. No advertisements for lists of software will be accepted.

It cannot be swapped.
Warning: It is illegal to advertise pirated software.

COMPUTER SWAP

Please write your copy in capital letters on the lines below.

Name .....

Address .....

..... **Telephone** .....

☐ *Please charge my Visa/Access card no:*

FOR SALE

QL QL QL QL WITH
TAXAN/KAGA or CANON PRINTERS
(TAXAN KP810, KP910 and CANON PW108DA, PW1156A)

If you would like the highest quality printer output, then write or phone for a (FREE) 7 page demonstration of "CuePrint" with "Printer Toolkit"

MUST BE SEEN TO BE BELIEVED

D. A. Burridge, 23 Cromwell Avenue, Hammersmith, London W6 9LA.
Tel: 01-748 3437 (256)

AMIGA JUMPDISC

Best selling American monthly magazine on disc now available in UK. Every issue contains at least ten programmes and ten articles. To receive the current issue please send cheque for £8.50 to:

GEORGE THOMPSON SERVICES LTD, OLD REIGATE ROAD, BETCHWORTH, SURREY RH3 7DR

TELEPHONE: 073 784 4675 (208)

DUPLICATION

jbs records
COMPUTER PROGRAMS

REAL-TIME or HIGHER-SPEED professional Cassette Duplication and Blanks 1 to 1,000+. Computer printed cassette labels, BBC & PC Disk copying 1 to 500+. Fast Security Delivery Service.

FILTERBOND LTD. – JBS RECORDS DIV., FREEPOST, 19 Sadlers Way, Hertford SG14 2BR. 0992 500101 17

COMMODORE 64, C2N cassette unit, two joysticks, light-pen graphics package, laser basic extended interpretor. Over £550 worth of software originals, latest titles. Many magazines. Tel: 01-529 5502.

PBM game 'Rugby League Challenge' kicks off shortly. Start-up kit £2. Then 95p per turn. S.A.E. for further details to: "Camelot" Games, Cae-Ymryson, Caernarvon, Gwynedd.

SPECTRUM 128K, 3½in. disc drive, Beta disc interface Ram. music machine, Videoface digitiser, multiface 1. £200s worth of software/books. All for £290. Tel: 04574 68947.

ATARI 2600 wanted with large collection of good games or games only. Must be in good condition with box. Good price paid for large good collections. Tel: Bromsgrove (0527) 32230.

DO YOU OWN A HOME MICRO? Do you want something more than the usual boring games? This is most certainly for you. Don't just play at life, become part of it by starting your own home base business. The benefits are many and varied. Full or part time. For FREE details, S.A.E. to: Mr G. McGovern (PCW6), 97 Pilton Place, King and Queen Street, Walworth, London SE17 1DR.

ATARI ST520 plus £200 s/w. £450 o.n.o. Hi-res mono vdu, mouse, drive, Lattice C, Psion Chess, Silent Service, Sundog. Tel: Oxon (0491) 33906.

BEEB discs containing Clip Art £3 each. Varied subjects up to 20 screens per side. State format, 40/80 single or double-sided, AMX, Fleet Street, Mode ¼. Cheques to DISART, Sunnybank, School Lane, Euxton, Chorley, Lancs.

SPECTRUM SOFTWARE CLUB. Free membership, limited period only. Then only £1.10 per tape. Latest titles available. S.A.E. "Camelot" Software, Cae-Ymryson, Caernarvon, Gwynedd.

CREATE IDEAS and stories for today's arcade and adventure games with "Storymaker". Large S.A.E. plus £1.50 to: T. Davies, 46 Coed Arhyd, Culverhouse Cross, Cardiff CF5 4TZ.

ATARI ST software, VIP International Gem version £100, Printmaster plus Art Gallery One/Two £50, dBase II £50. All with manuals. Tel: 01-407 5892.

SINCLAIR QL 640K Ram, 3½in. floppy disc, Vision colour monitor, Psion Chess, £285 o.n.o. Tel: 0242 43516.

ELECTRONIC TEST EQUIPMENT and components. 6800 development system with E-Prom programmers and AS100 Canon computer with 256K MSDOS/CPM86 OS. For quick sale tel: 0628 36121.

FOR SALE. Spectrum 48K interface 1, microdrive, joystick and interface, lots of games and books. Bargain at £150. Tel: 0744 815183. Evenings only.

AMSTRAD SOFTWARE HIRE

Unlimited titles
Guaranteed fast, efficient service
Free membership

Send for details:

Tornado Computer Services
4 Swan Court, Dunstable, S. Beds LU6 3DE
Tel: 0582 604610 (262)

ATARI 520 STM ½ meg drive £295. Will sell software separately. Tel: 028487 541 after 5pm.

DISCS 3½in. D/S with labels, £13 for 10. Access/Visa. Grafton Limited, 147 High Street, Huntingdon PE18 6TF. Tel: 0480 51444.

PCW6. Do you own a home micro? Do you want something more than the usual boring games? This is most certainly for you. Don't just play at life, become part of it by starting your own HOME BASE BUSINESS. The benefits are many and varied. Full or part-time, for FREE details S.A.E. to: Mr G. McGovern (PCW7), 97 Pilton Place, King and Queen Street, Walworth, London SE17 1DR.

MONEY MAKING opportunity for all Amstrad users. S.A.E. please to Allendata, 1 Lorn Road, Dunbeg Connel, Argyll PA37 1QG.

SERVICES

FAULTY SPECTRUM?

As you are probably aware from press reports Sinclair Computers no longer have a repair department.
Our computer repair workshop has been an **OFFICIAL** Sinclair Repair Depot for the past six years and we are pleased to announce that we will continue to do your out of guarantee repairs as in the past.
Send your faulty computer **DIRECT**

SPECTRUM	**£18.75 inc parts**
ZX81	**£11.50 inc parts**
16K RAM	**£9.95 inc parts**
MICRODRIVE	**£15.95 inc parts**
INTERFACE 1-11	**£18.75 inc parts**

CALL OR SEND WITH CHEQUE OR P.O.

T.V. SERVICES OF CAMBRIDGE LTD
FRENCH'S ROAD, CAMBRIDGE CB4 3NP
Tel: 0223 311371 28TV

COMPUTER REPAIRS

Fixed Super Low Prices!
Inclusive of parts, labour and VAT



FIRST AID FOR TECHNOLOGY

1 week turnround
Free collection/delivery available for local area

★ INTRODUCTORY OFFERS ★

SPECTRUMS	£14 inc. + Free Game
C64	£22 inc. + Free Game
C16	£18 inc.
VIC20, C+4	£22 inc.
BBC	£32 inc.
ELECTRON	£19 inc.
AMSTRAD 464	£32 inc. + Free Game
C & N CASSETTE UNITS	£19 inc.
C64 P.S.U. FOR SALE	£20 inc.

Please enclose payment with item – 3 month warranty on repair
Please enclose advert with repair

W.T.S. ELECTRONICS (182)
5–9 Portland Road, Luton, Beds LU4 8AT. Tel: 0582 458375. Telex: 265871

COMPUTER BROKEN?

Send it to the experts!

★★★ LIMITED SPECIAL OFFERS ★★★

Spectrum/Plus repairs	£14.95
CBM 64/Vic 20/C16/+4 repairs	£19.95

Vic 20 Owners

Upgrade your old Vic 20 to a CBM 64 for only £79.95.

BBC Owners

Acorn speech upgrades only £19.95
★ 1 week turnaround ★ 3 month guarantee ★

Please make cheques/postal orders payable to:

MICROMEND
Unit 1, The Old School, Main Street, Farcet, Peterborough PE7 3DB
Tel: (0733) 241718 (251)

FAST COMPUTER REPAIR CENTRE – IN LONDON

*BBC Micro, Commodore, Spectrum
*Amstrad, Others
*We sell spare parts
*Used Micros bought and sold
*Eprom Programming Service

Phone: 01-863 7166

PROMPT ELECTRONICS
Unit 4, 15 Springfield Road, Harrow, Middx HA1 1QF
(entrance in Amersham Road) (70)

400/800 **LOOK** NOW
XL/XE ST
ATARI OWNERS

Are you having difficulty finding suitable software. If so, then look no further. We have available for both hire and purchase one of the largest selections of both UK and American titles to choose from. Games and Utilities for all ages. Hardware and add-on utilities at discount prices and special deals regularly being offered. If you would like further information please send a large s.a.e. to:—

CHARNWOOD PRODUCTS AND GAMES
90A Warwick Avenue, Quorn, Loughborough Leicestershire LE12 8HD
Tel: 0509 412604

COMPUTER HIRE

TO HIRE A COMPUTER AND/OR PERIPHERALS BY THE WEEK OR MONTH RING 01-607 0157 or 01-997 6457
WE SPECIALISE IN BBC AND ALSO HAVE A RANGE OF AMSTRAD COMPUTERS FOR HIRE

COMPUTER HIRE SERVICES
294A CALEDONIAN ROAD
LONDON N1 1BA (9)

RIBBONS

FABRIC RIBBON RE-INKING

Introductory offer: £1.50 each

Send cassettes and payment to:

ALADDINK (Dept PC)
4 Hurkur Crescent, Eyemouth Berwickshire TD14 5AP

We will advise normal price for your ribbon

Tel: 08907 50965 (172)

AMSTRAD CPC text adventure "The Magicians Nephew", based on the chronicles of Narnia. Send £5 (cassette), £8 (disc) to: Mr S. P. Robinson, 47 Graeme Road, Enfield, Middlesex. Further details available.

