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A Database Publication

electron

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Vol 8, No. 9, June 1985 £1

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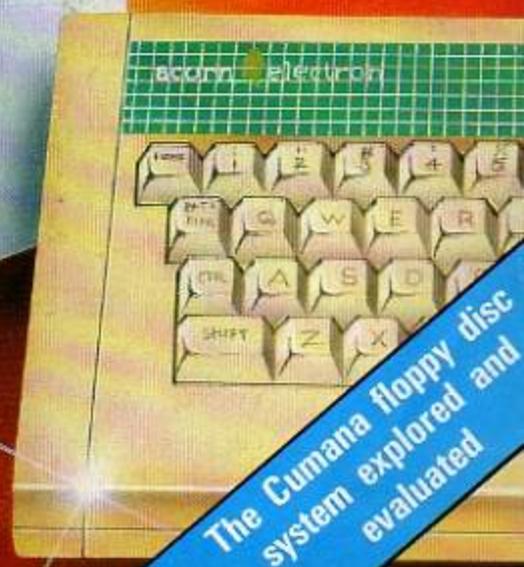
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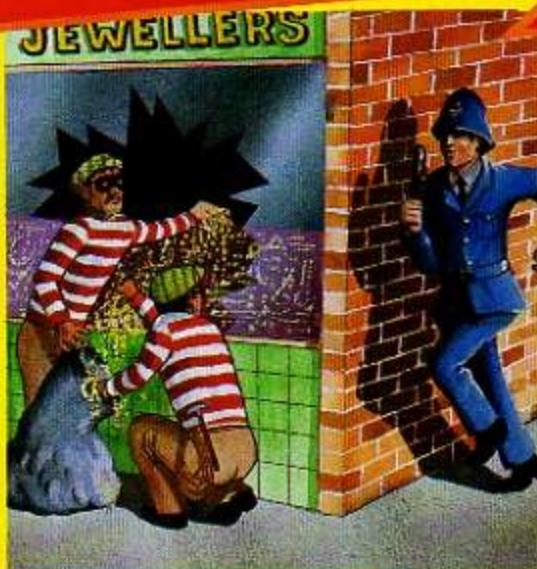


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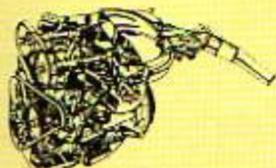


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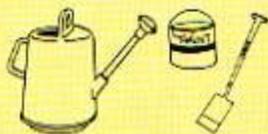
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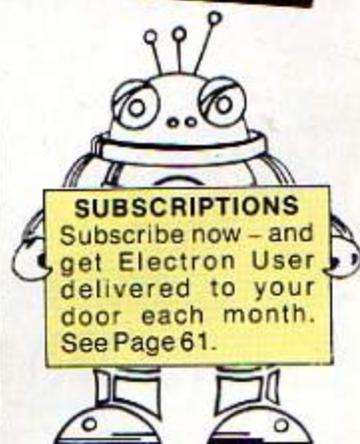
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DISC POWER

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NOW it's cheaper than ever to add the power of discs to your Electron Plus 1 – with the Cumana floppy disc system.

Easy to fit and simple to use, the Cumana system has the latest and most flexible DFS for the Electron – and much more besides.

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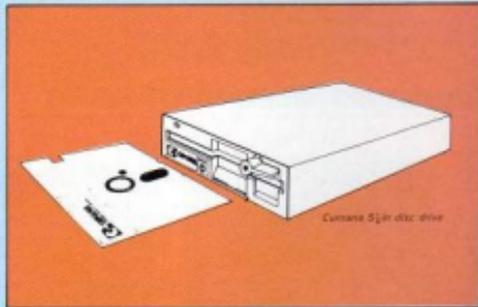
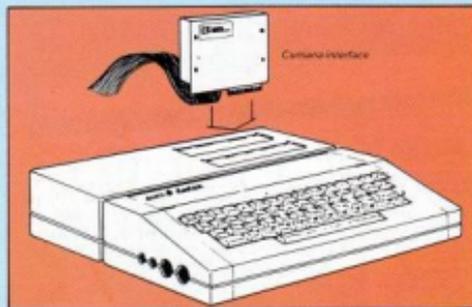
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electron user NEWS

Educational software galore for Electron

A NATIONWIDE investigation by Acorn has revealed that there are up to 1,000 educational software titles currently available for the Electron.

The study was launched in the wake of mounting criticism from concerned parents who have been unable to locate suitable scholastic programs for their children.

After the problem was first highlighted in *Electron User*, Acorn decided to crack the case of the missing software.

Within only 10 days the company had come up with a list of almost 250 titles – and it has already been suggested that this may be just a quarter of those on the market.

"In all, there could be up to 1,000 titles out

there", said Gareth Williams, the Acorn marketing consultant in charge of the project.

"While we knew there was a lot available, I was surprised to find out just how much and that the quality of most is so good".

Breakdown

Gareth Williams is now collating the Electron list – the first ever – which gives a complete breakdown of each program.

Apart from the title, the name of the software publishers and the price, it provides details of the type of subject covered, whether tape or disc and if any printed text is available with the program.

"What we have found to date is that the software covers across the range, without shortfalls in any one area", says Gareth Williams.

Availability

However, as comprehensive as the Electron list will prove to be, it does not in itself solve the basic availability problem.

"This can only be achieved by persuading the dealers to stock educational software",

admits the Acorn man.

"Up to now their objection to this is that it is too slow moving in comparison to games. And as a result, takes up too much of their valuable shelf space.

"However, I think they are going to miss out if they don't. After all, it's the parents who shell out the money for the computers hoping it will help them with their education.

"So if this situation carries on they may simply decide it isn't worthwhile to buy one. If this happens then everyone is in trouble – including the dealer".

MINI Office, the chart topping software package for the Electron from Database Software, is being used as a teaching aid by leading UK computer retailers, W.H. Smith.

Shortlisted for two major categories in the 1985 British Microcomputer Awards, MINI Office has been selected to bring the message home to W.H. Smith staff that home com-

Special supplement

ACORN'S unique list of educational software available for the Electron is to be published as a special supplement with the next issue of *Electron User*.

This will be undertaken as part of the magazine's ongoing commitment to the campaign to make a wide range of scholastic programs readily available to readers.

"Once Electron users have seen what is available, they will

at least know what to order from their dealers", says Derek Meakin, the managing editor of *Electron User*.

"In this way, it will demonstrate to retailers just how large the demand is for these products.

"And from there on they will hopefully realise the undoubted potential in carrying a range of educational software. In this way, the entire problem could be solved".

Retail training aid

puters have a serious application.

The company is currently using the program in its mobile training classroom, which is on a nationwide tour.

Capable

"We have a lot of staff and we want them to know what the goods are capable of which they are selling," said a training spokesman.

W.H. Smith chose

MINI Office because its four programs – word processing, database, spreadsheet and graphics – emphasise how easily a computer can be turned into an inexpensive office tool.

"At its revolutionary low price of £5.95, MINI Office is a truly cost effective way of introducing the business concept of computers to our staff", said the man from W.H. Smith.

NEW BRIDGE 'CONTRACT'

AN improved version of Contract Bridge has been released by Alligata Software.

The firm is offering owners of the original version a "new for old" deal costing £1 for cassette exchange and £3 for cassette to disc upgrade.



NEW BOBBY DAZZLER

FORMER England and Manchester United star Bobby Charlton is the inspiration behind a new Electron football simulation game.

Using Charlton's knowledge of the game, simulation specialists DACC have come up with Bobby Charlton Soccer.

The program includes a management module, enabling the player to master team building skills, a match play module, plus voice instructions and play hints

from the great soccer maestro himself.

Available soon will be the extra World Cup and Canon League modules. Prices range from £11.95.



ELITE CHAMPIONSHIPS FOR THE BIG SHOW

THE National Elite Championships are to be a major attraction at the first of this year's Electron & BBC Micro User Shows.

Six finalists, from an entry of 5,000, have the chance of winning equipment and software to the value of £1,000.

Forming the last stage of the competition – the world's first championship for the best-selling "cult" space game – is a two-day

Elite-athlon to be held at the Show on the Saturday and Sunday.

Finalists will be called on to play a new, second processor version of the all-colour game now with faster graphics. It will be the first public showing of this version.

Elite has sold more than 100,000 copies since its launch.

Its success has prompted Acornsoft to sign a licensing agree-

ment for Commodore and Spectrum versions.

"Naturally we are very pleased they have chosen our show as the venue for the final", says Derek Meakin, head of Database, the show's organisers.

"It will certainly be a major attraction at an event which will once again prove to be the launching pad for all that's new in the world of the Electron".

Radio boost

THE school radio series "Maths with a Story" has been augmented by two software packs for the Electron, designed for home users as well as teachers.

Written by former maths teacher Peter Smith, the programmes, aimed at the primary age group, have been given extensive trials in schools.

The BBC Publications software is being published in two cassette packs costing £10.95 each – the first now, the second in September.

The second of the maths radio series is being repeated this summer and autumn.

Playing the game

FOR the first two days of the Electron & BBC Micro User Show the Elite stand will be open to the general public. Visitors will get the chance to see and play the sophisticated 6502 second processor version of the top selling game.

The stand will be open all day Thursday May 9 and Friday May 10 and also on Saturday May 11 after the first Elite-athlon session finishes at 3pm.

Sports quiz released

THE third in the Kosmos Software series of Answer Back quiz programs for the Electron has been released.

Answer Back Sport combines tennis and football games with a series of quizzes on sporting subjects.

The games can be run

separately or in conjunction with the quizzes, but either way the objective is to beat the Kosmos team.

A master control program is first loaded into the Electron, allowing any of 26 quiz topics to be selected. Subjects covered range from ath-

letics to water sports.

As with the other titles in the series, Answer Back Sport includes the facilities to enable the user to create, edit and save an unlimited number of new, multiple-choice quizzes.

Price is £9.95.



Electrons brought in to train handicapped

SEVERELY handicapped and disabled residents of Cheshire Homes are using Electrons to entertain, educate and train themselves for jobs.

With backing from the Manpower Services Commission, Robin Nixon and Steve Ludlow have set up extensive computer facilities at two Cheshire Homes - Seven Springs and Heatherley - using Electrons.

To "interface" a resident to a micro may need individual input controls, and these are produced in workshops at each Home.

The computer software may also need to be modified, and this too is done on the premises, with the new versions being made available to other Cheshire Homes.

Experience to date has been highly encouraging, say those involved in the scheme.

Quicker thinking

AN enhanced version of the challenging mental arithmetic program Quick Thinking has been produced for the Electron by Mirrosoft.

Quick Thinking Plus comes in two parts and costs £6.95. New-for-old upgrades cost £2.50.

Multivaders puts the player in charge of a robot invasion prevention force. Addition, subtraction, multiplication and division tasks have to be completed successfully within pre-specified time limits.

Levels of play can be set so that children can

play against adults without being at a disadvantage.

In Robot Tables the aim is to perform speedy mental multiplication to make robots good enough to pass the critical eye of the quality controller.

For stargazing Electron owners, Mirrosoft has brought out Star Seeker on cassette for £9.95.

It allows the user to follow planets, track stars and discover constellations - and trace the path of Halley's Comet as it passes the Earth.

LOGO PACKAGE

A COMPLETE schools and home Logo package for the Electron has been launched by Honeyfold Software.

It consists partly of a set of classroom lessons presented in a format designed for the primary school.

They are supplemented by a set of work cards which integrate with the text. A com-

panion guide assists the teacher in putting over its contents and explains the major teaching points.

Reflecting the needs of the older reader, "A Guide to Logo for Parents and Teachers" is also provided.

Honeylogo on tape or disc with the parent-teacher guide costs £16.

Computers have helped people with poor control to write perfect letters and produce geometric computer graphics.

The games that are often the start of computer interest have helped them develop control and dexterity.

Worthwhile jobs can be performed by residents - helping with the accounts, for example, or organising fundraising projects.

Favourite

They are better able to follow educational courses, both in mathematical subjects and the arts, including languages. Spanish is a favourite course for use on holidays.

There are, of course, residents who are not at all interested in computers and are happy to leave new technology to others. This is accepted and respected.

But, for many, computers like the Electron are proving valuable and adaptable communication devices, and a means to pursue other interests.

A programme called COMPAID - Computer Aid for Speech-Impaired and Disabled People -

was started by Lorna Ridgway, then chairman of management, at Seven Springs early in 1982.

Robin Nixon told *Electron User*: "We were mainly concerned with solving the communication difficulties of some of our more-severely-disabled residents, using customised input devices and software."

Converted

"To get the project under way, we converted an old storage room into a computer room and took on eight previously unemployed trainees on a part-time basis under the Opportunities for Volunteering scheme".

Under the supervision of Stuart McKears, the computer tutor, the trainees' tasks were to learn the basics of programming and computer use, and in turn pass these on to the residents.

The scheme struggled at first because there was only one readily-available program, but the situation eased with the advent of the Electron and BBC micros with their extensive software range.

One of the first projects of COMPAID was a large-letter word-processor program to help visually-impaired people to read. This was followed by a two-switch-operated drawing program called Rainbow.

As well as communication and graphic design software, games such as Patience (see picture) were created to amuse and stimulate the residents.

Says Nixon: "Many commercially available

games are designed with keyboard or joystick input in mind and, being in machine code, are hard to adapt.

"Having ascertained that two switches were the maximum that our most severely disabled residents could easily use, we set about writing some games to help with the assessment and improvement of coordination".

One such game is Lunar Run, a machine code arcade-style action game which can be played using the joystick fire buttons or the Space and Return keys.

Other projects tackled included a portable Morse communicator for Mark, a resident who has lost virtually all sight and hearing.

Amplifier

Text typed in at the keyboard was converted into Morse Code, which was then output via the cassette interface to a high powered amplifier.

The Morse can then be felt - not heard - through a set of headphones.

Using this system, Mark won an essay competition on how best to spend £650 for a career.

The cash was spent on adapting a hand-held computer as a Morse communicator, so he no longer needs to come to the computer room when he wants to have a chat.

For the past 18 months COMPAID has been funded by the Manpower Services Commission Community Programme. There are four full-time computer trainees, eight part-time trainees and three workshop trainees.

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THIS month we'll be leaving our ANDs, ORs and ELSEs and moving onto the Basic keyword GOTO.

Simple to grasp but complicated in action, GOTO is one of the most powerful commands at the disposal of Basic programmers. With it you can do all sort of interesting things, sending the program here, there and everywhere as need be.

The trouble is that like all powerful things it can be misused, and it often is. Because of this GOTO is frowned upon in polite programming society.

In Electron Basic there are other ways of achieving the same results as a GOTO and it's usually better to use them.

However you have to learn what GOTOs are all about before you can really understand the value of these other methods. And, used sensibly, they're not as awful as some people make out.

In fact I could go as far as to say that there are no bad GOTOs, just bad programmers.

Anyway, those are my excuses for teaching you about GOTOs and I'm sticking to them. Please note that although I'm showing you how to use them, that doesn't mean I want you to use them. And, if you do (as you will), don't tell anyone that I told you to.

After all that preamble, let's see the beast in action. Try Program I and, when the thrills wear off, press Escape to bring it to a halt.

```
10 REM PROGRAM I
20 PRINT "HELLO"
30 GOTO 20
```

Program I

Line 10 is just the REM that gives the program a title, while line 20 prints the friendly message. The GOTO rears its head in line 30.

What it does is to tell the program that it is to go to the line number following the aptly named GOTO and carry on from there. In this case the GOTO of line 30 tells the Electron to go back to line 20 of the program.

It duly does this, printing out the message and then

comes to line 30. Here the GOTO again sends the micro back to process line 20, the message is printed, it goes onto line 30 and the whole thing starts over again.

As there is no end to the way lines 20 and 30 cycle, it's called an infinite loop. In this case I meant it to be an infinite loop, but usually they crop up by accident, causing programs to "hang".

Even though the above example is fairly simple, you can see the power unleashed by a GOTO. We have a three line program producing thousands of HELLOs.

To be a little bit theoretical for a moment, this has been done by altering the flow of control of the program. This is simply the order in which the micro processes the program's lines. The program controls the micro, the lines that it consists of telling the Electron what to do.

Up until now all our programs, except for one case, have started at the lowest line number and worked relentlessly through lines of ascending numbers. Line 10 was

processed, then line 20, then 30 and so on. The flow of control was simple and straightforward.

When we came to conditionals we found out how IFs and THENs could decide if all or part of a program line was processed, but still control passed from one line to the line with the next highest number.

Only with the FOR...NEXT loops did we come across a case where the program jumped backwards. The linear flow of control we were used to was changed into a loop (we'll deal with this next month.)

As you can see, using GOTO has a profound effect on the flow of control. Have a look at its use in Program II:

```
10 REM PROGRAM II
20 PRINT "HELLO"
30 GOTO 10
```

Program II

Here the Electron starts at line 10 and then goes on to lines 20 and 30 as normal. Line 30, however, contains a

There are no bad GOTOs - only bad programmers

Part 17 of PETE BIBBY's introduction to the art of programming

GOTO which sends the Electron back to line 10.

Here it carries on as usual, working through the program line by line, until it hits the GOTO again and control of the Electron passes to line 10.

Try changing line 30 to:

```
30 GOTO 30
```

Can you explain what is happening? It's another infinite loop.

Let's leave GOTO for a moment and look at Program III:

```
10 REM PROGRAM III
20 INPUT "Number",number
30 IF number>20 THEN PRINT number" is greater than 20"
```

Program III

If you've been following the series so far this should cause you no difficulties.

Line 20 asks for a number and if the number is greater than 20, line 30 tells you so.

Now suppose, for reasons best known to yourself, that you wanted the message to be on a separate line.

You might think that you could put the message in line 40 and get to it via a GOTO after the condition of line 30. Program IV shows what I mean.

It looks fairly convincing

```
10 REM PROGRAM IV
20 INPUT "Number",number
30 IF number>20 THEN GOTO 40
40 PRINT number" is greater than 20"
```

Program IV

From Page 9

doesn't it? All that we've done is to move the message of line 30 to line 40 and "glue" the two together with a GOTO. The trouble is, it doesn't work.

The program is fine so long as the numbers you enter are above 20, but look what happens when you type in a number like 12.

You get told:

12 is greater than 20

Can you figure out why this has happened? Let's take the case where you enter a number that is greater than 20, say 100.

The Electron comes to line 30 of Program IV and checks the condition after the IF.

As 100 is greater than 20 the condition is true and the micro goes on to perform whatever comes after the THEN.

Here it finds a GOTO and, ever obedient, it goes to line 40 and prints out the message. So far, so good.

Suppose, however, that you had entered 5, which is obviously not greater than 20. Now the condition of line 30 is false, so the Electron ignores everything after the THEN and goes on to the next line as normal.

Line 40 tells it to print out a message, and so it does.

Never mind the fact that the message is wrong, the Electron just does what it's told. Line 40 says print a message, there's nothing to stop the program reaching line 40, so the message gets printed.

As you can see, using a GOTO can have unexpected consequences. Line 40 is printed in either case.

When the number is greater than 20 the GOTO ensures that line 40 is obeyed. In the other case, the program carries on to line 40 just by doing what it does normally, going from one line to the next.

The remedy is simple. What we really meant at line 30 was that the Electron was to print the message if the condition was true or else to stop there. Program V shows how this is achieved.

Here the END after the

```
10 REM PROGRAM V
20 INPUT "Number",number
30 IF number>20 THEN GOT
0 40 ELSE END
40 PRINT number" is grea
ter than 20"
```

Program V

ELSE of line 30 does just that. If the condition is false the micro goes to the part after the ELSE; finds the END there and halts. Line 40 doesn't get processed.

From this you should see that using GOTO thoughtlessly can cause all sorts of problems. In this case it was easy to find where the fault lay, but in long complicated programs it can be very hard to spot the error. Usually it's come from an ill advised GOTO.

What makes things worse is the way that the bugs can hide, only coming out to play at odd times.

After all, if we hadn't have tested Program IV with numbers less than or equal to 20, we'd have never noticed the bug.

Of course, if we'd have shown our masterpiece to our friends they'd find the values that trigger the error straight away!

Program VI shows an attempt to make Program V print a message if the number input is less than or equal to 20. Before you type it in and run it have a look at it and see if you can see any flaws.

Line 30 looks fairly convincing. If number is greater than 20 the condition is true and the GOTO after the THEN sends the Electron to the appropriate message at line 40. If it isn't the case, the

GOTO after the ELSE is obeyed and line 50 produces its message.

Try it and see.

Have a look at the condition of line 30. Make sure that you test the program with values that make it both true and false so you can find out what happens in every eventuality.

As you'll find, the program works well enough if the numbers are less than or equal to 20. The trouble is that when you give number a value above 20 you get both messages instead of just the one you

```
10 REM PROGRAM VI
20 INPUT "Number",number
30 IF number>20 THEN GOT
0 40 ELSE GOTO 50
40 PRINT number" is grea
ter than 20"
50 PRINT number" is less
than or equal to 20"
```

Program VI

wanted. It's exactly the same problem as before.

When the condition of line 30 is false then control immediately goes to line 50 and the message is correct. However, when the condition is fulfilled with a value of number such as 25, then things go wrong.

The GOTO after the IF sends control to line 40, which the Electron then obeys. This would be fine if things stopped there, but then control goes to line 50 - why shouldn't it? There's nothing to stop it.

Now you get the second, erroneous message. The program has crashed into a line you didn't want to be obeyed in those circumstances.

Program VII shows how

things can be improved with the appropriate ENDS to bring things to a halt:

```
10 REM PROGRAM VII
20 INPUT "Number",number
30 IF number>20 THEN GOT
0 40 ELSE GOTO 50
40 PRINT number" is grea
ter than 20":END
50 PRINT number" is less
than or equal to 20":END
```

Program VII

One thing you might have noticed is that there is no real reason for using GOTOs at all in the above example. The program could be written without them using simple IFs.

This is true of many of the times that GOTO is used. Often there's a simpler way of doing things, less fraught with difficulties than using GOTO.

The trouble is that it's often easier to slip in a quick GOTO with all its dangers than to think of the simpler method.

There's no surer sign of a poor programmer than a listing filled with GOTOs. They have a sort of "if in doubt, use a GOTO" mentality which makes programs almost unintelligible.

What can make things worse is when they discover that you don't always have to put in the GOTOs. Program

```
10 REM PROGRAM VIII
20 INPUT "Number",number
30 IF number>20 THEN 40
ELSE 50
40 PRINT number" is grea
ter than 20":END
50 PRINT number" is less
than or equal to 20"
```

Program VIII

‘Using GOTO thoughtlessly can cause all sorts of problems’



VIII shows what I mean.

While line 30 isn't all that difficult to understand, when you get a lot of them together listings become almost impossible to follow. Notice also that in line 50 I've left off the END.

The point I've been trying to make is that GOTOs are easy to understand but complicated to use. When you start using them they have all sorts of unexpected side effects.

Suppose we wanted to add a final message to Program VII. You might think that all we had to do was add a line like line 60 in Program IX.

```
10 REM PROGRAM II
20 INPUT "Number",number
30 IF number>20 THEN GOT
40 ELSE GOTO 50
40 PRINT number" is grea
ter than 20":END
50 PRINT number" is less
than or equal to 20":END
60 PRINT "That's all fol
ks!"
```

Program IX

Try it and see what happens. There's no final message because of the ENDS of lines 40 and 50. And you can't solve the problem by just leaving them out.

Again, try it and see what happens. What you have to do is shown in Program X.

Here the ENDS are replaced by GOTOs pointing to the final message. Whichever path through the program the Electron takes after line 30, it still ends up printing the message of line 60.

Notice that once you start using GOTOs you've got to use them all over the place to "leap over" bits of code you don't want.

Suppose that number was 5 in the last program. Then the flow of control would go from line 30 to line 50 (avoiding line 40) and on to line 60. On the other hand, if number was greater than 20 the program would go from 30 to 40 and then on to 60, avoiding line 50.

As the number of GOTOs in a program mounts, so does the number of leaps grows, as do

```
10 REM PROGRAM X
20 INPUT "Number",number
30 IF number>20 THEN GOT
40 ELSE GOTO 50
40 PRINT number" is grea
ter than 20":GOTO 60
50 PRINT number" is less
than or equal to 20":GOTO
60
60 PRINT "That's all fol
ks!"
```

Program X

the chances of landing in the wrong place.

Remember that if it can go wrong it will, and the more GOTOs you use the more things will go wrong and the harder it will be to sort them out.

If you want to see a real horror, take a look at Program XI.

```
10 REM PROGRAM XI
20 GOTO 40
30 GOTO 50
40 GOTO 60
50 GOTO 60
60 GOTO 30
70 PRINT "MADE IT":END
80 GOTO 70
```

Program XI

I leave it to you to figure out what's happening. The flow of control is all over the place, leaping from line to line in gay abandon.

You'd be surprised at the number of people who write programs like this and then wonder why things go wrong!

Figure 1 is an attempt to show what is happening. From it you should be able to see why programming using lots of GOTOs is called spaghetti programming.

Before you leave Program

```
10 REM PROGRAM XI
20 GOTO 40
30 GOTO 50
40 GOTO 60
50 GOTO 60
60 GOTO 30
70 PRINT "MADE IT":END
80 GOTO 70
```

Figure 1:
Spaghetti
programming

XI, try renumbering it with:

```
RENUMBER 100
```

or

```
RENUMBER 5
```

Not only will your Electron renumber the lines, it will also deal with the line numbers after the GOTOs.

Now after all my warnings against the use of GOTO I'll give you an example of when I think it is justified, in the form of Program XII.

This is what is known as a mugtrap. It is designed to avoid people putting in erroneous inputs to your programs. Bibby's first law of programming states that if you ask someone to input in a number between 1 and 10 they will enter 11 or -1 or anything but what you ask.

Mugtrapping deals with this by ignoring any input not in the required range.

Line 30 does the work. If number isn't in the required range then the GOTO sends the program back to line 20 and lets the mug have another go. The program won't proceed to line 40 until number is in range.

This is one area where I

```
10 REM PROGRAM XII
20 INPUT "Number in rang
e 1-10",number
30 IF number<1 OR number
>10 THEN GOTO 20
40 PRINT number" is in
range"
```

Program XII

think using GOTO is allowable. After all, I can't see anything that complicated in just going to the previous line.

However, there are some who would still frown on this and go to ridiculous lengths to avoid it. So if you use a GOTO

in a mugtrap you didn't get the idea from me.

If you want a bit of fun, try altering Program XII so that it allows the user three goes and then prints out a rude message if he still doesn't get it right.

Program XIII is a variant of Program XII. Here I've stored the line number in the variable *notinrange*. This may seem a little strange, but notice how line 40 seems to make a lot more sense.

If I have to use a GOTO I much prefer to use it this way, as when things go wrong I find it easier to understand something like:

```
200 GOTO explosion
rather than the anonymous:
```

```
200 GOTO 900
The only drawback to this method is that RENUMBER can't be used. Try:
```

```
RENUMBER 15
```

on Program XIII, run it and you'll see why.

```
10 REM PROGRAM XIII
20 notinrange=0
30 INPUT "Number in rang
e 1-10",number
40 IF number<1 OR number
>10 THEN GOTO notinrange
50 PRINT number" is in
range"
```

And that's about it for this month. A whole article telling you about something that I'd advise you not to use! Such is the strange world of computer programming.

Having said that, have a go at using GOTO in your programs. You'll find that as the programs increase in length and GOTOs, so the errors multiply. Finally, take a look at Program XIV:

```
10 REM PROGRAM XIV
20 LET variable=1
30 PRINT variable
40 LET variable=variable
+1
50 IF variable <=10 THEN
GOTO 30
```

Does this remind you of anything? If it does, then go to the top of the class.

Notebook Part 17

Trevor Roberts

Branching out

THIS month I thought we'd have a look at the use of recursion in pattern drawing with Trees.

