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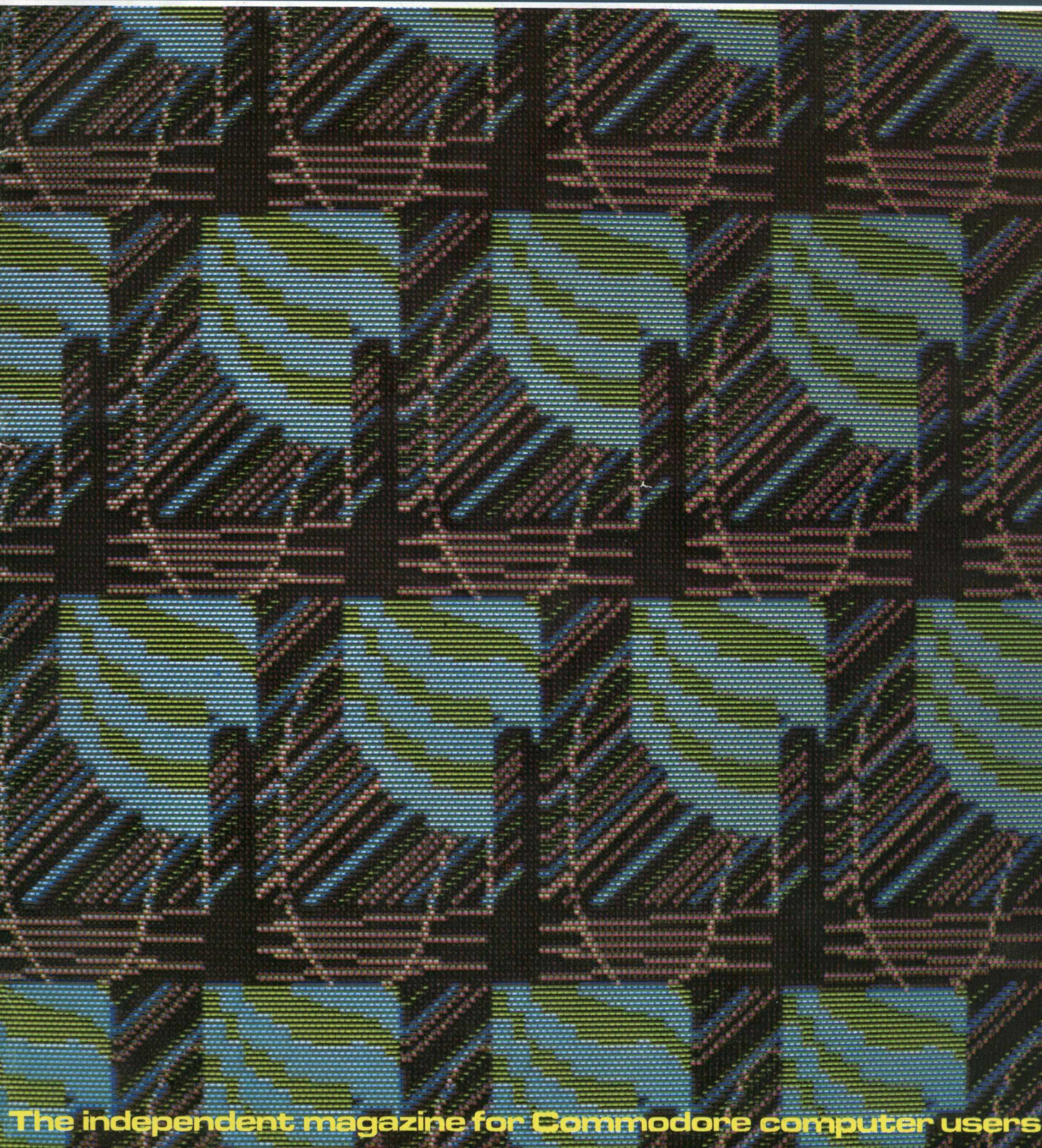

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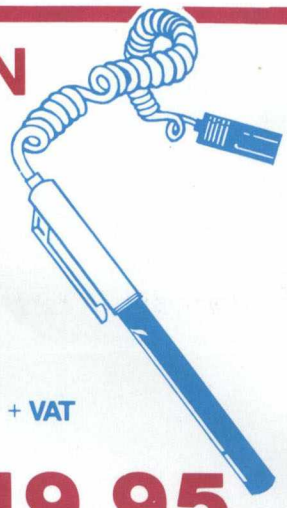

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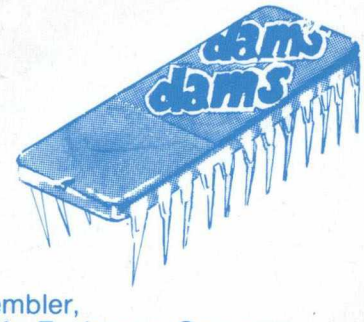

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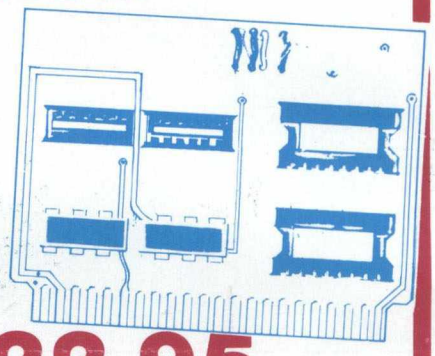

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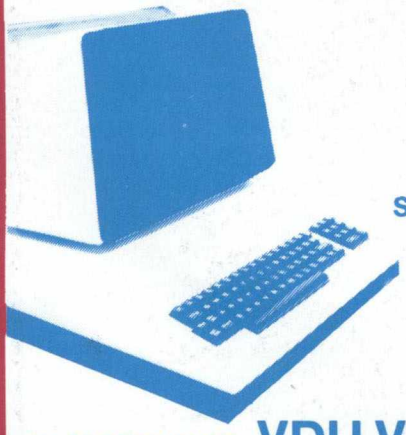

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Editorial

Editor
Pete Gerrard

Advertising Manager
Peter Chandler: tel 01-439 3537

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Managing Editor
Nick Hampshire

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London W1

We will pay 10 pounds for each program printed, and 20 pounds for each article published, which should be approximately 1,000 words long.

As Autumn draws on, and the computer industry gears itself up for the usual busy Christmas period, it's worth reflecting on what has so far happened in the year for Commodore (and indeed ourselves), together with a look to the possible future.

Way back in January, when we were still an in-house magazine, Commodore had finally got the VIC 20 out of the warehouse and into the shops, and must have been wishing that they'd been able to do it a few months earlier. Unfortunately, the all-too-common practise of the computer world (announce a new product and then wait six months before you can actually deliver it) had affected them again.

By March, everything had settled down to a relative calm, and Nick Hampshire had taken over the old Commodore Club News and re-vamped it into Commodore Computing International: the magazine you now hold. The Hanover Fair at the start of the year had seen them proudly launch a number of new computers. So far only the Commodore 64 has been able to appear in quantity, and a small quantity at that. We are now being told that the first 720s will be coming out minus disk drives, and even when those drives appear they will probably be the old 4040 system. In other words, a machine that can be expanded up to one megabyte of RAM, will have a disk drive capable of holding just one third of that.

Let us hope that by the time next month's issue appears this situation will have been resolved one way or the other.

Letters

Dear Sirs,

Please find enclosed a cheque for one year's subscription to the magazine.
I would be grateful if you could backdate my subscription to include all vital Vic related stuff.
Thank you for your co-operation.

Yours sincerely
Joly Mactie
London E2.

Dear Joly,

Thanks for the cheque: we hope you enjoy the magazine! The question of back issues has been raised often enough for it to be worthy of mention here. As most of you will probably be aware, we started producing the magazine Commodore Computing International in the earlier part of this year, with our first issue being a combined April/May one. Consequently we can quite happily provide you with back issues as far as that, for a cost of 1.00 pound each.

Dear Sirs,

With reference to the new Commodore 64.
I am one of many awaiting the launch of this new machine, but many dates have been published in the press, and I was wondering if you could give me a clear launch date, and a price (including VAT!).
Some other queries that you might be able to answer. Can all Vic 20 Software be used, including data programs? Can Pet 40 column software be used? Will this machine require a special tape recorder, as with the Vic 20?
Thank you in advance, and I await your reply.

Yours sincerely
J.S. Pain,
Derby.

Dear Mr Pain,

A clear launch date, for a Commodore product?! Whatever I say I'm bound to be proven wrong, but I would guess that they'll be available in limited quantities until the start of December, and then rather more of them after that. The price will be 299.99 pounds, plus the ubiqutous VAT, or in other words 345.00 pounds altogether.

As this has a 40 column screen, and the Vic 20 has a 22 column screen, you will not get much joy there. However, due to one of the best memory management systems I've ever seen on a micro, you'll quite happily be able to transport 40 column Pet software: routines already exist to enable you to do that.
Finally, yes you will need a special tape recorder, although the existing Pet or Vic one will do. Having started the system, I cannot see Commodore altering it!

Dear Sirs,

I read with interest your journal 'Commodore Computing', and enjoy the articles specifically written for Comodore micro users.

In our department we have a 2001 Pet, a 4022 printer, and a 2040 disk drive, and as we write scientific papers that require several drafts it would be very useful to use the Pet as a word processor, as well as in its current role as a data storage and data processor.

I would therefore be very grateful if you could provide me with details of either a software supplier who produces this type of package, or a simple program that would achieve the same end.

Yours sincerely
Neil K. Gibbs
London E9

Dear Mr. Gibbs,

Thank you for your kind comments!

As you say that you have a disk drive, presumably your 2001 Pet has been upgraded to Basic 2/3 at some point. What you don't mention is how much RAM you have on board, but I'll assume the worst and guess that you have an 8K machine.

As far as we know, no-one still has on the market a word processing package for this type of configuration: even if you could find one it would probably be very primitive, and written in Basic to boot! Consequently, I suggest you look at our September issue, and copy out the very basic (small B) program called 'not quite so weeny word pro'.

If any of you suppliers out there do still produce such a package, let us know and we'll quite happily give you editorial mention!

Dear Sirs,

I have been using a Commodore Pet (3032) for some time now, and have been developing some programs for my own use. I know a fair amount about Basic, and regret that the Pet has not got a 'computer GOTO' implemented on it. Lacking the courage to dive into machine code, I've never been able to implement such a command myself, and wonder if you, or any of your readers, have come across such a routine?

Yours sincerely,
James M. Edgar
Windsor.

Dear James,

There was a routine for doing just this, developed by our old friend Brad Templeton, which appeared in print some time ago. For your benefit, and for those of you who missed it first time around, here it is:-

```
110 FOR J = 826 TO 854
110 READ X
120 POKE J,X
130 NEXT J
140 DATA 172,2,242,48,13,32,
248,205,32
150 DATA 139,204,32,210,
214,76,176,199
160 DATA 32,17,206,32,164,
204,32,208
170 DATA 214,76,160,199
```

This puts the routine in the second cassette buffer, so once you've run this little program, type NEW, and our new command will be accessible whenever it's required. The syntax to use is:-

```
SYS 826, EXPRESSION, or
A%=826:SYS
A%,EXPRESSION
```

By way of an example, where you'd like to say:-

```
100 IF S1 THEN GOTO (ST*10)
```

You can now use as:-

```
100 IF S1 THEN SYS 826,
ST*10
```

This routine works on both Basic 1 and 2.

Dear Sirs,

Please find enclosed a cheque for 12.50 pounds, for one year's subscription to Commodore Computing.

I already own the Vic Revealed, and was wondering if you could tell me about any other Vic related literature?

Thank you for your time and trouble.

Yours sincerely
James Gibson
Tonbridge.

Thank you for your subscription.

There are many books published on the Vic, most of which are not terribly good. However, at the beginners level, Commodore have the Introduction to Basic series, parts one and two, both of which are excellent books for learning how to program in Basic. Both books retail at 14.95 pounds, and come complete with two cassettes full of programs to complement the learning process.

At 1.90 pounds we have Learn Computer Programming with the Commodore Vic, but perhaps the best one of all is again one from Commodore themselves, namely Programmers Reference Guide. Taking you on further from the original manual, at 9.95 pounds this is a book well worth buying.

For further news on Vic related literature, watch our monthly selection of book reviews, and also the New Product News section has regular news of books as and when they become available.

KEEP IN TOUCH

If you've any point of view that you'd like to air, or any question that you'd like an answer to, drop us a line. It's your chance to keep in touch, both with us, and with other users.

The Editor reserves the right, prior to publication to amend/alter any letter as he sees fit.

New Product News

More training courses start us off this month, promoted this time by a company going under the name of Computotech Ltd. (tel. 021-743 8711).

They're aiming these courses at the 'owners and management of small to medium sized businesses', who are thinking of the possibilities of acquiring micros in the office. They offer a basic 'core' module, covering an introduction to micros, defining requirements, a look at equipment and software selection, and finally a course on the implementation of systems, covering environmental problems, systems testing and control, and so on.

As well as this there are a number of optional modules, on package evaluation (2 days), program design techniques (3 days), Basic and Interactive programming (5 days), which incorporates the Basic language itself (file handling etc.).

They've already held three courses, and promise more in the later part of the year, based around centres at Birmingham, Manchester and London. The courses are spread over 10 or 20 weeks, depending on whether you choose none or all of the options, and occupy one day of each week.

The cost is a fairly reasonable 40 pounds per day (and there is always the possibility of recovering half of this through public funds!), and this covers all materials, morning coffee, buffet lunch and afternoon tea: how civilised.

Computotech boast an impeccable pedigree, being recognised as a training service to the Manpower Services Commission, amongst others, and registered as an examination centre with the National Computing Centre, the British Computer Society etc., so there's no need to worry about being caught out by a bunch of cowboys!

Well worth contacting for further details.

A Book at Bedtime

Addison-Wesley publishers (tel. 01-631 1636) have just produced a splendid new catalogue, containing many books of interest for Commodore users, and indeed those just interested in microcomputers in general.

Among a whole host of new titles we have Practical Guide to Computers in Education, Electronic Design with Integrated Circuits, Computer Choices : Beware of Conspicuous Computing, Digital Control of Dynamic Systems, and many, many more.

Old favourites include William Burge's Recursive Programming Techniques, Caxton Foster's Programming a Microcomputer : 6502, an interesting read in Abbe Mowshowitz's Computers in Fiction, Patrick Wilson's Artificial Intelligence, amongst about 10,000 other books. Get a copy of their catalogue, it will take you as long to read as some of the books!

A New Look for Old Vics

An idea that was originally mentioned at Commodore a number of years ago (although I assure you they'll deny it!), was to do a mail-order software and accessories service. Well, it's finally happened for the Vic, in the form of a club called Vicsoft (where did they get that name, eh, Julian?). This club produces a catalogue of some of the available Vic peripherals, and a fairly comprehensive list it is too. All the well-known companies, Stack, Adda, Rabbit etc. are in there, as well as the more obscure operators.

The catalogue covers the whole gamut of add-ons, from software games and educational programs, through books and hardware, and onto such gems as Vic carrier cases. Telephone Slough (STD 0753) 73638 for further details.

Bug-Byte (being a remarkably reticent company they only give out an ansaphone number: 051-227 2642) have a range of arcade games for the Vic, including Asteroids and Cosmiads, and also the rather more interesting game of Chess.

Inside this edition of Commodore Computing we carry a full review of just some of their games, and something definitely worthy of your attention is their MultiSound Synthesiser program : the first cassette based program I've seen for the Vic that I did NOT believe was working on an unexpanded Vic. But it does! An amazing example of machine code programming, turning your Vic into a very acceptable synthesiser. See inside for further details.

Quite a few companies have leapt onto the memory expansion bandwagon, including Audio Computers (0702 613081), with 8K RAM plus three additional slots for just 44 pounds (memory expansion for the PET as well here, 128K for 130 pounds), Torch Computers Ltd (0223 841000) have a whole range of cartridges, and finally Stonechip Electronics (0276 681131) who proudly boast that 'all products are British Designed and Built'. Well done, lads!

Feeling More Secure

Softguard, in Birmingham (021-622 4755) recently announced a system that would safeguard against all methods of copying disks and cassettes for both Pet and Vic machines. Quite how you protect against copying of cassettes I'm not quite sure (there are, after all, high

New Product News

speed duplicators around!), and at 500 pounds I for one don't intend finding out. Equally, I fail to see how you can justify claiming that you can stop copying of disks. The equipment it was done on is there in front of you: if it was done on it, it can be un-done on it! Again, at 500 pounds I don't particularly want to find out.

However, spurred on by this, Danny Doyle, one of our regular contributors, has come up with a package that will prevent most people (the 'casual thief') from producing illegal copies of disks. This one costs just 15 pounds, and should stop most people. Those who get round, well, they deserve a free copy! The address to write to is 9 Main Street, Gawcott, Bucks.

More Disk News

Yet another merge utility, from Leader Systems (021-236 9768). Easy to use, bug-free, and it costs 7.95 pounds.

Commodore, perhaps in retaliation to Mator, have produced their own hard disk system, designated in their usual confusing style as the 9060 and 9090. These allow you 5 megabytes and 7.5 megabytes respectively, with a transfer rate of 5 megabytes per second, and an average access time of 153 Msecs. They are both easy to get used to, as they use the familiar Commodore disk operating commands, along with our old friends copy, scratch and rename. For further info contact 0753 79292.

Down to Business

Staying with Commodore for a moment, we'll pause for a brief mention for their 8300P daisy wheel printer. Nothing too spectacular here, apart from the fact that it weighs 80 lbs. I can just see the sophisticated word processor operating secretary lugging that around the office. Print speed of 40 characters a second at its fastest, which makes it more of a viable proposition than the Olympia printers they took on last time, and it can work in either friction or tractor feed modes.

Accountancy

Some more news on the Pegasus accounting suite, from (surprisingly) Pegasus (0536 522822). Presumably being reasonably confident about their 'comprehensive, easy-to-use accounting system' they are offering 50 pounds for anyone who can find a bug in any of the programs. I can think of some companies, who, if they did the same, would be out of business tomorrow!

Seriously, this is a very good idea, and does inspire its own confidence in the end user. Their service generally seems to be very good, and they provide regular updates on the packages. For instance, if someone writes in with a suggested improvement, and this view is subsequently supported by other users, it will be incorporated in future editions of the program.

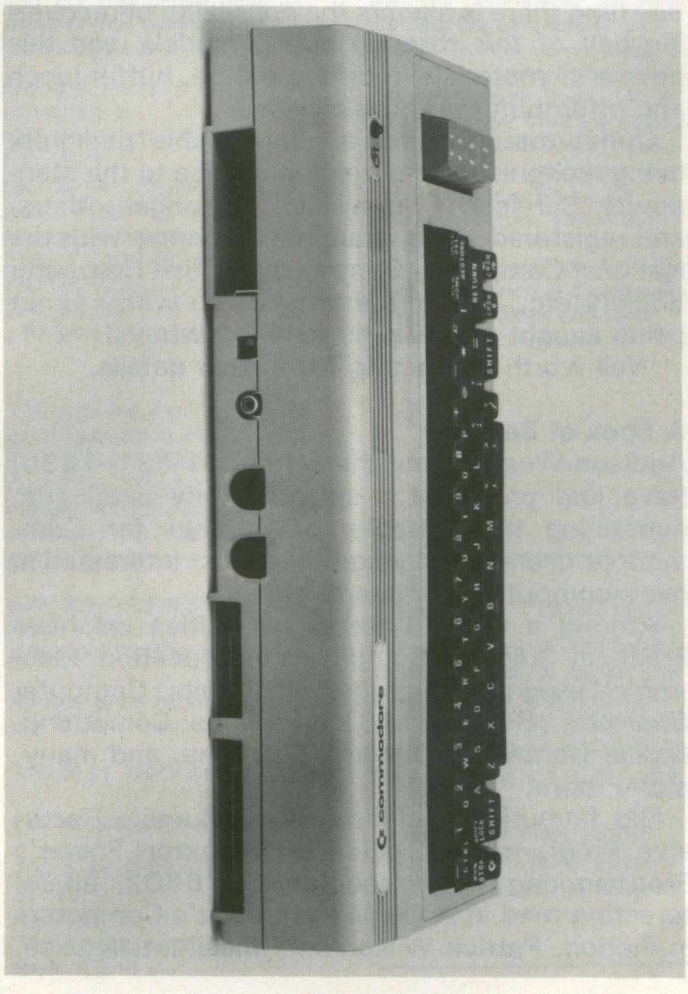
A company who are doing their best to destroy the usually dismal image people have of the computer industry. Nice to see.

Still in accountancy mode, a package called Superclerk (Clerk Kent?), has been developed by Reprodesign, in Lancashire (02575 78376). Unusually, this is written neither in Basic nor machine code, but in extended Business Basic, as produced by JCL Software (0892 27454). Basically combining accounts, typing and filing packages, this has the usual features of linking to Visicalc, DMS etc., and is designed essentially for (and would be extremely useful to) the small business.

It's worth ringing up just to acquire a copy of the catalogue: 'X-Ray vision to see through unwanted records in your files' indeed!

Simply Super software

Supersoft (01-961 1166) have now brought out their follow-on to the successful 40 column



high resolution board (700 sold last year), this time for the 80 column Pet. Giving a resolution of 640 by 200, or two 320 by 200 screens, you can overlap with the existing Pet screen to produce some very good three dimensional effects. Also included in the price of 199 pounds is the Graphix Plus software set : over 70 commands to control the high resolution screen in each of its graphic modes.

Since this board replicates the UD11 and UD12 expansion sockets, for an additional 80 pounds you can acquire the Graphics Pager board, which turns those two sockets into an extra fifteen.

Also out from Supersoft is the first additional module for MicroScript, their 80 column word processor. This gives what many people feel is vital in such a package: the ability to perform arithmetical operations with text files. Clever chaps, these Supersoft lads.

New Horizons

Finally this month, brief mention for Micronet 800. A link up to Prestel, giving you 'instant' access to a whole variety of information from business to education, games to advertising. More next month, but meanwhile call Bob Denton on 01-242 6552 for further information.

Believe it or not !

But a word-processing program actually drew this advertisement - completely - words, lines and all! Of course, it was using a plotter instead of a printer - The HP 7470A. We'll leave you to imagine what uses you could make of this ability.

WORDFORM 2.2 is a very remarkable word-processing program which runs on the CBM/PET microcomputer - a very powerful combination. But, although WORDFORM can do all the sophisticated things that you may require of a word-processor, it is still very easy to do the simple things - like just writing a letter.

The price of this remarkable program is only £225+VAT, or £350 together with the brilliant SPELLCHECK program.

SPELLCHECK is a 35000 word spelling dictionary that adds to WORDFORM. The spelling of any word can be checked at the touch of a key in about 4 seconds. Or, alternatively, SPELLCHECK can be left to check through completed text. It's also 'organic', so that those in specialised fields can add their own vocabularies.

ASK YOUR DEALER FOR A DEMONSTRATION or write to:

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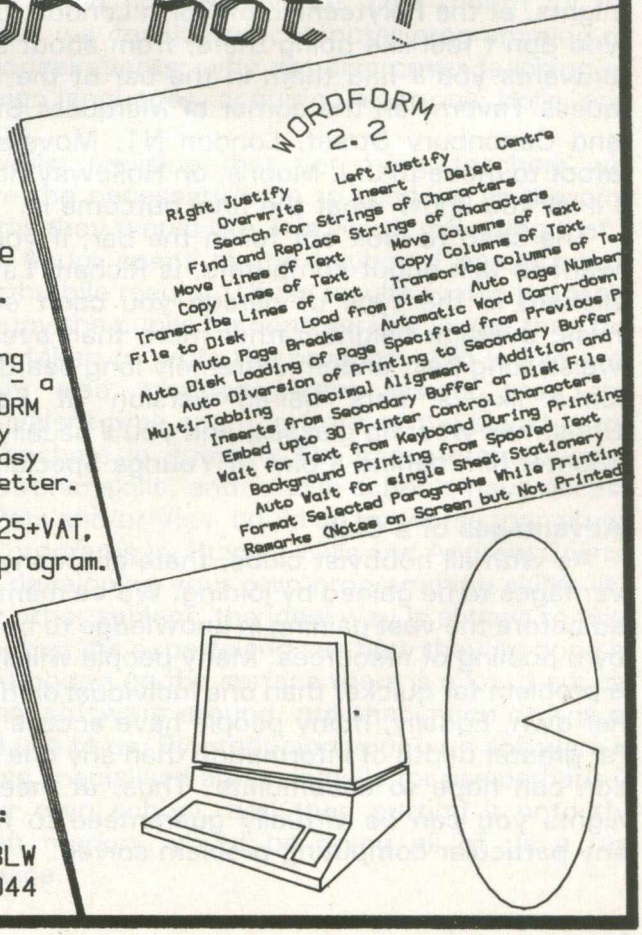

Club News

Pints 'N' Chips!

Over the last few months we've concentrated on some of the regional divisions of ICPUG, but just for a change this month features a report on a non-specialist Pet group (but which nonetheless has a fair amount of Commodore-related interest), namely the North London Hobby Computer Club.

Now, if there's one thing I like writing about, it's a mixture of computing and drinking, and I warn you in advance that if you don't like one or the other you won't enjoy this article! The reason for this is quite simple: the North London Hobby Computer Club (NLHCC from now on) have a very active Real Ale section, and at times it's hard to distinguish one from the other.

This is, in the writer's opinion, a good thing. Not only from the point of view that I get to drink a reasonable pint whenever I meet members of the club, but also I feel that it is more encouraging to newcomers to meet and chat in the more relaxed atmosphere of a pub, rather than the (at first) possibly daunting surroundings of hundreds of computers, ninety nine of which you're not familiar with!

