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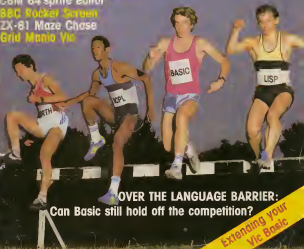
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OCTOBER 1983



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sinclair special

4



*Inside...
Two special offers...
Six new software titles...
Microdrive!*

Something for everyone, from Sinclair!

Welcome to another Sinclair Special! Even if you're not yet a Sinclair owner, I believe you'll find something of interest in this latest issue.

For instance, if you're looking for the best way to begin computing, turn to our back page. You'll see that leading Sinclair retailers are now offering the popular ZX81 complete with a 128K RAM Pack and a free software cassette, all for £45. That means savings of at least £25 on one of the world's all-time best-selling computers.

These same retailers are also offering the ZX Printer at its regular price of £39.95, but accompanied by a free 5-roll Paper Pack, worth £11.95.

If you want to add even more speed and versatility to your ZX Spectrum system, you'll be pleased to hear that the new ZX Microdrive has now been officially announced.

Microdrives are being released on an order of priority basis. Spectrum owners who purchased direct from us will be sent order forms, in a series of mailings that began with the earliest names on our list of Spectrum owners. If you don't buy direct from us by mail, order, send us your name and address (use the coupon in this Sinclair Special). We'll add your name to the list, and send you a colour brochure and details on how to order.

Finally, if you're looking for more ways to use your ZX system, take a look at the software opposite. There are programs for programmers, a space-chase and car race for arcade-game players, a brand new logic game for those who've exhausted "the cube".

The Cattel IQ Test is based on the definitive professional psychological test—and forms an accurate but easy way of measuring your own IQ. All the new programs are available direct from us, through the order form in this issue.

You'll see what I mean about Sinclair having something for everyone. And we'll have even more to show you at two forthcoming exhibitions: the PCW Show at the Barbican Centre, from September 26th to October 2nd, and the Great Home Entertainment Spectacular at Olympia, from September 17th to 23rd.

Nigel Seale

Nigel Seale, Managing Director
Sinclair Research Ltd

ZX Microdrive System preview!



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Video World, Feb '82

"Its design has given the BBC Micro an unparalleled potential for business, educational and serious home applications. It has been equipped to function as the heart of a system which can be expanded to suit its owner's taste."

W. David Mervin, Software Review, Feb '82

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Andrew Corbridge, W. David Mervin, June '82

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Steve Parker, Educational Computing, May '82

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Mr. A. D. Allen, a BBC Micro owner from Hampden

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Mr. J. Inwood, a BBC Micro owner from Leighton

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Mrs. J. M. Thomas, a BBC Micro owner from Devon

"No other computer can offer such ease of use when dealing with complex control effects."

W. David Mervin, June '82

"It isn't often a journalist can sit down to write about a computer with the certain knowledge that he has never seen a nicer machine."

Lesley Keen, Personal Computer World, Dec '82

"It has got huge potential. Besides playing the games, the whole family are learning basic programming."

Mr. J. S. Green, a BBC Micro owner from Southwicks

"Everything possible seems to have been done to ensure that this is not a dead end machine..."

Paul Davies, Personal Computer World, July '82





Perhaps we could just add that the BBC Micro is the machine which was chosen to beat the hearts of the BBC's massive Computer Literacy Project.

It is also the machine which, having won the Department of Industry's blessing, will account for over 80% of the computers bought by British schools this year.

And now, for some facts about the machine itself.

The BBC Micro is light, compact and, with a conventional electric typewriter keyboard, easy to get the feel of.

It can be loaded from virtually any cassette recorder. And there is a wealth of ready-made programs available covering games, education and business subjects.

The BBC Micro uses BBC BASIC, a sophisticated version of the most popular computer language.

However, as your confidence and fluency grow, it can be adapted to switch to other languages.

It can also become a word processor, with the facility to link with a word processor for high-powered business use.

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For example the Electron's colour graphics have the highest resolution of any home computer.

This is because the chip that controls the graphics, specially designed by Acorn, is one of the most advanced of its kind. As a result,

the Electron delivers twice as many characters across the screen as its closest competitor.

Both to live and to grow.

The Electron has been designed and built to be a permanent part of the family, year in, year out.

Particular care has been paid to the keyboard. It is electric typewriter style robustly constructed with a good solid 'F' key, a space bar, and single entry keys for key commands.

In other words it's comfortable and easy to use, avoiding the need for the manual gymnastics sometimes associated with calculator style key boards.

And it will grow with you via expansion modules, that Acorn are developing, to take peripheral additions such as printers and disc drives. So as your knowledge, interest and ambitions develop, the Electron can develop with you.

Additionally, to give you all the support you'll need to generate your own applications software, we've established a phone-in service attended by specialists to give advice, encouragement and practical help.

A gentle teacher.

The Electron plugs straight into virtually any TV set and cassette player so you will be



ready to go as soon as you get it home.

It comes not only with a comprehensive user guide, which describes the machine and its functions, but also with a book that takes you step by step through the basic principles of programming.

A free taste of universality.

You will also receive an "Introductory" cassette which will put the Electron through its paces, showing you a little of what it can do with its 64k of memory (32k ROM, 32k RAM).

The cassette will give you a taste of those exceptional colour graphics we mentioned earlier, of its ability to play and compose music, and show you how it might help in home accounting. It will challenge you to a few games and well, if you ask it, do your whole family's hourly tasks in a matter of seconds.

You will in short, through the 15 separate programs it contains, get a glimpse of the Electron's potential. But only a glimpse, for that potential is as limitless as your own interest and imagination.

A widening range of software.

To help you realise some of that potential, Electron software already ranges from "Personal

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important for the Electron and even now O and A Level revision papers are being processed for Electron users.

How to get your Electron.

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NOTE...

The case can be purchased separately with the keyboard, separate add-ons, therefore if you require one of our early unboxed keyboards, or in fact, any other suppliers' keyboards these could be fitted. The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the similar connectors. It is a simple two minute task and requires no electronic skills. The keyboard does not need any soldering. Please specify on order whether you require the DS1 or Spectrum case.

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The Spectrum Toolkit contains most of the features shown plus surplus numbers and spaces, and will run in the 16K and 48K Spectrum.

4K GRAPHICS ROM £24.95

This module unlike most other accessories fits neatly inside your case under the keyboard. The module comes neatly built, fully tested and complete with a 4K graphics ROM. This will give you an unbelievable number of extra pre-programmed graphics. This now turns the 81 into a very powerful computer with a graphics set rarely found on larger more expensive machines. In the ROM are lower case letters, icons, bullets, rosters, tanks, a complete set of invaders, graphics and that only accounts for about 80 of them, there are still approximately 400 left that may give you an idea as to the scope of the new ROM. However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM. This holder can be fitted with a UK ZX81RAM module to use for user definable graphics so you can create your own custom character sets.

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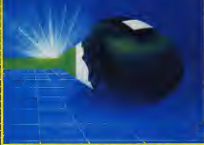
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After a year's hiatus from Hobbit, The Hobbit was finally back a way of its better than ever. It's the only Hobbit I feel that all the time and space in an added to it, and I'm sure that you are looking forward to playing the game and feeling that same excitement. It's the best of the best and a real treat.

MR J STERN Hobbit

I have at last enjoyed your Hobbit program and wish like to congratulate you on its excellent play. After four days of rest and tears, I have just played to 27.5 per cent of the adventure. The program has lived up completely to expectations, and there is no doubt about it being the best production for the Spectrum to date. You have surpassed all other games in my opinion.

A lot of fun

COMPUTER

The excellent game The Hobbit is a real treat. It is a game that is easy to play and fun to play. It is a game that is easy to play and fun to play. It is a game that is easy to play and fun to play.

POPULAR COMP

I am writing to you because I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

JEREMY GUESTER

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

DECLARATION

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

COMPUTER

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

COMPUTER

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

GORDON DUMPHYER Scotland

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

MR P BASHFORD Leeds

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

COMPUTER

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

CHRISTINE VERHAU Wals

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

WESTWOOD

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

PERSONAL CO

I am the owner of a copy of The Hobbit which is wonderful entertainment and very challenging. I have other tapes and sub-stations of yours, all of which are excellent.

MR D J BASHFORD Kent

I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program. I have enjoyed your Hobbit program.

LINDA ROGERS Avon

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BBC

In my office today, your program 'The Hobbit' (MSB) has taken
DAVID MAXWELL (London)

I am the proud owner of your excellent
 program 'The Hobbit' and have spent
 many happy (and, well, not so
 many) hours trying to solve its



...well you on a
 ... I have enjoyed
 ... I must thank you
 ... (I must say) as I have
 ... of the purchase

MRS J. BYDRAFT (Northampton)

"The Hobbit" is a beautifully re-
 created, so wonderfully exciting
 narrative, gloriously illustrated,
 thoroughly spooky adventure - far
 better than I could have hoped for and
 certainly the finest of the dozen or so
 adventure programs I have to date. I
 congratulate the four who created for
 a year and a half to succeed with a
 superb result!"

MR. PETER JONES (London)

"Nothing is better in this Adven-
 ture, but certainly! Add to this the
 brilliant graphics that are used to
 describe many of the locations and we
 have an Adventure that is going to
 become a classic for the Spectrum
POPULAR COMPUTING WEEKLY

"I am writing to congratulate you on
 your excellent program 'The Hobbit'
 for the Spectrum. I make up to the
 middle of the night with an idea, and
 have to lead the adventure to try it
 out!"

MR. PHELIP HARRISON (London)

"A most impressive package!"
DAVID SPRADON

"... we are not making food, we
 are being sleep and it's great! I
 thank you very much for why life isn't
 completely sad and utterly lost, in the
 Hobbit program!"

MR. JOHN HARRIS (London)

"... one of the most complex games for
 the home computer I have seen!"
DECLAIR VERBEE

... for my ZX
 ... you supply called
 ... excellent
 ... the money I had
 ... my wallet. The
 ... the game's 8 tracks
 ... book, which has
 ... is very compelling

MR. JOHN GIBSON (London)

I have recently purchased a Sinclair
 Spectrum and I decided to buy 'The Hobbit'
 since I have been doing a literature project
 based on 'The Hobbit' with my class of 10
 and 11 year old children. Over the last 30
 weeks the children, having read the book,
 have been attempting the program with my
 assistance. Let me congratulate you on a
 most entertaining program.

MR. G. REED AND OLIVE J
 (Wellingham)

... more of an experience than a
 program!

POPULAR COMPUTING WEEKLY

The most unique factor of this program
 is that the user instructs the computer in
 completely ordinary English sentences. The
 Hobbit program is capable of very
 sophisticated conversations.

20 COMPUTING

I purchased 'The Hobbit' not long ago and
 since then I have been engrossed in the
 game, and I'm beginning to think no one
 wants to talk to me as I talk about my
 adventures in 'The Hobbit'!

DAVID ROWLEY (Wales-on Trent)

The use of graphics is one of the features
 which makes 'The Hobbit' special. The
 addition of graphics allowed us three adults
 whole new dimensions to the Adventure. It is
 certainly a marvellous game, which should
 set the standard for future Spectrum
 adventures.

20 COMPUTING



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 identical with regard to the
 adventure program. Due to memory
 constraints, BBC cassette version
 does not include graphics.

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Address: _____



Complete this sentence in 12 words or fewer: "I would most want the new Atari because..."

Your Computer Atari competition

ACROSS

- 1 The machine built marked for making parts (7)
- 2 August and a girl with a top? (7)
- 3 Delay when? (2, 4)
- 10 Teaching of the law is being given (7)
- 11 Atari refers to the most... word (3-4)
- 14 Love the kind in Paris to use the computer (7)
- 16 50/50 in word-mean definition (7)
- 18 It's a kind of ball struck but with steady power (7)
- 19 Top — quickly becoming round the stadium (7)
- 20 Having approximately equal — shows lack of equal (4)
- 21 Output because it was pressed wrong (7)
- 22 The sound-making off for the statement a job (7)

DOWN

- 1 Bug an officer or find title in a magazine (6)
- 2 Electronic lines with a striking feature (7, 4)
- 3 Multisyllabic sentence that is marked by 11-syllable 4-4-4-4 12-syllable 4-4-4-4-4
- 4 Total a business growth (6)
- 5 Copies in sequence (6)
- 7 Steps in 1980? A 60 (2, 11-11)
- 10 Saw the delicate and hollow pipe (6)
- 12 Saw my cousin at some time (6)
- 13 Member entering the bodyguard (6)
- 17 Took away the last group or over an area (6)

Your Computer **Atari** competition

Your Computer
Quadrant House
The Quadrant
Sutton
Surrey SM2 5AS

Atari
Quadrant
House

Your Computer **Atari** competition

RULES

- The winner of the competition will be the person who enters a correct solution to the crossword and, in the view of the editor, completes the unfinished sentence in the most interesting way.
- The name of the winner will be printed in the December issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in October 1983.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
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YOUR COMPUTER OCTOBER 1993 49

ATOMS LEFT BY THE WAYSIDE

Two months ago I purchased an Atari 5200. After many weeks of careful thought about which computers were available for the time I was sure I had made the right choice. I felt that I had bought the ideal recreational and games computer to use with my family and by myself.

Now it is becoming increasingly more apparent to me that Atari's success has been due to the expertise by AtariSoft and the excellent software component. In light of the newer more popular computers:

When I purchased my Atari, it was quite popular with many programmers and much software was available.

Nowadays there is hardly anything advertised for my computer. I can rarely obtain it having passed with Commodore for what is now a price of hardware not covered for by programmers.

What I am wondering, is how long will it be before Spectrum and Model B owners feel themselves in the same boat as myself?

All I ask is that the programmers and manufacturers think of the computers that have been in the market, every now and a while. Also how about, *Top Computer*, publishing an update for — maybe only once a quarter — of software currently available for the various machines and, "One-Stop" machines, along with contact addresses of where we can purchase the software.

M. Johnson, Portland, Oregon



Send the program listing to the appropriate price in the article, and be the winner!

WIN A COMPUTER
to appear and save quickly break the program. Move change all calls to Steve, then call Tim for final by adding three bytes to the address given in the listing. This can be done by a few simple steps:

- Address 21750 = 42 (vertical)
- 21880 = 42
- 21890 = 42
- 21900 = 42
- 21910 = 42

Can you find the program to follow and then should be an extra obstacle between you and the *Superdisk* program. You could, of course, spend up the leading and bring by using a modified version of *Travis*. Help's leader program from the March 13 issue of *Four* Computer.

After the program to lead along *RAIDING* and receive *News*, then:

- 0000 00
- 10 RAM 0000000-00 (convert to 000)
- 20 RAM 000000
- 30 Save "Save FILE"
- 40 RAM 000000

Use the well known hex leader to enter the following machine code: 000 00000 00 0000 00000

0000 0000 00 00 0000
0000 00 0000 00
0000 00 00 00
0000 00 0000 00 0000

0000 0000 0000
0000 00 0000
0000 0000 00 00 0000
0000 0000 00 00 0000
0000 0000 00 00 0000
0000 0000 00 00 0000

0000 0000 00 00 0000
0000 0000 00 00 0000
0000 0000 00 00 0000
0000 0000 00 00 0000

The well known hex leader to enter the following machine code: 000 00000 00 0000 00000

Ernesto Kalkot, Irvine, Germany

SHARP TONGUE

I am one of those lucky few owners of a Sharp XG-100 computer. It serves my purposes very well, with only a few shortcomings, and the best of which I share with you.

One of the major errors of the "new" XG-100 was some concern. This has been available since last summer in Japan, where it has sold very well. In fact, companies like NEC and CTR in the market have purchased divisions into the success of Japanese computers in Japan. But then in late February, I saw one of the XG-100 sold with without any problems. (It is not sold and probably all the XG and XG around the world.) It will make him and throughout the confidence of the XG, the average buyer here is quite on faith, vision and light, which is not even because of several major errors. This is why the XG-100 will not appear anymore.

My wife expressed an interest in late January in an XG-100, and was of a somewhat XG-100 with color. In total we are about 12 months into the XG-100. Some many loyal Sharp owners have forsaken their old old XG, as well as the owners, (I don't remember) They are so likely to return, return. Meanwhile, what has Sharp been up to?

Well, not supporting or product fully. There is some difference between the present organization and its former subsidiaries. Sharp Japan will continue their as an agency to sell various built-in cases. The major companies supply a few range of additional software and programs. For example, I own several other Sharp, a XG-100, XG-100 and for the XG-100, Japanese and

color cards for all the models, and even a XG-100 conversion kit.

In Japan, Sharp units are built largely around a single design. The XG-100 is Japan has two flavors. One for the original Sharp line and a full and versatile Microsoft Basic from the Matsushita Company of Sapporo. Sadly, it seems that the latter — perhaps by copyright reasons — has not survived the city. However, how much better than very worthy computers would have sold here if there had been similar support.

Perhaps Sharp, with the XG, is making a slow and gradual withdrawal from a low performance personal computer market in the U.S. The introduction of the XG-100 into your market of last year may be a good pattern for its remaining Sharp units.

Artem D. Whalen, Reading, Arkansas

FILES HEADACHE

After months ago I was lucky enough to discover a copy of *Top Computer* at my local newspaper and I have not missed any of its monthly issues ever since. I greatly appreciate the news on various applications — particularly those in the home use — content of the useful *Hardy* computer games.

What gave me a bit of a headache was *Event* Hill's *Tap* File program. Until I found out that the XG-100 was to be using a XG-100 with an old XG-100. So, for all your readers who purchased their models after the fall of 1981 here is what can be done for it.

PLAYING THE 1802 OVERTURE

Following the launch of the Comco II and the numerous disappointing remarks that have been leveled at us CPU — *My Computer*, *Apple* — I feel I must thank you as my only fan and make a stand for the CPU 1802.

To start with *My* File refers to the 1802 as an extended CPU. If this is the case an old there is no doubt that the CPU. How many CPUs have an extension or where all microprocessors are either one or three machine cycle long? How many CPUs have user-definable program counters, stack pointers and? How many CPUs have seven input and seven output lines available. Such many CPUs have a single bus system that is provided simply for the use as a my device?

How many CPUs have address a full 18K and jump to any address within that block on a single instruction? (I should mention) "How needs to calculate these?" If it is a 24-bit block that can be used there you are at address 0. Finally, if it is that old bus why is there an extension to the work in *Comco*?

The Base on the Comco is probably also for that if you want speed you can machine code or *Top*. What you I do with I could find a machine of the Comco as I could give it a my because I do not believe it can be made better than *Sharp SP 1000* Base.

I am not impressed with RCA in any way, it is just that having used SC-100, 6400/600, 6760, 6700, 240 and call 1802 based machines, I have found the 1802 was the most productive in its response to my comments.

As a newspaper publisher why is every machine apparently concerned with its ability, or otherwise, to support them or drop off the face of the globe? Of course the real answer could be that as 5%, I suspect that I am not a model programmer. Still I do not *Four Computers* in preference to one of the others because it is readable — a major enough than they.

Finally you probably all remember when you get your first computer have the nightmares all about "What do you use *IBM*?" Well at a recent meeting about my local radio club stand, I got involved in a conversation with a young boy regarding computers.

He possessed a *Dragon*, and when I listed my experience in this, he immediately asked what games I had for it. On being told that I had none, one — *hard program* — he looked most shocked and asked me, "Well what do you do you do with those that if you do not play games?" Obviously I'm getting old.

Bob White, Reading, Penn.

EDITORIAL

they might not like the idea of downloading their IBM PCs the first of having the other computers. This problem is solved easily by typing the following:

MODE=IBM PC/XT/AT

This will change RAMdisk to 15, so as far as your Am is concerned you are now using a RAMdisk!

Now the loader will run as if there is no RAMdisk connected, so you can program the computer as if you had the standard 16 KRAM.

Once you have your program, it will run on any loader. And by loading it as you would any other program.

At Capital
Liberation
Group

COMPILING SINS

I was amazed when I saw that you were publishing a computer for the ZX81. I was in the range of having one and it was with excitement I bought Acorn's advice. The machine only being as difficult, but after six hours I had a 11 hours in an editor's manual using Richard Taylor's Quick Load program - then Four Computer's.

The compiler seemed perfectly. I was very pleased about will found able to use the editor and OPER sources of Basic, as well as the Basic Pac/Turbo routines. Unlike most machine-code programs, you can break out of the program using the Break key. This can be disabled by the direct extension.

FOUR COMP 7.0
FOUR 1670.00

The advice in the compiler do not tell you that the program must not have a Stop command, so after the compiler will stop with an error message. The Break key can be used to stop the program by:

FOUR 1670.00
FOUR 1670.00

These values are at the address the computer will jump to when the Break key is pressed, and when obtained by using the machine-code editor of Turbo Hall in Four Computer, March.

Paul Hudson,
Surrey,
Sussex

Notwithstanding the more understanding than preparing peak computers for girls and this may be boys, but if such a future suggestion actually led more girls into computing it might even be worth taking seriously.

Of course it is exactly the kind of peak and then something which has at the root of the problem. While this goal is being given little, the goal that boys play will make the late transition to computer about every game may not materialize.

In general, mechanical and technological issues are the boys, and girls who take an interest in them are considered maintenance. A check of recent surveys gives statistical substance to this sorry state of affairs.

Clowley's report published early this year showed that the father and son partnership makes up 88 percent of home-computer owners. New research from Acorn's sales team is similar message.

In all the families that have computers you will find that boys are 13 times more likely to be using them than girls.

Because the boys are putting in the extra work at home they pull ahead in the classroom. This discipline which leads to enthusiasm for clubs here, and makes them more likely to become discouraged and so even more likely to drop out.

Some schools have decided to take the matter into their own hands. They have given for a form of positive discrimination by setting computing classes for girls only. This is an attempt to get away from the idea that computers are male machines.

The problem is not a particularly British experience either. Across the Atlantic, researchers at California's Stanford University found that three times as many boys attended computer summer schools than girls - and that it had been particularly in 13 states from 1976 to 1978.

How to write for Your Computer

We called this magazine Your Computer precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to use your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer - you can always use a friends or user group's - that's preferable. The risk of error is a perfect world - cassette would accompany the article. That considerably speeds up the check-out process. Not only do you get to air your own discoveries and opinions, but we will even play you off for the postage. We pay £35 per published page - that's on it appears in the magazine and includes first class.

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The article concerning the ZX81 See More program is dependent upon the reader to ensure that suitable software is used for the appropriate value thereby from the software. What you may find useful is the program from the following addresses:
LET 01 = 02 issues
LET 08 = 0688
LET 09 = 0388

Some of the graphic characters in the Spectrum's software programs may not have been printed to give full the characters are in graphics Q and graphics R while in graphics S the characters in graphics S.

Advance into IBM country with a home micro with recognised business potential

With 128K and a 1MHz processor for the price of a BBC Micro the Advance looks almost too good to be true. The Advance sets out to be a good home computer with speed and power plus cost and includes high resolution but the real advantage comes if you wish to upgrade to a full size board system when you can afford to.

For a further 2500 you can upgrade to the Model B with two floppy disc drives and the capability to run software from the IBM Personal Computer. The total cost will be £3,200 — a third of the price of an equivalent IBM PC, yet the Advance Model B is based on a 40 percent faster than the IBM because it has an 8086 central processor, and it will grow with some of the best software available, WordStar, dBase, and dBase, and dBase included in the package.

Initially most Key Computer dealers will be more concerned as the 128K Model A because the keyboard is designed to compete with professional machines it is of a far higher standard than those computers are used to.

It is separate from the main control board which is housed in a sliding unit, although you can save the sliding keyboard in the case for storage.

The Advance is being built in Broom, the name Main Computers



Model B, and the extra board, two floppies, and keyboard of Model A.



Price war hots up and NewBrain bites dust

The price war in the 16-bit home computer price war are now being joined. Grandly Business Systems, manufacturers of the NewBrain, has gone into liquidation, while its customer performance of the Dragon 32, Dragon Data has been forced to arrange a bid of £1.5 million.

Further up the market scale,

Debut who produced the 16-bit portable Business computer, the Delta 1, has also collapsed leaving debts worth £1.5 million. The debtors are now beginning to consider if an Apple spokesman Apple was planning to sue after the latter end of the home computer market but has now decided to hold

Spectrum Stewart's naps beat the bookies

SEVENTEEN Year Old David Stewart's horse racing prediction program for the BBC Spectrum has a 48 per cent success rate in picking winners — certainly a higher rate than that achieved by most second-leggers.

Ralph Chiverson, second head casting David Stewart's tape earlier this year. Recently the national device took up the story and he is now under contract to the Sun to supply the paper's readers with these tips a day.

David says that in many points we are looking for winners that they are influencing the odds dramatically. This is not a position that troubles him greatly since he does not bet himself. He says he got pleasure simply from writing programs and picking winners.

In fact, last year he completed the program during which he achieved a very creditable 48 per cent success rate. The current program is 50K long and runs in data flow which together hold the details on over 11,000 horses. The program runs for three quarters of an hour before a show-up the day's likely winners.



David Stewart's success in predicting winners has earned him on the BBC. He is not a betting addict, the possibility of a good prediction program.

Elan Enterprise warps in to add a new dimension to the £200 computer market

IMPRESSIVELY SOFTWARED Elan Enterprise looks like the computer we have all been waiting for. The only problem is we will have to wait some. Agreed or not, and if it is as good as it seems.

The Elan has higher resolution graphics than the BBC Master, with a maximum of 611 x 310, across 16 types of colour, relative to its nearest rival, 320 on off, and 192 of intensity available in the year since this is our very best home computer.

As the Elan also has a built in word processor and a price tag of just £200, it is no wonder that Savilegard Software's David Levy is confident it will sell well. "It is one of the best home computers," he says, and he is quite confident that his team has not only achieved the expectations — it has produced the best three programs as a result, *Cyber* is for the hardware. One of our systems designed the *Acorn* *Image*, another designed the *Master*.

The Elan has a real keyboard although the best is one you go to that of the Electron in Commodore 64 and a built in speaker which can be used either to make word processing more or for



game playing. The Elan is still available in a 128K version, and with the 64 and 128K versions can be expanded up to 4 Megabytes of RAM using page stealing.

The Elan has a 2-MHz processor rated at 6MHz and has a 128 Kbytes cache on a 6501 chip. It has a fixed in control through with four channels through eight access with

a video option. Output is through the TV speaker but you can also plug a pair of Walkman headphones into the stereo socket in the back.

When the Elan is launched in April there will be plenty of software.

The Elan also has two cartridge and two floppy ports, RAM, Commodore and local network interfaces and one control via

externally to make comprehensive. The keyboard has eight definable function keys.

Elan will also be selling two 3.5in floppy disks which will plug in to a 5.25in floppy disk drive which also substituted RAM modules and other peripherals. The Elan also connects to the Elan through a 40-way connector.

While other manufacturers are working on later models for the year, the Elan seems to be better prepared when it comes to being prepared to go before the year is allowing the best of all the existing computers a table for more for a fraction of the price it would cost you today. Let us hope it does not be as good as it looks.

BBC, Oric and Atom learn to speak with the Microtalker

MICRO TALKER is a common name with a few more specific and business compatible with the Oric, BBC and Atom, and seems to be available for other systems, too.

The Atmel-based Microtalker plugs into the BBC's own ports and the ports on the Oric and the Atom. On the latter two machines a separate using standard printer commands. For the BBC a simple driver module consisting of about three lines of assembly is used.

Based on the V0 32K-72K speech via cassette strip, the J40 Microtalker has built in amplifier, volume control and speaker and can

be obtained with documentation software from BPS Electronics, Sutton, Wokingham, Ashley Lane, Slough, West Yorks in Telephone 0274 708190.

If you are trying to turn your Spectrum into a filing system you have probably already discovered that you need a controller as automatically load and save stacks of information. Ideally the world shows you an external unit like the Spectrum to save a program would take you into your own cassette and it is not a substitute for another cassette. The New Media Systems Tape Control is designed to meet the need. The CPU controller plugs in between the cassette sockets of the computer and the control and volume control of one or two cassette recordings. It also doubles as a tape amplifier for the Spectrum's sound channels.

Horace and Hobbit move

TWO OF THE MOST popular characters in Spectrum games are moving to other machines. *Horace Mouse* and *The Hobbit* have both (Muller's) moved to the more popular Spectrum games but now *Horace* is moving on to the Dragon 32 and the Commodore 64. Meanwhile back on Muller's *Horace*, *The Hobbit*, which was built in the last mid-range Spectrum game when it first appeared, has moved on to the BBC Master, Commodore 64 and the



YOUR COMPUTER TOP 20

Game	Company	Machine
1. <i>Archie</i>	Imagine	V0-64
2. <i>Chess</i>	Snider	20-64
3. <i>King</i>	Imagewriter	V0-64
4. <i>King</i>	Imagewriter	20-64
5. <i>Crack</i>	Snider	64-64
6. <i>Crack</i>	Snider	20-64
7. <i>Crack</i>	Snider	20-64
8. <i>Crack</i>	Snider	20-64
9. <i>Crack</i>	Snider	20-64
10. <i>Crack</i>	Snider	20-64
11. <i>Crack</i>	Snider	20-64
12. <i>Crack</i>	Snider	20-64
13. <i>Crack</i>	Snider	20-64
14. <i>Crack</i>	Snider	20-64
15. <i>Crack</i>	Snider	20-64
16. <i>Crack</i>	Snider	20-64
17. <i>Crack</i>	Snider	20-64
18. <i>Crack</i>	Snider	20-64
19. <i>Crack</i>	Snider	20-64
20. <i>Crack</i>	Snider	20-64

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Sir Clive joins the monochrome set — this is where the flat screen revolution starts

Dr Clive Sinclair is about to become a star of the small screen. His address (no. 10 the 120 flat-screen TV which he hopes will lead to any one of the peaks of the world's television-viewing public.

Although Sinclair is not the first to make a set with a retractable screen — Sony has done so with the D200 Walkman — his TV is smaller, for cheaper and more-linear components. Our Presses shop handles most of the Clive Sinclair digital products.

The 10-year-old Sinclair project that produced the 9-inch black and white TV will have a novel feature, as its designers describe components to the magazine's feature.

The re-engineered video path, again developed for the TV, will remain to be used in a portable form, although Sir Clive claims that "ultimately we are not a real video player".

What has not yet been decided is whether or not a larger tube will be needed especially for the computer. The alternative would be to use the TV's 4.2in by 3.1in by 0.8in tube and achieve a larger video by magnification on black program.

David Southwood, Sinclair's director of research and development, says this is the probable outcome, while Sir Clive himself believes that "a bigger tube is required".

When Five Computer first revealed Sinclair's plans for a portable in November of last year, the main impression on published showed a fold-down screen, which would be in line with the magnification of back projection monitors.

In any case if you are thinking of buying the flat screen TV as a main monitor for your Spectrum, you will find that there is more on it than the 10-inch type displaying game — better as the screen will not be visible without use.

This is the CPD-8000 Computer Program Case Analyzer 180 from WH Smith. It features an electronic scanner designed to be controlled by the computer via the video monitor control socket. Don't let the layout fool you — you can get a computer monitor with a different sized screen upgrade. The next smallest version also also is available.



You will also have to open the TV up and mess around with its controls because it has an aerial socket for connecting with a converter.

Sir Clive calls his TV "a consumer video with a purpose". Unfortunately it does not have a name as yet. Clearly he hopes that the component remains beyond the

TV's owner, rather like the 9-in. by 3.1in by 0.8in black and white tube the size of an old coin.

A special 16-bit Federal history program the TV has 15 hours. Three WH Smith features (no. 120 for three) and you should note that they push the price of the TV up to almost £25 (instead of £15).

component with the set. Alternatively, you can plug the TV into the main using a 21 adaptor.

Finally the TV will only be available mid-order, and production will only start in 1986 (most a month by the end of the year — so be prepared for the new delivery standard too).

WH Smith software comes in through the back window

WH Smith plans to get software into the home through The Window. This will be a series of video games that young ones will use a program to see how and a computer monitor to see the answer every night, because The Window is like WH

Smith's selling its first venture into cable television.

The idea is that each cable system will have 10 computer games to be available in the broadcasting code. People could then subscribe to a game service which would send out boxes to the cable network a 4KB computer which would download games from the cable. Five new games would be put on the central computer each month.

The idea comes from America and WH Smith is negotiating with a California company. As yet the price of the subscription has not been fixed, but a California to run the operation of £1 to £10 a month.