This program defines a procedure to draw two branches of a tree. The procedure then calls itself over and over from within the procedure to form the final pattern.

```

10 REM TREES
20 REM TREVOR ROBERTS
30 MODE 1
40 PROCtree(600,100,0,10
      0,100)
50 END
60 DEF PROCtree(seedx,se
      edy,level,offsetx,off
      sety)
70 MOVE seedx,seedy
80 DRAW seedx+offsetx,se
      edy+offsety
90 MOVE seedx,seedy
100 DRAW seedx+offsetx,se
      edy+offsety
110 REM Calculates left c
      oordinates
120 sx:=seedx+offsetx:svl
      :=seedy+offsety:lv:=level+1
130 IF lv/6 THEN PROCtree
      (svl,svl,lv,100,100)
140 REM Calculates right
      coordinates
150 sxr:=seedx+offsetx:svr
      :=seedy+offsety:lv:=level+1
160 IF lv/6 THEN PROCtree
      (svr,svr,lv,100,100)
170 ENDPROC
  
```

Initially calls procedure

Moves graphics cursor to base point

Draws left branch

Draws right branch

Calculates co-ordinates of lefthand point

Uses left point as base for a new pair of branches

Calculates coordinates of righthand point

Uses righthand point in procedure call.

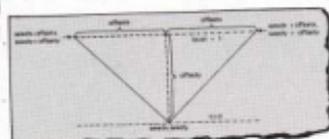
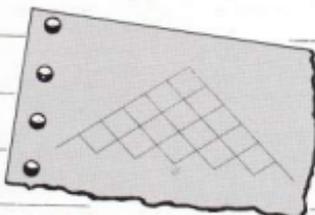


Figure 1: Parameters used in PROCtree

PROGRAM EXPLANATION

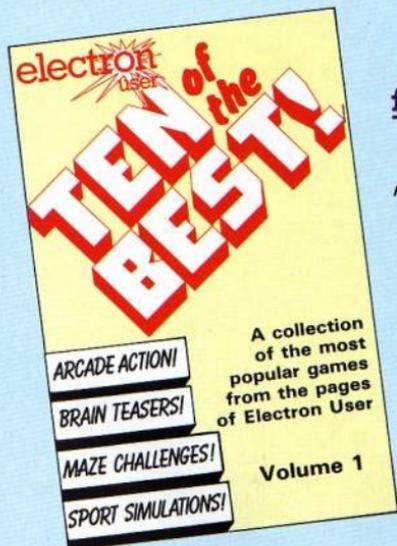
- 10,20 The usual REMs explaining what's going on. 100
- 30 Puts the Electron in Mode 1. Try the other graphics modes. 120
- 40 This calls PROCtree, the parameters in the brackets telling the micro that the pattern is to start at point 600,100. The level is to be called level 0 and the X and Y offsets are both to be 100. Again, try other values and see what happens. 130
- 50 Stops the program crashing into the procedure definition.
- 60-170 Form the definition of PROCtree. It's here the Electron will look when the procedure is called from the main program. Figure 1 shows how the parameters in the brackets correspond to the two branches drawn by PROCtree. 150,160
- 70 Moves the graphics cursor to the initial point.
- 80 Draws the branch to the left by joining the previous point to one calculated using the offsets.
- 90 The graphics cursor goes back to the initial 170

point, ready to draw the second branch. Now the branch to the right is drawn. This line isolates the coordinates of the lefthand point of the initial branch, storing them in *svl* and *svl*. These will be used as the initial point for another pair of branches. *lv* takes account of the fact that the level these new branches start at will be one higher.

Recursion in action. PROCtree is called again, this time using the end point of the previously drawn lefthand branch as the starting point. It is the coordinates of this point, along with the adjusted level and the standard offsets, that are passed to the procedure. This happens until the sixth level is reached.

These lines again call the procedure repeatedly until the sixth level is reached. Each time the procedure is called another pair of branches will eventually be drawn. This time it uses the righthand points of previous branches as the starting points of the new branches drawn with PROCtree. Ends the procedure definition.

Out of the many thousands of programs submitted to Electron User... out of the dozens that have been considered good enough to appear in these pages... we have selected 20 of the most outstanding to delight, intrigue - and frustrate! - Electron users everywhere.

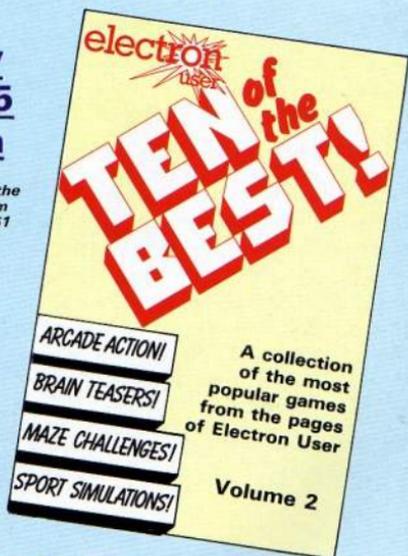


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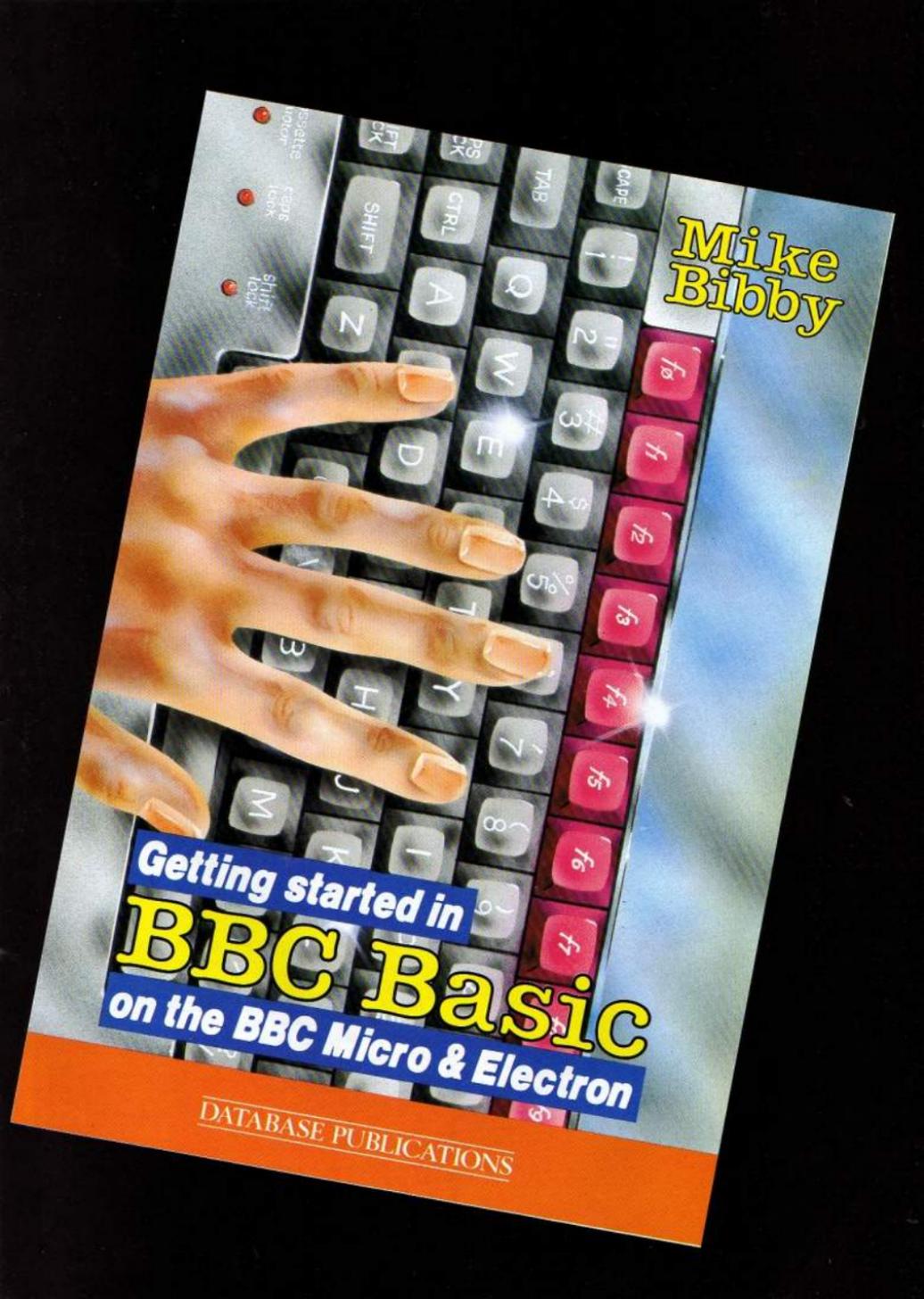
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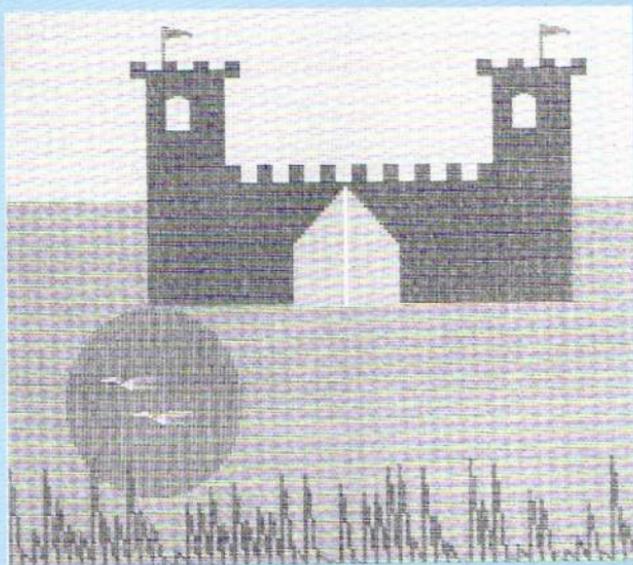
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```

10 REM CASTLE
20 REM by Adam Wortley
30 REM (C) ELECTRON USER
50 REM
70 MODE2
90 VDU 23,0,0202;0;0;0;
90 PROCinit
100 PROCsky
110 PROCpool(300,300,175)
120 PROCgrass
130 PROCcastle
140 REPEAT:UNTIL FALSE
150 END
160 DEFPROCsky
170 COLOUR132
180 CLS
190 VDU 28,0,31,19,11
200 COLOUR 130
210 CLS
220 VDU 26
230 ENDPROC
240 DEFPROCpool(X,Y,R)
250 GCOL 0,6
260 LOCAL I,J
270 FOR I=Y-R TO Y+R STEP
-4
280 J=SQR(ABS(R*(R-(I-Y))*(
I-Y)))
290 MOVE X-J,I
300 DRAW X+J,I
310 NEXT
320 MOVE X,Y
330 ENDPROC
340 DEFPROCgrass
350 MOVE 0,0
360 GCOL 0,J
370 FOR M=@TO1279 STEP 24
380 DRAW M,0
390 DRAW M,RND(200)
400 NEXT
410 ENDPROC
420 DEFPROCcastle
430 COLOUR 3:COLOUR 132
440 VDU 28,4,20,19,0
450 LET A$=STRING$(0," ")
460 LET B$=STRING$(0,CHR$
225)
470 LET C$=CHR$226+STRING
$(13,CHR$229)
480 LET D$=" "+CHR$ 230+A
$+" "+CHR$ 230
490 LET E$=" "+CHR$ 231+A
$+" "+CHR$ 231
500 LET F$=CHR$224+CHR$22
4+CHR$224+CHR$225+" "
+CHR$224+CHR$224+CHR$224+CH
R225
510 LET G$=CHR$226+CHR$22
9+CHR$229+A$+CHR$226+CHR$22
9+CHR$229
520 LET H$=CHR$226+CHR$22
7+CHR$229+A$+CHR$226+CHR$22
7+CHR$229
530 LET I$=CHR$226+CHR$22
8+CHR$229+A$+CHR$226+CHR$22
8+CHR$229
540 LET J$=CHR$226+CHR$22
9+CHR$229
550 COLOUR 5:PRINT D$:PRIN
T E$:COLOUR 3:PRINTF$:PRIN
T G$:PRINTH$:PRINTI$:PRINTG$
:PRINTG$:PRINTJ$:PRINTC$
560 COLOUR 130
570 FOR A=@TO5
580 PRINTC$
590 NEXT
600 GCOL 0,1
610 FOR N=590TO695 STEP 4
620 MOVE M,476
630 DRAW M,N
640NEXT
650 LET X=695
660 FOR P=695 TO 800 STEP 4
670 LET X=X-4
680 MOVE P,476
690 DRAW P,X
700 NEXT
710 GCOL 0,0
720 MOVE 695,476
730 DRAW 695,690
740 VDU26
750 PRINT TAB(3,21)::COLO
UR 134:PROCDUCK
760 PRINT TAB(4,23)::COLO
UR 134:PROCDUCK
770 ENDPROC
780 DEFPROCDUCK
790 COLOUR 4:VDU 232
800 COLOUR 2:VDU 233
810 ENDPROC
820 DEFPROCinit
830 VDU 23,224,240,240,24
0,240,255,255,255,255
840 VDU 23,225,240,240,24
0,240,240,240,240,240
850 VDU 23,226,15,15,15,1
5,15,15,15,15
860 VDU 23,227,231,195,12
9,129,129,129,129,129
870 VDU 23,228,129,129,12
9,129,129,129,129,129
880 VDU 23,229,255,255,25
5,255,255,255,255,255
890 VDU 23,230,192,240,25
4,255,249,192,120,120
900 VDU 23,231,120,120,12
0,120,120,120,120,120
910 VDU 23,232,0,48,241,1
1,7,3,1,0
920 VDU 23,233,0,126,252,
240,224,240,240,36
930 LET X=1300
940 ENDPROC

```

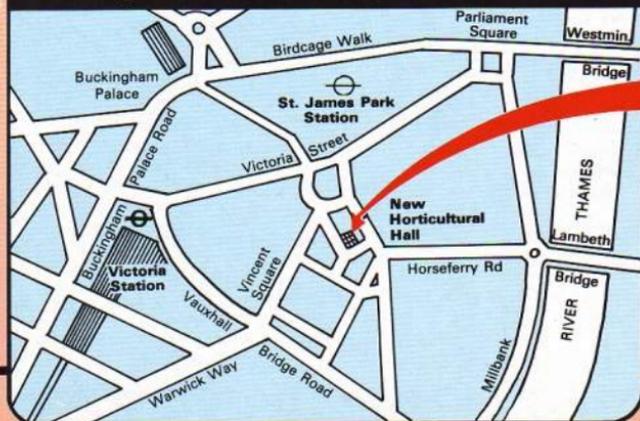
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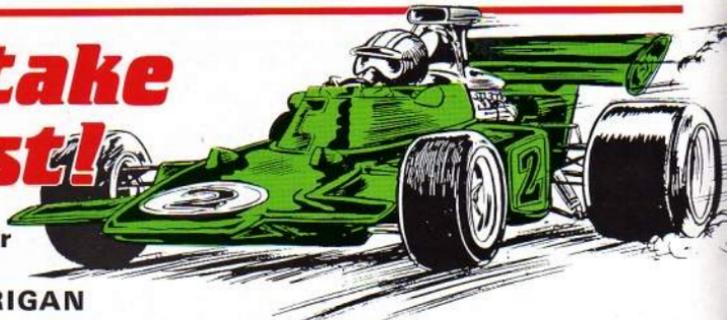
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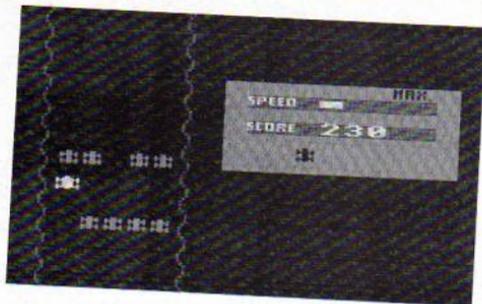
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It's hard to avoid having a smashing time!



PROCEDURES

PROCvar

Sets the variables, envelopes and characters.

PROCdown
PROCmove_man
PROCrnd

Moves opposing cars.
Moves your car.
Chooses three random numbers and places them in arrays.

PROCsetup
PROCch
PROCdead
PROCbonus

Draws screen.
Prints score.
Ends game.
Changes screen display and chooses number of rows.
Prints instructions.
Prints high score table.

PROCINS
PROCILSC

VARIABLES

ac%, **UP%** Position of your car.
SC% Score.
X%, **Z%**, **Q%** Position of opposing cars.
HIS, **HI%** High score.
E(), **W%** Random numbers.

```

10 REM DODGE
20 REM BY STEPHEN MERRI
GAN
30 REM (C) ELECTRON USE
R 1985
40 ON ERROR GOTO 1290
50 MODE6:VDU23,1,0;0;0;
0:PROCins
60 MODE5
70 PROCvar
80 VDU23,1,0;0;0;0
90 VDU20
100 DIM WX(6):DIM SX(6):
DIM EX(6):DIM HIX(7): DIM H
I(7):FOR I=STOISTEP-1:HIX(I)=HI*(I)=1)*STEVIE*:NEXTI
110 PROCrnd
120 PROCsetup
130 REPEAT:PROCdown:PROC
move_man:UNTIL WEX=1
140 MODE6:IF SC%:HIX(5)
PROCHI
150 PROCHI_SC:MODE5:PROC
var:VDU23,1,0;0;0;0:VDU20:P
ROCRnd:PROCsetup:GOTO130
160 DEF PROCvar
170 XI=5:ac%=2:UP%=24:ZI=0
:STEVIE%=100:SC%=0:CI=10:CC
Z=0:Q%=10:ERI=11:AS="
:UYI=0:LIX=3:WEX=0:JXI=0
180 RESTORE1500
190 FOR=224 TO235
200 READO,W,E,R,T,Y,U,I
210 VDU23,A,Q,W,E,R,T,Y,
U,I
220 NEXTA
230 ENVELOPE1,2,-12,0,16
,32,64,1,-40,-10,10,-126,12
6,126
240 ENVELOPE2,1,-10,-5,-
3,5,7,10,127,0,0,-126,126,1
26
250ENDPROC
260 DEF PROCdown
270 ZI=ZI+1:XI=XI+1:IF C
CX=10X=QX+1
280 PRINTTAB(2,ZI-1),A$:
TAB(2,XI-1),A$:IF C=CX-1 PRI
NTTAB(2,QX-1),A$
290 COLOUR1
300 IF C=CX-1 PRINTTAB(2,
QX),B$
310 PRINTTAB(2,ZI),C$:TA
B(2,XI),D$
320 IF XI=UP% AND XI=ac%
THEN PROCch
330 IF ZI=UP% AND BX=ac%
THEN PROCch
340 IF C=CX-1 AND QX=UP%:
IF VVZ=ac% THEN PROCch
350 IF XI=UP% AND AX<ac
% THEN PROCdead
360 IF ZI=UP% AND BX<ac
% THEN PROCdead
370 IF C=CX-1 AND QX=UP%:
IF VVZ<ac% THEN PROCdead
380 IF ZI=UP% THEN PROCrn
d
390 IF ZI=UP% THEN ZI=0
400 IF XI=UP% THEN XI=5
410 IF QX=UP%+10 THEN QX=1
0
420 FOR ANYX=1 TO STEVIE%:
NEXTANYX

```

```

430 ENDPROC
440 DEF PROCmove_man
450 COLOUR0
460 IF INKEY(-67) THEN AC#
=acx+1:PRINTTAB(acx-1,UPX);
" *GOTO400
470 IF INKEY(-98) THEN AC#
=acx-1:PRINTTAB(acx+1,UPX);
"
480 IF acx>6 THEN AC# = 6
490 IF acx<2 THEN AC# = 2
500 PRINTTAB(acx,UPX);CH
R#225
510 ENDPROC
520 DEF PROCrnd
530 PRINTTAB(2,UPX+1);A#
;TAB(2,UPX+6);A#;IF CCX=1 P
RINTTAB(2,UPX+11);A#
540 YUX=INT(UYX/20)
550
560 GOSUB 690
570 FOR I=2 TO 6:WX(I)=
224;SX(I)=224;EX(I)=224;N
EXT I
580 BX=RDND(5)+1;WX(BX)=2
26
590 AX=RDND(5)+1;SX(AX)=2
26
600 IF CCX=1 VVX=RDND(5)+
1;EX(VVX)=226
610 IF CCX=1 B#CHR#EX(2
)+CHR#EX(3)+CHR#EX(4)+CHR#E
X(5)+CHR#EX(6)
620 C#CHR#WX(2)+CHR#WX(
3)+CHR#WX(4)+CHR#WX(5)+CHR#
WX(6)
630 D#CHR#SX(2)+CHR#SX(
3)+CHR#SX(4)+CHR#SX(5)+CHR#
SX(6)
640 UPX=UPX-1
650 IF UPX<ERX THEN UPX=
ERX
660
670 IF STEVIEV#0 STEVIEV
=STEVIEV-2;UYX=UYX+2
680 ENDPROC
690 COLOUR130;COLOUR0;PR
INTTAB(10,11);" *;E#
=LEFT$(CHR#227+CHR#227+CHR#
227+CHR#227+CHR#227,YUX);PR
INTTAB(10,11);CHR#228+CHR#2
29+CHR#226+E#+CHR#226;COLOU
R131;RETURN
700 DEF PROCsetup
710 VDU20;COLOUR131;COLO
UR0;CLS;R=0
720 COLOUR129;FOR I=1 TO 7:
PRINTTAB(9,9+I);"
";NEXT I;COLOUR130

```

```

730 GOSUB 690
740 COLOUR130;PRINTTAB(1
0,13);CHR#232+CHR#233;"
";COLOUR129;COLOUR3;PRINT
TAB(12,15);CHR#224+CHR#224+
CHR#224;TAB(16,18);CHR#234+
CHR#235
750 COLOUR2;COLOUR131
760 FOR I=1 TO 29:PRINTTAB(
1,1);CHR#(230+R)+" *CH
R#(230+R)
770 IF R=1 R=0 ELSE R=1
780 SOUND0,-15,1,1;NEXT
790 ENDPROC
800 DEF PROCch
810 SCX=SCX+CX;SOUND1,-1
5,50,1
820 IF SCX=300 OR SCX=90
0 OR SCX=1600 OR SCX=2200
PRINTTAB(2,QX);A#;TAB(2,2X
);A#;TAB(2,2X);A#;PROCbonus
830 COLOUR0;COLOUR130;PR
INTTAB(13,13);SCX;COLOUR131
840 ENDPROC
850 DEF PROCdead
860 LIX=LIX-1
870 FOR I=1 TO 101 STEP 1:
SOUND1,1,IX,1;SOUND1,1,IX+5
,1;PRINTTAB(acx,UPX);"X";NE
XT I
880 IF LIX<(-1) COLOUR3
;COLOUR129:PRINTTAB(13,15);
LEFT$(CHR#224+CHR#224+CHR#2
24,LIX-1);" *;COLOUR131
890 PRINTTAB(2,QX);A#;TAB
(2,2X);A#;TAB(2,2X);A#
900 QX=10;IX=5;IX=0
910 *FX15,1
920 KEY=INKEY(100)
930 IF CX=0 UPX=17ELSEUP
X=19
940 IF LIX=0 WEX=1
950 PROCrnd
960 ENDPROC
970 ENDPROC
980 DEF PROCbonus
990 COLOUR0
1000 STEVIEV=STEVIEV+5
1010 PRINT TAB(8,8)"0 0 N
U 5"
1020 FORSX=1 TO 5 STEP 1:SOUN
D1,1,SX*5,1;SOUND1,1,100,1;
NEXTSX;FORSX=15 TO 1 STEP 2:SO
UND1,1,50,1;SOUND1,1,SX*5,2
;NEXTSX
1030 FOR I=1 TO 600:NEXT
1040 PRINTTAB(8,8);"
"
1050 SCX=SCX+50

```

```

1060 *FX15,1
1070 SOUND1,-15,50,2
1080 KEY=INKEY(50);SOUND1
,-15,50,1
1090 VDU19,3,2;0;0;0
1100 KEY=INKEY(50);SOUND1
,-15,100,2
1110 VDU19,1,4;0;0;0
1120 KEY=INKEY(50);SOUND1
,-15,150,3
1130 IF CCX=0 GOSUB1150 E
LSE GOSUB 1170
1140 ENDPROC
1150 J3X=J3X+0;IF J3X>50
J3X=50
1160 STEVIEV=(50-J3X);UYX
=(42+J3X);ZX=0;XZ=5;QX=10;C
CX=0;UPX=19;ERX=16;PROCrd:
RETURN
1170 J3X=J3X+0;IF J3X>50J
3X=50
1180 STEVIEV=(50-J3X);UYX
=(42+J3X);ZX=0;XZ=5;QX=10;C
CX=0;UPX=24;ERX=11;PROCrd:
RETURN
1190 DEF PROCHI
1200 INPUTTAB(8,5);"YOU A
RE IN THE TOP 5";TAB(8,6);"
*****"sp
C(7);"Please enter your nam
e";TAB(13,13);"-----";
TAB(13,12);SX;S#LEFT$(SX,10
);HIX(7)=S#;HIX(7)=SCX
1210 FOR I=5 TO 1 STEP 1
1220 IF HIX(7)>HIX(I) PRO
Cswap
1230 NEXT I
1240 ENDPROC
1250 DEF PROCswap
1260 HIX(I+1)=HIX(I);HIX(I
+1)=HIX(I+1)
1270 HIX(I)=HIX(7);HIX(7)
=HIX(I)
1280 ENDPROC
1290 MODE6;SOUND1,-15,100
,1;REPORT;PRINT " at line "
;ERL:END
1300 DEF PROCins
1310 CLS
1320 PRINT "SPC(12);"INSTR
UCTIONS"
1330 PRINTSPC(12);"-----
-----"
1340 PRINT "You are in a r
acing car on a busy track."
1350 PRINT "Two rows of o
posing cars will come" "str
aight for you. This will in
crease" "to three and as th

```

```

e game progresses" "will re
turn to two, but this time t
he" "speed will be increase
d."
1360 PRINT "Each time you
pass the rows of cars" "vo
u will move up the track, th
us" "reducing your time to
react."
1370 PRINT "As you play, t
he screen display changes."
1380 PRINT "SPC(12);"Your
keys are:"
1390 PRINT "SPC(14);"Z- LE
FT"
1400 PRINT "SPC(14);"X- RI
GHT"
1410 PRINT "SPC(12);"PRESS
SPACE"
1420 REPEAT UNTIL GET#="
"
1430 ENDPROC
1440 DEF PROCHI_SC
1450 CLS
1460 PRINTTAB(7,4);"*****
*****"
1470 FOR I=1 TO 7
1480 PRINTSPC(7);"
"
1490 NEXT I
1500 PRINTSPC(7);"*****
*****"
1510 FOR I=1 TO 5
1520 PRINTTAB(9,5+I);I;
";HIX(I);TAB(22,5+I);HIX(I)
1530 NEXT I
1540 PRINT "*****"SPC(5);"D
O YOU WANT INSTRUCTIONS (Y/
N)";
1550 REPEAT:BB#GET#;UNTI
L BB#="Y" OR BB#="N"
1560 IF BB#="Y" CLS;PROCin
s
1570 ENDPROC
1580 DATA 24,90,126,90,24,
90,126,90,24,189,255,189,60
,189,255,153,0,0,0,0,0,0,
0,0,0,255,255,255,255,0,0,0
,221,149,221,81,209,0,0,0,1
83,37,181,37,183,0,0,8,16
,16,32,32,32,32,32,16,16
,8,8,8,0,219,146,210,82,2
19,0,0
1590 DATA 0,187,170,179,17
0,171,0,0,0,87,117,87,85,85
,85,0,0,80,80,32,80,80,84,0

```

This listing is included in this month's cassette tape offer. See order form on Page 61.

IT must be the dream of every programmer to get the maximum happening in a program from the minimum amount of typing in.

If, at the same time, it's possible to make the program more understandable and run more quickly then that would be wonderful.

This article shows one way in which such a seemingly optimistic dream can come true.

It's amazing how often you need to use the same piece of code over and over again.

There seem to be lots of occasions when it's all too easy to repeat yourself and this can make your listing remarkably long.

The first example, Program I, which doesn't do anything very special, shows what I mean.