AMSTRAD CPC 128 green screen Rombo expansion, board with Protext Utopia and Spellcheck Roms. Spreadsheet and database disc plus games, books. Ideal for small business, £325. Tel: 0206 391223.

ATARI 500 with Ultimon 810 drive, Happy 1010 recorder, 1020 printer plotter 150 + discs. Over 700 programs, books + mags. Only £210 complete system. Tel: 01-949 8994.

ATARI 520 STFM only. Upgrade to one meg Ram. Electronic experience required. Interested, send £3.95 for comprehensive information and parts availability. A. S. Denby, 6 Ropewalk, Alcester, Warks B49 5DD.

ATARI 800XL, 1050 disc drive, 1029 printer, touch table £500. £'s of software plus mags, books and accessories. Excellent condition, worth £800. Sell for £300 o.n.o. Tel: Thomas, 027984 3106 evenings.

AMIGA 256K memory expansion cartridge. Brand new, boxed, £75. Tel: 0962 881644 evenings.

SPECTRUM 48, Saga Elite keyboard, disc interface (magic button), 1 megabyte NEC disc drive, centronics printer interface, joystick, £400 worth latest software including Starglider, Bismark, Silent Service, Offers around £250. Tel: 01-727 6184.

COMMODORE 128D, 1901 colour monitor, C2N cassette, very little used, £500. Superbase, Easyscript, Supertype, Flight Simulator II, Freeze Frame, Pro joysticks, PET/CBM programming Raeso West. Offers: tel: Bracknell (0344) 421502.

QL CASH TRADER (£35), Super Charge and other softwares for sale due to computer broken down. All brand new. Tel: 0223 322625.

ATARI 130XE, 1050 disc drive, covers, joystick, 100+ discs, lockable boxes, Roms, books, manuals, mags, original packaging. First to see will buy! £299 o.n.o. Tel: Darren, 0621 782826 after 7pm.

DRAGON 32 with Maplin RS232, some books and software £45. ZX81 with Memotech 16K and ZX printer, books and software £35. Tel: Worcester (0905) 351617.

ATARI ST USER GROUP in Manchester. Anyone welcome. Phone: Julian on 061-442 0858. Also ST SF354, ½ meg. drive with International Karate + 10th Frame + Starglider + ST Karate + Mousetrap (originals), £90 o.n.o.

AMSTRAD CPC 6128, colour monitor, cassette, video digitiser, multiface 2, D'k' tronics speech and stereo unit plus loads of software. Offers: contact Danny on Sutton, Surrey, 01-661-7547.

ATARI 520 ST with mono monitor and twin disc drives with bundled software £300. Cash only, no offers. Tel: Slough 23064.

ATARI 800XL, disc drive, tape printer plus over 100 software titles, books, mags, etc. £175 the lot. Tel: Ashford, Kent, 45749 during office hours and ask for Lee.

ATARI ST software, APL6800 £110, MCC Pascal £50, Fast Basic V5.0 £50, Leaderboard £15, Basketball £15, Silicon Dreams £10, Trivia Challenge £10. Tel: 01-902 4310 evenings and weekends.

MACINTOSH 512K with external 400K disc drive, £875. Further details. Tel: Stratford-on-Avon (0789) 750192.

ATARI 520 STM, ½ meg drive, mono monitor, Epson LX80 printer, modem, 14in. colour TV, lots of the best software, books and mags, £550 o.n.o. Tel: 0293 28464. Will deliver, within limits.

GL TWIN 720K disc, 512K Expanderam, green screen monitor, centronics interface, software and books. Current value is £841, asking £400 o.n.o. Please ring Mark on 061-202 4917 between 9am and 5pm.

DISKS 3½" Wabash, 10 – £12, 50 – £55 inclusive. Atari 1050 drive fitted with laser and U.S. doubler, switchable, £120. Tel: 0978 753238.

SPECTRUM AND ZX81 software exchange club, swop your unwanted software. For details send S.A.E. to: S.S.C. (Dept PCW), 27 Mansfield Road, Eastwood, Notts NG16 3DY. Over 200 games to swop. Hurry!

AMSTRAD CPC 464 colour monitor, disc drive, joystick, over fifty games, utilities including Tasword, Lazer-basic, Trivial Pursuit, printer cable, books, magazines. £260. Tel: 0268 690850.

COMMODORE 64, 1514 disc drive, daisywheel printer, C2N data cassette, joystick, interface and assorted software, including word-processor package. £350 (will split). Tel: 01-435 7714.

AMSTRAD PC 8512 with various s/w packages, including word processor and Supercalc 3, plus many others. £450 o.n.o. (reluctant sale!). Tel: (home) Reading 58601, (work) Bracknell 426511 ext. 222 (Joe).

ATARI hyper drive enhancement, for 1050 disc drive, allows true double density, faster reading and writing, and will back up protected software, easy plug-in installation. £40. Tel: 01-508 2671.

MAGIC FILER (Sage) database, £35, for Amstrad PCW. Tel: 01-902 0273 or write Moore, 3 Crawford Avenue, Wembley HA0 2HX.

ATARI USERS – happy board for 1050 wanted. Will give fair price or swap for large selection of software. Contact: Andrew, 13 Willow Road, Gurnos Estate, Merthyr Tydfil, South Wales CF47 9BA.

COMPLETE MEMOTECH business system, MTX512 computer, d/drive (3.5" 1Mb), CP/M, RS232 communication board, DMX80 printer, monochrome (high res) monitor, disc software, Newword, Supercalc, EDASM, utilities, arcade software, cables, manuals. £400. Tel: Alan 0946 63232.

AMSTRAD CPC6128, sound sampler, speech synthesiser, stereo speakers, Amdrum, mouse, 10 blank discs, over £300 software, joystick, books and magazines. Sell for incredible £450. Tel: 0232 615479. Ask for Daniel.

Z80! Z80! Z80! Z80! Programming expertise, does your company need it? Then write to: K. Jeffery, 27 St. Mary's Avenue, Gosport, Hants PO12 2HU.

CBM64 and BBC Business Software for sale, including Anagram Micro Simplex Gemini batteries inc. acc. £30 each. Tel: Courtney on 01-989 2136.

Dealers

BIRMINGHAM

SOFTWARE EXPRESS
COMPUTER SYSTEMS LTD
ATARI *AMIGA*
We have the largest range of Atari 8 and 16-bit software in the Midlands.
Mail order service available.
514–516 Alum Rock Road, Alum Rock, Birmingham B8 3HX
Tel: 021-328 3585 (198)

ESSEX

ESTUARY PERSONAL COMPUTERS
318 CHARTWELL NORTH
VICTORIA CIRCUS SHOPPING CENTRE
SOUTHEND ON SEA
Tel: (0702) 614131 PL484

NOBLES
14-17 EASTERN
ESPLANADE
SOUTHEND-ON-SEA,
ESSEX
Tel: (0702) 63377/8 PL908

Dealers

MIDDLESEX

SAXON SOFTWARE
Software and hardware for all Atari, IBM and Amiga machines.
Send for full list of details:
90 Neild Road
Hayes
Middlesex (255)

GLASGOW

THE COMPUTER DEPOT
205 BUCHANAN STREET
GLASGOW G1 2JZ
Tel: (041) 332 3944 PL705

GLASGOW COMPUTER CENTRE
Atari appointed dealer and Service Centre
Specialists in Atari ST Computers
VIRGINIA GALLERIES
(1st FLOOR)
33 VIRGINIA STREET
GLASGOW G1 1TU
TEL: 041-552 1522 (136)

Dealers

KENT

LIGHTHOUSE COMPUTER SERVICES
★ Specialists in Amstrad
★ Mail Order Service
★ Software for Amstrad – Single Drive a speciality
★ Hot-line help for Amstrad
OWNERS
4 Park Avenue, Deal, Kent CT14 9AL
Telephone:
(0304) 369313
(0304) 362049 (254)

LEEDS

MICROPOWER
NORTHWOOD HOUSE
NORTH STREET
LEEDS LS7 2AA
Tel: (0532) 458800 PL683

Dealers

LIVERPOOL

CITY SOFTWARE
Specialists in:
AMSTRAD
COMMODORE
ATARI
SOFTWARE
AND HARDWARE
66 Lime Street,
City Centre, Liverpool
Tel: 051-708 7100 (263)

LONDON

GALLERY SOFTWARE
1st FLOOR
THE ARNDALE CENT,
WANDSWORTH,
LONDON SW18
Tel: 01-870 4941 27PL29

FREE SOFTWARE ...