If the first subscription is to be 12 years before even half the households in Britain are on cable TV, subscribers to the service will download programs from the telephone lines via Windows while the rest of us buy cassette or tape programs from the pages of The Computer.

Sinclair's launch of his own Interface 1 for the Spectrum has not altered the flow of plug-in expansion boards from outside their geographical boundaries.

Microcomputers are now used to making add-on boards for the Apple II for use in a portable or plug-in module which can take four cards offering features such as an RS 232 interface and control over the anything from 200 channels to electric networks. Microcomputers at an 8000 94117.



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I could do that...

If you have been doing the same design of Post-Script graphics you will be sure that a program they can add and address any job of similar nature. It is easy now to use two multiplexers and three-bit data multiplication is just a matter of repeated addition division is repeated subtraction.

At least that is all that is needed for simple integer arithmetic where all the numbers included will fit into the registers. So here is this month's task - write your own computer Arithmetic Unit!

To keep it simple you will restrict registers to 8 and 8-bit words and long for the numbers to be operated upon, and a word 16 to hold the solution. The input numbers must not be larger than 16 - that is they will fit into 4 bits, so there is no problem with overflow carries and the like.

There you will need to be able to input the two binary numbers and your register, specify the operation -

1. Add and calculate the result if you want a two-bit bus to write the additional part of the program - put that in the program panel below as the fourth from two installed bits.

2. In and large most of the errors for Apple's Binary Arithmetic problem took the same approach. They found that it was easiest to get the two numbers in binary, gave the list of their operations to be printed from the comparison flag came from P. Russel, *Electronic* 43, 800 P4 Avenue Holmdel and turn on a 200 BT.

I could do that...writing program

```
10 INPUT A#
20 INPUT B#
30 LET C=0
40 FOR N=16 TO 1 STEP -1
50 LET S=C+
60 PRINT "AT ",N;C
70 NEXT N
100 IF C=1 THEN PRINT "OVERFLOW"
```

BEGINNERS

first bytes

Starting out in home computing? First Bytes is for you. Just write to Your Computer with any hardware or software problems, no matter how small or simple.

Heart of silicon

I have got a game that will not run on my friend's computer. He says it is because our computers have got different processors. Can you explain what he meant by that?

AS THE HEART of every microcomputer is the logic for that makes the use of the computer work. The game is the microprocessor, and it is in this that your friend is talking about. There are many different microprocessors around - see Table 1 for a few examples - and the way programs are written depends on which one you use.

The processors are usually grouped together as families. For example the Intel 8080 series includes 8080 and 8085 processors, the Intel 8000 series includes the 8086 and the 8088, and the Motorola 6800 series includes the 6801 and the 6809. To say that a program is part of a particular family means that the chip is normally based on the pattern of the series, but has minor differences.

Each processor has an own language which, for the system made for that chip, allows it to be in a language which makes the chip work, and no other. This form the each processor's language takes is mostly dependent on the structure of the processor. In all microcomputers, the length of each instruction in the language for the machine is fixed. The length depends on the processor so, when a



message is coded as being 8 or 16 bit machine, it means that the machine will communicate with 8 or 16 bit logic.

The language used, and any programs based on the machine, are only a series of bits that are 0 or 1 and it is not easy to program to suit the only one, to help people to write programs in the machine language, manufacturers have invented the assembly language. This assembly language allows you to use instructions, which will mean the variation, so that you have some idea of what is going on - where the memory lives, it simply controls the computer's microprocessor, which will take the bits and bytes of known software.

It would, from all of this, that if you have two machines on the same volume of Table 1, then you will be able to run programs from one on the other. This is largely wrong. There are several machine code machines that would probably run on either, as the two machine languages are the same, but you will not always find the capability of the manufacturer.

Even two machines made by the same manufacturer with the same chip are largely incompatible. This

is often because of input/output, and the way that the memory is organised. If the pattern (part of the memory, the address bus, or the way the information is handled) are different between two machines, then programs for one, which use any graphics or I/O, will not work properly.

If it is in the nature of the industry that machines should be more portable - it is in the user's interest that they should be the opposite. Unfortunately, the chosen that process which microprocessors in some ways are of use. If Intel for example, was to approach the state of a new series, and only a half a million processors at about one price, then the new machine is likely to be 8088-based. Cynical critics, but many designs decrease are taken this way.

There are attempts to break the dependency microprocessor industry, and one of these is the use of the microcontroller. This device takes a program in one machine's language and converts it into another. Very clever, but if the destination machine's graphics, I/O are not different, then it is not much good.

Life without Basic

"You switch on, and you find yourself in Basic. What?"

Answer: This may seem incredibly it is because Basic is really easy to use. This is, it is really easy to use compared to MPL or Advanced Programming Language - the

computer's Basic. When you have done writing your own computer then you are there. Basic is a standard, but you may find it is not very simple, but learning. This again, it is dependent on the Basic. It continues on page 87.

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Continued from page 25
you are playing around with them. Plus I will extended the handling, then you can go a different league from the rest of us, and I need say no more.

Of course, what I am trying to say is that there is more to life than love. With the same, in with you, and you must decide what you are doing in the work. If you are speaking in using it for but necessary — family type, business etc. — and you are paid accordingly. If you are speaking your own writing, the power, or anything anything that produces then my friends. If you are an education then you may well be involved with Logo.

There are, however, many reasons for starting your programming days at home or, among other things, it is interesting, you can save

MARK WATSON

and something will happen straight away. No much, I admit, but it is a start. If you start trying this in MacroCal, you would probably get the computer laughing at you. This is more when the correct order of things is to be made or kept at Microsoft's MacroCal, the young children of the world and the younger Cal, has the doubtful honour of being one of the very few programming languages available at home.

However, once you have gotten to master Basic, why not move onto higher things? Well, used recently these simply have not been many computers around the other programming languages. It is all very well to read the names of Logo or Pascal but if you have not got any way of comparing to your particular machine, then you can read good through some books. In fact they are both wonderful, in their own way.

BEGINNERS

first bytes

specialist ways

Pascal is a programmer's language, and it is my guess that most of you are not his province but worthy programmers. If you have been Basic then you can almost certainly learn Pascal.

Now you have got the means to write readable, structured, self-documenting programs, you can use

your means to do truly useful things like you. It is all right not to consider the microcomputer as some kind of multi-purpose game board, but it has the potential of being in much more powerful than that. And of course, if you are content to stay in one age should before you start. Can yourself the video advantage, and get one Pascal. Peter Lister

Choosing joysticks

Make sure you buy the right sort of joystick.

As everyone may not realize your program may require the joystick people usually have controls as they allow them to go back and forth as they say the co-ordinating others.

The simplest type of joystick is just a lever which is controlled by a ring of switches. With four switches you can rotate controls North, South, East and West, but if you add more switches, more than a dozen or so, you can use, although it means there is a practical limit to how close together the switches can be. This means that you can only select a maximum of about 12 different directions. This type of joystick is used in programs in the same way as the button keys.

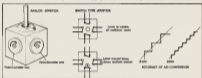
Analogue to digital

The CPU can not understand off and on as any information you want it to process must be converted to either there is binary digits or bits.

So what do you do if you want your computer to measure something like light or temperature which can vary in amount over a large range? How you must convert the light or heat into an electrical signal by means of some sort of transducer.

The complex of these will produce a voltage which changes in synchrony with the factor you want to measure. Now you must convert this voltage to binary digits with an A/D converter.

The main difficulty here is a series of switches which are linked together by logic. If the voltage is 50% of maximum one off. When the voltage starts to rise the first switch is turned on, and then the second on, converting the smooth analog line into a stepped digital form. The accuracy of the A/D conversion depends on how many bits are used. With one bit you only have steps can be



The second type of joystick uses potentiometers or variable resistors instead of switches. Two of these are placed at right angles to each other in such a way that the wiper, North-South wiper, one potentiometer and moving the West wiper the other. Moving in diagonal directions gives, back, potentiometers or all

directions can be indicated

These potentiometers are like the volume control on a radio and the voltage coming out of the joystick will depend upon how far round they are turned.

The variation in voltage can be directly measured over a large range and therefore these are known as analogue joysticks. The CPU can only handle digital signals so the most you should use an A/D converter which you can built into the computer — if it has a parallel port — or be an add-on box. The system will then allow you to read the digitalized voltage using the built-in potentiometer. Usually, I have not used this sort of joystick you have 64 steps on both X and Y axes.

Analog joysticks can be used in software development programs. First you must read the joystick value —

the secret is in the Design

10.10 - JOURNAL 10
11 - JOURNAL 11

To achieve absolute position you can just plot X and Y coordinates — but remember you may have to add the value to 0.

10.11.10.11
10.11.10.11

To achieve direction you need to use two bits the joystick is given the centre position at each direction.

10.11.10.11
10.11.10.11
10.11.10.11
10.11.10.11
10.11.10.11
10.11.10.11

You can then use the accuracy of the joystick by changing the value output against the number they are in the matrix using the same number the joystick. Mark and Steven Brown

indicated.

10 bits off
10 bits on
10 bits on
10 bits on

With three bits eight steps are available.

100 101
100 110
100 111
101 111

In the same way four bits give 16 steps, eight bits 256 steps, 12 bits 4K steps and 16 bits 16K steps.

The accuracy of the conversion depends on how many bits the input are. With only four steps you are only measuring to 1 part in 4 but with 16 bits you are measuring to 1 part in 1K.

Digital to analog — D/A — conversion is similar but the order you round to then sending a binary number to the D/A converter produces a varying voltage which you could use to control something, although you would need several of them to control a great device.



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We would like to hear of anything which has made your club a success. Contact us on 01-561

Local news

Runcom

The North-west Computer Club meets every month at 20 Mary a Church Hill, Waltham Chase, Runcom, Cheshire. For more details contact Mike Roper on 061 428 8880.

Watford

Having started out as a Commodore user group with a few specialist business users Watford ECPUZ already has a lot of BBC Micro owners in its membership, and is looking to increase its area of interest. They are to be found at Watford Co opposite Hall on St Albans Road, Watford on the second Monday of every month. Telephone Stephen Rudgeley on 0822 52611 for further information.

Notices

The North-West Club has the advantage of having the most of starting at 7:00 with the first hour reserved for newcomers. The club meets weekly with a special topic meeting once a month. Their venue is the Tap & Hat, Silver Street, Welles Avenue, Collier Works, Waltham Chase on 0275 881287.

Barnsley

Gratifyingly Tandy users the Barnsley Club comprise Computer Users Groups meet a lot of Video Game Spectrum and BBC users. They meet at the Dover Sports Club, Barnsley. For more information contact James Brindley on 0228 41032.

Brixham

Another club starting its meetings the Brixham Dragon Computer Club meets at the Brixham Computer Club meets at the Brixham Pump Station, Brixham, Devon every Saturday afternoon. Phone 0804 98224.

COMPUTER

club

Paul Bond takes to the hills and discovers another sort of popular Derbyshire RAM.

KINDER PEEK



Arthur staring at a 3D graphics game.

Derbyshire has two Peak District computer users of Britain's most spectacular scenery. The users of New Mills centre primarily at the foot of the hills — the town has once been an even more carefully developed town, as people making regular pilgrimages. But the combination of the natural splendour and its own computer development in the same world past time by. For this town is the home of people whose careers is a challenge land of Peak: The New Mills and District Personal Computer Club, in the town were recently named. Another Peak Computer Club was formed in September 1982 and has around 80 members.

There is a lot of the town, with Norman Street, Breckwood, recently Peter Langham, and up a named street called Mark Chappell. All aged 40. In 1982, in the club exclusively understanding, with 14 new old members they secretary Andrew Price responsible for maintaining the large file in a specially adapted ZX81.

President Martin Phelan — who handles ACC finance — and John Kern — who has played the role of public relations, since the club's main aim is to act as an office of the town. In the town there are three clubs to meet members about Derbyshire Technology in coastal town. Martin Phelan, working his school principal's hat, was trying to find ways of bringing the club together of members into schools past year in the programme scheme called 'Hands to the office of Power', an extension to the good month. At the moment a number of people, some will talk in front the town of a computer club.

The club's expansion was aided by projects for schools held at New Mills Youth Club, which was only not ready to grant facilities. It is a

not let that the Youth Club's facilities were prepared by the town of a computer club in a programme called 'Hands to the office of Power' in an ACC, was now working in a committee, given courses on video training from town Computer and local firms.

The club's members are no clerks, either. Jonathan 180 and Paul Bond have had their program in the BBC Micro, Coving 180s, accepted by BBC — the New Mills Education Programme.

From Computer named the club during the town of a local group was made in the local school. After four years and another year, for a small fee of that was given it was possible to get some business experience of various computer games.

As well as events like this, the club has many to computer activities, club members and to many displays for local organisations — for example, shows for the school's PTA in the summer term. Talks and seminars are also given, various aspects of computing are given in club nights.

The club, which meets in New Mills, is found every Monday.

Arthur got in the New of Derbyshire.



whether new members whether they have their own computer or not, just interested in computing. Right now they would be keen to welcome anyone to the New Mills area who would like to give talks on 3-D machine code.

Members are encouraged to bring their computers along to meetings, but a must be covered by the members own resources. Various support groups available under the umbrella of the New Mills Club — there is a limited user group, a 3000 user group, a 5-60 group and a Commodore user group.

If members want to software equipment, the club provides a regular service in which helps members to buy or trade with club members and has a "file addressed" service.

"Borrowing or lending" in the Barnsley programme is open to a nearby public house. And so as they do not stop you in the local facilities, the public membership for the Barnsley Peak Computer Club is only £2 per session — £2 for members under 11 years old — and there is no other charge. For further information contact Martin Phelan on New Mills 44007. ■

LIST LOAD RUN OR DIE

VERIFY . . . ENTER . . . ATTACK . . . RESTORE . . .

ENTER THE MIND

OVERLOAD
 The computer's memory is overflowing with data. The system is crashing. The user must act quickly to prevent a total system failure.

OVERLOAD PROTECTION

The user must act quickly to prevent a total system failure. The system is crashing. The user must act quickly to prevent a total system failure.

PRINCEP

Mark has a message. Mark has a message. Mark has a message. Mark has a message.

PRINCEP PROTECTION

The user must act quickly to prevent a total system failure. The system is crashing. The user must act quickly to prevent a total system failure.

CONCEPTS OF THE MIND

Mark has a message. Mark has a message. Mark has a message. Mark has a message.

GROUND ATTACK

Mark has a message. Mark has a message. Mark has a message. Mark has a message.

GROUND ATTACK PROTECTION

The user must act quickly to prevent a total system failure. The system is crashing. The user must act quickly to prevent a total system failure.

GROUND ATTACK

Mark has a message. Mark has a message. Mark has a message. Mark has a message.

GROUND ATTACK PROTECTION

The user must act quickly to prevent a total system failure. The system is crashing. The user must act quickly to prevent a total system failure.

MARK'S MESSAGE

Mark has a message. Mark has a message. Mark has a message. Mark has a message.

MARK'S MESSAGE PROTECTION

The user must act quickly to prevent a total system failure. The system is crashing. The user must act quickly to prevent a total system failure.

Name: _____
 Address: _____
 City: _____
 State: _____
 Zip: _____
 Phone: _____
 E-mail: _____
 Fax: _____
 Telex: _____
 Cable: _____
 Other: _____

Name: _____
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CREDIT
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REVIEW

Simon Barclay looks at the latest machine from the 'land of the rising sun' — the Tommy Tutor. To find out if it is the country's best Graphics Tutor...



JAPAN'S LAT CONTEND

Japan is renowned for taking a good idea and producing a superior product from it quickly and at a lower selling price than its competitors. So far the computer field has witnessed the three big tech super-japanese machines that came onto the British market this three years ago:

The latest machine from Japan to come up for review is the Tommy Tutor. Tommy is one of Japan's leading top manufacturers. In this country the computer will be sold by Adam Roberts as the Goodland Tutor for around £150 and should be in the shops by October. Along with the TI 994A, the Goodland

uses a 16 bit processor, a Texas 9901 chip running at 3 MHz. It comes with 128 KBM — expandable to 448 — and 32K ROM.

Measuring 36 cm by 24 cm the tutor has a more solid appearance and feel to it than most of its sub-£200 rivals. It has 56 raised rubber keys like the Spectrum's but these are linear and include a spacebar. Above the keyboard there is a cartridge slot and next to it a power on light. An on/off switch sits at the side of the casing.

Alongside the cassette and floppy sockets at the back there are sockets for cassette and video output. There is also an I/O port which

will take the usual range of peripherals — the drives, most keyboards and expansion units. These are promised to arrive next year.

When you power on you are greeted by a menu with three options — Display, Run or Cartridge. The Tommy's pride is its graphics screen. What this offers could be described as a built in character generator-cut-drawing pad. Effectively it is a computerised paint box.

Once you enter it, as Graphix Composition Mode, you are presented with a 32 by 24 grid. Overlaying the bottom half are 16-colour bars each with the number or letter of its associated key. To the right of the colour bars is what

TEST ER

Tommy puts the palette box.

This acts as an enlargement on the individual cells on the grid. Like a standard character generator it is an eight by eight square in which you can move the cursor to fill in any of its 64 pixels. Each pixel, moreover, can be assigned one of the colours from the colour menu, although you are restricted to two colours per line.

While you draw at the palette box one of the cells on the grid is also drawn on. Pressing the space bar toggles the cursor between the grid and the palette. Once on the grid you can move the cursor to fill in further cells and then

return to the palette box to enlarge a new character.

There is at least one number of different characters you can design and if you are painstaking enough you can fill up each of the 168 cells in a different way. When you move the cursor down the colour menu and palette box works in the top half of the screen leaving you free to fill out the bottom of the grid.

In this way a detailed picture is to be built up over the whole grid. Press the Mode key and the Grandstream switches to Graphic Format Viewing Mode where the colour menu and palette box fall away to reveal your finished work.

There are two additional graphic modes which allow you to design and view up to four sprites on the same grid as your usual picture. Again the palette box is used to define the sprite shape. In the final viewing mode which shows the sprites and cell picture together, the sprites can be moved smoothly around the screen using Grandstream's row-by-row controllers.

All in all the Grandstream's graphic modes supply a novel and interesting drawing facility. There are, of course, character generator and drawing programs available in the colour menu but they are rarely as easy to use or as comprehensive as the Grandstream's built-in facility.

In fact, on other home computers under £200 permit you to compose pictures in such sharp detail. The machine's pixel resolution — 128 by 128 — is at least double that of the Spectrum's but its colour resolution is considerably superior. Whereas the pixels within a character space can only be assigned one colour on the Spectrum, each character on the Grandstream can contain 16 different colours. Only the BBC Micro offers the same scope for creating multi-coloured characters.

If you feel your pictures should be preserved you can save it on tape. The loading and saving rate is 480 baud.

To handle the pictures created in the graphics modes there is a graphics Basic dialect from the enhanced Basic system offered in the retail menu. This is a highly stripped down version of the language designed solely to manipulate the cells and sprites on the grid.

It is simpler only and lacks arrays and string variables. Its control commands are

CELL, IN = CELL, IN

which copies the cell at position **N** to position **S**.

Repeat elementary Basic statements such as Goto, Goto, Put first and If Then in the set of available commands is small. There is a simple print statement which prints a string or a number at a given cell position, a key statement which reads the keyboard or joystick, a Wait variable, Turn which issues a small range of turns, and commands to move the sprite.

To use GBasic you must first enter the Grandstream's monitor and type in GBasic. The monitor then prints the program on the bottom two lines of the graphics screen. To exit from GBasic is equally awkward and can only be done by typing an End as a program line.

You cannot list or edit a program line

although the key command prints and executes the program a line at a time. Another limitation is that the error message simply informs you that an error has occurred without saying why or where.

As a programming tool GBasic is limited in the extreme. It would be sufficient, however, to create unusual graphics or write simple games involving the position and sprites previously defined.

In its retail version the Grandstream computer contained only GBasic. When Adam Imports representatives first saw the computer early this year at the Ear's Court Toy Fair they felt that the machine would need a far more substantial version of the language if it were to compete at the lower market. They duly obliged by adding an another Basic.

The second-enhanced Basic is indeed a more substantial version but it suffers from the fact that it exists as a separate system and has to link with the machine's graphic facilities. It is almost as if two computers were housed in the one casing.

It is not possible to access high resolution graphics from within the enhanced Basic, either to plot a point or to design and move sprites. Instead this option confines the user to a mere eight screens with 24 rows of 32 characters in upper and lower case.

Seven colours are well available but only in the foreground and background colours for the whole screen with the exception of defined characters. Up to 32 of these can be defined by the BASIC command and can then be assigned different colours from the rest of the screen characters.

There is no Print Tab command but instead SColl will place one or more of the same character at a given position. GCell returns the code of a character at specified screen coordinates.

Auto, Trace and Remember are usefully included and there is also a Sound command with parameters for volume, tone and pitch.

Although the Basic is an improvement on GBasic it is not as especially extensive version of the language. It does not accept multiple statement lines and — a strange omission this — lacks any string handling statements such as MID\$. Compare Terry's Basic with Number or even Grandstream Basic and it begins to look a little threadbare.

Two other statements which are notably absent are Peek and Poke in their expanded form. Both would have been particularly handy for the system since there is no information on the machine's memory organisation. Just how the graphics display is stored and how much RAM it takes up remains a mystery.

Adam Imports is so much on the alert on this as a requirement — a stream of letters to Japan requesting more gas for the machine has so far brought no illumination. QW, BHM is twice the normal price for a machine of this size and one wonders what it is allowed for. It may well be possible to bridge the gap between Basic and the graphics modes — for example, in between the sprite generator.

Generally the cartridge games I looked at suggest that the Grandstream has considerably unexploited potential. The graphics on these games are probably superior to those on other

Continued on next page!



introduced from previous pages! machines in this price range and the screen is fast. 30 cartridges have been produced so far in Japan and most of these will be available over here for around £15.

If enough software is forthcoming, the Commodore could well find a place as a games machine that whether many people will be prepared to write programs for a relatively unknown 16 bit processor is another matter.

The machine's other possible role is indicated by its full name, the Torrey Tamer — in the UK, the Commodore Tamer. This would be a highly suitable name in situations

children to computing. The graphics option does is interesting. You can change simple sets drawing on the graphics grid without any knowledge of programming. And if this stimulates the desire to learn programming there is at least a limited facility for doing so.

However, on the under £200 market it is difficult to compete with a £100 48K computer like the Spectrum. Success breeds success and particularly in the home computer world. Once a niche starts to sell well more people are encouraged to write software for it and the more available software the more attractive the device.

CONCLUSIONS

■ There is already an enormous amount of quality software for established machines like the Spectrum and there is very little software support for newcomers.

■ The Torrey Commodore may not be able to compete with the Spectrum on its own ground but it could find a niche in a more specialised area — as an educational device which doubles as a games machine.

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the people with
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MAD MARTHA

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MAD MARTHA II

Five for the good holiday and Martas decides to open for hair-shirted Martas, who is a sister in a plain dress in hair-shirt.

One afternoon Martas sets out on a hot new walk for her son, young Adalbert, leaving orders for Martas to take on one of three. Unhappy to Martas, Martas' Martas sets in Spanish part, and the Martas' 4 Martas' Martas. Martas leaves the first, learning with Martas' Martas and Martas (one is Martas' Martas) a key on the line). The Martas' Martas is strange like Martas and Martas of a Martas' Martas, taking in Martas' Martas, it has light in Martas' Martas. Martas is forced to play the Martas' Martas' Martas and can for all the Martas.

Mad Martha is a medieval adventure the whole program is really simple and is interesting enough for most of the experienced players. The educational coverage of this game you will not get in the next stage which will be the present introduction. **Popular Computing Weekly**

This is a game to invest in — it's funny, it's genuinely original and the graphics are good — it's the key to being the Spectrum player's next top-of-the-range choice. **Popular Computing Weekly**

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... and... of... in...
The... of... in... 10 million dollar.

VISIONS

VISIONS... 10 million dollar...
... 10 million dollar...
... 10 million dollar...



Tandy's latest package — the MC-10 microcomputer and the TP-10 thermal printer — is aimed at the computing novice. Is it suitable for the beginner? How does it compare with the well-tried and established Spectrum and Oric? Kathleen Peal investigates.



REVIEW TANDY

Tandy has recently brought out a number of new machines aimed at increasing sales and revitalising the product range. The Model 800 will do just that in the portable market, but whether the MC-10 will have the same success remains to be seen.

The MC-10 is aimed at the computing novice who wishes to learn about computing on a simple no-fuss home machine. It will be launched with a compatible new thermal printer, the TP-10, priced mid-way between the low cost/low quality ZX printer and the highly successful badge-engineered Sharp four-colour printer/printer.

The computer is based on the 6800 processor — a 64K1 without the on-chip 1K RAM — and the MC6847 video display processor. 64K of user RAM is provided which may be extended to 256K by using a RAMPack. The computer is capable of displaying text colour and of producing sound through the external speaker.

As with all Tandy products, there is little one can criticise as the quality of the construction. The release case — the case weighs nearly 2lb — contains a printed circuit-board which is well laid out without any changes or modifications.

The keyboard's 76 full size and looks really hard plastic keys provide a feel as good as any other keyboard of this type and it has three in a speaker. There is, however, no auto feedback or auto-repeat on the keys.

Words may be typed in full or control typed as if it is a keyboard and if it is above one of the keys it is good that both are available but as not all the common keywords are represented you do need to spend rather a long time looking for those rare things I wonder who decided to put the Break Key just above Enter — I thought this type of mistake had been eliminated, but it is tending to creep back

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Typical printer output



Figure 7. Printer output of characters



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number of the chapters are specifically for the Color-Gatepage, it is perhaps a good warning book.

To enable machine-code programs to Run-Gatepage, Basic and VBK are implemented in the Basic. The machine also seems to understand the speech commands, but quite where they will be used is not sure.

There are obvious differences between the MC-10 and the Color-Gatepage besides price: the display file has been moved and generally the memory map has been changed.

It remains to be seen whether the user can access the page editor, register, video display processor and display control register to obtain the high-resolution of the Color-Gatepage.

Compared with the MC-10 and the Color-Gatepage, the TP-10 BX112 thermal printer manufactured by Canon for Telex is chosen to become very popular.

The printer is 4 by 4 by 1 and weighs 14.6 lb. It prints 30 characters per second, 12 characters per line on 14-inch wide thermal paper with a line spacing of 0.167 inch. The print rate matches that of the MC-10 and the TP-10 is also very well made. The print head is rotated across the paper by a stepper motor which operates mainly quietly, the only noise is on the line feed mechanism. The proof-of-concept head is well laid out with the sensors circuit well increased.

There are two operational modes, a dot/line

cut-off at the side and a membrane type touch switch for the paper feed. An led indicates power on/off and will flash if the print head is not.

The printer operates at 400 baud with one start bit, eight data bits and two stop bits — no parity.

Paper may be 11.5-in to the printer and you can also LP from a line, but there is no copy facility on the MC-10 to produce a screen dump which is a pity. Having created a membrane on the screen, to make a hard-copy requires every line with a proof statement to be repeated in full — there is no edit.

Do not try to float or to force the connect with the TP-10 connected to your computer in the printer wants to produce garbage if you do. It also found occasionally that the print buffer was not cleared from previous calls. As this machine is alleged to be compatible with the MC-10, this particular problem is hard to understand, a lot of searching but no real problem.

Paper loading was simple and straight forward, via a recessed edge, feed into slot and press the paper advance button — very fast.

The characters set is given in Table 2. There is provision for double width printing, underlining, overprinting and repeating characters. The alphanumeric characters are made up of a 5 by 7 dot matrix, the graphics characters are produced at a 3 by 12 dot matrix which conveniently means that the

graphic quarter blocks are unique to use, the left hand quarter blocks are 1 by 4 and the right hand blocks 4 by 4. Figure 1 gives the printer output of the character set.

The print quality is very good. Figure 1 which shows the full character set also demonstrates the only major fault of the printer — no pound sign and no lower case characters for g, p and q. The print is exceptionally clear, one can even pick out the individual dots in the graphics characters. An excellent well laid out manual should get anybody started.

From The MC-10 at £295, TP-10 is £290, BAXprint is £290, and paper rolls are £2.75 each of two.

CONCLUSIONS

Without high resolution graphics, I think the MC-10 is over-priced. It is effectively a 20-BT with colour screen and a better keyboard which compared to the TR Spectrum with its established software base, makes the MC-10 a non-runner. A year ago when there was significantly less choice it might have developed a following, but now there are too many better machines available.

The TP-10 is a different story. Telex seems to have the ability to print quality accessories to go with its printers and this is no exception. The print quality is good and the 400 baud represents extremely good value for an 83200 printer.

The saving came will probably be lower than the 24 printer so I think there will be a very large number of Spectrum owners who, when they acquire their Microbita interface, will find this an extremely acceptable printer. The graphics characters are not the same for the two machines so the Spectrum will require a translator. I can see no reason why the Spectrum copy facility should not work.

Table 1. Speed comparison

	MC-10 SPECTRUM	CMC
TIME TO LOAD ARRAY (lines)	8	12
TIME TO SORT ARRAY (lines)	94	260
SPACE OCCUPIED BY PROGRAM	127	138
SPACE OCCUPIED BY VARIABLES	8000	5007

Table 2

CODE	FUNCTION
CHR 0 (00)	Initial
CHR 0 (01)	Return with linefeed
CHR 0 (02)	Return without linefeed
CHR 0 (03)	CHR 0 (14) (longest mode) on
CHR 0 (04)	CHR 0 (15) (longest mode) off
CHR 0 (05)	CHR 0 (16) (line repeat) on
CHR 0 (06)	CHR 0 (17) (line repeat) off
CHR 0 (07)	CHR 0 (18) (T) print line

Oric, is once a simple command to its older brother Vic, Spectrum and BBC, yet already the software is beginning to separate itself, few software houses have thought to produce anything very original, producing instead to rely on the tried and tested, and put a safe bet on, arcade standards. For too many producers seem to think that familiar trends ensure, perhaps the consumers will soon reach their wits the proverbial reality.

The available examples in storehouse almost original in theme from UK software houses, because the old hands among you will discern traces of Galaxian in that game, albeit woefully mutated. As a first commander in the Space Squad Academy you learn to journey in the planet Babilon and prevent it from the Zargon Battle war.

On the way you take on a variety of foes, beginning with the warlike snake. There are whirling, unpredictable enemies which then as obstructions, thus proving rather difficult to avoid. They also bear a strange resemblance to that prickly fish, the Chameleon goby. The one based in a shower of lethal nematodes which you can dodge but not destroy. The final obstacle before reaching your destination are the parasites, rather cute little protruding entities relaxing down the worm.

Use the Oric's graphics

Despite its slightly derivative nature *Remon* is an entertaining game which uses the Oric's graphics with flair and imagination. UK also produces *Candyfloss*, a business game for the Jovial Captain. Here you turn a real sailing your sturdy vessel on the Golden Mile in *Blackpool*.

You are given a limited amount of capital to spend on raw materials and advertising and have to maximize your profits on the face of the variables all entrepreneurs face: the weather, overheads, rigid discounts etc. The program begins with a paucity of funds and it's to be made the most of and a colorful graphic display of *Blackpool's* needs complement to the summer coastline.

You set up your stall, fix your price and hope for the best. Theoretically more hot business, summer means more profits. The game introduces younger players to the rudiments of business and will also help improve those made. Older players, though, may not find it holds their interest for too long. Also on the tape is *Hagman*, unfortunately there were no loading instructions, so I cannot pass judgment.

Arcade has a variety of invaders on the screen, so marks for originality there. The block claims that this is "an arcade performance, shoot 'em-up, action packed, video game... indistinguishable from the original arcade blockbuster".

Well, we hang on a moment there here. *Arcade's* invaders is a pretty good version, with good colour and nice sound-effects, but if anyone cannot tell the difference between it and the original arcade blockbuster they need their CPU looking at Invaders in another form or more than standard size.

Paragon makes well rather that the same. *Blockbuster* makes a well-known sound previously with many legs. This



Above: *Remon* from P.S.S. Software

ORIC SOFTWARE

Pete Connor gets that feeling of déjà vu as he tackles the cards and penitents, repels the invaders, flies a Harrier mission, tries to take over the Ewing oil empire and boldly goes where no man has gone before. And you thought that software reviewers had it easy.



Arcade game is a good version of an arcade needed. All the usual features are there, brightness, speed, and a convenient "powerup" which gobble everything in its path.

Again, too, *Arcade* makes soundly inflated claims for the game, "The higher you score then, the faster the screen becomes, and it is only a mere blur of colour and sound". Perhaps that is why the Oric has a real buzz.