Monday nights during term time are meeting nights, at the Polytechnic of North London, but if you don't feel like going there, from about 9.15 onwards you'll find them in the bar of the Marquess Tavern, on the corner of Marquess Street and Canonbury Street, London N1. Move's are afoot to move to J.J. Moons, on Holloway Road : I'll let you know what the final outcome is.

The chap to look out for in the bar, if you do want to talk about computers, is Richard Larkin. Richard is the type of person you can't easily miss: average height, rather more than average waist, long hair, and an extremely long beard. He looks like a dark haired version of Father Christmas wearing glasses, and you'll usually encounter him behind a pint of Youngs Special.

Advantages of a Club

As with all hobbyist clubs, there are many advantages to be gained by joining. We've mentioned before the vast gaining in knowledge to be had by a pooling of resources. Many people will solve a problem far quicker than one individual on his or her own. Equally, many people have access to a far greater depth of information than any one person can hope to accumulate. Thus, at meeting nights you can be virtually guaranteed to have any particular computing problem solved.

More so perhaps at the NLHCC than many other clubs. No disrespect to the ICPUG groups, but they are strictly Pet and/or Vic oriented, and so, however hard you try, you're bound to get an answer biased one way or the other. However, in a club that offers a variety of micros on display, you're more likely to get a reasonable, straightforward answer: there will always be, of course, the Commodore 'haters', but the unbiased usually far outweigh those.

For instance, the NLHCC has recently acquired A BBC micro, and this was not without its traumas. Twice sent back to Acorn, who made it abundantly clear that they were not going to repair the beast, it finally fell to the aforementioned Richard Larkin to take a look into matters.

From this we have a constructive criticism. The main board inside the BBC micro is extremely flexible: too so, perhaps, because as soon as you start doing anything you're in imminent danger of collapse. This would tend to imply a short life time in a laboratory environment.

On the other hand, they've been taking Pets apart for years, and (surprisingly from Richard's viewpoint) we have yet to see a major disaster. This perhaps says something for Commodore's lasting success in the school, laboratory etc. environment.

Stars of the Show

One of the 'stars' at the meetings is Robin Bradbeer, who's now formed himself into a limited company! Robin is probably best known for his recent work with Spectrum, but still remains an authoratitive voice on the Commodore world. Barry Miles, another well known name, particularly on the business side, is also quite often to be found.

The Robots are Coming

One part of the NLHCC they're hoping to see expand this year is the Robotics group. They've acquired their own robotic arm now, there's the promise of various micro-mice being built, although they will as usual look nothing like mice, and generally they have great hopes for that this year.

So, if robotics is your interest, and you're in the London area, pop along and have a chat.

Similarly, whatever your interest in computing, you are more than welcome to join, and see the kind of work that they're doing.

Education

Teacher's PET

From the point of view of the teacher, many of the educational programs currently available for both Pet and Vic, leave a lot to be desired. What may appear good on the surface to (say) a competent programmer, and what indeed may be a very well written program, will simply not work in a classroom environment. What is the reason for this? To try and explain why, this month we take a look at some programs, and present guidelines for the writing of good, useful, educational software.

Classic Authors

Many of the classic authors in this field are themselves teachers. Take for instance A. Russell Wills, a teacher in Dundee and writer of many programs distributed by Audiogenic, ESM, and others.

Mr Wills' programs quite often follow the same lines: they are humourous, entertaining, and combine the game-playing role with that of the learning one. A recurrent theme is the game of Hangman: if a game has stood the test of time as well as this one, why not adapt to the more modern role of computing?

Presented with a map of South East England, a part of the human anatomy, or whatever, the pupil is shown a highlighted part of the screen display, and then given a hangman game to play to try and identify the relevant feature.

Thus the interest is kept, with a combination of playing a game and learning at the same time. This is the way to do it: the pupil quite often doesn't know, or realise, that he or she is in fact learning. The game playing takes over, which, from the teaches point of view, is ideal. If they've enjoyed the lesson one day no doubt the next will produce renewed interest : vital, in order to keep to any learning schedule.

Another 'best-seller' is Professor Andrew Colins, of Strathclyde University. Now Colins adopts a different approach, but one that is equally valid. Rather than teaching a traditional school subject (geography, mathematics, etc.), he usually confines himself to the learning of the programming language itself: in his, and our, case, the Basic language used in the Pet or Vic.

Rather than just presenting the raw programs (or very sparse documentation), Colins provides copious notes to go with his programs. The programs themselves (well into double figures with each cassette) are usually illustrative of various points in the manual. You may well remember his extremely successful Strathclyde Basic course, distributed by Commodore themselves a few years back.

The manuals are straightforward, with plenty of room for users notes, solving of examples, comments, and so on, and play an integral part in the learning process.

So here we have another approach: the simple, straightforward program, with comprehensive accompanying instruction.

Different Styles

Both of these methods have their merits, and both in their way illustrate the art of writing useful, commercially successful and educationally useful software. On the one hand, the cross-over of games and learning, and on the other the 'well, we'll start gently and let you determine your own pace' style.

Let me stress here that these are by no means the only good authors in the field: rather, they illustrate our point.

Other Subjects

Most people tend to regard educational software as confining itself to a few, well-trodden paths. However, this need not be the case. By adopting one or other of the roles outlined above, there is no reason why traditionally forgotten subjects could not be covered. Last month for instance we considered computer programming of historical events: why not also cover teaching of foreign languages, acquiring electronic skills, and so on.

Whilst realising that not many teachers will have the necessary time to produce all the programs they would like, it is worth reflecting that a few hours spent at the keyboard can produce worthwhile results. These results would probably occupy the pupils for considerably longer than the time taken to write the program, and would probably also produce better results than the equivalent time spent in front of the blackboard.

Teachers in subjects like the aforementioned electronic skills, and whose schools have access to Pets and/or Vics, could do far worse than study the programs by Russell Wills and Andrew Colins. For developing your own programming skills, like any other subject, the ideal way is always to take a look at the experts and see how they've done it.

Although on the surface there is a lot of educational software around, not that much of it is of real use to us. By producing your own software in these specialised areas, initially for use perhaps in your own school, and then putting it onto the open market, you'd be doing all of us a real service.

If it came to the worst you'll be glad you went to the best.

If your computer develops a fault chances are that it will happen just when you can least afford the interruption and downtime. So you'll want fast and effective action. That's where Mills Associates comes in.

Mills are the only independent maintenance company recommended by Commodore to provide comprehensive engineering services throughout the United Kingdom.

Through Mills you have access to a range of preventative maintenance and fault repair services backed by a network of 10 engineering centres and over 15 years experience in computer engineering.

Full maintenance contract

This is designed for users for whom a minimum of downtime is essential. The service includes two routine maintenance visits each year and a call-out service with 24 hour response and fix times. Replacement loan units for standard equipment are available at no extra cost and the annual contract charge includes all replacement parts, labour, travelling and so on.

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For occasional repairs and upgrades Mills offer a first class workshop service and will collect, repair and deliver Commodore units anywhere within mainland Britain at fixed rates.

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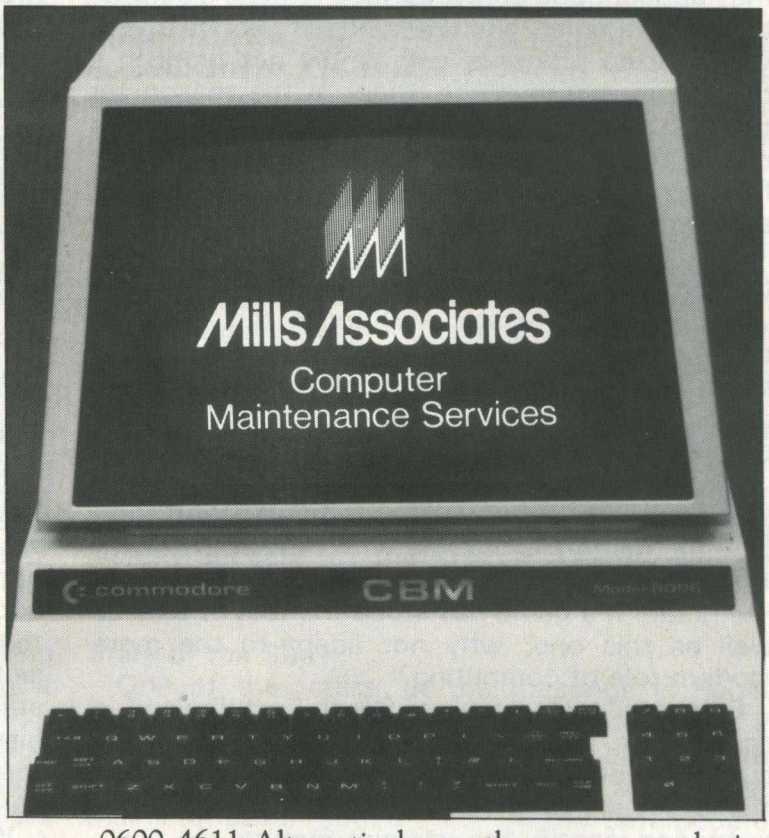
For immediate action call Mills' head office on 0600-4611. Alternatively, use the coupon to obtain further information about the service that will best meet your needs.



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Telephone _____ MA/CCO/1182

To: The Commodore Information Centre
675 Ajax Avenue, Slough, Berks SL1 4BG.

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Changing business for the better.

Readers Survey

Are You Being Serviced?

In response to a number of requests from both readers and companies, we are this month launching a new feature in the magazine.

There are many aspects of the use of computers that require, from time to time, outside help, and in particular the maintenance of these computers. A number of companies around the country provide such a service, and what we'd like you to do is fill out the form below, and return it to the address at the front of the magazine.

This will provide valuable feedback for ourselves, for you (whether you've had to use a maintenance company or not), and perhaps most importantly for the companies themselves. No-one will want to see themselves blacklisted in the magazine: a statement to the effect that XZY company does not give adequate maintenance will lose them business unless something is rapidly done to remedy this.

Similarly, if a company provides a good service they will be used by other customers as well, and so will strive to keep up the good work.

So, by filling out the form below, you'll be doing all of us a favour.

In future months we'll be looking at other sides of the computer business, but for now .....

Survey Form

Type of Equipment (e.g. 8032, 4040) .....

Use (e.g. business, private, company) .....

.....

Area (e.g. Manchester, Glasgow) .....

Company Used (name and address) .....

.....

.....

.....

.....

Service Required (e.g. faulty ROM .....

disk heads aligning) .....

Equipment Repaired Satisfactorily (Y or N) .....

Quality of service in terms of: speed .....

terms of: time .....

terms of: cost .....

(Please rate from 0 low to 9 high)

Would you use them again if required (Y or N) .....

Finally, your name and address .....

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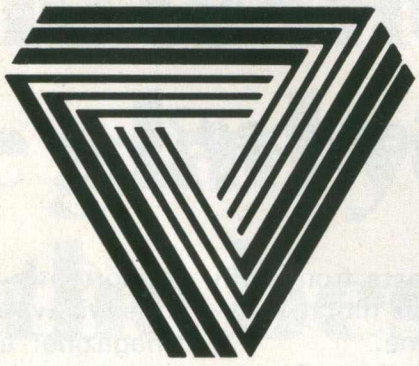

VISICORP™

Rapid Terminals are pleased to announce CBM 8096 VisiCalc. Now available in the U.K.

If you're using 8050, 4040 or 2040 disk drives, you can take advantage of the full power of VisiCalc right now on Commodore 8096, 8032, 4032 and 2000/1 computers.

And there's also an upgrade package available for the 8032 to the 8096.

Sounds interesting? For full details just contact your local Commodore Pet dealer.

Rapid Terminals

Dealers – contact Rod Smallwood on High Wycombe **(0494) 38525.**

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Microcomputers in Business·

Forecasting

Some companies save a fortune by the installation and successful employment of microcomputers in the office, whilst others get the machines in and then flounder around wandering quite what to do with them.

Over the last two months we've offered some basis advice when actually buying a system, and then onto something slightly more specific in 'I've got the machine, so what do I do with it now?'.

To continue the trend of becoming more specific, this month we'll take a look at an area of office computer use that has saved many thousands of pounds for many companies, with directly related examples of various programs to help you achieve this, and how by following these examples you can get your company on the road to financial savings.

Once you've considered the more mundane (albeit vital) office practises of accountancy, word processing, payroll etc., it soon becomes apparent that there are many other functions that your microcomputer is capable of performing. One of these, and one that is becoming ever more evident, is the role of financial forecasting.

So what, precisely, is financial forecasting?

Financial Forecasting

In its most basic, it's taking a look at the future and trying to sort out what is going to happen! However, there's a world of difference between looking at the bottom of a tea cup and using sophisticated electronic equipment.

Any company, if it is to survive and thrive, must be able to take an informed look into the future and project its own strategy against the results of that look. If you're in the business of making our old friend the Widget, and opinion is that the bottom is going to fall out of the Widget market, you'd better act and act fast.

That is why programs like Visicalc, Finplan, Financial Director and the like are, to say the least, rather useful. All three (and these are by no means the only three such programs) are designed to assist in not just financial forecasting but management planning generally: in other words, gaining every bit of knowledge you can before making the decisions that count.

Fortunately, the development of the microprocessor has put the making of these decisions firmly in our grasp. What would previously have taken many man hours, entire office walls of projection charts (complete with scrawls and crossings out that make just about everything totally illegible), to say nothing of the 'impatience factor', can now be achieved in a fraction of the time.

It's an obvious statement to make that, if you know what's going to happen in the future, you're in a far better position to act and make the best of plans for your company. Let's take a look in turn at each of the three programs mentioned earlier, and see how they can be used in the everyday office environment.

Visicalc

The grand-daddy of them all, and probably the first program to make the most use of the available features of the Pet. I can well remember the first time I saw this particular package, and the look of disbelief that was evident on the face of one of Commodore's resident machine code geniuses when he saw the program in operation. It was so fast!

Visicalc was the first program to use the 'electronic worksheet' approach: that is, rather than be confined to the 40 (as it was then) or 80 columns of the screen, and the 25 rows down, you could flip through far more than that just by scanning along with the Visicalc cursor: a rather larger version of the Pet's own.

More than anything else, a major point in its favour is its ability to link to other programs: Visicalc does not suffer from the insularity of other programs, because just about everyone who brings out a decent program these days makes sure it can be used in conjunction with Visicalc.

Using its built in, very powerful, calculator capability, the program comes into its own in the vital area of 'What if ...' calculations.

When planning for the coming months, or even years, there are so many factors that are out of the control of even the largest company. Exchange rates, freight charges, material costs, and more, become a nightmare that you can't really know what's going to happen to. What if the dollar slips against the pound? How will that affect the final cost of your product in the U.K. after shipping in? What if an extra import duty of 0.5% is slapped on that wonderful printer you're importing from Germany? How does that affect the markup?

Using Visicalc, the result of these, and other such changes, can be instantly seen. As an example, Audiogenic in Reading were using the program when they were importing large numbers of software products, books etc., and had a sheet with the months of the year running across the top, and various prices down the side. For in-

Microcomputers in Business·

stance, original price, import duty, freight charges, exchange rates, VAT levy etc. were all included in the Audiogenic list, to help calculate the final U.K. selling price of the goods.

With just a couple of keystrokes, they were able to see what effect a 5 cent drop in the exchange rate would have on everything else, as, just by altering that one figure, Visicalc recalculated all the other figures virtually instantaneously. As an end result, they stopped selling books imported from the States and saved quite a considerable amount of money.

This is where Visicalc can be used in your company: to instantly see what effect just one change will have on the whole market position. An extremely powerful program (and only 120 pounds as well), further details can be gained from the U.K. distributors Rapid Recall, Terminals, on 0494 38525, but dealer calls only please!

Finplan

Finplan works in a similar way, in that it allows for forecasting, trending, data extrapolations, linear regressions, and so on, but differs by including such things as budget appraisal, man management etc. Thus it can be seen to be a rather more powerful and versatile package than Visicalc, but then at 475 pounds one would hope so too.

This is currently available from McDowell Knaggs and Associates, on 0905 28466.

Financial Director

Aimed at anyone who ever has to make a decision greater than 'should I get up this morning', our third package comes from Dataview (tel. 0206 865835). This really is the domain of the business man, as it enables us to take a look at cashflow profit and loss, balance sheets and management ratios, over any 24 week/month/year period.

The various models constructed in using this program can all be consolidated together, and all told this is a comprehensive and all-embracing package.

This, incidentally, is the most costly of the three, retailing at 750 pounds.

Summary

The old saying about looking to the future: 'Fortune Telling? I can't see any future in it', should not be applied to the modern business. Certainly not the business that wants to succeed and see its profits grow over the years ahead.

Part and parcel of maintaining a position at the front of the market is the ability to anticipate moves by rivals in the area, and by anticipating keep ahead of them.

Similarly, if you can acquire a fairly detailed breakdown of how your company fortunes would sway if various key market factors were to alter, one can ride with those changes and come out (hopefully!) the better for it.

These are the sort of achievements we can make by using not only the programs mentioned above, but others that are also on the market. Although we have talked in this column before about developing your own programs, in this particular area I would not recommend it, as there are so many good programs already available.

Available inexpensively, more to the point. Visicalc, at just 120 pounds, represents a real bargain in these days of ever increasing costs of software. It is also a very versatile and adaptable program, so there should be no reason why it cannot be fitted into your own office plans.

And that, my friends, is the key to success in this field of financial forecasting and management planning.

Versatility and adaptability. It's what we want in the program, and it's what you want in your business.

We'll be back next month with a seasonal round up of ideas to help you and your business, but to close for this month a very brief look at what Commodore plan to do with the Commodore 64.

Taking Steps Forward

The Commodore 64 is a bold new machine. With built in superb graphics and sound capabilities, thus making it eminently suitable for being a games and educational computer, John Baxter (U.K. Marketing Manager for Commodore) is nonetheless hoping that this will be the machine to knock Apples out of the tree and take over the bottom end of the business market for Commodore.

Personally I have to disagree. I can see it being, as mentioned above, a games and educational machine, and at under 300 pounds we're also in the region where enthusiastic amateurs can buy one: the old H.P. bills will start mounting up!

It will be a programmers machine, there is no doubt about that: so many wonderful things can be done with it, that people will start getting very enthusiastic about programming the beast when it appears in quantity. Business packages too will certainly be produced, but for the serious businessman?

Wait till the 500 and 700 series machines come out!

Superscript

The Ultimate CBM Word Processor

A Commodore enthusiast wanted a word processor that was simple, fast and easy to use. He wanted to handle up to 20,000 characters of text, use a wide screen format of up to 240 characters with full window scrolling in all directions and be able to use the screen while printing. He wanted a word processor at a reasonable price. The enthusiast, Simon Tranmer, couldn't find one . . .

So he wrote

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SUPERSCRIPT runs on the CBM 2001, 3016, 3032, 4016, 4032, 8032 and 8096 computers, and with the CBM 2040, 3040, 4040 and 8050 disk drives, all Commodore printers and a wide range of letter quality printers.

Superscript does everything he wanted. . . and much more. It provides a complete document preparation and storage system, making optimum use of memory and disk space. it gives access to all the letter quality printer features such as boldface and ribbon colour change. In short, it provides all of the advantages of a dedicated professional word processor.

Superscript does everything Commodore wanted. . . which is why they are adopting it for all of their forthcoming models.

SUPERSCRIPT is available from Calco Software at £249 plus Vat. Order by mail or telephone, using cheque, Access Card or Barclaycard, or official Purchase Order. All goods are despatched by First Class Post.

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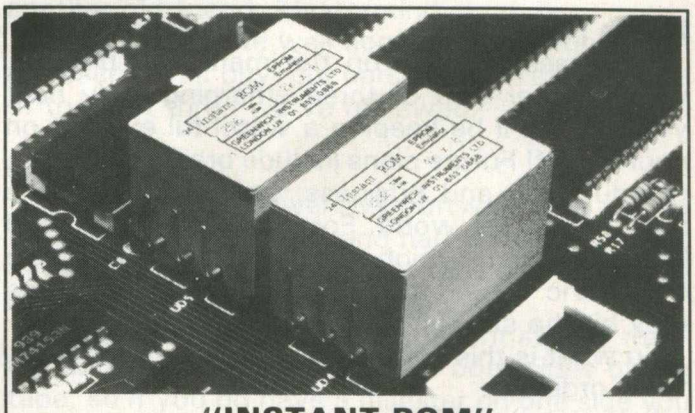

"INSTANT ROM"

"Instant Rom" ROM/EPROM EMULATORS contain CMOS RAM with internal battery backup. When the power is switched off, data is retained for up to 10 years.
In the PET, a 4K INSTANT ROM can be fitted in the $9000 or $A000 socket. Machine-code (and Basic) programs can be stored, and are available at switch-on.
INSTANT ROM saves time. It can be used for long periods; when the program is finally "bug-free", an EPROM can be programmed.

4K INSTANT ROM (ROM socket replacement).....£56.00
2K INSTANT ROM (character generator replacement).....£39.00
Adaptor GA1 (essential for PET users).....£6.00

"G-ROM E"

G-ROM E is a 4K EPROM which will Auto-run, at switch-on, any Basic or Machine-Code program stored in INSTANT ROM. Basic programs can be stored with a few quick key-strokes. No skill is needed. Programs can now be run without a tape or disk unit, and can be changed without cost to the user. Diagnostic aids are included.

G-ROM E (specify type of PET).....£25.00

Postage (£1.00) and VAT are extra. Leaflets are available.

"INSTANT ROM" and "PETCLOCK" are COMMODORE APPROVED PRODUCTS.
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Software Review

New Games For Old VICs

A new Commodore software house for the Vic 20 was launched on September 9th of this year. For those of you who missed it, their name is Romik Software Limited (tel. 0753 71535), and their public debut was at the Personal Computer World Show on that same date: you may have seen their stand there.

Director Michael Barton is a self confessed home computer addict, afflicted with an obsession for TV games, and hence his desire to produce high quality arcade-style games for the Vic 20. Preferably, in machine code, and working on an unexpanded Vic at that.

Mike used to work for another well-known games software house, but felt that things were not moving in quite the direction he desired, and so he hopped out and formed his own company. Since the launch of Romik just that short while ago, orders from the U.K., U.S.A. and Europe have exceeded over 10,000 units: quite an impressive start for a new company.

Future Plans

Five cassettes are on the market at present, with another two or three emerging early next year, so we'll be keeping a watchful eye out on your behalf! Future plans include branching out into education and business, but always for the home computer world. For instance, they intend having extremely high quality software available for the Vic 10 and the Commodore 64 as soon as they hit the streets.

So what is this software that has brought in so many orders?

Let's take a look.

The Software

Probably the best musical cassette on the market at the moment is the Romik 'MultiSound Synthesiser'. You no longer have to spend thousands of pounds on expensive equipment, because Romik have given you the capability to do most of what such equipment can do, for the price of a Vic 20, a cassette deck and a 9.99 pounds cassette.

The Synthesiser has four main sections: Normal, Normal and Drum, Programmable Music, and the White Noise synthesiser. Each section is accessed by pressing one of the four Vic function keys.

Whether you are musically talented or not (and I am most definitely not!) the MultiSound Synthesiser will provide hours of fun. You can create your own tunes, special effects and background music. Once you have created a tune you can save it for later use, and play it back later, whilst at the same time playing another tune over the top of it, complete with background beat and special effects. In other words, we've managed to achieve over-dubbing on a home computer!

You can experiment to your heart's content: we had the office grooving away to a funky little number, with keyboard maestro Peter Chandler setting the controls for the heart of the sun.

Summary

An excellent example of good programming. Virtually every key has at least one function, and most remarkable of all is that it all fits into an unexpanded Vic 20. Just for good measure, and unlike a lot of other cassettes currently available, it will also work with whatever memory expansion you've got fitted.

Shark Attack

In this game you take on the role of a shark net, controlled by four keys to move you left, right, up or down. The object of the game is to cover the whole screen with your net, increasing your score as you move along clear virgin screen.

But! While you are trying to cover the screen there are four sharks out to get you. Just when you thought it was safe to use a Vic 20, along come Romik Software with Shark Attack!

You can pen them in with the net, but it doesn't take them too long to eat their way out again. As you score increases Octopi (octopusses?!) start appearing on the screen: you must avoid these, and the sharks, because bumping into one of them will cause the loss of one of your three lives.

As your skill at the game increases, and so does your score, more and more octopi start getting in on the action and the screen becomes very crowded. Rapid reflexes are required to survive.

Summary

As the old saying goes, the proof of the pudding is in the eating. So it is with software: the proof of a game is in the playing of it. Shark Attack is another example of good programming, and is a highly enjoyable, exciting, and ludicrously addictive game.

And what is more, it's original. So often we see mere re-hashes of well known arcade games

(and so many of them are truly dreadful) that it makes a refreshing change to see a company coming along with good, interesting and novel games.

Martian Raider

At least when Romik take an existing arcade game, they make a good job of it.

Many versions of this game, usually going under the name of Scrambler, have appeared in the pubs and clubs of our green and pleasant land (not that we reviewers frequent such places you understand), but this version is still enjoyable.

With one of your three intergalactic rockets you skim across the surface of Mars, dropping bombs on cities and other rockets out for your life. At the same time you must bob and weave your way through meteorite storms and all manner of alien lifeforces intent only on your death!

Using the keys A and D for slow and fast movement, and S to fire your photon torpedoes of destruction, the space bar will drop the bombs and function keys 1 and 4 move the rocket up and down the space lanes. A word of praise here: Romik have standardised on the use of various keys to fulfill various functions, so you don't end up with fingers like the proverbial wet spaghetti trying to find the right key in time. At least you know what you're doing.