Is what you get when you buy an Amstrad PCW, but how many people make the most of it? Now, for the first time, this double package from two of Britain's most experienced computer authors takes the lid off the PCW's hidden power:

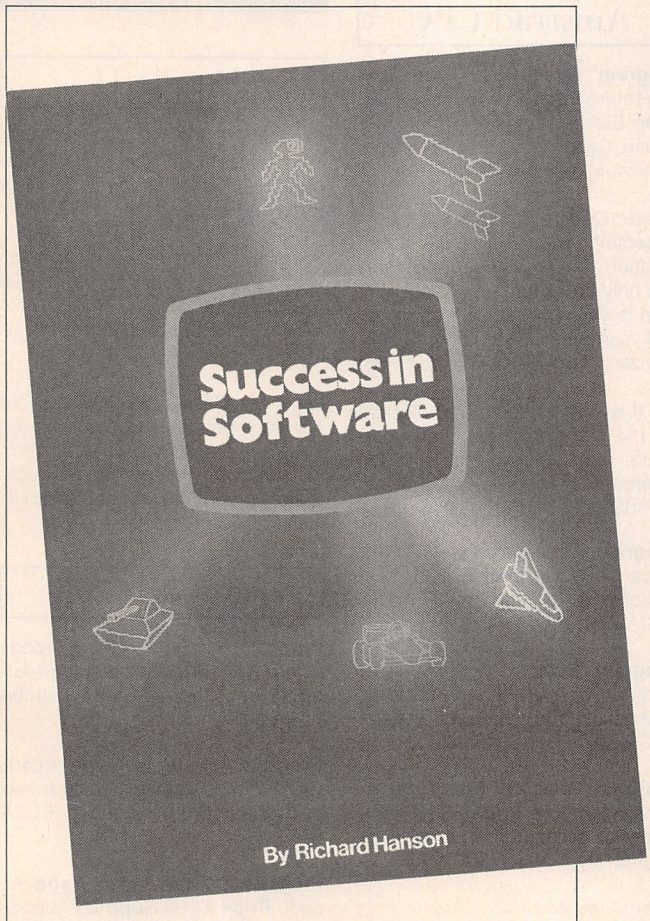
- **WORD PROCESSING:** everything you always wanted to know about templates, layouts, standardised forms, odd-sized formats — from the ABC of LocoScript to the sophisticated techniques of the modern office
- **CP/M:** sensible working methods for a secure and efficient system
- **GSX:** complete details of how to get presentation-quality graphics from straightforward Basic programs
- **LOGO:** graphics and list processing for the first time user
- **BASIC:** your own suite of business programs including a database, accounts program, bank account record, invoice creator and many more.

Practical Amstrad Word Processing and The Amstrad Companion — 440 pages of ideas that will turn your PCW into the power house it was meant to be! **You can obtain the books at only £6.00 each or an amazing price of £10.00 for the two including p&p.**

To Theresa Lacy, Sunshine Books
12/13 Little Newport Street
London WC2H 7PP

Please send me _____copies of practical Amstrad Word Processing and Amstrad Companion (both for £10 inc. p&p)

I enclose a cheque/postal order for £_____payable to Sunshine Books
Alternatively please debit my Visa ☐ Access ☐ American Express ☐
Account Number _____ Expiry Date _____
Signed _____
Name (capitals please) _____
Address _____



PROGRAMMERS!

The definitive reference guide for all aspiring game programmers FREE when you subscribe to:

POPULAR Computing WEEKLY

★ Will help you write high-quality marketable computer games software.

★ Explains what qualities you need to succeed and the pitfalls to avoid.

★ Extensive advice on writing and marketing the software.

Please enter my annual subscription to *Popular Computing Weekly* at **£25.00 UK, £39.95 Overseas** and send me my FREE copy of "Success in Software"

☐ Please debit my Access/Visa/AmEx card no:

Expiry date: ..... Signature: .....

☐ I enclose a cheque made payable to: Sunshine Publications Ltd.

Name: .....

Address: .....

.....

Return this form to: PCW Subs, 12–13 Little Newport Street, London WC2H 7PP, UK.

NEW RELEASES

Your complete guide to all the software released this week

Amstrad PCW

Program *Guild of Thieves* **Type** Text/Graphic Adventure **Price** £24.95 **Supplier** Rainbird Software, 74 New Oxford Street, London WC1A 1PS.

Follow-up to adventuring's gift to the universe, *The Pawn.* Back in Kerovnia, you must strip an island bare of all its valuables in order to prove to the guild of thieves that you are worthy of its memebership.

Guild uses the same sophisticated parser as *The Pawn;* however, while the graphics on the Amiga and Atari ST versions are distinctly nifty, and those on the Commodore 64 pretty damn good, the PCW version's graphics (and this is after you make allowances for monochrome, etc) are a disappointment. Rather blurred and fuzzy.

Of course, if you're a purist who thinks graphics are an irrelevance in adventures, then the delights of the plot and the parser will keep you happy for months.

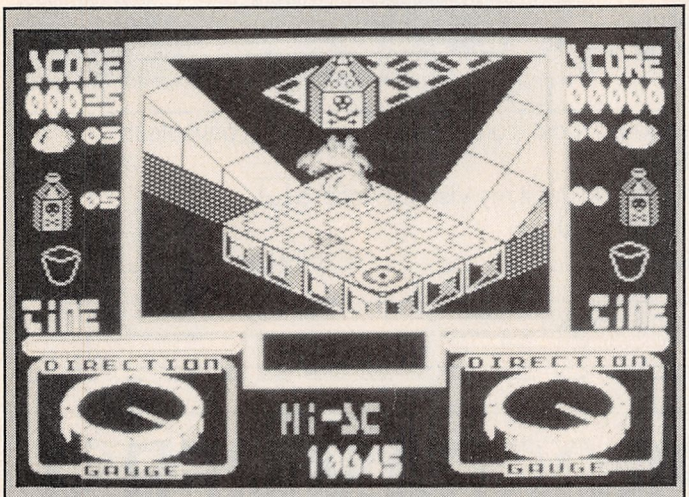
Program *Witch Hunt* **Type** Text Adventure **Price** £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.



See Amstrad CPC for comment.

Program *Psi-5 Trading Company* **Type** Arcade Adventure **Price** £19.99 **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

Welcome conversion of one of US Gold's more intelligent releases.



The industry's most enigmatic gamesters are back with yet another in their endless series of 3-D Spectrum arcade adventures; but is it any improvement on the last few disappointments?

Ultimate's *Bubbler* is, in fact, something of a departure. While it retains many of the typical Ultimate features, it goes for a much more complex playing area than the usual maze of tricky chambers. Bubbles seem to be in vogue these days, what with Softek's *Bobby Bearing,* Firebird's *Parabola* and Microdeal's *Airball* – perhaps it's because they're easy to design.

Whatever, the plot of *Bubbler* is pretty straightforward stuff; collect poison bottles, corks and mystery bubbles in order to trap the monsters threatening your city, and free it from the spell of an evil sorcerer – or something like that.

On each side of the screen are the counters and icons so beloved of Ultimate, while at the bottom are two direction gauges. These feature rotating arrows which indicate your current direction of movement; pretty helpful when you're a featureless blob.

Your ability to fire bubbles of goop will help you fight off the scuttling crabs, spinning aliens, flying saucers and other horrors which assail you on your quest. All these are pretty standard Ultimate fare. More interesting is the background, which is an eight-way scrolling network of slopes, planes, pipes, platforms and spikes, adding up to one of the most complex playing areas in any Spectrum game.

The masking as sprites disappear behind objects is clever too. While *Bubbler* looks good and seems agreeably complex, there isn't much in it which hasn't been seen before, both in Ultimate games and in several imitators – some of them cheaper than £8.99.

Chris Jenkins

Amstrad CPC

Program *Witch Hunt* **Type** Text Adventure **Price** £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.

Classic Quests is a new label from Supersoft; *Witch Hunt* its debut product. You play Filbur Apse in this text only adventure; your only attribute is your obnoxious personality and your quest is to retrieve it after a wizard turns you into someone nice.

If this sounds somewhat off-beat for the traditional text adventure genre, rest assured that witches, wizards and spells are all there in abundance.

Program *Destructo* **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Bump Set Spike* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Throne of Fire* **Type** Arcade Adventure **Price** £8.95 (tape) **Supplier** Melbourne House, 8–10 Paul Street, London EC2A 2JH.

About time, too.

Program *Enterprise* **Type** Arcade Adventure **Price** £8.95 (tape) **Supplier** Melbourne House, 8–10 Paul Street, London EC2A 2JH.

Program *Bubbler* **Type** Arcade Adventure **Price** £9.99 (tape) **Supplier** Ultimate/US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

Program *Kat Trap* **Type** Arcade **Price** £8.95 (tape), £14.95 (disc) **Supplier** Streetwise, Domark Software, 24 Hartfield Road, London SW19 3TA.