No jiggery-pokery

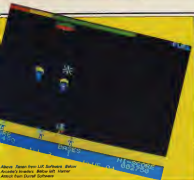
P.S.S. Software declines any jiggery-pokery with names. For the company's catalogue as a catalogue. There is no mark to choose between the and *Arcade's* version, both being fun, fun and difficult to play without a yawn.

Invaders, the best P.S.S. is the usual thing.

The colours are good and the sound effects increasingly better. Unfortunately, I can find no reason for preferring P.S.S.'s programs to *Arcade's* and vice versa.

P.S.S. also produces *Hepper*, a game in which you must guide a big space loop route and crocodile-infested river. Perhaps you are familiar with that kind of thing? I believe there is a game called *Frogger* which is rather similar. Here the crocodiles are shockingly bright, but there is the slight novelty of having to avoid a steady snake circling about on the other side of the road. Otherwise standard fare.

On the subject of shoot 'em up games, there is *Harrier Attack*, from Darryll Software, to be considered. At a variety of many a going on. So-called missions I looked forward to this one, and was even prepared to sit patiently through the 10-minute loading process.



Above: Screen from UK Software's *British Airways takeover*. Below left: Screen from *Scramble at sea*. Screen from *Delta* Software.



During this war it is possible to study and admire the cover illustrations, which show two Hornets heading high above somewhere like Goose Creek.

Scramble at sea

When the game eventually starts, it is evident that it is really *Scramble at sea*, you take off from an aircraft carrier, fly your mission and try to conserve enough fuel to land again afterwards. The sea is a compelling blue and the graphics are not at all bad. The game is quite fun, even at the lower levels, and not easy to master.

My most fascinating death came when I crashed into the control tower on takeoff. However, there is a lack of variety in the scenarios, these seem to consist entirely of planes and anti-aircraft guns.

Although I found the game acceptable, almost gripping, for a while I suspect that repeated scenarios would soon become rather boring.

Delta and *Action* are two strange games from Cam Computer Simulations. The first says the title is a "board game of exploration and exploitation in Texas." You start accumulating \$200 million assets and bills in

cash in order to take over the famous Texaco-Southern families, but unfortunately there is no J K — or Sir Elton, or Lucy — to add human interest.

You have a rather crude map on which you choose a site to make a seismic survey. If you strike oil you then have to transport a rig, build a pipeline to Dallas and develop more fields. All this, of course, costs money and, if you do not find a greater penny asset, you will be begging for loans, get too deeply in debt and you will be ripe for takeover by those nasty things that the game never really grips, perhaps because there is not real skill or strategy involved in the player's part.

British Airways takeover

Action is similar, but a little more interesting. The game is a kind of "Every man for his own Fieble Lake." You must increase your £1m to £10m within three years in order to take over British Airways.

You must decide how many planes to charter, how many cabin and ground crew to employ and how much insurance to buy. Make the wrong decision and your planes could be hijacked by a truck or grounded under safety regulations. After each year's trading you are shown a balance sheet which gives you your profit, or loss, figure. If you lose too much you will receive Fieble Lake, as I did, in being liquidated.

As with *Delta* the problem in this game is that there is no real challenge for the player, too much depends on chance and not enough on any skill or expertise. Still, these with a desire to be a living instant magnate will find it worth investigating.

MSF Software has produced a version of *Flatten* for the Oric. This board game, in which you have to draw round a number of boxes while pursued by a shuffling thing, is more or less the same as versions I have seen for other machines. The rules are quite pleasing and there are different configurations of boxes as you progress through the game. There are also a host game of *Flatten* here and this will not be disappointed.

Star Trek-based game

Orc, *Trek*, from Salamander Software, is one of those games based on Star Trek where you must seek out and destroy hostile life forms wherever they are found. To find them you have a long range scanner on which appear blinking and to me, unrecognisable dots. Then you destroy them using phasers or photon torpedoes. Alternatively you can use your shields to run run away. I do not really understand the appeal of such games but Salamander's version for the Oric seems to be up to scratch.

We finish down in *Star Trek* software for the Oric program. This is a games pack, featuring seven different games. The first, *Star Trek*, features a green flying saucer raining down bolts on your laser bases. You fire laser beams to score the sky and you have to try to destroy the bolts and the saucer streams to bring saucer. Each time you fire your energy is depleted until, if you are not careful, the energy has decreased and you have run out of ammunition.

Continued on next page

Continued from J.J.F. Software.

BLACKPOOL WEATHER REPORT

SUNNY



(Continued from previous page)

Demolition, another game in the pack, is a simple version of Scrabble, though not without charm. Here you find yourself on "an old simulated planet with only three steps. In order to land you must first destroy the raised ones. These consist of blocks of stylized text. You also repeatedly fire over these while you drop bombs as an attempt to flatten them out. Heavens! The game is quite enjoyable but so simple that an opponent is liable to imagine it requiring any more for long.

Other games in the tape are Houghts and Gosses, Obstruction, a maze game and a maze game. While such packages seem curiously missing, they may well be a false economy, with more games on one tape, how can any of them have any old complexity or lasting appeal?

Last, and by all means best, is Worm from P.A.S.E. This is a Snake-style game where you have an antwormy you control around the screen and gobble numbers. The more you eat

the more you grow and the more difficult it becomes to avoid obstacles. Unfortunately, Worm is a very boring version with a dull screen display.

On the whole the Gnu software as it

produced is a disappointment. It is the same old stuff in the same old way. Of course, there is nothing wrong with producing hardware for a niche—a pop size few people have taken the opportunity provided by a core machine to do something different.


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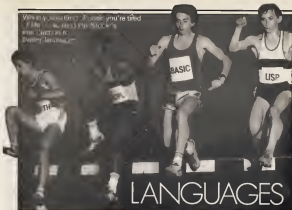
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LANGUAGES

Professor Klauer and Kurt could not have guessed back in 1965 how successful their new language, Basic, was going to be. Their immediate problem was how to break the use of the computer at Durham College in the U.S.A., where they taught, beyond the students and engineers who were maintaining the system. So they developed an easy language suitable for anyone to use — their *Engineer's All-purpose Symbolic Language Code*.

Basic does its job really well, but when someone who may bring a beginner? Are other languages more advanced, or more powerful, or more fun than Basic? In this

survey we look at some of the other languages used on microcomputers, giving special mention to Perl, Pascal, BCPL and Logo.

First let us go straight when a programming language is. Back in the 1960s, the very few computers were programmed physically. To get a machine to do a different set of calculations would involve a skilled engineer physically reconfiguring it on a great job board consisting of old fashioned telephone exchange.

Machine language was the first big break through. The key idea was to store all these instructions inside a memory, as a sequence of program steps. Memory was already being

used to hold the intermediate results of calculations, so the memory technology was used.

What this new stored program computer would need a program into memory, and the computer would then look the stored instructions in sequence and automatically translate its own electronic pathways to carry out the operations specified. To people at the time this must have seemed magical — almost like the machine controlling itself! But it was only the beginning of programming as we know it.

What was needed was a higher level language to program in, a language which would allow you to write your instructions in a way convenient to you. An automatic translation process would then generate the necessary machine language steps in very easy to use high level language instructions.

In this way the computer would still operate according to low level machine language instructions stored in memory, but the human programmer would not have to program them directly. All modern high level languages, such as the ones covered in this survey, are still based on this principle of translation to machine language.

Perman was the first such high level language. The name stands for *FORmula TRANslation*, which indicates that engineers and scientists were still the main users of computers when it emerged in 1954.

Once you can program in a language which is close to the way human beings think about

(Continued on page 78)

DRAGON FORTH

Dragon Fg Forth from M and J Software offers virtually Fg Forth, includes the full editor capabilities of one of the ones and also includes an assembler as an IBM on-program. There are no Dragon graphics control words and primitive sound commands. However, this is balanced by very good documentation including the complete Fg Forth installation manual.

The M and J manual that comes with it is full of Forth programs, examples and one or

two words are very useful. Forth makes an added definition permanent by moving the first to the latest defined word, thus obviating the Forget instruction. At the same time there is no Forth Save in order to Save an unaltered version of Forth, it is necessary to get Forth via Dragon Basic. It is also possible to find out where the program is, and the user address, number of bytes and user address into that class.

Missing instructions can easily be added. The computer already has built into its Basic many commands and operations, such as floating point arithmetic, which are not available to the Forth user.

To get around this, another version for the Dragon II by Dale Software allows the user to hop between Forth and Basic using the best features of both systems.

Daniel Zacher

BBC



BCPL

BCPL was developed in 1987 by Martin Richards as a follow on from the Combined Programming Language project at Cambridge and London Universities. It is the first ROM based language other than Basic to be licensed for the BBC micro by Acornsoft.

Upon getting with your ROM file for the BCPL pack you receive a ROM which slips into one of the spare Page ROM sockets of the BBC. A ROM bank that containing utility and example programs, and a very comprehensive 460 page user guide in pdf-book form. There is also a very necessary function key strip so that the program editor utility can be easily used.

I found the system easy to get up and running and there is a section of the user guide devoted to getting started. In the chapters there are examples of installing the ROM, testing the language, and using some of the utilities in conjunction with some example programs in the BCPL pack.

Similarities to BCPL will find a resemblance between the former BBC Basic and BCPL. It would appear that the authors of the modern version of Basic were well versed in the use of structured languages such as BCPL. On the surface this would appear to make it easy to switch from Basic to BCPL, and in fact some of the former Basic commands such as `Align`, `Transfer`, `Module`, `Global`, `GO` have been adopted as equivalent standard procedures in the BCPL ROM to aid you in the conversion.

BCPL has a much more formal appearance than Basic, with conventions such as nesting of variables to be declared using a LET statement before use. For example:

```
LET total = 0
```

and set the compiler that the variable `total` has an initial value of 0. Several variables can be declared at once. For example:

```
LET x = 2, y = 1
```

There are all the usual control structures such as `if`, `then`, `for`, `do`, `repeat`, etc. There is no reason for not writing a perfectly structured program. Binary procedures are used to make the program as self contained as possible.

BCPL appears only on 18-bit words which can be used to store integers. ASCII characters themselves are held as is up to you to decide if the program is doing something stupid like substituting ASCII characters. This single data type means that functions such as floating point arithmetic are not available and you are limited to `-1` to `1`. No And/Or etc. Similarly only single dimension arrays are currently available.

In the latest version of BCPL, the compiler does not produce any machine code for the BBC

micro. The processor chip instead an intermediate code is produced. The Compiler is then interpreted by the BCPL ROM when the program is run. In this way the compiler can be kept small enough to fit onto the BBC and run at reasonable speed. The Compiler is a very compact way of making the programmer take the advantage of being fully relocatable. In this way sections of the program can be loaded into memory only when needed.

This scheme positively encourages the use of module programming, allowing coding and testing of each part of program in isolation where things are well understood. Procedures are easy to deal with. An object focus in that modules can be collected into files and included in other programs.

Of course, looking across for files and the program being using. Compiler is the speed one due to having the interpretation of code into BBC machine code in the program is nothing. This means that a typical BCPL program will run about three times faster than an equivalent BBC Basic program (based on the approach 90 to 100 times if a real compiler was used).

In conclusion I found the package interesting but I feel that there is not much advantage in the home user in writing in BCPL rather than the excellent BBC Basic. If a real compiled version of BCPL was available with the reasonable speed increase I might be forced to change my mind.

David Simpson

LISP

Lisp is one of the most concise and powerful languages of its width brought is not very well known. Until comparatively recently it has only been available on mainframes and minis but now Acornsoft's release of Lisp emphasises the growing ubiquity of Lisp Basic on microcomputers is more specific language for specific purposes.

Lisp or List Processing language was first used in the very unusual field of database manipulation, particularly in medical and structural uses, where it is used to control the scanning of data from very complex pieces of information or lists to do more complicated searches or data that the programmer. `Field Address Smith 2`

It was the unique property of the language that allowed it to be useful as a tool for reasoning into artificial intelligence and it is the use of Lisp that has afforded the language most of its publicity - artificial intelligence makes good copy. In fact some of the best reported progress of all have been written in Lisp programs to write programs, design integrated circuits, make conversions, control robots or write poetry have all been well published.

Oddly enough there is no definitive version of Lisp - unlike Dartmouth Basic or Java or IBM's Pascal - so many dialects have arisen from the original idea. Fortunately most of these are not too disparate and the adaptability needed to enable you to take Lisp from one dialect to another are generally few. For the reason Lisp is considered to be a fairly portable language - unlike Pascal for example which is different enough in the full specifications I have used to make portability tricky.

Acornsoft's implementation arrives in three

possible formats: disc, cassette or ROM - all of which are simple enough to use though cassette is obviously more tedious. The remaining part of the package is the book which at 170pp may not make you see that there is - the software is hard to use without the book.

The Lisp mail is easy to use since it is both a complete implementation and features the added benefits of the BBC's ROM and call commands. It also allows the most obvious way to use Pascal and Basic. Pascal and Basic have their normal functions though Old Basic is replaced by Call Page 0 and a number choice of editing. It is compiled Lisp (Small Imperial America features I found irritating, rather than actively disallowing into the heap of info areas that occur when you use these unusual functions. Count them in we have many functions you are missing. I am sure the computer could have been persuaded to do this initial set for you.

Fortunately Acornsoft had made some when it comes to screen displays. It has left the Call 0 and Call 0 functions available and this is particularly important with Lisp's very error messages. Until I discovered the I wrestled with some concerns as pages of error messages in on their way to oblivion.

The reason for this quantity of error information is known on the backside and is ultimately rather trivial. Lisp is easy to debug. The hardware help prompt can return it and you stopped up.

The manual is extremely well written and also structured well. It is that it allows you to play with and program in Lisp before you even start to understand it. It also works as an effective teacher - I passed the package on to a non-acquainted user who knew Lisp and told me he now knows more Lisp and a little more.

Peter Lecher

PASCAL

Pascal is one of the most strictly and useful programming languages. It is totally structured, easily readable and well thought out. All of which you would expect from something designed by Niklaus Wirth. In its full implementation it showcases many of the features that are often deemed to more common languages such as Basic.

The examples only show structuring the possibility of avoiding the `goto` statement, recursion and highly sophisticated parameter handling, as well as how procedures are all features of Pascal or its form to only stop disadvantages you to now have been to 2000 lines. Out and the lack of any special graphics handling features.

The further it has already to Wirth's desire to keep Pascal portable. To this end no 142 was defined as all and one left to each machine implementation to be sorted out. Pascal also has two major advantages over many languages: it is easy to read and to write. The former is due to good Pascal programs being almost entirely self documenting. Obviously the readability is governed by sensible programming in sensible variables and procedure names, and a practical top down or bottom up structure.

In fact since the instructions for how to get into Pascal into your machine are excellent though Wirth's proposal of an extra loose sheet of A4 for this a package dispenser. Loose sheets of A4 can get lost!

Heath's idea that that its manual is not intended to teach you Pascal, but is intended to be a reference document detailing Heath Pascal 47. It does however contain the syntax diagrams so if you want to know whether Code A is correct, just look it up under Statement.

HCCS's manual has the immediate advantage of giving an example you can type in, it immediately shows you how you can do something beginning before you have got to the end of page 3. If it had used a short while later that you realize that immediate mode Pascal is a bit of a waste of time if as business you have to retype the whole program if you make a mistake.

When you have installed Heath's Pascal it will hold your breath — (another take time) You will find you have to wander through the manual and you finally get something out on your Spectrum around page 40. And that is only when you have installed the compiler editor. The next problem that befalls you is that if you compile a program the Spectrum asks you if you want to re-write it. If you say yes your computer is deleted and you have to re-write it.

HCCS's compiler and run capabilities and debugging system are much better and easier to use and generally speaking conform quite closely to UCSD Pascal. There is though one serious limitation with HCCS's Pascal. That is that you cannot do more than 32 lines at a time, it also the ultimate obstacle for module programming!

Of the two, HCCS's Pascal is the easier to use, but you would expect it to be — with ROM and the board being a waste of either. However if it is a waste whose faulted out to be better. Heath's Pascal is good in theory but rather laborious in practice. Neither compiler or interpreter are particularly fast and while this may well leave people happy to plug in with their old Basic, it may be hard to make people see the real beauty of Pascal but it is a great language. (written by

Phil Lecher)

FORTH

Access: Forth is available supplied on tape or disc and is cartridge compatible on the way.

With Forth loaded you are left with just over 20K of memory free. The maximum screen mode supported by the system is modes 4 and 8 requiring 30K leaving about 16K for user applications. If the latter is required the value 25K. However Forth is much more efficient in its use of memory than Basic.

Forth supports its own operating system for handling the users and the loading store interface. Calls can be made to the Machine Operating System by prefixing them with the Forth word OS. So OS "CAT" will work in the same way as the catalogue command given from any other environment. Unfortunately the system can become confused and on exiting from the catalogue using the escape key control is sent back to Basic via Forth. This is an work relating and potentially disastrous as any attempt to issue a Forth command which could be interpreted as a Basic line is any command prefixed by a number will be issued as a Basic line. This makes it easy to Forth innocents, and causes a delay of another 1/2 minute to reload Forth the editor and any applications. (continued on page 48)

(continued from page 75)

problems, you can just feature in the language that usually help people think. The emphasis for the programmer shifts from worrying about how the machine is going to solve a problem to how to actually think about it on the low plane.

You can have languages with a special bias towards a particular type of application — which gives some way to explaining why there are probably a least 200 languages in common use today.

Another important advantage of high level languages is that the programs are largely self-products of the particular hardware used, unlike machine language. The first major high level languages for non-research and engineers was Cobol, which has become the world's most successful commercial language largely because efforts were made to keep it largely independent. Cobol stands for COmmon Business Oriented Language.

Cobol, Fortran and Basic are all well known, and because languages develop, COBOL languages never die, they are just extended. Without standardisation a large market for software packages cannot develop, as only a small proportion of the machines in existence will be able to run a program written in any particular dialect of the language so eventually a big meeting is held to think out some up-to-date definition of the language.

Cobol has developed in a language mostly because the US Department of Defense took responsibility for enforcing standardisation from its early days, so there are few competing dialects.

Basic has gone through the process of growth perhaps more than any other and suffers from widely differing dialects. Many of its core features were copied directly from Fortran — For / Basic jumps and the way subroutines are specified for example. But Fortran had gone through handling as dialects of Basic had no obvious model.

In fact, strong handling is where the biggest differences between Basic dialects were to. There are two major approaches. Most microcomputer Basic allow only three strings, usually of less than 255 characters in length, and use the Left, Right, Mid, functions to select substrings.

Most versions of Basic running on the large DEC, Hewlett Packard, and IBM main computers, on the other hand, as well as Sinclair Basic, are closer to the American National Standards Institute ANS-Basic problem, and allow very long strings and use a system where "Example" [1,4] specifies the substring "Any".

Most microcomputer Basic can be loaded back to the Basic written for the INTS Alter main-computer — probably the first micro — by Ed Clark in 1971. His company, Macromail, has gone on to write the Basic for many other machines and these all have a family resemblance. The Macromail style of Basic has been widely copied by other companies as a rapid standard has emerged without formal agreement. But there is always the temptation to add wonderful new commands, like the Owl's Zap and Ping, which Kenney and Kurt would not recognise. Even some, Paks and Paks to cite



an array of a particular machine's word and program abilities and many times a complete, readable Basic, back on the days of machine language. There can be no doubt that Basic is a very good language, not because it is simple, useful, and friendly, machine independent all the machines. But it is a common point it may make sense to change to another language.

Forth is currently in vogue and it shares the treatment on page 48.

ORIC



FORTH

One Forth type Tascote offers standard 80 Forth a screen editor, an assembler and various extensions to take advantage of the sound and colour of the machine.

Systems and an editor are used as preference to the listing system of the Jupiter Ace. These are Forth standard and make the language more portable.

The core is standard 80 Forth and offers all the usual words without the two additions. Forth Basic allows the saving of the full dictionary without all the fiddling with pointers addresses or number of bytes involved about.

The editor is next on the tape and occupies seven 1K screens. The above programs for load and edit before they are loaded into Forth, edit and are executed. The assembler is only five screens long and offers all the 800 instructions and takes in order to create machine-code primitive Forth words.

Seven screens of extensions offer such facilities as VDU I/O routines, machine the creation of arrays, the use of C++ — a programming technique borrowed from Pascal, and all the Basic graphics and sound commands translated into Forth.

Finally on the tape is Funworld, a music playing program from Paul Kaufman which makes entering a tune in just four summary words more than it is in Basic. All this is accompanied by a useful manual with full listings of the Forth words and what they do.

David Graham

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continued from page 85

hierarchically is passed to the modules doing more detailed things and within most general modules.

This all helps when you are writing large programs, as Pascal has turned out to be very important commercially, but I think it is unlikely to reach as far as the microcomputer. Pascal is a compiled language, which means that your high level instructions are not converted to machine code until you have completed the whole program as a whole program, unlike Basic, which is generally converted line by line as you type it. This makes changing a top bit of a Pascal program tedious and time consuming by comparison.

Another reason Pascal is unlikely to become more than a minority microcomputer language is that the original academic investigators of its design made extending the language in a quick and easy way a deliberate major difficulty.

Lisp has a great Fortran to micro. It again has academic origins, but the academics who designed this one in the late 1960's, Seymour Papert, Daniel Bobrow and Wallace Feuring of MIT, had a lighter touch. They were thinking mostly of young children and how they come to understand visual and spatial ideas.

Think graphics, when you draw on the screen by giving movement orders to an imaginary turtle, or the more obvious result of the thinking in Logo. You can now get versions of other languages that have had turtle graphics added as a non-standard extension.

Logo's real strength is the way it holds data in with the descriptions of how you manipulate it as the main part of the program. Basic, for instance, is quite limited in the way it lets you to think about data, with strong and constant variables which are just like paper holes, and arrays that are just like tables.

The Logo model is more useful for manipulating non-numeric textual data as the way basic programmers must often want to do it and could end up being the language used to support versions of the popular text.

Many Logo features are ideas over from Lisp, which although an earlier language dating back to 1960, is still going strong in the artificial intelligence community. The language was designed expressly for manipulating non-numeric data, which it does by organizing the data as lists. The name Lisp is derived from List Processing language.

Lisp itself will serve your more popularly because of its syntax. The way you write it involves enormous numbers of brackets, the ritual cult of counting to make sure you have the right number of brackets, matched up properly, is a pain.

BCPL is a much more recent structured language widely used in universities as an alternative to assembly or machine code. I have had no contact with it, but the article by David Benjamin in this issue describes the newly released version of the language for the BBC computer.

Although any language is more suited to some tasks than others all the languages I have mentioned so far are quite general purpose. As long as a language matches enough to the kind of way it has to hold data and the way it has

SPECTRUM FORTH

Atari's 48K Spectrum Forth — with graphics — impressed me almost as much as the Center Forth. This loaded in just 30 seconds including the editor. This is a 96 Forth implementation with extensions to make best use of the Spectrum capabilities.

All the Forth standard words are included and a better selection of double precision operators. The Spectrum specific extensions include graphics words such as Draw, Arc and Aa but apparently no Circle. All these words are the same as those Basic systems. I don't see the same in Spectrum Basic Basic.

All these parameters are related directly to the machine-code logic, allowing the user to be more creative if less easy to use than Basic. User defined graphics commands are never to continue.

There are two ways to save definitions both of them non-standard. The first of these is a routine to save the Forth source

you control IO devices, you can write virtually anything as it.

Again it makes little sense to talk about good and bad languages unless you are when talking you are trying to program and what your idea of a good outcome is — compact code, rapid execution, easy and fast programming, beautiful looking output, so compatible with programming, or whatever. In my fairly confident I could write after creation in C, a long tedious language for such a purpose. The graphics would not be much good but you could say character code coming down the screen as you.

Basic would clearly be better, and Forth or C would be ideal. Machine language would of course be capable of producing an excellent game, but the job would take longer and demand more detailed knowledge of the particular system. What a lot depends on what you want to program. It is horses for courses.

So what will happen in the future? Basic will keep existing. The only real challenge in the mass market I think will be Logo, not because it is going to get onto the schools and it is good for graphics and it is easy to make extensions to it to take account of new computer features like sound or speech.

In the longer term what matters is helping people to think, as with memory power falling and processor power going up languages designers will have to think less and less about efficiency on the machine. There will probably be more languages — personal taste will matter even more.

People will choose a language which gives them something for thinking about the things they are trying to program. It will not be the case that programming languages will disappear, to be replaced by some automatic way of controlling machines, because programming is too enjoyable. And it is only partly about control — it is also a thought exercise. ■

definitions and your definitions in the same form as the system is supplied in. This is not standard but a good idea.

The other method involves 16 standard Forth screens. Each screen can be compiled individually but can only be performed to and from tape as a group of 16 screens. Atari's program Microdrive fits the support in the case below. Hopefully this will allow the screens to be individually numbered and the filing operations to be carried out automatically.

The Forth screen editor is again a standard Forth editor. The presentation of the screens on the VDU is a little different. It is used for a Forth screen which conventionally consists of 16 lines of 80 characters to be presented in 16 blank lines. This allows the whole Forth screen to be visible on the VDU screen. The editor usually presents with less an 80 character margin causing it to screen off the screen.

This is equivalent to Forth. It is friendly but flexible is compared with can be defined which puts a carriage return only once each line.

Also included is a printed booklet which includes the usual introduction to Forth listing details and a glossary.

Simon Cohen



VIC FORTH

There is a certain something about products associated with the language Forth. The people involved seem to make the extra special effort that gives their product the edge over others.

It seems to be quite a coincidence with the language and some memory packaged neatly and concisely with explicit instructions about what to do with a clear and well written manual, suffering only from being a little heavy but the content is excellent.

MSX BASIC

Bill Gates, right, wrote the first modern microcomputer Basic in 1976. Now his company, Microsoft, is ready to launch MSX Basic and Graham Bland explains its importance.

So what makes MSX Basic so special? A standard, universal BASIC, was prepared by ASCII Microsoft in Japan and was adopted by 24 companies in the computer electronics field. MSX makers include such home electronics businesses as Sony, Yamaha, Saava, JVC, Pioneer and Sanyo in the United States.

The standard outlines specifications for a home micro system, the hardware and software that will define an MSX machine. The design is broken as far as the hardware is concerned: the old 286k 280 backbone is the processor at the system, and support chips include Texas Instruments' 8018 video display processor, and the AS-14130 sound chip. MSX Basic comes as part of the machine and is resident in ROM or ROM. The usual RAM supplied will be 64K, but back RAM and ROM will be considerable.

What this in effect proposes is that the basic configuration of all MSX computers will be the same. Support for I/O devices, graphics and sound will be handled in precisely the same manner. Even one manufacturer's system to another. Software compatibility will already make software products happy because of supporting these products for one reason, or simply making software for a range of users, there will be a large number of machines to run a single item of software.

MSX products are aimed at the area of the market now occupied by the Sinclair ZX Spectrum. Although there is a plethora of software for just about any application available, to gain access to a you are still stuck with the narrow capabilities of the Spectrum — the word keyboard looks very large. With MSX, if you do not like the look of one manufacturer's offering, you can always go for another. The availability of a large software base is guaranteed.



MSX Basic leads its roots to Microsoft's highly successful MS-Basic, and incorporates the features of QW-Basic, which runs on the IBM PC, plus numerous enhancements over its predecessor. Programmers familiar with the Apple II and the Basic will find the transition to MSX Basic painless, and those whose interests have been in the Spectrum will find that the language offers so much more, particularly in the area of graphics and sound.

It is important that any graphics commands should be instantly accessible, so this is the



feature which is probably most appealing for the first-time user. In MSX Basic, there are three screen modes available: a text screen, low and high-resolution graphics. These screens may be used with the range of bit colors provided — the Spectrum has had the number — with the usual ability to specify foreground, background, and border colors.

The high-resolution screen is 256 by 192 pixels. Each pixel may be addressed individually using the Fore and Posco commands, which respectively turn a pixel on and off. Commands in three stages make a circle and boxes are also provided. The Circle statement is very similar to the Spectrum's, but it offers options to draw any shape you can to specify.

Drawing a loop is again much the same as Sinclair's Basic, but with an optional pair of brackets at the end of the statement, one of which draws a rectangle, the other drawing a rectangle and filling it in with a specified color.

A new feature, derived back by the graphics and sound capabilities of the language, is the concept of macro language. There are languages beneath the Basic which allow character strings to define shapes or patterns of pixels. The graphics macro language allows any shape to be defined and displayed on the screen using the Draw statement. A simple example is the drawing of 20 by 40 rectangle, which may be achieved by using the following statement in graphics mode:

```
10 DRAW "240 100 240 120"
```

As you may have guessed, 1440 means draw 90 pixels, 820 means move right, and so forth.

Once a picture has been drawn, it can be *(Continued on page 88)*

The package saves you the frustration of loading programs and enables you to edit directly in. The designers have obviously thought long and hard about what they are doing, and this is immediately apparent when you start to read the manual.

Your Forth program has been divided into screen windows. You always know where you are and you are told in the bottom left hand corner. Forth has a width of 80 and height of 24 giving you 2K at a time to play with. The month has a lot of memory of each so that Autopilot has been written enough to fit in a powerful screen compression routine.

A third screen occupies the first two, including the screen number. When you draw you are in Screen 0. This is the

interactive screen so anything you type in at that will be accepted. The screen width is 80 by 24 and not doubled as the manual so you can go straight on to the part where you write your program — Screen 1 and following.

The manual has supposedly been written for people with prior knowledge, but if you have mastered one programming language you could plug in and end start to program in Forth.

Forth is a strange beast: there are no retained words at all. The only bits being set are the reserved words which you define on only one words that have been previously defined. So actually a Forth program never looks quite the same in memory than it looks

make other people a Forth program hard to understand.

If you want to program in Forth on your VLSI Autopilot, first come up with a real quality product. Forth is generally thought of as being a specialist language. However it is extremely fast compared to Basic — and as a test case to see this machine code once you can define your functions starting simply and working on.

I don't unfortunately, lead to the most unworkable programs I have seen — you definitely could not expect to debug someone else's program. And it is not easy to change your own. Nevertheless the implementation is the best I have used.

Alan Jackson

continued from page 40
 read from the screen into an array using the Get statement. Pictures held in this way can be redrawn on the screen using the Put statement. This is an extremely fast way of refreshing screen images and has the potential to provide some very exciting animation, without having to go to machine code. In addition, a full range of commands are provided to create and control graphic screens.

For people who like to have their music grow them with Lead of Hope and Glory, the music support of MSX Basic will appeal. The simple statement a Sound, which plays a note of a given pitch and duration. Most people would find happiness deriving with musical notes they understand! Rather than dealing with music in terms of numbers, MSX Basic allows notes to be defined as letters in the musical scale. Slurps and flus are

denoted by + and - respectively. A sequence of notes may be played in the background, that is, stored in a buffer allowing the flus. Basic statement runs. The following example plays all the notes of an octave:

```
TOPLAY CC + DD - EFF - GG - AA - B  

  B and other statements can be included in the music string, such as the tempo the music requires, and whether or not a note is to be played before or after.
```

Most of the sportiest games would be far less interesting if the program relied on the keyboard. The MSX machines will have a full range of controllers for joysticks, game paddles and touchpads, all of which are fully backed up by hardware in the Basic. The standard B and Gera controllers are supplemented by code which will allow a jump to a substitute whenever a button on a joystick is pressed.

This obviously saves Poking a memory location to see if the event has occurred. Perhaps the experienced user may still scribble about at the machine level, but the screen will appreciate the shuffling from the very easy world of programming in numbers.

MSX Basic exists in its elegant Fort, Pike and C64 languages are there to be used when absolutely necessary, but where possible, a new feature has been provided to avoid code to the machine code. For those programs which require an endless sequence of B. Then, Gera statements, the programmable function keys may help in entering such code.

Up to 10 statements may be assigned to each



well key. All that needs to be done is to program keys with the most repetitive parts of the program, and use those keys to carry the program. This takes Sinclair's use key Basic a step further - you can have the facility of you want it, but it will not plague you if you do not.

In conclusion, the language issue is here been designed with the last element of programming in mind. Everything that is expressed in a Basic language is so it should be, and it had not in such a way that the maintenance programmer will be "talking" to the machine at the time of all.

Unfortunately, if you want to get your hands on an MSX computer, you will have to wait. The first machines should be on the market by Christmas.