```

10 REM PROGRAM I
20 PRINT"Title Page"
30 PRINT"Press space to
continue"
40 REPEAT UNTIL GET$=""
50 CLS
60 PRINT"Instructions"
70 PRINT"Press space to
continue"
80 REPEAT UNTIL GET$=""
90 CLS
100 PRINT"Play the game"
110 PRINT"Press space to
continue"
120 REPEAT UNTIL GET$=""
130 CLS
140 RUN
    
```

Program I

It's a very silly program in which lines 20 60 and 100 represent whole chunks of code.

Now consider lines 30, 40 and 50. Lines like these are frequently needed in programs. They hold things up until the Space bar is pressed and then clear the screen before moving on to the next section of the program.

You'll notice that lines 70, 80 and 90 are just the same as 30, 40 and 50, and so are lines 110, 120 and 130.

Wouldn't it be nice if there was some way of avoiding this? Well, there is a structure available to do this job. It's called the subroutine.

A subroutine is a chunk of

GOSUB - for those routine tasks

ROGER FROST explains this powerful structure which can help make your programming much more efficient

code that can be accessed (or used) from any point in a program by the Basic keyword GOSUB.

When the program reaches a GOSUB statement it jumps to a separate section of code (the subroutine) and processes it.

At the end of the subroutine another Basic keyword, RETURN, is found. This shouldn't be confused with the Return key on the Electron.

When the RETURN statement is reached the computer goes back to the main program immediately after the GOSUB command. Figure 1 shows what's happening.

Normally the Electron deals with one line after another. 10 then 20, then 30. As you can see from Figure 1, GOSUB changes all this.

When it comes to line 30 the Electron shoots off to the subroutine at 100. Here it obeys the following lines until it comes across a RETURN which sends it back to the line after the original GOSUB. It

then carries on as normal.

You may want to use lots of subroutines in your program so, to avoid confusion, each one is labelled with the line number it begins at.

To call up a subroutine starting at line 500 you type in GOSUB 500. Figure 2 shows a program route with two subroutines.

Program II is a rewrite of Program I, but using a subroutine to replace those repeated lines.

As you can see, that's cut down on the repetition of lines. In fact one of the main uses of subroutines is to make the computer carry out a task more than once with just one piece of code.

At first sight Program II seems to offer little advantage over Program I. It's only one line shorter, but for each additional occasion you wanted the subroutine, extra lines would be saved.

Apart from saving on typing time, you also use less of your precious RAM. This could be

```

10 REM PROGRAM II
20 PRINT"Title Page"
30 GOSUB90
40 PRINT"Instructions"
50 GOSUB90
60 PRINT"Play the game"
70 GOSUB90
80 RUN
90 REM Subroutine for mo
ving to next stage of progr
am
100 PRINT"Press space to
continue"
110 REPEAT UNTIL GET$=""
120 CLS
130 RETURN
    
```

Program II

very important if you were writing a long program, particularly in a memory-munching mode.

You may notice that an extra REM statement has come in at line 90. It really is worth labelling subroutines in that way so that if you have several you can quickly tell what each one is for.

If you find you have to use the RENUMBER command when programming, you need have no fears regarding GOSUBs with a line number. Your clever Electron will automatically adjust the GOSUB line numbers for you.

Try adding this extra line to Program II:

```
15 PRINT"Author - Fred
Bloggs"
```

Now RENUMBER it (Func B will do the job.) You will find

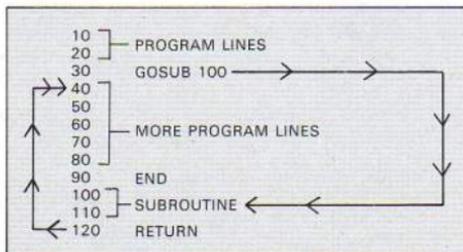


Figure 1: Program control for a single subroutine

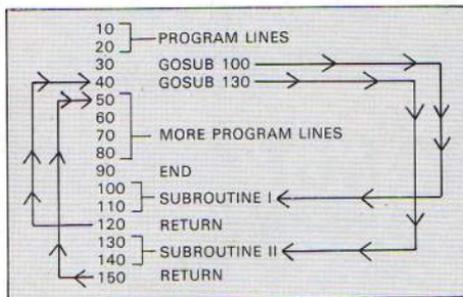


Figure 11: Program control with two subroutines

that the subroutine now starts at line 100 and all the GOSUB statements have changed to GOSUB 100. Clever, isn't it?

It is, however, quite a good idea to use a standard numbering system. Subroutines could start at lines 1000, 2000, 3000 etc. This helps to make the program easier to follow, but it needs forward planning to avoid having to renumber.

Using subroutines can aid your programming in that each subroutine can be devoted to a single task.

Large programs are more manageable when they are broken down into smaller sections. It's a very good example of divide and conquer!

If you look at the listings for many programs, particularly those originally written for other computers, you might see a start something like this:

```

10 GOSUB 500
20 GOSUB 1000
30 GOSUB 3000
40 GOSUB 5000

```

Each subroutine will be devoted to a specific task and may even be an off-the-peg routine that the programmer had stored away ready to use.

In Program II the GOSUB statement had an actual line number after it. If you want to live dangerously you can use a variable instead of a line number.

Program III shows what I mean.

This little program just calls three subroutines at lines 100, 200 and 300. This could be a very snappy start to a program, but great care and forethought are needed because this

```

10 REM PROGRAM III
20 FOR X=100 TO 300 STEP
100
30 GOSUB X
40 NEXT X
50 END
100 PRINT"SUBROUTINE 1"
110 RETURN
200 PRINT"SUBROUTINE 2"
210 RETURN
300 PRINT"SUBROUTINE 3"
310 RETURN

```

Program III

cannot be renumbered successfully.

If you were to use the RENUMBER command on Program III you'd get an error message "Failed at line number" whatever. This happens because, clever though your Electron is, it does not know the value of X until you run the program.

However this is a minor drawback compared with the effect using variables in subroutine calls can have on a program's readability. After all,

GOSUB instructions

makes a lot more sense than

```
GOSUB 12345
```

While we're talking about line numbers, you may like to know that it's possible to GOSUB to a calculated line number that's calculated while the program is actually running.

You could use this technique within a game to jump to a random routine. Program IV shows a safe, slow way of selecting one out of three routines.

This could be replaced by Program V, making use of an



expression to calculate which number to jump to for the subroutine.

Not only has this saved three lines of code, but it's

```

10 REM PROGRAM IV
20 X=RND(3)
30 IF X=1 THEN GOSUB100
40 IF X=2 THEN GOSUB200
50 IF X=3 THEN GOSUB300
60 END
100 PRINT"X=1"
110 RETURN
200 PRINT"X=2"
210 RETURN
300 PRINT"X=3"
310 RETURN

```

Program IV

speeded things up, as the computer no longer has to work through the IF statements.

In fact, to repeat Program IV 100 times takes 1.85 seconds while Program V does the same job in 1.48 seconds. Mind you, while Program IV will happily renumber, Program V will not.

Don't expect either of them to do anything wonderful as they stand. Remember that the subroutines in them represent a chunk of code with a specific task.

One of the most powerful features of GOSUB occurs

```

10 REM PROGRAM V
20 GOSUB(100+RND(3))
30 END
100 PRINT"X=1"
110 RETURN
200 PRINT"X=2"
210 RETURN
300 PRINT"X=3"
310 RETURN

```

Program V

when it is used with the keyword ON. This can allow you to overcome some of the problems with both Programs IV and V.

Listing I shows how it can be used.

```

10 REM Listing I
20 N=RND(4)
30 ON N GOSUB
100,250,560,780

```

Listing I

You could invent your own subroutines to go at lines 100, 250, 560 and 780.

Notice that using this technique allows you to pick on any line number, and not just those which can be calculated easily.

If N is 1 then the subroutine starting at line 100 would be used. For N equal to 2 the

From Page 23

program jumps to line 250, while if *N* is 3 the jump is to line 560, and so on.

Of course the 100, 250, 560 and 780 are just examples.

This technique can greatly help with a mammoth task like writing an adventure program.

Having said that, care must be taken to ensure that there are enough lines to GOSUB to. If line 30 was just:

```
30 ON N GOSUB 100,250,560
```

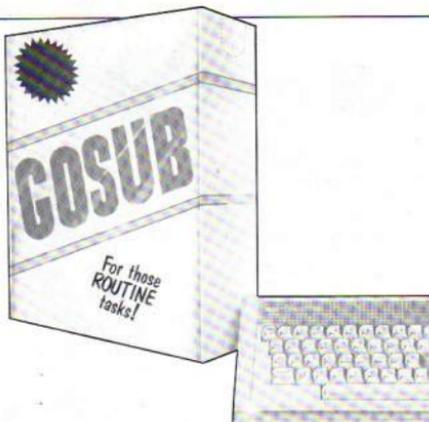
your program would crash if *N* became 4. The error message would be "ON range at line 30".

If you wanted, it's perfectly in order to have the same line more than once. Line 30 could become:

```
30 ON N GOSUB  
100,250,560,250
```

The RETURN command will still take you back where you started from.

Now you may have heard



some people talk about structured programming. Such people are not very fond of subroutines, and will shake their heads in sorrow if they see one in a program, muttering words like "untidy" or "spaghetti".

They don't like the way subroutines can jump all over the program. Poor programmers tend to use them to get

out of tight corners, with almost inevitable incomprehensibility and disaster.

However many home micros have nothing better than GOSUBs, so if you want to write code for different computers you need to get used to the subroutine.

One point in favour of the humble subroutine is that it's possible to transfer sub-

routines from one program to another. This can really speed up programming.

Also a program that is broken up into sections is more easily understood by other people (such as the editor). Remember that meaningful variable names will help other people as well.

If you look through the listings printed in *Electron User* you won't find too many GOSUBs or RETURNS. This is because there is a better, and usually faster structure available in BBC Basic called the procedure.

These are a sort of super subroutine, and they will form the basis for a future article.

Finally, despite the dreadful mutterings of its detractors, the subroutine is a powerful structure which can allow you to break your program down into manageable sections.

You could find this advantageous both at the writing and de-bugging stages.

Carefully used, GOSUB can shorten a program, simplify it and make it run faster.

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THE COLUMN THAT TAKES A LOOK INSIDE THE LATEST RELEASES

Addcomm
Vine Micros

AS the name indicates this is a utility program which adds commands to your Electron, giving you, in effect, an even more extended Basic.

It is stored on a ROM chip and to be able to use it you must have a ROM card or box such as the Slogger ROM Box.

The added commands fall into four categories:

- Graphics.
- Logo graphics.
- Toolkit commands.
- Miscellaneous.

Electron graphics are already superb, but the Addcomm commands make them even better. There are, for example, commands for creating circles and ellipses. They are really easy to use.

For instance:

```
10 MODES
20 CIRCLE640,512,400
```

will draw a circle of radius 400 screen units with its centre at the centre of the screen. If you don't like your screen being 1280 units across and 1024 units up, you can scale it.

```
SCALE0,10,0,10
```

will make the screen 10 units across and 10 units down. To get a similar circle you need:

```
CIRCLES,5,4.
```

On the scaled screen you cannot use MOVE, DRAW or

You get a better bit of Basic with Addcomm

PLOT but you can use SMOVE, SDRAW and SPLOT.

Any line in a program can mix Basic and Addcomm statements or variables. So:

```
CIRCLEX,Y,RND(500)
```

is quite acceptable. Extra parameters give arcs.

If you've ever envied the colour fill routines you see in commercial programs it's easy with Addcomm. The statement FILL with X and Y coordinates will fill from the point specified to the edge of the screen or to a non-back-ground colour.

This will fill any shape, however complex, even through text. If you fancy patterned filling, CFILL allows you to specify a mix of colours for individual pixels.

It's even possible to have a non-upright screen by using ROTATE, or to shift the whole thing up or to the side with the TRANS command.

Logo graphics give you the

chance to create displays with minimal use of coordinates. It's rather more like using a pen.

First you decide where to start on the screen (LMOVE). This sets the position of the Logo cursor.

You choose your PEN (dots, lines or fills) and then the ANGLE to draw and the distance to ADVANCE.

If you prefer relative rather than absolute angles, TURN can be used to rotate a specified number of degrees. LCIRCLE and LELLIPSE draw circles/ellipses or arcs around the Logo cursor.

The Toolkit commands offer a mix of useful and informative commands.

MEM displays in decimal and hex how much memory your program takes and what is spare. This is based on your current mode, so put yourself into the correct mode when using it.

CHAR is a superb com-

mand enabling you to design/edit VDU23 characters. There are dozens of programs which do this, but this one can be used while you're actually writing your program.

GOODPROG attempts to mend a Bad Program, while FKEYS displays on screen the contents of your function keys. Both work well, and, because Addcomm becomes a part of your computer they sit there waiting to be used in crisis situations.

The same applies to LVAR, which lists all the variable names you've used. This can really help to avoid a muddle.

VERIFY is a facility that was missed out on the Electron. It checks that what has been saved on tape exactly matches the same program in memory.

LLIST is a line listing command. Unlike ordinary LIST, LLIST can be included in a program. Silly? Not at all. My error routine, when debugging programs is now:

```
ON ERROR
MODE6:REPORT:PRINT*at
line*:ERL:LLIST ERL:END
```

This tells me the error and displays the problem line.

Using FIND it is possible to list the whole program, including the possibility of different list formats such as multi-statement lines broken up.

Whenever I program I like to use meaningful variable names. It makes life easier for me, but the computer can handle the resident integer

```
10REM POOLS SELECTOR
20REM By Rog Frost
30REM
40REM
50MODE1
60RND=RND(-TIME)
70VDU19;4;0;
80PRINTTAB(1,10)*Auto se
lection of twenty four num
bers*TAB(10,13)*for footbal
pools*TAB(4,20)*Press spac
e bar to get numbers*
90REPEATUNTILGET=32:CLS
```

```
100DIM choiceX(55)
110FORselectionX=1TO24
120numberX=RND(55)
130IFchoiceX(numberX)<>0
THEN120
140choiceX(numberX)=numbe
rX
150NEXT
160PRINT
170FORprintoutX=1TO55
180IF choiceX(printoutX)<
>0 PRINT printoutX
190NEXT
```

```
10MODE1:RX=RND(-TIME):VD
U19;4;0;PRINTTAB(1,10)*Aut
o selection of twenty four
numbers*TAB(10,13)*for foot
ball pools*TAB(4,20)*Press
space bar to get numbers*:R
EPEATUNTILGET=32:CLS
20DIM CX(55):FORSX=1TO24
30NX=RND(55):IFCX(NX)<>0
THEN30
40CX(NX)=NX:NEXT:PRINT:
FORPX=1TO55:IF CX(PX)<>0 PR
INT PX
50NEXT
```

Program I: Long pools selector

Program II: Compacted

From Page 25

variables (A%-Z%) more quickly and efficiently.

Using the Addcomm command GREPL I can ask for a variable such as *pos_of_frog* and change it right through the program to F%.

SREPL finds each variable you might want to change and then gives you the option to change it or not.

I can now use variables that I understand and when the program is fully de-bugged change to short fast variables.

Not only that, I can use KILLREM to remove all REM lines and then the superb COMPACT to combine lines, thus saving more memory and processing time.

Programs of mine that I have put through the processes save about one third of the original memory - and run more quickly in to the bargain.

Programs I and II are identical in what they do (selecting football pool numbers) but Program II has had its variables changed and its REMs removed.

It has then been compacted and renumbered. Table I shows the differences, which are quite dramatic. Imagine the effects on long programs.

So far all has been very good, but three of the miscellaneous commands are dreadful. POPGDS, POPREP and POPFOR allow you to jump out of subroutines, REPEAT/UNTIL loops and FOR/NEXT loops.

All of these make for very bad programming and should be avoided.

Another command, LGOTO, is like GOTO but instead of jumping to a specified line number you jump to a label.

It works fine, but so far I've had no particular use for it. SETWIN allows you to predefine seven text windows which can then be called with

the WIN command. It's easier than VDU 28.

The last miscellaneous command is SORT. This can be used to sort string arrays into alphabetical order.

In truth, it actually produces Ascii order with upper case letters before lower case. It's a very fast sort taking just 0.75 seconds to sort 100 words into order.

To sum up, Addcomm is brilliant, particularly the graphics and the toolkit, but there is a small price to pay in terms of memory.

It requires 256 bytes of RAM for its own use and so it pushes page up to &F00. If you are going to load a long commercial program it's as well to turn Addcomm off. To do this type ADDCOMM and then hit the Break key. *FX163 will turn it on again.

Firmware like Addcomm requires good documentation, and Vine Micros has achieved a winner here. The 72 page manual is clear, concise and simple giving full syntax and examples for each of the forty commands.

Addcomm is the most valuable piece of software I've got. Every Electron owner who does some programming should consider getting it. It's easily worth the £28.

Rog Frost

Storm in a micro

Tempest
Superior Software

YES, this is the superb arcade game of the same name, converted by Superior Software for the Electron, and released with the full approval



of Atari who created the original.

It involves protecting the universe from aliens who are swarming through the star gates.

Your ship, armed with a blaster and super zapper, can skip round the rim of the star gate in clockwise or anti clockwise directions.

As the flippers, spikers, flipper tankers, fuseballs and pulsars emerge they can be destroyed with a quick spray of missiles from your blaster - well, theoretically anyway, it's not quite so easy in practice.

The aliens are semi-intelligent and tend to move in your general direction if they can, so you have to watch out for any that make it through the star gate.

If you get in a really tight spot you can use your super zapper which destroys all the aliens in the gate. However it can only be used once per screen.

When most of the aliens have been destroyed your ship enters the star gate to proceed to the next. At this point there may well be several spikers left which must be avoided by blasting a clear route when the message "Avoid Spikes" appears.

There are eight star gate patterns and 255 levels of play. At the start of each game there is the option of one or two players and any odd numbered star gate can be selected.

The sound and graphics are excellent and it's quite an exciting game to play. Also it is quite an original idea.

My only criticism is that there isn't a high score table or a joystick option - but it is compatible with both Plus 1 and 3.

Arcade fans will thoroughly enjoy this classic.

Roland Waddilove

Don't mind if I do...

The Complete Cocktail
Maker
Acornsoft

ONE of the main uses of home computers, apart from alien zapping, is the storage and retrieval of information in databases.

These can be based on any topic and The Complete Cocktail Maker is a database concerned with that complex set of drinks.

It contains information on over 300 with details of how much of each ingredient is needed.

Not only that, but it tells you how to mix them and what type of glass to serve them in.

On loading you are presented with the command menu which gives you four options.

Browse allows you to look through all the recipes in alphabetical order. For each drink you are given the liqueur flavour needed, the spirit required as well as any other ingredients.

The recipe also suggests what decorations to use and the mixing method. A picture is drawn of the type of glass to use which also gives some idea of the final colour of the drink.

Option two is A Drink Containing. You specify which ingredients you want, chosen from four different lists. Any cocktail containing your specified substances is then displayed on the screen.

In the event of none being found the program reverts to Browse mode.

A Drink Made Using sounds



	Program I	Program II
Time taken	2.1 seconds	1.9 seconds
Program length	394 bytes	246 bytes
Variable storage	291 bytes	232 bytes
Spare memory	7763 bytes	7970 bytes

Table I: Addcomm advantages

almost identical, but in fact means that not all of the ingredients have to be used in the cocktails.

You could enter the entire stock of your drinks cabinet and find all the cocktails you could make.

The final option allows you to enter the name of a cocktail and the computer will display its recipe. If you enter part of the name all drinks containing the letters you entered will be found.

The program comes with a 12 page booklet which explains clearly how to use the program. The whole package is well produced and, if you are into cocktails, it's very useful.

The trouble is, it contains no samples.

Rog Frost

Grovel before go

Twin Kingdom Valley
Bug-Byte

THIS graphical adventure combines some of the better elements of monster-bashing with the puzzles usually associated with text-only adventures.

There are 175 "pictures" in the adventure and since you can "look" at some of the objects within the locations this leads me to assume there are about 160 actual

locations.

You play the typical greedy adventurer and the object of your quest is to collect all the treasure you can find and deposit it safely. When you've scored the maximum points of 1024 you will find that you have a further problem. What to do next.

The program loads in several parts and full instructions are given during loading.

When the adventure starts you're asked to choose one of six options. These determine whether you have the graphics displayed or not and the type of messages you want about your location.

You can alter these during the course of the game by typing OPTION. As soon as you have made your choice the adventure proper begins.

You find yourself on a road outside a cabin. Inside the cabin are three objects that will be come in handy.

At this point I would suggest you save the game, as should you die the program simply ends.

If you have a game saved you can restart by using *LOAD, otherwise you have to load the game back in from the start.

I think it quite excusable for Bug-Byte not to have given you the option of playing another game. On saving the game, using *SAVE, you will see that you're in fact saving three programs, one of which is 24 blocks long.

Anyway, back to the game.

You'll find that over 100 locations are readily accessible and are generally logical.

For example, moving North and then South brings you back to the location you started from. However, this isn't always the case, especially when underground, so making a map is a must.

You will meet various characters most of whom, if armed, will attack you on sight.

An elf will carry things for you, but is sometimes reluctant to let you have them back. This same elf is also a positive nuisance when mapping underground - he kept picking up the objects I was dropping in order to make my map!

It is possible to frighten off or kill the characters you meet but you need to be at maximum strength (190 points) and armed with a better weapon than them.

This is also a good way of obtaining any treasure they may be carrying since they quite often drop them if you are winning.

Watch out for your strength points after doing battle, they will be very low and any further combat will probably finish you off.

A good tip for your strength is low is to WAIT for a bit since every command you give builds up your strength. If you are near Watersmeet a quick dip will work wonders.

On the subject of strength points, don't drink too much

ale in the local inn - it's definitely not good for you.

The graphics are excellent and quickly drawn but tend to slow the game down a lot, so doubtless you'll do the same as me and use the Option command to turn them off.

I've mapped about 140 locations and collected a few treasures but frankly, I don't think I'm nearer to finishing than when I started.

I've tried giving the crystal ball to the castle witch but keep getting killed.

I've tried throwing water, oil and everything else at the dragon but still can't get the master key.

I'm afraid that the adventure doesn't generate enough atmosphere for me to want to persevere with it.

Having said that, if anyone has completed it and would like to send me a map of it I will mention them in my bedtime prayers.

Overall, Twin Kingdom Valley is impressive. It is extremely well programmed and packaged. However, the save game facility and the abrupt ending, along with the characters in the program, who are more of an impediment than a problem, tend to make me reluctant to recommend it.

Yet the mail I've received about it tends to indicate that a lot of people do like it. My advice therefore, is to go to your friendly computer dealer, grovel and try before you buy!

Merlin

Deft fingers the key in Free Fall

Free Fall
Acornsoft

THE story line goes "When the Alphoid battleship attacked Deep Space Station Coriolis and Alphoid life forms injected the air supplies with their own cyanide-based atmosphere, only one crew member managed to don his space suit in time.

"Unable to reach the armoury, he must face the Alphoid warriors barehanded to defend not only his own life but also the vital computer records which the Space Station contains".

The object of Free Fall is to control that sole crewman to help him survive as long as

possible and to kill as many Alphoids as he can. It sounds easy.

However there are a few nasty creatures lurking around bent on getting our lone spaceman - the Craboids, Lobstoids, Batoids and Waspoids.

Craboids are pleasant little creatures that will bite through a space suit and poison the occupant with a nerve toxin. As you might guess, this causes our spaceman to lose all control and to thrash about with convulsions.

As light relief, Lobstoids breathe fire and use up the oxygen supply. They also burn whoever comes in range.

The Batoids are nice fellows who fly around catching and

throwing bombs.

Last, but far from least, the deadliest of them all are the Waspoids. "They have a sting which is worse than the bite of a Craboid, they can breathe fire like the Lobstoid and they can fly as well as a Batoid".

To control the spaceman requires dexterity of three fingers on each hand and a thumb for the space bar.

Catching a bomb requires another finger. This might sound a bit difficult, but the keys are well positioned and control is soon gained.

Several features are so good that, hopefully, they'll become standard on all games.

There are two panic buttons that can be operated at any

time. (I did. Often!) The Escape key causes the game to be aborted and the program restarted, while the Copy key is used to hold the game. This can be for an indefinite time, the Delete key being used to restart the action.

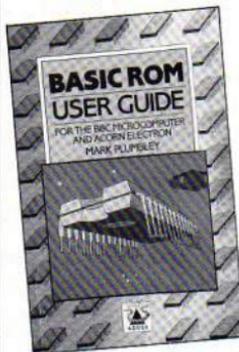
Sound can be switched on or switched off at any stage.

One excellent aspect of this program is the screen display. Not only are the characters and their movement of a high standard but there are also displays showing heart rate, air supply, high score and present score.

I thoroughly enjoyed getting to grips with this value for money package. Recommended.

John Woolford

BOOK SHELF



How Basic really works

Basic Rom User Guide for the BBC Microcomputer and the Acorn Electron, by Mark Plumley (Adder Publishing, Cambridge)

THE Basic ROM User Guide is designed to cover one area of computer technology that is frequently ignored – the Basic ROM. This book is therefore extremely useful if you want to find out how your computer really works.

You may not know it, but Basic is a computer program. Its purpose in life is to convert the programs you write into machine code. Basic is stored in a ROM chip so that it is available as soon as you switch on your machine.

It is an extremely complex program and includes all of the functions, statements, error handling routines and commands that you can use in your programs.

This book succeeds in describing that complex process in clearly-explained

units. It begins with a brief introduction to machine code programming and a description of the 6502 micro-processor.

This section includes an outline of the instruction set and registers.

The Guide then moves straight into the task of explaining the structure of the Basic program, which is treated as a system.

The comprehensive glossary of terms at the back of the book is extremely useful. In addition there is an extensive index so cross-referencing and finding one's way around the book is relatively easy.

As I read further and further into the book I became more and more tempted to try things out. It certainly does encourage exploration and self-awareness – there are a lot of examples and programs to illustrate the text.

I kept discovering new and useful short-cuts to my programming and techniques to improve my old programs.

However, there is one serious drawback to using the facilities of the Basic ROM directly and not through the usual *FX calls – the programs may not be transferable from one machine to another.

The book does list the differences between BBC Basic I, BBC Basic II and Electron Basic.

If you are writing for your machine only, then there is no problem. But, if the program is to be transferred to another machine, then problems may easily arise.

This text provides a very useful handbook for the advanced programmer and a useful guide to those who wish to find out more about their computer.

It contains listings for a complete disassembler and a very useful routine for recovering "bad programs". The section on error analysis and recovery after an error is most enlightening.

In all, this book fills a gap left by many user guides and texts on the Acorn range of computers.

John Woollard

INSIDE ADVENTURES

How to Write Adventure Games for the BBC Micro and Electron, by Peter Killworth (Penguin Acorn Computer Library)

AS you sit at your micro in the early hours of the morning, puzzling over some tricky problem in the latest adventure from your favourite software house, do you ever wonder what is going on in the mind of the programmer?

Well, here's a book written by Acornsoft's top adventure writer, Peter Killworth.

After a brief introduction to adventuring, the author starts with a discussion of how the games are written.

The best way to explain any problem is by example, so three adventures are created and their development discussed in detail.

"Caves" involves exploring a random network of caves and passages, searching for treasure. "Mini" is an adventure with only four rooms and is surprisingly complex. "Roman" is a larger, more-involved adventure, set in Ancient Rome.

The reader is taken through each stage, step by step. First the plot needs to be outlined, then the game logic worked out before any code is written.

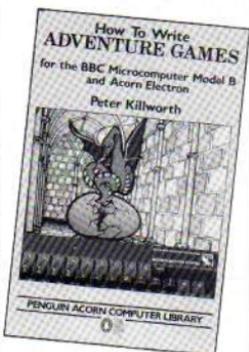
The most complicated and difficult part of the program is the database for storing the location of the objects, rooms and occupants.

A great deal of time is spent looking at this to try to find the most efficient way of storing the data.

I had to read through the text several times before I even remotely understood how the author was storing and retrieving the information.

It's amazing how much information Mr Killworth can cram into a few simple variables. Every bit is significant and often shows whether something exists, or is possible, or present, and so on.

"Mini" is an adventure with



only four locations, but is packed full of puzzles, messages, objects and magic words.

This is an excellent, typical adventure. Don't be put off by the number of rooms, this is irrelevant. It's the structure that is important.

Chapter five describes how an advanced database is constructed and a program which can be used by the reader to construct a database for his own adventures is presented.

The program enables you to enter the objects, rooms and vocabulary for the adventure and then stores it in the most efficient way.

The following chapter develops routines for extracting the information from the database, using "Roman" as an example.

Finally there is a complete listing of the adventure "Roman".

This is an excellent book from a superb programmer which gives an insight into how adventures are constructed. It's not an easy text to follow, so I can only recommend it to advanced programmers or those wanting an intellectual challenge.

If you have written a few simple adventures and want to know how the professionals do it, then this book is definitely for you.

Roland Waddilove

The ultimate guide to the Electron!

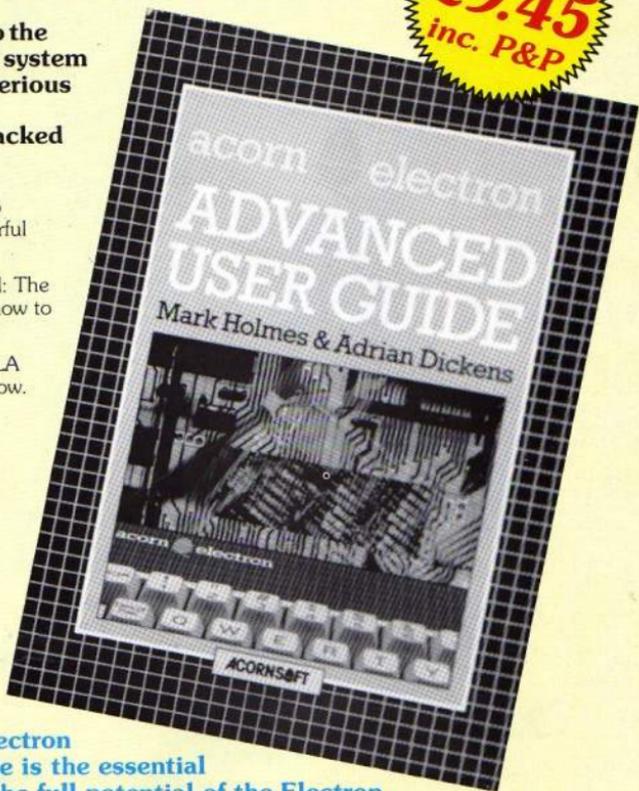
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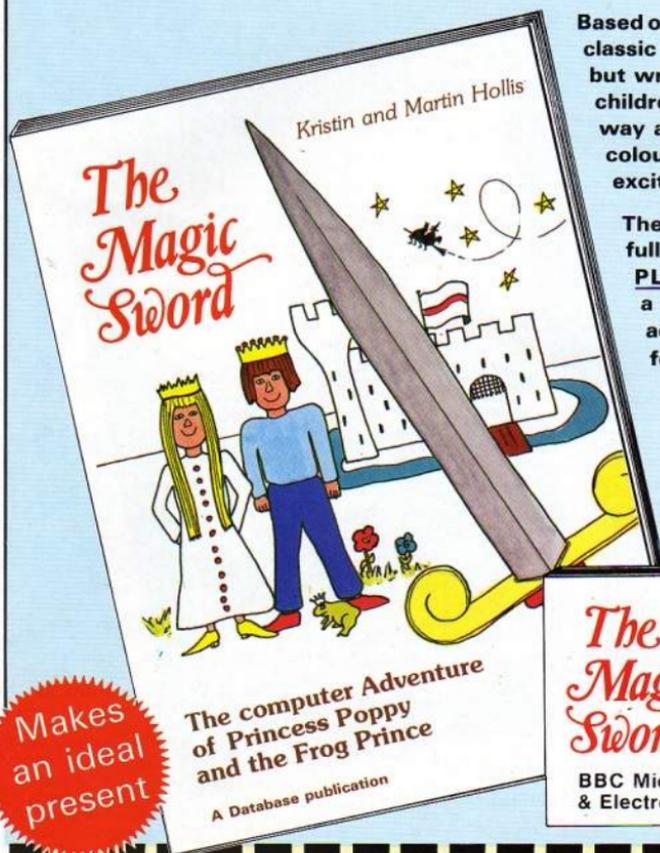
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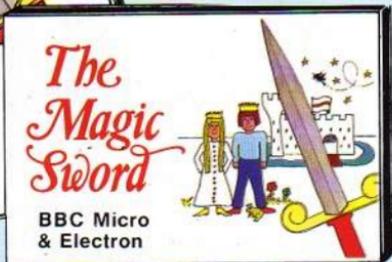
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STRINGALONGASCROLLA

STEPHEN MARTIN shows how string manipulation can be made much easier – and at the same time much more efficient

IT would seem from previous editions of *Electron User* that text scrolling programs are very popular. Two have been published, both written in Basic.

This however is a major drawback, for string manipulation in Basic is a cumbersome process.

To illustrate my point take a look at Program I. Its objective