Program *Nemesis the Warlock* **Type** Arcade **Price** £8.95 (tape) **Supplier** Martech Software, Bay Terrace, Pevensey Bay, East Sussex BN24 6EE.



Apple II

Program *Guild of Thieves* **Type** Text Adventure **Price** £19.99 **Supplier** Rainbird Software, 74 New Oxford Street, London WC1A 1PS.

Program *Silicon Dreams* **Type** Adventure Compilation **Price** £19.95 **Supplier** Rainbird Software, 74 New Oxford Street, London WC1A 1PS.

Level 9's classic (ie, very old, but still very good) trilogy, comprising *Snowball, Return to Eden* and *Worm in Paradise.* Be warned, though, there's one of those Rainbird novellas in the package.

Atari XL/XE

Program *Invasion* **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Powerdown* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Universal Hero* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

continued on page 43 ▶

Hall of Fame

Program *Stifflip & Co* **Type** Graphic Adventure **Micro** Commodore 64/128 **Price** £9.99 (tape), £12.99 (disc) **Supplier** Palace Software, 276 Pentonville Road, London N1 9NL.

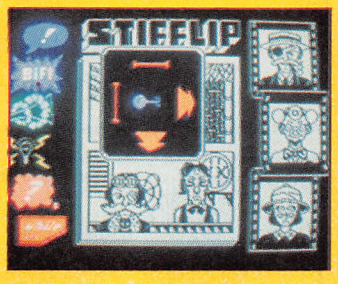


TONGUE IN CHEEK, STIFFLIP

Palace Software's releases are few and far between; when they do emerge, though, they tend to be goodies. Witness the excellent chop 'n' slash simulator *Barbarian*, and now the equally excellent (though completely contrasting) *Stifflip & Co.*

Rarely have I seen the idea of the 'icon-driven adventure' implemented with such style and sense of humour. The synthesis of the two forms is managed with great skill, both the graphic and adventure elements being novel and advanced enough to capture the imagination of the most jaded player.

Bonuses are the excellent music and effects by Richard Joseph; well up with your Hubbards and your Whittakers if you ask me. Stirring patriotic themes and good spot effects.



Stifflip is set in the days when the sun never set on the British Empire, when Englishmen were all gentlemen and when Johnny Dago could expect a visit from a gunboat if he stepped out of line and, yes, it is all tongue in cheek.

Against this scene is played out the drama of the greatest threat to the empire since the Kaiser; Count Chameleon's Rubbertronic Ray, which would take the stiffness out of upper lips, neutralise the starch in wing-collars and radically alter the bounce of cricket balls.

You, Viscount Stifflip, together with companions Col R G Bargie, Prof Braindeath and Miss Primbottom, have travelled to the state of Banarnia to investigate the disappearance of the rubber crop. At the left hand side of the screen are the action icons, the middle is occupied by comic-style drawings of the action, and the characters you wish to control are selected from the sketches on the right.

As with a conventional adventure, you can speak to other characters, give and take objects, fight, explore your surroundings and check your status. All these functions and many more are selected from the main icons.

The fight screen is a complex affair requiring you to build up your power and aim at the centre of a movie target in order to throw the most effective punch. You can also opt to run away, or hit below the belt – not sporting, but sometimes effective.

Dialogue with other characters such as General Moustachio appears in speech bubbles, and normally sounds like something from a Biggles novel, while other characters such as the swarthy barman, native and monkey can offer help, advice and clues – or a biff on the nose.

The adventure itself is as complex as you might desire; it took me ages just to work out how to pay General Moustachio the airport tax and get on to the second scene, but after that things started moving at a fair pace, ending with my untimely demise in a jungle animal trap. Back to the start; alternatively, there's a Ram save facility which will avoid hours of trouble.

Most impressive is the character-switching function by which you can abandon one player, switch to another character, and try to solve any given problem from another direction; using different objects, trying different responses to questions and so on. This makes the game almost infinitely variable.

Chris Jenkins



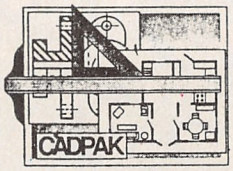
Above right: the title screen. Above left: the status screen shows your strength, and what percentage of the game you have played. Left: the fight screen, where you get to biff people on the nose.

ABACUS SOFTWARE PRODUCTS
from ADAMSOFT

See us at the Commodore Show Stand No. 159

CADPAK Enhanced Version!
For C-64 or C-128

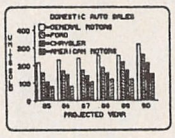
CADPAK is a superb tool for computer aided design and drawing. Using either the keyboard or optional lightpen you draw directly on the screen to create and edit pictures, drawings, layouts and renderings—quickly, accurately, creatively. The new *dimensioning* feature allows exact scaled output on your designs. Choose from the menu options and draw on the screen at an exact location using our *AccuPoint* cursor positioning. Using the two graphics screens, you can draw LINE's, BOXes, CIRCLEs, ELLIPSESs; fill with solid colors or patterns; freehand DRAW; COPY sections of the screen; ZOOM-in to do detailed design on a small section of the screen. With CADPAK's improved object editor, you can define and save furniture, electronic circuitry or machinery as intricate as the screen resolution permits. Hard copy to most dot matrix printers. Perfect for all your design needs.

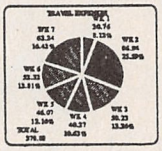


For C-64 **£24.95**
For C-128 **£34.95**

Lightpen (optional) **£12.95**







CHARTPAK
For C-64 or C-128

CHARTPAK lets you make professional quality charts *fast*—without any time-consuming programming. Enter, edit, save and recall your data, then interactively build your pie, bar, line chart or scatter graph. You specify scaling, labeling and positioning. CHARTPAK instantly draws the chart in any of 8 different formats—you can change your format immediately to draw another chart type. Other features include statistical routines for average, standard deviation, least squares and forecasting. You can also use data from spreadsheets such as Multiplan, Calc Result or Busicalc. CHARTPAK records your final results on Commodore 1525 / MPS-801/1526, Epson, Gemini, Okidata (including OKIMATE 10/color) or C Itoh Prowriter dot matrix printers.

C-64 version **£24.95** C-128 version **£34.95**

'The C-64 versions work at 320×200 resolution and the C-128 versions at 600×360 resolution. CHARTPAK screens can be read by CADPAK for further enhancement if required.

All software products are on disk.

Free postage on U.K. and overseas surface mail orders. Add £3 per item for airmail. We stock the entire range of Abacus software products and books. Send SAE for catalogue. Generous dealer terms available. Access (not VISA) or Transcash orders accepted (a/c 687944007). Add £1.50. Mail Order. Callers by appointment.

ADAMSOFT (Dept PCW1), 18 Norwich Avenue, Rochdale, Lancs OL11 5JZ
Tel: 0706-524304 (Day or evening)

UNIQUE OPPORTUNITIES

Robtek is expanding and consequently requires further employees.

An excellent salary is on offer for a customer support technician with experience in 16- and 8-bit machines. Whilst this is a part-time position at present, it is likely to be upgraded. Application in strictest confidence to Mike Segrue, Sales Director, by June 19th 1987.

We'll give you top payments and royalties for any programs published on our successful games label, Diamond Games. Gems only!

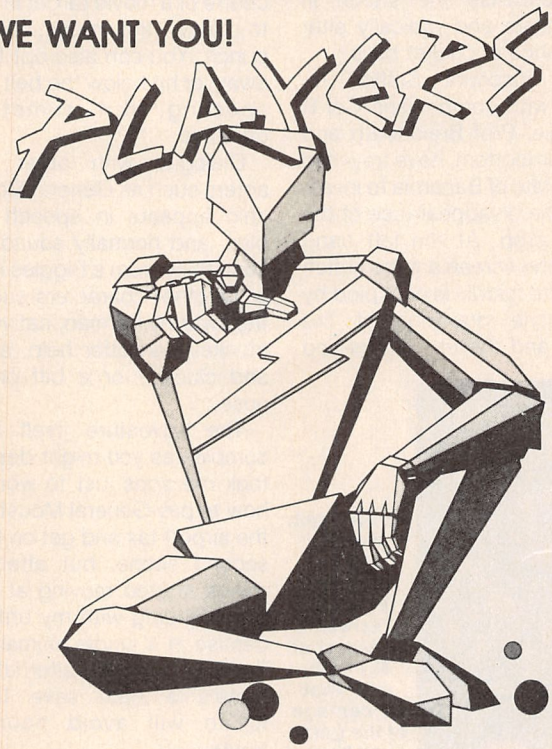
Applications to:

Robtek Ltd
Unit 4, Isleworth Business Complex
St. John's Road, Isleworth
Middx TW7 6NL

Games to:

Diamond Games
Unit 4, Isleworth Business Complex
St. John's Road, Isleworth
Middx TW7 6NL
Telephone: 01-847 4457

WE WANT YOU!



THE PLAYERS TEAM ARE OUT LOOKING FOR YOU!