In order to keep your ship going, you have to knock out fuel dumps which appear from time to time, otherwise your rocket will run dry and you'll crash to the surface. There is a bonus however: arriving at a score of 10,000 points awards you an extra ship to continue your mission.

Summary

A good and enjoyable game, that will keep you involved for many a happy hour. Like all Romik Software, it comes in at 9.99 pounds.

Sea Invasion

It seems that every set of releases contains at least one disaster, and alas Romik are no exception. This is merely an underwater version of Invaders, and quite a slow one at that: not very taxing on the old reflexes at all. Nice use of user definable graphics, but that's about it. Sorry.

Mind Twisters

Actually, this is four games on one cassette, none of them good enough to sell on their own, but with all four on the tape it does end up being reasonable value for money. Just a quick mention for each one:

With their policy of promoting their own writers (a big hello to Steven Clark, Clifford Ramshaw and Darren Hall), and a 20% royalty offered on sales of the programs (remember those orders for 10,000 units?) you'll probably be interested to hear that they are currently on the lookout for recruiting new programmers. If you think you can produce exceptional arcade games, all written in machine code of course, give Mike Barton a ring on the number given earlier: he's waiting to hear from you!

Black Jack. 1,000 pounds to play against the Vic in this old favourite. At 20,000 you break the bank, but I felt like breaking the computer long before that.

Teaser. You start with a series of boxes numbered 1 through 9, and the object is, by playing against the Vic, to gain three boxes that when added together total fifteen. Quite fun, but nothing special.

Four Thought. A larger version of noughts and crosses. Again playing against the Vic, you have to get four counters in a row before it does.

And finally Decipher, which is a version of another old friend, Mastermind.

All four are quite well done, and in combination represent a fair buy, but personally I'd stick to one of the first three we've reviewed.

Conclusions

It is nice to see inventive software that makes full use of the software and hardware capabilities of the Vic, and even more so to see such software running on an unexpanded machine.

Romik have also taken the decent step of making copies of the programs on both sides of the tape, so if you do have a disaster on one side you can always try the other, although this reviewer had no such problems.

They are a small company with big ideas, and from the showing so far have got a major contribution to make to home entertainment. Let's just hope this trend continues.

To conclude then, they've got off to a good start, and look like carrying on that way. Somehow, I don't think you've heard the last of Romik yet.

Hardware Review

A New Printer Each For PET and VIC

Smith-Corona TP-1 for the Pet

If you want better quality output, for a long time now you've had to pay anything in the region of 1,000 pounds, or sometimes even more, for the priviledge of producing the kind of document that your company deserves.

Dot matrix printers are, of course, much less, but the quality of those usually leaves a lot to be desired. Certainly not suitable for any material that goes out in your company's name. You're hardly likely to send out invoices, payslips etc. from the old Commodore 3022. Somehow, it just doesn't put forward the right kind of image.

On the other hand, who wants to fork out a grand to get decent output?

Well, that dilemma has now been solved, with the introduction of the Smith-Corona TP-1 from, surprisingly, Smith-Corona. Distribution in this country is handled by Butel, and further information can be gleaned by contacting Cliff Osborne on 01-202 2277.

The TP-1 comes in at just 485 pounds, and will interface to any Pet computer, and in theory to the Vic as well, although you'll have to start playing around with various interfaces before that option opens up for you.

Print speed is a rather slow 10 characters a second (quoted rather more impressively in the press hand-out as being 120 words per minute. Same thing), but if you've previously been used to one of the Commodore daisy wheels this shouldn't be too much to have to overcome.

It comes in two different forms, with either a serial or a parallel data interface: you must specify which one when ordering. Another choice comes when you have to select whether you want a 10 character per inch or 12 character per inch model.

Whatever version you finally end up with is fully capable of printing an 88 ASCII character set, in excellent quality; although of course it is not designed to be able to print the Pet control characters. Still, you shouldn't be using a printer of this quality to print out listings anyway.

Our choice of characters per inch determines what line length we have. 105 characters with the 10 per inch, or 126 with the 12 per inch. The choice is yours.

Whatever the pitch, you have the possibility of using any one of 6 different typefaces, and another nice touch is that it can handle either single sheet or fanfold paper.

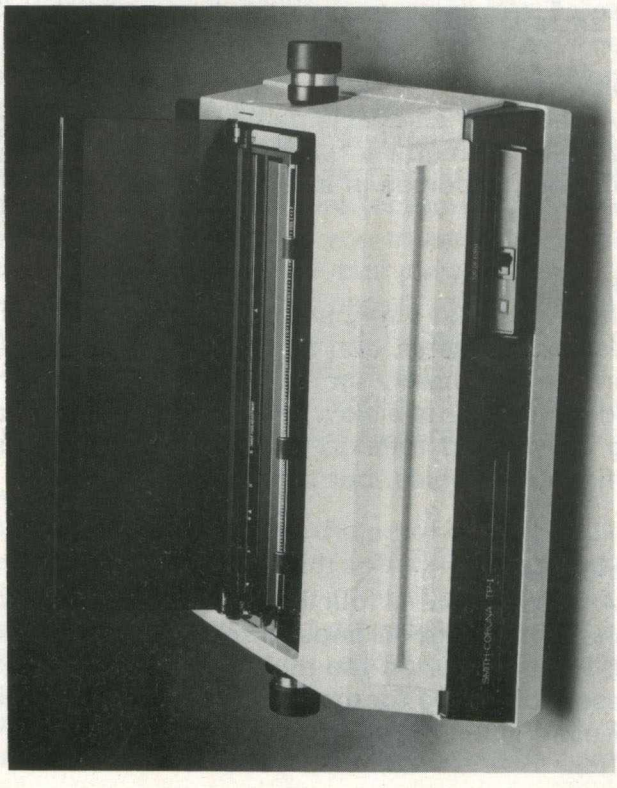
In use as a programmed device, well, there's not much joy here. True, you can set it up to be whatever device number you require, within the usual constraints, but from there on in there isn't a lot that we can do. The self test at power on should reassure you that everything is working correctly, but there are a few (very few) commands you can try out yourself should you feel so inclined.

Operator Controls

Margins and tabs can be set and released easily enough, although these won't be of much use since you can't actually use the beast as a typewriter: it is a printer purely and simply. But, again you don't buy a daisy wheel printer, only to program it to perform wonderful tricks: it is there as a printer!

In use, well, it's rather quiet, and you can certainly handle a telephone call with one of them next to you clattering away, unlike some other printers we could mention. There's an extremely fine vernier adjustment for the paper, which to me seems a bit excessive, but no doubt someone will find a use for it.

Cosmetically it looks quite appealing, and has a couple of redeeming features which will be appreciated by the people who have to use the TP-I day in and day out.



TP-1

-letter quality printing from your micro for under £500

The Smith-Corona TP-1 Daisywheel Text Printer.
Fully formed executive quality printout. Letters of real character. For the price of a matrix printer.

The TP-1 costs just £485, plus VAT. Interfaces with all popular microcomputers (Serial, Parallel and IEEE).
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Minimum controls. Snap-on daisywheels. Drop-in ribbon cassettes. The TP-1 is as easy to use as it is readily affordable.

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Yes, send details of the TP-1.

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Company/Occupation _____

Address _____

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Computer details:

Make _____ Model _____ Interface _____

Software application _____

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Changing of the ribbon cartridges is very easy, again unlike some other printers, and the same can be said for changing of the print wheels. Both of these can be awkward and temper raising on some machines, but not here. Very straightforward. Even the reviewer, who couldn't change a ribbon on an 8026 to save his life, found no problems with the TP-1.

Just to make life even easier, all the spare parts, ribbons, wheels, various interfaces, etc. are all available from Butel direct, so there's no need to go marching around various high street stores trying to find the precise part you're looking for.

Conclusion

It will certainly find a place in many an office, where you're not too worried about speed of output (I wouldn't recommend printing out War and Peace on it), but are concerned about cost and the appearance which your company presents to the public.

For just 485 pounds, a daisy wheel printer can now be yours. If you've hesitated before about buying one, I suggest you give Butel a ring.

GP-100VC for the Vic 20

When Commodore introduced their own printer from the Vic, albeit a printer from Seikosha, for some unknown reason they chose one that took non-standard computer paper, and you actually had to hunt around in order to find a supplier of the stuff.

This to me has always been a bad move: for a micro that's expected to reach a mass market, you would have thought they could have chosen something a bit more accessible to that market. Still, ours is not to reason why, ours is but to buy the GP-100VC from D.R.G. Business Machines (tel. 0934 415398).

Yes, this printer from D.R.G. (again, strangely enough, a Seikosha one) uses the paper that we've all grown to know and love back in the days of the 3022 et al. And at only just over 200 pounds, you could do far worse, if you intend to use your Vic at all seriously.

Although somewhat slow for a dot matrix printer at only 30 characters per second, you're stuck with it at the moment because there's nothing else on the market: as usual, we'll let you know if anything else appears. Thankfully it is capable of reproducing all the Vic graphic characters, which come out on its own 6 by 7 dot matrix.

You can, as is usual with these beasts, create your own user definable graphics characters as well, for use in letterheads etc.

Whilst on the subject of graphics, as you know the Vic can be in either graphics mode or normal (the manual refers to it as character) mode, and the handy appendix at the back of the manual gives you the code table for each character, depending upon what mode you're in at the time. There's also a neat little bit of advice for producing characters in reverse field as well.

The final appendix in the book is also of interest, containing as it does a program to produce a hard copy of the screen.

Unusually for a manual accompanying anything to do with Commodore this one is quite good, and contains much valuable information for anyone intending to use the printer to its full capability.

After the usual technical information, and the idiots guide to putting the paper in etc., we find that, handily, the device number of the printer is switch selectable (the same switch also performs the self test routine: cunning, these chaps).

There are twelve 'special' control codes to play with on the GP-100, and while we're here we'll take a quick look at just some of them.

Control Codes

On power-on the printer is, reasonably enough, in standard character mode, and entering any other mode will keep the latter operative until we specifically request to get back to normal again.

Double width characters, your own user definable characters (and a neat little section of the manual tells you how to achieve this and design whatever particular symbol you'd like printed), determining print position, and selecting cursor up or cursor down (graphics or character) modes complete with reverse field, are just some of the tricks we can do.

An interesting one is repetition of graphic data: in other words, repeating a column of graphic information, to save drawing it out ten thousand times.

Conclusion

A good printer, it does what it's supposed to, produces fairly reasonable copy, even if it does make a bit of a noise whilst printing, and can quite happily be chained on at the end of a row of disk drives, or another printer for that matter. Quite a good buy, and worth seeking out for a demonstration.

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Book Review

Business And Pleasure

Business System Buyers Guide

As computers become more and more apparent in our lives, and the number of computer literate people increases, so does the demand for appropriate literature. Books and documentation are always needed to help the user: increasing numbers of businessmen are using computers to aid the running of their businesses.

As we know, computers are capable of processing information, of storing, filing and performing calculations with data much quicker and cheaper than a number of personnel. Money can be saved, but it can also all too easily be spent unnecessarily. Here is a book that will help prevent the snare of an unsuspecting businessman in an industry that can prove very expensive if certain rules are not observed.

It is nice to see a book whose title justifies its contents. The book 'Business System Buyers Guide', by Adam Osbourne with Steven Cook, and published by Osbourne/McGraw-Hill, does, as the title suggests, act as a guide to buying a computer system for use in business.

We are presented with 170 pages, divided up into six chapters. Chapter one begins with the question 'So you want to buy a small computer do you?', and goes on in logical steps, chapter by chapter, giving invaluable help to the unaware businessman who wants to buy and install a computer system.

This is a comprehensive, well thought out book. The authors are obviously well aware of the problems facing businessmen who want to bring computers into their lives and offices. Problems are defined, and practical solutions given. To outline some of the problems mentioned, the book quite rightly warns against buying a system on 'special offer' before you actually know what the computer does, and if indeed its capabilities are sufficient for your needs.

In other words, make sure you define your problems and needs before parting with money on software and peripherals which you are not even sure will perform the job required.

You are advised to make sure that any product you buy is not soon to become obsolete in this rapidly changing industry, but by the same token not brand new either: as we know, new products, not having had exhaustive field testing, are prone to errors.

Rights and Wrongs

Many good examples of the right and wrong way to buy a computer system are given. The book also asks questions only the reader can answer: this helps him or her to decide exactly what they are looking for, in respect of the size of the business, and the amount of work involved.

Once the businessman has successfully bought and installed the machinery, in chapter five we read about the sort of after sales service that should be given, and the right way to ensure that it is given!

The company/customer relationship, training of personnel, preventative maintenance and regular servicing are all mentioned, and just as important the most economical way to make sure these services are provided.

The final chapter of the book contains a useful summary of products, giving a brief individual description of the different makes of microcomputers and their particular features. Very useful tables are also listed, giving the various types of software, hardware, computer languages, and the various manufacturers associated with them.

Tables of peripherals are also given,including prices, and which computers these peripherals are compatible with, and a useful appendix, giving many names and addresses of the companies mentioned, is included.

Unfortuantely this section of the book is geared to the American market (fair enough, since that was what it was originally written for), so you'll have to do some field research of your own: as ever, the book points you in the right direction.

Other excellent tables include a microcomputer capabilities check list, asking many questions with yes/no answers: the answers not only tell you whether it is a good buy, but also whether the company providing the product can offer an sales service.

Summary

Although not aimed specifically at Commodore owners, this is nonetheless worth looking at. Written in a style that the beginner will easily understand, it explains clearly and precisely some of the phrases and technical jargon that are part and parcel of the computer industry.

After reading this, a person will have a very good idea of how to buy and install a computer system, use it at its most efficient, and (most importantly!) all this with the minimum amount of cost.

At just 5.95 pounds, you could save yourself a fortune.

Vic Innovative Computing

As a complete change from the Business System Buyers Guide, for our second book this month we take a look at the new publication from Melbourne House Publishers, namely Vic Innovative Computing by Clifford Ramshaw.

Basic details first of all. The book in softback costs 6.95 pounds, and during the course of its 150 pages covers 30 games for the unexpanded Vic 20. In a nice gesture, to save you the trouble of typing in 21 of them (assuming that looking at the listings has sufficiently whetted your appetite), those 21 are available on 3 cassettes, at 5.95 pounds per cassette.

If, at the end of this review you require any further information, I'm sure that Christine Laugharne (on 01-977 9160) would be happy to speak to you.

First Looks

Any book which uses colour inside as well as a glossy front cover, scores an immediate advantage over any of its competitors. The pictures inside the book, and indeed those on the cover, look like actual screen photographs, which makes a change from the usual lurid covers that have nothing to do with the actual program listings.

All 30 of the programs, and all incidentally written in Basic (no concessions to machine code here), are the work of one Clifford Ramshaw, described as 'undoubtedly one of the most creative and imaginative authors to explode onto the microcomputer market'. I hope he cleared the mess up!

This, although stretching the truth a little bit perhaps, is underneath a fair enough comment. Given that Ramshaw only has 3.5K to play about with, within those confines he has come up with a number of interesting programs.

The listings are all direct onto a Vic printer from appearance, with suitable annotations to make it easier to read the things. Thus, we have little room for error in reproduction, and your job is made distinctly easier by not having to spend days peering around the keyboard trying to find the appropriate graphic symbol.

Each game is accompanied by a brief (sometimes very brief!) description of itself, how to play it and overall what the game is all about. This is followed by an outline of the program listing: in itself, extremely interesting. As well as pointing out which parts of the program do precisely what, there is also a list of the variables used in the program: of great use if you subsequently decide to modify the program yourself. Most people do, and this is perhaps another bonus of this kind of book. Not only do you get 30 games to play, but also, by altering the listings yourself, you get to learn a fair bit about basic programming.

The Games Themselves

Three main types of games are covered, the old standbys of arcade games like Invasion and Hoppy, strategy games like adventure and chess (and don't expect too great a showing from a 3.5K chess program), and simulations of outdoor sports like Golf, Squash and Grand Prix.

A look at some of the other titles will give an ideal of the ground covered: Space Fight, Rat Trap, Alien Overun etc., and its good to see some old favourites like Snakes and Ladders given the modern computer treatment.

The listings work, is the great point in their favour. Some of the games it is true are not too phenomenal, but they will nonetheless provide welcome amusement, and some will keep you quite happily occupied for hours. You won't get true arcade type reproduction, but then who would expect that given 3.5K. What you do get is fairly good though.

One or two points of complaint however. On buying a book about the Vic, I wouldn't expect to see a comment like 'Welcome to the Wonderful world of Spectrum Chess'! The clue lies in another publication from Melbourne, called Over the ZX Spectrum, which contains a chess program, copyrighted by Beam Software and one Clifford Ramshaw. Still, the program has been altered if nothing else has.

Summary

But that must not detract from what is overall a useful addition to the range of Vic literature available. No one magazine publishes vast numbers of Vic programs, and no one book has presented before a collection of games for the unexpanded Vic 20.

Even this has two exceptions, but they're as close to being games as to make no difference: a high resolution drawer, and a maths question and answer session.

Still, to sum up, quite a good book, and fair value for 6.95 pounds. One word of warning to other publishers: if you produce books about a variety of different micros, but books that are along roughly similar lines, do make more than a cursory effort to translate those books. Melbourne have done quite well (although one or two infuriating passages have not been looked at quite as closely as they might have been : why keep referring to INKEY$, ZX fans?), and I wish others would do as well.

Applications

Getting Acquainted With Jim Butterfield

by Gail Hook

Jim Butterfield's gravelly voice speaks in the measured phrases of one used to teaching or being quoted for publication. His looks are unremarkable — he's rather short, greying and middle-aged. Yet he brings to his interest in microcomputers a curiosity and sense of delight which led him first to an absorbing hobby, and then in February, 1981 to a new career as a freelance writer, consultant and teacher.

How did the transition to a new career take place? "Well, almost purely by accident." Jim replies. "I worked for CN/CP (Canadian National/Canadian Pacific Telecommunications) for the reason that the company had decided to move substantially away from the centre of the city (i.e. Toronto). I was faced with a considerable amount of commuting time that would make it impossible for me to continue with my hobby at the same time I was working. When faced with that choice I really had no choice and I quit."

It was in 1964 while Jim was working for CN/CP that he spent a year as a programmer on a rather specialized computer, a Collins C8401. Although FORTRAN and COBOL were being developed, the Collins didn't use an advanced language. Programmers had to do almost everything in machine language. Jim soon moved into other areas of the company, but a little over ten years later, "I decided to find out what this 'micro' stuff was all about and started watching the current magazines. I finally decided to purchase when I saw a completely pre-built machine called a KIM-1 which had a 6502 microchip in it. That turned out to be like a return to the past. Everything we had been doing a dozen years before on the large million and a half dollar computer we were doing again on this little two hundred and fifty dollar board — including making the same mistakes.

One machine led to another, and Jim began sharing his knowledge with other microcomputer users, and writing about his discoveries. Born in western Canada, Jim got his first writing experience there many years ago as a continuity writer for a couple of radio stations. Jim smiles, "That means I spent about a year of my life writing commercials." Besides the machine launguage column and numerous articles he contributes to **Compute!**, Jim writes for the Commodore trade publications, a British magazine called **Printout** and for the **Torpet.**

Jim's writing is informal and witty in spite of its technical content. He achieves this easy-to-read style in two ways: "I try to write it as I would say it. I do a lot of presenting material to both kids and adults and I try to keep the same style in my writing. Also, whenever I can I slip in a simple example program. Then even if the readers can't understand what I mean, they can run the programs which are constructed to prove the same point I'm trying to get at with narrative."

Lecturing and teaching courses, such as the machine language course he gives each month to a special interest division of TPUG (Toronto PET Users Group), provide Jim with feedback about problems and areas where people need more information. He has a reputation for being generous with his time, and his phone is open from 10am to 10pm Monday to Friday. "If somebody phones me up and asks a question which shows they just haven't bothered trying it themselves, then I will sometimes be a little short, because it does seem like a waste of my time. But most people who call do so because they're stuck on something. It's just a question of getting another opinion. If I get a number of enquiries in a certain area, that's usually a signal that it's time for me to write an article about it. It's a very good way of keeping posted on what's bothering people at the moment."

In addition, Jim does what he calls "light consulting", principally for Commodore. This spring he went on a Western Canadian promotional tour for the VIC. He's also frequently invited to shows such as the PET Show in London, which he attended in June, 1982. Jim finds this part of his work "really great fun" because it provides opportunities for travel.

Vicki Butterfield, Jim's wife, is not a computer enthusiast. Jim observes, "She really feels that to be involved in computers at all would be competitive, so she simply stays completely away". Sometimes Vicki accompanies Jim on his travels, but often she chooses to stay at home and pursue her own interests. During the last election, Vicki ('Spoiled Ballot') Butterfield ran as a candidate for the Rhinoceros Party in the Toronto riding of Broadview/Danforth. Her party platform contained promises to move Parliament to Florida for the winter (most Members are down there anyway, so we might as well have better attendance) and to eliminate winter by seasonally adjusting temperatures. At first, she was shy of meeting the public; but people were so delighted to have a

'rhinoceros' to liven up the political scene that the venture proved enjoyable.

Jim adds that Vicki also enjoys time to herself. "I think she has a gothic view of life and likes to see herself alone in this large mansion with a pot of tea in her hand, wearing trailing garments, followed by three cats."

The Butterfield mansion is a modest brick house within walking distance of downtown Toronto. It is comfortably cluttered with books, plants, and the three cats. However, only Sacha, the Siamese, has an interest in computers. With a feline knack for finding the centre of warmth and attention, she often dozes on top of whatever PET is in operation. There are no antiques or ancestral ghosts in the attic either, Jim uses it as storage space for whatever books and computers he can't cram into his small office.

At this moment the office contains a changing assortment of computers drawn from: four PETs of varying screen sizes and ages, a VIC, an Atari 800, a European unit called an Alpha, a KIM and a Rockwell AIM. The "disk tower" consists of two Commodore disk units (4040 and 8050) and an Atari disk with a Commodore 2023 printer "of ancient vintage" perched on top. Bookshelves along one wall are overflowing, and every available inch of floor space is covered with piles of diskettes, books and papers. Amazingly, Jim seems to know into which pile to dive for what he needs. He would like a new printer, but he shakes his head, "If I had another, I'm not sure where in the world it would fit. I have several computer systems set up in a small space, plus a considerable amount of literature. It gets horrible-looking pretty fast. I also get in a lot of stuff for review. I do want to comment on many of the books and pieces of equipment I get, but it's very hard. It's very time-consuming to review something properly. I find it quite difficult to find what amounts to half a day to go over a book carefully, or a full day going through a piece of equipment thoroughly.

The emergence of microcomputers as a basis of social, not merely technical interaction is one of the facets of his interest that Jim most enjoys. He notes that in the early days of "roll your own computers", everyone had a different machine, and sharing of information was minimal. "Suddenly, along came the KIM. Everybody had the same computer. An amazing thing happened — and this is multiplied many times over in the Commodore line — people built a social life around microcomputers."

The thriving Toronto PET Users Group is a case in point. Jim had what he calls a "Machiavellian influence" on Lyman Duggan whom he persuaded to hold the first meeting in his basement one summer evening. While he firmly rejects any organizing responsibility. Jim contributes a great deal as a friend of the club, speaking at meetings and sharing his expertise. His presentations at the monthly TPUG meetings are greeted with enthusiasm.

The club has been run by a hard-working executive since Lyman Duggan was transferred to Florida two years ago. In August 1982 its membership exceeded 2000. And is growing at the rate of 40 new members a week. Jim admits, "It's getting harder to know what to talk about at those meetings. There are a number of people who have the ability to track down any part of the machine they want to go after, and who are quite skilled at machine language. As a result, my sympathy is with the beginner. I'd rather bore ten experts than lose the bulk of the people, so I try to keep things fairly simple."

The club has its share of young "whiz kids", but more surprising, many members are of retirement age. Business users of micros are also well represented. Jim notes with amusement that computer companies still seem a little puzzled by all this user interaction, even though they realize by now that these are not the traditional complaint groups. "The groups arrived almost spontaneously. By the time the manufacturers had decided maybe they were a good thing, most had reset their sights on commercial users. They never really thought that business users would band together, and I think partly we're still in that phase where manufacturers think that all they have to do is make sure they have a few really good pieces of software, and the user groups will go away. They don't — because the secret truth of it is most people want to wait until the store door is locked, then put Space Invaders on."

Jim rarely sells his software. He states, "I would like to foster an environment where people pass out their software with reasonable generosity. I think that by showing a good example, I might sort of lead the way in that." He notes that his software usually is written because he needs to use it to illustrate a point, and it costs him nothing to give it away. Often Jim distributes his work on the TPUG disk because that keeps him from having to answer individual requests.

However, Jim vehemently supports an author's copyright: "I believe very strongly that the person writing an original program has the right to do as he chooses with that program. If he chooses to sell it or to request that it not be copied except for a fee, than he has absolutely that right. I will support that."

On the other side of the coin, Jim believes that

the person who takes money for software acquires an obligation to support the program in terms of upgrading it and furnishing the purchaser with the means to modify the program. He says, "That's another good reason to give programs away. I really feel that most people who put down a lot of money for software feel that they are not buying a disk or cassette tape, but they are buying a service."

The problem of software piracy might solve itself with the increasing business use of microcomputers. Jim laughs, "If an employee ran to the boss and said, Chief, I think you should give me a raise because I just saved you five hundred dollars, I lifted a copy of a program. I really don't think very many businesses would stick a cigar in my mouth and give me a promotion. They would more likely start keeping an eye on me."