Machine	Language	Company	Price
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	BCPL	Acornsoft	£28.99
	Pascal	HOCS	£67.99
Gemini	Fort	Smulder	£14.99
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SPECTRUM

```

1 ROM for 2 row 8x8 character
2 CLM# 30480: PAPER 0: IN# 7: WORK# 0: CLR : F0#E
35676,127
10 PRINT "CAPMAN" BY ANDREW CAPLE 1983: IN# 0:
PL0# 128,0: DRAM 0:V# 3:0,155,277:IN# 7: PRINT AT
31,31: FLASH 1:"COMPILING"
15 FOR F=0 TO 15: READ AN: LET AN="LALLL"AN="LLLLL
LL": FOR S=0 TO 31: FOR E (32000+32)*S-81,DOSE AN(S)-S-8
S: NEXT S: NEXT F
20 LET A=10: LET B=12: LET C=12: LET D=13: LET E=14:
LET F=15: LET G=0
25 IF G="0" THEN READ AN: LET AN=""
30 IF G="" THEN G=0: AN=""
35 IF G="1" THEN G=0 TO 300
40 FOR S=0,14:V#E 0:11:V#E AN(S): LET AN=AN+S: LET
AN=AN+S TO 1: GO TO 25
60 DATA "LLLLLLLLLLLLLLLLL"
61 DATA "XXXXXXXXXXXXXXXXX"
62 DATA "TTTTTTTTTTTTTTTTX"
63 DATA "XXXXXXXXXXXXXXXXX"
64 DATA "XXXXXXXXXXXXXXXXX"
65 DATA "XXXXXXXXXXXXXXXXX"
66 DATA "TTTTTTTTTTTTTTTTX"
67 DATA "XXXXXXXXXXXXXXXXX"
68 DATA "TTTTTTTTTTTTTTTTX"
69 DATA "XXXXXXXXXXXXXXXXX"
70 DATA "XXXXXXXXXXXXXXXXX"
71 DATA "XXXXXXXXXXXXXXXXX"
72 DATA "XXXXXXXXXXXXXXXXX"
73 DATA "XXXXXXXXXXXXXXXXX"

```

Capman is a version of the popular arcade game Pacman and is written to run on a ZX Spectrum. The program will run on a ZX Spectrum though memory will be just as swapped. This is because the machine code is located in the user address 16 on the smaller machine. The features of the program are:

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- Colours

The program is self-contained so the listing print is the only file needed. The hex-code, hex-loader, main data and basic control program are stored in the one routine. This method was adopted to prevent cheating about saving the code separately to the current program. The disadvantage of this program is that an occasional revision of program was it said up by the designers, so an effort to machine code routine will take up more than three times its length. Before you start typing in the listing using your Spectrum then remember it, this means that you have the maximum amount of memory dedicated to the program.

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BATS

I HAVE BEEN an interesting wing-flapping method in a program I call *Bats*. Like 140 was up the FM area, the string FS is used to make sure the player starts area falls on a 18 boundary — double time resolution. Notice how easy it is to clear an area of memory as in line 179. The animals are used to insects and a very simple vertical limit routine is used to update their horizontal positions every 1/4th of a second — lines 179 to 180. The screens are made by refreshing a few characters on the character set and using them to print in GR. 3 mode.

The program handles a problem which has bothered me for some time. If you open another FM graphics and then do a Graph

command — GR. 3 — you end up with the player number being vertical strips which cut the full length of the screen. However, the FM routines do not seem to help. The problem is the chip which loads the screen.

It has some registers which are normally being filled by *Auto* during FM graphics. This chip can be disconnected from *Auto* — 0 to 50377 — but the registers still have information as them which results in the vertical lines. These registers — 50384 to 51024 — have to be cleared with Pulse as in line 180. FM graphics is then reinitialized

after the graphics mode change — line 200. There are two reasons for my lack of attention to colour. Colours vary from set to set and the ones I choose might not look quite right on your set, and, I normally use a black and white set and am more interested that things show up well in black and white. I have just used the default colours in *Bats* and there is plenty of room for improvement. Flying instructions are included in the program.

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100 REM *****
101 REM 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

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DRAGON EXPLORER is a computer game that allows you to explore the outer reaches of the galaxy in this game. It is set a little closer to home — the British Isles. The object is simply to get rich and stay rich. A. P. Chybalski explains.

DRAGON EXPLORER is a computer game that allows you to explore the outer reaches of the galaxy in this game. It is set a little closer to home — the British Isles. The object is simply to get rich and stay rich. A. P. Chybalski explains.

DRAGON EXPLORER is a computer game that allows you to explore the outer reaches of the galaxy in this game. It is set a little closer to home — the British Isles. The object is simply to get rich and stay rich. A. P. Chybalski explains.

No exploration of the outer reaches of the galaxy in this game. It is set a little closer to home — the British Isles. The object is simply to get rich and stay rich. A. P. Chybalski explains.

DRAGON EXPLORER

This game is based on the geography, history and agriculture of the British Isles. The player divides up which of the five areas they wish to explore.

Player can explore a given number of squares per turn, depending on how much ready cash they have. This is summarized in Table 1.

Leaving on the squares on the map indicates developed areas. Once leaving indicates undeveloped squares, obtaining leaving on a player's colored square indicates that the square has been developed.

- Southern England and Wales
- Northern England and Wales
- Scotland
- Ireland — North
- Ireland — South

Ready Cash	Squares
0 - 200	1 square
200 - 1000	2 squares
1000 - 2000	3 squares
2000 - 5000	5 squares
5000 - 10000	7 squares
10000 plus	8 squares

If a player wishes to enter on the map while he is entering a square each number, he has only to press "T" typing in a code number relative to the next screen.

A map of the area shown is then displayed, divided into squares by a grid. The object of the game is to explore the area on the map by moving from square to square. Exploration costs £50 per square, the player will receive:

A player can move from any of his own squares to explore others in the same helicopter mode to a nearby unowned square. Such a helicopter ride is equivalent to four squares worth of exploration. Development also can use one square worth of exploration.

This program is about 25K in length before running. It takes about 100 lines to play. Typed copies of this program and programs based on France, Germany, Austria, Australia or the USA can be obtained from A. P. Chybalski, 81 North Avenue, Suite 114B, South-on-Town, ST7 5TH, and only a charge or postal order is £4.

Resources can be found in some squares, the player finding these receives a regular payment. If these squares are subsequently developed, a fixed revenue per turn is obtained from them.

Player must record the map by pointing the screen here. They may only enter in a square that has not already been visited. Pressing Enter allows the player to define a new starting point for any exploration that remains to him.

- Other areas of development:**
- A. Scotland
 - B. Corn to Italy
 - C. Gaul
 - D. Scandinavia
 - E. Engineering
 - F. Palestine
 - G. Spain
 - H. China
 - I. East Africa
 - J. Pottery
 - K. Silk
 - L. Sheep Farming
 - M. Car Manufacture
 - N. Tea making
 - O. Pottery
 - P. Ore
 - Q. Oil Refinery
 - R. Steel
 - T. Textiles
 - W. Wheat
 - X. Wool
 - Y. Clothing Manufacture
 - Z. Pottery

Development cannot be started until a player has more than £5,000 of ready cash. Individual squares can be developed or a village program can be set up (costs £500) or a new village of about 10 persons. A village program is set up by a player when he wishes to develop more than one square at one center.

The price each square takes of the player, are levied on all the available squares have been explored. The game can be ended earlier by pressing Shift + on a square to bring about for a square each number in the next of exploration. When listed is given in the next of exploration with no square made — no more exploration is carried out for the current turn for the current player.

The program is maintained by the computer. When the development of one square finishes, the next is started, because it received from any square that has been fully developed. Player can have a maximum of one village program.

Pressing Enter walk on square mode along development starts the development and tells whether the player wishes to continue.

Money can be lost in the bank at a rate of 10 percent interest and borrowed at 20 percent. A player may not run out of ready cash or obtain a bank deficit of more than £10,000. If this occurs, the player cannot take on

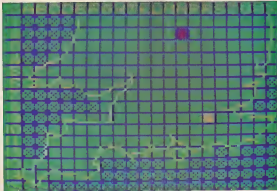
- Specialist on the map:**
 Player 1 — Yellow squares
 Player 2 — Red squares
 Player 3 — Blue squares

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Continued on page 102



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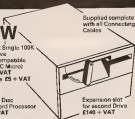
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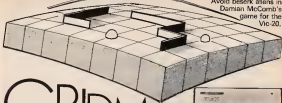
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Vic-20.



GRIDMAD



GRIDMAD is an Asterix-type game in which you control your galactic ship as a white grid walk sequence across alien planets. Your grid-plate leaves a black trail and you lose as completely Madas the grid and then return to home base — the pulsating character in the center of the grid.

Use below the pages I will describe here to type it on and save it. The game will run on the unexpanded Vic-20 that requires at least a KR expansion kit type in. The more memory it needs to store the loader program. This program will help you to enter and manipulate the object code in bits.

Memory memory: the header you may store it either above or below unexpanded Vic memory

For Vic with KR expansion kit

PAGE 041 0 PAGE 042 0 PAGE 043 0
PAGE 044 0 END 0400

Then type in and save the loader

If you have a KR expansion memory type

PAGE 045 0 PAGE 046 0 PAGE 047 0
PAGE 048 0 END 0400

For the very fast thing to be typed in a program. I then can be fix up to load the game code.

Page 1 — You enter a start address and that were entering the object code in hex. Start by typing "END"

Page 2 — You are asked for a start address and then the contents of memory, a based on

hex. Press this address on. To continue the listing press the space bar or to start a memory page any other key

Page 3 — Loads code into memory from which it was saved

Page 4 — Shows code between start and end addresses entered by you

Once you have entered all the code, to make further copies type

PAGE 041 0 PAGE 042 0 PAGE 043 0 PAGE
044 0 END 0400

Obviously each copy of the object code must be preceded by a copy of program one. To control your grid-plate you can use a joystick or a large selection of keys.

(Continued on page 107)

Addr	0400	0401	0402	0403	0404	0405	0406	0407	0408	0409	040A	040B	040C	040D	040E	040F	0410	0411	0412	0413	0414	0415	0416	0417	0418	0419	041A	041B	041C	041D	041E	041F	0420	0421	0422	0423	0424	0425	0426	0427	0428	0429	042A	042B	042C	042D	042E	042F	0430	0431	0432	0433	0434	0435	0436	0437	0438	0439	043A	043B	043C	043D	043E	043F	0440	0441	0442	0443	0444	0445	0446	0447	0448	0449	044A	044B	044C	044D	044E	044F	0450	0451	0452	0453	0454	0455	0456	0457	0458	0459	045A	045B	045C	045D	045E	045F	0460	0461	0462	0463	0464	0465	0466	0467	0468	0469	046A	046B	046C	046D	046E	046F	0470	0471	0472	0473	0474	0475	0476	0477	0478	0479	047A	047B	047C	047D	047E	047F	0480	0481	0482	0483	0484	0485	0486	0487	0488	0489	048A	048B	048C	048D	048E	048F	0490	0491	0492	0493	0494	0495	0496	0497	0498	0499	04A0	04A1	04A2	04A3	04A4	04A5	04A6	04A7	04A8	04A9	04AA	04AB	04AC	04AD	04AE	04AF	04B0	04B1	04B2	04B3	04B4	04B5	04B6	04B7	04B8	04B9	04BA	04BB	04BC	04BD	04BE	04BF	04C0	04C1	04C2	04C3	04C4	04C5	04C6	04C7	04C8	04C9	04CA	04CB	04CC	04CD	04CE	04CF	04D0	04D1	04D2	04D3	04D4	04D5	04D6	04D7	04D8	04D9	04DA	04DB	04DC	04DD	04DE	04DF	04E0	04E1	04E2	04E3	04E4	04E5	04E6	04E7	04E8	04E9	04EA	04EB	04EC	04ED	04EE	04EF	04F0	04F1	04F2	04F3	04F4	04F5	04F6	04F7	04F8	04F9	04FA	04FB	04FC	04FD	04FE	04FF
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(Listing continued on page 107)

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Program 1

1. This program is designed to simulate the movement of pieces on a board.

```

1000 DIM A(10,10)
1010 FOR I=1 TO 10
1020 FOR J=1 TO 10
1030 A(I,J)=0
1040 NEXT J
1050 NEXT I
1060 GOTO 1100
1070 INPUT "Enter piece number (1-6):"; P
1080 INPUT "Enter row (1-10):"; R
1090 INPUT "Enter column (1-10):"; C
1100 A(R,C)=P
1110 GOTO 1100
1120 INPUT "Enter direction (Up, Down, Left, Right):"; D
1130 IF D="Up" THEN R=R-1
1140 IF D="Down" THEN R=R+1
1150 IF D="Left" THEN C=C-1
1160 IF D="Right" THEN C=C+1
1170 IF R<1 OR R>10 OR C<1 OR C>10 THEN GOTO 1100
1180 IF A(R,C)=0 THEN GOTO 1100
1190 IF A(R,C)=P THEN GOTO 1100
1200 GOTO 1100
1210 PRINT "Board state:"
1220 FOR I=1 TO 10
1230 FOR J=1 TO 10
1240 PRINT A(I,J);
1250 IF J=10 THEN PRINT
1260 NEXT J
1270 NEXT I
1280 GOTO 1100

```

Continued from page 100



The key at the top left of the keyboard moves the piece northward and powers up.

There are eight different levels of chess attacks and they start off fairly slowly at level 1 and get faster with each level. Each level has two phases. Phase one has 10 of the chess and one phase two has 10 of chess. After this a game back to us, but the

level goes up and you a new kind of chess appears.

Your task is to completely cover the whole grid with black and chess to return to home base at the quadrate zero. If you return to base before completing the grid you will lose a life. You cannot destroy the previously chess as you must avoid them.

All of this work's enough unless you don't do it continuously decreasing energy supply at the bottom of the screen. If this falls empty you lose a life. However when you complete a grid and return to base you will get a bonus for remaining energy. You will have to go quick though since this is the only way you can score.

The lowest high score the game will accept is 1000 and you also get a 100 life at this score.

Advanced mode

```

1. This program is designed to simulate the movement of pieces on a board.
2. It is a more advanced version of the program above.
3. It includes a timer and a score system.
4. It also includes a bonus system.
5. It is designed to be played on a 10x10 grid.
6. It is designed to be played on a computer.
7. It is designed to be played on a terminal.
8. It is designed to be played on a printer.
9. It is designed to be played on a screen.
10. It is designed to be played on a keyboard.
11. It is designed to be played on a mouse.
12. It is designed to be played on a joystick.
13. It is designed to be played on a trackball.
14. It is designed to be played on a light pen.
15. It is designed to be played on a touch screen.
16. It is designed to be played on a voice input device.
17. It is designed to be played on a gesture input device.
18. It is designed to be played on a brain-computer interface.
19. It is designed to be played on a neural network.
20. It is designed to be played on a quantum computer.

```

Incidentally you can speed up or slow down the game with the following two functions:

- 1001 = speed of your grid cycle
- 11 = normal, any higher than
- 1002 = speed of chess
- 10 = normal

In order to change these you will have to define the part of program you which handles the run parameters, i.e. the last few lines of this is line 100 - AKA 100, 10 11

Whenever you load out of the game, it means play 100 1000

I have a cassette available containing Graphics, for \$5.00 at the following address: Graphics, 100, 11 Woodlawn Drive, Decatur, Co. Texas, 75701 14

There is also a cassette of the Flying Soccer Attack program for \$3.00 from the same address.

1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500
1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500



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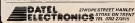
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Whenever you want to use *Smiles*, Load this program which starts RAMMap at address 12500. Now you can start entering the line codes in Figure 1, using program 2 — a second line loader with one extra advantage: when data has to be entered, you do not have to type the line codes corresponding with the data. You use just the data provided and coded by a dollar sign.

So, when you want to enter *Smiles* as data, you do not have to type 10203120910301 — the line codes for the individual letters — but simply 1020310301. This facilitates entering data. The Load, Save and Restore statements in the data at address 12400 can be obtained from the keyboard by typing: Then, followed by the statement concerned and finally by defining the keywords. Then and putting the cursor back in its correct position. Figure 1 contains all the machine-code instructions and every four bytes of data is provided with an address-indication, so you can check whether or not you have forgotten one or more bytes or double-typed some.

If you think you have mistyped a byte, break into the program by entering: *Quit*. You will get an error-message, but do not bother about that. Make a note of the address at which you made your mistake, let, for instance 70 and change 12700 into your address. When you Run again you can start entering the line codes from this address onwards. After having entered all the hexadecimal and data you will have to adjust the program to a final size by means of program 3.

Check everything very carefully as one little error might cause an unretrievable program-crash. Once you have tested all the bytes for accuracy, you can Save them.

This has to be done with a special program as the position of RAMMap and the bytes above it are not Saved by the Basic-level Program 4 (see machine code to copy a block of bytes into memory A, then Saves the program and again uses machine code to copy the contents of A, placing them at their proper positions, starting at address 12300).

The machine-code program to achieve this is shown in Figure 2. The second time this machine code is used the *Exit* field is changed into *Map* if you have done everything as described, the program can be Run.

Smiles offers three possibilities after being executed. I will discuss them one by one.

Save. One statement that has to be used is to include a program-name. This name has to be put between a *Quote* statement in the first line of the program. It must contain at least one and at most 30 characters which all have to have a code between 11 and 64. Spaces are also allowed.

An error-message is displayed if the first line does not contain a *Save* statement or the number of characters behind the *Save* is too

small or too large or illegal characters are found, if all is correct, the program is loaded. On entering the program one number is seen, or *Run*.

Smiles-Load will put a back into visible memory. If you have machine code stored in the first line here is a hint for you as to how to adapt a *Print* type Pake 10310.2. The instructions transfer the first line, the one with the machine code, to line 2. If you already have a line 2 in your program that will not be overwritten by the new line 2.

Next, add line 1 including the program name. To Run the machine code — in the second line — see Read User 12444+Peak 0511 instead of Read User 0, where X is something around 10114. You will have to go through your Basic and machine-code program to change the addresses that are called by User and Call.

For example, if you give a certain program the name *Name* then Peak 10111 equals 0. The machine code that first stored at address 0510, now starts at address 12444+Peak 0511 or 10114+0+0 = 10114. If you want to Save a Program without having to pass the memory, see Read User 12423.

Load: Having Saved several programs using the above routine, you will probably want to reload them. This can be done employing *Smiles-Load* after having executed Read User 12300 just choose Load. Now the computer will display a menu, showing all the programs available.

Pick one of them by pressing the key corresponding with the number — or letter if there are more than nine programs — on the menu — or from the name. The program will now reappear as first loaded and Load the program positioned. Although the Loading job is very, very fast it still might take a little while.

Once the program has been loaded it is automatically executed if you do not want the intermediate map, just type Pake 03700.0 and to regain the *Smiles* Pake 11735.04. Error messages are given when no programs are

available from the disc or when the program is already in memory, or not so called.

When one program is Saved and another Loaded, all the variables used with the first may remain. You can use this with different programs to preserve and manipulate strings.

The programs are stored above each other, all before the display file, that is shifted up each time you add a program.

After being Run program 3 will show all the programs stored.

New will destroy the total contents of the disc, not only the one that can be used.

When User 10425 or Save is executed within the program, the machine code remains until a *Quit*, *Clear* or *Run* statement is found, then the computer will stop with an end-of-operation message. *Run* and *Clear* are always generated after *Smiles-Save*.

To use a disc on cassette I should use program 6. The machine code is not Saved by the *Smiles-Use* program 4 instead.

If it is best to you all the full "ideas" on our cassette, provided by program 1 — which costs RAMMap — and program 2 which Loads the machine code about RAMMap.

If you have any questions write to me: Carlo Delfino, Emmanuele 3, 00151 RV Ronzoni, Holland. Finance include all mailing.

```
Program 1
10000 00000000 00000000 00000000
10100 00000000 00000000 00000000
10200 00000000 00000000 00000000
```

```
Program 2
10000 00000000 00000000 00000000
10100 00000000 00000000 00000000
10200 00000000 00000000 00000000
10300 00000000 00000000 00000000
```

Figure 2

Address	Code	Comment
10000	00000000	LD SP, 12400
10001	00000000	LD SP, 12400
10002	00000000	LD SP, 12400
10003	00000000	LD SP, 12400
10004	00000000	LD SP, 12400
10005	00000000	LD SP, 12400
10006	00000000	LD SP, 12400
10007	00000000	LD SP, 12400
10008	00000000	LD SP, 12400
10009	00000000	LD SP, 12400
10010	00000000	LD SP, 12400
10011	00000000	LD SP, 12400
10012	00000000	LD SP, 12400
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10097	00000000	LD SP, 12400
10098	00000000	LD SP, 12400
10099	00000000	LD SP, 12400

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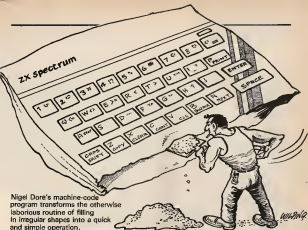
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Nigel Dora's machine-code program transforms the otherwise laborious routine of filling in irregular shapes into a quick and simple operation.

SPECTRUM

PAINT ROUTINE

Before using fill



After using fill with paint inside of shape



After using fill with paint outside of shape



FILLING IN (IRREGULAR) shapes on the Spectrum can be a long and laborious process, which can be avoided by using the fill routine.

The program, which is entirely in machine code, will fill any enclosed area simply given one paint shade of it. The machine code is approximately 900 bytes long but requires about 8K for storage of a normal screen. The use of assembly is no problem on a 48K Spectrum but leaves the 16K with about 2.

The fill routine is entered into memory by using the program in figure 1. The length of the machine code means that machine can easily made and the then saves the program in

extremely short command. So much so that the computer will tell you in which line you have made your mistake.

Having entered the program, save it before you Run it, then Run it. If there are no flagged variables the basic program will now self-destruct. If variables are detected then correct them and rerun the program, repeating if necessary. Check the machine code has been entered it can be saved with the command

SAVE: PLOT: CODE: 32000: 600

and loaded with the command

CLEAN: 28000: LOAD: PLOT: CODE:

(continued on page 120)

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ROCKET SCR

BBC

MINIABLE COMMAND is an arcade-type game for the BBC Micro Model B or Model A with ME. The program makes extensive use of the BBC's graphics and procedures to make a fast-moving fireworks in BBC Basic and machine code.

After each of the three programs have been Cleared, the computer will display the instructions. These show what the use of the game is and the control keys. The game is based on the arcade game *Minable Command*, but has some minor changes. Instead of using a ball to move your sights, you must use four keys. Also, instead of three separate missile boxes, you have one base in the centre which

can be used three times. This number is shown. It starts at three and works down. Six coins will be placed into your bank and you must collect these. Waves of enemy missiles appear from the top of the screen and work down towards your base. You can destroy these missiles by firing clouds of explosives in their path. The missile will be destroyed if a mine is cloud.

Each missile has come off with 10 minutes, which are fired by pressing the S key. To move your sights use the following keys:

W = up
X = down
A = left

D = right

Every so often, an enemy missile will fly across the screen and can only be destroyed by a direct hit from one of your missiles. Bonus points are gained for destroying these as well as for completing a wave. After each wave you will be awarded points for any missed missiles or ones left unattended. You also gain points by shooting the missiles and your score is displayed in the top right hand corner of the screen. If all your coins are destroyed the game will end. A bonus city is awarded every 10,000 points. Also, each wave of enemy missiles is slightly faster until they reach an incredible speed and wipe out all your cities.

PEN

Two separate routines, *infectio* & *offscr*, draw shapes over which the player can shoot a stream of bullets. The *infectio* routine is used to draw the shape of the enemy's gun, and the *offscr* routine is used to draw the shape of the enemy's shield.

```

Program 3
Line Use
100 Define the enemy's gun
110 Define the enemy's shield
120 Define the enemy's laser
130 Define the enemy's laser
140 Define the enemy's laser
150 Define the enemy's laser
160 Define the enemy's laser
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Line Use
100 Define the enemy's gun
110 Define the enemy's shield
120 Define the enemy's laser
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is well as 234 to 355. Therefore, page 234 is not higher up in the memory to avoid overlapping the program. This is achieved in the first program, so that all subsequent programs will be loaded from location \$1180 onwards.

The machine-code program is assembled from ASCII keywords and requires slightly over one page. Therefore, once the program has been fixed, pressing the **break** key will convert the machine code and you must return it. Do not press the **break** key until you have finished playing. The machine-code subroutine is used to print the explosions and should be quite easy to follow. The program requires data for the explosions to be stored in \$8480 onwards. This tells the computer what size explosion to print and at which angle. The program copies with some different sizes of explosion as, sometimes, when two explosions overlap, a gap might appear between them. Therefore, try to avoid overlapping explosions when playing the game.

The main program should be quite easy to follow. To help with understanding how the program works, I will give a brief description of what the main parts do.

Program 1 description

Line	Use
80-111	Print up title page
120	Define text screen
130	Set page and chain rates

Program 2 description

Line	Use
20-100	Print up control keys
120-150	Define envelopes
170	Define text screen
180-600	Define characters for explosions
610	Define pointers
680	Define IDs
730	Define terms

740	Define variables
750-760	Set up pointers to explosion in \$8480
770-800	Make up explosion from character and store in appropriate place in \$8480
810-1080	Assemble machine-code program
1090-1110	Reset positions of explosion data
1120	Chain this program

Program 3 description

Line	Use
50	Top screen
60	Assemble explosion
110	Make laser variable
120	Get page
130	Delay your sight
140-150	Your movement
160-180	Update score
200	Plot your sight
210	Fire missile
220	Countdown timer for missile firing
230	Miss counter
240	Move missile print explosion, miss missile
250	Printed miss?
260	Score points
270	Score finished?
280-300	Make up explosion
310-400	Print up miss screen
420-430	Set up positions of ID's
440-450	Print missile data
460-470	Put missile inside laser

Continued on page 123

To fit the programming into the BBC's 16K, requires some tidying. In fact, the program must be split up into three parts, which have the following functions:

- Display title page and set page to \$1180
 - Display control keys, define envelopes, define graphics characters and assemble machine code
 - The main game
- Unfortunately, the printer used has changed all occurrences of # in the program to & in the listing. This is most noticeable in the machine code, so every time a & appears in the listing, change it to #.

The program defines characters 170 to 233

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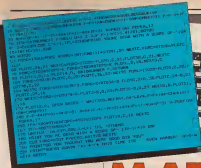
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- Make 2 Volume, Weights Percentages Fractions Area Time Minutes (Substrate) Test 2 Game 2
- Make 3 Directed Number Coordinates Angles Area Probability Density Temperature Expansion Test 3 Game 3
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Boolean algebra puts the zip in this fast Oric game by Russ Whitehead.

MATRIX isn't speed achieved primarily by reducing the repeated part of the program to just three lines, and it made possible such the use of Boolean algebra and by taking rather than placing characters on to the screen.

It was developed after having played many other slow games and being bored by the offers of future computer games in school and in the town in which I live. I was determined to find a game which was interesting, colourful and fast moving. It was an obvious attempt at a Free logic style program which eventually allowed me to produce Matrix Run.

Even then my problems were not resolved. The usual program was so slow that I could have seen the mouse while playing the game and still not see a life. I finally achieved success after discovering the advantages of Boolean algebra, and with the help of an April 1982 First Computer month on Spectrum the graphics which gave me some time to quit playing.

The object of the game is to move the 200 cycles or movements of the runner without crashing into a wall, a grass obstacle or a blue obstacle. These obstacles are placed in rows and columns and the blue obstacles are placed randomly. On completion of 200 cycles there is a jump and a new screen appears. The blue water grass and blue obstacles to avoid. Each new screen becomes increasingly harder and the 170 when a new type of maze situation appears.

The screen consists of consecutive squares and the aim is to reach the centre of the maze. However, as you drift out of you are lucky enough to get the life there are no opponents in the squares. To create them you must pay

MATRIX RUN

Variable	
A	Position of the runner - 0 = dead on the screen
C/D/E	Variables used in the five first lines, most common = D
F	The direction of the runner if F is 1 then the direction is up if F is 2 then the direction is right if F is 3 then the direction is down if F is 4 then the direction is left
G	The difficulty of the runner — how close the path boundary is to each other
H	The number of lives used up; the screen will lose every square has been passed; also the number of blue obstacles
I	The character at position A before the runner is plotted
J	A 200 number number — 200 = a used only to keep the 50 possible numbering of the five first lines to 10 of the runner position when it is on a screen; for some on the screen is recorded and is stored in the next line
K	What is open on the line — used to make key use up easy

directly towards the Open Gates sign.
 The game uses the left and right keys as a daily. But it must be borne in mind in all cases that left and right apply to the runner and not to the gate.
 At the start of the game you have three seconds to decide which way you want to go, and pressing an key means you will go straight onwards.
 Line 8 defines all the variables which are us-

ed at 8, and decides whether to Give the current goal screen on the main screen.

Line 18 defines the use of the main Run Next loop — how far the runner has to go — and sets the direction of the runner, F, when a key is pressed.

Line 20 alters the position of the runner — makes the runner move in the direction indicated by the key, and finds out which character occupied the position the runner now occupies. Line 30 determines if the character is an obstacle, and makes two statements for the completion of a grid.

Line 40 contains the list of instructions for the runner taking an obstacle.

Lines 50 to 80 set the screen — place the random Run data, and draw the grid. They also type the name of the game at the top of the screen.

Lines 90 to 120 set the main screen. Line 130 starts Open Gates at the top of the screen, sets up a repeat loop and alters the direction of the runner when a key is pressed.

Line 140 has the same function as line 20.

Line 150 opens the gates into the maze when the runner passes beneath the Open Gates sign. Line 160 finds out if you have reached the centre of the maze. Lines 170 and 180 do in the same function as line 40. Lines 200 to 230 contain the list of instructions for reaching the centre of the maze.

Let battle

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Move your cat and (killing) up this maze... eat a path through the ghostly ferocious... protect the panicky pointer... the 4 power... the 4 power... the 4 power... the 4 power...

Commence

IS YOUR ONLY DEFENCE!



**5 PATHS TO
EXCITEMENT
ON THE 16K
SPECTRUM!**



CATERPILLAR

The game caterpillar is coming to get you, helped by a host of wild enemies. Don't get segment by segment, beat it fully through the nearly empty forest the only creature. Talk to friends. Beware danger everywhere!



LEAP FROG

A frog necessary jumps on all ways home. Like a base of the message, a surprising filled-in jumping time. It's hard to see and only skip, but you know the way to see the frog's baby?



PAINTER

Dearborn color looking easy to paint the already (don't paint the 3-D color). Can you paint before it's too late? All the computer says go! And... and... - the game goes fast! Or you go order!



BOOBY BOAS

By... who's life being a lot in an... country game that... you can't... you are... and... and... you... and... you... you... you...



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we'll
keep on
coming
to
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DUEL

HINT: at 10:00:00 on the August issue, is the dual computer version of Submarine Warfare. Enough time has been allowed for fledgling programmers to get their rapid-eye eye on with the new program. Here for the moment of truth — a suitable opponent.

To link up two Spectrum for our present purpose clearly demands some hardware. In fact, I have written the 100 handling routines of the program around the Programmable Sound Generator and IO board — (PSGIO) — used for the Moscow contest featured in the March edition of Your Computer. That interface sometimes gets ugly a little more than a manual release on the 100 week of Submarine Warfare, but we chose these alternatives for several reasons.

In the first place, a considerable number of readers already have a PSGIO board. Secondly, with such versatile sound and IO capabilities, it can lay some claim to being the most useful general purpose add-on for the Spectrum. Finally, the sound can be very easily built by home constructors, or bought ready made for a very reasonable price. This is not to say that other IO interfaces might not be used. Indeed, machine code adapts should find modifications of the relevant benefit of various a very straightforward manner.

As a substitute for two Spectrums and three operators, Submarine Warfare adds a novel exciting extra dimension to home computing, the atmosphere and tension are of a different order. But for all that, the dual system is simply achieved. During each major program loop, one of the computers — shall we use the master — will inform the others — the slave — that it has data ready to send.

Meanwhile, every 20 ms the slave polls the master to check whether data is ready. If that should be the case then the slave will receive data, on completion of which roles are exchanged, the slave becoming the transmitter. The roles of master and slave are established automatically during initialization — line 1000 on — and we resumed through program restarts. Through the use of priority interrupts, one computer can dominate on agreed upon at the same time.

Polking at 20 ms intervals is achieved by polling the slave computer via interrupt;

AT SEA



This interactive submarine game by Rod Hopkins means you can pit your wits against another sub commander.

mode 2 and extending to various routines to enable reading the PSGIO input port. This method of synchronizing hardware has the great advantage that the performance of one computer does not depend that of the other.

Since real-time flag-indicating routine status information are being maintained, interrupt of data is important. For this reason, handshaking has been employed during exchanges, in the standard configuration. The format is an extended receipt of acknowledgement and acknowledgment, while a checksum is some numerical fraction of the data sent, appended to that data, and used by the receiver to verify the data.

Handshaking has been necessary, because handshaking was required by using the upper three bits of each byte of acknowledgment, the lower eight bits being reserved for data. This involves a certain amount of processing of both data for transmission and data received.

For each message, appended to the six variable transmission bytes, is a return to the sending submarine. It tells program elements and sends a data checksum, a receive checksum and sends a return data to the parallel set. The variables contained are shown at table 1.

Table 1

data	return/receive checksum
data	return/receive checksum
data	data/receive checksum
data	data/receive checksum
data	data/receive checksum
data	data/receive checksum

Let me emphasize at this point that the dual version of Submarine Warfare is very much an extension of the solo release, rather than a separate entry. For the most part in fact, it is the same basic code additions being mostly executed with IO.

Therefore the assumption is made that the hardware on next page!

Figure 2 Master-slave connection



Continued from previous page

reader: taking on the task of a pig in the dual program has already made a copy of the data on Figure 1 into the main addresses of main and program, of the two computers set up, these marked with an asterisk, marking the 10000 board, and so that the routine which will need modification to allow use of the program with any other interface.

If the steps outlined below are followed carefully, then the conversion from solo to dual operation should be fairly painless.

■ Write a print area into page/footer program ending with the line