```
10 REM PROGRAM I
20 REM BASIC STRING HAND
LING
30 MODE6
40 A$="ELECTRON USER"
50 PRINTTAB(10,10);A$
60 A$=LEFT$(A$,3)+CHR$32
+RIGHT$(A$,9)
70 PRINTTAB(10,11);A$
```

Program I

is simple, to take a string and replace its third character with a space.

Just look at line 60. As well as cumbersome this process is slow.

What is needed is an easy way to manipulate strings.

A better approach is to find

```
10 REM PROGRAM II
20 REM ALTERNATIVE STRIN
G STORAGE
30 MODE6
40 DIM string% 13
50 $string$="ELECTRON US
ER"
60 PRINTTAB(10,10);$stri
ng%
70 string%73=32
80 PRINTTAB(10,11);$stri
ng%
```

Program II

an alternative way of storing the string in memory which will allow us to manipulate it in such a way that we can examine and change individual characters within it.

This is easily accomplished as Program II shows. It works like this:

Line 40 reserves space in memory for string. It has to be

the exact length of the string. Line 50 places the string in memory and line 60 prints it.

Line 70 places CHR\$32 at position 3 in the string.

This program produces

```
10 REM PROGRAM III
20 REM TEXT SCROLLER
30 MODE6
35 VDU23,1,0;0;0;0;
40 DIM string% 14
50 $string$=" ELECTRON U
SER"
60 PRINTTAB(10,10);$stri
ng%
70 TEMP=string%70
80 FORT=0T013
90 string%7T=string%7(T
+1)
100 NEXT
110 string%713=TEMP
120 GOTO60
```

Program III

exactly the same effect as Program I but it is simpler and much faster.

We can now construct a program using this technique which will scroll text across the screen. Look at Program III. Line 40 reserves space for the string and 50 puts the string in memory.

Line 70 stores the first character and 80, 90 and 100 swap memory locations to produce scroll.

Line 110 puts the stored character at the end of the string to produce the wrap around.

Program III is probably the most efficient you can make it using Basic.

For even greater speed you need to use machine code. Fortunately this type of string storage and manipulation requiring repeated swopping and changing of memory locations is ideal for programming in machine code.

Program IV shows you how. It also demonstrates how to display part of the string so you can have a string of 100 characters long displaying 10 characters at a time on the screen.

```
10REM PROGRAM IV
20REM MACHINE CODE SCROL
LER
30MODE6
40*KEY100,1MRUN:IM
50VDU23,1;0;0;0;0;
60DIM string% 40
70$string$=" MACHINE COD
E SCROLLER BY STEPHEN MART
IN"
80new=string%
90start=string%+1
100num=40
110PROCAssemble
120CLS
130PRINTTAB(9,5)*MACHINE
CODE SCROLLER"
140PRINTTAB(14,10)*WHICH
DEMO?"
150PRINTTAB(16,12)*1 OR 2
```

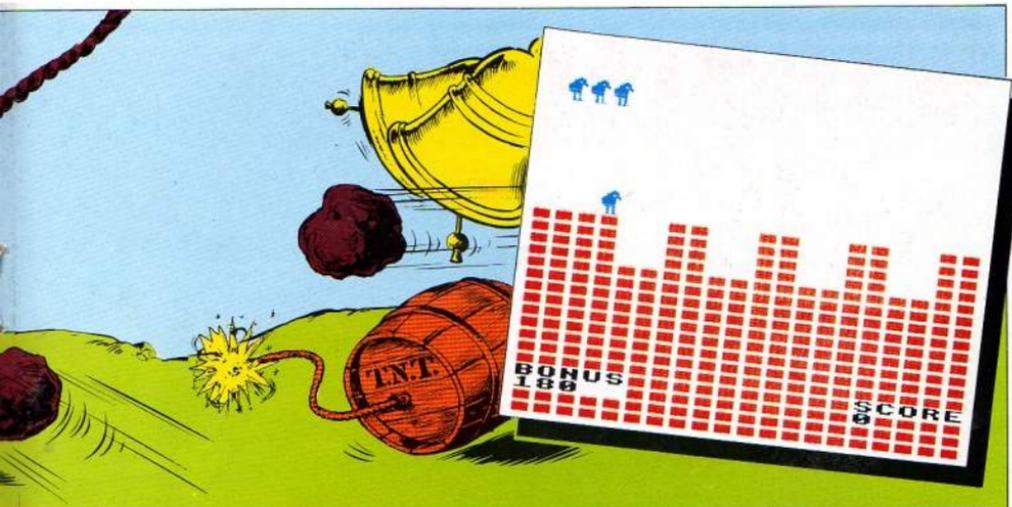
```
160REPEAT:A$=GET#
170UNTIL A$="1" OR A$="2"
180IFA$="1"PROCdemo1 ELSE
PROCdemo2
190DEFPROCdemo1
200CLS
210PRINTTAB(15,20)*FAST E
H!
220PRINTTAB(15,22)*IT SAY
S"
230PRINTTAB(9,6)*PRESS BR
EAK FOR MENU"
240PRINTTAB(0,24);$string
%
250PRINTTAB(0,10);$string
%
260CALL Q%
270GOTO250
280DEFPROCdemo2
290CLS
300PRINTTAB(10,6)*PRESS B
```

```
REAK FOR MENU"
310PRINTTAB(13,15)*THE AB
ILITY TO"
320PRINTTAB(13,17)*SHOW O
NLY PART"
330PRINTTAB(13,19)*OF THE
MESSAGE"
340PRINTTAB(13,21)* AT A
TIME IS"
350PRINTTAB(13,23)* AVAI
LABLE"
360FORT=10T030
370PRINTTAB(0+7,10);CHR$(
string%7T)
380NEXT
390CALL Q%
400GOTO360
410DEFPROCAssemble
420DIM Q% 50
430PI=Q%
440C
```

```
450LDX#0
460LDA new
470STA#70
480.LOOP
490LDA start,X
500STA new,X
510INX
520CPX#num
530BE LOOP
540LDA#70
550STA string%+num-1
560RTS
570J
580ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

Program IV



```

,60,20,20,30
630 VDU23,149,56,240,56,5
6,124,254,254,68
640 VDU23,150,16,56,56,56
,124,254,254,16
650 VDU23,151,0,1,66,255,
66,1,0,0
660 VDU23,152,240,240,126
,34,34,34,67,64
670 VDU23,153,255,129,129
,129,129,129,129,255
680 VDU23,154,0,60,126,25
5,255,126,60,0
690 ENDPROC
700 DEFPROCScreen
710 IF SCN=2 OR SCN=3 THE
N SOUND1,2,140,8:SOUND1,2,1
50,4
720 IF SCN=4 THEN PROCESM
TUNE:FOR J=0TO2000:NEXT
730 CLS
740 COLOUR3:COLOUR129:PRI
NTTAB(0,15):FOR F=0 TO 339
:VDU153:NEXT
750 FOR N=14TO17:FOR F=4
TO17STEP4:COLOUR131:PRINTA
B(F,N):* *NEXT:F:NEXTN
760 IF SCN<4 THEN BONUS=
SCN*400
770 IF SCN=1 THEN GOTO810
780 IF SCN=2 THEN GUARDS=
TRUE:GOTO 810
790 IF SCN=3 THEN GUARDS=
TRUE:BELL=FALSE:ARM=TRUE:ES
N=TRUE:GOTO820
800 IF SCN=4 THEN SCN=1:A

```

```

RW=FALSE:GUARDS=FALSE:LEVEL
=LEVEL-1:BONUS=SCN*500:LIVE
S=LIVES+5
810 COLOUR2:PRINTAB(19,1
0):BEL9:IF LEVEL<1 THEN LEV
EL=1:ENDPROC ELSE ENDPROC
820 IF ESM=TRUE COLOUR2:
PRINTAB(19,5):ESM#:COLOUR1
29:COLOUR3:PRINTAB(10,6):C
HR#153+CHR#153+CHR#0+CHR#10
+CHR#153:COLOUR131
830 ENDPROC
840 DEFPROCMANJUMPRIGHT
850 SOUND1,1,0,10
860 PRINTAB(X,Y):SPACE#
Y=Y-1:PRINTAB(X,Y):MAN2#:P
RINTTAB(X,Y):SPACE#X=X+1:P
RINTTAB(X,Y):MAN#:PRINTAB(X
,Y):SPACE#X=X+1:PRINTTAB(X
,Y):MAN2#:PRINTAB(X,Y):SPAC
E#
870 IF SCN>1 AND X>4 AND
(G=Y OR G=Y+1 OR G=Y-1)THE
NPROCDEAD
880 ENDPROC
890 PRINTAB(2,10)*G A M
E O V E R*:FOR F=0 TO 2500
:NEXT
900 COLOUR1:CLS:PRINT''S
PCS'QUASIMODO"
910 COLOUR:PRINT''H I G
H S C O R E S"
920 IF SC>HSC THEN HSC=SC
930 PRINT''SPC3'HIGH SCOR
E=":HSC
940 PRINT''SPC3'YOUR SCOR

```

```

E=:SC
950 PRINTAB(5,30)*PRESS
SPACE"
960 #FX15,0
970 REPEAT UNTIL GET=32
980 GOTO30
990 DEFPROCGUARDS
1000 PRINTAB(4,0):SPACE#:P
RINTTAB(0,0):SPACE#:PRINTTAB
(12,0):SPACE#:PRINTTAB(16,0)
SPACE#
1010 IF GUP=TRUE THEN G=0-
1
1020 IF GUP=FALSE THEN G=0
+1
1030 IF G=17THEN GUP=TRUE
1040 IF G=11 THEN GUP=FALS
E
1050 COLOUR5:PRINTAB(4,0)
GRD#:PRINTAB(0,0)GRD#:PRIN
TTAB(12,0)GRD#:PRINTTAB(16,
0)GRD#
1060 ENDPROC
1070 DEFPROCMARMOVE
1080 PRINTTAB(A,13)ARW#
1090 A=A-1
1100 IF A=0 THEN PRINTTAB(
0,13)* *ARW1=FALSE:A=17
1110 ENDPROC
1120 DEFPROCDIE
1130 LIVES=LIVES-1:FOR F=4
TO7:SOUND0,-15,F,2:NEXT:FOR
F=0TO500:NEXT:PRINTAB(X,Y
)SPACE#X=0:Y=13:BONUS=SCN*
500

```

```

1140 ENDPROC
1150 DEFPROCCJUMP
1160 PRINTAB(X,Y)SPACE#Y
=Y-1:PRINTTAB(X,Y):MAN#:PRIN
TTAB(X,Y):SPACE#Y=Y-1:PRIN
TAB(X,Y):MAN#:PRINTTAB(X,Y)S
PACE#Y=Y-1:PRINTTAB(X,Y):MA
N#:PRINTAB(X,Y)SPACE#Y=Y-
1
1170 IF Y<0 THEN Y=0
1180 ENDPROC
1190 DEFPROCSMTUNE:RESTOR
E1240
1200 FOR Q=1 TO10:READA,1
:SOUND1,-15,A+20,1:NEXTQ:E
NDPROC
1210 DEFPROCTUNE
1220 RESTORE1230:FOR Q=1TO
14:READZ,V:SOUND1,-15,Z-30,
V:NEXTQ:ENDPROC
1230 DATA0,3,44,3,48,3,52
,3,40,3,44,3,48,3,52,3,40,3
,44,3,48,3,52,3,48,0,34,7
1240 DATA30,10,40,7,50,5,4
0,10,30,7,30,4,40,5,62,6,69
,4,62,6
1250 IF ERR=17 THEN GOTO 4
0 ELSE MODE6:REPORT:PRINT E
RL:#FX12,0

```

This listing is included in this month's cassette tape offer. See order form on Page 61.

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	A	B	C	D
1	MONY	JANUARY	FEBRUARY	MARCH
2	HOUSING	85.72	85.72	85.72
3	FOOD	44.24	41.42	24.40
4	FUEL	40.20	20.00	20.00
5	LEISURE	20.00	47.28	20.00
6	OTHER	39.85	17.12	20.00
7	TOTAL SPEND	230.00	211.92	150.12
8	EARNINGS	221.21	221.21	221.21
9	B. FWD.	27.25	7.00	27.41
10	NET SPEND	108.79	90.71	28.91
11	SPEND	208.06	211.85	274.69
12	SAVING	0.00	109.84	113.99
13	SAVE	0.00	82.25	85.41
14	C.FWD.	0.00	27.41	28.41

DATABASE

RECORD No. 1	RECORD No. 1
SURNAME: JONES	SURNAME: ANDREWS
FIRST NAME: SIMON	FIRST NAME: JAMES
ADDRESS: 8 BROWN LANE	ADDRESS: 12 ELF ROAD
ADDRESS: LIVERPOOL	ADDRESS: HENEFORD
TELEPHONE: 051-632 8000	TELEPHONE: 221-623451
AGE: 42	AGE: 15

RECORD No. 2	RECORD No. 2
SURNAME: ANDREWS	SURNAME: ANDREWS
FIRST NAME: PETER	FIRST NAME: PETER
ADDRESS: 12 ELF ROAD	ADDRESS: 12 ELF ROAD
ADDRESS: HENEFORD	ADDRESS: HENEFORD
TELEPHONE: 221-623451	TELEPHONE: 221-623451
AGE: 19	AGE: 19

RECORD No. 3	RECORD No. 3
SURNAME: SMITH	SURNAME: SMITH
FIRST NAME: JANE	FIRST NAME: JANE
ADDRESS: 42 HIGH STREET	ADDRESS: 15 MILL ROAD
ADDRESS: SALFORD	ADDRESS: WARRINGTON
TELEPHONE: 622-61421	TELEPHONE: 893-80923
AGE: 27	AGE: 20

RECORD No. 4	RECORD No. 4
SURNAME: YATES	SURNAME: BROWN
FIRST NAME: IAN	FIRST NAME: IAN
ADDRESS: 177 FORD ROAD	ADDRESS: 17 LEAMFORD
ADDRESS: GULHAM	ADDRESS: NORTHAM
TELEPHONE: 452-988 74543	TELEPHONE: 611-94281
AGE: 35	AGE: 21

RECORD No. 5	RECORD No. 5
SURNAME: ANDREWS	SURNAME: BROWN
FIRST NAME: JAMES	FIRST NAME: JAMES
ADDRESS: 12 ELF ROAD	ADDRESS: 12 ELF ROAD
ADDRESS: HENEFORD	ADDRESS: HENEFORD
TELEPHONE: 221-623451	TELEPHONE: 221-623451
AGE: 15	AGE: 15

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THERE'S a definite trend towards multiple statements and/or graphics in adventures these days.

Does anyone use multiple statements? Do graphics really promote an atmosphere or are they just a nuisance? Is it true that anything new has to be good? Who knows what can come out of it - From big Acorns do little Electrons grow and all that!

Personally I prefer to turn the graphics off when possible, once I've seen them. The game usually progresses faster and adventures without them are often better as they have to use the memory better. What do you think?

On to the adventure Top Ten. So far we have received marks from lots of people, but, amazingly, for only four different adventures.

Please give marks for them all, not just the ones you like best. If you think the program is dire, then mark it accordingly. So get your pen and paper out.

I'd like to thank everyone who wrote in with answers to last month's problems. In particular Mark Steadman and Phillip Cook. I would also like to thank Michael Dunlop and Katy King for their advice and opinions. It's nice to hear what you think about adventures as well as where they are causing you problems.

Andrew Dickman writes to say that he can't even get into

the castle in *Sadim Castle*. I have to presume that he means the gates that you can see when the game starts.

These are the gates to the castle grounds, not the castle as such. Fix the farmer's roof and do a deal with the monk.

Brynn Edmondson is stuck in *Eye of Zoltan*. He wants to know what the password is for getting into the castle. Password IS the password!

HE is also stuck in *The Incredible Hulk*. He wants to know how to get rid of the bees and get the wax. One of the domes is worth EXAMining if you are a Scott Adams FAN!

John Miloren is having problems with *Wheel of Fortune*. Can you put things into the empty basket? No. Something will put itself in later.

How do you befriend the farmer, troll, spider and fly? Later. You can't. Bring it something it likes. You don't want to.

Go into the fly's cave and immediately out and into the spider's cave.

Can you stop the trapdoor from closing? No, no need to.

Where do the characters all go to when you come back up through the trapdoor? The policeman continues his beat on the other side of the canal and the tramp goes home for his tea.

How do you go down the well the second time? You

don't. Try spinning something. How do you get across the canal bridge? From the other side!

David Yates has written to say that if you type in EAT SPICES in *Sphinx Adventure*, the program crashes with a "BAD ARGUMENTS AT LINE 363" message. You have been warned.

Now some problems I need help with:

J.E. Squire wants to know what, if anything, can be done in the inner sanctum and what is the significance of DAVE KNEW in *Sphinx Adventure*.

H. Bastein is having problems in *Strange Odyssey*. How does he get to the Jovian Mine without getting squashed and into the Black Hole without getting ripped apart?

Terry Mealing wants to know where some of the jewels are in *Crown Jewels* - and I want to know who produces Crown Jewels, as I've never heard of it!

I have been taken to task by P. Eastwood for not finding the treasure in my review of *Java Star*. Apparently the treasure is easy to find and I must be stupid for missing it.

Some late news is that Epic has produced help sheets for all of its adventures and they are free to anyone sending an SAE - to Epic, NOT to me.

In view of the vast numbers of letters I am getting about *Twin Kingdom Valley*, I am

going to do a special on it next month.

Yes, I finally dug my old maps out and went back and solved it. For those of you who are wondering what to do with your 1024 points, watch this space.

Now, let's get back to answering some more readers' questions:

C.F. Dodds can't get off the beach in *Softek's Eye of Zoltan*: If you have mapped everywhere, use your treasures before you STORE them.

Terry Mealing wants to know how to get both the sword and the key box in *Stolen Lamp* - DONT.

Nicola King, Chris Wilson, R. Henderson and H. Bastien are all having problems with *Twin Kingdom Valley*.

To kill the dragon, one of the things you find in the castle should be examined carefully - it looks deadly. To get out of the maze with the witch, you need to bribe a guard with a bag of gold.

The giant is in the desert king's dungeon and so is the princess. Get there from the cave near watersmeet.

You can't do anything with the secret of life until you have done everything else. To help the sick giant, take him to watersmeet.

The master key will open just about anything, but the door to the south turret in particular. The rod isn't that much use, although waving it will bridge a gap.

Gordon Hoy and David Yates are having fun with *Sphinx Adventure*.

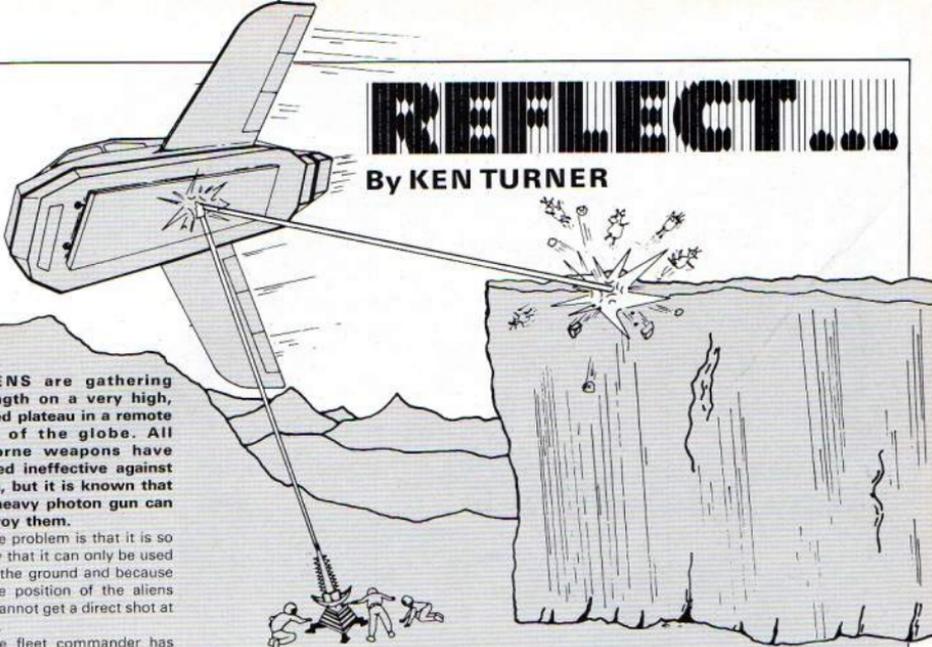
The mithril ring and stake are both across the everglades past the crocodile. If the sword breaks, then use your hands when trying to kill the dragon and the ogre.

The safe door doesn't need keys, only a magic word, and the boat and mouse are in the vampire's castle. You will need to map the maze of coloured rooms and metal passages and junctions. Sorry!

● If you want Merlin's help write to:
Merlin, Electron User,
Europa House, 68 Chester
Road, Hazel Grove,
Stockport SK7 5NY.
- and enclose an SAE if you
would like a reply.

REFLECT...

By KEN TURNER



ALIENS are gathering strength on a very high, walled plateau in a remote part of the globe. All airborne weapons have proved ineffective against them, but it is known that the heavy photon gun can destroy them.

The problem is that it is so heavy that it can only be used from the ground and because of the position of the aliens you cannot get a direct shot at them.

The fleet commander has come up with a brilliant but dangerous solution by fitting the remaining airships with reflective material on the base.

The brave pilots have put their lives on the line by flying back and forth over the alien's position to provide you with a mirror to fire at and thereby reflect your photons on to the aliens.

If you miss the mirror and hit the ship it will be destroyed

— and you only have five of them.

Every now and then the aliens launch a bomb which bursts above you and showers you with high explosive mini-bombs.

While in flight this bomb also disables your gun — most frustrating, but this is what we learn to live with in computerland!

In order to score you have to position your "sight" so that the photon hits the mirror on the airship and the reflected photons meet the alien.

The sight is a "+" at the top of the screen and is the point through which your photons will pass if not interrupted by the mirror.

Once fired, the photon's path is set and cannot be

changed — it cannot be guided.

As both the ship and the alien are always moving a hit with every shot would be miraculous.

For this reason there are no levels, and the idea is to score more hits than anyone else before you are killed.

VARIABLES

XS%	X coordinate of sight.
XB%	X coordinate of base.
XP%	X coordinate of photon.
YP%	Y coordinate of photon.
Xbomb	X coordinate of bomb.
Ybomb	Y coordinate of bomb.
XSHIP	X coordinate of ship.
XBAD	X coordinate of alien.
BAD%	Movement rate of alien.
diffx	Horizontal movement rate of photon.
diffy	Vertical movement rate of photon.
SHIP%	Movement rate of ship.
score%	Current score.
lives%	Lives left.
time	Random time before bomb is launched.

FLAGS

launched	Has bomb been launched?
dead%	Is game finished?
photon	Has photon gun been fired?

ARRAYS

X(12),Y(12)	Coordinates for shower bombs.
--------------------	-------------------------------

name\$(10) Names on hi-score table.
score(10) Their scores.