Jim predicts that eventually renting software may be the best way to distribute it. A yearly fee could be charged for the use of the software. In return the user would receive continuing support on such things as upgrades, newsletters, information, warranty and documentation. In Jim's words, "On all the things that go to make the computer feel warm and supported and cuddled."

Such a rental system might give the education market more appeal for writers and distributors of software. However, Jim suggests that providing students with access to computers in the very early grades should perhaps be given first priority. "As I understand the writings of Seymour Papaert, the earlier a child becomes exposed to computers, the better it is likely to be. I have seen no evidence to contradict this. It seems to me that more important than anything formalized we teach young people about computers is that we get them familiar with the concept, we get their fears allayed, we make sure that the usefulness of computers is understood at an early age. By the time a student gets to high school, computers are an oddity. There's something not quite natural about them — something manufactured and solemn. If you use computers in grade two or three you simply understand that they're around and they're going to help you whenever you feel like using them.

Teachers are faced with devising methods of guiding computer studies and providing resources for students, many of whom will soon outstrip them in programming ability. This enthusiasm should make it stimulating and challenging as well. Jim notes, "We have in the microcomputer one of the most incredible forces that has ever

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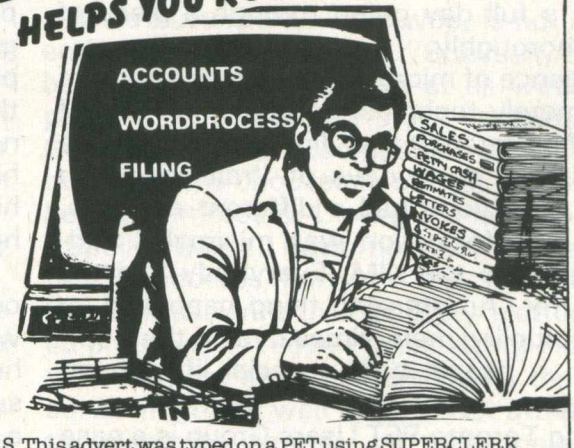

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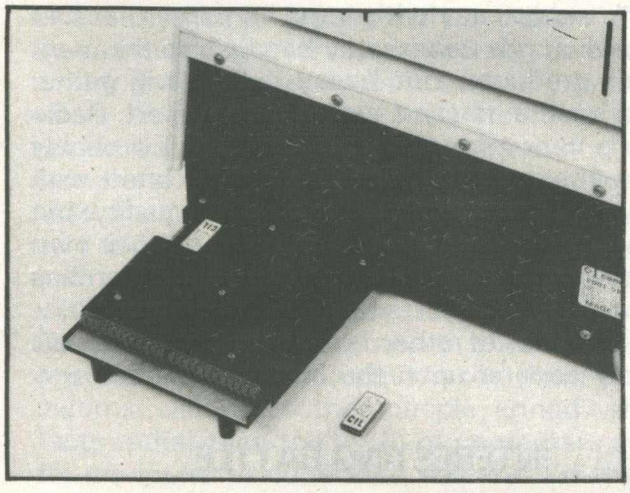

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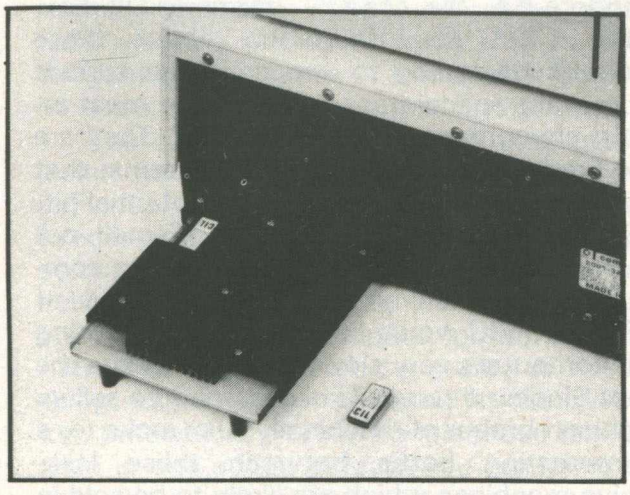

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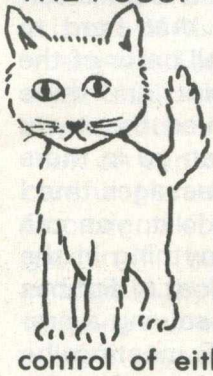

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obtain further information circle number

happened in education. I'm not talking about games; games don't last very long. Students are begging for access to this logic device. It has no precedent. I don't know what specific educational objectives are precisely to be served. All I know is there must be something in the whole phenomenon, some need in the young mind that causes an intense urge to interface with the computer, to try things, to make the computer do things."

Part of the appeal comes from the creative nature of programming. Jim finds programming mentally stimulating, and it soon becomes irresistible because you know that if your program doesn't work, the reason is that you haven't yet risen to the task. "Programming is creative not necessarily in the most visible sense. If you write yourself another Space Invaders it might end up looking like everybody elses. I sometimes like to compare programming, especially machine language programming which is more exacting, to doing a jigsaw puzzle. Why would you sit there for two or three days and put in all this effort when you know that the end result will be a rather crummy-looking picture? The point is that you will have felt you have accomplished something, that you have brought together a number of skills, and even though it's the same as everyone else's, in a sense you have created it. It's the same thing with programming — you feel so good when it all comes together, when it all works."

But what if it doesn't work? When you're the ranking expert, what do you do when you get stuck on a problem? "Well, when you reach a certain stage, and it really isn't all that hard to achieve, then you have control of all parts of the machine. Once you get to that point, and there are many people who have achieved that, you don't have to ask anybody. You can go in there and look for yourself. One of the messages that I try to deliver to people is 'if I can do it, you can do it'. Because often there isn't anything in the problem that logically you can't look at." Jim has another, more devillish, method of solving a programming puzzle. At the May TPUG meeting, he presented 'VICbreak/Paddle' (Breakout for the VIC) which didn't work as he wanted it to. Does this present an image of hundreds of enthusiasts staying up all night trying to outprogram Jim Butterfield? If they did, they toiled in vain because Jim came up with his own solution a couple of days later.

Microcomputers will undergo many changes in the next five years. Jim makes several general predictions: memory will be cheap, machines more powerful, and at the same time less expensive. The biggest single change will probably be a move toward better human interface. Commodore's easy screen-editing features are still relatively advanced, and other micros should incorporate better editing features. Colour and graphics will be almost universal and easier to use. Peripherals such as light pens, paddles or joysticks will simply plug in. Things such as upper/lower case letters, now viewed as optional by many companies, will be fully standardized. There will be some moves toward better languages, but Jim notes that "BASIC appears to be indestructible at present."

More specifically, Jim offers some insight into the future of existing microcomputer companies: "I think we can say with some certainty that IBM will survive, not necessarily because of the merit of their products, but because IBM will gather around itself a massive amount of support. Radio Shack is very strong. Like IBM they will probably survive for reasons not directly associated with quality. This is not a reflection on their quality, but they have access to so many outlets of their own that they can support continuing sales. Atari has so far suffered from its games image."

The survival of other brands of machines will probably depend upon the success of their new

INTERESTING BATTLE

products. Commodore has four new machines announced but not yet delivered. (The PET II, Commodore-64, the MAX — formerly Ultimax, and the CBM II. Information about these machines is beginning to appear in the current literature, Jim speculates, "One of the most interesting phenomena could be Sinclair. They are like the Freddie Laker of computer systems; that of course has its advantages and its potential pitfalls. Sinclair has introduced a series of small, not very powerful, but remarkably inexpensive computers. While people who are used to the speed of say a PET or a VIC would find some of the existing Sinclair computers very slow, we can't ignore the fact that Sinclair through Timex is going to sell an astonishing number of machines." Jim looks for a very interesting battle between these less-expensive machines which are likely to be sold in every corner drug store, and the more powerful products. He notes that people tend to be loyal to a product line, and so far Sinclair's line has a clearly defined top end. Whether this situation will change as a result of demands from buyers of machines such as the ZX-81 who want to upgrade their systems remains a matter for speculation.

As computer prices drop, it is likely that people

will begin to see a computer as an affordable addition to the family's financial management, entertainment and education. Wider distribution of machines will affect society in several ways. Already, of course, people use home computers in a limited way for business, and more commonly for enjoyment and exercise of mental agility. "People test themselves against their computers by asking. 'Can I make the computer do this task?' People also go to the computer for something resembling relaxation. I was talking to a microcomputer owner who is having difficulties in his business. He told me he goes home, speaks to no one, and works on his computer for an hour or so. Only when he shuts the machine off does he say 'hello' to everyone. He finds the computer a very great pacifier in some sense — perhaps he takes his energies out on it. He feels that he comes out of that environment more of a human being and his family is very understanding of it. Now that's not precisely enjoyment, but it's a very worthwhile thing."

Uninformed people tend to fear computers and, with some reason, they feel that information about themselves collected in the databanks of business and government makes them potential victims. Jim feels that people armed with the facts rather than the myth of computers are better equipped to cope with society. "If the computer tells your fortune, this is a harmless and amusing thing for the computer to do — unless you have somebody who believes in it grimly and with determination. If you understand that essentially you are talking to something no more intelligent than a bunch of transistors, you will not be seduced or misled by this sort of trash.

"The most important change that small computers have brought is they have restored to the individual a sense that he has control over the events around him. Not only can his computer calculate a mortgage as well as his bank can, but he had control in that he will not simply accept any nonsense the computer prints and mails to him. He's no longer at the mercy of this sort of thing. Essentially, it's related to the question of competence. If you can handle these little beasts, then in one sense at least you are more competent. You understand more about some of the things which are happening in the world around you. That in itself is probably one of the most profound things microcomputers do."

As we become more aware of a computer's true capabilities and limitations we may better assess the complex arguments on both sides of the issue of artificial intelligence. Jim defines AI very simply: "A computer which adapts its behaviour based on what it has learned from external sources is showing artificial intelligence." He cites the game called 'Animals' as a simple example of a program which learns from the user. " 'Animals' says it will guess any animal you can name. The first few times, you're going to name an animal it has never heard of. It will ask you for more information about the animal and put it in its list. Eventually you will run out of animals you know, and then it will know as much as you do."

FUTURE POSSIBILITIES

Videotex is another computer-based system with great possibilities for the future — one which Jim fears will not reach its potential. "I wish I could see a stronger future for videotex. Things like Telidon, Prestel and so on have a conceptual problem for me. They seem to be predominantly one-way only communications systems, perhaps a little bit like television only not as effective. You have a few people communicating to a lot of people. I don't view that as a good move, or even a typical move in this day where people are getting competence in their own hands. I think that if Telidon were more of a two-way interface, if more people could contribute, then you might have more of what I would call a lively medium."

Jim keeps very busy, and finds he must force himself to get away from computers for relaxation. He observes that when his hobby became his business, "That's almost a bit of a problem because I still have fun with what I'm doing." Prowling around whatever city he happens to be in is one of his favourite diversions. Jim particularly enjoys Toronto and New York because the downtown areas come alive at night. In a few cities, such as Los Angeles, he finds the police look on explorers with suspicion, so he has to be careful. He adds, "I do play the piano quite badly. Occasionally I go and dig dandelions out of the garden if I have time. But there is a little bit of change in the order of things. Since my hobby has become my work, I can't do it all the time."

In many ways, Jim has achieved celebrity status. He is much sought after by the microcomputer community around the world. In June, 1981 he spoke about 'Microcomputers for Fun and Business at the American Association for the Advancement of Science convention in Toronto. Yet he remains very approachable and down-to-earth: "It's really great fun, But simply if any part of it is intimidating to others — if I hear people say 'Well, that's all right for Jim Butterfield' — then I feel ... not good." If the respect shown by TPUG members for Jim's knowledge and willingness to share it is typical, he should indeed feel good.

Sound 'n' Vision

Stars And Bar Charts Forever!

Vision comes later with an article on the use of Pets graphics for the plotting of bar charts. Useful for many a business purpose. But first, sound for this month takes a listen to the Star Spangled Banner. Using 2 of the Vics voices, and the built on software volume control (line 100 defines our variables), a picture of the American flag is displayed on the screen, and the well known tune played for us. Straightforward use of data statements for tempo and notes should make it easy enough to produce your own 'variations on a theme'!

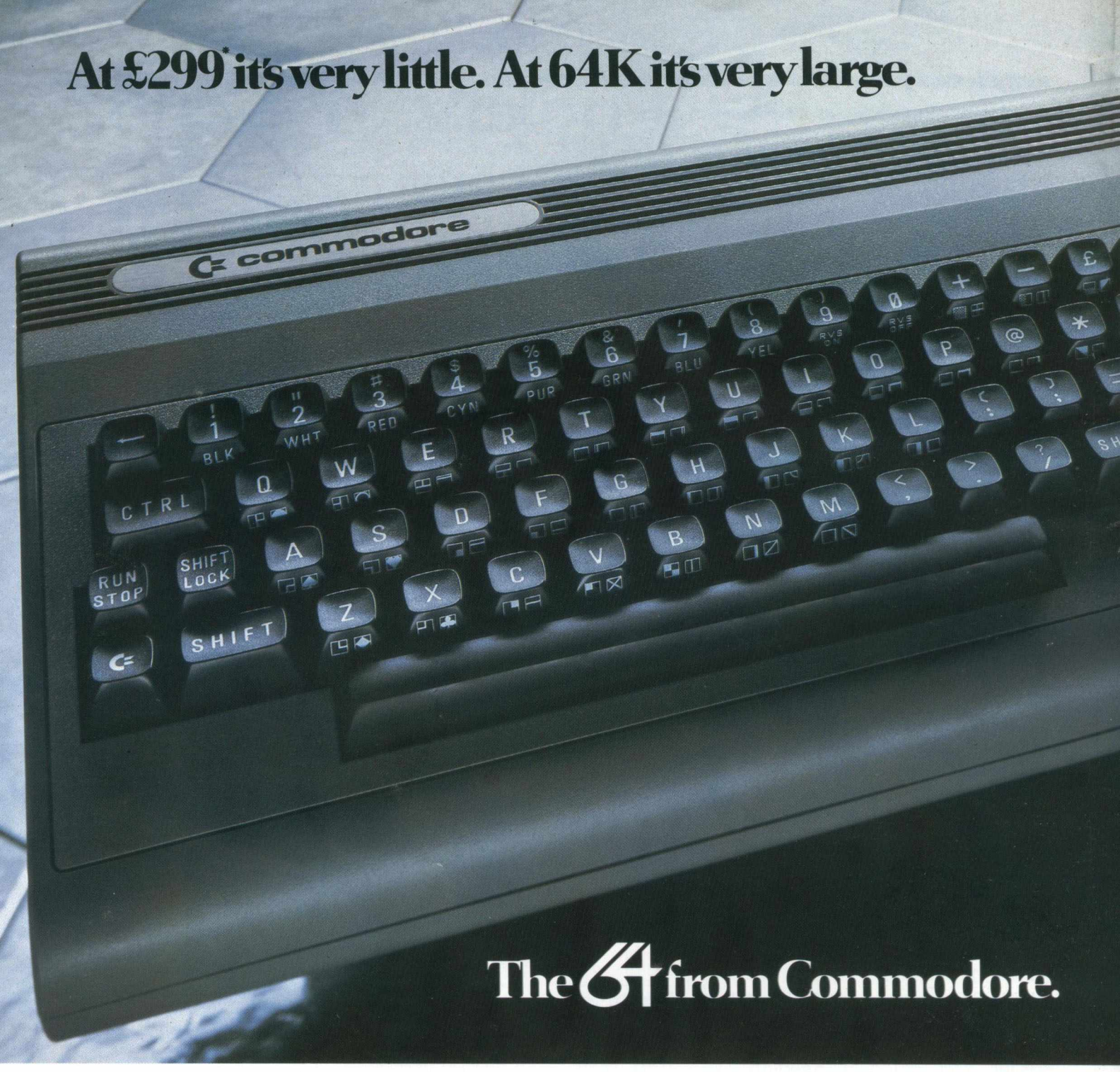
```
STAR SPANGLED BANNER : VIC 20


 10 REM **************
 20 REM * VIC  MUSIC *
 30 REM *BY JOHN HULS*
 40 REM **************
 50 REM *MONTFERLAND-*
 60 REM *   STRAAT 19*
 70 REM *            *
 80 REM *5628 BK -   *
 90 REM *   EINDHOVEN*
 99 REM **************
 100 G1=36876:G2=36874:G3=36875:X=300:GOSUB2000
 110 POKE36878,10
 120 READDC,V1,V2,V3
 130 POKEG1,0:POKEG2,0:POKEG3,0
 140 IFDC=0THEN199
 150 FORI=1TO50:NEXT
 155 PRINT"■■■■■■■■■■■■"X
 160 POKEG1,V1:POKEG2,V2:POKEG3,V3
 170 FORI=1TO100*DC:NEXT
 180 X=X+5:GOTO120
 199 SYS65234
 200 REM SONGTABLE FOR
 210 REM THE STAR SPAN-     REM GLED  BANNER.
 220 REM
 230 REM BY FRANCIS         REM SCOTT
 240 REM AND J.STAFFORD     REM SMITH
 250 REM
 260 REM DURATION COUNT     REM IS -4- FOR A
 270 REM QUARTER NOTE
 280 REM
 300 DATA6,195,225,
 305 DATA1,183,219,
 310 DATA4,163,209,
 315 DATA4,183,209,
 320 DATA4,195,207,
 325 DATA8,209,201,228
 330 DATA3,219,199,231
 335 DATA1,215,199,
 340 DATA4,209,201,
 345 DATA4,183,201,
 350 DATA4,191,215,215
 355 DATA8,195,225,215
 360 DATA2,195,225,
 365 DATA2,195,225,
 370 DATA6,219,209,232
 375 DATA2,215,215,
 380 DATA4,209,219,
 385 DATA8,207,225,225
 390 DATA3,201,221,221
 395 DATA1,207,221,225
 400 DATA4,209,219,225
 405 DATA4,209,232,
 410 DATA4,195,225,
 415 DATA4,183,219,
 420 DATA4,163,209,
 425 DATA3,195,225,
 430 DATA1,183,219,
 435 DATA4,163,209,
 440 DATA4,183,209,
 445 DATA4,195,207,
 450 DATA8,209,201,228
 455 DATA3,219,199,231
 460 DATA1,215,199,
 465 DATA4,209,201,
 470 DATA4,183,201,
 475 DATA4,191,215,215
 480 DATA8,195,225,215
 485 DATA2,195,225,
 490 DATA2,195,225,
 495 DATA6,219,209,232
 500 DATA2,215,215,
 505 DATA4,209,219,
 510 DATA8,207,225,225
 515 DATA3,201,221,221
 520 DATA1,207,221,225
 525 DATA4,209,219,225
 530 DATA4,209,232,
 535 DATA4,195,225,
 540 DATA4,183,219,
 545 DATA4,163,209,
 550 DATA3,219,215,232
 555 DATA1,219,215,232
 560 DATA4,219,209,232
 565 DATA4,221,215,232
 570 DATA4,225,219,232
 575 DATA8,225,219,232
 580 DATA2,221,215,232
 585 DATA2,219,219,232
 590 DATA4,215,225,231
 595 DATA4,219,232,232
 600 DATA4,221,235,231
 605 DATA8,221,195,235
 610 DATA4,221,195,231
 615 DATA6,219,209,225
 620 DATA2,215,215,225
 625 DATA4,209,219,225
 630 DATA8,207,225,225
 635 DATA2,201,221,
 640 DATA2,207,221,225
 645 DATA4,209,219,225
 650 DATA4,183,228,209
 655 DATA4,191,215,215
 660 DATA8,195,195,215
 665 DATA4,195,225,
 670 DATA4,209,209,225
 675 DATA4,209,215,221
 680 DATA2,209,219,225
 685 DATA2,207,219,225
 690 DATA4,201,221,221
 695 DATA4,201,221,221
 700 DATA4,201,219,225
 705 DATA4,215,215,221
 710 DATA2,221,215,221
 715 DATA2,219,219,219
 720 DATA2,215,221,215
 725 DATA2,209,223,209
 730 DATA4,209,225,225
 735 DATA8,207,195,225
 740 DATA2,195,225,
 745 DATA2,195,221,
 750 DATA6,209,219,225
 755 DATA2,215,225,
 760 DATA2,219,235,
 765 DATA2,221,235,
 770 DATA8,225,237,237
 775 DATA2,209,228,228
 780 DATA2,215,227,223
 785 DATA6,219,225,232
 790 DATA2,221,225,232
 795 DATA7,215,225,231
 800 DATA14,209,232,225
 999 DATA,,,
1000 REM ************
1010 REM *INTERPRET *
1020 REM *YOUR  DATA*
1030 REM ************
1100 INPUTA:FORI=ATOA+95STEP5:PRINTI"D♠":NEXT:END
1200 REM ************
1210 REM *INTERPRET *
```

```
 1220 REM *YOUR  DATA*
 1230 REM ************
 2000 REM
 2010 REM ************
 2020 REM *DRAW FLAG*
 2030 REM ************
 2040 REM
 2050 PRINT"■";
 2060 POKE36867,44
 2100 FORI=1TO11
 2110 PRINT"■■
 2130 NEXT
 2150 PRINT"■";
 2160 FORI=1TO5
 2170 PRINT"■■ * * * * * "
 2175 PRINT"■";
 2180 PRINT"■■* * * * * *"
 2190 NEXT
 2200 RETURN
READY.
```

```
1000 REM ****************************
1001 REM *EXAMPLE OF SUBROUTINE CALL
1002 REM *TO DRAW GRAPH OF FUNCTION
1009 REM ****************************
1010 DEFFNP(X)=SIN(X/6.28)
1020 GOSUB24000
1030 END
2000 REM
3000 REM
4000 REM
5000 REM
6000 REM
24000 REM ******************************
24002 REM *SUBROUTINE TO DRAW A DOUBLE
24004 REM *DENSITY GRAPH OF THE FUNCTION
24006 REM *DEFINED BY - FNP(X)
24008 REM ******************************
24010 PRINT"■"
24012 FORX=32768TO33728STEP40:POKEX,101:NEXTX
24014 PRINT"■■■
```

At £299* it's very little. At 64K it's very large.



This is the new Commodore 64 Personal Computer.

It costs £299. Not bad for a brilliant piece of technology with a 64K memory.

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The Commodore 64's nearest rival – if that's the word – costs over half as much again.

Here is the specification, a comparison with the Apple II, and a coupon.

The rest is up to you.

---

1. A total memory capacity of 64K; 38K directly available to BASIC. When not using BASIC a full 54K is available for machine code programs.

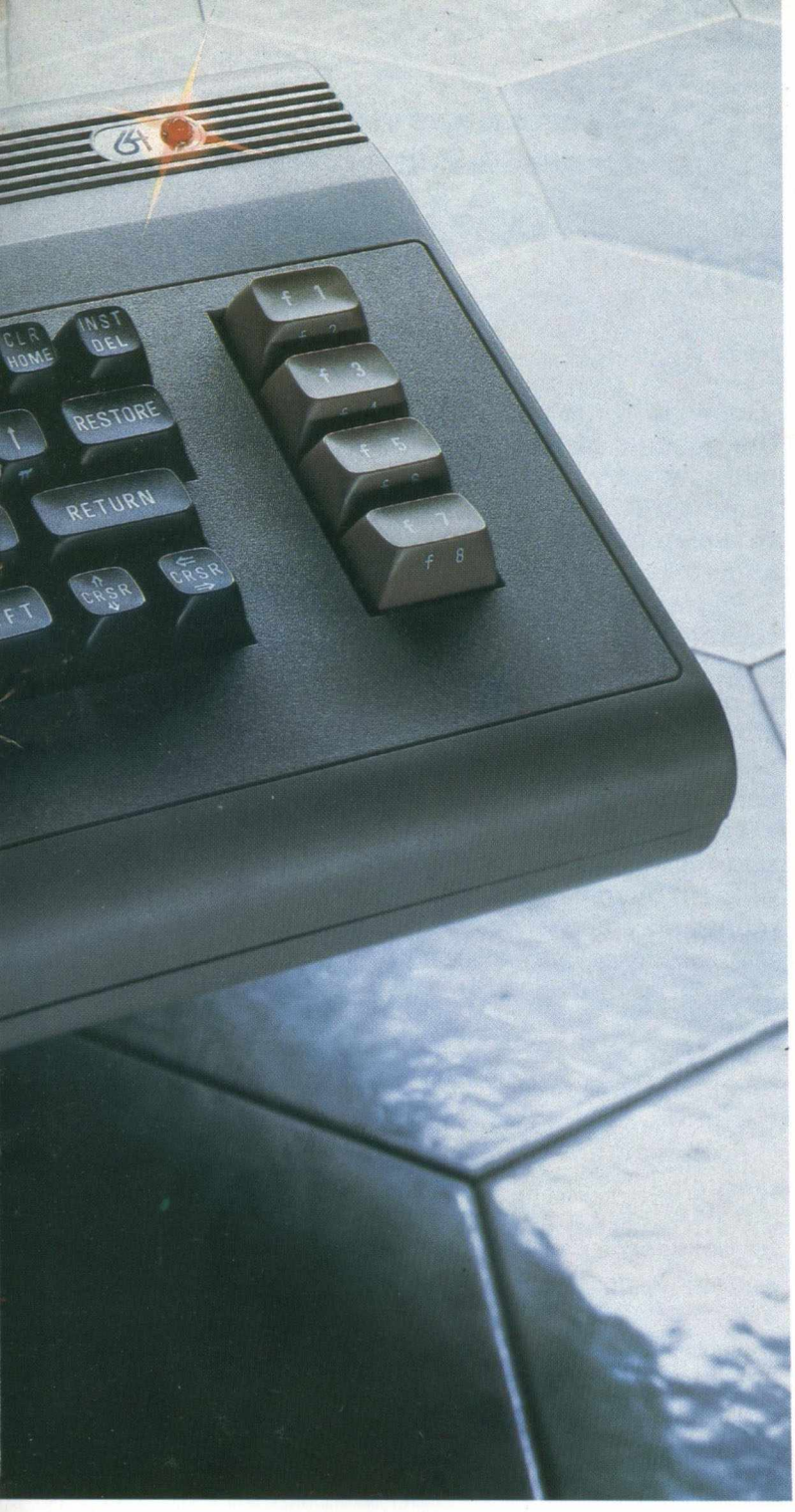
2. Interface adaptors will allow the use of a complete range of hardware peripherals including disk units, plotter, dot matrix and daisy wheel printers, Prestel communications, networking and much, much more.