```
200 PRINT PAGE FOOTER PROGRAM
CLEAR 3000
```

```
210 LOAD * 0000 LOAD *
```

Note that an asterisk stands in the last of a dual tape, which we shall refer to as tape 1.

■ Type Clear 3000 New and then load in the Code 3000.3000 of the solo program.

■ If you prefer Word and Base to be in their main memory operation, and assuming you have kept a copy of the Classroom Drawing Routine, load in this routine, make the necessary change to line 100, Run, and save the new routine on a different tape. (Always double check! Load a fresh area via 300 block of code by typing,

```
LOAD CODE 3000.000
```

If you intend making this change, it must be done in this order.

■ Change the leader section given in the Appendix (page 112), top left, attach the seven blocks of code (given in Figure 2) if the job is loaded in more than one format, always save and reload using

```
CODE 3000.3000
```

■ Carefully enter the following in a decade

```
successor line
FOR M=0000 TO 0001 STEP 1 FOR
M=01 0000 0001
```

Place in these bytes in the right octagonal address format: 0750.

Simple register set up

ADDRESS	DATA	ADDRESS	DATA
0000	0	0000	0
0001	0	0001	0
0002	0	0002	0
0003	0	0003	0
0004	0	0004	0
0005	0	0005	0
0006	0	0006	0
0007	0	0007	0
0008	0	0008	0
0009	0	0009	0
0010	0	0010	0
0011	0	0011	0
0012	0	0012	0
0013	0	0013	0
0014	0	0014	0
0015	0	0015	0
0016	0	0016	0
0017	0	0017	0
0018	0	0018	0
0019	0	0019	0
0020	0	0020	0
0021	0	0021	0
0022	0	0022	0
0023	0	0023	0
0024	0	0024	0
0025	0	0025	0
0026	0	0026	0
0027	0	0027	0
0028	0	0028	0
0029	0	0029	0
0030	0	0030	0
0031	0	0031	0
0032	0	0032	0
0033	0	0033	0
0034	0	0034	0
0035	0	0035	0
0036	0	0036	0
0037	0	0037	0
0038	0	0038	0
0039	0	0039	0
0040	0	0040	0
0041	0	0041	0
0042	0	0042	0
0043	0	0043	0
0044	0	0044	0
0045	0	0045	0
0046	0	0046	0
0047	0	0047	0
0048	0	0048	0
0049	0	0049	0
0050	0	0050	0
0051	0	0051	0
0052	0	0052	0
0053	0	0053	0
0054	0	0054	0
0055	0	0055	0
0056	0	0056	0
0057	0	0057	0
0058	0	0058	0
0059	0	0059	0
0060	0	0060	0
0061	0	0061	0
0062	0	0062	0
0063	0	0063	0
0064	0	0064	0
0065	0	0065	0
0066	0	0066	0
0067	0	0067	0
0068	0	0068	0
0069	0	0069	0
0070	0	0070	0
0071	0	0071	0
0072	0	0072	0
0073	0	0073	0
0074	0	0074	0
0075	0	0075	0
0076	0	0076	0
0077	0	0077	0
0078	0	0078	0
0079	0	0079	0
0080	0	0080	0
0081	0	0081	0
0082	0	0082	0
0083	0	0083	0
0084	0	0084	0
0085	0	0085	0
0086	0	0086	0
0087	0	0087	0
0088	0	0088	0
0089	0	0089	0
0090	0	0090	0
0091	0	0091	0
0092	0	0092	0
0093	0	0093	0
0094	0	0094	0
0095	0	0095	0
0096	0	0096	0
0097	0	0097	0
0098	0	0098	0
0099	0	0099	0

Figure 4b: Bit manipulation in decoder

BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT
1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1
22	1	1	1	1	1	1	1
23	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1
25	1	1	1	1	1	1	1
26	1	1	1	1	1	1	1
27	1	1	1	1	1	1	1
28	1	1	1	1	1	1	1
29	1	1	1	1	1	1	1
30	1	1	1	1	1	1	1
31	1	1	1	1	1	1	1

Register 7 bit functions

1	0	1	0	1	0	1	0
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0

```
0000 00 00 00 00 00
0001 00 00 00
```

■ For the addresses listed below, take in the corresponding type:

```
0000 00 00 00 00 00 00 00
0001 00 00 00 00 00 00 00
0002 00 00 00 00 00 00 00
0003 00 00 00 00
```

Save the entire block of code in Code 3000.3000 on tape 1 immediately following the solo page program.

Change to the Base being set to follow:

■ Delete line 100, which should not be present in the solo version either. Also line 0004, lines 0005 to 0000 and lines 0000 are void.

■ Type all the 144s given in Figure 3.

■ Using the Vat function and combinations of assigned variables, compare non-dynamic parts of the program or, as a possible, for example the Pattern routine, the Bit routine and the Decoder routine. Note that variables A through H are used in constants, setting the values 0 to 7. To replace the number 30 for constant, VAL "30" saves three bytes, while H"3" saves five. Do not use the technique of base constant jumps since it will slow down interpretation too much.

■ Save the resulting listing on tape 2 in code run mode, immediately following the 3000 block of code. This will complete the routine.

It will be noted that in both versions of the

program, manual has been prepared using the Spectrum loader. The method has been chosen in the dual version both to make the run version more straightforward and to allow room for individual code which runs greatly in this area. Needless to say, the workload is double of the greater change than the loader, and a complete staff to program. Lack of space precludes a full discussion of manual programming in this context. Suffice it to say that the manual chip is represented in two-by-two units.

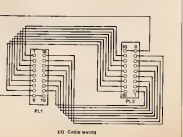
Q) Final in a register (0-15) as far as sound is concerned — by accessing in Out (21), Run the instruction in Base as machine code.

Q) Send data to the register by executing in Out (21), type instructions, open either in Base or machine code.

Continued on page 120



Figure 2: General output I/O cable



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Just by plugging in extra interfaces to each

S RINGS STICKS.



TRICKSTICK

other, up to eight of you can loop the loop and battle it out. All at the same time.

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So fill in the coupon now. And start turning rings around your mates before they start turning rings around you.

→ → → → → → → → → → → → → → →

Price (and the 24hr number required) -
 Tricksticks with training software at £28 each + postage at £7.50
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HyAccess Visa
Name Address

Please send no post payment for this to your Trickstick. Under £10.00 now otherwise please to 05-550200 at your convenience morning 9a. to 5.30p. 1820 Avenue Road, St. Albans, Herts. AL3 3JG (Team 01332) 320000. See us at any local computer or model shop.





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It's by going down to your local Dragon stockist.

 **DRAGON**

Continued from page 120

Figure 4 summarizes the functions of each PSC register. Ah gives a breakdown of the functions of register 7 along with an example of the manipulation to be done, and a couple of other examples for experimenting with equal or less. For more detail, readers might refer back to the March issue of *Your Computer*.

Figure 5 lists the code for a general purpose PSC subroutine — a 12700 — and two other routines to replace the keypad or basic program lines 1290, 4000, 101, 145, 305 and 4008. To use the routine at 12700 for your own special effects, a very straightforward, as I will show, find a spare slot in RAM. Immediately following the figure 5 code up to 1211 is the code having included on the required register data using the basic experimenting routine, over it to 16 sequential addresses in descending register order. That is, register 11 first, register 9 last. From the next line address, over a seven-byte routine.

It is most critical of register data on 12800.

Then, 21 bytes in all are needed for each extra routine, a very small overhead indeed. Almost, however.

Figure 6 shows the schematic of the two-computer link. Both computers are precisely the same program. Now doing maintenance, Port A is set up to output, Port B to input. It follows therefore the communication is managed by connecting one computer's Port A to its opposite number's Port B and vice versa. For home constructors, probably the easiest method of constructing the link would be to buy a pair of 18-pin dual in-line header plugs, and using flexible stranded wire, hardware according to Figure 6. For those without the resources of confidence, an easier solution is offered at the end of the article.

Whatever, both ports are TTL-compatible and can readily drive the couple of feet of cable required. The various stages of the PSC10 board in green as it was cutting that is not readily available, and presents an

operational problem. It is worthwhile emphasizing that since a-priori, the board and cable can perform an endless variety of interesting tasks effectively. It is to A or A or B, upwards, sound to logic units, send to parallel ports, perhaps even a little power status or not!

180 programming follows the same format as that for equal generation. First of all, set up the ports in the desired configuration. Lines 8 and 9 of register 7 describes the links, controlling Port A and Port B in that order. A logic 1 in the appropriate bit sets the corresponding port to output mode and vice versa, so that:

OUT 121 7 OUT 222 266

would place both ports at output mode, whereas:

OUT 121 7 OUT 222 127

leaves Port A in output mode, Port B in input mode. Registers 14 and 15 set data codes for ports A and B respectively, at which A set to output,

OUT 121 14 OUT 222 227

would establish the data base 120 on the port A pins of the expansion socket. Similarly, with B set to input,

OUT 121 15 IN 222 14 120

will transmit whatever data is present on the B pins of the socket. With nothing connected these pins would float at around two volts, sufficient to be seen as logic 1s, giving the appropriate result of 255. That's all there is to it.

Search all both computers before connecting the soundboards, plug in the cable at both ends before switching on. After verification, if other party intends to do any experimenting with the soundboards, both should use type:

OUT 121 7 OUT 222 127

Then, when using register 7 for sound control, ensure that any number loaded into it is greater than 81 and less than 128. This of course, only applies when two boards are linked together. Both computers could Load Subroutine Mason at the same time, if a simple Typewriter adapted is made to connect between their 400 sockets and the one order of

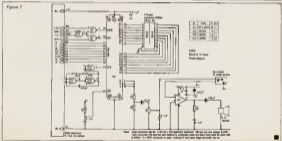
the tape recorder. If by any chance, one of the computers should crash for whatever reason, it would be wiser to switch both off!

A cavity carrying both the side and dual versions of Subroutine Mason, the PSC10 interface and the cable can all be obtained, the hardware built back and tested, from French Computing, Cyclestyle Bank Buildings, South Queensferry, Midlothian the price is:

Cables 19.99
PSC10 interface 218.25
10 cable 14.75

Figure 7 lists machine-code routines for dual Subroutine Mason.

Register	Function
0	set Channel A tone period 1.02
1	set Channel A tone period 194
2	set Channel A tone period 1.02
3	set Channel B tone period 194
4	set Channel B tone period 1.02
5	set Channel C tone period 194
6	set Channel C tone period 1.02
7	enable noise period of channels
8	enable noise and to start on all channels, control 0 disable
9	channel A amplitude 81 to 127
10	channel B amplitude 81 to 127
11	channel C amplitude 81 to 127
CONTROL	
12	envelope period of channels 1.02
13	envelope period of channels 194
14	define envelope shape
15	10 Port A data store
16	10 Port B data store



PROGRAMS WANTED

SPECTRUM DRAGON
DEC 28/81WORK  FORCETHE BIGGEST
LITTLE SOFTWARE
HOUSE AROUND**THE
WINGED
AVENGER****DO YOU FEEL SO...**

...like you've fallen behind in your work? ...like you've been taking on too much? ...like you've been putting off your work until it's too late? ...like you've been procrastinating? ...like you've been taking on too much? ...like you've been putting off your work until it's too late? ...like you've been procrastinating?

**Do you
Feel So
Grumpy?****THE BIGGEST
LITTLE SOFTWARE
HOUSE AROUND****THE WINGED AVENGER**

Fast and Furious! This version of the same game as "The Winged Avenger" is a... (text continues with details about the game's features and pricing)



... (text continues with details about the game's features and pricing)

PROLOGUE NUMBER ONE
... (text continues with details about the game's features and pricing)



SIXTY SIXTY SIX
A SIMPLE VERSION OF THE ORIGINAL... (text continues with details about the game's features and pricing)

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... (text continues with details about the game's features and pricing)

MATCH!
THE SPECTRUM
... (text continues with details about the game's features and pricing)



JAWS
... (text continues with details about the game's features and pricing)

DISPLAY
... (text continues with details about the game's features and pricing)

CLONE
... (text continues with details about the game's features and pricing)

**THE PROGRAMS ON
THIS PAGE ARE
ONLY AVAILABLE
AND AVAILABLE
ON SPECTRUM**
... (text continues with details about the game's features and pricing)

WORK FORCE
140 WILSON AVENUE
LUTON MK35
Post Included

Listing 1. *Circle program*

```

1000 FOR C=1800
1010 C=C+30
1020 C=C-30
1030 IF C<0 GOTO 1000
1040 IF C>360 GOTO 1000
1050 GOTO 1000
1060 GOTO 1000
1070 GOTO 1000
1080 GOTO 1000
1090 GOTO 1000
1100 GOTO 1000
1110 GOTO 1000
1120 GOTO 1000
1130 GOTO 1000
1140 GOTO 1000
1150 GOTO 1000
1160 GOTO 1000
1170 GOTO 1000
1180 GOTO 1000
1190 GOTO 1000
1200 GOTO 1000
1210 GOTO 1000
1220 GOTO 1000
1230 GOTO 1000
1240 GOTO 1000
1250 GOTO 1000
1260 GOTO 1000
1270 GOTO 1000
1280 GOTO 1000
1290 GOTO 1000
1300 GOTO 1000
1310 GOTO 1000
1320 GOTO 1000
1330 GOTO 1000
1340 GOTO 1000
1350 GOTO 1000
1360 GOTO 1000
1370 GOTO 1000
1380 GOTO 1000
1390 GOTO 1000
1400 GOTO 1000
1410 GOTO 1000
1420 GOTO 1000
1430 GOTO 1000
1440 GOTO 1000
1450 GOTO 1000
1460 GOTO 1000
1470 GOTO 1000
1480 GOTO 1000
1490 GOTO 1000
1500 GOTO 1000
1510 GOTO 1000
1520 GOTO 1000
1530 GOTO 1000
1540 GOTO 1000
1550 GOTO 1000
1560 GOTO 1000
1570 GOTO 1000
1580 GOTO 1000
1590 GOTO 1000
1600 GOTO 1000
1610 GOTO 1000
1620 GOTO 1000
1630 GOTO 1000
1640 GOTO 1000
1650 GOTO 1000
1660 GOTO 1000
1670 GOTO 1000
1680 GOTO 1000
1690 GOTO 1000
1700 GOTO 1000
1710 GOTO 1000
1720 GOTO 1000
1730 GOTO 1000
1740 GOTO 1000
1750 GOTO 1000
1760 GOTO 1000
1770 GOTO 1000
1780 GOTO 1000
1790 GOTO 1000
1800 GOTO 1000
1810 GOTO 1000
1820 GOTO 1000
1830 GOTO 1000
1840 GOTO 1000
1850 GOTO 1000
1860 GOTO 1000
1870 GOTO 1000
1880 GOTO 1000
1890 GOTO 1000
1900 GOTO 1000
1910 GOTO 1000
1920 GOTO 1000
1930 GOTO 1000
1940 GOTO 1000
1950 GOTO 1000
1960 GOTO 1000
1970 GOTO 1000
1980 GOTO 1000
1990 GOTO 1000
2000 GOTO 1000

```



Finlan Culwin describes a drawing program for the BBC.

This remarkably sophisticated graphics drawing system for the BBC Micro was originally designed for use with a digitizing table but has been tailored for use with mouse or keyboard.

Because developers of this idea have retained a part of the screen for the mouse. This has the advantage of allowing all the mouse changes to be interpreted directly by the drawing program, however it is that part of the

screen which could be used for drawing has been sacrificed.

This is a particular disadvantage if you are using the system to produce a picture for a different application. Part of the specification for this system has been for the mouse to only be an option when it is called. This was achieved by a short machine-code routine which will exchange the top of the screen for a reserved block of memory before Haman.

When the mouse is required the code will change the screen to make room and the mouse can then draw when the mouse is no longer required.

Other parts of the specification allow for plotting points, continuous lines and dotted lines in red, pink, purple, cyan, magenta and dotted lines by having a marker, plotting triangles and quadrilaterals by having two or three

(continued on page 143)

recovered from page 184) markers, and the production of filled or open circles by hitting one marker.

The main program uses the 16-color mode, and makes use of all 16 colors. This uses 20K of memory, as necessary for the program as of a program. This led to upgrading the system one two parts. The first part — being — is used to assemble the code for the memory exchange routine, on the user-defined character, contains a table which will be used by the main program and, finally, I did not Run the main program. It may also be useful if you include the example code for a printer dump routine in the program, if you intend to use this facility.

The main program — being 2 — is Changed automatically by the first program. It commences by constructing the menu and then exchanging it. You may just see a flash onto and all the screens after the program is loaded. Following this it sets for input (keyboard, touch, or keyboard) and also allows for a previously stored screen to be released — obviously for disc access only.

The program has two modes of operation: automatic and manual. In the automatic mode the position of the cursor is indicated by a flashing horizontal cross. This cross can be positioned by using the position or by using the shift keys. In order to make this less tedious, pressing the shift key in automatic mode with a cursor key, will speed up the movement of the cross.

In order to cause output to the screen, either the fire button on the joystick, or the Return button on the keyboard, has to be pressed. When using the keyboard options output is immediate and, in the case of lines, is between the current point and the point last marked. In the automatic mode this either causes an offset heading, or to be left as a marker on, if

it is the last point needed, the whole shape is produced.

To enter in positioning the markers the system produces a line between the last marker and the current position of the cursor as the cursor is moved. This is known as rubber banding. If a cross is required then pressing key X on the keyboard causes the first marker to be removed.

The screen can be cleared to the currently selected colour by pressing the C key in the mode and the printer stamp, if installed, can be pulled by pressing the G key. By pressing the M key the menu can be called.

When the cursor is on the screen the colour and function can be changed. The menu is divided into two parts, the left-hand part is the colour available. The currently selected colour is the one which is flashing, it can be toggled onto the next colour by pressing the C key.

The functions are displayed on the left of the menu. Again the currently selected function is the flashing one and can be toggled by pressing the F key. In control mode the pointer can be fixed by pressing the S key. In order to preserve the screen the screen information system is turned off.

After pressing the R key the recorder has to be prepared and when it is ready the Return key has to be pressed as usual. The current row or LEDs will light up and return on and the file has been completed and the same functions can be accessed again. This is, of course, automatic if you are using discs. To run from control to automatic mode the M key is pressed again.

The keys have been chosen to have a maximum value. If you would like to change these then the appropriate letter values in the program will have to be changed. For details see page 215 of the user guide.

The structure of the program is quite straightforward. The main control routine between lines 180 and 340 displays in several high-level control procedures depending on which key is pressed. Free-Headings will direct to one of two subsequent screens — JoyStick or Keyboard — depending on the mode, and update the global variables X% and Y% which are the current position.

Free-Colour first calls the machine-code routine labelled by MCON% and then directs to either Free-Function, Free-Colour or Free-Line as a header to the control functions used the M key is pressed to run.

Free-Function is probably the most complex part of the routine and depends upon three global variables: Count%, Targ% and Pos%. Targ% and Pos% are dependent upon the current function. The values are stored as an external entry. The data is stored in Page 4020 and is controlled by loading.

The base address of the table is known and the offset is dependent upon the function value. This method is at a much lower level than array handling by base and is only possible by the low-level programming.

Remembering the Free-Function, Targ% represents the number of markers, this has to be on the screen before output is called. Count% is the number already on the screen and Pos% is the Pos value needed as co-ordinates with the line. Pos contained the co-ordinates of the markers on the screen are stored in the dimensional array P% (L,2).

So when Free-Function is called, if Count% is less than Targ% that is all that is needed is the current co-ordinates to be stored at the screen, the value of Count% to be increased and a marker to be left on the screen. If Count% is equal to Targ% then control is passed to one of the drawing routines. The complete code is contained within Free-Function.

Listing 2: Main program

```

1000  REM *****
1010  REM *****
1020  REM *****
1030  REM *****
1040  REM *****
1050  REM *****
1060  REM *****
1070  REM *****
1080  REM *****
1090  REM *****
1100  REM *****
1110  REM *****
1120  REM *****
1130  REM *****
1140  REM *****
1150  REM *****
1160  REM *****
1170  REM *****
1180  REM *****
1190  REM *****
1200  REM *****
1210  REM *****
1220  REM *****
1230  REM *****
1240  REM *****
1250  REM *****
1260  REM *****
1270  REM *****
1280  REM *****
1290  REM *****
1300  REM *****
1310  REM *****
1320  REM *****
1330  REM *****
1340  REM *****
1350  REM *****
1360  REM *****
1370  REM *****
1380  REM *****
1390  REM *****
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1480  REM *****
1490  REM *****
1500  REM *****
1510  REM *****
1520  REM *****
1530  REM *****
1540  REM *****
1550  REM *****
1560  REM *****
1570  REM *****
1580  REM *****
1590  REM *****
1600  REM *****
1610  REM *****
1620  REM *****
1630  REM *****
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1790  REM *****
1800  REM *****
1810  REM *****
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1840  REM *****
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1860  REM *****
1870  REM *****
1880  REM *****
1890  REM *****
1900  REM *****
1910  REM *****
1920  REM *****
1930  REM *****
1940  REM *****
1950  REM *****
1960  REM *****
1970  REM *****
1980  REM *****
1990  REM *****
2000  REM *****

```

```

2100  REM *****
2110  REM *****
2120  REM *****
2130  REM *****
2140  REM *****
2150  REM *****
2160  REM *****
2170  REM *****
2180  REM *****
2190  REM *****
2200  REM *****
2210  REM *****
2220  REM *****
2230  REM *****
2240  REM *****
2250  REM *****
2260  REM *****
2270  REM *****
2280  REM *****
2290  REM *****
2300  REM *****
2310  REM *****
2320  REM *****
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2790  REM *****
2800  REM *****
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2870  REM *****
2880  REM *****
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2920  REM *****
2930  REM *****
2940  REM *****
2950  REM *****
2960  REM *****
2970  REM *****
2980  REM *****
2990  REM *****
3000  REM *****

```