PROCEDURES

PROCscreen	Draws battle scene, score etc.
PROCinit	VDU 23s, initialises variables.
PROCship	Creates new ship.
PROCbaddy	Creates new alien.
PROCmoveship	Moves ship.
PROCmovebaddy	Moves alien.
PROCmovesight	Moves sight on your command.
PROCbase	Creates base.
PROCmovebase	Moves base on your command.
PROCphoton	Photon launched, sound, flight until result of shot.
PROExp1	Rubs out what was hit and shows explosion.
PROCscore	Increments score.
PROCbomb	After random time, called to launch bomb.
PROCshower	Bomb bursts and showers down mini-bombs.
PROCchiscore	Compares score with previous scores.
PROCTable	If hi-score asks for name and displays table.
PROCinstruct	Displays instructions.
PROCerror	Calls Mode 6 and reports error.

Reflect listing

From Page 37

```

10 REM REFLECT
15 REM (C) Electron User
20 REM By K.B.Turner
25 ON ERROR:MODE 6:PROC
error:END
30 DIM X(12),Y(12):Y(1)=
200
40 DIM name$(10),score(1
0)
45 ENVELOPE 1,1,5,5,12
,12,12,126,0,0,-126,126,126
46 ENVELOPE 2,1,-5,-5,-5
,12,12,12,126,0,0,-126,126,
126
50 FOR S=1 TO 10
60 name$(S)="Electron":s
core(S)=0
70 NEXT
75 MODE 6:VDU 19,1,2;0;
76 PROCInstruct
77 MODE 5
79 PROCinit
80 VDU 23,1,0;0;0;0;
90 VDU 5
100 PROCscreen
110 PROCchip
120 PROCbaddy
130 PROCbase
140 VDU 4:CLS
150 MODE 700,100:GCOL0,3:
FOR C=100 TO 100:PLOT77,700
,C:NEXT
160 MOVE 636,100:GCOL0,1:
DRAW 1279,100:DRAW 1279,288
:DRAW 636,288:DRAW 636,100
170 VDU 5
180 MOVE 0,0:GCOL0,1:DRAW
0,1023:DRAW 1279,1023:DRAW
1279,0:DRAW 0,0
185 PROCscore
190 REPEAT
200 PROCovesight
210 PROCoveship
220 PROCovebaddy
230 PROCovebase
240 IF INKEY (-99) THEN p
hoton=TRUE:XP=XBX+32:difff
=((XSX+32-XPX)*50)/700:MODE
XPX,YPX:GCOL3,1:DRAW XPX+d
ifff,YPX+difff
250 IF photon THEN SOUND
1,1,0,0:REPEAT:PROCphoton:P
ROCovesight:PROCoveship:P
ROCovebaddy:PROCovebase:U
NTIL photon=FALSE
260 PROCscore
280 IF TIME>time THEN lau

```

```

nched=TRUE:Xbamb=XBAD:Ybamb
=64:MOVE Ybamb,Ybamb:GCOL3
,3:PRINTCHR#245
290 IF launched THEN REPE
AT:PROCbamb:PROCovesight:P
ROCoveship:PROCovebaddy:P
ROCovebase:UNTIL Y(1)<100
OR dead%:TIME=0:time=RND(100
00):Y(1)=200:launched=FALSE
300 UNTIL dead%:lives%>0:
PROCscore
310 #FX15,0
320 MODE 2
325 VDU 23,1,0;0;0;0;
330 PROCscore
340 IF A$="Y" THEN GOTO 7
5
350 END
360 DEF PROCscreen
365 FOR col=0 TO 3:VDU 19
,col,0;0;NEXT
380 MOVE 0,727:DRAW 50,40
0:DRAW50,300:DRAW100,200:DR
AW600,200:DRAW600,300:DRAW
500,300:DRAW650,600:DRAW650
,400:DRAW 1279,400
390 MOVE 0,0:GCOL0,3:FOR
Y=0 TO 726:PLOT 77,0,Y:NEXT
400 MOVE 646,0:FOR Y=0 TO
595:PLOT 77,646,Y:NEXT
410 MOVE XSX,926:GCOL3,2:
PRINT"*"
415 VDU 20,19,3,2;0;
420 ENDPROC
430 DEF PROCinit
440 BAD%:XSX=640:XB%:10
0:YPX=230:difff=50:launched
=FALSE:SHIPX=16
450 score%:dead%=FALSE:
photon=FALSE:lives%=5
470 VDU 23,255,3,14,12,56
,48,224,192,192,23,254,192,
112,48,28,12,7,3,20,10,27
,19,23
480 VDU 23,255,0,0,0,0,0,
0,63,63,23,252,0,0,0,0,0,0,
252,252
490 VDU 23,251,129,255,24
,60,60,60,66,129,23,250,24,
60,60,126,126,126,66,129
500 VDU 23,249,7,12,48,10
2,164,128,105,136,23,248,12
,178,194,70,25,9,193,90,23,
247,96,36,30,112,64,33,18,1
2,23,246,18,6,17,177,142,72
,48,0
510 VDU 23,245,0,24,126,2
55,255,126,24,0
520 expl#CHR#249+CHR#248

```

```

+CHR#8+CHR#8+CHR#10+CHR#247
+CHR#246
530 ENDPROC
540 DEF PROCchip
550 XSHIP=800
560 MOVE XSHIP,856:GCOL3,
2:PRINT CHR#255:CHR#254:MOV
E XSHIP,856:GCOL3,1:PRINT C
HR#253:CHR#252
570 ENDPROC
580 DEF PROCbaddy
590 XBAD=660+RND(1554)
600 MOVE XBAD,432:GCOL3,2
:PRINT CHR#251
610 TIME=0:time=RND(10000
)
620 ENDPROC
630 DEF PROCoveship
640 MOVE XSHIP,856:GCOL3,
2:PRINTCHR#255:CHR#254:MOVE
XSHIP,856:GCOL3,1:PRINT CH
R#253:CHR#252
650 XSHIP=XSHIP-SHIPX:IF
XSHIP<000 OR XSHIP>800 THEN
SHIPX=-SHIPX
660 MOVE XSHIP,856:GCOL3,
2:PRINTCHR#255:CHR#254:MOVE
XSHIP,856:GCOL3,1:PRINT CH
R#253:CHR#252
670 ENDPROC
680 DEF PROCovebaddy
690 MOVE XBAD,432:GCOL3,2
:PRINT CHR#251
700 XBAD=XBAD+BAD%:IF XBA
D>1214 OR XBAD<660 THEN BAD
%=-BAD%
710 MOVE XBAD,432:GCOL3,2
:PRINT CHR#251
720 ENDPROC
730 DEF PROCovesight
740 IF NOT INKEY (-104) A
ND NOT INKEY (-103) THEN EN
DPROC
750 MOVE XSX,926:GCOL3,2:
PRINT"*"
760 IF INKEY (-104) THEN
XSX=XSX+32
770 IF INKEY (-103) THEN
XSX=XSX-31
780 MOVE XSX,926:GCOL3,2:
PRINT"*"
790 ENDPROC
800 DEF PROCbase
810 MOVEXB,232:GCOL3,2:P
RINT CHR#250
820 ENDPROC
830 DEF PROCovebase
840 IF NOT INKEY (-98) AN
D NOT INKEY (-67) THEN ENDP

```

```

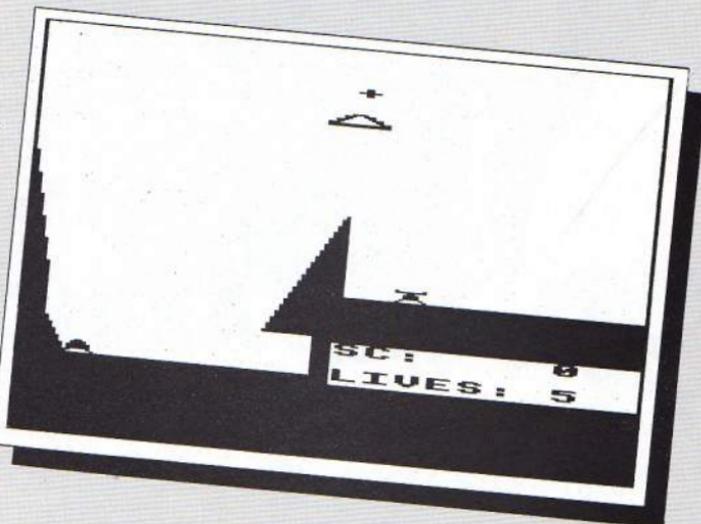
ROC
850 MOVE XB,232:GCOL3,2:
PRINT CHR#250
860 IF INKEY (-98) THEN X
BX=XB-16:IF XB<100 THEN X
BX=100
870 IF INKEY (-67) THEN X
BX=XB+16:IF XB>535 THEN X
BX=535
880 MOVE XB,232:GCOL3,2:
PRINT CHR#250
890 ENDPROC
900 DEF PROCphoton
910 MOVE XPX,YPX:GCOL3,1:
DRAW XPX+difff,YPX+difff
920 IF POINT(XPX+difff,YP
X+difff)=2 THEN PROCexpl
930 IF POINT(XPX+difff,YP
X+difff)=51 THEN difff=-d
ifff:YPX=800:SOUND 1,2,100,7
940 IF POINT(XPX+difff,YP
X+difff)=3 OR YPX>926 OR XP
X>1279 OR XPX<0 THEN SOUND
1,-15,200,5:photon=FALSE:d
ifff=50:XPX=XB+32:YPX=230:EN
DPROC
950 XPX=XPX+difff:YPX=YPX
+difff
960 MOVE XPX,YPX:GCOL3,1:
DRAW XPX+difff,YPX+difff
970 ENDPROC
980 DEF PROCexpl
990 IF YPX+difff=830 THEN
X1=XSHIP:Y1=800:MOVE XSHIP
,856:GCOL3,2:PRINTCHR#255+C
HR#254:MOVE XSHIP,856:GCOL3
,1:PRINTCHR#253+CHR#252:lives
%:lives%-=1:IF lives%>0 TH
EN dead%=TRUE
1000 IF YPX+difff=430 THEN
X1=XBAD:Y1=464:MOVE XBAD,4
32:GCOL3,2:PRINTCHR#251:sco
re%:score%+=150
1010 IF YPX+difff=230 THEN
X1=XB:Y1=264:MOVE XB,232
:GCOL3,2:PRINTCHR#250:dead%
=TRUE
1020 MOVE X1,Y1:GCOL3,2:PR
INT expl: SOUND0,-15,5,10:F
OR delay=1 TO 500:NEXT:MOVE
X1,Y1:PRINT expl#
1030 IF YPX+difff=830 THEN
N PROCchip
1040 IF YPX+difff=430 THEN
PROCbaddy
1050 IF YPX+difff=230 THEN
PROCbase
1060 ENDPROC
1070 DEF PROCscore

```

```

1000 0%:=800404
1000 VDU4:COLOUR 1:PRINTTA
B(0,0)"SC:",score%:TAB(0,2)
"LIVES: ";lives%:VDU 5
1100 ENDPROC
1110 DEF PROCbomb
1120 IF Xboab=400 AND Yboab=700 THEN PROCshower:ENDPROC
1130 MOVE Xboab,Yboab:GCOL 3,3:PRINTCHR#245
1140 Yboab=Yboab+32:IF Yboab>700 THEN Yboab=700
1150 IF Yboab=700 THEN Xboab=Xboab-64:IF Xboab<400 THEN Xboab=400
1160 MOVE Xboab,Yboab:GCOL 3,3:PRINTCHR#245
1170 IF Xboab=400 AND Yboab=700 THEN SOUND 0,-15,6,5:MOVE Xboab,Yboab:GCOL 3,3:PRINTCHR#245:FOR N=1 TO 12:X(N)=RND(400)+100:Y(N)=600+RND(100):NEXT:GCOL 3,3:FOR N=1 TO 12:PLOT 69,X(N),Y(N):NEXT
1180 ENDPROC
1190 DEF PROCshower
1200 GCOL 3,3:FOR N=1 TO 12:PLOT 69,X(N),Y(N):NEXT
1210 FOR N=1 TO 12:Y(N)=Y(N)-32:NEXT
1220 GCOL 3,3:FOR N=1 TO 12:PLOT 69,X(N),Y(N):NEXT
1230 FOR N=1 TO 12:IF POINT(X(N),Y(N))=1 THEN X1=X(N):Y1=264:MOVE X1,232:GCOL 3,2:PRINTCHR#250:PROCExp1:dead%=TRUE:TIME=0
1250 NEXT
1260 ENDPROC
1270 DEF PROCscore
1280 Z=0
1290 FOR S=1 TO 10
1300 IF score%>score(S) THEN Z=Z+1
1310 NEXT
1320 COLOURS:PRINT""
You scored %
1325 COLOUR 1:PRINT""
"score%
1330 COLOUR 3:PRINT""
you are"
1340 IF Z=0 THEN PRINT""
NOT"
1350 COLOUR 5:PRINT""
on the high score"
1360 PRINT""
TABLE

```



```

1370 FOR C=1 TO 2000:NEXT
1380 IF Z=0 THEN PROCtable
1390 FOR C=1 TO 5000:NEXT
1400 CLS
1405 #F115,0
1410 PRINT TAB(0,15)"Another game?(Y / N)"
1420 REPEAT:AB=INKEY#(0):UNTIL AB<>"*"
1430 ENDPROC
1440 DEF PROCtable
1450 CLS
1460 COLOUR 3
1465 #F115,0
1470 PRINTTAB(0,4)"What is your name?"
1480 INPUT TAB(4,15),name$
1490 FOR C=1 TO 2
1500 name$(C-1)=name$(C):score(C)=score(C)
1510 NEXT
1511 score(Z)=score%:name$(Z)=name$
1515 CLS
1520 COLOUR 3:PRINT""
ALL OF HONOUR"
1530 PRINT""
1540 0%:=800505
1550 FOR C=10 TO 1 STEP -1
1560 COLOUR 1
1570 PRINT score(C);",...."
name$(C)
1575 GCOL 0,6:MOVE 0,0:DRAW

```

```

0,1025:DRAW 1279,1023:DRAW
1279,0:DRAW 0,0:MOVE 0,939
:DRAW 1279,939
1580 NEXT
1590 ENDPROC
1600 DEF PROCinstruct
1610 PRINT""
The aliens are patrolling a walled plateau. All airborne weapons have proved useless against them. The only weapon which can destroy them is the 'PHOTON GUN' which is very heavy and is ground-based."
1620 PRINT""
The FLEET COMMANDER has come up with a brilliant idea. All aircraft have been fitted with reflective material on the base. Your PHOTONS must hit this base to be reflected back onto the aliens."
1630 PRINT""
If you hit the ship you will destroy it and you only have FIVE left. The '+' sign at the top of the screen is your sight and is the point through which the PHOTON will pass if not interrupted."
1640 PRINT""
TAB(5)"PRESS SPACE BAR TO CONTINUE"

```

```

1650 REPEAT UNTIL GET=32
1660 CLS
1670 PRINT""
TAB(16)"CONTROL"
TAB(16)-----"
1680 PRINT""
Z
- Move base LEFT""
-----
Move base RIGHT""
< ----- Move sight (
+) LEFT""
----- Move sight (+) RIGHT""
SPACE BAR ---- Fire PHOTON GUN""
GOOD LUCK!
1690 PRINT TAB(5,23)"PRESS SPACE BAR TO CONTINUE,"
REPEAT UNTIL GET=32
1695 CLS:PRINT TAB(2,2)"A FEW MOMENTS DELAY, THEN BE READY...."
TAB(13,6)"By the way...."
TAB(2,18)"Watch out for the shower boabs!"
1700 FOR DELAY=1 TO 4000:NEXT
1710 CLS:ENDPROC
1720 DEF PROCerror
1730 REPORT:PRINT" at Line";ERL
1750 ENDPROC

```

This listing is included in this month's cassette tape offer. See order form on Page 51.

ROLAND WADDILOVE's handy utility
lets you examine your
machine code without
any fuss or bother



TAKE IT ALL APART

MACHINE code is the language which micro-processors such as the 6502 used by the Electron understand. It consists simply of binary numbers in the range 0 to 255.

As you can imagine, this is very difficult to follow and next

to impossible to write. You get line after line of 0s and 1s.

So instead of using straight machine code we normally work with assembly language.

This is a great deal easier to manage, as mnemonics are used to represent each instruction. If you wanted to

write a machine code program you would normally write it in assembly language and use an assembler to convert this into machine code.

An assembler is a program which will take a series of assembly language mnemonics and convert them into

machine code proper.

To read a machine code program then you do the reverse - convert it into assembly language using a disassembler.

A disassembler is the opposite of an assembler, taking an unintelligent mach-

```

10 REM Disassembler
20 REM By R.A.Waddilove
30 REM Version 3
40 REM (c) Electron User
50 MODE 6
60 PROCinitialise
70 REPEAT
80 PROCinput
90 REPEAT
100 char$=""
110 PROCfind_code
120 IF found PROCdisassemble ELSE PRINT TAB(18);"No such code";address+address+1
130 PRINT TAB(36);char$;FX21;0
140 UNTIL INSTR("i",GET$)
150 UNTIL FALSE
160 END
170 DEF PROCdisassemble
180 IF (type AND type<5) OR (type>8 AND type<12) PROCprint(byte1);address+address+2
190 IF type=5 OR type=6 D

```

```

R type=7 OR type=12 PROCprint(byte1);PROCprint(byte2);address+address+3
200 IF type=8 OR type=0 address=address+1
210 RESTORE 1010
220 FOR I%=0 TO (EVAL("&"+code$)AND &FF00)/DIV &100
230 READ anemonic$
240 NEXT
250 PRINT TAB(18);anemonic$;":
260 PROCprint_data
270 ENDPROC
280 DEF PROCinitialise
290 VDU 19,1,0;19,0,4;0
300 PRINT TAB(13);"DISASSEMBLER""TAB(7)"ROM's";
310 FOR I%=0 TO 15
320 IF I%>2&0 PRINT I%";":I%";ROM:I":PROCrows
330 NEXT
340 PRINT TAB(18)"I=input new address"" Hold down any other key to disassemble"

```

```

350 ENDPROC
360 DEF PROCrows
370 AX=&800;FX=0
380 REPEAT byte1=FNbyte(A
X)
390 IF byte1>31 AND byte1<127 VDU byte1
400 AX=AX+1
410 IF byte1=0 FX=FX+1;PRINT " ";
420 UNTIL FX=2
430 ENDPROC
440 DEF PROCinput
450 INPUT " Start address=";address$
460 address=EVAL address$
470 IF address>67FFF AND address<&C000 INPUT " ROM number";ROM ELSE ROM=-1
480 ENDPROC
490 DEF PROCfind_code
500 IF ROM=-1 byte1=FNbyte(address);byte2=FNbyte(address+1);byte2=FNbyte(address+2) ELSE byte1=address;byte2=address+1;byte2=address+2

```

```

510 PRINT " ";address;":
";
520 PROCprint(byte2)
530 RESTORE 1020
540 REPEAT
550 READ code$
560 UNTIL (EVAL("&"+code$)AND &FF)=byte1 OR code$="FFFFFF"
570 IF code$="FFFFFF" found=FALSE ELSE found=TRUE;type=(EVAL("&"+code$)AND &FF0000)/DIV &10000
580 ENDPROC
590 DEF FNbyte(BX)
600 !&6=BX;YX=ROM
610 =USR(&FFB9)AND &FF
620 DEF PROCprint(BX)
630 IF BX>31 AND BX<127 char$=char$+CHR$(BX)
640 IF BX<16 PRINT "0";
650 PRINT;"BX";":
";
660 ENDPROC
670 DEF PROCprint_data
680 REM accumulator
690 IF type=0 PRINT "A";:
ENDPROC

```

line code program and converting it back into a list of assembly language mnemonics.

As you probably know, the Electron has a pretty powerful assembler built in to the Basic ROM. This can be used to write machine code programs in assembly language.

What's lacking is a disassembler for reading machine code programs. This isn't quite as essential as an assembler, but is still a useful tool.

The program presented here will fill that gap. It's a powerful disassembler which will convert 6502 machine code back into assembly language mnemonics.

A disassembler is useful for checking whether a machine code program has assembled correctly or if it's become corrupted for some reason.

Also it's interesting to explore the ROMs and follow the various routines within them. These can be selected and disassembled quite easily.

When run, the disassembler will print a list of all the ROMs present and their number.

If you opt to disassemble from an address between

```

DISASSEMBLER
ROM # : 0 : VIEW E1.8
      1 : Acorn ADOS 1.00
      2 : BASIC (C)1982 Horn
      3 : Electron Expansion 1.00
      4 :
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```

&8000 and &BFFF you will be prompted for a number. Just type in the number of the ROM you'd like to disassemble and the program will do the rest.

The disassembler has been designed to use up as little memory as possible so that a machine code program can sit in the memory at the same time and be disassembled.

The program is reasonably intelligent, so that when a common operating system call is encountered its name will be printed instead of just the address.

Whether you're a serious machine code programmer or just a dabbler, you'll find it such a useful tool you'll wonder how you ever managed without it.

The program needs 4k of memory which can be anywhere, so set PAGE to any value from &E00 (or &1D00 for Plus 3 disc drivers) to &5000 before loading it. This will enable a machine code program to be "LOAded to the memory left over and disassembled.

The start address for dis-

assembly can be entered in decimal or hex. The ROM number, however, must be in decimal.

A hard copy can be obtained by pressing Ctrl-B when you enter the address.

Be careful when entering data statements. When the program is running type in a few machine code programs and test the disassembler. There are several to choose from in the Electron User Guide.

The second set of data statements might seem a little strange. Each item is a three byte hexadecimal number, &AABBCC.

&CC is the first byte of the object code. Each byte is compared with this until a match is found. If there is a match then &BB is a pointer to the instruction and &AA is the type of addressing mode. PROCprint_data shows the various modes.

FNbyte(B%) reads a byte of data from a paged ROM. The address is placed in &F6/&F7 and the ROM number in the Y register. CALL &FB9 reads the byte, and returns with it in the A register.

```

700 ON type GOTO 720,740,
740,780,800,880,900,910,930
,960,980,1000
710 REM immediate
720 PRINT "#%":byte1%:E
NPROC
730 REM zero_page
740 PRINT "#%":byte1%:END
PROC
750 REM zero_page_x
760 PRINT "#%":byte1%:",X"
::ENDPROC
770 REM zero_page_y
780 PRINT "#%":byte1%:",Y"
::ENDPROC
790 REM absolute
800 BX=byte1%+256*byte2%:
RESTORE 1070
810 FOR JX=0 TO 11
820 READ OScall%,Oscall%
830 IF BX=Oscall% PRINT O
Scall%:BX=-1
840 NEXT
850 IF BX=-1 PRINT "#%":BX%
860 ENDPROC
870 REM absolute_x
880 PRINT "#%":byte1%+256*

```

```

byte2%:",K":ENDPROC
890 REM absolute_y
900 PRINT "#%":byte1%+256*
byte2%:",Y":ENDPROC
910 ENDPROC
920 REM relative
930 IF byte1%(128 PRINT "#%":
"address+byte1%: ELSE PRI
NT"#%":address-(256-byte1%):
940 ENDPROC
950 REM pre_indexed_indir
ect
960 PRINT "#%":byte1%:",X
)":ENDPROC
970 REM post_indexed_indi
rect
980 PRINT "#%":byte1%:",)
Y":ENDPROC
990 REM indirect
1000 PRINT "#%":byte1%+256
*byte2%:",)":ENDPROC
1010 DATA ADC,AND,ASL,BCC,
BCS,BEQ,BIT,BMI,BNE,BPL,BRK
,BVC,BVS,CLD,CLD,CL1,CLV,CN
P,CPI,CY,DEC,DEX,DEY,EOR,I,
NC,INX,INY,JMP,JSR,LDA,LDX,
LDY,LSR,NOP,ORA,PHA,PHP,PLA

```

```

,PLP,ROL,ROR,RTA,RTS,SBC,SE
C,SED,SEI,STA,STX,STY,TAX,T
AY,TSX,TXA,TXS,TYA
1020 DATA 80A00,A2201,2220
5,28206,82408,12209,20A,522
8D,5020E,90918,82211,32215,
30216,80D18,72219,6221D,602
1E,51C20,A0121,20624,20125,
22726,82628,18129,272A,5062
C,5012D,5272E,90730,80131,3
8135,32736,82C38
1030 DATA 70139,6013D,6273
E,82940,A1741,21445,22046,5
2348,11749,20A,5184C,5174D
,5204E,90850,81751,31755,32
856,80F58,71759,6175D,6205E
,82A60,80061,20065,22066,82
568,10069,206A,C186C,5006D,
5286E,90C70,80071
1040 DATA 30075,32076,82E7
8,70079,6007D,6207E,A2F81,2
3184,22F85,2308A,81688,8358
A,5318C,52F8D,5308E,90390,8
2F91,33194,32F95,43096,8379
8,72F99,8369A,62F9D,11F9A,A
1DA1,11EA2,21FA4,21DA5,21EA
6,833A8,11DA9

```