3. A complete range of business software including word processing, information handling, financial modelling, accounting and many more specific application packages will be available.

4. Other computer languages such as LOGO, UCSD PASCAL, COMAL and ASSEMBLER are being developed. Existing VIC and 40 column PET BASIC programs can be easily converted.

5. The powerful sound chip gives 3 totally independent voices each with a range of 9 octaves. User control over music envelope, pitch and pulse shapes provides the ability to make your Commodore 64 sound like a variety of musical instruments, solo or in harmony.

6. 62 predefined graphic characters plus



full alpha numerics with upper and lower case letters, all available directly from the keyboard and displayable in normal or reverse video in any of 16 colours.

7. 40 column by 25 lines colour display. In high resolution graphics mode, a bit mapped screen gives 320 x 200 individually addressable pixels.

8. The dedicated video chip allows the use of high resolution multi-coloured "Sprites" (moveable object blocks). Sprites can be moved pixel by pixel, independently of anything else on the screen.

9. Sprites can also be set up in 8 "layers" giving full 3 dimensional effects with, if required, automatic collision detection between sprites and any other screen object.

10. Machine bus port will accept ROM cartridges for many applications, including business, educational, home and leisure software.

11. A second processor option using the Z80 gives the Commodore 64 the ability to support CP/M®.

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AUDIO FEATURES		
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Music Synthesizer	YES	NO
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Programming Tips

User-Friendly And Idiot Proof!

The object of incorporating a degree of 'user-friendliness' is to prevent unintentional errors and remove any semblance of difficulty in using the programs.

However there is a danger of making it all too simple. The operator can be lulled into a false sense of security in which he can do no wrong. We shall have prevented minor problems but we may have overlooked the possibility of major tragedies.

Only last week I 'copied' a program using the wrong name and obliterated a complete program. Two hours hard slog put that right — but suppose that an error of that kind destroyed a file that had taken a week — or a month — to create. Replacement would represent a considerable waste of time and frustration as well as diminishing faith in computers.

Some instructions to the computer are just too easy — notably 'Copy' and 'Backup'. Even the use of the 'Are you sure?' caption is not enough to prevent the possibility of error when the operator is distracted or under pressure: particularly at the end of the day or when trying to clear up for the week-end.

The programmer is conscious of such errors but he does not work under the same conditions as an office operator — and he is used to taking precautions. He has been caught out in the past and has learned to check before entering these disguised traps. He checks 'Directory' before taking any irredeemable action; he checks results to see that his intentions have been carried out exactly.

The two small programs — 'Duplicat' and 'Copycat' —are designed to alert the operator to the dangers of the action about to be taken. Admittedly they slow down the work, but, at the same time, they are 'user-friendly'. After all, a true friend will warn you if you are about to do something really silly.

Perhaps there are other areas where the operator should be protected by incorporating 'pause for thought' rather than allow the operator to plough ahead regardless. The caption 'Are you sure?' can be annoying when you are very experienced, but it can prevent senseless and careless errors.

When files of data have been carefully prepared and reconciled, it is very easy to make nonsense of them by making alterations — but such amendments may be necessary.

A program should be prepared so that any amendments to data are printed out to show the data before and after alteration. Such 'Amendment Reports' can be filed and referred to if it becomes necessary to go over the work again in the future.

As programmers, we should certainly make our programs 'user-firendly' and, if possible, 'idiot-proof' but we must remember that they are going to be used in an entirely different environment and under pressure by people who are not always aware of the posible traps into which they may fall. So, be a real friend to your computer operators — look over their shoulders all the time, ready to say — 'Hang about — are you sure you're sure!'

```
10 print"":goto100:rem----------------------------------------load as 'copycat'
20 getq$:ifq$=""then20
30 return
100 print"C O P Y C A T"
110 print"-------------"
120 print"To copy a single program from one disk to another:-
130 print"  1 - Fix WRITE-PROTECT TAB to ORIGINAL disk.
140 print"  2 - Put ORIGINAL disk in Drive 0 - right-hand drive.
150 print"  3 - Put RECIPIENT disk in Drive 1 - left-hand drive.
160 input"  4 - Enter name of program to be copied  - ";o$
170 input"  5 - Enter name it will have when copied - ";c$
180 print
230 print"Check that '";o$;"' is in the Directory below:-":print
240 directory d(0)
250 print:print"If correct then press RETURN otherwise press A to abort!
270 gosub20:ifq$="a"then100
```

```
280 print:print"Is new name '";c$;"' in the Directory below?
290 directory d(1)
300 print:print"Please reply with 'y' or 'n'!
310 gosub20:ifq$="n"then380
320 ifpeek(0)=2then380
330 forb=1to10:printchr$(7);:next
340 print:print"NOTE - Program will SCRATCH '";c$;"' before copying it in
Drive 1
350 print"Press RETURN to continue or A to abort!
360 gosub20:ifq$="a"then410
370 scratch d1,(c$)
380 copy d0,(o$) to d1,(c$)
390 print:directory d(1)
400 print:print"The Program '";c$;"' has been transferred!"
410 end
```

```
10 print"":goto100:rem-------------------------------------load as 'duplicat'
20 getq$:ifq$=""then20
30 return
100 print"D U P L I C A T"
110 print"---------------"
120 print"To make a complete 'Back-up' copy of one disk on another disk.
130 print"Fix a WRITE-PROTECT tab on the ORIGINAL disk to be copied.
140 print"Put ORIGINAL disk to be copied in DRIVE 0 - right-hand drive.
150 print"Put a FORMATTED disk in DRIVE 1 - left-hand drive.
160 print"Press RETURN when ready!";:gosub20:ifq$<>chr$(13)then160
170 print"Directory for disk in DRIVE 0 is:-":print
180 directory d(0)
190 print"Please check and, if correct, press RETURN - to abort press A!
200 gosub20:ifq$="a"then100
210 ifq$<>chr$(13)then200
220 print"Directory for disk in DRIVE 1 is:-":print
230 directory d(1):ifds<>74then270
240 print"Drive NOT ready - Disk missing or not formatted! Press A"
250 gosub20:ifq$="a"then100
260 ifq$<>chr$(13)then240
270 forb=1to10:printchr$(7);:next
280 print"NOTE - data or programs on Disk in DRIVE 1 will be REMOVED!
290 print"Please check and, if correct, press RETURN - to abort press A!
300 gosub20:ifq$="a"then370
310 ifq$<>chr$(13)then290
320 print"D U P L I C A T":print"---------------"
330 print"Disk in Drive 0 is being duplicated on disk in Drive 1.
340 print"Duplication will take about four minutes. Please wait!
350 backup d0 to d1
360 print"Duplication completed - Directory for disk in Drive 1:-
370 directory d(1)
380 end
```

Programming Tips

This is written for the PET — basic 4, but will run on the basic 3 new rom PETS with slight modifications of the keywords — dolose, dopen and dload.

With the advent of INSTANT ROMS I decided to write a program which would list the various chips which I had purchased in menu form and by pressing the appropriate number key the chip would be loaded from disk and automatically initialised.

First the chip has to be saved to disk —

1. Place the appropriate chip in the correct socket.
2. Enter the machine code monitor (SYS4 or SYS1024)
3. Type the following:-

.s''D:PROGRAM NAME'',08,xxxx,9999

where D = drive number (0 or 1)
xxxx = start memory location (eg 9000) of the appropriate chip
yyyy = finish memory location (eg 9fff)

When disk activity has ceased, typing S(return) brings you back to basic and the chip has been saved to disk.

The same procedure can be repeated for each ROM chip which you buy, then by placing an instant ROM in the socket with the write lead in position the appropriate chip can be loaded from the disk into the instant ROM.

Unfortunately when the chip was originally saved to disk the pointers as to the position of the program in memory were also saved. So when loaded back into the instant ROM the pointers are set to way above basic and if fre(0) is requested a negative quantity will be given. However all is not lost as typing 'new' will reset the basic pointers but does not affect in any way the program in instant ROM. (in fact when the PET is powered down and then switched on again the program will still be there as basic only writes, on power up, into locations upto 327 68 or thereabouts).

Now to the program — This is the first on my disk so that shift run loads and runs it. One other key pressed and the appropriate chip is loaded and initialised.

The ROM chips are named in data statements (starting at 6000 the order being — ROM chip name, SYS number to initialise. The last item of data has to be an asterisk (for no other reason than the program as written demands it).

If the programs on the disk are a mixture of normal basic programs and ROM chip programs the number following the basic program name will be 0 (again program requirements). See data statements 6000-6090. One other important point: the name of the program in the data statements must match the program name on disk.

Sub-routine 5000 consists of instructions and checks as to whether the correct key is pressed and also if more programs are to be listed to the screen — these are listed in blocks of 9.

Line number 60 reads the data statements and counts them so that the array in line number 80 can be correctly dimensioned. This enables programs to be added to the data statements without having to worry about changing the dimension value of the array 3.

Line number 100 reads the asterisk into the program name array as a check for no more programs to list.

Line numbers 110 to 140 lists the program names to the screen in menu form with the variable 'a' providing the number (1-9) before the program name. If another block is there to be listed the last item on the menu is 'continue' whereby if 'c' is pressed then the next block of programs is listed, again numbered 1-9.

Line number 150 checks which block of 9 has been listed through variable 'c' and calculates the value of 'a' which is the position of the program in the array table.

Program block 1000 to 1070 then carries out a number of important things:-

a) checks if the sys number is 0. If it is then a normal basic program is assumed or at least a program which does not require a sys command to initialise it immediately.

b) Line 1010, 1020 peeks the memory location given in the sys number. Writes back to it a number higher then peeks it again. If the first peek is equal to the peek after write then the instant ROM is not available (write lead removed) an error message is given and the program aborted.

c) Line 1030 does the obvious — checks to see if the program is on the disk — it might have been scratched. If it isn't then again an error message is given and the program aborted.

d) Line 1040 — clears the screen and also prints on the screen the following:

dload program name''
Note chr$(34) is quotes('')

Sets qw$ to 4cursor downs + new, whilst line 1050 resets qw$ to 4 cursor downs + run if the program is not a ROM chip.

e) Line numbers 1060,1070 — prints qw$

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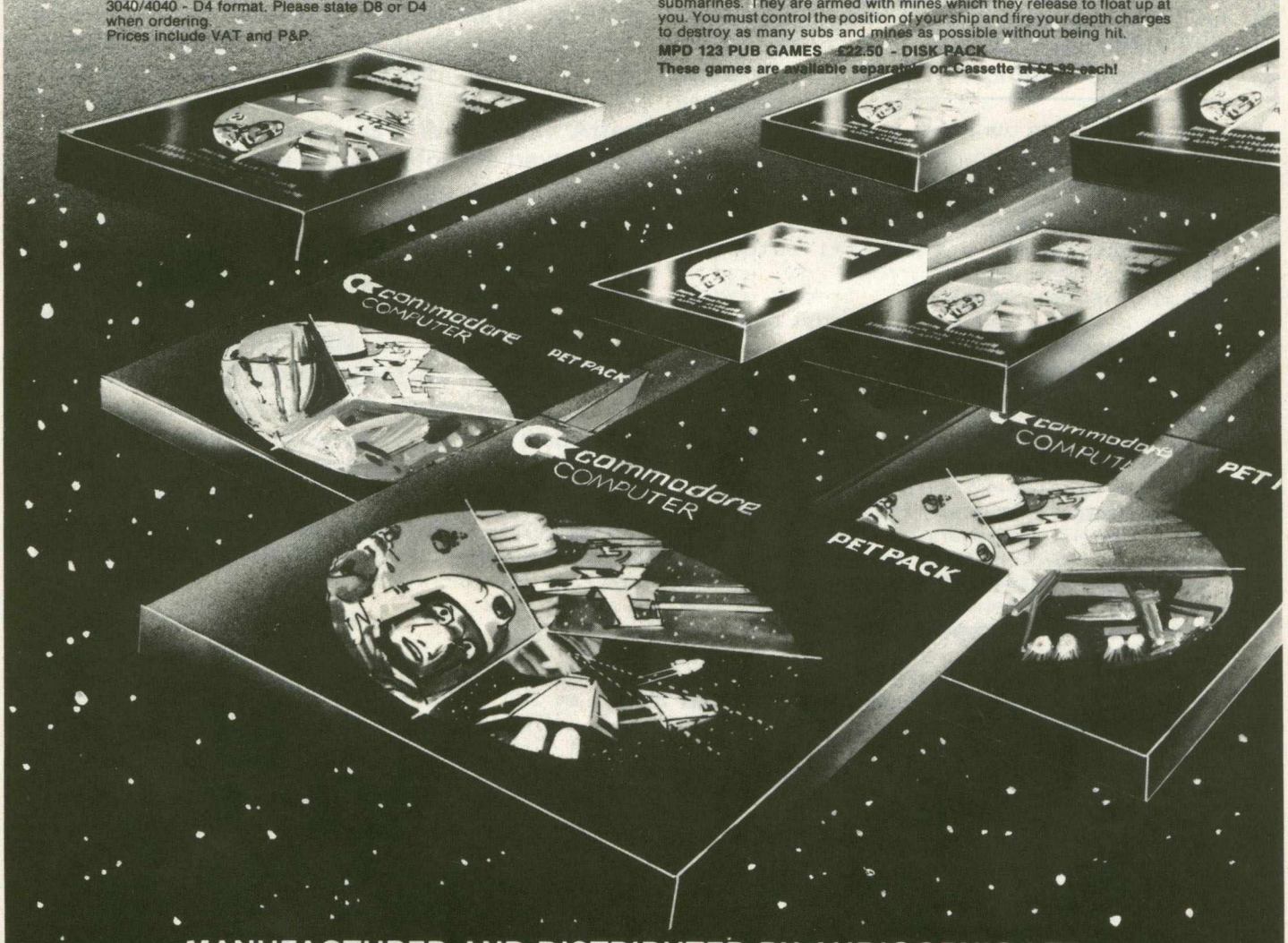

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and also if a ROM chip prints on the screen sys(number).

Line number 2000 puts into the keyboard buffer queue the following characters —
home cursor (chr$(19))
3 — carriage returns (chr$(13)) and
clear screen (chr$(147))

then puts the number 5 into the pointer to the number of characters in the keyboard queue.

On the screen we have therefore:-

```
d load''programname

new

sys(number) — (or run)
```

When the PET sees the keyword 'end' or 'stop' it empties the keyboard buffer of any characters which remain there.

Thus the cursor is homed, then a carriage return is produced over the first message (dload etc), the PET searches the directory on the disk, loads the program — obeys the word 'new' then obeys the sys command because of the third carriage return. Finally the screen is cleared and either the necessary chip has been loaded and initialised or the appropriate program has been loaded and is now waiting for some response from the operator.

```
10 rem load programme
20 rem
30 rem d.milnes january 1982
40 rem
50 c=1:gosub5000
60 reada$:ifa$<>"*"thent=t+1:goto60
70 t=t/2:restore
80 dimch$(t+1),s(t)
90 fori=1tot:readch$(i):reads(i):next
100 readch$(i)
110 fori=1tot:a=a+1:printtab(12)"■"mid$(str$(a),2)" "ch$(i):ifa<9then140
120 gosub5010:ifflthenfl=0:goto140
130 goto150
140 next:gosub5020
150 a=c*9-9+val(a$)
1000 p=s(a):ifp=0then1030
1010 q=peek(p):pokep,q+1
1020 ifpeek(p)=qthenprint"■■sorry instant rom not available■":end
1030 dopen#6,(ch$(a)):ifds<>0thenprint"■■"ch$(a)" ■ --"mid$(ds$,4,15):dclose:end
1040 dclose:qw$="■■■■new":print"■dload"chr$(34)ch$(a)chr$(34)
1050 ifs(a)=0thenqw$="■■■■run"
1060 printqw$:ifqw$="■■■■run"then2000
1070 print"■■sys("s(a)")"
2000 poke623,19:poke624,13:poke625,13:poke626,13:poke158,4:end
5000 print"■                ■program loader■":print"■■":return
5010 fl=1:printtab(12)"■c■ continue"
5020 print"■■   type in number - program will load
5030 print"      and run the appropriate chip if
5040 print"       the instant rom is available."
5050 geta$:ifa$=""then5050
5060 ifa$="c"andch$(1)<>"*"thena=0:c=c+1:gosub5000:return
5065 ifa$="r"thena=0:gosub5000:goto110
5070 ifval(a$)<1orval(a$)>athen5050
5080 fl=0:return
6000 datasuperchip,38039,powerchip,36864,mikrochip,36864,toolkit,40960
6010 datamikro/tool,36864,old/new,826
6020 data copyall4/8000,0
6030 data copy all,0,screen mik.4,36864,supermon,0,progrec,0
6040 data disk show data,0,picchip,38039,micromon,0
6090 data*
63999 scratch"prog load":dsave"prog load"
```

Basic Programs

Word Count

Purpose:
After slaving over the composition of an article, most writers are required to count the words, as the basis for payment for their work.

The program works with either WordPro 3 or WordPro 4 files and with Basic 2.0 and Basic 4.0 (Regular–, Fat-40 and 80-column machines). The WordPro file is read from Drive =0 of the disk unit. DOS 2.1 is not necessary, although I have not included an error-checking routine (except for Basic 4.0).

Procedure:
First, type in the BASIC listing exactly as given below. Be very careful to include all the spaces specified, especially in Line 8 of the program. There is one after the CLR/HOME, 13 before the title and 12 following.

Now SAVE this parts as "WC.BAS". After VERIFYING, reset the machine for the next step.

a) For the "non-Assember"-crowd here's the method for you. Type in 'SYS4' to get into the M.L. monitor. Then enter the following line, right after the displayed '.' (at the preset cursor position):

.M 0624 06BC RETURN

The screen will fill with a display much like that shown in the 'HEX DUMP' listing below. Your task is to carefully change all of the displayed figures to match the listing (top half). Simply type in the proper values, remembering to hit 'RETURN' at the end of each line.

For the remainder, do the same again after typing this line:

.M 06BC 0733 RETURN

After making the required changes, this should be SAVEd using the monitor, as follows:

.S "0:WC.ML",08,0624,0733 RETURN

.X RETURN (exist the monitor)

You may VERIFY this normally, if you wish.

b) If you're still with me, only two things remain to be done:

Simply reLOAD "WC.BAS" first, then reLOAD "WC.ML". Use the normal BASIC SAVE command now, and both pieces will be linked together.

Remember that any changes to the Basic portion now will also move the machine language. Do so at your own risk.

Operation:
Before you RUN the program, be sure you know the file name of the WordPro file to be counted. Put this diskette into Drive =0, and you are ready to go.

The program self-adjusts for 40- or 80-column operation. This assumes that you will only be counting 40-column files on a 40-column machine, and 80-column files on an 80-column machine. Thus, the correction is based on the machine in use, not the file being read.

The program ignores WordPro format commands (and anything on the same line as a format command).

If you have used the "--" characters as a dash, there should be no preceding or following blanks. If you use a series of "-", (as I sometimes do for underlining) the count may not be correct.

If you've entered everything correctly, the word count total should have appeared on the screen, after 2-25 seconds. Disk activity should end and the "READY" prompt should now be displayed.

```
WORD COUNT 9 : LISTING

 0 REM     WORD COUNT 9 -- WORDPRO 3
 1 REM      AS OF NOVEMBER 29, 1981
 2 REM
 3 REM  (C) DAVID A. HOOK, 58 STEEL ST.
 4 REM BARRIE, ONTARIO, CANADA, L4M 2E9
 5 REM
 6 REM        ALL RIGHTS RESERVED
 7 REM
 8 PRINT"■ ■                    WORD COUNT ML
 9 PRINT"■■■PLACE PROGRAM DISK IN DRIVE #0
 10 PRINT"■■HIT A KEY WHEN READY ■";
 11 GETZ$:IFZ$=""THEN11
 12 PRINT"  OK"
 13 INPUT"■PROGRAM NAME   *■■■";F$
 14 OPEN1,8,15,"I0":CLOSE1
 15 OPEN2,8,2,"0:"+F$+",P,R"
 16 IFDSTHENZ$=DS$:GOTO21
 17 SYS1582
 18 PRINT"■■■■■■■■■■■■WORD COUNT = ";
 19 PRINTPEEK(1572)+256*PEEK(1573)
 20 Z$="DONE"
 21 PRINT"■■"Z$:CLOSE2:END
READY.
```

```
WORD COUNT 9 : HEX DUMP

READY.
▌
.:  0624 45 01 99 22 11 12 22 5A   .:  06B4 F0 0F C0 6F F0 0B C9 20
.:  062C 24 3A A2 09 A9 00 9D 24   .:  06BC F0 04 C9 6F D0 03 EE 26
.:  0634 06 CA 10 FA A9 28 A2 60   .:  06C4 06 C9 20 F0 AC C9 6F F0
.:  063C 8E 00 84 AE 00 80 E0 60   .:  06CC A8 A2 FF 8E 29 06 C9 20
.:  0644 F0 01 0A 8D 28 06 A2 02   .:  06D4 F0 16 C9 6F F0 12 C9 2D
.:  064C 20 C6 FF 20 06 07 20 06   .:  06DC D0 04 C0 2D F0 0F 8E 2B
.:  0654 07 A2 00 8E 2B 06 8E 29   .:  06E4 06 E8 8E 2A 06 4C 75 06
.:  065C 06 8E 27 06 18 AD 24 06   .:  06EC AE 2A 06 D0 84 AE 2B 06
.:  0664 6D 26 06 8D 24 06 AD 25   .:  06F4 F0 08 EE 26 06 A2 00 8E
.:  066C 06 69 00 8D 25 06 8E 26   .:  06FC 2B 06 A2 FF 8E 2A 06 4C
.:  0674 06 AE 27 06 EC 28 06 F0   .:  0704 75 06 AE 2C 06 8E 2D 06
.:  067C D8 20 06 07 EE 27 06 AD   .:  070C 20 E4 FF D0 02 09 40 8D
.:  0684 2C 06 AC 2D 06 A2 00 C9   .:  0714 2C 06 A5 96 F0 06 20 CC
.:  068C 7A D0 09 8E 26 06 20 21   .:  071C FF A2 F8 9A 60 AE 28 06
.:  0694 07 4C 55 06 C9 1F D0 0B   .:  0724 CA 86 B4 20 06 07 A6 B4
.:  069C AE 2B 06 F0 03 EE 26 06   .:  072C CA EC 27 06 B0 F3 60 44
.:  06A4 4C 92 06 AE 29 06 D0 21   .
.:  06AC AE 27 06 CA D0 13 C0 20   READY.
```

Basic Programs

Pretty Printing

When I first started using the CBM machines (PET etc), I wrote Basic programs in the same way as I wrote Algol programs ie with indentations, spaces and blank lines. Some of the effects were quite easily achieved in Microsoft Basic by starting each line with a colon.

I soon found that small programs (in terms of coding) got too large (in terms of memory occupied) to fit on the machine. They also ran rather slowly since the machine was fully interpretive and interpreting spaces and colons took a fair amount of time.

I removed these redundant objects (as advised by the manual) and errors started creeping into fully working programs. Take for example the following:

What used to be
```
MD = T OR (RT AND IM)
```
with spaces removed became
```
MD=TOR(RTANDIM)
```
which the machine interpreted as
```
MD = TO R (R TAN DIM)
```
which gave a syntax error and had to be rewritten as
```
MD+(IMANDRT)ORT
```

There were quite a few of these but they were a minor problem: the major problem was maintenance. After four years of maintaining 'well laid out' programs, I found these dense pieces of code extremely difficult to follow (even though I wrote them). Some statements looked rather confusing and took quite some time to sort out (I find this true of most of the published Basic programs: they are extremely easy to copy but not so easy to comprehend).

It was also at that time that Commodore brought out its new range (the 3000 Series). It was also at that time that my installation bought a printer. I soon discovered that uppercase letters were printed as lowercase letters and vice versa. Some of the control characters were not printed and those that did appear made very little sense (see Listing 1).

I wrote a simple utility to cope with the problems of control characters and the reversal of upper and lowercase letters. This utility also gave an added extra to readability: subroutine headings were printed in enhanced mode (wide print). Some lowercase letters were used as substitutes for control characters. This idea caused a bit of confusion at times (see Listing 2).

Although this utility gave me something better than what I had previously, it was still inadequate; the need for a utility which would print a program source text in a readable format (see Listing 3) was obvious.