```

3100  REM *****
3110  REM *****
3120  REM *****
3130  REM *****
3140  REM *****
3150  REM *****
3160  REM *****
3170  REM *****
3180  REM *****
3190  REM *****
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3890  REM *****
3900  REM *****
3910  REM *****
3920  REM *****
3930  REM *****
3940  REM *****
3950  REM *****
3960  REM *****
3970  REM *****
3980  REM *****
3990  REM *****
4000  REM *****

```

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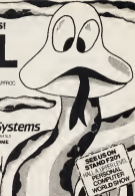
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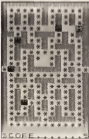
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Listing 1	01	START	011	LET B = 0 + 1	PRINT B;GOTO 4
10	PRINT "MAZE (1)	002	PRINT 040	100	PRINT 040
20	PRINT A4	003	PRINT 140	110	LET C = POWR X
30	PRINT 00	004	LET B = B + 1	120	PRINT 040
40	GOTO 030	005	LET D = 00 + 11 TO 1	130	PRINT 00, 00
50	LET 00 = 00	006	PRINT 10	140	PRINT
60	IF 00 = 00 THEN PRINT 00	007	PRINT "ENDGAME"	150	LET B = 0000 00 + 1
70	IF 00 = 00 THEN PRINT	008	PRINT 00	160	PRINT 040
80	PRINT 0, 10 + 0000 00 + 1	009	PRINT 100	170	LET C = POWR 00010
900	PRINT 0 + 000	010	PRINT 000	180	PRINT 00
90	PRINT 00 01 0	011	PRINT 000	190	LET 00 = 00 + 00
				200	PRINT

ZX-81 MAZE CHASE



This MAZINGO CODE VERSION of the popular Pac-Man game for the ZX-81 contains the main features of the original, including power points and fruit. The machine code is one of a 4-Kbit economy 1620 bytes long. This is obtained as the following way. First, enter the first line:

1 RUN 00 000000

Then, erase lines 2 to 9 by entering line 1. Finally, erase line 10 by entering line 1 and then adding one more character. Now

POWR 0000 0
POWR 0000 0
POWR 0000 0

then clearing one long Run instruction numbered 10, so that it cannot be accidentally erased. Do not let this get too strange as do so will put the display into an endless loop.

Now enter listing 1. This is a few bytes and few lines program which works entirely at hexadecimal, including addresses. If the program is Run it sets for the starting address to line 10. The machine code at listing 1 should now be entered starting with address 4000. A number of hex numbers can be entered together but they must be entered as pairs and not single characters. Once all the program has been entered, type 1 to stop the first line and

then save the program a couple of times on tape.

Now enter the following lines

1 SAVE MUNCHMAN
2 POWR 0000 0
3 CLR
4 RAND 0000 0000

and then delete the line leader by entering the hex numbers one by one and pressing NewLine. Now Running the program will Run the game and then Run it. Before doing this, however, it is advisable to first enter an 8 character

RAND 0000

This is to ensure that a suitable number is in the random number seed. Some machines cause the program to crash if the program starts Run correctly, then you will now have a correct version recorded which will save you when mistaked if not, then you will have to go back to one of your original saved versions or look for the number at the machine code Run 000 will produce a listing.

Lines 2 and 3 are necessary in the first program as the program was originally written to fit into line 10, 0K and elsewhere uses the minimum display file.

(Continued on page 140)

Speedy munchman Chris Bailey gobbles ghosts, pops power points and feeds on fruit to clear 16K of ZX-81 screen.

Listing 2	01	00 00 00	02	00 00 00	03	00 00 00	04	00 00 00	05	00 00 00	06	00 00 00	07	00 00 00	08	00 00 00	09	00 00 00	10	00 00 00	11	00 00 00	12	00 00 00	13	00 00 00	14	00 00 00	15	00 00 00	16	00 00 00	17	00 00 00	18	00 00 00	19	00 00 00	20	00 00 00	21	00 00 00	22	00 00 00	23	00 00 00	24	00 00 00	25	00 00 00	26	00 00 00	27	00 00 00	28	00 00 00	29	00 00 00	30	00 00 00	31	00 00 00	32	00 00 00	33	00 00 00	34	00 00 00	35	00 00 00	36	00 00 00	37	00 00 00	38	00 00 00	39	00 00 00	40	00 00 00	41	00 00 00	42	00 00 00	43	00 00 00	44	00 00 00	45	00 00 00	46	00 00 00	47	00 00 00	48	00 00 00	49	00 00 00	50	00 00 00	51	00 00 00	52	00 00 00	53	00 00 00	54	00 00 00	55	00 00 00	56	00 00 00	57	00 00 00	58	00 00 00	59	00 00 00	60	00 00 00	61	00 00 00	62	00 00 00	63	00 00 00	64	00 00 00	65	00 00 00	66	00 00 00	67	00 00 00	68	00 00 00	69	00 00 00	70	00 00 00	71	00 00 00	72	00 00 00	73	00 00 00	74	00 00 00	75	00 00 00	76	00 00 00	77	00 00 00	78	00 00 00	79	00 00 00	80	00 00 00	81	00 00 00	82	00 00 00	83	00 00 00	84	00 00 00	85	00 00 00	86	00 00 00	87	00 00 00	88	00 00 00	89	00 00 00	90	00 00 00	91	00 00 00	92	00 00 00	93	00 00 00	94	00 00 00	95	00 00 00	96	00 00 00	97	00 00 00	98	00 00 00	99	00 00 00	100	00 00 00
-----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	----	----------	-----	----------

(Listing 2 continued on page 140)

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Listing F (continued from page 165)

00 12	00 13	00 14	00 15	00 16	00 17	00 18	00 19	00 20	00 21	00 22	00 23	00 24	00 25	00 26	00 27	00 28	00 29	00 30	00 31	00 32	00 33	00 34	00 35	00 36	00 37	00 38	00 39	00 40	00 41	00 42	00 43	00 44	00 45	00 46	00 47	00 48	00 49	00 50	00 51	00 52	00 53	00 54	00 55	00 56	00 57	00 58	00 59	00 60	00 61	00 62	00 63	00 64	00 65	00 66	00 67	00 68	00 69	00 70	00 71	00 72	00 73	00 74	00 75	00 76	00 77	00 78	00 79	00 80	00 81	00 82	00 83	00 84	00 85	00 86	00 87	00 88	00 89	00 90	00 91	00 92	00 93	00 94	00 95	00 96	00 97	00 98	00 99												
00 00	00 01	00 02	00 03	00 04	00 05	00 06	00 07	00 08	00 09	00 10	00 11	00 12	00 13	00 14	00 15	00 16	00 17	00 18	00 19	00 20	00 21	00 22	00 23	00 24	00 25	00 26	00 27	00 28	00 29	00 30	00 31	00 32	00 33	00 34	00 35	00 36	00 37	00 38	00 39	00 40	00 41	00 42	00 43	00 44	00 45	00 46	00 47	00 48	00 49	00 50	00 51	00 52	00 53	00 54	00 55	00 56	00 57	00 58	00 59	00 60	00 61	00 62	00 63	00 64	00 65	00 66	00 67	00 68	00 69	00 70	00 71	00 72	00 73	00 74	00 75	00 76	00 77	00 78	00 79	00 80	00 81	00 82	00 83	00 84	00 85	00 86	00 87	00 88	00 89	00 90	00 91	00 92	00 93	00 94	00 95	00 96	00 97	00 98	00 99

(Continued from page 165)

The actual game is started by pressing any key. The mannequin appears on the screen as an average M. He is moved around the maze by the method first shown in Tom Baker's *Mystery House* (Ed in the ZX-4). The top line of keys moves him up, the bottom line moves him down, and the two middle lines are split so that the left-hand half moves him left and the right-hand half moves him right.

Collision with a glass screen means death. The mannequin's only advantage is his speed and his ability to go through the walls.

One guess is correct for each star screen. Clearing a screen will result in a being killed again.

Four times during each screen either that, represented by an average F or a percent point, represented by a 1 will appear underneath the glass. This killing that screen 10 points.



During power points screen 1 points, but also causes the glass to change so that they can now be seen by the mannequin. Each glass screen costs 20 points. All of these chances is score only last for about 10 seconds so you have to move fast.

At the end, the game is resumed by pressing any key.

00 00	00 01	00 02	00 03	00 04	00 05	00 06	00 07	00 08	00 09	00 10	00 11	00 12	00 13	00 14	00 15	00 16	00 17	00 18	00 19	00 20	00 21	00 22	00 23	00 24	00 25	00 26	00 27	00 28	00 29	00 30	00 31	00 32	00 33	00 34	00 35	00 36	00 37	00 38	00 39	00 40	00 41	00 42	00 43	00 44	00 45	00 46	00 47	00 48	00 49	00 50	00 51	00 52	00 53	00 54	00 55	00 56	00 57	00 58	00 59	00 60	00 61	00 62	00 63	00 64	00 65	00 66	00 67	00 68	00 69	00 70	00 71	00 72	00 73	00 74	00 75	00 76	00 77	00 78	00 79	00 80	00 81	00 82	00 83	00 84	00 85	00 86	00 87	00 88	00 89	00 90	00 91	00 92	00 93	00 94	00 95	00 96	00 97	00 98	00 99
00 00	00 01	00 02	00 03	00 04	00 05	00 06	00 07	00 08	00 09	00 10	00 11	00 12	00 13	00 14	00 15	00 16	00 17	00 18	00 19	00 20	00 21	00 22	00 23	00 24	00 25	00 26	00 27	00 28	00 29	00 30	00 31	00 32	00 33	00 34	00 35	00 36	00 37	00 38	00 39	00 40	00 41	00 42	00 43	00 44	00 45	00 46	00 47	00 48	00 49	00 50	00 51	00 52	00 53	00 54	00 55	00 56	00 57	00 58	00 59	00 60	00 61	00 62	00 63	00 64	00 65	00 66	00 67	00 68	00 69	00 70	00 71	00 72	00 73	00 74	00 75	00 76	00 77	00 78	00 79	00 80	00 81	00 82	00 83	00 84	00 85	00 86	00 87	00 88	00 89	00 90	00 91	00 92	00 93	00 94	00 95	00 96	00 97	00 98	00 99

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The LEAST SCIENTIFIC (and best) form of adventure is the computer and grid game focused on the first article in this issue — *First Computer*, September 1983 — which makes use of a fixed playing area represented by a two-dimensional array and upon which various obstacles, challenges, landmarks and other features are used.

Usually, these positions on the grid do not change during the course of any one game and, as the player is usually provided with a map, play becomes fairly predictable after a fairly short time is gained. With the C and G adventures, the program structure, therefore, does not commonly allow for more than one fixed response per successive, start a creature and he always kills you, or land on a certain coordinate and you will always be at the mouth of the next cave.

You can, of course, introduce one or two modifications to provide at least a little variation in the ordering of features, such as the location of the treasure to be discovered, but even so, more elaborate development is rather restricted. Nevertheless, designing computer and grid games is always a good exercise in writing tidy lines — and it is of particular value when it comes to gaining experience in assembling useful and legible screen displays.

With more advanced software the appearance of instruction and other mainly text pages seems to have less creative scope than the design of "lookbook" screens — whereas they are quite happy to spread across fitting panels to improve the looks of a disoriented player. When you remember how many times you and others will be conditioned by the text screens you write, it is surely worthwhile to devote just a little time making them neat and readable.

So, what should you watch for? First, screen composition more than a short line or one-off text usually looks better, and can be read more easily, if they are keyed on upper and lower case. Alternatively, if you have a generous supply of RAM to play with, you might prefer to copy your screen's scrolling RAM-based alphabet and digits onto a chunk of reserved memory and then refresh them specially for optimum readability.

Working through the pages of the weekly colour supplement, for example, will provide you with plenty of typographic inspiration for your electronic alphabet, as the site in particular makes use of minuscule and often novel characters for these two copy.

Secondly, do not overlook the value and flexibility of the SPC and TAB functions on screen browsers, and always use them in preference to the Cursor Right and Cursor Down keys when you want to advance more than one or three screen positions away. Doing so will save bytes as well as keyboard wear.

Next, remember to make the most of the role that colour can play in improving the appearance and player comprehension of screen displays — and in aiding to the atmosphere.

For example, an encounter with a diaphanous dragon might be appropriately declared as white floating against a black red background — whereas the player's subtle reaction may through the wall occur until too be



found in a text display of lights against a black background, but as most design the adventure programs rely heavily for their critical operation on the careful usage of Gex and logical statements.

Every instance of these are must be carefully thought through if you are not to end up at the wrong end of the advanced dragon's tongue when you really expected to be home and dry with the loot and/or dammed to death.

In this connection, keyboard response benefits from some form of suitable confirmation and it should be an easy matter to write at a Map instruction to provide this.

In the case of any Gex, it is always advisable to add a map key so that control will loop back to the starting line not only if the key is pressed but also in any but one of the designated keys is pressed.

Still on the subject of Gex statements, it is worth mentioning a warning flag about operational — and available — bug that can arise whenever Gex or Input does not follow a screen display and that effectively breaks the screen in such instances, you must introduce a delay loop so that the user remains no very long enough to be lost.

If you fail to do so, all you will see is a unnecessary change of screen before the program speeds on to the next instruction.

Before leaving what can be the increasing subject of screen presentation and associated comments, a word or two about the Great Two screen Text and Graphics Editors. The past year's games played on Scott Adams' adventures were quite content with working more than words.

Then along came Melbourne House and The Hobbit, with its bill of operativity incorporating no fewer than 30 graphically illustrated screens. However, players might argue that the whole point of adventure gaming is that it allows the player's imagination to role a full job. Indeed, the American software house Infocom, publishers of the new classics Zork and Deadline, states that one rather well on its job —

Variables	
DL	Difficulty level
B	Buffs
LN	Location North
LS	Location South
LE	Location East
LW	Location West
BB	Board position
S	Strength of torch battery
TL	Time limit
RS	Response

It's often our graphics from the limited images of text imagination — a technology is powerful, a modern day game that is a combination of a screen and life player's computer.

So that you may, it is also necessary to note that even Scott Adams is now beginning to make his graphics-enhanced versions of Adventureland, The Cave and other famous titles which started life when an ASCII CHR(10) was about all you could ever control the screen.

In any case, and even if you do have the spare RAM and the imagination and spirit to produce dazzling graphics, the most is probably now to create it. Working for a high resolution screen to build every other more screen around in the terminal states is watching paint dry.

The overall program structure for an open menu style of adventure — of which The Night Forest is a modest example — is fairly easy to grasp and design. The listing shown will run on a Vic 20 plus 32 expansion but — the title screen, page and help routine apart — the program is easily portable to other basic dialects.

Think of the program as a group of almost self-contained modules. One is there to create the playing area, one to make and implement each screen, and others pose encounters or role and they report the outcome. There are smaller modules to check the player's current position and other parameters.

In fact, elegantly structured it is not — yet does it part of the charm of open-style adventures, as they allow for plenty of

Underplaying — the answering in substitution of complex modules in other play variations and handsets events occur in the module's mind. It is even possible to add entirely new modules by simply updating only the ES logic and using a Gate that passes control to the risk and most elements of a training module.

A walk through The Night Patrol's living, while referring to the guide notes which follow, should help you to understand how it all comes together and to start writing your own message-on-a-lyle's adventure.

You had better keep it simple to start with. Only you have the experience of constructing an original program that runs the way it should, you can then look at other modules, graphics and sound effects.

In The Night Patrol, lines 120-134 make a start by taking 180 rich symbols — 1800, actually — into random locations and collecting them green. Lines 136-149 set up the instructions option, and the first trap trap occurs in the last of them, looping control back to 170 if any but line Y or H is touched. On this screen page, all characters, information here appear in white and response demands in yellow — both against a black background.

The difficulty level is set in lines 200-210, where 20, 30 or 50 more lines is awarded to the variable DL for the hard, medium and easy options respectively. This may allow one of

more of these figures to vary, the overall or respective difficulty of the different options.

The player's starting position on the available playing grid, which is 90 elements square, is set in lines 240-244, together with other variables. Line 270 sets the number of bullets in three — you can increase this number but remember to amend the rest in line 14200 100 — and gives a value to S — representing weak battery strength — which may be lowered to make for a tougher game.

After 114, control branches off to the substitution beginning in line 3000, which first deducts two points from the S variable on each turn, while 3014-3070 set up the score prompt display and update the player's grid position accordingly.

If the player reaches into past on the North, South, East or West boundaries — or comes next to them — he loses points as required by lines 1500-1503 or 1200-1203 respectively. Meanwhile, lines 3014-3045 subtract one from DL on each move and end the game if DL zero. Line 3180 serves the same purpose in checking the remaining battery strength.

If the result is negative in either case, control passes to the report play option beginning with line 1510. If the response is positive, the variables are reset and the program flows again while bypassing the

usual screen display and page — which can go unmentioned.

If none of these conditions are met, control passes back to line 110, which randomly selects one of several events. The first encounter is with a leader of foot, where a trap is set by line 430 and implemented by 442. Another challenge occurs in line 460, with three options. In this module, the results of the other options lets you increase the player's current strength rating and update simple inventory variables. Showing us the various dimensions the number of bullets left by triggering line 580.

Line 600 presents a poisonous water trap, which you may or may not escape, while a crossing in line 710, which also deducts the contents of the bear trap encountered in line 630. The good module ending in line 814 also presents another hazard to your weak battery strength, which is instead of control passes to 800.

Whenever a number or letter key is touched, or if the space bar is pressed, the instructions in lines 9000-9050 contain a help 1 does on the remaining page is found when something needs to about to happen to your character. If lines 9000-9090 Lines 12000-12040 are the initial help page, which can be omitted — but remember to line lines 130-130 and area 1 of line 131 to 1310 200.



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Damian McComb details a method of extending Vic-20 commands vocabulary. A 3K expansion is necessary to execute this program.



In this BASIC FOR the Vic-20 I aim to explain how it is possible to add commands to the Vic-20 Basic, and to extend the Basic by 42 commands. The program to do this will require a 3K expansion but if you have no expansion board you can also use additional RAM or RAM Expansion.

The set of commands I have chosen give several advantages to the user. First, there are some commands which are programming aids, including Trace and Breakpoint. There are others which will make convenient programs extended the other way: a list would such as Control — an equivalent to Prtscr — Paper, Zap and Page.

There are some commands which will merely speed up operations which would have needed to be done in several steps before, such as Fill. But perhaps most important are the commands which exploit the very good colour, sound and graphics features of the Vic and make it very easy to use them. These include Sound, Mode, Window, Ink and

(Continued on next page)

VIC EXPANSION

```
FOR #P REAR DIMERGE FOUHD 610H
0 POKESG,22:POKESG,7 CLR
1 POKESG$7,236 PRINT"-----" PRINT"##### EXTENDED BASIC"
2 PRINT"###" PRINT"#####COPYRIGHT 1983" PRINT"#####
v
3 PRINT"#####DAMIEN MC COMB" PRINT"#####PLEASE WAIT..."
7 REM ##
8 REM ## INITIALISE
9 REM ##
10 BTR20:46,04,20,1A,04,38,4C,75,E3,A2,08,00,26,04
20 BTR3D:09,03,CA,10,F7,69
30 DATR0A:C4,03,C4,79,85,08,08,0E,06,04,06
40 DATR0C:11,91,28,34,F7,20,E1,FF,08,06,20,49,04,6C,82,C8,4C,56,FF
50 DATR0E:6D,6A,28,6D,EA,20,F7,FD,28,18,E5
60 DATR0F:32,08,16,03,0D,FE,03,17,03,08
67 REM ##
68 REM ## DISPATCH 66 REM ## LOCATIONS
69 REM ##
70 BTR09:FF,62,06,03,05,32,35,C3,06,03,06,2E,07,5C,07,6D,07,92,07,37,07,0E,07,
D1,87,05,07
71 BTR0F:04,33,FB,F9,07,07,09,15,03,2F,05,03,09,63,09,21,09,2E,09,0F,08,37,09,
F7,09,17,09
72 DATR0A:09,70,09,03,09,20,0A,42,09,09,03,17,E5,57,0A,83,0A,09,0A
73 BTR0D2:00,03,0A,F4,0A,01,00
84 DATA END
87 REM ##
88 REM ## TOKEN TABLE
89 REM ##
90 DATR52:45,53,53,40,C3,4C,49,4C,CC
91 DATR43:4C,03,45,52,D2,57,49,4E,44,4F,37,55,4F,55,4E,C4
92 BTR043:55,53,45,45,08,49,4E,C8,59,41,59,45,32,42,44,3C,41,55,08,52,453,59,43,
41,34
93 DATR59:41,55,53,C5,43,59,52,53,45,04,52,45,53,45,04,49,49,4C,CC
94 DATR4C:4F,43,45,CB,48,49,43,45,CD,59,45,54,49,41,55,C5,43,52,45,41,CB
95 BTR049:52,01,42,43,45,0A,46,45,54,45,43,41,41,4C,14,45,53,36,42,4F,4F,CB,56,41,
10
96 BTR058:49,4E,07,43,4F,44,C5,52,45,4E,55,4D,42,45,3C,54,52,41,43,C5,44,4F,43,
C5,58,55,1A
```

(Continued on next page)

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Dragons.



Now you that has come to look it more detail in how machine code is put together. First, you will need to understand the concepts of addresses and numbers. For example, we have a number 30, and five people live there, so you could say the contents of address 30 is five. Basic does not use addresses, except for special values, but calls variables by name, like V1, V2. You cannot do this in machine code, but you can use the address or pair of addresses as a variable.

Another concept you will require, especially if working without an assembler, is hexadecimal numbers. This works in a similar way to decimal, except that the first column contains numbers up to 15 (FF), the second, numbers up to 255 (FF), the third, numbers up to 65535 (FFFF) and the fourth, numbers up to 4294967295 (FFFFFFFF), which is the largest number our chip can handle directly.

If you place the number into two parts, and name the high byte — first two hexadecimal digits — in the first address, and the low byte — second two hexadecimal digits — in the second address of a pair. Now that this is different from chips such as the 286, if you have used those. Our instruction set also has two types of instructions, those using one byte of memory — 8-bit — and those using two bytes — 16-bit — more of these later.

The low way to learn machine code programming is to look at programs, and so do this, you will need to understand them. If you have an assembler, however, there is no problem, but if you do not, you will need to get a book such as *The MC6809 Clubbook* by C. D. Warren, TAB Books, distributed by W.

Frederick and Co. You will then need to look up the codes, some of which are one byte, some of which are two, and work out from the instruction's meaning how many address or number bytes you would expect to follow it. Yes, it is easier with a monitor program, which does all this automatically. There is a considerable amount of published 8-bit code in storage, and of course you could always look in the RAM. Try

First 16 hexadecimal

for the range 0000 to 0015, using a loop to do this in Basic. This will show you your ROM's opening screen, which is, of course, a large machine-code program.

All computers usually do it in more numbers from one place to another, so methods of moving numbers are one of the most important facets of programming in machine code, you have three options: chip registers, RAM addresses and the stack. There are sometimes differing uses and limitations, so I shall describe them separately.

■ **Chip registers** — These consist of the following: two eight-bit registers, A and B, which can be used as a single 16-bit register, D. These registers are the most versatile and have the most instructions available, so they get used most. Then there is a pair of index registers, each of 16-bits, called X and Y. These are of particular use in indirect addressing, but can also store numbers and perform some arithmetic operations.

Next, there is a pair stack register, U, which is also 16-bit. This is primarily for holding the user stack pointer but can also store a number, and perform arithmetic and controlling operations. There is a similar register, eight-

which is the hardware stack pointer. Finally, there are three special eight-bit registers, CC, which holds condition codes or flags, DP, the direct addressing, and PC, the program counter register, which shows where the program has reached. We shall not be using eight CC, DP or PC as the relatively simple level of machine code under discussion.

When do you use the chip registers? The answer is the most operations — it is quite surprising how few operations need more than four or five registers. The chief thing to remember is that all the chip registers values are lost when you reset or Basic, so, if you need their values, you will have to store them in RAM addresses before starting.

■ **RAM addresses** — these are slower and thus, cumbersome than chip registers, but also more permanent, as they are into three return back to Basic. Use RAM storage when you run out of chip registers, and when you need to take values back with you, or pass them from Basic to a machine-code routine in the other direction. One register stores eight bits, — like a pair stores 16-bits, High byte first.

■ **The stack** — usually there are two stacks, but since the hardware one is used for return addresses, we shall create it at this stage. The user stack is nearly as you designed and works as follows:

It starts from the address in the U register 1, and grows downwards in memory as you push numbers onto it. An often used and good analogy is a spring loaded pliers stack in a cabinet, where you push plates in the top, and they push them aside or there farther down. When you pull them out, the top one is gone. (continued on next page)

movement from previous page:

out line, and the output goes up to fill the space. The stack works exactly like this, and has two instructions, Push and Pull corresponding to put in, and take out.

I cannot page all modes of addressing in detail, but will concentrate on the ones that will be most useful to us in our next session.

█ Indirect addressing is the simplest form, and requires no operand number following the instruction because it is implied or, occasionally, then, CLRA shows A, RTN 1, come from the substrate.

█ Immediate addressing has a number — data — in the operand. Most assemblies have a right side as 4 or octal, dec, or, LDR #17FFF will load D with 17FF. The 4 digit octal is hexadecimal on the operating 16.

█ Indexed addressing will be assumed unless you specify otherwise. In this mode, the operand is a memory address, and the contents of the address will be obtained, then, LDR 16000 would get the contents of the first address of your RAM, and register D. This mode of addressing is specified by % in some assemblies. Direct Page addressing is a special version where the high byte is stored on the BFF register, resulting in greater speed of access, but this need not concern us.

█ Register addressing, there is no operand, because you are manipulating data between chip registers only. There will probably be a prefix which specifies which registers to use, but this is calculated automatically by the assembler. For example, TFR D,X transfers the value in D to X.

█ Indirect addressing is used primarily with the X and Y registers, but we could also use it with U. In this mode, the operand itself is the X or Y register, which contains an address number. Various operations are possible, as shown in the examples. The assemblies indicate the mode with a percent. Examples of this are as follows:

█ LDRX #0400 then STA,X will first load X with the beginning of the test count — 0400 — then store A's contents in 0400 if A had contained a character into, the character would then appear on the screen.

█ If you had got STA,X* in the previous example the X register value would be incremented by +1 after the operation. This has obvious uses as graphics: LDRX #0400 LDA #17F indirect STA,X* has the advantage of a program in clear the screen to yellow. All you need now is a CLAMP #0600 to see if you have reached the end of the screen, and a branch instruction such as BNE to repeat if you have not. Other forms allowed are,

X - +

which increments twice, to get the next 16-bit register rather than register, and,

X

and

-X

which decrements first, before storing, as required by the order of printing.

█ You can alternatively specify an offset to the X color as a number or as the contents of A or B. LDRX #27000 then LDA X,X will load B with the contents of 27000-03001. LDA #03000 LDA A,X would achieve exactly the same thing. These instructions are useful when you want to effectively increment the address pointed to by the following register, X or Y, while still retaining its old value.

In relative addressing, the operand after the instruction is assumed to be relative, that is, go back or forward n addresses. The same use of this is by branch instructions, which come in two forms: ordinary and long. These do the same thing except that you can the long form like LDRX 0, the range is greater than 127 to -128. This mode is represented in two's complement numbers — see my first article for explanation. Example BRA Start so LBRX Start must go back, or on to the

address which we have decided to call Start.

Indirect addressing is like above. "I do not know where James is, but Betty does, so I will ask her." You store an address in another address, and then go back the contents of the second address, whose address is itself stored in the first address. Some examples may help: LDA 00000 would load A with the contents of the address in 00000 so that 00000 and 00017 contained 100 and 100 respectively and 00018 contained 100 then A would have contents 00018.

% Indirect addressing will also work with the indirect mode, so that LDR 0000 Y would load Y with the value of the address indicated by Y + 0000.

I have not included the whole instruction set, but only the instructions which I have found the most useful. For the rest, see a manual on 6803 programming.

Note that instructions using a single eight bit register are register, only in a single RAM address if they use a, and hexid numbers in the range 0 to 255 — 40 or 4FF. This means 128 to plus 127 — 040 to 4FF — if relative instructions using 16 bits need a 16-bit chip register and/or two RAM addresses. They can handle numbers in the range 0 to 65535 — 40 to 6FFF — or more 31769 to plus 12747 — 40000 to 67FFF — if relative in the table below, AAH refers to addressing modes allowed. EXT is extended INDEK is indirect, IRR is indirect and IMM is immediate. Note that indirect addressing is allowed with extended addressing, and with most forms of indirect addressing.

LD Loads register with number or contents of address. Rgn and 16-bit forms AAH, EXT, IMM, IMM.

Prefix LDA LDR LDD LDX LDY LDD

BT This is the opposite instruction to LD — stores the register contents in memory. It has the same and addressing as the same as LD, except that obviously you can't use immediate addressing, because you cannot store a register

Table 7. Assembly listing of codes

The columns are as follows: left to right

- 1 Hexadecimal address where instruction is located — this is not relevant
- 2 Hex code consisting of one or two bytes. This is the actual instruction
- 3 OPERAND: the number address for Postfix or using indirect addressing. See Tables 2 & 3 for calculations of Postfix
- 4 Assemble line number — not relevant
- 5 Comment
- 6 Operated on memory code
- 7 Comments

1	2	3	4	5	6	7	8	9
0000	0000							
0001	0000							
0002	0000							
0003	0000							
0004	0000							
0005	0000							
0006	0000							
0007	0000							
0008	0000							
0009	0000							
000A	0000							
000B	0000							
000C	0000							
000D	0000							
000E	0000							
000F	0000							
0010	0000							
0011	0000							
0012	0000							
0013	0000							
0014	0000							
0015	0000							
0016	0000							
0017	0000							
0018	0000							
0019	0000							
001A	0000							
001B	0000							
001C	0000							
001D	0000							
001E	0000							
001F	0000							
0020	0000							
0021	0000							
0022	0000							
0023	0000							
0024	0000							
0025	0000							
0026	0000							
0027	0000							
0028	0000							
0029	0000							
002A	0000							
002B	0000							
002C	0000							
002D	0000							
002E	0000							
002F	0000							
0030	0000							
0031	0000							
0032	0000							
0033	0000							
0034	0000							
0035	0000							
0036	0000							
0037	0000							
0038	0000							
0039	0000							
003A	0000							
003B	0000							
003C	0000							
003D	0000							
003E	0000							
003F	0000							
0040	0000							
0041	0000							
0042	0000							
0043	0000							
0044	0000							
0045	0000							
0046	0000							
0047	0000							
0048	0000							
0049	0000							
004A	0000							
004B	0000							
004C	0000							
004D	0000							
004E	0000							
004F	0000							
0050	0000							
0051	0000							
0052	0000							
0053	0000							
0054	0000							
0055	0000							
0056	0000							
0057	0000							
0058	0000							
0059	0000							
005A	0000							
005B	0000							
005C	0000							
005D	0000							
005E	0000							
005F	0000							

control on a number. It can appear as follows:
Form 85A STB STC STX STY STZ
 and, the arithmetic functions. These are for use with the accumulator registers, A, B and C.

ADD This has eight bits — **ADDA**, **ADDB** — and **ADDC** — **ADDQ** — registers, and sets a carry flag on a two memory registers and A, B or C. **AM**, **INM**, **EXT**, **INT**.

STB This is the complementary pair of **ADD** and sets the same carries apply. It subtracts the contents of C or two memory addresses from the A, B or C register.

MUL This is an unusual but useful instruction. It multiplies the contents of A and B together and leaves the result in C. **AM**, **INM**.

Form 85B
 Next, we come to the bit manipulation instructions, which function on individual bits in the registers. You might see these to set the carry bit on, for arithmetic operations — **MO** — for example. You need these instructions for converting high resolution graphics into printer instructions. All the group of instructions have the same address modes: **INM**, **EXT**, **INDEX**. All are eight-bit only.

AND performs a logical and between the contents of A or B and a memory register, and leaves the result in A or B. This is different from a basic **AND**, and checks each bit in turn.

OR performs a logical or between the contents of A or B and a memory register, and leaves the result in A or B. This is different from a basic **OR**, and checks each bit in turn.

Form 85C
 If both the memory and the accumulator — A or B — has a 1 in bit N, then a 1 is left, otherwise a 0. For example **0081101** and **0011010** give **0000100**.

Form 85D
OR is in some ways the counterpart of **AND**, because it gives a 1 on the accumulation of either or both of the bits being compared was a 1. To repeat the example **0081101** or **0011010** gives **1011111**. Note the difference from the basic **OR**.

Form 85E
ORC completes that two a stands for exclusive or, meaning that the bits are compared as before, but if both are 1 or both

are 1, a 0 will result. You will only get a 1 if one bit is 1 and the other 0. In our example, **0080111** XOR **0011010** = **0011101**.

Form 85F
 The rotate and shift instructions are conventionally taken together because their operations are similar. Again, these are eight bits, but the addressing modes are not quite the same as above: rotate and shift use **INM**, **EXT**, and **INDEX**.

LSR moves all the bits left by one, effectively multiplying by two. Bit 0 becomes B, and bit 7 passes into the carry bit, where you could detect it with an **ORC** — **OR** combines code register — for example. Thus, if we put **0001001** in A, and then do **LSR**, we get **0010010**.

Form 85G
LSR is analogous except that the bits are shifted one to the right. A bit goes into bit 7 — bit 0 — and the 8th bit of the next one the carry bit. **LSR** effectively divides by 2.

Form 85H
RCL This instruction is a little different from **LSL**. Again, the bits are all moved one to the left, since the carry goes to bit 0, while bit 7 goes into the carry. This is a kind of "rotation" through one bit — right — carry. Again, this has the following address modes: **INM**, **EXT**, **INDEX**.

Form 85I
RCR As you might expect, this rotates to the right, again passing through the carry. Each of these **RCR** or **RCL** instructions moves the bits by one place.

Form 85J
ROL, **ROL**, **LSR** and **LSL** are all also be used on memory registers, in exactly the same way. This is what the extended and indexed addressing refers to.

The branch instructions all work in a similar way, as are conventionally listed together. All use relative addressing, that is, are followed by a number to indicate the size of the forward or backwards branch. All also have a long branch form signaled by a prefix 1. For example, **LBRQ**, **LBRB** and so on.

All the branch instructions rely on testing flags, which are usually set up by an

immediately preceding **ORP** instruction. Taking them in alphabetical order, and including the most useful ones only:

- BRQ** — Branch on equal, branches if the two values are equal
- BRG** — Branch if greater than or equal
- BGT** — Branch if greater
- BLE** — Branch if less than or equal to zero — C=0

- BLA** — Branch if lower or the same
- BLT** — Branch if less than 0 — C=0
- BNZ** — Branch if unequal
- BRR** — Branch always
- LBRQ**, **LBRG**, **LBRGT**, **LBRLE**, **LBRLE**, **LBRGT**, **LBRB** and **LBRB** are all a bit self-explanatory, and again these are a selection from the set.

Form 85K
Form 85L
Form 85M
Form 85N
Form 85O
Form 85P
Form 85Q
Form 85R
Form 85S
Form 85T
Form 85U
Form 85V
Form 85W
Form 85X
Form 85Y
Form 85Z

As indicated above, an equal size of 10 sets up the condition for a branch.

There are some miscellaneous but useful instructions which I have grouped together — **INM** instructions on eight bit registers, A or B or C as the address mode, or a memory register as the extended or indexed mode. It addresses not from the value in the register.

INC is the corresponding alternative, and increments by adding one to an accumulator or memory register.

Form 85A
Form 85B
Form 85C
Form 85D
Form 85E
Form 85F
Form 85G
Form 85H
Form 85I
Form 85J
Form 85K
Form 85L
Form 85M
Form 85N
Form 85O
Form 85P
Form 85Q
Form 85R
Form 85S
Form 85T
Form 85U
Form 85V
Form 85W
Form 85X
Form 85Y
Form 85Z

Form 85A
Form 85B
Form 85C
Form 85D
Form 85E
Form 85F
Form 85G
Form 85H
Form 85I
Form 85J
Form 85K
Form 85L
Form 85M
Form 85N
Form 85O
Form 85P
Form 85Q
Form 85R
Form 85S
Form 85T
Form 85U
Form 85V
Form 85W
Form 85X
Form 85Y
Form 85Z

0000	0000	0000	0000
0001	0001	0001	0001
0010	0010	0010	0010
0011	0011	0011	0011
0100	0100	0100	0100
0101	0101	0101	0101
0110	0110	0110	0110
0111	0111	0111	0111
1000	1000	1000	1000
1001	1001	1001	1001
1010	1010	1010	1010
1011	1011	1011	1011
1100	1100	1100	1100
1101	1101	1101	1101
1110	1110	1110	1110
1111	1111	1111	1111

0000	0000	0000	0000
0001	0001	0001	0001
0010	0010	0010	0010
0011	0011	0011	0011
0100	0100	0100	0100
0101	0101	0101	0101
0110	0110	0110	0110
0111	0111	0111	0111
1000	1000	1000	1000
1001	1001	1001	1001
1010	1010	1010	1010
1011	1011	1011	1011
1100	1100	1100	1100
1101	1101	1101	1101
1110	1110	1110	1110
1111	1111	1111	1111

0000	0000	0000	0000
0001	0001	0001	0001
0010	0010	0010	0010
0011	0011	0011	0011
0100	0100	0100	0100
0101	0101	0101	0101
0110	0110	0110	0110
0111	0111	0111	0111
1000	1000	1000	1000
1001	1001	1001	1001
1010	1010	1010	1010
1011	1011	1011	1011
1100	1100	1100	1100
1101	1101	1101	1101
1110	1110	1110	1110
1111	1111	1111	1111

continued from previous page

Note that upon the register must be the same bit.

BR or jump to subroutine transfers control to a subroutine. The address must be

EXT ADDR

BR or branch to subroutine is similar except that it uses relative addressing.

RTS or return from subroutine is the instruction that takes you back at the end of a subroutine, either to the same address after the subroutine call, or, if there was not one, back to base. What this instruction actually does is pull the first return address from the hardware stack and jump to it.

SWI or software interrupt is the corresponding instruction to cause control to be conveyed to another system, when running a program from the knowledge to debug and test it, for example. An **RTS** in this instance will really start things up, because there will not be a return address to go to.

NOP or no operation is a useful instruction, principally when you want to leave an address blank, or temporarily remove an instruction when debugging. Surprise, surprise — a does nothing.

NEG or negate — this command is right to use, and replaces the contents of an accumulator or memory register with the two's complement — see article #1 — of the process contents.

See also: **EXT ADDR**, **INSTR**, **INSTR ADDR**

LEA or load effective address is used to add a value to a register which would not normally allow this, such as X, Y, U, D. For example **LEAR**, Y, X, with 5 to the value in X, while **LEAR**, X, Y, loads Y with the value in X + 10. Note that three other values are allowed.

See: **LEAR**, **LEAR X**, **LEAR W**, **LEAR**

Note: **LEAR**, **LEAR** are not allowed.

Finally, we come to the Push and Pull instructions. These are stack operations.

PUSH pushes registers not including U onto the user stack, which grows downwards from 1 in an unnumbered order. Its addressing mode is immediate, and its form is **PUSH**.

PULL is the converse, and pulls values of the user stack, placing them into the register specified in the register list. **PULL**, X, pulls the top value and puts it in X.

We now have the complete set of addressing and instructions, and can now write simple routines to do useful operations at high speed. If you are using an assembler, you will have less problems, and the instructions can be entered as shown. You will need constants to control your loops, and it is best to use only the X, Y, U and U registers, the possible use of the accumulators, before you start using RAM addresses for storage.

It is quite surprising how few programs need more than three registers going simultaneously. You can assemble your program to a suitable address, near the top of memory, then delay it from the monitor. The best way to do this is to insert lots of triplets and do this to speed the chip registers (regards), so as if they weren't what they should. Do not be discouraged by errors — all programmers make them.

Once it runs, change the final **RST** to an

RTS and save the program on tape. Then try running it with the basic calling routine. It shall be using the in more detail next issue, but for the moment, try an **EXEC**, **NONNON** instruction, where **NONNON** is the first address of your program.

Finally, let me advise memory program 1 get an outline of how this works.

Line 170 loads Y with the starting address of the storage area.

Line 180 loads X with 4000 which is the address of the right hand side of the screen half way down.

Lines 185-190 are a loop which takes the value at the address in X and stores it in the table pointed to by Y. It then adds 32 to X to get the end of the current table. It then gets the next table pointer and stores it. It repeats until the bottom of the screen is reached (line 190 checks that).

Line 195 stores the end of the screen address in X.

Lines 200-210 are a loop which gets the row screen address contents and stores it in address in the right — **LEAR** X, X. This produces a scroll right, and line 210 checks for half the screen completed. Lines 205-210 set up the pointers for reversing the values from our storage table.

Lines 215-220 are a loop that reads from back into the left hand end of the screen.

Line 230 checks for job finished.

The method of storing the last screen column and putting a blank at the left hand side ensures the wrap around necessary for the final of scroll.

Those of you who have an assembler can save time, but those who do not will find the page tables below. It is not possible to list all possible combinations, as there are more than 1400 of them. However I have given the codes represented in the article in the form of a hexadecimal assembly listing. To use them, you need to take the hexadecimal digits into your chosen

address using a hex loader such as the one published as my first article.

You will see the term Postbyte in the table — this is a byte that comes after the instruction proper and allows it to operate and be used addressing. The method for working this out is given in Table 1 for Register addressing and Table 2 for Indexed addressing. These Postbytes come after the instruction and before the operand, that is, second. You have to build them up from a series of bits, these are at the binary end of bits. This is a bother, but it all done automatically by an assembler. If you plan any serious machine-code work, an assembler will be essential, definitely not a luxury. It will also make debugging far easier.

Table 2 Postbytes for indexed addressing. Four bit offset addressing, where the offset is 2-15 or less is quite different from the one.

BIT 7 IS 0
BITS 6 & 5 INDICATE THE REGISTERS
BIT 4 IS 0
BIT 3 INDICATES THE SIGN — SET IF NEGATIVE
BITS 2 TO 1 CONTAIN THE ACTUAL OFFSET

The remainder of the codes work as follows — only those discussed are included.

BIT 7 IS ALWAYS 1
BITS 6 & 5 SHOW THE REGISTER AS FOLLOWS

00 X
01 Y
10 U
11 X, Y if required

BIT 4 INDICATES INDIRECT ADDRESSING which is not allowed for simple instructions (except X, Y, X) Functions

bits 2 to 0 are as follows, using X to indicate or register register could be X, Y U or X.

X	0000
X, Y	0001
X	0010
X	0011
X	0100
X, Y	0101
X, Y	0110
X, Y	0111
ANY X	1000 (offset is a 7 bit number)
ANY X	1001 (offset is a 15 bit number)

The 7 and 15 bit offsets are in two's complement notation, so can take plus or be taken as minus.

You will need to use other bits which are not from the table, they constitute a binary number. They constitute the one decimal as follows:

# BIT 7 SET	ADD 128
# BIT 6 SET	ADD 64
# BIT 5 SET	ADD 32
# BIT 4 SET	ADD 16
# BIT 3 SET	ADD 8
# BIT 2 SET	ADD 4
# BIT 1 SET	ADD 2
# BIT 0 SET	ADD 1

Note convert the resulting decimal number to hex, either from tables or with the computer. Press **PRINT** if it is you find it that possible, but then be proud to know!

Table 3 Postbytes for **EXT**, **TWR** and **Push**, **Pull** instructions.

1 110 AND 100 POSTBYTES are the same. They are arranged as two sets of four bits, 7 to 4 representing the source register, bits 3 to 0 the destination.

0	0000
X	0001
X	0002
Y	0003
Y	0004
U	0005
U	0006
U	0007

As an example: 0 to U would be 00000011. For **Push** and **Pull** (**EXT**) is **PULL**, on the **Push** order a Y, X, X, X, so then go into the stack at that order, and the **Pull** order is the reverse so they come out in the order X, X, X, Y. The codes are shown below.

Push/Pull both: A, U, X
BIT 6 — Y
BIT 4 — X
BIT 3 — X
BIT 2 — X
BIT 1 — A

The complements for **TWR**, **PC** list **U** (not allowed), **U** 2 — **CP** list **U** 2 — **CC** 1. The Postbyte specifies which register to use as shown in the table. Does again, you will have to synthesize the Postbyte from the list.

CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD-ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost. These offers usually have a hidden pitfall, namely that the essential accessories such as monitor, leads, peripherals and software often carry very high cost premiums in addition to the computer hardware usually quoted being sold with a 10% "margin".

CHECK THE QUALITY OF THE PRODUCT.

Buyers should see how an installation system can be set up, and probably would be doing, building and effect the up-time if you wish. Areas to watch out for are unreliable edge connectors, component and poor quality PCBs. Low quality components and/or design will affect the reliability of the microproduct, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Games you won't just games and nothing else! With a games computer you are limited. Some computers, however, take the advantage of built-in game facilities for the whole world of computing to equate to your interests and skills. Aerial computer systems will allow you to expand your knowledge of the IT technology and help you to do this with all added value in the field of education, communications and home automation.

SOFTWARE

Make sure the system you choose has a growing library of support software to enable you to make the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (in detail). Check up the various and personal envelopes in graphic mode and multiply the line numbers together if the result is less than 2048. Even the graphics capability for consistent high resolution. Without high resolution graphics displays will be those used in general use. Check up in appearance.

● High Quality Board

Some computer systems provide a sound channel when in reality there is a small board inside the computer is a small board controlled by electronic parts. At the very least, a sound board should provide more than one channel analogue channel so we'll get you that effect in games for example. The best system also provide analogue control of the sound channels to produce very realistic and effects very important for generating music. Also look for the ability to connect external amplifiers.

● Keyboard

For an entire array of programs and data into a computer it is important that the keyboard has a good level of specification. Coupled with a quality keyboard the user is fully aware whether computer has accepted his/her orders. Also of importance is a keyboard layout. A standard QWERTY keyboard layout will minimize the user with the advantage of computers used in the world of business and professional applications very important if the purpose of your buying a computer is educational.

● RAM

One of the most important features of a computer is the amount of RAM or memory included. In general the more powerful and exciting a computer program is the more RAM it requires. But there are all computers are advertised quoting the maximum used in the system. Computers can use a great deal of their own RAM for posting extended data and particularly in supporting the graphics display and the CPU. It is less than 256K then you are in a trap!

● Computer Language

It is difficult to program a Computer in its own binary language so high level languages are used. The most popular being BASIC. However there are a number of BASICs, some being very different from others. A list has been compiled in the computer industry is Personal BASIC. Learn the one and you will be able to program in the majority of computer BASICs with an independent price for home computer as it is used to educate your children in the technology of the future.

● Expansion

As you extend your knowledge of computing you will need to



Choosing the right software will go a long way to making your home micro a money saving CPU. It will give you the ability to do the job and reduce the price. Before you buy, probably choose either for your system that you expect to need your needs.

colleague system that will give you the ability to communicate. Printers, Disk drive, Modem, Communications Modem and Local Modem as well as software (if it is not offered).

● Software

The computer you choose should have a growing educational ability.

software to make the most of its capability. Before you buy, probably choose either for your system that you expect to need your needs. You can learn to compute at a rate of a device which does not better than a microcomputer. It isn't, but you can for a computer which offers all the points above and you will be sure of getting the best value for money.

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I MADE MYSELF, the Maple, Modem and it has worked well, giving me access to a number of amateur and commercial databases around the country. The Modem has proved reliable and useful. It has worked successfully on both a BBC Micro and an Apple II fitted with a Compaq Diplomat serial card.

The Maple Modem connects directly to British Telecom's telephone lines and the receiver has been signal possible in the UK and, consequently, low error rates. The alternative method for putting a signal on to the telephone line is to use a small headpiece near the microphone and a microphone close to the speaker to read and receive the tones that carry a message.

There is no electrical connection in the telephone lines in the type of Modem, instead it is electronically coupled — the computer produces a digital signal which is turned into analogue tones for the Modem and these are fed to the headpiece which vibrates and chirps and sends the information down the line.

Unlike many amateur couplers which are referred to as rotary calls, the Maple Modem can both originate and answer calls. That means that the receive and transmit flows at the Modem can be reached between incoming and outgoing messages. This is important because not originate only electronically coupled modems will be unable to communicate with each other — one Modem must answer the other's incoming call.

The Maple Modem relies on the operator to switch the Modem into the telephone circuit, it is not an auto-answer device. Using the Modem is quite straightforward, you dial the number you wish to communicate with and listen on your telephone and the call connects. A steady tone indicates that the computer is on the line and is waiting for the outgoing tone from your Modem.

You switch the Maple line switch on and register your telephone number on its ring. The remote computer will send a welcome message and then you can start to view messages. At the end of the exchange of

MODEM



Paragon's Modem for the Apple II

MAPLIN ON LINE

information you wish the Maple has made it!

Whatever I have used the Modem with either a BBC micro or an Apple II computer the number of corrupted characters has been very low. In other terms the best way to describe the results is solid copy. All the computers I have connected — some of which are listed in Figure 1 — use full duplex which means that a character typed onto the BBC micro does not appear directly on the VDU but is sent, instead, to the Modem and the remote computer.

(Continued on page 170)

John Dawson found the thought of putting together and using a Modem quite daunting until he actually went ahead and did it. Now he finds it reliable and useful. Here he looks at operating procedures for the unit with particular reference to the Maplin Modem.

Figure 1 Computer database

Event	01 475 1488	Douglas
Modem	0302 602641	Maplin
Serial	0377 286028	Electronic Trade S Barnes
Forum 80	0402402 806 80	Electronic and Video
TEBS London 01 248 9800		London
Maplin 80	081 628 8828	Electronic, and Video

Figure 2