CAN YOU WRITE COMMERCIAL QUALITY GAMES IN MACHINE CODE?

Write in Strictest Confidence to:
RICHARD PAUL JONES
PLAYERS SOFTWARE, CALLEVA PARK
ALDERMASTON
BERKS. RG7 4QW

or phone: (07356) 77421 (5 lines)

G.T. COMPUTERS

Wales Largest Independent Retail Outlet

*** Part exchange welcome**
*** All prices inc. VAT: excl. P.&.P.**
*** All computer repairs undertaken**

* USED *	£	* NEW *	£
Spectrum 48k	39.99	Spectrum 128	79.99
Spectrum 48k Plus	49.99	Spectrum 128+2	119.00
Spectrum 128	59.99	Commodore 64	150.00
Spectrum 128+2	89.00	Commodore 64 Connosseur	189.00
Commodore 64 inc. Rec.	110.00	Commodore 128	199.00
MPS 803 Printer	119.00	Commodore 128D	359.00
Commodore 128 inc. Rec.	150.00	1541C Disc Drive	150.00
Commodore 1541 Disc Drive	99.00	Amstrad 464 inc. Mod.	179.00
MPS801 Printer	79.99	Amstrad 464 inc. Col. Mon.	279.00
Amstrad 464 inc. Mod.	99.99	Amstrad 6128 inc. Mod.	279.00
Amstrad 464 inc. Col. Mon.	189.00	Amstrad 6128 inc. Col. Mon.	360.00
Amstrad 6128 inc. Mod.	199.00	Amstrad PCW8256	430.00
Amstrad 6128 inc. Col. Mon.	279.00	Amstrad PCW8512	530.00
Amstrad PCW8256	350.00	Amstrad PC1512SM	499.00
Amstrad PCW8512	450.00	Amstrad PC1512DC	799.00
DMP2000 Printer	110.00	Amstrad PC1512/HD20M	999.00
FD-1 Disc Drive	70.00	Amsoft 3" discs (per 10)	29.99
DD-1 Disc Drive	110.00	Cumana 40/80 Disc Drive	150.00
BBC Model B Series 7	199.00	Opus 40T Disc Drive	69.99
BBC Model B inc. DFS	249.00	1050 Disc Drive	120.00
Acorn Electron	45.00	Atari Data Recorders	24.99
Atari 800XL	45.00	Atari 520STM	249.00
Atari 130XE	79.00	Atari 520STFM	359.00
Atari 520ST	189.00		
Atari 520STFM	310.00		

* NEW *

Cheetah 125+ joystick £5.99 – Spectrum joystick interface £7.99 – Spectrum light pen £12.95 – Spectrum power supplies £6.50 – Commodore power supplies £19.99 – Commodore data recorders £19.99 – Large range of used disc drives, printers, monitors, add-ons available.

ALL CHEQUES to made payable to: G.T. COMPUTERS LTD.
21 Charles Street, Newport, Gwent. Tel: (0633) 216654
133 City Road, Cardiff, Glam. Tel: (0222) 483038

WE DON'T SELL CHEAP COMPUTERS!
WE SELL OUR COMPUTERS CHEAP!

◀ continued from page 40

BBC/Master range

Program *Technology and Design* **Type** Education **Price** £24.95 **Supplier** BBC Software, 80 Wool Lane, London W12 0TT.

Suite of scientific programs demonstrating how pneumatic devices work; how to design your own structures; how to control motors, among others. Audio tutorial cassettes included.

Commodore Pet

Program *Witch Hunt* **Type** Text Adventure **Price** £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.

Commodore 16/ Plus 4

Program *Xadium* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Witch Hunt* (Plus 4 only) **Type** Text Adventure **Price** £12.95 (tape), £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.

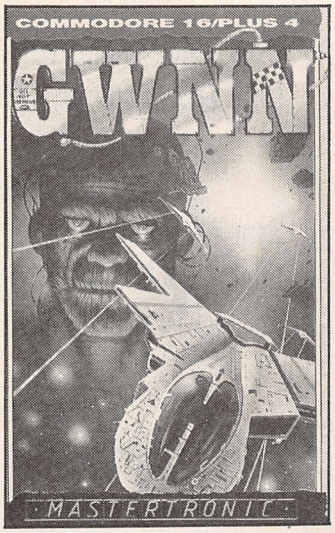
See Amstrad CPC for comment.

Program *Thrust* **Type** Arcade **Price** £1.99 **Supplier** Firebird Silver, 74 New Oxford Street, London WC1A 1PS.



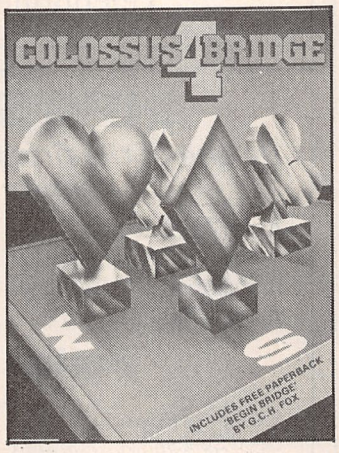
Conversion of one of last year's arcade shoot'em up gems.

Program *GWNN* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.



Commodore 64/128

Program *Colossus 4 Bridge* **Type** Card Game Simulation **Price** £11.95 (tape), £14.95 (disc) **Supplier** CDS Software, CDS House, Beckett Road, Doncaster DN2 4AD.



Bridge simulation for those who can't stay on speaking terms with human bridge partners – this one is packaged excellently for beginners or near-beginners.

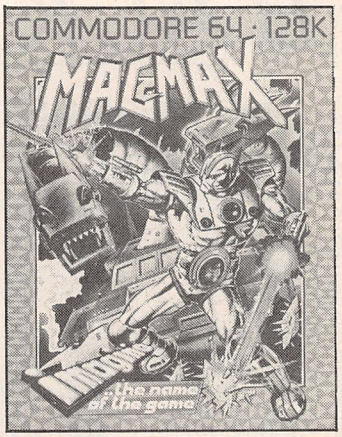
Program *Wonder Boy* **Type** Coin-op Conversion **Price** £9.99 (tape), £14.99 (disc) **Supplier** Activision, 23 Pond Street, London NW3.

See panel for comment.

Program *Colony* **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Magmax* **Type** Arcade **Price** £8.95 (tape), £12.95 (disc) **Supplier** Imagine Software, 6 Central Street, Manchester.

Program *Witch Hunt* **Type** Text Adventure **Price** £12.95 (tape), £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.



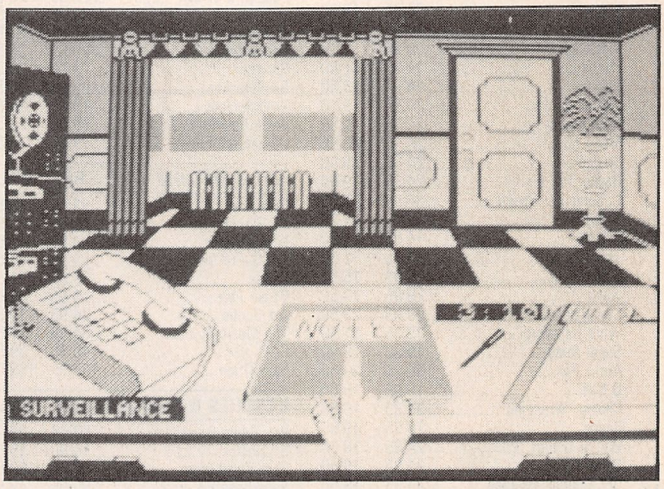
See Amstrad CPC for comment.

Program *Destructo* **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Kikstart II* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Hyperforce* **Type** Arcade **Price** £1.99 **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Wiz* **Type** Graphic Adventure **Price** £8.95 (tape), £14.95 (disc) **Supplier** Melbourne House, 8–10 Paul Street, London EC2A 2JH.



I hope you like Agatha Christie, because if murder mysteries are not your thing you won't get much fun out of *Killed Until Dead.*

What goes on is this: five of the world's best selling murder mystery writers, known as the Murder Club, have booked into the Gargoyle Hotel for their annual reunion. During the conference they will all try to bump each other off to lay claim to being the world's greatest murderer. Your task, as Hercule Holmes (really!) is to prevent these nefarious acts from taking place, and to get the vital information that will enable you to arrest a suspect.

There are four basic steps to solving the case, the first of which is checking the profiles of the guests, getting to know who dislikes who and what. And why!

Part two concerns break-ins, where the suspects leave their rooms and go a wandering in the night. You have to answer a few questions from a security guard before you can get to do anything useful like tape record meetings or attend them personally.

Step three is actually using your tape recorder to garner useful hints and clues as to the goings on.

The penalty for failing to arrest the right person before midnight is death. Yours and the victims.

There are a few problems with the game. The first is that this was a disc based game so converting it to a tape system has resulted in lots of messing about with the two tapes. The second is that a lot of the notes given in play are riddled with American jargon.

Still, if you can cope with these two things, and you like mysteries, then I think you'll find *Killed Until Dead* intriguingly good.