```

1050 DATA 832AA,51FAC,51DA
D,51EAE,90480,81DB1,31F84,3
1DB5,41E86,81088,71DB9,8348
A,61F8C,61DB0,71E8E,113C8,A
11C1,213C4,211C5,214C6,81AC
8,111C9,815CA,513CC,511C5,5
14CE,908D0,811D1,311D5,314D
6,80ED8,711D9
1060 DATA 611DD,614DE,112E
8,A2BE1,212EA,22BE5,518E6,8
19E8,12BE9,821EA,519E8,52BE
D,518EE,905F0,82BF1,32BF5,3
18F6,82DF8,72BF9,62BF0,618F
E,FFFFF
1070 DATA 05ind,&FFCE,05su
put,&FFD4,05osget,&FFD7,05ar
qs,&FFDA,05ofile,&FFDD,05srdc
h,&FFDE,05ascii,&FFES,05newl
,&FFEF,05srch,&FFEE,05word,
&FFF1,05byte,&FFFA,05cl1,&F
FF7

```

This listing is included in this month's cassette tape offer. See order form on Page 61.



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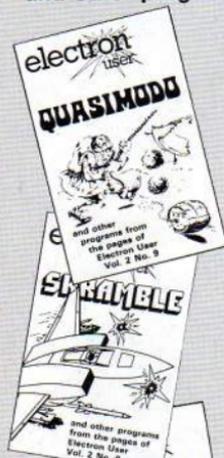
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On the May 1985 tape:
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On the April 1985 tape:
SUPER ARCHER Target practice. **BINARY SEARCH** Search data efficiently. **JOYPLUS** Switched joystick routine. **ODD ONE OUT** Educational fun. **POLYGON** 3D rotation. **MONEY CRAZY** Arcade action. **STARCHART** The night sky. **FORTUNE TELLER** Horoscope. **COLLISION DETECTION** Alien encounter. **HILD** Guessing game. **NOTEBOOK** Maths to assembler.

On the March 1985 tape:
MR. FREEZE Ice cube arcade action. **SCREENDUMP** Two procedures for printer dumps. **FILLER** The machine code fill routine. **FRED'S WORD GAME** Educational fun. **BIG LETTERS** Large text utility. **PERCY** Beat the burning fuse. **ANIMATION** Two example programs. **PIGS** Frying bacon. **NOTEBOOK** Display formatting.

On the February 1985 tape:
CRAAL The mystifying maze adventure. **BOUNCY** Addictively annoying action. **PAIRS** Can you remember the cards? **BASE** A binary calculator and conversion utility. **CATCHER** Catch the eggs before they break. **CLOCK** Time-keeping utility. **BAGER** Grand Prix action. **NOTEBOOK** Graphics windows. **TRIG** All the right angles.



On the January 1985 tape:
SPACE BATTLE Destroy the deadly descending aliens. **NEW YEAR** A sound and graphics treat. **ESCAPE FROM SCARGOV** Minefield action. **PIE CHART** Statistics made simple. **CLAYVIGEN** An Electron best-seller. **ORGAN** Music maestro please! **NOTEBOOK** An original program. **RANDOM NUMBERS** Or not so random. **SHAKES** Reptilian arcade action. **CHEESE RACE** Beat rival mice.

On the December 1984 tape:
CHRISTMAS BOX Align the presents logically. **SILLY SANTA** Sort out the muddle. **SNAP** Match the Xmas pictures. **RECOVERY** The Best Program message saved. **CAROL** Interrupt driven music. **AUTODATA** A program that grows and grows. **NOTEBOOK** Simple string handling.

On the November 1984 tape:
STAR FIGHTER Anti-aliased missions. **SCROLLER** Wrap around machine code. **URBAN SPRAWL** Environmental action game. **SPELL** Alphabetic education. **JUMPER** Level headed action. **CAESAR** Code breaking broken. **KEYBOARD** Typing game.

On the October 1984 tape:
BREAKFREE Classic arcade action. **ALPHASWAP** A logic game to train your brain. **SOUND GENERATOR** Tame the Electron's sound channels. **MULTI CHARACTER GENERATOR** Complex characters made simple. **RIGEL 5** Out of this world graphics. **WAYDAY** Help with your mouse code. **NOTEBOOK** Palindrome and string handling.

On the September 1984 tape:
HAUNTED HOUSE Arcade action in the spirit world. **SPLASH** A logic game for non-swimmers. **SORT SHOWS** How sorting algorithms. **MULTI CHARACTER GENERATOR** Sort the time that take. **CLASSROOM INVADERS** Multicoloured characters go to school. **SAILOR** Nautical antics. **MATHS TEST** Try out your mental powers.

On the August 1984 tape:
SANDCASTLE The Electron seaside outing. **KNOCK OUT** Bowling balls, batter brick walls. **PARACHUTE** Keep the skydivers dry. **LETTERS** Large letters for your screen. **SUPER-SPELL** Test your spelling. **ON YOUR BICE** Paddle power comes to your Electron. **SCROLLER** Sliced strings slide sideways. **FLYING PIGS** Bacon on the wing.

On the July 1984 tape:
GOLF A day on the links with your Electron. **SOLITAIRE** The classic solo logic game. **TALL LETTERS** Large characters made simple. **BANK ACCOUNT** Keep track of your money. **CHARTIST** 3D graphs. **FORMULAE** Areas, volumes and angles.

On the June 1984 tape:
MONEY MAZE Electric ghosts to get the cash. **CODE BREAKER** A mastermind is needed to crack the code. **ALIEN** Set extra brain meat. **THE ELECTRON WAY** SETUP Colex commands without tears. **CRYSTALS** Beautiful graphics. **LASER SHOOT OUT** An intergalactic shooting game. **SMILER** Have a nice day!

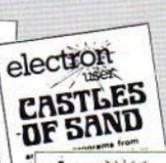
On the May 1984 tape:
RALLY DRIVER High speed car control. **SPACE PODS** More aliens to annihilate. **CODER** Secret messages made simple. **FRUIT MACHINE** Spin the wheels to win. **CHASER** Avoid your opponent to survive. **TIC-TAC-TOE** Electron thoughts and moves. **ELECTRON DRAUGHTSMAN** Create and save Electron masterpieces.

On the April 1984 tape:
SPACEHIKE A hopping arcade classic. **FRIEZE** Electronic wallpaper. **PELICAN** Cross roads safety. **CHESTIMMER** Clock your moves. **ROMAN NUMBERS** In the ancient spirit. **BUNNYBITE** The Easter program. **DODDUCK** The classic logic game.

On the March 1984 tape:
CHICKEN Test dangerous drivers just your nerve. **COFFEE** A tantalising event game from Down Under. **PARKY'S PERIL** Parky's lost in an invisible maze. **REACTION TIME** How fast are you? **BRAINTEASER** A puzzling program. **COUNTER** Realistic arithmetic can be fun. **PAPER SCISSORS, STONE** Out-guess your Electron. **CHARACTER GENERATOR** Create shapes with this utility.

On the February 1984 tape:
NUMBER BALANCE Test your powers of mental arithmetic. **CALCULATOR** Make your Electron a calculator. **DOLIES** Multi-coloured patterns galore. **TOWERS OF HANOI** The age old puzzle. **LUNAR LANDER** Test your skill as an astronaut. **POSITION INVADERS** A version of the old arcade favourite.

On the introductory tape:
ANAGRA Sort out the jumbled letters. **DOODLE** Multi-coloured graphics. **EUROMAP** Test your geography. **KALIEDOSCOPE** Electronic graphics fun. **CAPITALS** Now upper case letters. **ROCKET, WIRE & CANDLE** Three fireworks programs. **BOMBER** Drop the bombs before you crash. **BUCK** Simple animation. **METEORS** Conflicts in space.



Use the order form on Page 61

ENGINE!

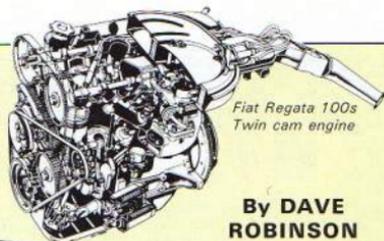
HAVE you ever really understood how a car engine works? Never mind - sit back and let your Electron show you.

The program first draws and names the relevant pieces of machinery involved.

It then runs through the four cycles that make up a petrol driven internal combustion engine.

Each step is clearly labeled. Once you can follow the sequence, things can be speeded up by holding the space bar down continuously.

The program makes extensive use of procedures with lots of meaningful names, and should be easily followed.



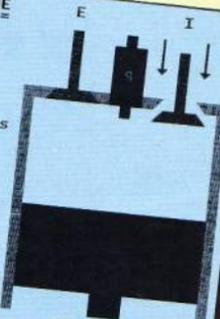
Fiat Regata 100s
Twin cam engine

By DAVE ROBINSON

FOUR STROKE ENGINE

1. INDUCTION

Exhaust valve closes
Inlet valve opens
Piston moves down
Petrol/Air mixture drawn into cylinder
Press SPACE



Engine listing

```

10 REM PETROL ENGINE
20 REM DAVE ROBINSON
30 REM (C) ELECTRON USER
40 :
50 MODE1
60 ON ERROR PROCError:EN
D
70 VDU23,1,0;0;0;
80 PROCchars
90 PROCtitle
100 PROCdiagram
110 REPEAT
120 PROCengine
130 UNTIL FALSE
140 END
150 :
160 DEFPROCchars
170 VDU23,224,255,255,255
,255,255,255,255,255
180 VDU23,225,255,254,252
,248,248,224,192,128
190 VDU23,226,128,192,224
,248,248,252,254,255
200 VDU23,227,255,127,63,
31,15,7,3,1
210 VDU23,228,1,3,7,15,31
,63,127,255
220 VDU23,230,24,24,24,24
,24,24,24,24
230 VDU23,231,24,24,24,24
,255,126,68,24
240 VDU23,232,24,68,126,2
55,24,24,24,24
250 A$=CHR#230+CHR#8+CHR#
10
260 B$=A$+A$
270 d_arrow$=B$+CHR#231
280 u_arrow$=CHR#232+CHR#
8+CHR#10+B$
290 ENDPROC
300 :
310 DEFPROCtitle
320 COLOUR2
330 PRINTAB(6,3)*"INTERNA
L COMBUSTION ENGINE"
340 PRINTAB(6,4)STRING$(
26,"=")
350 COLOUR3
360 PRINTAB(2,0)*"A diagr
amatic explanation of the"
370 PRINT*"internal worki
ngs of a single cylinder"
380 PRINT"TAB(2)"*from a f
our stroke petrol engine."
390 PRINTAB(2,17)*"This i
s the type of engine fitted
"
400 PRINT*" to most motor
vehicles in use today."
410 PROCnext(12,26)
420 ENDPROC
430 :
440 DEFPROCnext(AZ,BX)
450 COLOUR1
460 PRINTAB(AZ,BX)*"Press
SPACE"
470 REPEAT UNTIL GET=32
480 ENDPROC
490 :
500 DEFPROCdiagram
510 CLS:COLOUR3
520 PRINTTAB(1,3)*"FOUR ST
ROKE ENGINE"
530 PRINTAB(1,4)STRING$(
18,"=")
540 PROCcylinder
550 PROCpiston
560 PROCrod
570 PROCplug
580 PROCvalve("I")
590 PROCvalve("E")
600 PROCnext(3,28)
610 ENDPROC
620 :
630 DEFPROCengine
640 PROCinduct
650 PROCnext(3,27)
660 PROCcomp
670 PROCnext(3,27)
680 PROCignite
690 PROCnext(3,27)
700 PROCexhaust
710 PROCnext(3,27)
720 ENDPROC
730 :
740 DEFPROCcylinder
750 COLOUR2
760 PRINTAB(2,7)*"CYLIND
E"
R*
770 COLOUR1
780 VDU7
790 FOR I=10 TO 28
800 PRINTAB(21,I)CHR#22
4
810 PRINTAB(39,I)CHR#22
4
820 NEXT
830 PRINTAB(22,10)CHR#22
4
840 PRINTAB(23,10)CHR#22
5
850 PRINTAB(27,10)CHR#22
7
860 PRINTAB(28,10)STRING
$(5,CHR#224)
870 PRINTAB(33,10)CHR#22
5
880 PRINTAB(37,10)CHR#22
7
890 PRINTAB(38,10)CHR#22
4
900 key=INKEY(100)
910 ENDPROC
920 :
930 DEFPROCpiston
940 COLOUR2
950 PRINTAB(2,10)*"PISTON
"
960 VDU7
970 VDU28,22,20,38,13
980 COLOUR131
990 CLS
1000 COLOUR128
1010 VDU26
1020 key=INKEY(100)
1030 ENDPROC
1040 :
1050 DEFPROCrod
1060 COLOUR2
1070 PRINTAB(2,13)*"CONN
ECTING ROD"
1080 VDU7
1090 VDU28,29,28,31,21
1100 COLOUR131
1110 CLS
1120 COLOUR128
1130 VDU26
1140 key=INKEY(100)
1150 ENDPROC
1160 :
1170 DEFPROCplug
1180 COLOUR2
1190 PRINTAB(2,16)*"SPARK
ING PLUG"
1200 VDU7

```

Turn to Page 48

15 full-length programs

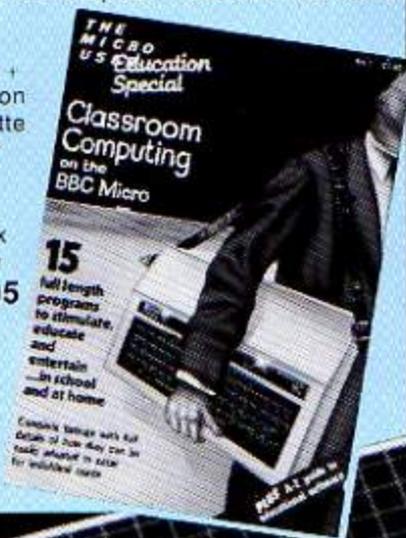
designed to stimulate,
educate and entertain
— both in school
and at home

£5.95 Electron
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All necessary instructions are contained within the programs themselves, but more detailed descriptions can be found in **The Micro user Education Special**. Originally written for the BBC Micro, it includes complete listings of all the programs, together with advice on how they can be adapted to cater for individual needs.

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Tuadd: Teaches how to add up two digit numbers, including carry and is illustrated with animated graphics. At various stages in the addition the child has to tell the Electron what to do next.

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Tumult: Helps with elementary multiplication of two digit numbers — in particular where there are 10s to carry.

Calculator: Sums at a stroke! We turn your micro's screen into an easy-to-use calculator.

Table Mountain: Despite ever-changing fashions in maths teaching, tables still have to be learned. This program adds a lively new dimension to what is all too often tedious rote.

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House: Gentle, pictorial word, number and colour recognition for the very early reader or for those with learning difficulties.

Gallery: Based on a shooting gallery, this typing tutor will not only have parents, teachers and children touch-typing with ease — it's fun, too!

Whatnumber?: "I'm thinking of a number" is a well known classroom standby. We've taken it much further in this computer version, giving children far more flexibility in their strategy.

Bridge Breaker: Find the hidden word before it is too late. This is an exciting and novel way to reinforce vocabulary and spelling skills.

Snap: Practice vital pre-reading skills with this letter and number recognition game. Also helps develop coordination.

Manipulation: This is a compulsive and thought-provoking maths game. Given the four rules of number and three integers to work with, how close can you get to the target number?

Matrices: Takes the calculations out of matrix manipulation, leaving the student free to understand the underlying concepts. (To obtain the fullest benefit from this program see *The Micro User Education Special*.)

Hidden Answers: Designed to help primary school children understand a maths learning technique called mapping maths. It explores the ideas of mapping with the use of simple number bonds.

Curvefit: Drawing lines of best fit between points, this program will find applications from the infants' class to the sixth form.

Engine listing

From Page 45

```

1210 COLOUR3
1220 VDU28,29,10,31,6
1230 COLOUR131
1240 CLS
1250 VDU26
1260 COLOUR128
1270 PRINTTAB(30,5)CHR#224
1280 PRINTTAB(30,11)CHR#22
4
1290 COLOUR1:COLOUR131
1300 PRINTTAB(30,8)*S*
1310 COLOUR128
1320 key=INKEY(100)
1330 ENDPROC
1340 :
1350 DEFPROCvalve(A#)
1360 VDU7
1370 COLOUR2
1380 IF A#="I" THEN PRINTTAB(2,19)*INLET VALVE*ELSE PRINTTAB(2,22)*EXHAUST VALVE*
1390 IF A#="I" THEN IX=35 ELSE IX=25
1400 FOR IX=6 TO 11
1410 PRINTTAB(IX,IX)CHR#22
4
1420 NEXT
1430 PRINTTAB(IX-1,11)STR1
N6$(3,CHR#224)
1440 PRINTTAB(IX-2,11)CHR#
228
1450 PRINTTAB(IX+2,11)CHR#
226
1460 PRINTTAB(IX,3)A#
1470 key=INKEY(100)
1480 ENDPROC
1490 :
1500 DEFPROCclear
1510 VDU28,0,30,20,6
1520 CLS:VDU26
1530 ENDPROC
1540 :
1550 DEFPROCinduct
1560 PROCclear
1570 FOR IX=5 TO 7
1580 PRINTTAB(23,IX)SPC1
1590 PRINTTAB(27,IX)SPC1
1600 COLOUR1
1610 NEXT
1620 PRINTTAB(3,10)*1. INDUCTION*
1630 COLOUR2
1640 PRINTTAB(0,13)*Exhaust valve closes*
1650 PROCclose("E")
1660 PRINTTAB(0,16)*Inlet
valve opens*
1670 PROCopen("I")
1680 PRINTTAB(0,19)*Piston moves down*
1690 PROCdown
1700 COLOUR2
1710 PRINTTAB(0,22)*Petrol/Air mixture*
1720 PRINTTAB(0,24)*drawn into cylinder*
1730 PROCin
1740 ENDPROC
1750 :
1760 DEFPROCcoap
1770 PROCclear
1780 FOR IX=5 TO 7
1790 PRINTTAB(33,IX)SPC1
1800 PRINTTAB(37,IX)SPC1
1810 NEXT
1820 COLOUR1
1830 PRINTTAB(3,10)*2. COMPRESSION*
1840 COLOUR2
1850 PRINTTAB(0,13)*Inlet valve closes*
1860 PROCclose("I")
1870 PRINTTAB(0,16)*Piston moves up*
1880 PRINTTAB(0,18)*mixture compressed*
1890 PROCup
1900 ENDPROC
1910 :
1920 DEFPROCignite
1930 PROCclear
1940 COLOUR1
1950 PRINTTAB(3,10)*3. IGNITION*
1960 COLOUR2
1970 PRINTTAB(0,13)*Electricity to plug*
1980 PRINTTAB(30,11)d_arrow
$
1990 key=INKEY(100)
2000 PRINTTAB(0,16)*Mixture ignited*
2010 SCOL0,1
2020 FOR IX=752 TO 1254 STEP5
2030 MOVEIX,600
2040 DRAW#72,632
2050 NEXT
2060 FOR IX=4 TO 7
2070 SOUND0,-15,IX,2
2080 NEXT
2090 key=INKEY(100)
2100 PRINTTAB(0,19)*Piston forced down*
2110 PRINTTAB(0,21)*by expanding gases*
2120 PROCdown
2130 ENDPROC
2140 :
2150 DEFPROCexhaust
2160 PROCclear
2170 FOR IX=1 TO 3
2180 PRINTTAB(30,IX)SPC1
2190 NEXT
2200 PRINTTAB(23,12)SPC15
2210 COLOUR1
2220 PRINTTAB(3,10)*4. EXHAUST*
2230 COLOUR2
2240 PRINTTAB(0,13)*Exhaust valve opens*
2250 PROCopen("E")
2260 PRINTTAB(0,16)*Piston moves up*
2270 PROCup
2280 COLOUR2
2290 PRINTTAB(0,19)*Burnt mixture out*
2300 PRINTTAB(23,5)u_arrow
$
2310 PRINTTAB(27,5)u_arrow
$
2320 ENDPROC
2330 :
2340 DEFPROCclose(A#)
2350 IF A#="I" THEN XX=35 ELSE XX=25
2360 PRINTTAB(XX-2,11)SPC5
2370 PRINTTAB(XX,5)CHR#224
2380 PRINTTAB(XX-1,10)STR1
N6$(3,CHR#224)
2390 COLOUR129
2400 PRINTTAB(XX-2,10)CHR#
228
2410 PRINTTAB(IX+2,10)CHR#
226
2420 COLOUR128
2430 key=INKEY(100)
2440 ENDPROC
2450 :
2460 DEFPROCopen(A#)
2470 IF A#="I" THEN XX=35 ELSE XX=25
2480 PRINTTAB(XX,5)SPC1
2490 PRINTTAB(XX-2,10)SPC2
TAB(XX+1,10)SPC2
2500 COLOUR1
2510 PRINTTAB(XX-2,10)CHR#
225
2520 PRINTTAB(IX+2,10)CHR#
227
2530 COLOUR2
2540 PRINTTAB(XX-1,11)STR1
N6$(3,CHR#224)
2550 PRINTTAB(XX-2,11)CHR#
228
2560 PRINTTAB(XX+2,11)CHR#
226
2570 key=INKEY(100)
2580 ENDPROC
2590 :
2600 DEFPROCdown
2610 COLOUR3
2620 FOR IX=13 TO 19
2630 SOUND1,-15,IX+50,2
2640 VDU28,22,IX,38,IX
2650 COLOUR128:CLS
2660 VDU28,22,IX+7,38,IX+7
2670 COLOUR131:CLS
2680 key=INKEY(5)
2690 NEXT
2700 key=INKEY(100)
2710 VDU26:COLOUR128
2720 ENDPROC
2730 :
2740 DEFPROCup
2750 COLOUR3
2760 FOR IX=19 TO 13 STEP-
1
2770 SOUND1,-15,IX+50,2
2780 VDU28,22,IX,38,IX
2790 COLOUR131:CLS
2800 VDU28,22,IX+7,28,IX+7
2810 COLOUR128:CLS
2820 VDU28,32,IX+7,38,IX+7
2830 COLOUR128:CLS
2840 key=INKEY(5)
2850 NEXT
2860 key=INKEY(100)
2870 VDU26:COLOUR128
2880 ENDPROC
2890 :
2900 DEFPROCin
2910 PRINTTAB(33,5)d_arrow
$
2920 PRINTTAB(37,5)d_arrow
$
2930 ENDPROC
2940 :
2950 DEFPROCerror
2960 VDU22,6
2970 IF ERR=17 THEN END
2980 REPORT:PRINT* at line
*:ERL
2990 ENDPROC

```

This listing is included in this month's cassette tape offer. See order form on Page 61.

Micro Messages

The Elite way to become Deadly!

I HAVE compiled a list of tips for Elite players who are just starting out.

As soon as you have 1000 credits, buy a front beam laser. You will get 400 credits refunded for the pulse laser.

Replenish your credits back to 1000 credits, then buy an extra cargo bay. This will extend your capacity from 20 tonnes to 35 tonnes, thus increasing the profit on each trip.

Soon after those, both docking computers and an Energy unit are musts.

Never, once you have got your amount of credits above 400, let it fall down below 400 when buying extra equipment because (unless you bought your cargo first) you will not have enough money for a profitable amount of cargo.

Unless you know it is a meteor (asteroid) never shoot anything inside the Safety area. Otherwise the vipers get kill-happy and won't let you dock with a docking computer, or manually (I think).

As soon as you have a beam laser, instead of hyperspacing straight after you get out of the Coriolis, when you get out of the Coriolis, speed right up, switch to rear view, do a loop until the planet is full on your rear view.

Switch to market price or Data on system etc, then wait for the S to disappear, then

Front view and Jump until something appears on your scanner.

Blast it, make sure you're going away from the planet again and repeat.

This, within a short time, will push your rating up to Above Average.

If you ever get into trouble, for example, Shields Down, hyperspace to the next system, unless the planet is Anarchy or Feudal. In that case, alter it to a safer one. Or, if nothing is on your scanner, in that case slow right down and drift until shields are up again.

I hope that helps the potential combaters.

It should, I'm Deadly, soon to be Elite (hopefully!) — David Kennedy, Teignmouth.

How do I keep it secret?

I HAVE been computing for only a short time and would like to learn program security — how I can stop people being able to break into my pro-

grams and see what I've written? — D.S. Leng, Cottingham, N. Humberside.

● Add the following line to your program:

I REN

and enter in direct mode.

? (PAGE+15)=21

This will poke character 21, which disables the VDU, into the first line.

Adding *FX200.3 will disable the Escape and Break keys. Your programs should now be quite secure.

A bug down in the Valley

I HAVE written to Electron User once before, giving some suggestions to improve the magazine (glad to see that Merlin has finally started a column).

It is Justin Leese's letter in the March issue of Electron User which has inspired me to write again.

He tells Katy King and the rest of us that we should SAVE

our initial position on Twin Kingdom Valley, and so, when we die, we could simply LOAD this position in the computer, reducing the time of waiting between games.

Is this a theory or has he tested it? On my copy of the game, and other people's, a saved position will not re-load.

I have not yet solved the adventure, but I now know how to and a saved position seems essential. HELP! — David Thompson, Sale, Cheshire.

● I have noticed recently in Micro Messages and my own mail that readers are having difficulty loading and saving their position in Twin Kingdom Valley.

On the review copy I received from Bug-Byte the commands used are *SAVE and *LOAD to save and restore your position.

These commands are documented in the cassette insert and worked perfectly at all times.

I have now finished the game and probably would not have done so had the commands not worked.

I suggest that if anyone has problems with these commands still not working they presumably have a faulty copy and should contact Bug-Byte on 051-709 7071 who will I'm sure be happy to organise a replacement. — Merlin.

Ghouls have me fooled . . .

COULD you tell me how to get the treasure and to get on to the rest of the screens in Micro Power's Ghouls? I have tried and tried without success. — Paul Godley.

● Can any of our readers help?

SLEEPLESS KNIGHTS!

FOR the third time my wife called down: "Are you coming to bed or are you sleeping down there again tonight?"

The time was 1.30am. The game was Acornsoft Chess. I had been waiting 45 minutes for my Electron to make the next obvious (indeed the only) move to avoid checkmate.

In sheer desperation — and to prevent further domestic trauma — I pressed Escape, got the Main Menu, switched to Player vs. Player, switched back to the Chess Board and made the obvious move for the poor comatose computer. But

I did not get the message.

On resuming the vs. Computer game, with no word of thanks for my help, it went back into its slothful routine of a move about every 45 minutes. (Castling took about 50 minutes.)

I have tried everything to speed up a game of chess with Acornsoft Chess — playing at all levels, switching levels during a game, cursing, making stupid moves which a normal opponent would pounce on right away, cheating, typing in derogatory messages — all to no avail.

Acornsoft Chess still plods on its weary come-back-tomorrow pace.

Perhaps one of your more experienced readers might devise a way of speeding up the computer chess moves.

Or, better still, perhaps Acornsoft will issue another Chess program more suited to ageing chaps like myself who have not all that much time left in which to play computer chess. — V.J. Horgan, Didcot, Oxon.

● On the higher levels it is rather slow, but is pretty quick on level 0 or 1.

No joy with the joystick

AFTER buying a Plus 1 for my Electron, along with a Voltmace Delta 14b joystick, I was disgusted to find that the joystick did not work on two of my favourite games – Elite and Zalaga.

Both these games stated that it was possible to use a joystick.

I obviously thought it must be a fault in the Plus 1 of the joystick, but when I returned the equipment to the shop where I bought them, there were no faults to be found.

Does this mean that programmers are getting lazy?

Will there be more half-finished games in the future? – **Robert Cope (age 13), Chelmsford, Essex.**

● Both programs have bugs in which prevent joysticks being used.

You're right to be annoyed, as these bugs should have been spotted before the programs were released. However, even the experts make mistakes occasionally.

Even numbers are odd...

I MAY sound sarcastic, but I must complain about two letters (Electron User April issue).

First of all, J. Gooding, you can't have 59,528 on Guardian because 28 is not possible. 20, 25 or 30 is OK, but no even numbers are possible unless they go up in tens.

Also, D.M. Bell, of Manchester, the reason why Elite is so inferior is because the Electron has less memory available than the BBC.

By the way here are my highest scores:
Guardian, 28,060.
Danger UXB, 147,010.
Felix In The Factory 7,440.
– **Tim Hier (age 13), Pembrey, South Wales.**

Frustration is overcome

WHEN writing programs in the graphic modes, it can be frustrating to try making sense

DON'T GIVE UP – IT WORKS!

I'VE finally worked out how to get the Galactic Hyperspace in Elite to work!

Press F6 (local chart) and make sure the cursor is positioned at the planet you are presently at.

After that, press the buttons Caps Lk Func, Ctrl and H simultaneously and very quickly.

Keep pressing the buttons rapidly until the message "Galactic Hyperspace"

of your listing when the size of the character set makes it hard to read and edit.

Mode 6 provides the most legible writing, but changing back to this mode each time is time-consuming.

The following program overcomes this problem by inserting control codes into the first line of the program which will change to mode 6, with a blue background, and paged mode on, whenever the program is LISTed.

Also, to overcome the problem of losing the top line of the display, control code 10 is inserted before the program is listed, which moves the display down by one line.

Lastly, as a reminder that the line is still in memory, a short message is shown at the head of the listing.

To produce this effect, first type in the following program carefully, making sure that no spaces lie between the line number 0, and the REM statement, nor between the REM and the series of numbers that follow it.

If this is not done, it will result in a "Bad program" error when the program is RUN.