```

10 NUMBER = 01770
20 NAME = 02000
30 100 NUMBER = 02000
40 NAME = 02000
50 CLS
60 PRINT 10010, 0101 BBC
terminal operators
70 PRINT 10015, 1210 "PARSONS"
80 REM 01010101 01010101
90 PRINT 10015, 1010 "PARSONS"
100 NAME 10015, 1010 "PARSONS"
110 IF 10015 = 1010 "PARSONS"
120 GOTO 10
130
140 GOTO 10015 20
150 REM 01010101 01010101
160 GOTO 01010101 20
170 GOTO 01010101 20
180 GOTO 01010101 20
190 GOTO 01010101 20
200 GOTO 01010101 20
210 GOTO 01010101 20
220 GOTO 01010101 20
230 GOTO 01010101 20
240 GOTO 01010101 20
250 GOTO 01010101 20
260 GOTO 01010101 20
270 GOTO 01010101 20

```

```

280 10015 0
290 10015 0
300 10015 01010101
310 10015 01010101
320 10015 01010101
330 10015 01010101
340 10015 01010101
350 10015 01010101
360 10015 01010101
370 10015 01010101
380 10015 01010101
390 10015 01010101
400 10015 01010101
410 10015 01010101
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930 10015 01010101
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990 10015 01010101

```

```

990 10015 0
1000 10015 0
1010 10015 01010101
1020 10015 01010101
1030 10015 01010101
1040 10015 01010101
1050 10015 01010101
1060 10015 01010101
1070 10015 01010101
1080 10015 01010101
1090 10015 01010101
1100 10015 01010101
1110 10015 01010101
1120 10015 01010101
1130 10015 01010101
1140 10015 01010101
1150 10015 01010101
1160 10015 01010101
1170 10015 01010101
1180 10015 01010101
1190 10015 01010101
1200 10015 01010101
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1480 10015 01010101
1490 10015 01010101
1500 10015 01010101

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continued from page 100

The remote machine then offers the user back down the line, through the Modem and into the BBC macro, where it is displayed on the VDU. Full duplex allows the simultaneous transmission and reception of data.

Mail duplex, also available on the Magtek Modem, means that the terminal — the BBC macro plus Modem — transmits and receives data consecutively, and transmitted data is displayed locally before it is sent to the remote machine.

Many of the telephone numbers printed on our computers magazine or another journal are to be answered. Some of the computers are only connected to the Bulletin Board service between certain hours. You also, quite reasonably, have to be prepared for human error on the other end of the line — "Sorry later, he's on holiday for two weeks". The numbers listed in figure 1 were correct at the time of writing.

The hardware is only part of the story because the Modem and computer on their own are just pieces of apparatus with no function. In concert with all peripherals you need some software to make the computer recognise and use the equipment you have connected. The BBC machine is particularly clear in this respect. The machine operating system, or MOS, allows you to work at a high level of ease simply with a control line of data out of the machine and the built-in assembler makes the development of a terminal package quite easy.

Figure 2 lists a basic program which will set up the BBC macro either as a terminal or to transfer a file of information held on the machine to another computer. The terminal section of the program — lines 140 to 360 — is taken largely from Mike James' excellent book, *The BBC Macro* — an expert guide. The book is worth buying and the expansion of the program is explained in considerable detail. The additional part of the terminal program does a much interesting character at the address pointed to by the variable "ZZ".

When you have completed the exchange of data with the remote computer you can return to the main menu by pressing the Escape key. The program is very credit user for too many

MODEM



Lines received are and could be carried into a number of our Letter Running procedures. It was developed in a hurry, it does work, but it needs a long — it is not an example of good programming.

Lines 190 to 300 send the data stored between "A:2500" and "A:2501" to the serial printer port in the name BS-423 output as was used by the terminal program. The data is sent at 100 baud — line 820 — and the file is created by sending a Control Z character — line 830. The purpose of this expansion is to streamline the transfer of information to a CP/M file using the Personal Knowledge Program or PIP.

Someone will the other day that the Magtek Modem is over-engineered. That may be but it certainly works reliably and, despite the over-availability of single chip Modems, a respectable good value for money. The isolating transformer is essential for any Modem that is to be connected to BT lines — careful construction is necessary to ensure that the most plied equipment is electrically safe.

I expect to use the Modem and the BBC macro together to access an Amstrad database Colleague by going through the public switched network for such purposes. The different frequency tones that are used in the US are not a problem because all you are doing is to make a local phone call to the public switched network.

The BS-150 interface for the Sequent ZX-61 computer is made by Cable Technology,

Limited and a comes with software on a tape to turn the ZX-61 into a console terminal. The terminal software uses the SeaShell protocol to control the flow of data into the computer and can change the ZX-61 screen to the ZX screen.

One option at the start of the program will set up the system to look like a Teletext Gold terminal. Unfortunately I was unable to borrow a ZX-61 to run the Cable interface with the Magtek Modem but as theory, there should be no problems.

The Microdrive are now on sale for the Sequent Spectrum. Probably the most interesting part of the new hardware is the interface between the Spectrum and the Microdrive. The interface has an RS-232C module and also enables to set up a local area network or LAN. It supports up to 64 Spectrum computers. The manual does not say how long the links can be between computers on the net but if the same distances are used for both the RS-232C and the LAN then you might expect to be able to run up to 50 metres of cable from one computer to the next.

You can direct the output from your computer to another specified computer on the network or you can broadcast a message of data for everybody to receive. The manual says that the output from your computer is coded for the recipient and if this is not working for the message your computer will wait for ever, attempting to get the message through.

Although you must not use high level calls since it appears from the manual that more than one pair of stations may use the net at the same time. Low level addresses are apparently needed. Storage programs need over to be problem open although you expect suggests that the network operates at 110 Kbaud.

Learning about computing happens at a series of steps. Moving information from one computer to another was quite a big step and I still think it was not. The BBC machine is ideal for experimenting at this field. Connecting the Magtek Modem was remarkable simple and retrieving Mike James' original program was not difficult given the BBC user guide as a reference book. ■

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RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

GETTING LOADED

I am intending to master my own software, but I want to ensure that the cassette will load on any Sinclair Spectrum through any tape recorder. I have read that recordings made on some recorders will not load through other recorders. Could you please recommend a low-priced cassette recorder which I can use to produce recordings which will load on any Spectrum?

D. G. Brown,
Rugby, Warwick.

THROUGH REPLYING you are approaching the problem from the wrong end. Better than trying to find a cheap recorder which will work with all Spectrums, you should ensure in the first instance cassette recorders you use offer the recording of the recording, rather than the mode of cassette blank used to load the program back onto the cassette. In the most expensive thing to purchase these days, a cassette recorder you could give your cassette duplicated by one of the commercial tape operators at recording company software. This will only be a sensible path to follow if you will be making large quantities of your program.

TAPE CONTROL

In your February issue you reviewed Spectrum hardware. Could you please tell me where I could obtain an Adams tape controller?

Erica Daint,
Barnfield, Middlebury.

THE ITEM is available from Douglas Adams, 1 Levens Road, London, N16 7NL.

STAR GAZER

I am interested in amateur astronomy and particularly in the observational side. I have a Dragon 64 and would like to know if there is software available which gives astronomical figures such as positions, distances, magnitudes of stars and planets for any given day. Could you help?

John Williams,
Aylesford.

I MUST SET 'back side' to locate a supplier of such software in the U.K. However, Computer Company magazine in America publishes a list of computer programs related to navigation using the stars, and the way used prior to arrival.

You could contact, among other bodies, Star Navigation, Plymouth.

I Buy New Read, Penworth, Manchester, M19 5LZ, five copies of its extensive catalogue of Dragon products. In one of them a spelling module which might be adapted to my needs. Baffle Micro-Day 400 (Shrewsbury, Nuff. Road, London, SW12 8BB) has provided a catalogue of Dragon products, although you may specify your own. In the Dragon one is a word-addressed module as requested. Finally, if you cannot get time to play around with the stars, Squire Services, 61 The Vale, Leam, LE17 5EF offers an evening program called Solar P 10.01.

TALK TALK

I have seen advertisements for programs for the Spectrum and Dragon which enable the computer to speak without the need for extra hardware. How do they do it? Surely it should be able to do it on any BBC. Mine without having to buy the special Avance speech controller.

Alan Jarman,
Merles.

THE SPEECH IS produced on the Spectrum and Dragon by use of voice manipulation of the computer's vocal output. It is perfectly possible to do so on the BBC Micro. In the results are, in general, purely artificial in those produced by a custom-made speech unit.

I have found some Spectrum 'speech' that has used to be 'voice bank' by the programmer before I could understand what it was supposed to be saying.

As well as being of much higher quality, speech produced by a custom unit is much, much superior to natural tone hardware speech.

LEADING ZERO

I have a problem relating to the Maths and Cass programs in the book *Introducing Basic*. My computer, an Atari, accepts an input of 1200, but it won't add 1200. It ignores the leading zero. I have played with the relevant lines of the program, but to no avail. Your help in this matter would be most appreciated.

J. Shaw,
Penworth.

LEADING ZEROS are ignored by all computers and nearly all calculating devices. Even my own program of the Mathematical program you refer to, that the problem is simply that the program does not allow zero to be part of the operand code. There is no need to include a zero in the

operand, at the start of operands of your numbers. This may be incorrect, but it appears so from the part of the program you sent.

In general, in a other case to most numbers an string — using ASCII or change them to the string, and ASCII code. In all, there is to get them back into binary form — if they require extensive manipulation. Strings are much easier to cut up, and play with, than are numbers.

IN FUNCTION

I have devised a 100-Spectrum game which allows two players to meet in individual circumstances about the screen. Each player has his own battery of pieces. Of course, if two boys are present at the same time, Intely! becomes an empty shell, and there is no response. How can I get the computer to only look at one set of boys at a time?

C. Bradley,
Bosmer Way, Buxton.

THE ANSWER is to use the In function, which allows them to see the other set to be used at a time. Use a low like IF IN 100000 = THEN to get the other you want. You can set up a simple routine to get the effect you want. You can set up a simple routine to get the effect you want to return the result of the In actually set by including a Print to test it to a program. To use the following numbers: 10000, 10000, 10000, 10000, 10000, 10000, 10000 and 10000. The use of it is explained in the book *Introducing Basic* — see *IX Spectrum* by Douglas Jones.

MEMORY LOSS

I Was my 10000 lost its memory? When I typed in some long programs which are better to be for the unexplained 10000, I often get an "out of memory" error. Sometimes a program which fits the first time I use it gives an "out of memory" error when loaded back in from the cassette. What is going on?

M. Park,
Pewsey.

As you must discovered, the 100 is very badly when the memory is nearly full. When the 100 has a thin memory as you have, a common-sense to memory for each address required. I suggest you use CLR to get rid of all values assigned to variables, and keep your eyes down to the absolute maximum.

DISABLING

I have been writing programs on my BBC Spectrum. I have had you some break out of a machine code program. Is there any way of disabling the Break key when using Basic?

Robert Atkin,
Alley Day, Newport.

There is no way to say that can be done in Basic. It

however, you want to know about this so you can prevent your own programs, you can add lines to the listing — amongst the listings, for example, to you — which cannot be removed from the listing by anyone.

If you were your own and very right close to be the number zero, which means you cannot, make the first line lines of your program: 1 LET A = 1000: GOTO 1: END: PRINT A: PRINT A: GOTO 1: STOP.

I NEED TO PURSUE HOBBIES

When you run this, then List, you will see how many where how you could be. All you have to do the time a little on line 1, and your name and copyright will be locked on the listing line zero.

SPRITELY SPRITE

I am a Commodore 64. Could you please explain how I can score a sprite across the screen using keys or a joystick?

John Clark,
Leek.

SPRITES ARE NOT as I am sure you have gathered, the easiest things in the world to use, but the reward of using them over other programs for the effect required is undoubtedly there. A sprite is a character which you define. It will look just as you specify, in terms of shape and colour, and can be placed anywhere on the screen and moved under your control.

The Commodore 64 Programmer's Reference Guide explains how to produce and move sprites on page 242. Combine this information with a routine to read the joystick position on page 140 of the same book or a standard Intely! submission to read the keyboard, and you can score your sprite around. The graphics are extremely suitable, but a standard multi-control reading.

VIC FOKS

I see a Vic-64 and am very pleased with its performance. However, I would be pleased if you could tell me how to get the command `Poke 532,120` — which sets a repeat function on all keys — to stay permanently in memory?

G. Adams,
St. Johns,
Morpeth.

You can really change if it is possible to change the contents of the Vic ROM. Although, as you know, ROM can't be changed except by your entry something into the computer, ROM is fixed, even you try the machine. Therefore, there is no way, short of reprogramming the ROM, to change the area of a particular address — POK, in this case. You will just have to continue to type the command into the machine in the case of each programming session, and possibly lose it in the saving process of New Year's resolution of the editors. ■

SNOWBALL

of £9.99 is the ultimate adventure for

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Snowball is a massive adventure with over 7000 footprints. It took nine months to perfect and marks a new leap forward in adventure games - it has a detailed, planned background and is set aboard a huge starship that would really work. Snowball could be a glimpse of the future!

You play Kim Kimberley - security agent. Your mission is to guard the colony ship Snowball if from sabotage.

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The descriptions are so good that few players could fail to be impressed by the realism of the mythical worlds where they are the hero or heroine. The booklet supplied with each program is very helpful. Extensive information is supplied about the game scenario. The Level 9 programs are great fun to play (and plenty happens to keep you bemused and amazed for hours on end.

- Which Micro & Software Review August

A major miracle of programming. & An impressive suite of adventures. They are always a pleasure to play.

Popular Computing Weekly 12 May & 23 June

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King Kong

Stephen Hill last
Nicholas Williams,
Kendal/
Cambridge

OSPREY

This PROGRAM is for the AM8 Spectrum. The control keys are as the instructions in the program. There are four levels, and each more difficult than the last.

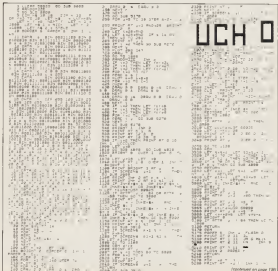
The two barrels will sometimes bounce back off the edge of the screen as well as bounce

higher up. There are various items for you to collect, and for each one you get 100 points. If you have to jump to reach one, do not keep the jump pressed or you will carry on doing it, and may bump your head. To reach the next level you must go up to the highest point on the screen and jump right, but if you are on the very top of the screen then just go right normally. Do not jump or you may be killed.

After each level your score is doubled and 100 is added.

11 to 16 contains the data for the user-defined graphics.
17 to 21 contains data for the levels.

22 to 75 set up user-defined graphics.
76 to 100 set up the first level.
101 to 150 set up the subsequent levels.
151 to 199 contain the main loop.
200 to 250 contain the routine for when you fall down a hole.
251 to 299 contain the high score table routine.
300 to 350 contain the routine for calculating items for points in the routine for the movement of the barrel.
351 to 400 contain the routine for jumping.
401 to 450 hold the routine which opens the gorilla eye.
451 to 500 contain the routine for getting you to the next level.
501 to 550 make the gorilla fall down the screen when you get through all the levels.
551 to 600 are the instructions.
601 to 650 are the machine code for the sound.



(Continued on page 136)

BBC

continued from page 28

screen which were saved before the crash.

The interface between the Forth operating system and the existing store is essential for an efficient Forth system. Forth definitions are stored within the machine in a compact form and the source code stored externally on a screen.

Screens are swapped in and out of the machine as required - automatically by the host system interface with the tapes. The Forth operating system can become confused about which screen is in memory and which has been saved.

The Forth stack is a standard 20 Forth system with extensions to allow effective use of some of the BBC's facilities. These are primarily the word 2VDU for the VDU drivers and Plot which apart from the use of pins for screen as observed in the Room Plot command. The manual gives some guidelines concerning implementation of other facilities notably the operations of the Sound and Drawpage commands in Basic.

No guidance is given as to how to implement the system code of the A to D converters. The machine code addresses for these are not difficult to write if you are familiar with the MOS BBC machine code and Forth stack it would have been useful for the host user to have had these included in the dictionary somewhere or being that explicit is given in the manual.

I managed to implement these in machine code but did not use the assembler supplied on the tape. For modifying small parts of machine code there is a simple way to include the routines to routine operators within definitions it is within the philosophy of Forth to leave definitions short and simple. If I wanted to include longer pieces of machine code then the assembler looks a useful tool.

The screen editor is used to edit and add screen prior to their being compiled into a Forth dictionary. I did not find a default screen being used to buffer typed editors on other machines. I imagine that people when only editing experience has been screen based as on the BBC itself used that it difficult to present a default screen with both the Forth and screen editors in tandem possibly the best of both worlds. The only thing specially missing from the editor is a search and replace command. The extensive nature of Forth makes this very easy to implement.

Also supplied by Acornsoft is a manual. This is one of the best and one of the worst books on Forth I have read. The most useful feature is a dictionary which correctly and carefully explains the meaning of almost every word included in the dictionary.

After a very gentle start in the few chapters it then rushes between the low and very high level systems in an extremely and frightening manner. As an experienced programmer it has some disturbing omissions and the apparent errors does not help in finding information. It shows signs of a hasty rewrite and has omitted some major points which will surely nobody I would suggest a national edition with the obligatory national expanded and separated from the advanced.

In conclusion I would recommend Acornsoft Forth to anybody who has a BBC

Steve Cohen

Continued from page 28

advantages of Basic, as being well suited for use on microcomputers with their relatively limited memory. It was originally designed for controlling radio telescopes by Charles Moore at Ka Post National Observatory in Arizona in the early 1970's.

Forth's advantages are that it is compact, taking up much less of a system's memory than the typical Basic, and that it contains very few. To the programmer it is very difficult to mistake in Basic, because Forth is an extensible language. It comes with a standard set of commands, the Dictionary, which you then add to, to build up your program.

New commands, which are called Words at Forth, are created out of combinations of the old ones, or by writing machine code routines. Eventually you end up with a single word which when you type it in causes the whole program to Run.

Another distinctive feature of Forth is the stack, a sort of heap on which you store numbers which you are about to use.

In Forth each programmer ends up creating virtually their own language. But the core Dictionary, when you go when you buy a Forth language system and all you have before you set to work, has to be agreed otherwise Forth would fragment into a thousand idiosyncratic quads.

Forth represents a new development in the dictionary definition of Forth was arrived at not by a committee or consensus or consensus but by the community of Forth users themselves meeting at Forth limited group meetings. Forth is the standard Forth, arrived at in 1975.

There are still problems with Forth. Although it is fast and efficient, it is incredibly



difficult to teach other people Forth programs. Gary Kildall, inventor of CP/M, who is particularly a C and Logo enthusiast, describes Forth as a near-ideal language for the 1980s.

Forth, designed in 1971 by Allan Forth, a Texas University Professor, is, on the other hand, very concerned with the human programmer's thinking. The language is named after Alan Forth who, in an 18-year-old, attended the first commercial calculating machine in France in 1830. Forth is designed to be easy for programmers to learn and reuse.

To be frank, I do not like Forth - it faces out to Basic in a particular way which might be good for you but which I would like to be opposed. Allan Forth had strong ideas about structuring programs - that is writing them in separate chunks, or modules, with each program module containing a complete logical thought. The modules are then

continued on page 28

ZX-81 FORTH

ZX-81 Forth from Spectra limited has one selling advantage plus a further four reasons to buy the editor which it writes. In Forth also based on a Forth for IBM the editor limited there is about 70 key for the application dictionary.

The most surprising part of the system was the facility to save the Forth definitions as Forth files. Using the editor a screen can be opened, saved and loaded normally in a Forth file. There is no indication of the screen number as the screen is loaded or unopened to be loaded, which makes loading the file on the tape a little difficult.

Only one screen can be held in memory at one time. Once the screen has been written it can be saved to tape with the word Save and loaded for printing with List or for execution with Load. A heap screen is prepared with a 'Clear' which is the screen number on the top of the stack.

The editor is very different from the Basic editor. The user to save a screen initially will be able to using a number of words for moving a pointer around the screen. When the pointer has been positioned there are words to delete and insert one line into the screen.

Spectra Forth is very close to standard implementation. All the control loops -

initials letters and Unit are printed as is all the expected stack memory and dictionary manipulation words. It even supports recursion.

The standard set has been implemented to ACORN which would be a good screen for a screen program to be written on the ZX-81 in high level Forth using the standard editor for experimentation user code routines.

The speed advantage of Forth on the ZX-81 is pronounced. The slow mode of operation has disappeared. The screen is printed at all times. A sample 1 to 10000 Forth loop for example executes in about 4 seconds in Forth compared with over 20 seconds in Basic.

Also supplied with the tape are two printed books. The 'Primer' of these is an excellent guide. It includes details of the operation as well as a brief introduction to ZX Forth and a glossary containing a definition of every word included in the Forth dictionary. An appendix also includes the machine code provided for getting on the screen. The other booklet is a useful and comprehensive guide to the editor.

Spectra Forth for the ZX-81 supports the Forth philosophy by entering the machine, or possibly beyond, no file.

Spectra Forth for the 48K Spectrum is almost identical to the ZX-81 version. Obviously some new problems have been introduced to make use of the Spectrum's graph-ic and sound capabilities.

It also provides the Spectrum with a full screen editor as on the BBC.

Peter Clifton

SOFTWARE FILE

Continued from page 170



```

1000 PRINT "HOW MANY BYTES REQUESTED"
1010 INPUT N
1020 LET L=MIN(PEEK(1611)+2000+PEEK(1612),N)
1030 LET L=MAX(L,1)
1040 LET L=MIN(L,255)
1050 LET L=MIN(L,255)
1060 LET L=MIN(L,255)
1070 LET L=MIN(L,255)
1080 LET L=MIN(L,255)
1090 LET L=MIN(L,255)
1100 LET L=MIN(L,255)
1110 LET L=MIN(L,255)
1120 LET L=MIN(L,255)
1130 LET L=MIN(L,255)
1140 LET L=MIN(L,255)
1150 LET L=MIN(L,255)
1160 LET L=MIN(L,255)
1170 LET L=MIN(L,255)
1180 LET L=MIN(L,255)
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1390 LET L=MIN(L,255)
1400 LET L=MIN(L,255)
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1420 LET L=MIN(L,255)
1430 LET L=MIN(L,255)
1440 LET L=MIN(L,255)
1450 LET L=MIN(L,255)
1460 LET L=MIN(L,255)
1470 LET L=MIN(L,255)
1480 LET L=MIN(L,255)
1490 LET L=MIN(L,255)
1500

```

Rotating display

Alan Knowles
Gillingham,
Kent



THIS PROGRAM FOR THE C64 with a level 16K will allow pages of information to be entered, which will be fitted onto the Ram windows and appear with a multi-color scanner will run through the display, printing to the screen with the speed of machine code. Entering the program is divided into three main parts:

- Loading the Ram windows
- Entering and rotating the text loader
- Entering and rotating the screen display loader

The final program will be able to translate code with a couple of lines of Basic to run in:

Stage 1 — entering the Ram windows: on a 16K machine up to 19 pages can be displayed if all 79 pages are wanted the data list is 10 roughly 15,000 bytes long. An easy way of entering this is to Load a program from tape that uses most of the 16K, then use the Programmer Rom published in Your Computer Software File, September 1983 by R Young, to change it to a screen Rom.

When this is done store 16000 in the pointer. Once this has been entered as a default command enter:

POKE 16000 0

to make the first line of the program 0. If you have any trouble with line 0 remaining in the screen then:

POKE 1612:LIST 10

is a direct command.

Stage 2 — entering and rotating the text loader — figure 2. When this is run enter the hexadecimal numbers missing out the spaces for example:

POKE 1612:LIST 10

or: When completed press **Nextline** and the program will stop with an error message. Delete the loader — line by line.

Stage 3 — entering and rotating the screen display loader — figure 3. Enter the loader, before running it, save it on tape. Although the program is in Basic a Poke can value RAM and the program may crash if incorrectly entered.

When Run on screen '0' will be displayed on the top left corner of the screen. If a key is pressed the appropriate character will take on place and it will move on to the next print position. If a space is wanted press **Nextline** as the normal space key will break out of the program. To rub out a character press shift 0 as an normal Basic. If a key is pressed for a short time one character is printed. If a key is held down the characters will be printed repeatedly.