Duncan Evans

continued on page 45 ▶

BYTEBACK

THE ATARI ST SPECIALIST

BEST PRICES *FASTEST* DELIVERY!

GAMES	RRP	ONLY
Gauntlet	24.99	19.50
Star Trek	19.95	15.50
Barbarian	24.95	19.50
Airball	24.95	19.50
MGT	24.95	19.50
Arkanoid	14.95	11.50
Goldrunner	24.95	19.50
Metro Cross	24.95	19.50
Mouse Trap	14.95	11.50
Skyfox	24.95	19.50
Prohibition	19.95	15.50
Turbo GT	15.95	12.50
SDI	45.95	36.50
Balance of Power	29.95	23.50
Arena + Brataccas	34.95	27.50
Eden Blues	24.95	19.50
Trailblazer	24.95	19.50
Macadam Bumper	24.95	19.50
Liberator	12.95	10.00
Timeblast	9.95	7.50
Plutos	14.95	11.50
Xevious	24.95	19.50
Leaderboard	24.95	19.50
10th Frame	24.95	19.50
Mean 18	29.95	23.50
Shanghai	24.95	19.50
Hacker I or II	24.95	19.50
L. Computer People	34.95	27.50
Strip Poker	19.95	15.50
Tee Up	14.95	11.50
Thai Boxing	14.95	11.50
Space Pilot	19.95	15.50
Joust	29.95	23.50
Star Raiders	29.95	23.50
Word for Word	39.95	31.50
Super Huey	19.95	15.50
Arctic Fox	39.95	31.50
Q Ball	19.95	15.50
Champ. Wrestling	24.95	19.50
Rogue	24.95	19.50
Winter Games	24.95	19.50
Super Cycle	24.95	19.50
GFL Champ. Football	24.95	19.50
Basketball (2 on 2)	24.95	19.50
Karate Master	12.95	10.00
Typhoon	19.95	15.50
Hippo Backgammon	39.95	31.50
Colourspace	19.95	15.50
Ninja Mission	9.95	7.50
Techmate Chess	19.95	15.50
Shuttle II	24.95	19.50
Karate Kid II	24.95	19.50
Pinball Factory	24.95	19.50
Cards	19.95	15.50
Electronic Pool	19.95	15.50
Major Motion	19.95	15.50
Time Bandit	29.95	23.50
Lands of Havoc	19.95	15.50
Silent Service	24.95	19.50
Harrier Strike	49.95	39.00
Strike Force Harrier	24.95	19.50
Mercenary	24.95	19.50
Universe 2 ST	69.96	55.50
Mission Mouse (b/w)	19.95	15.00
ST Karate	19.95	15.50
Protector/Space Stn	24.95	19.50
War Zone/Fire Blast	24.95	19.50
3D Chess	24.95	19.50
Deep Space	34.95	27.50
Wanderer 3D	24.95	19.50
Starglider	24.95	19.50
Terrestrial Encounter	14.95	11.50
Flight Sim. II	49.95	39.00

STRATEGY	RRP	ONLY
Phantasie II	24.95	19.50
Temple of Apshai	24.95	19.50
Ultima 2 or 3	24.95	19.50
Road War 2000	24.95	19.50

ADVENTURES	RRP	ONLY
Guild of Thieves	24.95	19.50
Beaurocracy	29.95	23.50
Hollywood Hi-Jinx	29.95	23.50
Moonmist	29.95	23.50
Questprobe	19.95	15.50
Kings Quest II	29.95	23.50
Jewels of Darkness	19.95	15.50
Silicon Dreams	19.95	15.50
Alternate Reality	24.95	19.50
Pawn	24.95	19.50
Trinity	34.95	27.50
Hitch Hikers Guide	29.95	23.50
Tass Times	24.95	19.50
Borrowed Time	24.95	19.50
Mindshadow	24.95	19.50
Leather Goddesses	29.95	23.50
Mind F. Voyaging	34.95	27.50
Zork (I, II or III)	29.95	23.50
Deadline	29.95	23.50
Bally Hoo	29.95	23.50
Enchanter	29.95	23.50
Sorcerer	29.95	23.50
Spellbreaker	29.95	23.50
Transylvania	19.95	15.50
Black Cauldron	29.95	23.50
Winnie the Pooh	24.95	19.50

ART & DESIGN	RRP	ONLY
GFA Draft	99.95	79.50
Art Director	49.95	39.50
Film Director	59.95	47.50
Pro Sprite Generator	39.95	31.50
Degas	39.95	31.50
Degas Elite	79.95	63.50
Art Scribe	24.95	19.50
The Music Studio	34.95	27.50
CAD 3D	49.95	39.50
Easy Draw	149.95	119.50

UTILITIES & BUSINESS	RRP	ONLY
Pro Sound Designer	57.44	49.00
ST Doctor	19.95	15.50
First Word Plus	79.95	63.50
SuperBase Personal	99.95	79.50
Publishing Partner	159.85	127.50
Fleet St. Publisher	115.00	92.00
Ramdisk/Spooler	24.95	19.50
ProCopy ST	34.95	27.50
TRIMbase	89.95	71.50
VIP Pro. GEM	228.85	183.00
Thunder	39.95	31.50
Back Pack	49.00	39.00
Minicomm	29.95	23.50
1st Mail	29.95	23.50
K-Comm 2	49.95	39.50
K-Ram	29.95	23.50
K-Spread 2	79.95	63.50
K-Switch	29.95	23.50
Metacomco Make	49.95	39.50
Payroll	199.00	159.00
MI Print	19.95	15.50
Digidrum	24.95	19.50
Digidrum sample disk	14.95	11.50
Zoomracks 1	39.95	31.50
Zoomracks 2	69.95	55.50
Cornerman	29.95	23.50
Michtron Utilities	39.95	31.50
Megafont ST	29.95	23.50

LANGUAGES	RRP	ONLY
GFA Basic	59.95	47.50
GFA Basic Compiler	59.95	47.50
Fast Basic	89.90	71.50
K-Seka	49.95	39.50
MCC Cambridge Lisp	149.95	119.50
MCC BCPL	99.95	79.50
MCC Pascal	89.95	71.50
MCC Lattice C (3.04)	89.95	71.50
MC Assembler	49.95	39.50
Modula 2 ST	99.95	79.50
Pro Fortran/Pascal	147.95	118.00

Lots of Public Domain Software from only ..... £3.50 per disk!

ALL PRICES INCLUDE VAT AND FIRST CLASS POST
TELEPHONE (0636) 79097 FOR PERSONAL ASSISTANCE
Send Cheque/PO to:

BYTEBACK 20a SPRING GARDENS, NEWARK, NOTTS NG24 4UW

Summer Madness

Amstrad PC1512 at Trade Price!!

Dual Drive Mono (RRP £559) ..... £474 + VAT
Dual Drive Colour (RRP £729) ..... £605 + VAT

Printer Bargains

Star NL10 ..... £199 + VAT
Epson RX100 Wide Carriage ..... £199 + VAT
Parallel Printer Lead ..... £12 + VAT

Terms and Conditions
Add VAT at 15% to all prices
Delivery £5 per order in Mainland UK
Cash with order

ABBOT COMPUTER PRODUCTS LIMITED

50 High Street
Edgware
Middx HA8 7EP

Telephone: 01-951 5809

MPC Software

Be one of the first people in the UK to get an Amiga A500

Amiga A500 ..... £530
Amiga A500 & TV Modulator £550
Amiga A500 & A1081 Hi-res Colour Monitor £860
Amiga A2000 ..... Phone

Amiga Software

GAMES

Balance of Power £36
Deep Space £30
Defender of the Crown £42
Guild of Thieves £23
Marble Madness £26
Mindwalker £40
Pawn £21
Starglider £22
World Games £21

BUSINESS

Aegis Draw (CAD) £150
Analyse II (Spreadsheet) £130
DB Man (DBase 3 Clone) £120
Deluxe Paint II £135
Logistix £155
PCLO (PCB Design) £280
Prowrite (Wordprocessor with graphics) £120
Superbase Personal £135
Talker (Wordprocessor) £65

All prices include VAT & delivery in UK.
This is just a small sample of our Amiga software and hardware.
Phone for a complete list.

Offical Commodore Amiga dealers

MPC SOFTWARE

72 Julian Road, West Bridgford, Nottm. NG2 5AN
Tel: (0602) 820106/455114

◀ continued from page 43

Program *Mystery of Arkham Manor* **Type** Adventure **Price** £8.95 (tape), £14.95 (disc) **Supplier** Melbourne House, 8–10 Paul Street, London EC2A 2JH.

Program *Kat Trap* **Type** Arcade **Price** £8.95 (tape), £14.95 (disc) **Supplier** Streetwise, Domark Software, 24 Hartfield Road, London SW19 3TA.

See Spectrum for comment.