The Design

Typically a Pretty Printer or Program Formatter has to perform a full syntax analysis of the program. Take for example the following piece of code:

```
25 A(X)=1:X=X-1:IF X GOTO 25
```

This is basically a REPEAT-UNTIL structure and could be printed as
```
 25 A(X)=1
x = x -1
IF X GOTO 25
```
The only problem with such a scheme is syntax errors and error recovery: if an error is detected, how should it be handled? To avoid this problem, the program must be completely written and debugged before it can be prettyprinted.

Unfortunately complete progams are not always possible; to add to that, the statements are not pre-processed for syntax errors. To write a syntax analyzer would be a task in itself. As a result, a different scheme was adopted: the formatter would only format on a local basis, handling individual constructs (such as IF-THEN) rather than the entire program.

The general strategy is simply to scan the program on a symbol by symbol basis and print a result conforming to the following:

1. Only one statement will be printed per line.
2. The next following the THEN part of an IF statement will be indented and printed on the next line.
3. The body of a FOR loop will be indented.
4. If a REMark is followed by anything other than a space, a blank line will be printed before that REMark.
5. If an equals sign appears immediately after a REMark, that REMark will be printed in enhanced mode (if such a facility exists).
6. If a REMark appears at the end of a line, it will be printed as the first statement in that line.
7. Non printing characters (eg pi, clear screen etc)

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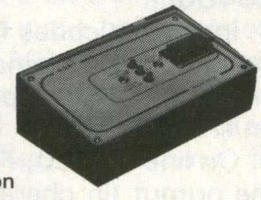

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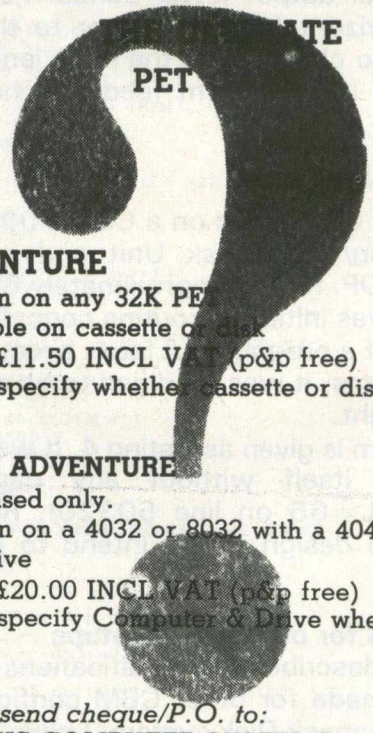

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will be printed in brackets.
8. Any spaces in the source (other than those in REMarks and strings) will be deleted.
9. Spaces will be printed in between distinguished symbols.
10. Any ill defined construct wil lead to ill defined prettyprinting (ugly printing?).

In general, no matter what rules are chosen, the output is bound to displease someone.

The Implementation
The program is implemented as a series of drivers (routines, machines etc) interacting with each other. Each driver performs a single task. This concept may appear inefficient and unduly complicated to some while being simple and efficient (in terms of maintenance) to others.

The main driver (10100) initializes the system, calls the line driver until the end of file is reached and terminates the system.

The line driver (10200) obtains a line from the input driver and sends the REMarks and individual statements to the horizontal output driver.

The input driver (20000) obtains a line from the source and puts it into the input buffer.

The horizontal output driver (40000) splits the line into sections not exceeding the page width and sends these sections to the vertical output driver.

The vertical output driver sends the sections from the horizontal output driver to the output device. It also checks that the page length is not exceeded; if it is, a form feed and header are generated.

Realization
The program was raised on a CBM 3032 using a 400K Compu/Think Disk Unit and a Walkers Dolphin BD80P. It used approximately 6Kbytes of memory. It was initially a routine concatenated at the bottom of a program but later, because of updating problems, it was modified to be a program in its own right.

The program is given as Listing 4. It was used to pretty print itself without any page feeds (PL=450, FL=66 on line 50320). Remember rule 6 of the design if you intend to copy this program.

Modifications for other CBM Setups
This section describes the modifications that may have to be made for other CBM configurations. First, the Novapack Disk system: I have never used one of these so I cannot say anything about it. As for Commodore Disk Units, I have not used them either but I have access to the preliminary manual. From what I read in the manual, the following modifications are obvious but do not be surprised if there are more.

1. Lines 21020 thru 22060 should be removed and replaced with 21020 GET#1,C$:CL(EL)=ASC(CS$+Z$):S=ST:RETURN
2. On lines 10200, 20100 and 20200 'S<3' should be replaced with 'S<>1'.
3. Lines 50880 thru 50960 should be replaced with
50880 OPEN 5,8,15: OPEN 1,8,2,"O:"+F$+",P,R,"
50900 GET#1 C$:REM--DISCARD LOAD START ADDRESS
4. 'CLOSE1:CLOSE15 should be inserted at the beginning of line 58010.

The following modifications may be required for other printers. Please note that this list is not exhaustive.

1. If the printer does not have enhanced mode, line 30240 should read 30240 BE=CO+1:IFBE>=ELGOTO30400.
2. If the printer does not have enhanced mode, line 30500 should read 30500 CL(B)=:EL=B:GOSUB40000.
3. If the printer does not have red ribbon shift or enhanced mode, remove lines 30220 and 30400.
4. Insert the codes for enhanced mode (or red ribbon shift) and normal mode (or black ribbon shift) in W$ and N$ respectively. This modification is on line 50360.
5. On line 50320, FL should contain the width of the output (in characters) and PL should contain the page length.

Extensions
These are facilities that I would have liked but did not include in the prettyprinting program.

1. Generating a form feed (basically because of the paper budget).
2. Including a cross reference of the symbols and lines.
3. Generating the name of the routine next to its call (this would be a two-pass job unless all the calls were backward references).
4. Splitting a line at a blank space if it exceeds the full width. This was not done because the horizontal output driver would have to be rewritten to check whether the splitting point was the middle of a string where spaces were significant.

Concluding Remarks

The pretty printer does a fairly good job but is by no means perfect. It runs rather slowly (20 minutes for a listing of itself). It could be written in assembler but that is another story (see below). The following complaints have been launched so far:

s. A multiple NEXT statement (eg NEXT K,J,I) will not de-indent the text.
2. The sequence IF (condition) then NEXT will not de-indent until the end of the input buffer is reached.
3. An IF (condition) THEN (label) is printed on two lines: it should be altered to IF (condition) GOTO (label) if it is preferred on one line.
4. If extended Basic commands are used in an IF-THEN statement, a colon should be inserted after the THEN for the program to execute properly. This generates a redundant blank line.
5. Spaces are stripped from DATA statements.

Postscript

Except for the concluding Remarks, the rest of the above article was written about 1½ years ago. I have now got a fully working assembler version of the pretty printer with complaints 1 to 3 attended to. It includes a variable and line number cross reference which I found extremely useful (it was included when I felt that waiting 2 hours before anything is printed by Jim Butterfield's cross reference program was a bit trying). It has been tested over the past one and a half years on Final-year undergraduate and MSc computer projects on the PET. At the moment it only works from the CBM Disk Unit, and is being distributed through Safeguard Computer Systems in Birmingham.

Listing 1 - Program printed without modifications

```
 10 REM==DEMO PROGRAM
 200 REM  STARTED: 21/12/80, CUP
 3000 REM--TTHIS IS A NONSENSE PROGRAM
 3020 FORI=1TO10:IFBORETHENS=AANDTOR(C+25*2:B=1:C=2
 3040 NEXTI
 4000 IFI=2*RGOTO80:REM--TRY COMMENTS
 50000 PRINT"3hELP IS ON THE WAY bATMAN"
 50100 FORI=1TO10:FORJ=1TO10:A=B:B=C:C=A:NEXTJ:NEXTI
READY.
```

Listing 2 - Program after going thru a text modifier

```
 10 REMDEMO PROGRAM
 200 REM  STARTED: 21/12/80, CUP
 3000 REM--TTHIS IS A NONSENSE PROGRAM
 3020 FORI=1TO10:IFBORETHENS=AANDTOR(C+25*2:B=1:C=2
 3040 NEXTI
 4000 IFI=2*RGOTO80:REM--TRY COMMENTS
 50000 PRINT"cssssHelp is on the way Batman"
 50100 FORI=1TO10:FORJ=1TO10:A=B:B=C:C=A:NEXTJ:NEXTI
READY.
```

```
Listing of demo on 13 Jan 81 at 17:30


  10 REM=DEMO PROGRAM
 200 REM  STARTED: 21/12/80, CUP

3000 REM--TTHIS IS A NONSENSE PROGRAM
3020 FOR I=1 TO 10:
        IF B OR E THEN
           S=A AND  TO R(C+25*2:
           B=1:
           C=2
3040 NEXT I

4000 REM--TRY COMMENTS
     IF I=2*R GOTO 80:
50000 PRINT "[clr][cdn][cdn][cdn][cdn]Help is on the way Batman"
50100 FOR I=1 TO 10:
        FOR J=1 TO 10:
           A=B:
           B=C:
           C=A:
        NEXT J:
     NEXT I



Listing of Pretty37d on 13 Jan 81 at 17:27


10000 REM=PRETTY PRINTER
10020 REM  WRITTEN: 11/03/80, CUP
10040 REM  UPDATED: 13/01/81, CUP

10100 REM=DRIVER
10120 GOSUB 50000
10200 GOSUB 20000:
      IF S<3 THEN
         GOSUB 30000:
         GOSUB 33000:
         GOTO 10200
10300 GOSUB 58000:
      END

20000 REM=OBTAIN THE NEXT LINE

20100 REM--LINK AND LINE NO
      FOR EL=1 TO 4:
         GOSUB 21000:
         IF S<3 THEN
         NEXT EL:

20200 REM--REST OF LINE
20220 IF S<3 THEN
         FOR EL=5 TO 255:
            GOSUB 21000:
            IF CL(EL) THEN
            NEXT EL
20999 RETURN

21000 REM=GET THE NEXT CHARACTER

21020 IF M=EB THEN
         GOSUB 22000
21040 M=M+1:
      S=-(PEEK(M)=0)*(S+1):
      CL(EL)=PEEK(M)
21999 RETURN

22000 REM=GET NEXT TRACK
22040 RT=RT+1:
      POKE 45051,49:
      SYS 45092:
      POKE 45055,TR(RT)
22060 SYS 45083:
      SYS 45095:
      M=SB:
      RETURN

30000 REM=PRINT COMMENTS
30020 Q=0:
      SM=LM:
      EN=0

30030 REM--HUNT FOR THE COMMENT
30040 FOR CO=5 TO EL
30050    Q=(CL(CO)=QU)=(NOT Q):
         IF NOT Q THEN
            IF CL(CO)=143 GOTO 30100
30060 NEXT CO:
      GOSUB 32000:
      RETURN

30100 REM--BLANK LINE REQUIRED?
30120 B=CO:
      T=CL(B+1):
      IF T<>0 AND T<>32 THEN
```

```
        P$="":
        GOSUB 40000
30140 GOSUB 32000:
      C=CL(B):
      TK=-1:
      C7=15:
      GOSUB 34000

30200 REM--ENHANCED MODE REQUIRED?
30220 EN=(T=61):
      IF EN THEN
         P$=P$+W$
30240 BE=CO+1-EN:
      IF BE>=EL GOTO 30400

30300 REM--DECODE COMMENT
30320 FOR CO=BE TO EL-1:
         GOSUB 35000:
         GOSUB 34000:
      NEXT CO

30400 REM--CANCEL ENHANCED MODE
      IF EN THEN
         P$=P$+N$:

30500 REM--MARK NEW EOL
      CL(B)=0:
      EL=B:
      LL=FL+EN*HL:
      GOSUB 40000:
      LL=FL:

31000 REM=SET UP FOR NEXT LINE
31020 P$=LEFT$(B$,SM):
      RETURN

32000 REM=LINE NO SETUP
32040 P$=LEFT$(RIGHT$(B$+STR$(CL(3)+CL(4)*256),5)+B$,SM):
      RETURN

33000 REM=REST OF LINE
33020 CO=5:
      Q=0

33100 REM--NEXT STATEMENT
      BE=CO:
      IF CO=EL THEN
         RETURN:

33200 REM--CONTENTS OF TOKEN
      GOSUB 35000:

33240 REM--LEADING SPACE REQUIRED?
33260 IF CO<>BE AND NOT Q THEN
         IF TK THEN
            IF C$="p" OR C$="b" THEN
               P$=P$+" "

33300 REM--DE-INDENTATION REQUIRED
33320 REM  NEXT?
      IF C=130 AND NOT Q THEN
         SM=SM-3:
         LM=LM-3:
         P$=LEFT$(P$,SM):

33400 REM--DECODE IF NOT SPACE
      IF Q OR (C<>32 AND NOT Q) THEN
         GOSUB 34000:

33500 REM--TRAILING SPACE REQUIRED?
33520 IF TK AND NOT Q THEN
         IF C$="s" OR C$="b" THEN
            P$=P$+" "

33600 REM--INDENTATION REQUIRED
33620 REM  IF?
      IF C=139 THEN
         SM=SM+3:
33640 REM  FOR?
      IF C=129 THEN
         SM=SM+3:
         LM=LM+3:

33700 REM--NEXT TOKEN
33720 CO=CO+1:
      IF CO<EL THEN
         IF (C<>167 AND C<>58) OR Q GOTO 33200
33740 GOSUB 40000:
      GOSUB 31000:
      IF CO<EL GOTO 33100
33999 RETURN

34000 REM=DECODER
34020 IF Q GOTO 34100
34040 REM  TOKEN
      IF TK THEN
         P$=P$+MID$(T$(C7),2):
         RETURN:
34060 REM  FORCE UPC
      IF C>64 AND C<91 THEN
         P$=P$+CHR$(C OR 128):
         RETURN:

34100 REM--STRINGS
34120 REM  CONTROL CHAR?
34140 FOR J=1 TO NC:
         IF C=CC(J) THEN
            P$=P$+"["+CC$(J)+"]":
            RETURN
34160    IF C>CC(J) THEN
         NEXT J
34180 P$=P$+CHR$(C):
      RETURN

35000 REM=NEXT TOKEN
35020 C=CL(CO):
      Q=(C=QU)=(NOT Q):
      TK=C>=128 AND NT>=C AND NOT Q
35040 IF TK THEN
         C7=C AND 127:
         C$=LEFT$(T$(C7),1)
35999 RETURN

40000 REM=OUTPUT GENERATOR

40100 REM--IS LINE SHORT ENOUGH?
40120 IF LEN(P$)<=LL THEN
         TM$=P$:
         GOSUB 41000:
         RETURN
40140 T$=LEFT$(B$,SM):
      IF EN THEN
         T$=T$+W$

40200 REM--SEARCH FOR SPACE
40220 FOR I=LL+1 TO HL STEP -1:
         IF MID$(P$,I,1)<>" " THEN
         NEXT I:
         I=LL+1
40240 TM$=LEFT$(P$,I-1):
      IF EN THEN
         TM$=TM$+N$
40260 IF MID$(P$,I,1)=" " THEN
         I=I+1
40280 P$=T$+MID$(P$,I):
      GOSUB 41000:
      GOTO 40100

41000 REM=PRINTER CONTROL
41020 IF CL<>PL GOTO 41200

41040 REM--NEW PAGE
      CL=0:
      PG=PG+1:
41060 X$="":
      FOR J=1 TO 5:
         GOSUB 43000:
      NEXT J:
      X$=TL$+STR$(PG):
      GOSUB 43000
41080 X$="":
      FOR J=1 TO 2:
         GOSUB 43000:
      NEXT J

41200 REM--TRANSMIT
      X$=TM$:
      GOSUB 43000:

41300 REM--BOTTOM OF FORM?
41320 IF CL<BF THEN
         RETURN

42000 REM=FORM FEED
42020 X$=""
42100 IF CL<>PL THEN
         GOSUB 43000:
         GOTO 42100
42999 RETURN

43000 REM=XMIT LINE TO PRINTER
43020 IF LEN(X$)<>0 AND D<>3 THEN
         SYS (CV)
43040 PRINT £P,X$:
      CL=CL+1:
      RETURN

50000 REM=INITIALIZATION

50100 REM--MACHINE QUERY
50120 CLR:
      POKE 59468,14:
      INPUT "[clr][cdn][cdn]Machine size (in kilobytes)";S

50200 REM--POSITION DEPENDANT VARIABLE
      POKE 53,S*4-1:
      CLR:
      X$="":

50300 REM--CONSTANTS
```

```
50320 FL=80:
      NC=13:
      NT=218:
      P=255:
      PL=66:
      QU=34:
      SB=36863
50340 BF=PL-4:
      CV=PEEK(52)+PEEK(53)*256+1:
      EB=SB+5120:
      HL=INT(FL/2)
50360 N$=CHR$(27)+CHR$(14):
      W$=CHR$(27)+CHR$(15):
      Z$=CHR$(0)
50380 REM  MAX NESTING IS 20
      B$=" ":
      FOR I=1 TO 6:
        B$=B$+B$:
      NEXT I:

50400 REM--VARIABLES(PRESET)
50410 CL=PL:
      LL=FL:
      LM=6:
      M=EB:
      PG=0:
      RT=0
50420 REM  VARIABLES
50430 BE=C<CO<CG7<D<EL<EN<I<J<Q<S<SM<T<TK
50440 C$=X$:
      D$=X$:
      F$=X$:
      P$=X$:
      T$=X$:
      TL$=X$:
      TM$=X$

50500 REM--ARRAYS
50520 DIM CC(NC),CC$(NC),CL(255),T$(127 AND NT),TR(7)

50600 REM--FILES
50620 PRINT "[cdn]Filename      "CHR$(QU)CHR$(QU)"[clf]
      [clf][clf][clf][clf]";:
      INPUT F$
50640 PRINT "[cdn]Date          "CHR$(QU)CHR$(QU)"[clf]
      [clf][clf][clf][clf]";:
      INPUT D$
50660 PRINT "[cdn]Time          "CHR$(QU)CHR$(QU)"[clf]
      [clf][clf][clf][clf]";:
      INPUT T$
50680 TL$=LEFT$("Listing of "+F$+" on "+D$+" at "+T$+B$,
72)+"Page"
50700 INPUT "[cdn]Output Device";D:
      OPEN P,D

50800 REM--TAGS ETC
      PRINT "[rvs]Initializing[off]":
50820 FOR I=0 TO 127 AND NT:
        READ T$(I):
      NEXT I
50840 FOR I=1 TO NC:
        READ CC(I),CC$(I):
      NEXT I
50860 FOR I=CV TO CV+46:
        READ C:
        POKE I,C:
      NEXT I

50870 REM--GET DIRECTORY
50880 POKE 45051,49:
      SYS 45092:
      POKE 45055,0:
      SYS 45083:
      SYS 45095

50900 REM--FIND ALL TRACKS
      F$=LEFT$(F$+B$,16):
      FOR I=1 TO 39:
        S=I*25+SB:
50920   FOR J=S+1 TO S+16:
          IF ASC(MID$(F$,J-S,1))<>PEEK(J) GOTO 50960
50940   NEXT J:
        RT=RT+1:
        TR(RT)=I
50960 NEXT I:
      RT=0:
      PRINT "[cup]"B$
50980 REM  RETURN ADDRESS CLEARED BY CLR
      GOTO 10200:

51000 REM=TOKENS
51125 DATA "nEND","sFOR
51130 DATA "sNEXT","sDATA","nINPUT £","sINPUT","sDIM
51135 DATA "sREAD","sLET","bGOTO","sRUN","sIF
51140 DATA "nRESTORE","bGOSUB","nRETURN","nREM","sSTOP"
51145 DATA "sON","sWAIT","sLOAD","sSAVE","sVERIFY
51150 DATA "sDEF","sPOKE","nPRINT £","sPRINT","nCONT
51155 DATA "sLIST","nCLR","sCMD","sSYS","sOPEN
51160 DATA "sCLOSE","sGET","nNEW","nTAB(","bTO
51165 DATA "nFN","nSPC","pTHEN","sNOT","bSTEP
51170 DATA "n+","n-","n*","n/","n¢
51175 DATA "bAND","bOR","n>","n=","n<
51180 DATA "nSGN","nINT","nABS","nUSR","sFRE
51185 DATA "nPOS","nSQR","nRND","nLOG","nEXP
51190 DATA "nCOS","nSIN","nTAN","nATN","nPEEK
51195 DATA "nLEN","nSTR$","nVAL","nASC","nCHR$
51200 DATA "nLEFT$","nRIGHT$","nMID$","bGO","sCONCAT
51205 DATA "sDOPEN","sDCLOSE","sRECORD","sHEADER","sCOLLECT
51210 DATA "sBACKUP","sCOPY","sAPPEND","sDSAVE","sDLOAD
51215 DATA "sCATALOG","sRENAME","sSCRATCH","sDIRECTORY

52000 REM=CURSOR CONTROL
52010 DATA 003,"stp
52020 DATA 017,"cdn
52030 DATA 018,"rvs
52040 DATA 019,"hom
52050 DATA 020,"del
52060 DATA 029,"crt
52070 DATA 131,"run
52080 DATA 145,"cup
52090 DATA 146,"off
52100 DATA 147,"clr
52110 DATA 148,"ins
52120 DATA 157,"clf
52130 DATA 255,"pi

53000 REM=CBM CODE TO ASCII
53020 DATA 160,004,177,042,133,254,136,177,042,133
53040 DATA 253,136,177,042,168,136,177,253,201,193
53060 DATA 144,008,201,219,176,004,041,127,208,010
53080 DATA 201,065,144,008,201,091,176,004,105,032
53100 DATA 145,253,192,000,208,225,096

58000 REM=TERMINATION
58010 GOSUB 42000:
      CLOSE 2:
      END
```

DIRECTORY LIST

When I wanted to update my disk directories I found it a bit of a laborious business having to LOAD each directory, then open a file to the printer remembering to turn the paging on and printing the date, then LIST, then turn the paging off to go to a new page for the next directory. In addition I found filing the printouts awkward as the listing is too close to the left hand edge of the paper.

As a result I wrote DIRECTORY LIST which has some advantages over the conventional method:-

(i) The required directory is not loaded into memory,
(ii) Enhanced directory heading including the date,
(iii)The listing is in the middle of the page and
(iv) Each new page is reheaded (for filing single sheets.
(v) Each entry is numbered, (as an additional aid to preventing DISK ERROR 72: DISK FULL).

The program should work on CBMs with BASIC 2 & 4, with with 2040, 3040 and 4040 disk drives (it checks which drive model is present) and with a 3022 or 4022 printer (but it can be adapted for other printers).

The following is a list of the variables used:-

D	Drive number
T	Track number
S	Sector number
DM	Drive model (1=2040/3040 2=4040 3=8050)
NB	Next sector
BP	Buffer pointer
TY	File type number
BF	Blocks free
BL	File block size
PS	Page size (number of lines)
PL	Number of print lines
L	Number of sub-sectors read (8 per sector)
N	Number of files
X	ASC(X$)
A	Number of first file output to a page
K,J	FOR loop variables
NL$	Null character
D$	Drive number string
X$	GET# & GET variable
NM$	Disk name
ID$	Disk ID
V$	DOS version
DA$	Date
TY$	File type number string
BL$	File block size string
K$	Print output string
TP$()	File types
F$()	Directory entries read
G$()	Non null directory entries

Basic Programs

The following is a list of the routines used with the line numbers:-

40-100	Definition of variables
120-140	Date & Drive number entry
150-200	Verification of drive model
220-310	Read Disk name & ID and DOS version
330-440	Read Directory
460-490	Remove null entries
510-570	Print Directory headings
580-650	Print Directory entries
660-700	Re-run query
720-740	Disk error sub-routine

I have used this program in conjunction with a program which rewrites the disk directory in alphabetical order to help me 'keep my house in order' so I thought that others may also find it useful.