```
0REM12345678901FIRST LI
NE IN USE
10PX=PAGE+6
20FOR AX=1 TO 10
30READ byte
40[ EQUW byte:]
50NEXT
60DATA22,6,19,0,4,0,0,0,
14,10
```

Now RUN the program, and the screen will display an assembly listing. The program should now be ready, so test it by typing LIST. The effects of

appears. You may get times when you think it's not going to work and your fingers are killing you – but don't give up, it will work eventually.

If this ever happens, and it usually does, it helps to change the screen or view after a few rapid bursts of pressing the buttons.

That is – after pressing F6 (local chart) press the buttons very quickly about 20 times and if it still doesn't work press

the program should now be apparent.

Delete lines 10 to 60, and SAVE line 0 for future use by typing:

SAVE "line.0".

To insert this line into other programs, first make sure your own program does not already include a line 0, as this will cause later confusion.

Now to combine the two programs, type:

```
LOAD "line.0"
PRINT"TOP-2"
*LOAD "XXXX" SSS
```

Where XXXX is the file name of your program, and SSS is the result that you should have obtained from TOP-2. The two programs should now be combined, and typing LIST when in any mode should produce a clear and legible listing. – **Stephen Harrop, Radyr, Cardiff.**

I thought I'd go mad...

MANY, many thanks for your help with Mr Freeze (March Electron User). I thought I'd go mad typing it in, but your comments helped me find and correct my mistakes.

I don't know which is better, the game (which is great), or the feeling of accomplishment when it is actually ran! Again, thanks. – **Cliff Holmes, Rotherham.**

● It's nice to hear from someone we've helped. Believe us, we know all too well how frustrating it can be, typing in listings. We do our best to help everyone who writes, but we need two

F4 (right view) and press buttons again.

If still no response, change view once again and press buttons.

Like I said before, don't give up – it will work.

One more thing, Don't worry if the message "Hyperspace range" comes up. It always does – so just keep on hitting those keys. – **Colin Harris, Stoke Newington.**

things. The first is a stamped addressed envelope, the second is patience!

Title pages – my method

I HAVE always been envious of the title pages used by games on the Sinclair Spectrum.

I didn't want to let my friends get away with this so I came up with a method similar to the Spectrum's method. It is used by the Island and Planets programs on the Introductory cassette.

It is fairly simple. All you do is save the screen memory direct to cassette.

As the length of the screen memory varies from mode to mode, it goes like this:

Mode 0,1,2 = *SAVE 3000
8000
Mode 3 = *SAVE 4000
8000
Mode 4,5 = *SAVE 5800
8000
Mode 6 = *SAVE 6000
8000

Firstly though you have to draw the picture you want to save and in the same mode with the picture on screen, type the relevant command above.

In Modes 0, 1 and 2 it takes a long time as the screen memory is 20k long. It may be better with a disc drive connected. – **Robert Fothergill, Redditch, Worcs.**

Solved

IN regard to Polygons (Electron User April issue) I would be grateful if you could explain where is the VDU25 that

actually draws the figures in the listing given on Page 56? — R.A. Smith, Camberley, Surrey.

● Line 780 is the machine code equivalent of VDU25.

A Top Ten for games?

THANK you for a great magazine — but please can we have more!

For example, a software chart of the top-selling 10 or 20 games. A hall of fame where readers can send in their best scores. Readers' tips on how to do well at certain games (for example, *Elite* and *Guardian*). And more reviews on the hardware and software being produced for the Electron.

Can you tell me: Would it be possible to use Acorn's Plus 3 in conjunction with First Byte's joystick interface? — Steven Haig (age 15), Stockport.

● Unfortunately both the Plus 3 and the First Byte interface use the same area of memory, causing problems if they are both used at the same time. Either can be used separately, though.

The Plus 3 can be disabled with *NOADFS allowing the interface to be used.

Riddle of the Lost Bracket

SURELY there's a mistake in April's Game of the Month? In the listing line 1670 reads:

```
x=arrowdev(play,arrow
```

Surely there should be a bracket at the end as in:

```
x=arrowdev(play,arrow)
```

— Dean Warner, Peterborough.

● Sadly, you are right. The listing was all right when it left the editorial office (all our listings are taken from working programs). However, somewhere between here and your magazine the bracket went walkabout.

So far we've had no reports of its progress but we're dreading its arrival in another program!

Our apologies to our readers and Ian Brown, the author.

WHAT would you like to see in future issues of Electron User?

What tips have you picked up that could help other readers?

Now's here is your opportunity to share your experiences.

Remember that these are the pages that you write yourselves. So

tear yourself away from your Electron keyboard and drop us a line. And please, if you want a reply, enclose an SAE.

The address is:

**Micro Messages
Electron User
Europa House
68 Chester Road
Hazel Grove
Stockport SK7 5NY.**

Attack — in slow motion

I RECENTLY bought Cylon Attack by A&F Software for my Electron.

The program was written for the BBC Micro, but I found it worked fantastically with my Electron.

Because of this I bought Chuckie Egg and Painter by A&F for the BBC 32k.

When I loaded them into my Electron they worked — but are so slow that they are virtually unplayable.

As I bought them on a clearance sale on a "no return" basis I was disappointed by having spent my money on two very good but slow pieces

of software.

Can you tell me of any routine which I could enter before loading these programs to make them faster?

The only routine I know and have tried is setting the auto repeat to the fastest rate and loading the programs, but this was unsuccessful.

It would be a good idea if readers suggested ways of speeding up slow BBC software and telling other readers which software works. — Mansoor, Halesowen, West Midlands.

● The Electron can't be made to run as fast as the BBC, unfortunately.

The simple answer is to buy Electron software — this will run at the correct speed.

By all means borrow BBC

Don't make my mistake!

I AM writing to warn other readers about the mistake that I made. I was writing the program for Mark Frost, who requested a rotating circle in the April edition of Electron User.

My friend asked me why integer variables are faster and I demonstrated by allocating values to A% variable and a normal one.

I pressed Break and called

up each variable and showed him how it no longer had the normal variable in memory.

Then to my amazement I discovered the program was now unlistable. Is there any explanation for this?

Incidentally, if anyone wants to protect their programs *FX200,1 makes it inescapable and *FX200,3 makes it inescapable. So if

software from friends, but don't buy any without seeing it running. Then you know what it's like.

A question of education

I BOUGHT an Electron 15 months ago hoping to help my sons' education as well as for its entertainment value.

While it has obviously been of assistance in their computer studies, I have been unsuccessful in obtaining any software of an O or A-level standard.

I have seen one mentioned in the December 1984 issue of Electron User — Micro English produced by L.C.L. but have been unable to obtain their address.

Is it, as a non-user, that I do not know what to look for, or is there very little good O and A-level software about? — M.K. Pelling, St. Leonards-on-Sea, Sussex.

● Most educational software is written for the BBC Micro, but some has been converted for the Electron, though L.C.L. is at 26 Avondale Avenue, Staines, Middlesex.

you use these codes always SAVE before running.

I wasn't quite sure what Mark meant about a rotating circle so I have written a rotating disc. If you look closely the effect can be quite good. — Paul Golding, Winchmore Hill, London.

● We don't know why you couldn't list your program. We couldn't reproduce the fault.

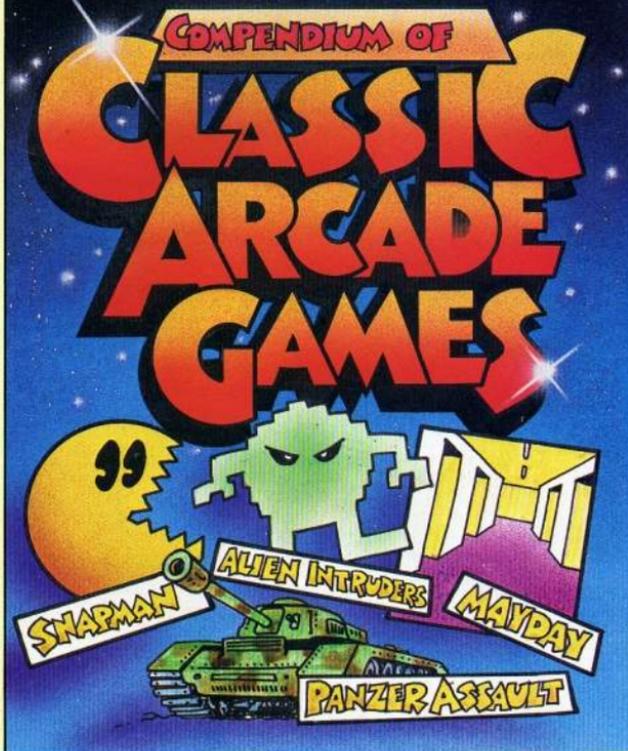
```

10 REM **ROTATING DISC**
20 REM By Paul Golding I
985
30 REM When the program
is run the building of each
separate frame takes a whi
le,so you must wait 50 seco
nds before you can see anyt
hing
40 REM it will run faste
r on the BBC Computer
50 MODE 2
60 VDU 23,1,0;0;0;0;
70 FOR XX=1 TO 11
80 VDU 19,XX,0;0;
90 NEXT
100 CX=1:RY=500
110 FOR BX=1 TO 11
120 MOVE 640,1012
130 GCOL 0,CX
140 FOR A=0 TO 2*PI STEP
0.25
150 DRAW 640+RX*XSIN(A),51
2+500+COS(A)
160 NEXT
170 CX=CX+1:RY=RY-50
180 NEXT
190 FOR XX=1 TO 11
200 VDU 19,XX,7;0;
210 PROCpause
220 VDU 19,XX,0;0;
230 NEXT
240 FOR XX=1 TO 1 STEP -1
250 VDU 19,XX,7;0;
260 PROCpause
270 VDU 19,XX,0;0;
280 NEXT
290 GOTO 190
300 END
310 DEF PROCpause
320 FOR X=1 TO 50:NEXT
330 ENDPROC

```

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"With the realism of this DACC Soccer Game your team win or lose by the way you instruct them to play. You will be shown a bird's eye view of your half of the pitch. Select and vary the skills of each of your players and then move them individually to whatever position in the field you know will create the best team formation."

"Each player is shown with three digits below him relating to skill, accuracy and stamina in the range 1-5. To start off with each man has 3-3-3, giving him a total of 9. So the total for your team is 11x9, 99. This total of 99 cannot be exceeded, but the object is for you, the manager, to formulate your winning team using the best possible combinations of positions and skills."

"Of course, as a professional footballer, injuries sustained by myself and team-mates often had a great influence on the outcome of the game. So, to create even more realism, you may add optional 'injuries' to the game, which are allocated randomly to each team by computer...hold your breath as your star forward swivels to shoot or goes in for a hard tackle!"

"Once your team is formulated, you are ready to move on from the Management Module to Module II - Match Play."

"With realistic 3D view of the pitch from the 'TV Camera' position the game really comes to life. From the kick off every moment of the match unfolds realistically, with throw-ins, goal kicks, corner kicks, passing and shooting."

"The game can be played by 2 people, 1 person v the computer or computer v computer. If the game is player controlled your joystick will control one man at once. Pressing the fire button enables

you to change player...or, if the opposition are attacking your goal, to the goalkeeper."

"If a player is in possession of the ball the fire button initiates a pass or a shot. Control the accuracy and strength of the pass or shot by the extent of joystick movement and the height of the kick by the length of time that the fire button is depressed... from a Bobby Charlton cannonball shot, to a carefully flighted Bryan Robson through-ball! Although you have set the skill, accuracy and stamina levels of your players during the Manager Module, the more a player is involved in the game, the more energy he uses...his stamina level falls and he runs more slowly! Then, when the player is not under joystick control, his stamina slowly builds up again."

"If the game is under computer control, one or both teams are played entirely by computer. Under joystick control the player controls one man at a time, whilst the computer provides intelligent action for the other 10."

"The skill level you have chosen affects the success of tackles, the accuracy level and the direction of the ball when kicked...what could be more realistic than the Bobby Charlton Soccer Game from DACC?"

"The Cassettes contains a voice introduction and play hints by Bobby Charlton and the Bobby Charlton Soccer Game package contains details on the Bobby Charlton Computer Soccer Club, with mail order products, services and special offers for members."

"Package with Manager and Match Play Modules £1195 inc. VAT (also including p&p for direct orders). Requires 2 analogue joysticks."

Bobby Charlton Soccer Game from DACC - the Simulation Specialists.

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EXTRA MODULES AVAILABLE SOON!
The World Cup Module and the Canon League Module will be created by Bobby Charlton's knowledge of individual players and teams.

ACTIVITIES

As it stands **Activities** is an educational program for use by younger school children. It could, however, be modified so that it could be an asset to older children as well.

It has been used by the teachers at my children's school in a slightly modified form on their disc based BBC Micros, and they tell me it is useful and well liked (although maybe they're just being polite).

The idea is to test a child's powers of observation and association.

The Electron selects a random activity from a list and draws some items on the screen which are associated with that activity. It also draws some irrelevant items.

The child's task is to decide which items are relevant and select them by pressing number keys 1-6.

If the selected item is relevant then it's ticked and the computer plays a chord, otherwise the drawing is

crossed out and the computer makes a rude noise.

When the child thinks that he or she has all of the right items selected then they can press the F key, whereupon the computer will assess how well they have done.

Any drawings which should have been selected but were not are left on the screen, along with a comment. All irrelevant or correctly selected ones are rubbed out.

After 10 activities (none of which are the same), a score sheet is printed and another turn is invited.

The initial instruction page can be returned to at any time by pressing the Escape key and the sound effects can be turned on or off whenever the computer is expecting a key to be pressed.

Although this all sounds very daunting, in fact most children seem to be able to use the program easily and enjoy doing so.

My children run it on our Electron, but the program was

originally written on a BBC, and because I am a lazy typist I'm afraid that the variable and procedure names are in upper case.

Also, because memory is at such a premium in the otherwise superb BBC/Electron computers, the variable and procedure names are rather cryptic.

Because of the way the program works, **it is essential that you do not renumber it**, or at least the DATA statements at lines 10000 onward.

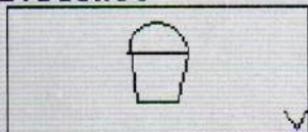
At this juncture it's worth outlining how the program works.

I have seen many programs of a similar nature which require access to a set of data in a random way - spelling games or Hangman spring to mind.

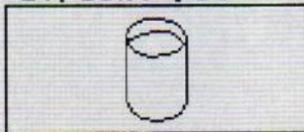
Most programmers seem to access the data in a random way by READING the data into a string array then generating a random number to be used as an array index.

Doing this means that there

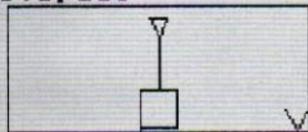
1.bucket



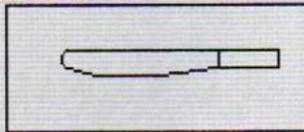
2.paint pot



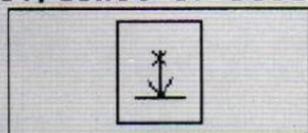
3.spade



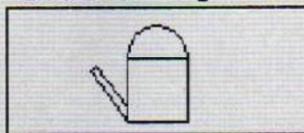
4.knife



5.packet of seeds

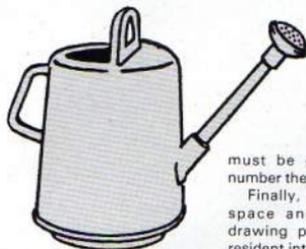


6.watering can



Which of these might I need to build a sandcastle ?

Press 1-6 or F to finish :-



are two copies of the data in the aforementioned limited Acorn memory. (When is some bright spark going to bring out a main RAM expansion for the Electron, like there is for the BBC?)

Because it is possible in BBC Basic to use the RESTORE statement using a variable or an expression rather than a line number, any DATA statement can be READ by setting the value of the variable to the line number of the DATA statement that you want.

It looks tricky, but in fact is very easy. This means that you

must be careful how you number the DATA statements.

Finally, to save memory space and speed up the drawing process a bit, the resident integer variables have been used to some degree.

As I have already hinted, it is possible to add extra activities and drawings to the list or create a completely different one.

To create a new activity you must add a new DATA statement as follows (numbers are counted from 0):

```
100nn DATA activity
name,n1,n2...n1,*
```

where nn is the number of the activity and n1,n2 etc are the numbers of the associated items.

There can be from one to six items in the list. The asterisk at the end is to tell the computer

there are no more items in the list.

Line 19999 with the hash sign must be present to show there are no more lists. Each individual drawing is defined as shown:

```
200nn0 DATA item
name,N,x,y,D,x1,y1,E,x1,y,r1,r
2,a1,a2...*
```

where nn is the item number and x and y are the coordinates of a 500 x 200 grid on which the item is drawn. The graphics interpreter reads these codes as follows:

M,x,y: Moves the graphics cursor to x,y without drawing.
D,x,y: Draws a line to x,y from the last graphics point.

E,x,y,r1,r2,a1,a2: Draws part of an ellipse with centre x,y, radii r1,r2 starting at angle a1 and finishing at angle a2.

The angles are measured in radians and increase anticlockwise with 3 o'clock being zero.

These codes may be in any order, but there is no error trapping, so they must be correct.

The asterisk at the end of

the statement is to indicate the end of the drawing. If the codes will not all fit into one DATA statement they may be continued into another one, although the line number for this must be less than 10 more than the initial one (for example, see lines 20100 and 20102).

The final DATA statement with the # indicates no more drawings are present, and it must be there.

If some clever dick of a little Johnnie points out that a so called irrelevant item goes with an activity, just add its number to the activity list.



Activities listing

```
10REM ACTIVITIES
20REM (C) Electron User
1985
30REM by Mike Plummer
40RN ERROR GOTO 1420
50MODE 6:PROCSETUP
60DIM ANX(5),QUX(5):LST$
=STRING$(40,"*"):ITEM=LST$
70CLS:PRINT TAB(5,10)"Wa
it a minute, I am thinking"
:VDU 23,1,0:0:0:0:
80RESTORE 10000:LCX=-1:R
EPEAT LCX=LCX+1
90REPEAT READ LST$:UNTIL
LST$="" OR LST$="*":UNTIL
LST$=""
100RESTORE 20000:ICX=-1:R
EPEAT ICX=ICX+1
110REPEAT READ ITEM$:UNTI
L ITEM$="" OR ITEM$="*":UNTI
L ITEM$=""
120REPEAT:RIZ=0:WRX=0:TTX
=0:MODE4:VDU19,0,4,0:23,1,0
:0:0:0:0:FOR TEST=0 TO 9:CLS
:PROCSK:PROCANS:NEXT:MODE6
:VDU19,0,4,0:23,1,0:0:0:0:
PROCSC:UNTIL FALSE
130:
140REM -- Get a set of it
ems + some random ones --
150DEF PROCASK:LOCAL N1X,
N2X:FOR N1X=0 TO 5:QUX(N1X)
=-1:ANX(N1X)=-1:NEXT:NX=TRU
E
160REPEAT TX=TRUE:N1X=RND
(LCX):FOR ICX=0 TO 9:IF N1X
=STX(ICX) TX=FALSE
170NEXT:UNTIL TX
180STX(TEST)=N1X
190RESTORE (9999+N1X):REA
D LST$:NANSX=0:REPEAT READ
ITEM$:IF ITEM$<"*" THEN AN
X(NANSX)=VAL(ITEM$):NANSX=N
ANSX+1
200UNTIL ITEM$="*"
210FOR N1X=NANSX TO 5:REP
EAT:SAMEX=FALSE:OSTX=RND(IC
X)-1:FOR N2X=0 TO 5:IF ANX(
N2X)=OSTX THEN SAMEX=TRUE
220NEXT:UNTIL NOT SAMEX:A
NX(N1X)=OSTX:NEXT
230FOR N1X=0 TO 5:REPEAT
QSTX=RND(6)-1:UNTIL QUX(QST
X)=-1:QUX(QSTX)=ANX(N1X):NE
XT
240FOR N1X=0 TO 5:PROCDRI
TEM(N1X):NEXT:TTX=TX+NANSX
:NANSX=NANSX-1
250PK$=""
260PRINT TAB(1,27)"Which
of these might I need to"
" :LST$* ?"
270ENDPROC
280:
290REM -- Draw an item (1
..6) --
300DEF PROCDRITEM(NX):QST
X=QUX(NX):RESTORE (10+QSTX+
20000):READ ITEM$:PRINT TAB
(1+(NX MOD 2)*20,1+(NX DIV
2)*9):NX+1:"*+ITEM$
310UX=(NX MOD 2)*600+50:V
X=755-(NX DIV 2)*290
320MOVE UX,VX:PLOT 1,0,20
0:PLOT 1,500,0:PLOT 1,0,-20
0:PLOT 1,-500,0
330$="*":REPEAT PROCINPR
T:UNTIL D$="*"
```

Activities listing

From Page 55