Enter **Character Mode** — to print screen characters, press shift 0, screen '0' will become screen '1'.

To screen to screen '1' press shift 1 space.

```

1000 PRINT "HOW MANY BYTES REQUESTED"
1010 INPUT N
1020 LET L=MIN(PEEK(1611)+2000+PEEK(1612),N)
1030 LET L=MAX(L,1)
1040 LET L=MIN(L,255)
1050 LET L=MIN(L,255)
1060 LET L=MIN(L,255)
1070 LET L=MIN(L,255)
1080 LET L=MIN(L,255)
1090 LET L=MIN(L,255)
1100 LET L=MIN(L,255)
1110 LET L=MIN(L,255)
1120 LET L=MIN(L,255)
1130 LET L=MIN(L,255)
1140 LET L=MIN(L,255)
1150 LET L=MIN(L,255)
1160 LET L=MIN(L,255)
1170 LET L=MIN(L,255)
1180 LET L=MIN(L,255)
1190 LET L=MIN(L,255)
1200 LET L=MIN(L,255)
1210 LET L=MIN(L,255)
1220 LET L=MIN(L,255)
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1270 LET L=MIN(L,255)
1280 LET L=MIN(L,255)
1290 LET L=MIN(L,255)
1300 LET L=MIN(L,255)
1310 LET L=MIN(L,255)
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1330 LET L=MIN(L,255)
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1460 LET L=MIN(L,255)
1470 LET L=MIN(L,255)
1480 LET L=MIN(L,255)
1490 LET L=MIN(L,255)
1500

```

Graphic **Character Mode** — to print graphics press shift 0. The screen '0' will become screen '0'. The keys 1 to 0 represent the first 10 characters of the character set — see appendix A of the Basic manual. Press shift 0 to return you to screen '0'.

When each screen is completed there is a short pause — lines 1040 and 4100. This can be used if you have finished. If you have then press 1 and the program will stop. Pressing 0 and the program will continue to the next page.

If you answered '1' then the program has been completed. Add these lines:

```

POKE 16000 16042
POKE 16000 16044
POKE 16000 16046

```

To look out of the display press the break key at the end of the top of page.

If you wish to use the two lines at the bottom of the screen — lines 25 and 26 — before running the screen display loader change line 230 to:

POKE 16000 16040

And before running the final program add:

```

POKE 16000 16040

```

To run the program with the extended screen use Run 1997.

To alter the time each page is on the screen **Poke 1612:1** where 1 is any number from 1 to 255. If you under a second, 255 is approximately 1 minute 45 seconds.

To run through the display once, restore line 1000.

Figure 1: Automatic Ram

```

1000 PRINT "HOW MANY BYTES REQUESTED"
1010 INPUT N
1020 LET L=MIN(PEEK(1611)+2000+PEEK(1612),N)
1030 LET L=MAX(L,1)
1040 LET L=MIN(L,255)
1050 LET L=MIN(L,255)
1060 LET L=MIN(L,255)
1070 LET L=MIN(L,255)
1080 LET L=MIN(L,255)
1090 LET L=MIN(L,255)
1100 LET L=MIN(L,255)
1110 LET L=MIN(L,255)
1120 LET L=MIN(L,255)
1130 LET L=MIN(L,255)
1140 LET L=MIN(L,255)
1150 LET L=MIN(L,255)
1160 LET L=MIN(L,255)
1170 LET L=MIN(L,255)
1180 LET L=MIN(L,255)
1190 LET L=MIN(L,255)
1200 LET L=MIN(L,255)
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1250 LET L=MIN(L,255)
1260 LET L=MIN(L,255)
1270 LET L=MIN(L,255)
1280 LET L=MIN(L,255)
1290 LET L=MIN(L,255)
1300 LET L=MIN(L,255)
1310 LET L=MIN(L,255)
1320 LET L=MIN(L,255)
1330 LET L=MIN(L,255)
1340 LET L=MIN(L,255)
1350 LET L=MIN(L,255)
1360 LET L=MIN(L,255)
1370 LET L=MIN(L,255)
1380 LET L=MIN(L,255)
1390 LET L=MIN(L,255)
1400 LET L=MIN(L,255)
1410 LET L=MIN(L,255)
1420 LET L=MIN(L,255)
1430 LET L=MIN(L,255)
1440 LET L=MIN(L,255)
1450 LET L=MIN(L,255)
1460 LET L=MIN(L,255)
1470 LET L=MIN(L,255)
1480 LET L=MIN(L,255)
1490 LET L=MIN(L,255)
1500

```

Figure 2: The Text Loader

```

1000 PRINT "HOW MANY BYTES REQUESTED"
1010 INPUT N
1020 LET L=MIN(PEEK(1611)+2000+PEEK(1612),N)
1030 LET L=MAX(L,1)
1040 LET L=MIN(L,255)
1050 LET L=MIN(L,255)
1060 LET L=MIN(L,255)
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1490 LET L=MIN(L,255)
1500

```

```

20 IF G=0 THEN INPUT G
30 POKE A,16+CODE A#CODE A#16
40 GOTO 20
50 SCROLL
60 PRINT A,0#1 TO 0
70 LET A#0#12 TO 1
80 LET A#1
90 GOTO 20

```

HEX DUMP FOR THE ABOVE LOADER	HEXADRICAL
10014 70 70 E1 7E 99 C0 FE FF	
10020 0B 00 80 80 10 F4 99 88	
10026 11 FF FF 01 32 37 10 99	
10030 FD 10 FD 00	

Figure 3: Screen display loader

```

1000 PRINT "HOW MANY BYTES REQUESTED"
1010 INPUT N
1020 LET L=MIN(PEEK(1611)+2000+PEEK(1612),N)
1030 LET L=MAX(L,1)
1040 LET L=MIN(L,255)
1050 LET L=MIN(L,255)
1060 LET L=MIN(L,255)
1070 LET L=MIN(L,255)
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1490 LET L=MIN(L,255)
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Continued on page 181

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WARRIOR

With over 100 levels this game offers the ultimate challenge to those who demand a serious test of their skills. Includes a manual, 200 pages of hints, and a 200 page strategy guide.



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SOFTWARE FILE

(continued from page 104)

440 BOARD 20.4
 450 FOR DEFENSE, "FOR DEFENSE" (COPY 11289) (COPY 11289) (COPY 11289)
 460 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)
 470 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)
 480 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)
 490 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)
 500 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)
 510 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)
 520 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)
 530 FOR DEFENSE (COPY 11289) (COPY 11289) (COPY 11289)

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 THE FIRST "WAS YOU GET EITHER TRAIL YOUR OWNERS AND
 AND A "WAS"
 THE "WAS" LEFT, STRONGER, 20, "WAS"
 THE "WAS" LEFT, STRONGER, 20, "WAS"
 THE "WAS" LEFT, STRONGER, 20, "WAS"
 THE "WAS" LEFT, STRONGER, 20, "WAS"
 THE "WAS" LEFT, STRONGER, 20, "WAS"
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 THE "WAS" LEFT, STRONGER, 20, "WAS"
 THE "WAS" LEFT, STRONGER, 20, "WAS"

Bomber

Strategic Support,
 Albany,
 London



IF YOU HATE FLAMES or even any of the
 Microsoft games (isn't every year about the
 multi-color graphics and the super smooth
 animation? I mean, even a simple game based
 on the traditional Atari, is also how multi-
 colored animation can be moved across the
 screen and to show how it can add the
 professional touch to simple games like this
 one.

The program also shows how cleanly
 moving the screen is faster than painting. This
 is not recommended by Atari, who says that a
 multi program incompatible with the Tube

but you cannot see anything on the Tube in
 the museum — and an Atari's past record of
 longevity — but progress for the BBC is well
 probably into a lot of time for the long-awaited
 second program to appear on the market.

Atelier software is that you are not
 interested in a certain number of characters but
 you can have a strong and well-developed
 character in the necessary class.

The game can be moved in many ways —
 usually from the top of the keyboard, but,
 clearly to give details, more than one key
 maps that are found elsewhere on the screen at
 once and so on. Let your imagination run wild
 and you could end up with a totally new and
 exciting game.

The program is very well structured and it
 displays very readable in fact, the program
 does not contain a single Core or Core's
 structure.

100	Temp menu
120	Screen Mode 7 and points
	characters
140	Defence character and average
160	Screen Mode 2 and background
	color in open and gets out of
	front of scene
180	Animation character look and
	data by the accelerated
	character
200 to 210	Screen loop
170 to 200	The screen open
220 to 230	A simple dirty procedure
300 to 400	A procedure to build the
	building
420 to 430	In fact to variables
470 to 480	then for variables
490 to 500	Screen Code
520 to 530	Procedure called on loading
1100 to 1200	Defence character
1250	Screen
1280 to 1300	Instructions

```

1000 *****
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10000 ***
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100000 ***

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(Continued on next page)

SOFTWARE FILE

Continued from previous page

```

1710 GOTO 1000 IF NOT @=64800, and
1720 END
1730 LOOP
1740 FOR N=0 TO 1000 STEP 10
1750 PRINT N, LOOP
1760 NEXT N
1770 END
1780 SCREEN 170: SCREEN 170
1790 SCREEN 170: SCREEN 170
1800 SCREEN 170: SCREEN 170
1810 END
1820 SCREEN 170: SCREEN 170
1830 SCREEN 170: SCREEN 170
1840 SCREEN 170: SCREEN 170
1850 SCREEN 170: SCREEN 170
1860 SCREEN 170: SCREEN 170
1870 SCREEN 170: SCREEN 170
1880 SCREEN 170: SCREEN 170
1890 SCREEN 170: SCREEN 170
1900 SCREEN 170: SCREEN 170
1910 SCREEN 170: SCREEN 170
1920 SCREEN 170: SCREEN 170
1930 SCREEN 170: SCREEN 170
1940 SCREEN 170: SCREEN 170
1950 SCREEN 170: SCREEN 170
1960 SCREEN 170: SCREEN 170
1970 SCREEN 170: SCREEN 170
1980 SCREEN 170: SCREEN 170
1990 SCREEN 170: SCREEN 170
2000 SCREEN 170: SCREEN 170

```

```

2010 SCREEN 170: SCREEN 170
2020 SCREEN 170: SCREEN 170
2030 SCREEN 170: SCREEN 170
2040 SCREEN 170: SCREEN 170
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2060 SCREEN 170: SCREEN 170
2070 SCREEN 170: SCREEN 170
2080 SCREEN 170: SCREEN 170
2090 SCREEN 170: SCREEN 170
2100 SCREEN 170: SCREEN 170
2110 SCREEN 170: SCREEN 170
2120 SCREEN 170: SCREEN 170
2130 SCREEN 170: SCREEN 170
2140 SCREEN 170: SCREEN 170
2150 SCREEN 170: SCREEN 170
2160 SCREEN 170: SCREEN 170
2170 SCREEN 170: SCREEN 170
2180 SCREEN 170: SCREEN 170
2190 SCREEN 170: SCREEN 170
2200 SCREEN 170: SCREEN 170
2210 SCREEN 170: SCREEN 170
2220 SCREEN 170: SCREEN 170
2230 SCREEN 170: SCREEN 170
2240 SCREEN 170: SCREEN 170
2250 SCREEN 170: SCREEN 170
2260 SCREEN 170: SCREEN 170
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```

Alien flashers

Compaq, Wilson, Flavia, Gopher



NOT EVERY OLD Marine is an alien, but you never know your friend. This program uses recursive and user-defined program to good effect, as well as a machine-code routine to achieve its purpose.

Instructions are included in the program and are quite straightforward. To score a high score requires a few games to work out the strategy. On destroying a mass of aliens, the usual number of which is eight at the start — up to 50 — the player is then confronted with a new mass of invaders, which will have increased in number by five — maximum 50. For each wave destroyed without losing a laser beam, the bonus is doubled, but is zero if any alien manages to pass your defenses and to destroy your laser beam. You start with three laser beams.

Some variables can be altered in the program to vary the game.

- L.B. — number of laser beams
- BE — bonus at start
- BC — score — shown at line 100
- G — top left of screen — Alter for G+C — start of laser motion (expanded) X

User-defined keys

John Burton, Apple, Wrenvater



THIS PROGRAM for the IBM Spectrum provides 50 user-defined function keys which are used in a number way to those on the BASIC Macro.

Because there are no unused keys on the Spectrum keyboard, a new shift key is used to score above. The Space key is used in the same way in the new example start keys. It, and any other key pressed against will produce the required line on the side/lines area in the bottom of the screen. For example, if the H

```

1000 SCREEN 170: SCREEN 170
1010 SCREEN 170: SCREEN 170
1020 SCREEN 170: SCREEN 170
1030 SCREEN 170: SCREEN 170
1040 SCREEN 170: SCREEN 170
1050 SCREEN 170: SCREEN 170
1060 SCREEN 170: SCREEN 170
1070 SCREEN 170: SCREEN 170
1080 SCREEN 170: SCREEN 170
1090 SCREEN 170: SCREEN 170
1100 SCREEN 170: SCREEN 170
1110 SCREEN 170: SCREEN 170
1120 SCREEN 170: SCREEN 170
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Continued on page 513

MEMOTECH

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Five months ago Memotech developed the first 64K Memopak, designed to maximise the capabilities of the Sinclair ZX81. Since then, using the ZX81 as a starting point, we've gone on to produce a comprehensive range of Memopaks, adding 16K and 32K memory expansions, address packages comprising a Word Processor, Z80 Assembler and Spreadsheet Analysis, plus Communication Interfaces, High Resolution Graphics and a professional quality Keyboard. To complete our range of ZX81 add-ons, we are now introducing the MEMOPAK RS232 Serial Interface.

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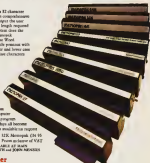
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For those who writing fast on the road to and comparing, these packs transform the ZX81 from a toy to a powerful computer. Data storage, extended program, long and complex displays all become feasible. Further details available on request. 16K Memopak £24.95 32K Memopak £24.95 64K Memopak £29.95. From enquiries of VAT REGISTRARS AND APPROVALS OF TRADE MARKS OF THE UNITED KINGDOM.

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Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, WOODY. ROM routines include an ASSEMBLER/DISASSEMBLER with screen display of the 240 CPU registers, memory and program, which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an option ROM pack.

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The MTX300 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 182 high resolution graphics with all sixteen colours available, and 32 easily redefinable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are reprogrammable printer port, two joystick ports, an uncommitted I/O port, 2400 baud Cassette port separate TV and Video Monitor ports, 4 channel sound with full output plus a dedicated cartridge port. Other standard features include the 280A processor running at 4MHz, real time clock, full moving key keyboard with 78 keys including eight 2-function keys and separate numeric pad.

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SOFTWARE FILE

Continued from page 155

Key was programmed with

BORDER 7 PAPER 7 BKS 0LS

Pressing Space and B together will produce characters when the next key is pressed.

Programming the keys is usually only done when the program is set up to machine code in raw, but could be done using Poit also.

After program I is stored, key definitions should be entered from line 3000 onwards. This should have the code for each keyboard or letter or symbol with the line data being zero. For example the line above should be: **3000 DATA 200, 50, 50, 200, 50, 50, 200, 50, 0** where 211 is the code for border, 10 the code for 5, and 10 the code for and so on.

The line data line of 3000 will default key H, the second will default Y and the third Y. The sequence is:

H Y H Y H Y H Y H Y H Y H Y

and so on.

The letters in brackets cannot be programmed but must still be given the code 0 in the Data line.

The codes are put in the area of memory from 3032 on with each key having 32 bytes. The machine code line interchanges and is chosen to used with another program that does to also. Examples of key definitions:

Key H LOAD 0 RUN
Key Y LOAD 0 DRAW 200 0 DRAW 1 0 0 DRAW 200 0 DRAW 1 0

Key B -NOT used

Key G Print 0

Key T Plot 50, 20 DRAW 50 50 100 0

Key 0 RANDOMISE 0

The data line for these are:

3000 DATA 200, 50, 50, 200, 50, 50, 200, 50, 0
3001 DATA 200, 50, 50, 200, 50, 50, 200, 50, 0
3002 DATA 200, 50, 50, 200, 50, 50, 200, 50, 0
3003 DATA 200, 50, 50, 200, 50, 50, 200, 50, 0
3004 DATA 200, 50, 50, 200, 50, 50, 200, 50, 0

10 DATA 10, 7, 20, 7, 30, 7, 40, 7, 50, 7, 60, 7, 70, 7, 80, 7, 90, 7, 100, 7, 110, 7, 120, 7, 130, 7, 140, 7, 150, 7, 160, 7, 170, 7, 180, 7, 190, 7, 200, 7, 210, 7, 220, 7, 230, 7, 240, 7, 250, 7, 260, 7, 270, 7, 280, 7, 290, 7, 300, 7, 310, 7, 320, 7, 330, 7, 340, 7, 350, 7, 360, 7, 370, 7, 380, 7, 390, 7, 400, 7, 410, 7, 420, 7, 430, 7, 440, 7, 450, 7, 460, 7, 470, 7, 480, 7, 490, 7, 500, 7, 510, 7, 520, 7, 530, 7, 540, 7, 550, 7, 560, 7, 570, 7, 580, 7, 590, 7, 600, 7, 610, 7, 620, 7, 630, 7, 640, 7, 650, 7, 660, 7, 670, 7, 680, 7, 690, 7, 700, 7, 710, 7, 720, 7, 730, 7, 740, 7, 750, 7, 760, 7, 770, 7, 780, 7, 790, 7, 800, 7, 810, 7, 820, 7, 830, 7, 840, 7, 850, 7, 860, 7, 870, 7, 880, 7, 890, 7, 900, 7, 910, 7, 920, 7, 930, 7, 940, 7, 950, 7, 960, 7, 970, 7, 980, 7, 990, 7, 1000, 7

1000 LET P=0:FOR P=0 TO 99:PRINT P:GOTO 10
2000 DATA 10, 7, 20, 7, 30, 7, 40, 7, 50, 7, 60, 7, 70, 7, 80, 7, 90, 7, 100, 7, 110, 7, 120, 7, 130, 7, 140, 7, 150, 7, 160, 7, 170, 7, 180, 7, 190, 7, 200, 7, 210, 7, 220, 7, 230, 7, 240, 7, 250, 7, 260, 7, 270, 7, 280, 7, 290, 7, 300, 7, 310, 7, 320, 7, 330, 7, 340, 7, 350, 7, 360, 7, 370, 7, 380, 7, 390, 7, 400, 7, 410, 7, 420, 7, 430, 7, 440, 7, 450, 7, 460, 7, 470, 7, 480, 7, 490, 7, 500, 7, 510, 7, 520, 7, 530, 7, 540, 7, 550, 7, 560, 7, 570, 7, 580, 7, 590, 7, 600, 7, 610, 7, 620, 7, 630, 7, 640, 7, 650, 7, 660, 7, 670, 7, 680, 7, 690, 7, 700, 7, 710, 7, 720, 7, 730, 7, 740, 7, 750, 7, 760, 7, 770, 7, 780, 7, 790, 7, 800, 7, 810, 7, 820, 7, 830, 7, 840, 7, 850, 7, 860, 7, 870, 7, 880, 7, 890, 7, 900, 7, 910, 7, 920, 7, 930, 7, 940, 7, 950, 7, 960, 7, 970, 7, 980, 7, 990, 7, 1000, 7

Sea-Fox

Jason Bell
Preston
Buckinghamshire



TRY PLAY THE ROLE of a submarine hunting beneath the surface of the water. In the shipping lanes in the Atlantic, Indian, and Pacific oceans, you'll find a variety of ships, submarines, and other vessels. You can play at a different speed. You can play by holding down ships with your fingertips, and you can leave games depending on the ship speed and distance from the submarine.

Use the joystick — in the left hand corner — to move your sub left and right. Press the trigger button to launch a torpedo. Usually, you have one minute to score in many points in you can. If you manage to score 1,000 points in the first minute, then you get 30 seconds of extra playing time. From that on, you have score another 500 points to win more time — 30 seconds. When the time counts' machine ends, the game is over.

If you get one of the top five scores, you then have the chance to enter your name into the high-score table. You can set up to seven lines, but the computer will only accept:

80 DATA 10, 7, 20, 7, 30, 7, 40, 7, 50, 7, 60, 7, 70, 7, 80, 7, 90, 7, 100, 7, 110, 7, 120, 7, 130, 7, 140, 7, 150, 7, 160, 7, 170, 7, 180, 7, 190, 7, 200, 7, 210, 7, 220, 7, 230, 7, 240, 7, 250, 7, 260, 7, 270, 7, 280, 7, 290, 7, 300, 7, 310, 7, 320, 7, 330, 7, 340, 7, 350, 7, 360, 7, 370, 7, 380, 7, 390, 7, 400, 7, 410, 7, 420, 7, 430, 7, 440, 7, 450, 7, 460, 7, 470, 7, 480, 7, 490, 7, 500, 7, 510, 7, 520, 7, 530, 7, 540, 7, 550, 7, 560, 7, 570, 7, 580, 7, 590, 7, 600, 7, 610, 7, 620, 7, 630, 7, 640, 7, 650, 7, 660, 7, 670, 7, 680, 7, 690, 7, 700, 7, 710, 7, 720, 7, 730, 7, 740, 7, 750, 7, 760, 7, 770, 7, 780, 7, 790, 7, 800, 7, 810, 7, 820, 7, 830, 7, 840, 7, 850, 7, 860, 7, 870, 7, 880, 7, 890, 7, 900, 7, 910, 7, 920, 7, 930, 7, 940, 7, 950, 7, 960, 7, 970, 7, 980, 7, 990, 7, 1000, 7

upper case, second value letters, so do not press the Atari keys and lower-case keys.

All movement in Sea-Fox is achieved by a vertical black rectangle, VBL, because in computerized war players usually graphics. The vertical black period occurs every 1/60th of a second after the screen has been drawn. Therefore, whatever happens in a VBL routine, it occurs every 1/60th of a second, regardless of most other operations. This is often known as multi-processing.

In Sea-Fox, a VBL routine gives fast, smooth movement. The routine performs three main functions: it moves the ships, submarines and torpedoes. The routine uses page 6 — locations 3000-3100 hex, 1538-1735 decimal — to be a variable which the routine uses:

1538 to 1539 Horizontal positions of players 0-9 — ship
1540 to 1542 Speeds of players 0-9
1543 to 1548 Direction of players 0-9
1549 Horizontal position submarine player 0
1550 Missile velocity flag 1 — yes 0 — no
1551 Horizontal position missile 0 — torpedo
1552 Missile speed

The ship speeds vary from 0 to 3 — 0 only when the ship is being exploded. The speed is simply the number of times a torpedo is

permitted in the VBL routine. Your submarine torpedoes in speed 3. The torpedoes are 1 to right and 201 to left. In the routine, these values are added to the horizontal position values, which give the desired result. The missile speed is usually set to 3, although this can be changed by altering the 1550 Data value in line 440.

The data line for the VBL routine is held in VBL8, another routine, which enables the VBL to be held in memory. The routine changes the desired vertical black vector — locations 3000 and 3020 hex — so as to pass to my routine. This can only be done at machine language, and is performed by jumping to an operating system routine SET VBL, which sets a variable VBL80 = 3000 hex.

Before jumping to the OS routine, the X register is loaded with the high byte of the address of the VBL routine, and the Y register is loaded with the low byte. The accumulator is then loaded with 0 in the accumulator register, or 1 for the desired vector. I used the deferred vector.

The VBL is enabled by executing **0 = LOAD VBL80, VBL81**

By changing the two values loaded by the X and Y registers — the 3rd and 5th values of **0 = 0** — to 128 and 95 respectively, and executing the same command, the VBL can be disabled.

—300, 0
00 DATA 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000
100 DATA 10, 7, 20, 7, 30, 7, 40, 7, 50, 7, 60, 7, 70, 7, 80, 7, 90, 7, 100, 7, 110, 7, 120, 7, 130, 7, 140, 7, 150, 7, 160, 7, 170, 7, 180, 7, 190, 7, 200, 7, 210, 7, 220, 7, 230, 7, 240, 7, 250, 7, 260, 7, 270, 7, 280, 7, 290, 7, 300, 7, 310, 7, 320, 7, 330, 7, 340, 7, 350, 7, 360, 7, 370, 7, 380, 7, 390, 7, 400, 7, 410, 7, 420, 7, 430, 7, 440, 7, 450, 7, 460, 7, 470, 7, 480, 7, 490, 7, 500, 7, 510, 7, 520, 7, 530, 7, 540, 7, 550, 7, 560, 7, 570, 7, 580, 7, 590, 7, 600, 7, 610, 7, 620, 7, 630, 7, 640, 7, 650, 7, 660, 7, 670, 7, 680, 7, 690, 7, 700, 7, 710, 7, 720, 7, 730, 7, 740, 7, 750, 7, 760, 7, 770, 7, 780, 7, 790, 7, 800, 7, 810, 7, 820, 7, 830, 7, 840, 7, 850, 7, 860, 7, 870, 7, 880, 7, 890, 7, 900, 7, 910, 7, 920, 7, 930, 7, 940, 7, 950, 7, 960, 7, 970, 7, 980, 7, 990, 7, 1000, 7

1000 DATA 10, 7, 20, 7, 30, 7, 40, 7, 50, 7, 60, 7, 70, 7, 80, 7, 90, 7, 100, 7, 110, 7, 120, 7, 130, 7, 140, 7, 150, 7, 160, 7, 170, 7, 180, 7, 190, 7, 200, 7, 210, 7, 220, 7, 230, 7, 240, 7, 250, 7, 260, 7, 270, 7, 280, 7, 290, 7, 300, 7, 310, 7, 320, 7, 330, 7, 340, 7, 350, 7, 360, 7, 370, 7, 380, 7, 390, 7, 400, 7, 410, 7, 420, 7, 430, 7, 440, 7, 450, 7, 460, 7, 470, 7, 480, 7, 490, 7, 500, 7, 510, 7, 520, 7, 530, 7, 540, 7, 550, 7, 560, 7, 570, 7, 580, 7, 590, 7, 600, 7, 610, 7, 620, 7, 630, 7, 640, 7, 650, 7, 660, 7, 670, 7, 680, 7, 690, 7, 700, 7, 710, 7, 720, 7, 730, 7, 740, 7, 750, 7, 760, 7, 770, 7, 780, 7, 790, 7, 800, 7, 810, 7, 820, 7, 830, 7, 840, 7, 850, 7, 860, 7, 870, 7, 880, 7, 890, 7, 900, 7, 910, 7, 920, 7, 930, 7, 940, 7, 950, 7, 960, 7, 970, 7, 980, 7, 990, 7, 1000, 7

Continued on page 157

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The TI Home Computer is a real computer system

The TI Home Computer has got the memory power you might expect from more expensive computers. Built in At its heart is a powerful TMS 9900 16-BIT Microprocessor. Most other home computers have only an 8-BIT. And you can expand the memory from 16K of RAM up to 512K.

The total memory capacity is 10K Bytes.

A wide range of software for everyone

Another feature that makes the TI system so powerful, yet so easy to use is Solid State Software™. These plug-in cartridges cover everything from space games like *Pirates™* to teaching math, managing home finances and composing music. And the range is getting wider all the time.

It even has what professionals look for in a home computer

CPU: TMS 9900 16-BIT, plus 256-byte Secondary RAM
Memory: Total 10K bytes, 16K bytes ROM external up to 16K 16M-address via real 16K built-in RAM expandable to 512K bytes.
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High resolution
Interfaces: 1 serial, TV I ports, most peripheral port

More than one programming language

The standard programming language, TI BASIC, is built into your TI Home Computer so you can begin programming right away. But there's an expanded range of optional languages like Extended BASIC, TI Logo, USCD-Pascal, TIFORTH and Assembler.

With these you can fully expand your programming skills.

A wide range of peripherals

Most computers lose a lot of memory when you add peripherals. The TI Home Computer is different. Every peripheral comes with its own built-in programs to keep the loss of memory to a minimum.

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A lot more for no more

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Self-writing

Jeremy H. Lee,
Northbrook,
Illinois

MS-DOS

Macros (DOS PROGRAMS) writes with the mouse cursor into a loop that it creates on the screen. One instance of the loop writes a basic program if you want the flexibility of having the code as part of your files. Also, chapters list macros created using programs that let you make the character without bothering with bit patterns and hexadecimal-based conversion and may be required to run on Dos machines.

Here is a program that will take memory locations within a specified range, print out a column of data together with a specified line number and usually enter it to go off without user intervention. It makes use of the fact that if any numbers are left on the keyboard buffer, or put there deliberately and the keyboard buffer pointer is not zero, then those numbers will be taken as valid ASCII, including carriage return. Location 190 is the keyboard buffer pointer, location 1 is the first location of the keyboard buffer, and 0 is the last.

When the program is done, it will ask for a start line number. This requires that you enter the value of the line number that you would like the program to start entering lines. Once the line number is kept in location 0, you may only have lines from 0 to 175. This should be as much of a limitation unless you already have a program there. If that is the case, however, it is simple to add an offset by changing line 0010 to

```
0010  L = 19000 + 1
```

where 1 is an offset, for example 1-600 and you change line 0010 to 1, then the lines you mean will start at 600 and go on increments of one. If you do not want them to go in increments of one, then change line 0010 to

```
0010  L = 19000 + 5
```

where 5 is a scaling factor. Thus, if 5-10 then the line numbers will go in increments of 10. Obviously the two can be combined, giving an offset as well as an increment

```
0010  L = 19000 + 5 + 1
```

The listing of the program, written for a Turbo, should pose no problems to other users of their computers have a similar type of keyboard buffer system and know the appropriate locations. The cursor control keys

are in brackets in the listing to ease interpretation. For example (forward) means home the cursor, left) means clear screen, down) means move the cursor down three lines.

There is just one other point about using the program. When an offset is specified

and it is not a factor of 10 away from the start location, the data contained in the last location, plus the consecutive increments up to 10, will be processed in the last line entered. This is so potential errors that it may not be five extra bytes of memory. In any case it is not much worse to delete the unwanted values

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Mean machine

Garrett B. Woodhead,
Brookline,
Massachusetts

FASTBALL

THIS GAME IS TO challenge your Mean Machine around the race track — grinding the walls. If your car suddenly drives over an oil slick, then you may slide and therefore lose the car.

After using your three cars, press key Y or key N to run or stop the game. The game can control cursor keys.

- 01 Graphic A
- 02 Graphic B
- 03 Graphic C
- 04 Graphic A and B
- 05 Graphic 1
- 06 Graphic 2
- 07 Graphic 3
- 08 Graphic 4
- 09 Graphic 5
- 10 Graphic Shifted 3

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You are in command of a galactic defence vessel searching through interstellar space to attack and destroy invading aliens. As long range this is controlled by your keyboard, however when the alien stars in the local quadrant, with passing planets space-pieces, the-jobs and all sounds the aliens which may strike in packs or single attacking and matter moves around your ship. You may counter-attack the aliens with your photon torpedoes or if you move in close enough switch over to manual and visual control to chase the flying alien and deal with your photon. See the star maps open relative to your ship's main-rearview. Switched-off for the start of the shooting part. This will need to continue energy returning to get back to the starting point and then the time-gate to the alien quadrant. Weapons, shield and energy status are all monitored throughout the game machine code game which may be some reference of use.

ORIG APPROVED VERSION (9/88)

GALAXY 8

ORIG

One of Galaxy 8 contains three parts made to take arcade type space games. They consist of Galaxy which is a 3-dimensional game with 15 angled stars including them. It looks a slight controlled nuclear launch in groups of one, two or three. Next Atom War is an arcade how game with a sensor shows moving objects across the screen towards your ship which the right left up and down controls plus power fire to chase the meters along with any items that may be being dropped them. The last game on the side is Space Chase which gives a view from your cockpit of a flying ship. You fire at an alien and he runs back, so you must get a shot to quickly before he destroys your force. Finally last is the last element of the game which is a space games but the end is BASIC which can only be seen from being silent, simple and clearly without any enemy are in the BASIC equipped in an English Manual statement.

ORIG VERSION (9/88)

Assembler/Disassembler ORIG

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|---------------------|----------|-----------|
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ORIG VERSION (9/88)

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SPECTRUM VERSION (9/88)

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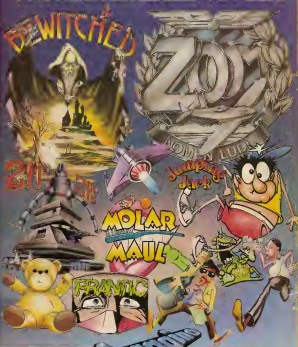
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