Alan Richards
6 Michael Gdns.,
Hornchurch,
Essex,
RM11 2LJ.

```
UNIVERSAL DEMO     V1 2A      04/08/82

 FILE   BLOCKS      FILE          FILE
  NO.    USED       NAME         TYPE

   1       5     1UNIVERSAL WEDGE   PRG
   2       3     CHANGE UNIT ADDR   PRG
   3       4     CHECK DISK         PRG
   4       6     COPY ALL DISK      PRG
   5       9     COPY DISK 2.0      PRG
   6      10     COPY DISK FILES    PRG
   7      11     COPY TO 8050       PRG
   8      15     DIAGNOSTIC BOOT    PRG
   9       2     DISK COMM2         PRG
  10       3     DISK COMM3         PRG
  11       3     DISK COMM          PRG
  12       1     DISK DATA          SEQ
  13       5     DISK DIR           PRG
  14      10     DISK DISPLAY       PRG
  15       2     DISK OVERLAYS      PRG
  16       3     DISK READ          PRG
  17       4     DISK WRITE         PRG
  18      12     DISPLAY T&S        PRG
  19      27     DUM 3.4            PRG
  20      11     PERFORMANCE TEST   PRG
  21       7     PET DATA           SEQ
  22      10     PET DISK           PRG
  23      27     PRINTER DEMO       PRG
  24      34     RANDOM 1.00        PRG
  25       9     RELATIVE ACCESS    PRG
  26       9     SEQ BASIC 4        PRG
  27      12     SEQUENTIAL         PRG
  28       9     UNIT TO UNIT       PRG
  29       5     VIEW BAM           PRG

        396 BLOCKS FREE.
```

```
DIRECTORY LIST

 10 REM ** DIRECTORY LIST *************
 20 REM ** ALAN RICHARDS **************
 30 REM ** AUGUST 1982 ***************
 40 DIMF$(144),G$(144)
 50 REM ** DEFINE VARIABLES & STRINGS *
 60 D=0:T=18:S=0:DM=1:NB=0:BP=144:TY=0:BF=664:BL=0:PS=66:PL=0:L=1
    :N=0:X=0:A=1
 70 NL$=CHR$(0):D$="":X$="":NM$="":ID$="":V$="":DA$="":TY$="":BL$=""
    :K$=""
 80 TP$(0)="DEL":TP$(1)="SEQ":TP$(2)="PRG":TP$(3)="USR":TP$(4)="REL"
 90 REM ** DISK ERROR VARIABLES *******
100 EN=0:EM$="":ET=0:ES=0
110 REM ** INPUT DRIVE NO. & DATE ****
120 INPUT"■ENTER DATE (DDMMYY)     *■■■■";DA$
130 DA$=LEFT$(DA$,2)+"/"+MID$(DA$,3,2)+"/"+RIGHT$(DA$,2)
140 INPUT"■■DRIVE NO.     1■■■";D$:D=ASC(D$)-48:IFD<00RD>1THEN10
150 REM ** VERIFY DISK MODEL *********
160 OPEN15,8,15:GOSUB710:PRINT#15,"I"+D$:GOSUB710
170 PRINT#15,"M-R"CHR$(255)CHR$(255)
180 GET#15,X$:IFX$=""THENX$=NL$
190 X=ASC(X$):IFXAND16THENDM=3:IFXAND1THENDM=2
200 TS=21-DM:IFDM=3THENPRINT"■ONLY FOR DISK UNITS <8000":CLOSE15:END
210 REM ** READ DISK NAME & ID *******
220 OPEN2,8,2,"#":GOSUB710
230 PRINT"■READING DISK NAME & ID"
240 PRINT#15,"U1:"2;D;T;S:GOSUB710
250 PRINT#15,"B-P";2;BP:GOSUB710
260 FORK=144TO161:GET#2,X$:IFX$=""THENX$=NL$
270 NM$=NM$+X$:NEXT
280 FORK=162TO163:GET#2,X$:IFX$=""THENX$=NL$
290 ID$=ID$+X$:NEXT
300 GET#2,X$:FORK=165TO166:GET#2,X$:IFX$=""THENX$=NL$
310 V$=V$+X$:NEXT:NM$=NM$+" "+ID$+" "+V$
320 REM ** READ DIRECTORY ************
330 S=1:PRINT"■READING DIRECTORY"
340 FORK=0TO7
350 IFS<10RS>TSTHENGOTO460
360 PRINT#15,"U1:"2;D;T;S:GOSUB710
370 BP=K*32:PRINT#15,"B-P;"2;BP:GOSUB710
380 GET#2,X$:GET#2,X$:IFX$=""THENX$=NL$
390 IFK=0THENNB=ASC(X$)
400 PRINT"■■■SECTOR■"S" ";TAB(21);"■FILE■"L:F$(L)=""
410 FOR J=2 TO 31
420 GET#2,X$:IFX$="" THEN X$=NL$
430 F$(L)=F$(L)+X$:NEXTJ
440 L=L+1:NEXTK:S=NB:GOTO340
450 REM ** REMOVE NULL STRINGS *******
460 FORI=1TOL:IFLEFT$(F$(I),1)<CHR$(1)THEN490
470 IFF$(I)=""THEN490
480 N=N+1:G$(N)=F$(I)
490 NEXT
500 REM ** PRINT DIRECTORY ***********
510 NM$="  "+NM$+"     "+DA$
520 OPEN4,4
530 PRINT#4,"■":PRINT#4
540 PRINT#4,CHR$(1)NM$:PRINT#4
550 H$="FILE    BLOCKS        FILE           FILE"
560 J$=" NO.     USED         NAME           TYPE"
570 PRINT#4,SPC(20);H$:PRINT#4,SPC(20);J$:PRINT#4:PL=7
580 FORK=ATON:BL=ASC(RIGHT$(G$(K),2))+256*ASC(RIGHT$(G$(K),1))
    :BL$=STR$(BL)
590 TY$=" ":TY=ASC(MID$(G$(K),1,1)):IFTY<5THENTY$="*"
600 TY=(TYOR128)-128:TY$=TY$+TP$(TY)
610 K$=LEFT$(STR$(K)+"          ",8):BL$=LEFT$(BL$+"          ",8):BF=BF-BL
620 K$=K$+BL$+MID$(G$(K),4,18)+"  "+TY$:PRINT#4,SPC(20);K$:PL=PL+1
630 IFPL=60THENPRINT#4:PRINT#4:PRINT#4:PRINT#4:PRINT#4:A=K+1:GOTO530
640 NEXT:PRINT#4:PRINT#4,SPC(28);BF;"BLOCKS FREE.":PL=PL+2
650 FORK=PL+1TOPS:PRINT#4:NEXT:CLOSE2:CLOSE4:CLOSE15
660 PRINT"■ANOTHER DISK (Y OR N)? ";
670 POKE167,0:GETX$:IFX$=""THEN670
680 POKE167,1:PRINTX$:IFX$="Y"THEN60
690 IFX$="N"THENEND
700 GOTO660
710 REM ** ERROR ROUTINE *************
720 INPUT#15,EN,EM$,ET,ES:IF EN=0 THEN RETURN
730 PRINT"■DISK ERROR■"EN,EM$,ET,ES
740 END
READY.
```

Racer

Racer is an action packed game for the unexpanded Vic 20, and comes in two parts. The first sets everything up and gives you the instructions, and the second part lets you into the game itself. This gets progressively harder and harder as time goes on, with various obstacles to avoid colliding with becoming more frequent as you carry on.

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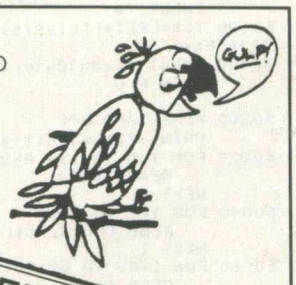

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So far we have a top score of 91. Anyone beat that?

```
100 POKE51,0:POKE52,28:POKE55,0:POKE56,28:CLR
120 POKE36879,8
150 GOSUB20000
200 FORX=0TO511
210 POKE7168+X,PEEK(32768+X)
220 NEXT
250 POKE36869,255:POKE36866,PEEK(36866)OR128
300 GOSUB8000
900 PRINT"■■HIT SPACE TO CONTINUE"
910 GETA$:IFA$<>" "THEN910
980 POKE36869,240:POKE36866,150
985 PRINT"■NOW LOAD & RUN THE    ■NEXT PROGRAM"
990 END
8000 REM DATA->X
8005 READX:X=7168+X*8
8007 IFX<7000THENRETURN
8010 READA$:IFLEN(A$)=8THEN8100
8020 POKEX,VAL(A$)
8030 FORY=1TO7
8040 READA:POKEX+Y,A
8050 NEXT
8060 GOTO8000
8100 GOSUB8910
8110 FORX=X+1TOX+6
8120 GOSUB8900:NEXT
8190 GOTO8000
8900 READA$
8910 A=0:FORY=1TO8
8920 A=A*2-(MID$(A$,Y,1)="*"):NEXT
8980 POKEX,A
8990 RETURN
10000 DATA 0,153,255,165,60,60,189,255,129
10030 DATA 27,129,255,189,60,60,165,255,153
10060 DATA 28,255,129,189,165,165,189,129,255
10080 DATA 29,255,255,255,255,255,255,255,255
10100 DATA 30,255,127,63,31,15,7,3,1
10110 DATA 31,128,192,224,240,248,252,254,255
10120 DATA 33,255,254,252,248,240,224,192,128
10130 DATA 34,1,3,7,15,31,63,127,255
10150 DATA 35,240,192,131,2,2,131,192,240
10160 DATA 36,0,0,212,84,84,215,0,0
10170 DATA 37,15,3,1,0,0,129,3,15
10390 DATA 38
10400 DATA...**...
10410 DATA..****..
10420 DATA.*.**.*.
10430 DATA*.****.*
10440 DATA.*.**.*.
10450 DATA..****..
10460 DATA...**...
10470 DATA...**...
19990 DATA-99
20000 PRINT"■■RACER BY A.MILLETT"
20030 PRINT"--------------------"
20040 PRINT"■USE THE 'L' AND ';'"
20050 PRINT"■KEYS TO STEER YOUR CAR"
20060 PRINT"'[' ALONG A ROAD. HIT
20070 PRINT"■'\' TARGETS FOR POINTS"
20080 PRINT"■BUT AVOID HEAD ON
20090 PRINT"■COLLISIONS WITH '@'
```

RACER PART TWO : VIC 20

```
100 PRINT"■RACER BY A.MILLETT
120 DIM X,A
130 DIMR$(2),O$(2)
150 GOSUB9000
200 GOSUB8000
300 L=L-1:IFLTHEN330
310 L=INT(RND(1)*5)+5
320 D=SGN(D+INT(RND(1)*3)-1)
330 IFT+D>100RT+D<4THEND=0
340 T=T+D:POKES1,1
345 POKEY,O:POKEY-P+O,4
350 PRINTTAB(T)R$(D+1)
360 IFRND(1)>CTHEN400
370 PRINTTAB(T+2+RND(8)*7)"■"O$(RND(1)*3)
400 Y=Y+(PEEK(K)=21)-(PEEK(K)=22)
520 O=PEEK(Y):POKEY,27:POKEY-P+O,7
530 POKES1,4
550 IFO=00RO=ASC(" ")THEN950
570 IFO=ASC("■")THENS=S+1:PRINT"■■"S"■":C=C+.015
580 IFO>34THENIFO<ASC("&")THENPOKEY,38:Y=Y+INT(RND(1)*3)-1:O=PEEK(Y)
900 GOTO300
950 IFS>HTHENH=S
952 FORX=15TO1STEP-1:POKES1,X:POKES2,128+X*(15-X):FORA=1TO50:NEXT:NEXT
955 PRINT"■SCORE"S",HI SCORE"H
960 PRINT"■ANOTHER GO? Y OR N"
965 POKES1,0:POKES2,0
970 GETA$:IFA$="Y"THEN200
972 IFA$<>"N"THEN970
975 PRINT"■"
980 POKE36869,240:POKE36866,150
990 END
8000 PRINT"■"
8100 T=10:C=.1:O=29:S=0
8110 Y=7845:L=3:D=0
8400 FORX=1TO22:PRINT,"■■"R$(1):NEXT
8450 POKE36877,128
8490 RETURN
9000 REM
9100 POKE36869,255:POKE36866,PEEK(36866)OR128
9110 P=7680:Q=38400
9120 K=197:H=0:S1=36878:S2=36877
9400 RESTORE
9410 R$(0)=CHR$(34)+"]]]]]]]]]!"
9420 R$(1)="]]]]]]]]]]"
9430 R$(2)="■↑]]]]]]]]]←"
9440 O$(0)="■■$%":O$(1)="■@■":O$(2)="■\■"
9490 RETURN
READY.
```

Cascade

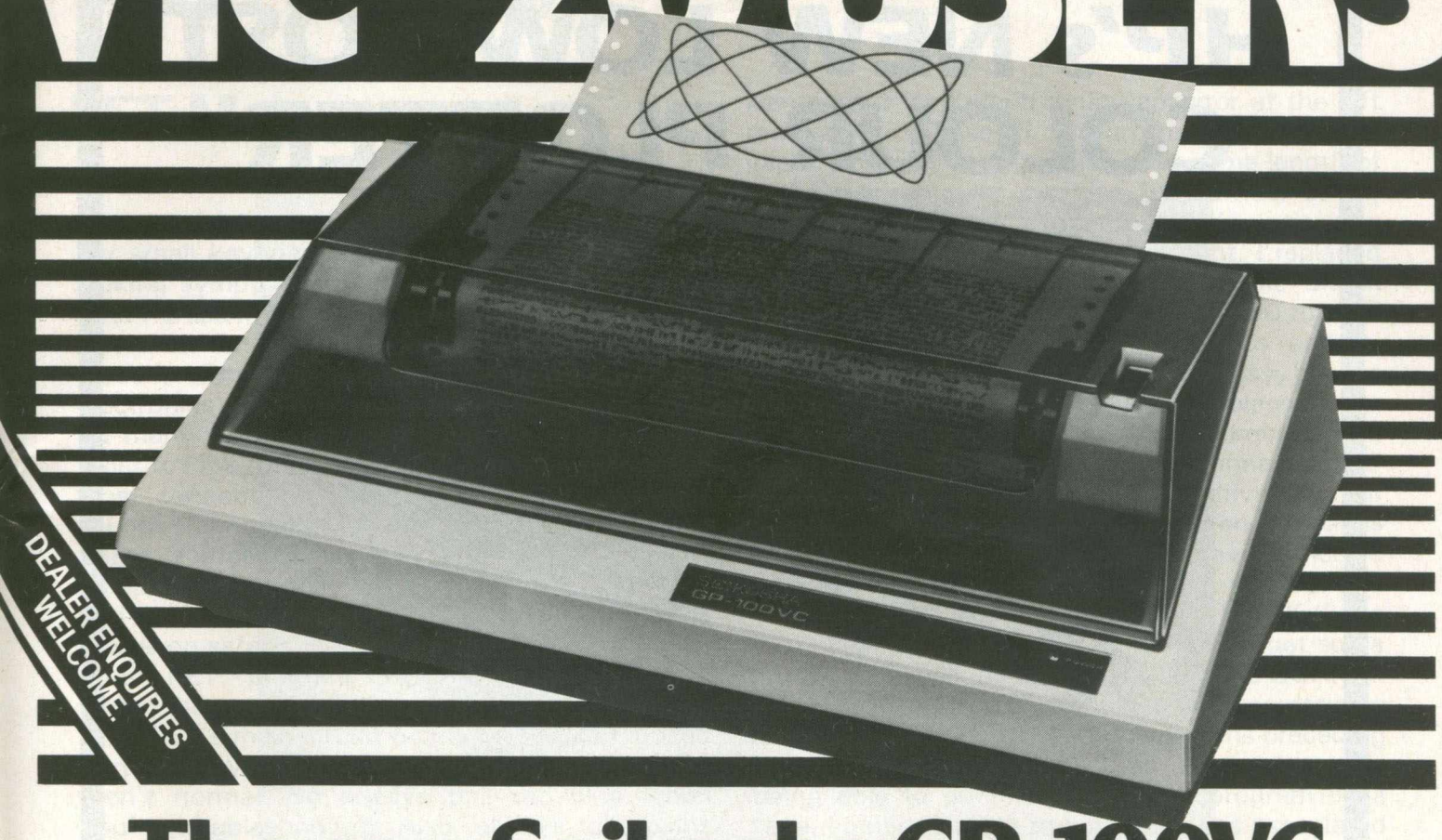
Cascade is an original strategy game, making good use of the Pet graphics. It will work on any Basic 2.0 machine with more than 8K of ram. All instructions for playing the game are included in the listing.

```
100 REM **  CASCADE  **
110 REM (C)&INVENTED A.MILLETT
120 REM LISTED ON A ZX PRINTER
122 REM USING THE SOFTEX
125 REM PRINTERFACE (SEE AD)
127 REM======================
130 DIM BL(51),AL(25),NA(25)
150 GOSUB20000
170 GOSUB9000
200 GOSUB8000
210 GOSUB7000
220 IFNB<0THEN15000
230 GOSUB6000
240 IFNB<0THEN15000
250 GOTO210
990 END
6000 REM * COMP.MOVE
6005 PL=1
6006 PRINT"■■■■■■■■HMM..■■■ ":POKE32807,KS
6010 FORX=0TO25:AL(X)=0:NEXT
6020 FORCB=0TONB:Z=BL(CB):Y=1.5+(PEEK(Z+40)=BL)
6030 FORD=39TO41:A=PEEK(Z+D)-1:IFA<26THENAL(A)=AL(A)+Y
6040 NEXT:NEXT
6050 BE=-1:BM=-1
6060 FORX=0TO25
6070 IFAL(X)>BETHENBE=AL(X):BM=X
6080 NEXT
6090 IFBE=<0THENSTOP
6100 A=BM+1
6105 PRINT"■■■■■■■■I MOV■■■■'"CHR$(A+64)"'":POKE32807,5
6110 GOSUB7900
6120 GOSUB6500
6490 RETURN
6500 REM * DROP BALLS DOWN->PL(0/1)
6530 FORCB=0TONB
6550 Z=BL(CB):IFZ<PTHENSTOP
6560 IFPEEK(Z+40)=KSTHEND=40:GOTO6610
6570 D=41-INT(RND(1)*2)*2
6580 IFPEEK(Z+D)=KSTHENGOTO6610
6590 IFPEEK(Z+80-D)<>KSTHENGOTO6690
6600 D=80-D
6610 POKEZ,KS:Z=Z+D:POKEZ,KB
6620 IFPEEK(Z+40)<>99THEN6560
6630 FORX=ZTO33690+35*PLSTEPPL*2-1
6640 POKEX,KB:WAIT59456,32,32:POKEX,KS
6650 NEXT
6660 IFPLTHENCS=CS+1:GOSUB8760
6670 IFPL=0THENHS=HS+1:GOSUB8780
6680 Z=0
6690 BL(CB)=Z
6700 NEXT
6710 GOSUB6900
6720 FORNB=51TO0STEP-1:IFBL(NB)=0THENNEXT
6790 RETURN
6900 REM * SORT BL()
6910 FORX=NBTO0STEP-1:Z=0
6920 FORY=0TOX-1
6940 IFBL(Y)<BL(Y+1)THENA=BL(Y):BL(Y)=BL(Y+1):BL(Y+1)=A:Z=1
:NEXT:GOTO6960
6950 NEXT
6960 IFZTHENNEXT
6990 RETURN
7000 REM * HUMAN MOVE
7010 PL=0
7020 PRINT"■YOU":PRINT"REMOVE":PRINT"? ■ ■■";
7030 GETA$:IFA$=""THEN7030
7040 A=ASC(A$)-64
7045 IFNB<0THENRETURN
7050 IFA<10RA>26THEN7030
7060 PRINTA$:IFNA(A-1)=0THENPRINT"USED.":GOTO7020
7070 GOSUB7900
7075 GOSUB7800
7080 GOSUB6500
7490 RETURN
7800 REM * CLR SIDES
7810 FORY=32768TO32888STEP40:FORX=YTOY+5
7820 POKEX,KS:POKEX+34,KS:NEXT:NEXT
7840 RETURN
7900 REM * MOVE LETTERS=A
7910 FORZ=32855TO33655STEP40
7920 FORX=ZTOZ+25:IFPEEK(X)<>ATHENNEXT:GOTO7950
7930 POKEX,KS
7940 NEXT
7950 NEXT
7990 RETURN
8000 REM * NEW SCREEN
8010 HS=0:CS=0
```

Basic Programs

```
8020 GOSUB8500
8030 GOSUB8700
8040 GOSUB8750
8050 GOSUB8800
8100 IFNB<>25THENNB=51
8490 RETURN
8500 REM * DRAW SCREEN
8520 PRINT"□";
8530 FORX=32814TO33692STEP40
8540 POKEX,KG:POKEX+27,KG:NEXT
8550 FORX=33728TO33767:POKEX,99:NEXT
8560 FORX=33648TO33653:POKEX,100
8570 POKEX+34,100:NEXT
8580 POKE32774,KG:POKE32801,KG
8590 IFNB=25THENPRINT"■■■
```

VIC-20 USERS



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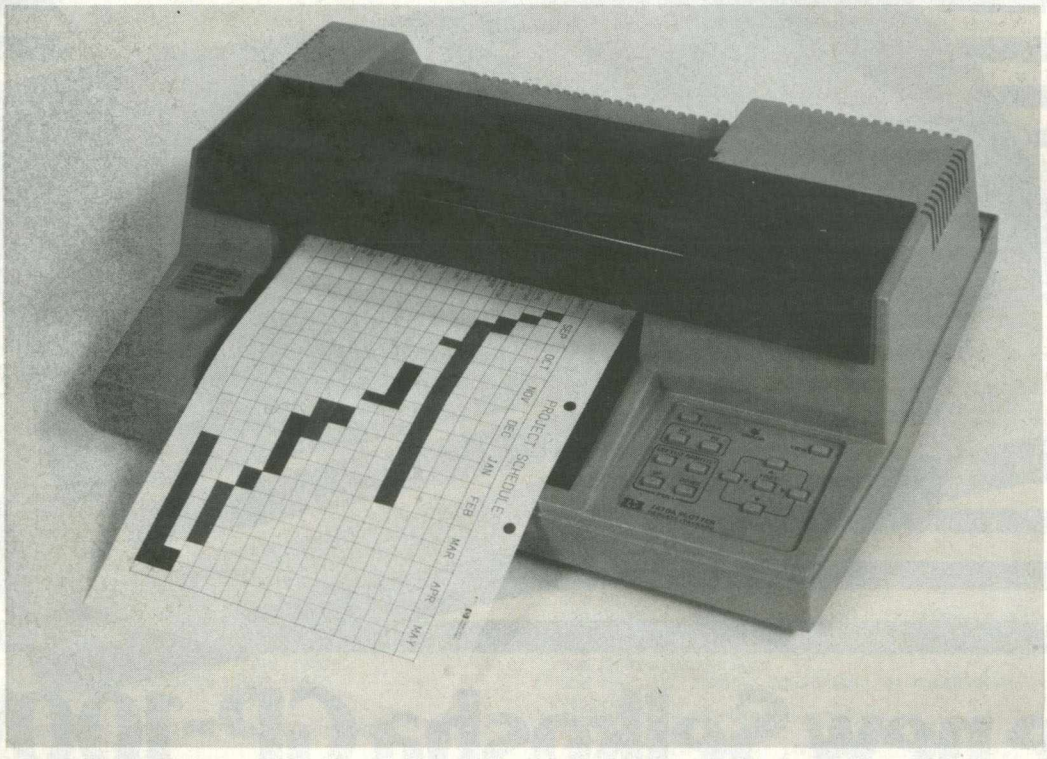

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Interfacing

PET Maintenance

My small keyboard PET has had several awful-looking symptoms over the past year, and each time I dreaded the size of the possible repair bill. But each time I was able to cure the problem myself, with no need for knowledge of digital electronics. Based on first-hand experience, and on many notes compared with others, here is what to look for when your PET is acting strange: loose connections, period.

Loose connections are probably the most frequent source of trouble in PET-like electronic equipment, and they are often the easiest to find and fix. You'll learn how I found mine, after a few words on safety. First, never look for trouble with your PET plugged in. Under normal circumstances, all lethal voltages are kept away from PET's main circuit board and other exposed parts, but when trouble comes, circumstances aren't normal. So always pull the plug when you're troubleshooting. Also, always take pains to avoid static electricity when you're poking around inside your PET. Tiny sparks that you can't see or feel can ruin some of the IC's in there, so don't take any chances. The best precaution is to ground yourself by touching bare metal on the cabinet whenever you touch an IC or the circuit board; it may look silly, but it's safe. Now for my war stories:

My first trouble was erratic operation. From time to time, I'd get a screen full of garbage, and my cassette motor would run and run. It looked like my reset button was locked down, but I knew it wasn't. On the advice of somebody who knew, I looked for an IC that was loose in its socket. When I found it, the trouble went away. With time and the flexing caused by neat, IC's all tend to walk out of their sockets. If you have symptoms of trouble, check this first. Open your PET and, with one hand touching the cabinet, firmly press down on both ends of every socketed IC, and walk them back into place. You'll be surprised how many are loose. Don't worry too much about flexing the printed circuit board itself — it can withstand a bit of bending.

My second problem came from a bad power connector. I'd lose everything on my screen, right in the middle of something important. At other times, I'd power up and not be able to get anything on the screen at all. When I found a hot power connector, I knew the cause was found. The power connector attaches your main circuit board to the wires coming from the large transformer and electrolytic capacitor at the left rear of PET's base. If you are having problems, especially ones that crop up after some length of 'on' time, run your machine for an hour or so, then feel the power connector. If it's noticeably hot, it is a candidate for replacement. I replaced both ends of my connector with Radio Shack 274-226 and 274-236, for under $3.00 total. If you're not an experienced electronics person, turn this job over to an expert — it's easy, but the new connectors are far from exact replacements.

'My biggest and most mysterious problem was caused by a dirty contact on the connector between the main board and tape drive #1. For several months, I'd get strange screen messages and frequent system crashes whenever I tried to load a program that was other than the first one on a cassette. I'd say LOAD''RINKYDINK,'' the tape would start to move, and then I'd get some horribly misspelled version of ?ILLEGAL QUANTITY ERROR, sometimes before and sometimes after the PET had FOUND the programs preceding RINKYDINK. It got so bad that I gave up on ever being able to put more than one program on a tape. I could tell that the problem was associated with the unrecorded gaps between programs, but that's as far as it went.

I found the problem one day as I connected an audio amp to the tape READ line. The recorder was running a totally blank tape, and the noise on the read line was tremendous. I accidently jiggled the wire going from the recorder to the main board, and the noise stopped completely. Later I found that a poor ground contact on the PC board connector was allowing motor noise to get into the signal circuits, and that PET was trying to read the noise as data. No wonder it got an ILLEGAL QUANIY ERRR! Two minutes with superfine sandpaper cured the problem, and now I can read through a whole C-60 with no system lockups. Keep your connectors clean.

By the way, I've had one minor problem unrelated to bad connections: My PET likes to read tapes a lot better without any amplifier connected to CB2. I don't know just why, but the machine definitely works better with nothing connected back there. So now I disconnect the amplifier whenever I'm through with a program that uses sound. I guess this really *is* another loose connection problem, but one of a different sort — in this one, loosest is best. But take it from one who knows more about it than he wants to — loose connections are common in your PET, and you can usually fix them yourself.