```

THEN AN$="F"
490IF AN$="Q" OR AN$="Q"
THEN #FX10,1
500IF AN$="S" OR AN$="S"
THEN #FX20,0
510UNTIL (AN$)="1" AND AN
$="(6)":IF OR AN$="F"
520IF AN$="F" THEN PROCEN
CH ELSE PROCNOCH:IF LEN(KP$)
<=6 AN$="F":PROCENCH
530UNTIL AN$="F":ENDPROC
540:
550REM -- Number answer h
anding --
560DEF PROCNOCH:ANSX=VAL(
AN$)-1:IF INSTR(KP$,AN$)=0
KP$=KP$+AN$
570IF QUX(ANSX)+2 THEN S
OUND 1,-15,192,2:SOUND 1,-1
5,0,4:ENDPROC
580FX=FALSE:FOR NX=0 TO N
ANSX:IF AN$(NX)=QUX(ANSX) T
HEN FX=TRUE:ANX(NX)=-2:QUX(
ANSX)=-2
590NEXT:IF FX THEN PROCHE
ER:MOVE (ANSX MOD 2)*600+51
0,790-(ANSX DIV 2)*290:PLOT
1,20,-30:PLOT 1,90,160:PRO
CDEL:ENDPROC
600PROCPRASP:MOVE (ANSX MO
D 2)*600+50,755-(ANSX DIV 2
)*290:PLOT 1,500,200:PLOT 0
,-500,0:PLOT 1,500,-200:QUX
(ANSX)=1:HX=FALSE:PROCDEL:
ENDPROC
610:
620REM -- Small delay --
630DEF PROCDEL
640TIME=0:REPEAT UNTIL TI
ME=100
650ENDPROC
660:
670REM -- Blow raspberry
--
680DEF PROCPRASP
690FOR PX=4 TO 7:SOUND 0,
-15,PX,5:NEXT
700IF QUX(ANSX)<-1 THEN
WRX=WRX+1
710QUX(ANSX)=-2
720ENDPROC
730:
740REM -- Fanfare --
750DEF PROCHEER
760RIX=RIX+1
770FOR PX=5 TO 20 STEP 15
780SOUND 1,-15,53,1
790SOUND 1,-15,69,1
800SOUND 1,-15,81,PX
810TIME=0:REPEAT UNTIL TI
ME = 25
820NEXT:ENDPROC
830:
840REM -- End of answers
handling --
850DEF PROCENCH
860FX=FALSE:FOR NX=0 TO 5
870GX=TRUE:FOR PX=0 TO NA
NSX:IF (QUX(NX)=ANX(PX)) AN
D QUX(NX)-1 THEN GX=FALSE:
FX=TRUE
880NEXT PX:IF GX OR QUX(N
X)<0 THEN LET XX=(NX MOD 2)
+20:YZ=(NX DIV 2)+9:FOR Z=
YX TO YX+8:PRINT TAB(XZ,ZX)
:SPC(20):NEXT ZX
890NEXT NX
900PRINT TAB(1,27)STRING$(
78," ")
910PRINT TAB(0,20):IF FX
THEN PRINT " What abou
t this ?" ELSE IF NOT HX TH
EN PRINT "You had some wron
g guesses!" ELSE PRINT "
VERY WELL DONE !"
920PRINT TAB(0,30)STRING$(
38,"")TAB(15,30)Press SP
ACE:REPEAT UNTIL GET$=" ":
ENDPROC
930:
940REM -- Draw an ellipse
--
950DEF PROCCELL:READ YX,YZ
,R1,R2,A1,A2:INC=40/(R1+R2)
:PLOT 4,R1+COS(A1)+UX+YZ,R2
+*SIN(A1)+VX+YZ
960FOR A=0 TO A2 STEP IN
C:PLOT 5,R1+COS(A)+UX+YZ,R2
+*SIN(A)+VX+YZ:NEXT:ENDPROC
970:
980REM -- Display scores
--
990DEF PROCSC:CLS:PRINT T
AB(5,2)"Your final scores
are :-"
1000PRINT " Total number o
f items wanted ";ITX
1010PRINT " Total number o
f correct answers ";R1
1020PRINT " Total number o
f wrong answers ";WRX
1030PRINT " Press SPACE fo
r some one else to try"
1040#FX21,0
1050REPEAT:KEY$=GET$:IF KE
Y$="Q" OR KEY$="Q" THEN #FX
210,1
1060IF KEY$="S" OR KEY$="S
" THEN #FX210,0
1070UNTIL KEY$=" ":ENDPROC
1080:
1090REM Print instructions
1100DEF PROCSETUP
1110DIM STX(9)
1120#FX10,0
1130#FX11,0
1140CLS
1150VDU 19,0,4;0,23,1,0;0;
0;0;
1160PRINT:PRINT TAB(15)"AC
TIVITIES"
1170PRINT " The computer
will decide that it wants"
1180PRINT "to do something
and will draw six items"
1190PRINT "on the screen,
along with their name"
1200PRINT "a number. Some
of the items drawn will"
1210PRINT "be needed to do
whatever the computer"
1220PRINT "wants to do. Yo
u must tell it what it"
1230PRINT "needs by pressi
ng keys 1-6. If the item"
1240PRINT "is needed then
a tick will be drawn by"
1250PRINT "the picture, ot
herwise it will be"
1260PRINT "crossed out. Yo
u will have 10 tries"
1270PRINT "then the comput
er will tell you your"
1280PRINT "score and ask f
or someone else to try."
1290PRINT " Set the sound
effects on by pressing"t
he 'S' key and turn them o
ff with the"Q" key. This
can be done now or at any"
"time the computer is waiti
ng for a key"to be presse
d. Select now (S/Q) "
1300REPEAT:#FX21,0
1310key$=CHR$(GET AND 15F)
1320UNTIL key$="S" OR key$
="Q"
1330IF key$="S" THEN #FX 2
10,0
1340IF key$="Q" THEN #FX 2
10,1
1350PRINT "Press SPACE to
start. ESC for this page"
1360#FX21,0
1370REPEAT UNTIL GET$=" ":
CLS
1380FOR ICX=0 TO 9:STX(ICX
)=-1:NEXT
1390ENDPROC
1400:
1410REM -- Error trapping
--
14200 ERROR OFF:IF ERR=17
THEN RUN ELSE MODE$:REPORT
:PRINT " at line ";ERL:#FX1
2,0
1430END
1440:
10000 DATA plant some seeds
,0,1,2,*
10001 DATA paint the house,
3,4,5,*
10002 DATA have my dinner,6
,7,8,16,*
10003 DATA build a sandcast
le,0,9,*
10004 DATA go for a drive,1
0,11,*
10005 DATA go for a sail,12
,13,14,*
10006 DATA have a drink of
tea,15,16,17,*
10007 DATA fly in the sky,1
8,19,20,*
10008 DATA play cricket,21,
22,23,*
10009 DATA tell the time,24
,25,26,*
10010 DATA write a story,27
,28,29,*
10011 DATA wash the windows
,9,4,30,*
10012 DATA do some woodwork
,28,31,32,33,36,*
10013 DATA do some cooking,
6,8,34,35,*
10014 DATA mend the car,10,
36,37,32,38,*
10015 DATA clean my teeth,3
9,40,41,*
10016 DATA wash my face,42,
43,44,45,*
10017 DATA walk in the rain
,46,47,48,*
10018 DATA do my shopping,4
9,50,51,*
10019 DATA play a tune,52,5
3,54,*
10020 DATA go for a swim,13
,43,55,*
10021 DATA play football,21
,56,57,*
10022 DATA have a party,58,
59,60,*

```

18023 DATA send a letter, 28
29, 61, 62, 63, *

18024 DATA make a phone cal
1, 64, 65, *

18025 DATA do the washing u
p, 66, 67, 68, 69, *

18026 DATA go to bed, 70, 71,
72, *

19999 DATA #

20000 DATA spade, M, 220, 18, 0,
280, 18, 0, 280, 70, 0, 220, 70, 0,
220, 5, M, 250, 70, 0, 250, 150, 0,
235, 180, 0, 265, 180, 0, 250, 15
0, *

20010 DATA packet of seeds,
M, 180, 20, 0, 320, 20, 0, 320, 180,
0, 180, 180, 0, 180, 20, M, 210, 6,
0, D, 290, 60, M, 250, 60, D, 250, 1
30, M, 260, 130, 0, 240, 110, M, 24
0, 130, 0, 260, 110, M, 270, 90, D,
250, 60, 0, 230, 85, *

20020 DATA watering can, M, 2
00, 20, D, 300, 20, D, 300, 120, D,
280, 120, 0, 280, 20, D, 140, 180,
0, 140, 100, D, 200, 42, E, 250, 12
0, 50, 50, 0, 3, 34, *

20030 DATA paint brush, M, 24
0, 100, 0, 240, 190, 0, 260, 190, 0,
260, 180, 0, 280, 90, 0, 220, 80,
0, 240, 180, M, 220, 73, 0, 220, 63
0, D, 210, 13, D, 290, 13, D, 280, 63
0, D, 220, 63, D, 220, 73, M, 280, 73,
0, 280, 63, *

20040 DATA ladder, M, 150, 10,
0, 240, 190, M, 340, 190, 0, 250, 1
0, M, 260, 30, D, 160, 30, M, 170, 3
0, D, 270, 50, M, 280, 70, 0, 180, 7
0, M, 190, 90, D, 290, 90, M, 300, 1
0, D, 200, 110, M, 210, 130, D, 31
0, 130, M, 320, 150, 0, 220, 150, M,
230, 170, 0, 330, 170, *

20050 DATA paint pot, E, 250,
150, 50, 30, 0, 6, 20, E, 250, 130,
50, 30, 1, 5, 3, E, 250, 50, 50, 30,
3, 14, 6, 28, 0, 300, 150, M, 200, 1
50, 0, 200, 50, *

20060 DATA fork, M, 80, 70, D, 1
00, 70, 0, 200, 90, D, 400, 90, D, 4
00, 110, 0, 200, 110, D, 180, 130,
0, 150, 130, D, 150, 70, M, 150, 90,
0, 80, 90, M, 80, 110, D, 150, 110,
M, 150, 130, 0, 80, 130, *

20070 DATA plate, E, 250, 100,
120, 50, 0, 6, 3, E, 250, 100, 100,
30, 0, 6, 3, *

20080 DATA knife, M, 350, 100,
0, 450, 100, D, 450, 130, D, 100, 1
30, 0, 90, 120, 0, 90, 110, 0, 100,
100, 0, 150, 90, D, 250, 90, D, 350

180, 0, D, 350, 130, *

20090 DATA bucket, E, 250, 125
50, 50, 0, 3, 14, D, 215, 50, 0, 28
5, 50, D, 300, 125, D, 200, 125, *

20100 DATA car, E, 150, 50, 25,
25, 0, 6, 433, E, 350, 50, 25, 25, 0
6, 433, E, 350, 50, 30, 30, 0, 3, 2
E, 150, 50, 30, 30, 0, 3, 2, D, 120
50, D, 100, 50, D, 120, 100, D, 20
0, 110, D, 225, 150, D, 350, 150, 0,
400, 100, 0, 400, 50, D, 300, 50,
M, 320, 50, D, 180, 50

20120 DATA M, 300, 60, D, 210, 6
0, D, 120, 100, D, 370, 100, 0, 350
140, 0, 300, 140, D, 300, 60, M, 3
00, 140, D, 225, 140, D, 210, 100, *

20110 DATA steering wheel, E
250, 100, 75, 75, 0, 6, 45, D, 250
100, 0, 200, 50, M, 250, 100, 0, 2
00, 150, *

20120 DATA boat, M, 150, 75, D,
175, 50, D, 350, 50, D, 400, 60, D,
400, 75, 0, 150, 75, D, 250, 190, D,
400, 85, D, 400, 75, M, 250, 75, D,
250, 190, M, 400, 85, D, 165, 85,
*

20130 DATA lifebelt, E, 250, 1
00, 50, 50, 0, 6, 5, E, 250, 100, 75
75, 0, 6, 5, M, 325, 90, 0, 300, 90
M, 200, 90, D, 175, 90, M, 175, 11
0, D, 200, 110, M, 300, 110, 0, 325
110, *

20140 DATA compass, E, 250, 10
0, 90, 90, 0, 6, 5, M, 250, 140, D, 2
40, 100, 0, 250, 60, 0, 260, 180, D,
250, 140, M, 240, 145, D, 240, 16
5, D, 260, 145, D, 260, 165, *

20150 DATA teapot, E, 250, 160
10, 10, 0, 6, 4, E, 250, 100, 50, 5
0, 5, 5, 10, 3, M, 275, 95, D, 225, 3
5, D, 150, 135, D, 160, 135, D, 200
100, M, 295, 75, D, 330, 75, D, 33
0, 120, D, 295, 120, M, 280, 135, D,
220, 135, *

20160 DATA mug, E, 250, 150, 50
30, 0, 6, 28, E, 250, 130, 50, 30,
15, 3, E, 250, 50, 50, 30, 3, 14, 6
28, D, 300, 150, M, 200, 150, D, 2
00, 50, M, 300, 125, D, 333, 125, D,
333, 75, D, 300, 75, *

20170 DATA kettle, E, 250, 100,
50, 50, 0, 3, 25, E, 250, 110, 10,
10, 0, 6, 4, M, 175, 25, D, 175, 75,
0, 200, 100, D, 300, 100, D, 325, 7
5, D, 325, 25, D, 175, 25, D, 115, 1
00, D, 130, 100, 0, 175, 55, *

20180 DATA aeroplane, M, 150,
60, D, 250, 60, D, 250, 80, D, 200,

80, D, 200, 60, D, 300, 60, D, 400,
100, 0, 150, 100, 0, 150, 60, M, 13
5, 60, D, 135, 120, M, 135, 90, D, 1
50, 90, M, 400, 180, D, 400, 140, 0,
365, 140, D, 350, 100, M, 300, 10
0, D, 200, 125, D, 225, 125, D, 200
100, *

20190 DATA airship, E, 250, 10
0, 150, 50, 0, 6, 4, D, 350, 100, M,
350, 135, D, 380, 170, D, 400, 170
0, 400, 30, D, 380, 30, D, 350, 65
M, 300, 55, D, 285, 20, D, 220, 20
D, 200, 55, M, 220, 42, D, 265, 42
0, 265, 30, D, 220, 30, D, 220, 42
*, *

20200 DATA balloon, E, 250, 14
0, 50, 50, 0, 6, 4, M, 300, 140, D, 2
00, 140, D, 230, 50, D, 270, 50, D,
300, 140, M, 250, 140, D, 250, 50,
M, 230, 50, D, 230, 15, D, 270, 15,
D, 270, 50, *

20210 DATA ball, E, 250, 100, 5
0, 50, 0, 6, 5, *

20220 DATA cricket bat, M, 23
0, 10, D, 270, 18, D, 270, 140, D, 2
55, 150, D, 255, 190, D, 245, 190,
D, 245, 150, D, 230, 140, D, 230, 1
0, M, 245, 150, D, 255, 150, *

20230 DATA wicket, M, 220, 10,
0, 220, 190, D, 280, 190, D, 280, 1
0, M, 250, 10, D, 250, 190, *

20240 DATA sundial, E, 250, 75
100, 25, 0, 6, 4, M, 300, 75, D, 25
0, 115, D, 200, 75, 0, 300, 150, *

20250 DATA watch, E, 250, 100,
50, 50, 0, 6, 5, M, 275, 100, 0, 250
100, 0, 250, 140, M, 295, 75, D, 4
35, 75, D, 450, 100, D, 435, 125, D,
295, 125, M, 285, 75, D, 50, 75, 0
50, 125, D, 205, 125, M, 75, 125,
0, 75, 75, M, 75, 180, D, 62, 100, *

20260 DATA clock, E, 250, 100,
75, 75, 0, 6, 5, E, 250, 180, 15, 15
0, 6, 8, M, 150, 15, D, 350, 15, D,
350, 185, D, 150, 185, D, 150, 15,
M, 260, 110, D, 280, 130, M, 260, 9
0, D, 300, 50, M, 250, 25, D, 250, 4
0, M, 175, 100, D, 200, 100, M, 250
175, D, 250, 150, M, 325, 100, D,
300, 100, *

20270 DATA writing book, E, 2
00, 125, 75, 35, 0, 5, 2, 5, E, 300,
125, 75, 35, 0, 5, 2, 5, E, 200, 25,
75, 35, 0, 6, 2, 5, 300, 25, 75, 2
5, 0, 6, 2, 5, M, 250, 150, D, 250, 5
0, M, 150, 50, D, 150, 150, M, 350,
150, D, 350, 50, M, 360, 45, D, 360
147, *

20280 DATA pencil, M, 150, 90,
D, 400, 80, D, 400, 120, D, 150, 12
0, D, 75, 100, D, 150, 80, D, 150, 1
20, M, 100, 94, D, 100, 180, M, 150
100, 0, 400, 100, *

20290 DATA rubber, M, 100, 100,
0, 125, 75, D, 275, 75, D, 300, 12
5, D, 275, 150, D, 125, 150, D, 150
125, D, 300, 125, M, 100, 100, 100,
125, 150, M, 150, 125, D, 125, 75,
*

20300 DATA washleather, M, 2
00, 50, D, 300, 50, D, 300, 150, D,
200, 150, D, 200, 50, *

20310 DATA saw, M, 100, 100, 0,
100, 50, D, 300, 50, D, 300, 100, 0,
100, 100, D, 100, 115, D, 300, 11
5, D, 325, 135, D, 365, 135, D, 365
75, D, 325, 75, D, 300, 100, 0, 30
0, 115, M, 310, 115, D, 330, 85, D,
350, 80, D, 350, 125, D, 325, 125,
0, 310, 115, *

20320 DATA hammer, M, 200, 85,
0, 200, 135, D, 215, 159, D, 200, 1
50, D, 170, 115, D, 170, 50, D, 200
50, D, 200, 90, D, 400, 90, D, 400
110, D, 200, 110, *

20330 DATA nails, M, 150, 50, D,
210, 140, 0, 200, 150, D, 220, 13
0, M, 250, 40, D, 250, 150, 0, 240,
150, 0, 260, 150, M, 400, 100, D, 2
75, 100, D, 275, 110, D, 275, 90, M,
400, 10, 0, 300, 50, D, 294, 40, 0,
306, 60, *

20340 DATA mixing bowl, E, 25
0, 150, 100, 100, 3, 14, 4, 2, M, 20
0, 70, 0, 300, 70, M, 150, 150, 0, 3
50, 150, E, 250, 100, 100, 5,
3, 6, 30, *

20350 DATA cooker, M, 200, 10,
0, 300, 10, 0, 300, 190, 0, 280, 19
0, 0, 200, 180, M, 210, 25, D, 290, 2
5, D, 290, 80, D, 210, 80, D, 210, 2
5, M, 270, 70, D, 280, 70, M, 200, 1
00, 0, 300, 100, M, 300, 120, D, 20
0, 120, M, 200, 170, D, 300, 170, M,
210, 110, 0, 215, 110, M, 247, 11
0, D, 255, 110, *

20352 DATA M, 290, 110, D, 285,
110, *

20360 DATA screwdriver, M, 15
0, 90, D, 300, 90, D, 300, 125, D, 4
00, 125, D, 400, 75, D, 300, 75, D,
300, 110, D, 150, 110, D, 125, 115
0, 100, 110, D, 100, 90, D, 125, 8
50, 150, 90, *

20370 DATA oil can, M, 45, 150
0, 200, 50, D, 200, 150, D, 300, 1

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50, D, 300, 65, D, 350, 65, D, 350, 135, D, 300, 135, D, 300, 50, D, 20
0, 50, D, 200, 65, D, 35, 150, D, 45
150, M, 200, 150, D, 200, 170, D,
250, 170, D, 250, 150, M, 250, 170
D, 350, 160, *

20380 DATA spanner, M, 50, 50,
D, 100, 50, D, 150, 80, D, 350, 80,
D, 400, 50, D, 450, 50, D, 450, 70,
D, 400, 70, D, 375, 100, D, 400, 13
0, D, 450, 130, D, 450, 150, D, 400
150, D, 350, 120, D, 150, 120, D,
100, 150, D, 50, 150, D, 50, 130, D,
100, 130, D, 125, 100, D, 100, 70
D, 50, 70, D, 50, 50, *

20390 DATA toothpaste, M, 125
.75, D, 50, 75, D, 50, 125, D, 125,
125, D, 150, 150, D, 450, 150, D, 4
50, 50, D, 150, 50, D, 125, 75, D, 1
25, 125, M, 150, 150, D, 150, 50, M,
440, 50, D, 440, 150, *

20400 DATA toothaug, E, 250, 1
50, 50, 20, 0, 6.33, E, 250, 125, 4
0, 16, 0, 6.33, E, 250, 50, 25, 10,
0, 6.33, M, 225, 50, D, 200, 150, M,
275, 50, D, 300, 150, *

20410 DATA toothbrush, M, 100
70, D, 200, 75, D, 250, 100, 45
0, 100, D, 450, 110, D, 250, 110, D,
200, 95, D, 100, 95, D, 100, 75, D,
100, 125, M, 117, 85, D, 117, 125
M, 134, 85, D, 134, 125, M, 150, 8
5, D, 150, 125, M, 167, 85, D, 167,
125, M, 184, 85, D, 184, 125, M, 20
0, 85, D, 200, 125, *

20420 DATA face flannel, M, 2
00, 50, D, 300, 50, D, 300, 150, D,
200, 150, D, 200, 50, *

20430 DATA towel, M, 125, 50, D,
375, 50, D, 375, 150, D, 125, 150
D, 125, 50, *

20440 DATA wash basin, M, 150
100, D, 350, 100, D, 350, 125, D,
150, 125, D, 150, 100, M, 175, 125
D, 175, 150, D, 190, 150, D, 190,
125, M, 325, 125, D, 325, 150, D, 3
05, 150, D, 305, 125, M, 300, 150,
D, 330, 150, M, 300, 150, D, 175, 1
50, *

20442 DATA E, 200, 100, 50, 59,
3.14, 4.91, E, 300, 100, 50, 59, 4
91.6, 4.91, M, 200, 41, D, 225, 41, D,
225, 0, M, 300, 41, D, 275, 41, D,
275, 0, *

20450 DATA soap, E, 250, 100, 1
50, 50, 1.1, 2.2, E, 250, 100, 150

, 50, 4.2, 5.3, M, 175, 60, D, 175,
140, M, 325, 60, D, 325, 140, E, 25
0, 100, 30, 10, 0, 6.4, *

20460 DATA umbrella, M, 150, 1
50, D, 350, 150, E, 250, 50, 141, 1
41, 70, 2.4, M, 250, 150, D, 250,
50, E, 225, 50, 25, 25, 3.14, 6.4,
*
20470 DATA wellingtons, M, 15
0, 50, D, 200, 50, D, 200, 150, D, 2
50, 150, D, 250, 20, D, 220, 20, D,
220, 25, D, 100, 20, D, 120, 20, E,
150, 20, 30, 30, 1.55, 3.14, M, 22
0, 150, D, 220, 170, D, 270, 170, D,
270, 40, D, 250, 40, M, 200, 70, D,
170, 70, E, 170, 40, 30, 30, 1.55
3, *

20480 DATA raincoat, M, 200, 2
0, D, 300, 20, D, 300, 125, D, 340,
70, D, 360, 75, D, 300, 170, D, 275
175, D, 225, 175, D, 200, 170, D,
140, 75, D, 160, 70, D, 200, 125, D,
200, 20, M, 250, 20, D, 250, 125,
D, 225, 175, D, 210, 175, D, 250, 1
20, D, 290, 175, D, 275, 175, D, 25
0, 125, *

20490 DATA money, M, 150, 50, D,
150, 100, D, 250, 100, D, 250, 50
D, 150, 50, E, 300, 100, 25, 25, 0
6.44, E, 275, 150, 20, 20, 0, 6.3
3, *

20500 DATA shopping list, M, 200,
100, 10, D, 200, 175, D, 300, 175,
D, 300, 10, D, 200, 10, M, 220, 150
D, 200, 150, M, 220, 110, D, 260,
110, M, 220, 80, D, 240, 80, M, 220
60, D, 275, 60, M, 220, 40, D, 240
40, M, 220, 20, D, 260, 20, *

20510 DATA shopping bag, M, 1
50, 25, D, 350, 25, D, 350, 125, D,
150, 125, D, 150, 25, E, 250, 125,
50, 70, 0, 3.2, *

20520 DATA music book, M, 250
50, D, 250, 150, D, 150, 150, D, 1
50, 50, D, 350, 50, D, 350, 50, D, 3
50, 150, D, 250, 150, M, 160, 125,
D, 240, 125, M, 160, 100, D, 240, 1
00, M, 160, 75, D, 240, 75, M, 260,
125, 340, 125, M, 260, 100, D, 3
40, 100, M, 260, 75, D, 340, 75, *

20530 DATA drum, E, 250, 125, 1
00, 25, 0, 6.33, E, 250, 50, 100, 2
5, 3.14, 6.33, M, 350, 125, D, 350
50, D, 300, 180, D, 250, 25, 20, 0
0, 105, D, 150, 50, D, 150, 120, M,
100, 175, D, 225, 160, M, 275, 160
D, 400, 175, *

20540 DATA recorder, E, 400, 7

0, 30, 30, 1.57, 3.14, D, 400, 70,
D, 50, 80, D, 20, 70, D, 20, 130, D,
50, 120, D, 400, 130, D, 400, 130,
D, 400, 110, M, 450, 130, D, 450, 1
15, D, 430, 115, D, 430, 130, *

20550 DATA swimming costume,
M, 150, 25, D, 100, 50, D, 100, 75,
D, 200, 75, D, 200, 50, D, 150, 25
M, 350, 15, D, 400, 40, D, 300, 75
D, 400, 150, D, 375, 170, D, 350,
130, D, 325, 170, D, 300, 150, D, 3
20, 75, D, 300, 40, D, 350, 15, *

20560 DATA football boots, M,
150, 50, D, 200, 50, D, 200, 70, D,
250, 70, D, 250, 20, D, 220, 20, D,
220, 25, D, 100, 20, D, 120, 20, E,
150, 20, 30, 30, 1.55, 3.14, M, 2
20, 70, D, 220, 90, D, 270, 90, D, 1
70, 40, D, 250, 40, M, 200, 70, D, 1
70, 70, E, 170, 40, 30, 30, 1.55, 3
1, *

20570 DATA football shorts,
M, 175, 50, D, 325, 50, D, 250, 70,
D, 260, 50, D, 325, 50, D, 325, 125
D, 175, 125, D, 175, 50, *

20580 DATA glass of squash,
E, 250, 150, 50, 200, 0, 6.33, E, 25
0, 125, 40, 16, 0, 6.33, E, 250, 50
25, 10, 0, 6.33, M, 225, 50, D, 20
0, 150, M, 275, 50, D, 300, 150, M,
225, 50, D, 275, 125, D, 325, 160,
*
20590 DATA fancy cake, E, 250
125, 100, 15, 0, 6.33, E, 250, 50
100, 15, 3.14, 6.33, D, 350, 125
M, 150, 125, D, 150, 50, M, 190, 1
30, D, 190, 160, M, 250, 140, D, 25
0, 170, M, 310, 130, D, 310, 160, *

20600 DATA balloons, E, 150, 1
25, 30, 30, 0, 6.33, M, 150, 95, D,
150, 50, E, 250, 150, 45, 45, 0, 0
30, M, 250, 105, D, 250, 50, E, 400
100, 50, 50, 0, 6.53, M, 400, 50,
D, 400, 10, *

20610 DATA "paper envelope",
M, 100, 40, D, 200, 40, D, 200, 17
5, D, 100, 175, D, 100, 40, M, 250,
50, D, 400, 50, D, 400, 120, D, 250
120, D, 250, 50, D, 310, 75, D, 34
0, 75, D, 400, 50, M, 400, 120, D, 3
40, 75, D, 310, 75, D, 250, 120, *

20620 DATA stamp, M, 200, 50, D,
300, 50, D, 300, 150, D, 200, 150
D, 200, 50, M, 250, 55, D, 250, 70
E, 275, 60, 10, 10, 0, 6.35, M, 22
5, 75, D, 275, 85, D, 265, 100, D, 2
75, 115, D, 275, 140, D, 225, 140,
D, 225, 100, D, 235, 93, D, 235, 86

, D, 225, 75, *

20630 DATA postbox, M, 200, 10
0, 300, 10, D, 300, 150, D, 200, 1
50, D, 200, 10, M, 225, 120, D, 275
120, D, 275, 135, D, 225, 135, D,
225, 120, E, 250, 100, 70, 70, 0, 8
2.4, *

20640 DATA phone directory,
E, 200, 125, 75, 35, 0, 5.2, 5, E, 3
00, 125, 75, 35, 0, 5.2, 5, E, 200,
25, 75, 35, 0, 6.2, 5, E, 300, 25, 7
5, 25, 0, 6.2, 5, M, 250, 150, D, 25
0, 50, M, 150, 50, D, 150, 150, M, 3
360, 147, *

20650 DATA telephone, E, 250,
85, 25, 25, 0, 6.5, M, 150, 50, D, 1
50, 15, D, 350, 15, D, 350, 50, D, 1
50, 50, D, 200, 125, D, 300, 125, D,
350, 50, M, 300, 125, D, 350, 125,
D, 350, 100, D, 400, 100, D, 375,
0, 50, M, 150, 50, D, 150, 100, D, 1
50, 100, D, 150, 125, D, 200, 125,
*
20660 DATA dishcloth, M, 200,
50, D, 300, 50, D, 300, 150, D, 200
150, D, 200, 50, *

20670 DATA washing up bowl,
M, 150, 100, D, 175, 50, D, 325, 50
D, 350, 100, D, 150, 100, *

20680 DATA tea towel, M, 125,
50, D, 375, 50, D, 375, 150, D, 125
150, D, 125, 50, *

20690 DATA washing up liqui
d, M, 200, 10, D, 300, 10, D, 300, 1
60, D, 275, 175, D, 275, 190, D, 22
5, 190, D, 225, 175, D, 200, 160, D,
200, 10, *

20700 DATA bed, M, 150, 50, D, 1
50, 120, M, 150, 100, D, 250, 100,
D, 350, 75, D, 150, 75, M, 350, 50,
D, 350, 140, *

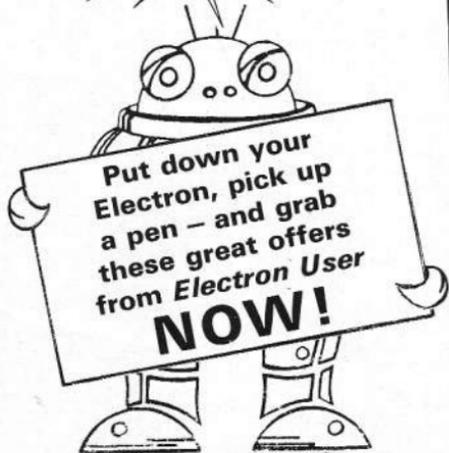
20710 DATA nightshirt, M, 200
10, D, 300, 10, D, 300, 115, D, 32
5, 00, D, 350, 100, D, 300, 150, D,
270, 160, D, 250, 140, D, 200, 160
D, 200, 150, D, 150, 100, D, 170,
0, 200, 115, D, 200, 10, *

20720 DATA pillow, E, 250, 100
150, 50, 1.1, 2.2, E, 250, 100, 1
50, 50, 4.2, 5.3, M, 175, 60, D, 17
5, 140, M, 325, 175, D, 325, 140, *

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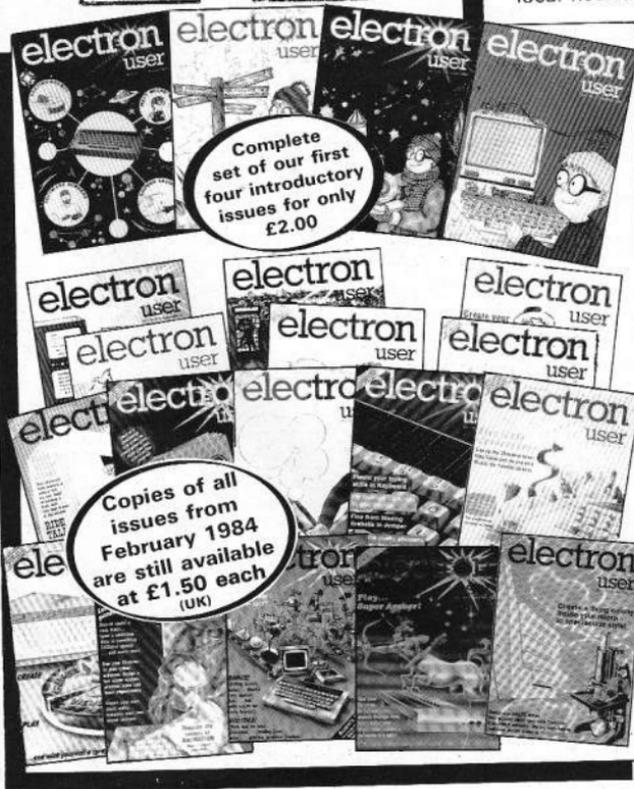


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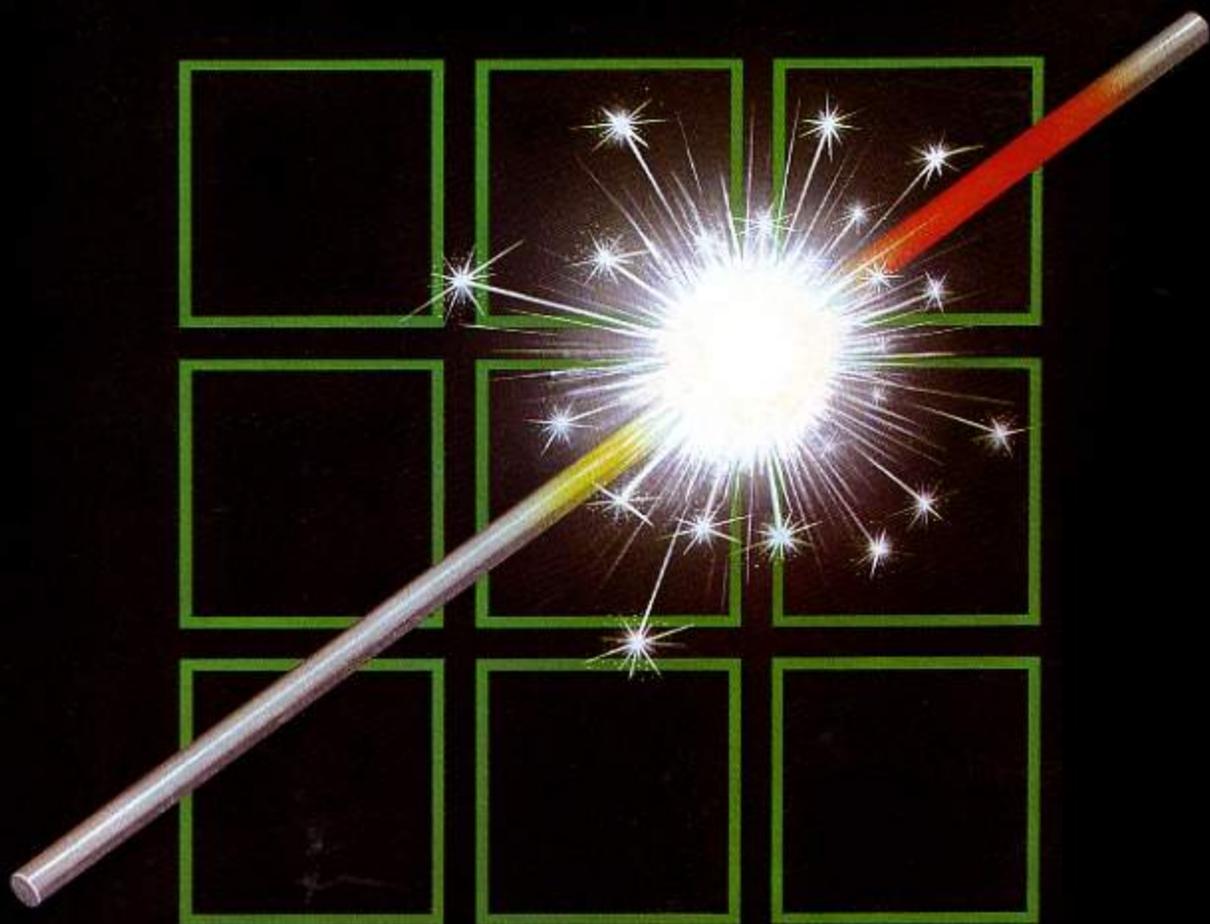
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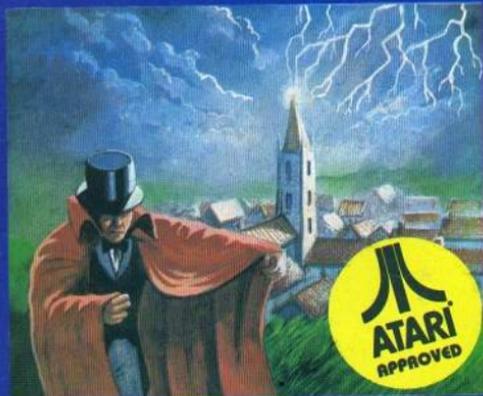
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