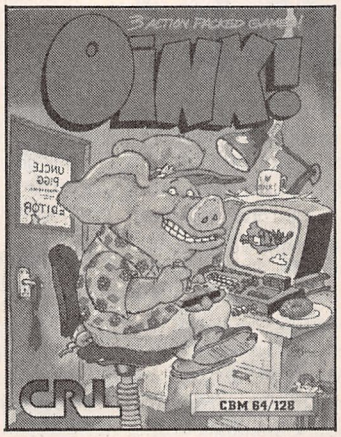
Program *Frankenstein* **Type** Adventure **Price** £8.95 (tape), £14.95 (disc) **Supplier** CRL, 9 Kings Yard, Carpenters Road, London E15.



Program *Oink!* **Type** Arcade **Price** £8.95 (tape), £14.95 (disc) **Supplier** CRL, 9 Kings Yard, Carpenters Road, London E15.

Oink! is a fanzine/comic with a wholly unhealthy obsession with pigs – or a hilariously funny obsession, depending on whether you've been amassed into the *Oink!* cult or not.

This is the game of the comic. Thus you'll either be tickled to bits by it or completely bewildered.



Program *Zolyx* **Type** Arcade **Price** £1.99 **Supplier** Firebird Silver, 74 New Oxford Street, London WC1A 1PS.

IBM PC and Compatibles

Program *Witch Hunt* **Type** Text Adventure **Price** £14.95 (disc) **Supplier** Classic Quests, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex.

See Amstrad CPC for comment.

Program *Rock n Wrestle* **Type** Wrestling simulation **Price** £19.95 **Supplier** Melbourne House, 8–10 Paul Street, London EC2A 2JH.

MSX

Program *10th Frame* **Type** Ten-pin bowling simulation **Price** £9.99 (tape) **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

Program *Bubbler* **Type** Arcade Adventure **Price** £9.99 (tape) **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

Program *Flash Gordon* **Type** Arcade **Price** £2.99 (tape) **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Voidrunner* **Type** Arcade **Price** £2.99 (tape) **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Stormbringer* **Type** Arcade **Price** £2.99 (tape) **Supplier** Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Spectrum

Program *Roundheads* **Type** Strategy/wargame **Price** £8.95 **Supplier** Lothlorien, Argus Press Software, Victory House, Leicester Place, London WC2H 7NB.

Program *Wolfan* **Type** Arcade **Price** £1.99 **Supplier** Bulldog/Mastertronic, 8–10 Paul Street, London EC2A 2JH.

Program *Wiz* **Type** Graphic adventure **Price** £7.95 **Supplier** Melbourne House, 8–10 Paul Street, London EC2A 2JH.

Program *Enterprise* **Type** Arcade Adventure **Price** £7.95 **Supplier** Melbourne House, 8–10 Paul Street, London EC2A 2JH.

Program *Killed Until Dead* **Type** Arcade **Price** £8.99 **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

Program *Bubbler* **Type** Arcade Adventure **Price** £8.99 **Supplier** Ultimate/US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

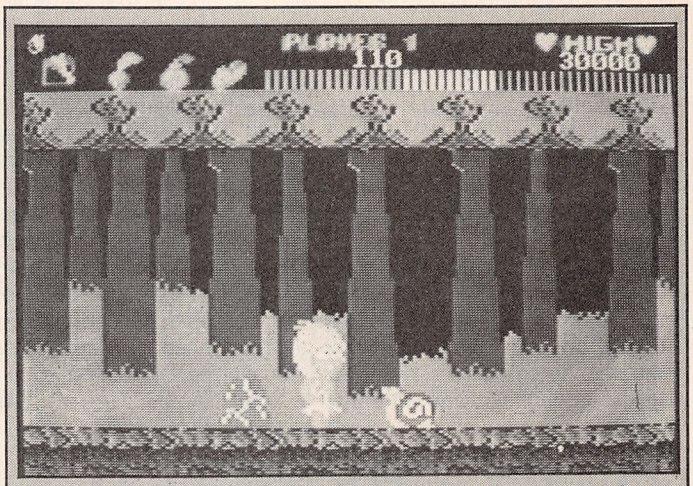
Program *Kat Trap* **Type** Arcade **Price** £8.95 **Supplier** Streetwise, Domark Software, 24 Hartfield Road, London SW19 3TA.

CHARTS

Top Twenty

1	(1)	BMX Simulator	Code Masters
2	(3)	Four Great Games	Microvalue
3	(2)	Football Manager	Addictive
4	(20)	Paperboy	Elite
5	(7)	Feud	Bulldog
6	(6)	Enduro Racer	Activision
7	(4)	Gauntlet	US Gold
8	(–)	Barbarian	Palace
9	(5)	Six Pack	Elite
10	(8)	Konami's Coin-op Hits	Imagine
11	(11)	Army Moves	Imagine
12	(13)	Ollie and Lisa	Firebird
13	(9)	Five Star Games 2	Beau Jolly
14	(14)	180	Mastertronic
15	(17)	Head Over Heels	Ocean
16	(15)	Milk Race	Mastertronic
17	(–)	Big 4	Durell
18	(16)	Vampire	Code Masters
19	(–)	Curse of Sherwood	Mastertronic
20	(–)	Leaderboard	Access/US Gold

All figures compiled by Gallup/Microscope



Remember *Hunchback*? Scrolling landscape from right to left, side on view, holes to jump over, things to avoid. That was all three or four years ago.

Now, tart up the landscape, provide a few weapons to collect and use, sprinkle on a bit of platform and ladders and substitute a small golden haired boy for the hero and what have you got? *Wonder Boy*.

The storyline has small brat bouncing through the unfriendly landscape to rescue his girlfriend. In defence of Activision I should say the light first dawned over Wonder Boy's nappy in the arcades with Sega's original.

From a technical point of view the game is quite reasonable, the graphics are nice, the animation and scrolling good. Unfortunately from an entertainment viewpoint it is mind numbingly uninspiring. The music is routine and monotonous and the whole affair generates little excitement or interest.

Duncan Evans

HAVE HUMANS OUT-GROWN THEIR USE?

Robots, and more specifically, the Android have gripped the imagination of scientists and sci-fi enthusiasts since the dawn of rational thought.

To create a perfect being in our own image is now much closer to being a reality than Mary Shelley, the author of *Frankenstein,* could ever have imagined.

Two recent technological developments have helped to bring this dream a step closer. The first is the development of the 'bio-chip'; and the second the imminent perfection of the use of superconductors at room temperature.

Briefly, the bio-chip uses organic molecules, such as proteins, to channel the flow of electric current through a circuit, instead of inorganic materials such as the silicon chip. Already, laboratory experiments have shown bio-chips to have a potential for memory far greater than that of silicon-based chips.

One drawback, however, is that they tend to be *slower* in operation than traditional chips. These bio-chips, therefore, can be considered as similar to the way in which our own biological brains work.

We also, have a far greater memory capacity than a computer-brain. However, we do suffer from the problems of slower interaction between circuits (try beating a computer at mental arithmetic). It would appear, therefore, not to be unreasonable for us to consider the bio-chip as the basic building block of a future human 'look-alike' android.

Computers based on bio-chips (because of their greater memory capacity pro rata) could be much smaller. With further technological advance, it's conceivable that a computer the size of a human brain could have similar faculties and attributes to that of a 'real' human brain.

Imagine now a latex being with a bio-chip brain; sub-microprocessors dotted around his body to gather information from input devices in eyes, ears, fingertips and feet. Further bio-chips to generate speech and output movements through limbs, wrists, waist, fingers and most importantly – the opposable thumb. A cooling system to aid the heat sinks and dyed red for effect.

What do we have? We have an android! Furthermore, an android who, from the outside at least, is indistinguishable from a human, and equally as intelligent and sensitive. What rights would this being have? Should it be allowed to vote? Or go to a disco? Does it need an MOT? The questions are endless.

But think on. Recent advances in the development of superconductors, and the sudden influx of money into Japanese companies with an interest in the product, suggest that we will soon have superconductors that work, not at near-absolute zero, but rather at *room* temperature. Superconductors, for the uninitiated, are materials that allow electric currents to flow with negligible resistance, thereby increasing the *speed* and cost effectiveness of an operation dramatically.

Imagine, if you will, therefore, an android whose brain consists of superconducting circuitry of heuristic design (ie, it learns from its own experiences) and with a bio-chip backup for memory storage.

This android would be astonishingly more intelligent than a human being (and learning all the time) and – provided it can arrange its own maintenance (android doctors based on expert systems perhaps) it will be permanently in peak condition.

Andrew G Stephenson

Puzzle No 261

What is the millionth digit?

By this I mean that if you were to write out every number starting with one and proceeding upwards, at which point would you write the millionth digit?

For example the first 21 digits would be:

123456789101112131415

By continuing in this way can you determine in which number the millionth digit would occur, and what that digit is?

(Of course, it is not difficult to find the result by a process of logical deduction – but can you do it by computer?)

Solution to Puzzle No 256

The fourth triangle in the series is one having sides of 193, 194 and 195 units length, and an area of 16,296 square units.