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Commodore 64

The Commodore 64, Commodore's latest machine, looks set to be the one to capture a large slice of the market. The 500 and 700 series machines appear to some way off yet (are you really surprised?), leaving us with the 64 as the sole representative of the new wave of computers.

If you already own a 64 you probably won't learn anything too new this time around: this page is intended for those of you who've only seen the machine, and not yet bought one. Still, you might learn something! What, to one person might be 'Oh, everybody knows that!' is quite often something totally new to another.

So, where do we start? Let's take a look at peripherals.

Peripheral Choice

Thanks to the availability of an IEEE cartridge, the 64 can use any of the existing Commodore peripherals like disk drives, printers etc., although its employment of Basic 2 makes taking advantage of some of the features of (say) the 8050 a bit tricky.

If you don't want to use the world of IEEE, the 64 can handle any of the usual Vic 20 printers and disk drives, and also what Commodore like us to call the Datasette (tape deck to you and me). However, a replacement chip is required in the Vic 1540 disk drive before we can start using that one. They say a 1541, fully compatible, will shortly be available: you can always upgrade the 1540.

Other goodies, such as the joysticks and lightpens, will still work, with the additional ability to handle two joysticks should you require it.

On top of this, we have the option of using a plug in Z-80 microprocessor board, giving us access to the millions of programs written in CP/M, should you so desire it.

No doubt manufacturers other than Commodore will be leaping onto the bandwagon before long. Indeed, some have already started to do so, and we should see all kinds of wonderful new devices with us shortly.

Finally, any glance at peripherals must also take in software. With the marvellous sound and graphics we should be getting some amazing arcade games coming along, but for the time being there is a fair degree of compatibility with some of the Pet software that's been around for a few years now.

Due to the way the 64's memory is configured, we can emulate a 40 column Pet if we want, and thus any software written for that machine, provided it ISN'T in machine code, can be transported over to the 64. Consequently, there is a vast array of educational programs readily accessible, amongst others.

Sound and Vision

Two of the 64's outstanding features are its use of SID (the 6581 Sound Interface Device) and the Video Interface Chip 6567 to handle sound and vision respectively.

SID is not just a simple tone generator, as found on most micros today: it is a true synthesiser. Envelope generator, attack, decay, sustain and release all come under its wing. four waveforms for each voice, 16 bit frequency resolution over a nine octave range? What more could a man want!

Thus, by just simple programming in Basic, we can quite easily synthesise the sounds made by other musical instruments, and even so as far as emulating all those wonderful sound controls found on much more expensive 'dedicated' synthesisers.

It is even possible to feed outside sources into the 64, as well as producing your own noises. So, we could do a passable Mike Oldfield by plugging the guitar into the 64, processing the sound through the 64, and then back out to the amplifier of your hi-fi system.

On the graphics front, sprites are the key to it all. Previously only the domain of the Atari 400/800 and Texas Instruments TI-99, the 64 has even more powerful use of sprites than these two.

We have three screen modes: 40 x 25, in normal mode, 320 x 200 pixel high resolution graphics, and 200 x 160 pixel medium resolution graphics.

Now in theory we can, in high resolution mode, have up to 256 sprites (defined as 21 x 24 pixel characters, with up to three colours each) on screen at any one time. But, performing FRE(0) on power up reveals we have just 38,911 bytes in Basic, or up to 52K in machine code, which effectively limits us to (realistically) about 48 sprites at once. With the additional constraint that we can only have 8 sprites per horizontal line (otherwise they disappear as they pass over each other) we begin to realise what our limits are. Still, with priority registers, collision detection, expansion, and very straightforward positioning of characters, wonderful displays are rather easy to achieve.

Summary

That's all for our little look this month. We'll be back in much more detail next time around, telling you all those wonderful facts and figures that the manuals left out.

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M/C Programming

Jumbo Numbers

A single byte will hold an unsigned number whose value may be from 0 to 255. Most of us, sooner or later, want to handle larger numbers. The techniques are fairly straightforward.

A number may occupy several bytes of storage. The usual convention is for the higher order bytes to contain powers of 256. In simple terms, this means that one byte counts in "ones"; another byte counts in "256-s"; the next byte, if used, counts in "4096-s" and so on. It's easier than it sounds if you convert the number to hexadecimal. One million, which is hexadecimal is 0F4240, fits nicely into three bytes: from high order to low order these bytes contain 0F, 42, and 40 hexadecimal.

It is possible to hold numbers in a decimal type of format. This makes input and output easy, since no conversion is needed to convert the decimal digits, and addition and subtraction can be quite easily accomplished. More complex arithmetic is difficult — even multiplication and division requires an effort — so that we choose binary if any real math crunching is needed. Decimal numbers can be held two ways: packed, with two digits to a byte; and unpacked, with one digit to a byte.

Sizing

We must make room for the largest possible numbers we expect to handle. The following table may be helpful:

	Unsigned	Signed	Packed Decimal
1 Byte:	0 to 255	−128 to + 127	0 to 99
2 Bytes:	0 to 65535	−32768 to + 32767	0 to 9999
3 Bytes:	0 to 1677215	−8388608 to + 8388607	0 to 999999

The table shows proportionately; if a count of over sixteen million in three bytes won't do, four bytes reaches to over four billion (after taxes, that's four thousand million in Great Britain). Enough for most applications, but you can continue to add bytes as you wish.

What about fractions? The most common method is to use an assumed decimal point. In other words, count in pennies instead of in dollars and you won't need fractions. There are more exacting methods, but most of us sidestep them if we can.

Memory Arrangement

There's really no special law regarding how you arrange these bytes in memory. You can have high order values at the higher addresses, or turn it around and have high order values at the low end. I like to have low order at the low address end, etc.: it's easier to remember and is more consistent with address modes. On the other hand, storing the bytes the other way around (high order at the low address) makes it a little easier to handle a number with indexing. Why? Well, if we have to test an index register for the end of its range with CPX or CPY, we'll affect the Carry flag . . . and we often need that flag to link information between the various bytes. A fine point; the choice is really up to you.

You can even scatter the values through memory rather than having them consecutive. Often it's better to keep them together so that you can "walk through" a number using indexing. But there are exceptions to every rule.

Some Simple Operations

We can manipulate multi-byte numbers just as readily as single bytes. All we need is some new rules.

For the following sample code, let's assume a two-byte value stored in locations 0300 low-order and 0301 high-order.

Moving: move both bytes instead of one. To move 0300/0301 to 0320/0321 we might code: LDX=$01; LOOP: LDA $0300,X; STA $0320,X; DEX; BPL LOOP. We have moved the high order byte first, but this makes no difference.

Addition and subtraction: start at the low end: fix up the Carry flag before you start, and then let the Carry link the bytes together. To add the contents of $0300/0301 to $0320/0321 and place the results at $0320/0321, we might code: CLC; LDA $0300; ADC $0320; STA $0320; LDA $0301; ADC $0321; STA $0321. Note that it's vital that we start at the low end of the numbers, in this case the low addresses. We might wish to check to insure that the result hasn't overflowed (overflew?) the space available. For unsigned numbers, we do this by checking that the Carry flag is clear.

Subtraction goes the same way, except we give SEC and use the SBC command. A valid subtraction will complete with the Carry flag set; otherwise there's an unsigned number overflow.

Comparisons

Comparison is a little different from the single-byte compare. We need to decide in advance if we're testing for equality or for greater-than; it's hard to check for both in a single sequence.

Equality tests are quite straightforward: test each of the pairs of bytes, and if any are not the same, the two values are unequal. We might code: LDX=$01; LOOP: LDA $0300,X; CMP

$0320,X; BNE UNEQUAL; DEX; BPL LOOP; EQUAL: . . . The code is fairly self-evident.

To compare for greater-than, we might do a full subtraction. We won't need to keep the result; the flags will tell us the answer. We might code: SEC; LDA $0300; SBC $0320; LDA $0301; SBC $0321. At this point, the Carry flag will be set if the value in $0300/0301 is greater than or equal to that in $0320/0321.

It's possible to compare from the high-order end down, on the theory that if the first byte is different, you don't need to look at the rest. Additionally, such a comparison can more easily test both equal and greater-than conditions. There's often not much difference; speed is likely to depend on whether or not the numbers are likely to be close or far apart.

Shifts and Rotates

Shifts and Rotates propogate readily through the Carry bit. The first operation must start at the proper end of the number: Right shifts start from the high end, Left shifts from the low. The remaining operations, which work their way through the number, must always be Rotates, regardless of whether the overall operation is Shift or Rotate.

To shift the two-byte number at $0300/0301 left, we might code: ASL $0300; ROL $0301. Finally we would rotate the number right with ROR $0301; ROR $0300.

Big numbers are not much harder to work with than small ones. All the usual operations are still available to you. There are more items to keep track of, but that's a natural result of expansion.

Make provision for future big numbers now. You wouldn't want to tell your boss that he can't give you a raise because there isn't room enough in the computer to hold what he wants to pay you . . .

LOONEY LINE NUMBERS

It should never happen. You have a program that you've been working on for hours (days? weeks?) and then suddenly a line number goes wrong. In between lines 6340 and 6360 the line number that should be 6350 has suddenly changed to 2254. Not only is that wrong — the GOTO's won't work right — but you can't get rid of it! The line seems stuck in your program forever. How does it happen? More to the point, how do you get rid of it without completely re-entering the program?

How It Happens

It won't happen under normal circumstances. BASIC guards carefully against this kind of error.

An unwise POKE instruction or a SYS to a machine language program that's not completely debugged can get you into all sorts of trouble. If you're lucky, all you'll get is a looney line number.

Sometimes a bad LOAD will do the trick. In theory, the computer should guard against load errors; but it doesn't always tell you the whole story. If you're loading tape on a CBM/PET, always ask for the Status value (type PRINT ST): if the value is zero, the load is reliable; otherwise, you're taking your chances.

Bad RAM (Random Access Memory) can plague you with faults. It's not always obvious. Memory can sometimes fail erratically: perhaps the power supply voltage drops for a moment, and a bit disappears; or the malfunction only starts after the computer's innards get hot. If you're plagued with this type of problem, have your machine checked out.

All of the above may cause goofy line numbers; but they also may randomly cause other errors. Some are fatal, and some cause your program to look weird. Try to pin down the cause; it's worth the effort.

Fixing Numbers That Are Too High

There are two cases: high line numbers (out of proper order) and very high line numbers.

If an out-of-sequence line number is high, but less than 64000, the trick is easy: delete the bad line and re-enter it with the proper line number.

If the line number is 64000 or more, we must go to the next section and run the program there. You're not allowed to enter a line number of 64000 or more, even to delete the line concerned. Try typing 64000 followed by RETURN; you'll get a ?SYNTAX ERROR.

Fixing Low And Super-high Numbers

Type in the following lines at the front of your program. If your program happens to have lines numbered in the range from 0 to 8, take them out and put them back later.

```
1 A=1025: V=256: X=-1
2 B=A:A=PEEK(B)+PEEK(B+1)*V
3 PRINT:IF A=0 THEN END
4 Z=PEEK(B+2):Y=Z+PEEK(B+3)*V
5 PRINT CHR$(145);Y;:IF Y>XAND Z<250
GOTO 8
6 Y=Z+1: Y%=Y/V:PRINT"TO";Y
7 POKE B+2, Y-Y%*V:POKE B+3,Y%
8 X=Y:GOTO 2
```

Meaning of the variables: B is the address of the current line of BASIC being examined; A is the address of the next line. X is the previous line

number and Y is the new line number. Z is the "high byte" of the new line number; it's used to test for a super-high number. V is a constant of 256.

The program goes through each line of BASIC including itself and checks that each line number is higher than the previous one and not over 63999. If the line number fails to test, it is set to one higher than the previous line number.

Note the logic: can you see why the program must not be used on a normal "too-high" looney line number? It would "pass" the bad line number, and then bump up the numbers on all following lines.

What do you do if you have too-low and too-high? Fix the too-high first before you run this program. If you do have multiple faults, chances are your program is in really bad shape anyway; get your computer fixed and redo the whole program.

Looney line numbers should never happen. Look for the cause if it happens to you.

You can fix them, however. And the mechanics of fixing bad line numbers has a tiny bonus: look at the coding and see if you can gain an insight into how BASIC is put together.

Super-coders can go after the same problems by attacking the program directly as it lies on disk, copying the program over and correcting it on the way. Users with BASIC enhancement packages (Toolkit, Command-O, Power, etc.) can fix everything in a trice with program renumber.

There are many ways of fixing it . . . once you know how.

SCREEN DUMP TO DISK

The program saves to disk the contents of the screen and will recall the same from within a 16K/32K — 40/80 column pets — upgrade basic 4 (see notes in assembler listing). The memory locations which differ for basic 2 are also noted although these have not been tested (I would be interested in knowing if they work)

The following short program will show how the routine can be used

```
10 printchr$(147):rem clear screen
20 rem build up your screen display
30 rem
40 rem
50 rem
60 rem
70 rem
80 rem
90 rem
100 geta$: ifa$ = ""then100
110 if a$ = "s" then sys
640"00:name",8:goto100
120 rem saves the screen on drive #0 under
'name' then loops back for input
130
140
150

2000 geta$:ifa$ = ""then2000
2010 ifa$ = "r"then sys 643"1:display",8
2020 rem recalls screen from disk on drive 1
previously saved as 'display'
```

Note the obvious use for the routine is as a 'help' routine within a program.

Now to the program

If you have an assembler then the program can be typed in more or less as in the assembler listing. If you haven't an assembler then it can be entered from the HEX dump via the machine code monitor.

To enter via monitor

1. type in sys4 — the flashing cursor will be on the right of a full stop
2. type in

   .m 0280 02b1 (return)

   This will give the range of memory locations for the routine.
3. Copy EXACTLY the figures given in the HEX dump noting the variations for your particular PET — 32K 40 column version given.

   Don't forget (return) at the end of each line of figures.
4. When you are satisfied that the figures typed in are correct then save the program to disk before you attempt to use it. If one byte is incorrect the PET could crash and all your work will be lost and will have to be retyped.
5. To save the program press return until the cursor lies to the right of the period with nothing on the right of the cursor:-

   .

Then enter the following

.s"prog name",08,0280,0261 (return)

If the disk fails to operate check the line typed in for a question mark — this tells you that you have made an error and also indicates by its position where the error occurred. One common error is the file name is too long, another is missing out one or both of the commas or the device number (08).

The zero (0) immediately following the first open quotation marks is the drive number and must be entered (either 0 or 1).

sigma four

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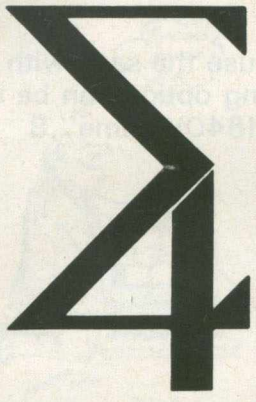

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M/C Programming

The syntax of the routine within a basic program is:—

a) sys640''name'',8 (saves screen on default drive 0 under program 'name'

b) sys640''@1:name'',8 (as <a> but saves with replace on drive =1)

c) sys643''name'',3 (recalls from default drive =0 screen saved as 'name'

d) sys643''1:name'',8 (as <c> but recalls from drive =1)

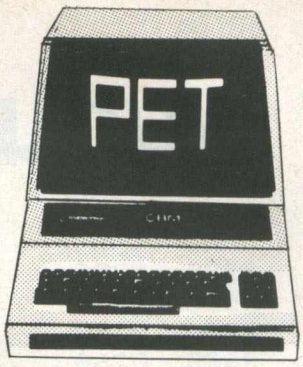
e) sys(x)''name'' (saves or recalls from cassette =1 screen 'name')

f) if you don't want to use the save with replace (see b) the following option can be used — scratch''name'',d0:sys(640)''name'',8

6.SCREENSAVE.SS

```
  0  041E              A=640:SYS(A)"@0:SCREEN1",8
  1  042F              GETA$:IFA$=""THEN1
  2  0445              SYS(A+3)"SCREEN1",8
  3  0456              GETA$:IFA$=""THEN3
  4  0469              POKE59468,PEEK(01):END
  5  046F              :
  6  0475              :
  7  0491              ::TRY THE ABOVE PROGRAM
  8  0497              :
  9  049D              :
 10  033A              ;*************************
 11  033A              ;*
 12  033A              ;* D.MILNES 10 AUGUST 1982
 13  033A              ;*
 14  033A              ;* ROUTINE FOR ----
 15  033A              ;*
 16  033A              ;* 1.SAVING SCREEN TO DISK
 17  033A              ;* 2.RECALLING SCREEN FROM DISK
 18  033A              ;*
 19  033A              ;*************************************
 20  033A              ;
 25  033A              ;** UPGRADE BASIC 4 **
 26  033A              ;
100  033A              *=640
199  0280              ;
200  0280              ;#### MISC STORES ####
201  0280              ;
202  0280              ;
210  0054              STORE1=$54
220  0055              STORE2=$55
230  0056              STORE3=$56
240  0057              STORE4=$57
250  0058              STORE5=$58
260  0059              STORE6=$59
293  0280              ;
294  0280              ;
295  0280              ;++++++++++++++++++++++++++++++
296  0280              ;+ JUMP TABLE
297  0280              ;++++++++++++++++++++++++++++++
298  0280              ;
299  0280              ;
300  0280  4C8602                JMP  SAVES
310  0283  4CE402                JMP  RECALL
```

IF YOU HAVE ONE OF THESE...



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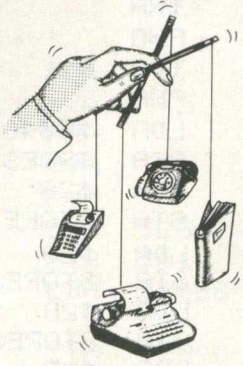

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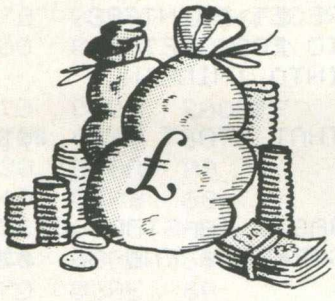

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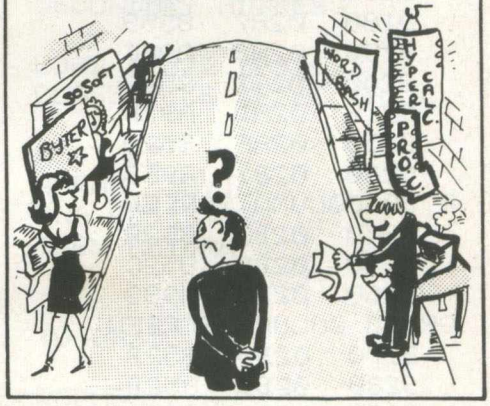

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```
 8992  0286                ;
 8993  0286                ;
 8994  0286                ;++++++++++++++++++++++++++++++
 8995  0286                ;+ SCREEN SAVE SYS640
 8997  0286                ;++++++++++++++++++++++++++++++
 8998  0286                ;
 8999  0286                ;
 9000  0286  48            SAVES PHA                ; SAVE REGISTERS
 9010  0287  8A                  TXA
 9020  0288  48                  PHA
 9030  0289  98                  TYA
 9040  028A  48                  PHA
 9050  028B  AD4CE8              LDA  $E84C           ; ; SAVE UPPER/LOWER
 9060  028E  8DE883              STA  $83E8           ; ; CASE:$87D4 FOR 80COL
 9070  0291  A528                LDA  $28             ; SAVE POINTERS TO
 9080  0293  8554                STA  STORE1 ; START OF BASIC
 9090  0295  A529                LDA  $29
 9100  0297  8555                STA  STORE2
 9110  0299  A52A                LDA  $2A             ; START OF VARIABLES
 9120  029B  8556                STA  STORE3
 9130  029D  A52B                LDA  $2B
 9140  029F  8557                STA  STORE4
 9150  02A1  A52C                LDA  $2C             ;START OF ARRAYS
 9160  02A3  8558                STA  STORE5
 9170  02A5  A52D                LDA  $2D
 9180  02A7  8559                STA  STORE6
 9190  02A9  A9FF                LDA  #$FF            ; RESET POINTERS
 9200  02AB  8528                STA  $0028           ; TO FOOL PET
 9210  02AD  A97F                LDA  #$7F            ; INTO THINKING
 9220  02AF  8529                STA  $0029
 9230  02B1  A9E8                LDA  #$E8            ; THAT START OF  #$D5 FO
R 80 COLUMN SCREEN
 9240  02B3  852A                STA  $002A
 9250  02B5  852C                STA  $002C           ; BASIC IS START OF
 9260  02B7  A983                LDA  #$83            ; SCREEN & END OF  :#$87 F
OR 80 COLUMN SCREEN
 9270  02B9  852B                STA  $002B           ; BASIC IS TOP OF
 9280  02BB  852D                STA  $002D           ; SCREEN
 9290  02BD  207DF4              JSR  $F47D           ; PARAMETERS FOR SAVE
 9300  02C0  20E0F6              JSR  $F6E0           ; PERFORM SAVE $F6A4 BASI
C2
 9310  02C3  A554                LDA  STORE1
 9320  02C5  8528                STA  $28             ; RESET
 9330  02C7  A555                LDA  STORE2
 9340  02C9  8529                STA  $29             ; POINTERS
 9350  02CB  A556                LDA  STORE3
 9360  02CD  852A                STA  $2A
 9370  02CF  A557                LDA  STORE4
 9380  02D1  852B                STA  $2B
 9390  02D3  A558                LDA  STORE5
 9400  02D5  852C                STA  $2C
 9410  02D7  A559                LDA  STORE6
 9420  02D9  852D                STA  $2D
 9430  02DB  20CCFF              JSR  $FFCC           ; RESTORE NORMALI/O DEVIC
E IE KEYBOARD & SCREEN
 9440  02DE  68                  PLA                  ; RESTORE
 9450  02DF  A8                  TAY                  ; REGISTERS
 9460  02E0  68                  PLA                  ; AND RETURN
 9470  02E1  AA                  TAX
 9480  02E2  68                  PLA
 9490  02E3  60                  RTS                  ; TO BASIC
```

```
 9500  02E4                ;
 9510  02E4                ;
 9991  02E4                ;**********************************
 9992  02E4                ;
 9993  02E4                ;
 9994  02E4                ;++++++++++++++++++++++++++++++
 9995  02E4                ;+ SCREEN RECALL SYS643
 9997  02E4                ;++++++++++++++++++++++++++++++
 9998  02E4                ;
 9999  02E4                ;
10000  02E4  48            RECALL      PHA
10010  02E5  8A                        TXA
10020  02E6  48                        PHA
10030  02E7  98                        TYA
10040  02E8  48                        PHA
10050  02E9  AD4CE8                    LDA  $E84C          ; SAVE UPPER/LOWER
10060  02EC  8501                      STA  $01            ; CASE FLAG
10070  02EE  ADE882                    LDA  $82E8          ; UPPER/LOWER CASE -$87D4
 FOR 80 COL
10080  02F1  8D4CE8                    STA  $E84C          ; FOR SCREEN DISPLAY
10090  02F4  A993                      LDA  #147           ; CLEAR SCREEN
10100  02F6  20D2FF                    JSR  $FFD2
10110  02F9  207DF4                    JSR  $F47D          ; FETCH PARAMETERS FO LOA
D $F43E BASIC 2
10120  02FC  A902                      LDA  #$02           ; SECONDARY ADDRESS
10130  02FE  85D3                      STA  $D3
10170  0300  2056F3                    JSR  $F356          ; LOAD $F322 BASIC 2
10200  0303  20E0F2                    JSR  $F2E0          ; CLOSE FILE $F2AC BASIC
2
10210  0306  20CCFF                    JSR  $FFCC          ; RESTORE
10220  0309  68                        PLA                 ; NORMAL DEVICES
10230  030A  A8                        TAY                 ; AND REGISTERS
10240  030B  68                        PLA                 ; THEN RETURN
10250  030C  AA                        TAX
10260  030D  68                        PLA
10270  030E  60                        RTS                 ; TO BASIC
63998  030F                           END
63999  030F          SCRATCH"6.SCREENSAVE*":DSAVE"6.SCREENSAVE.SS"
```

```
READY.

C*
     PC   IRQ   SR AC XR YR SP
.;  B780 E455 34 33 38 36 FA
.
.:  0280 4C 86 02 4C E4 02 48 8A
.:  0288 48 98 48 AD 4C E8 8D E8
.:  0290 82 A5 28 85 54 A5 29 85
.:  0298 55 A5 2A 85 56 A5 2B 85
.:  02A0 57 A5 2C 85 58 A5 2D 85
.:  02A8 59 A9 FF 85 28 A9 7F 05
.:  02B0 29 A9 E8 85 2A 85 2C A0
.:  02B8 82 85 2B 85 2D 20 7D F4
.:  02C0 20 E0 FC A5 54 C5 28 A5
.:  02C8 55 C5 29 A5 56 85 2A A5
.:  02D0 57 85 2B A5 58 C5 2C A5
.:  02D8 59 85 2D 20 CC FF 68 A8
.:  02E0 68 AA 68 60 48 8A 48 98
.:  02E8 48 AD 4C E8 85 01 AD E8
.:  02F0 82 8D 4C E8 A9 93 20 D2
.:  02F8 FF 20 7D F4 A9 02 85 D3
.:  0300 20 56 F3 20 E0 F2 20 CC
.:  0308 FF 68 A8 68 AA 68 60 00
.
.
READY.
```

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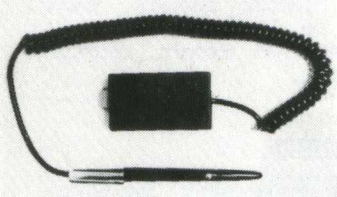

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