The standard formula for finding the area of a triangle of which the dimensions of the three sides is known is

Area = SQR(S * (S–A) * (S–B) * (S–C))

where A, B, and C are the sides, and S is half the perimeter, ie, (A+B+C)/2.

This formula is used in line 30 of the program.

Starting with a triangle with smallest side 3 units, line 20 computes the sides B and C, and the value of S. This information is then used to calculate the area. If this value is integral (a whole number) the results are printed and variable T is incremented by one to keep a tally of the number of such triangles found. When this value reaches 4, the program stops.

```
10 A=3:T=0
20 B=A+1:C=B+1:S=(A+B+C)/2
30 AREA=SQR(S*(S-A)*(S-B)*(S-C))
   A;" ";B;" ";C;" ";AREA:T=T+1
40 IF AREA=INT(AREA) THEN PRINT
50 IF T=4 THEN END
60 A=A+1:GOTO 20
```

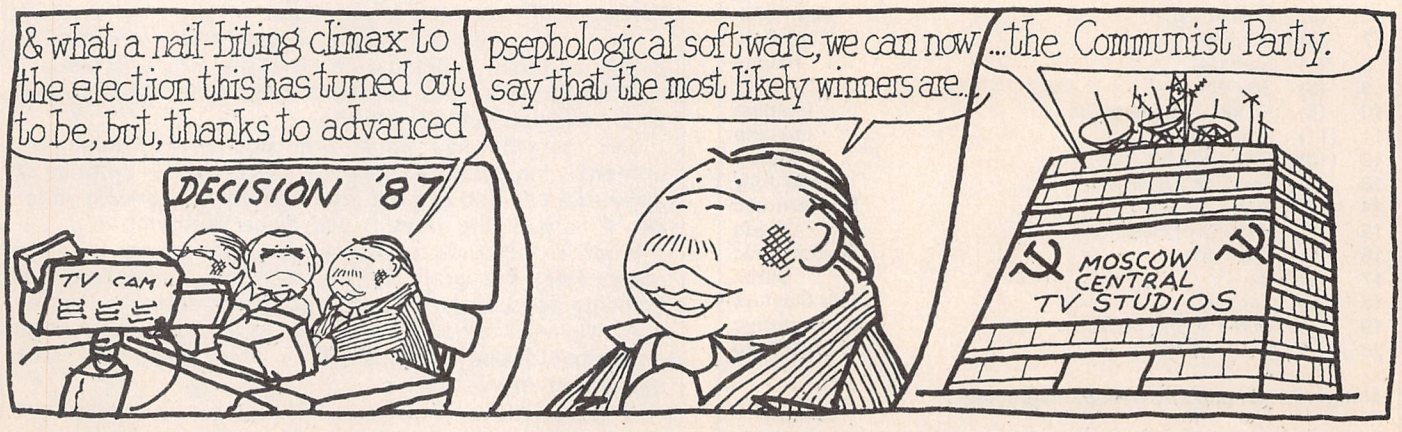
Winner of Puzzle 256

This week's winner is P E Webber of Salisbury, Wilts, who will receive £10.

Rules

The closing date for Puzzle 261 is July.

HACKERS



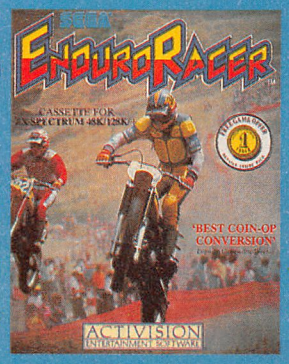
ATARI COMMODORE SPECTRUM

SPECTRUM COMMODORE AMSTRAD ATARI

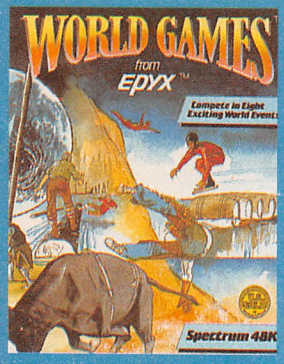
AMSTRAD COMMODORE SPECTRUM ATARI



WOOLWORTHS TOP 30 COMPUTER SOFTWARE

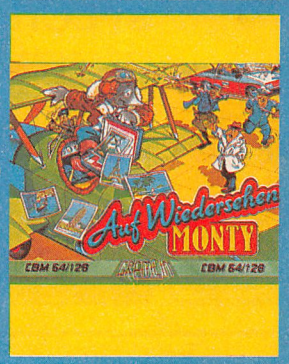


JUNE 1987

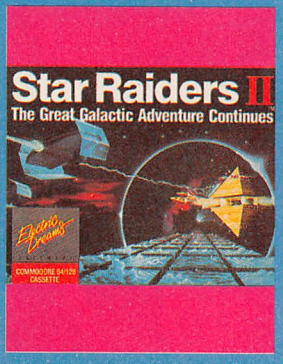


POSITION	TITLE	SOFTWARE HOUSE	MACHINE TYPE	PRICE
1.	6 Pack	Elite	Spectrum	9.95
2.	Enduro Racer	Activision	Spectrum	9.99
3.	6 Pack	Elite	C64	9.95
4.	World Games	U.S. Gold	Spectrum	8.99
5.	Star Raiders II	Electric Dreams	C64	9.99
6.	Saboteur 2	Durrell	Spectrum	7.95
7.	Auf Wiedersehen Monty	Gremlin	Spectrum	7.99
8.	Auf Wiederdehen Monty	Germlin	C64	9.99
9.	Sentinal	Firebird	Spectrum	9.95
10.	Nemesis Warlock	Martech	Spectrum	7.95
11.	Enduro Racer	Activision	C64	9.99
12.	Samurai Triology	Gremlin	C64	9.99
13.	Mag Max	Ocean	Spectrum	7.95
14.	Big 4	Durrell	C64	9.95
15.	Metrocross	U.S. Gold	Spectrum	8.99
16.	Enduro Racer	Activision	Amstrad	9.99
17.	Arkanoid	Ocean	C64	8.95
18.	Gauntlet	U.S. Gold	Spectrum	8.99
19.	Arkanoid	Ocean	Spectrum	7.95
20.	Gunship	Microprose	C64	14.95
21.	Army Moves	Ocean	Spectrum	7.95
22.	Konami Coin Op	Imagine	Spectrum	9.95
23.	Paperboy	Elite	Spectrum	7.95
24.	Leaderboard	U.S. Gold	Spectrum	9.95
25.	Metrocross	U.S. Gold	C64	9.99
26.	Konami Coin Op	Imagine	C64	9.95
27.	6 Pack	Elite	Amstrad	9.95
28.	Ranarama	Hewson	Spectrum	9.95
29.	5 Star Games Vol. 2	Beau-Jolly	Spectrum	9.95
30.	Paperboy	Elite	C64	9.95











WOOLWORTHS

A Great Deal in Entertainment

VISA

* At selected larger stores.

* Items subject to availabilty

COMMODORE SPECTRUM AMSTRAD

CARTOON'S MOST ELUSIVE CHARACTER HAS FINALLY BEEN TRAPPED.

ROAD RUNNER*

THE ARCADE SMASH HIT THAT RECREATES THE SPEED AND EXCITEMENT OF THESE CLASSIC ENCOUNTERS.



Young or old, whatever your age everyone enjoys the antics of the cunning Road Runner as he baffles and bemuses poor Wile E Coyote. Or does he?...

This is your chance to really find out as you take on the role of Road Runner in this comic, all action extravaganza that recreates these nail biting chases and the fast moving excitement to perfection. Speed through canyons and along the highways following the trail of birdseed left for you to feed on (is this the first trick???) Dodge your way round the onrushing trucks keeping an eye out for the perilous mines and feather ruffling, leg busting oil slicks. What dastardly plans has the sleazy Wile E Coyote got in store for you as he lurks in hiding, cowardly awaiting his moment to enjoy a succulent roast of "Road Runner and French Fries".

We're sure you'll overcome all the dirty tricks he can throw at you with ease, agility and grace and a haughty "Beep Beep". Overcome them that is if you've got nerves of steel, the reflexes of a wildcat and the speed of the fastest bird on two legs, otherwise its sorry, goodnight and "Burp Burp"!!!

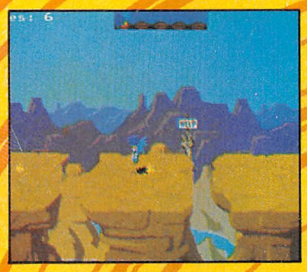


CBM 64/128 TAPE £9.99 DISK £14.99 **ATARI ST** DISK £24.99

SPECTRUM 48K TAPE £8.99 **AMSTRAD** TAPE £9.99 DISK £14.99

ATARI GAMES

© 1986 Warner Bros. and Atari Games Corporation. All rights reserved.
*Trademark of Warner Bros. used by Atari Games Corporation under license.







SCREEN SHOTS FROM ARCADE VERSION.

U.S. GOLD All American Software

U.S. Gold Ltd.
Units 2/3 Holford Way,
Holford, Birmingham
B6 7AX.
Tel: 021 356 3388.

