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Vol. 1 No. 2

June 1985

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News

Keep up to date with all the latest news... and who's this reading Atari User?

7

Beginners

This month Mike Bibby gets you started in writing your own programs. You'll soon be saying "programming is easy".



10

Analysis

With the Atari 1300X now in the shops, we bring you an analysis of this new machine and present the first program showing how to use the extra memory to good effect.

14

Software

If it's chess, adventures or arcade games you're thinking of buying, read our reviews first.



20

Submarine

Play this educational game and see if you can sink the enemy within six moves.



40

Bit Wise

Do your sums in binary notation with the aid of our regular series on the way the Atari works.

42

Sounds

It's music, music, music with Pete Bibby's creative use of the SOUND command.



44

Random Numbers

If it's a random byte you're in need of, read Kevin Edwards' article - he'll show you how to get one.



54



Guide the frog across the road and over the river to home in this arcade classic.

48

Graphics

Dave Russell continues his series with an introduction to Graphics Modes 1 and 2.

56

Adventuring

Brillig rehearses the arguments for graphic adventures and we give you a brain-bending puzzle to solve before next month.

50

Mailbag

Your chance to air your views, ask questions, provide answers, and generally contribute.

59

Microscope

Take a closer look at this etch-a-sketch program then use it to draw some exciting designs.

52

Order Form

Take out a subscription for Atari User - at a special introductory offer. Or buy this month's disc of listings.

61

Comms



25

Some of the most exciting developments in microcomputing are taking place in the field of communications. In this special 12-page section we bring you the low-down on linking your Atari to the outside world.

- Peter Atkinson confesses that he's hooked on hacking.
- Bulletin Boards explained by Peter Tootill, with all the latest Atari-based bulletin board

numbers for you to phone.

- Basilidon, gateway to the world via the ITEC's bulletin board.
- MicroLink, the exciting new micro-communications system tailored to your needs. Full details of the service and the facilities it offers can be found in the centre pages.
- Why use serial transmission? Robin Hudson explains.

STs on way to whack the Macs

BARRING a major hiccup, the first 520ST machines will be arriving in the UK within days of this issue of *Atari User* hitting the newsstands, and will go on sale shortly afterwards.

And with this initial shipment Atari boss Jack Tramiel will have kept his promise to the UK.

That was that the British would be given the opportunity to buy the 520ST before anyone else in the world.

He gave this undertaking to Atari User when the new machine was unveiled for the international press corps at the recent Hannover Fair.

"We want the British to have their first", the Atari bosslet said. "You see you (the British) are the most computer literate people in the world and, as such, you will have a true appreciation of the ST."

Carrying a price tag of £699, the new machine comes with a 500k 3½" floppy disk drive.

It is being seen as a real threat to Apple's £7,000-plus Macintosh.

This is due to the fact that it contains the Gem operating system, which provides it with a Mac environment at a greatly reduced price.

However, the 520STs which appeared in Hannover were

offering Gem only on disc.

But the company intends to have it on ROM by the time the machine goes into the shops.

"We have had a few machines out with Gem on disc for development purposes in software houses", said an Atari technical spokesman.

"They will help us identify the bugs so we can eliminate them before offering Gem on ROM at the time the machines get into the UK shops".



Atari 520ST ... but any day

Line up to become a millionaire...

ATARI boss Jack Tramiel has promised to create a new breed of UK millionaires - authors of successful software for the new ST range.

"The more there are the better as far as we are concerned", he told Atari User.

This is all part and parcel of the new-look Atari's philosophy to call upon third parties to develop the software.

Since he took over at the top, Tramiel has used virtually all the company's programmes - with reports circulating that up to 80 lost their jobs in the United States alone.

"We are now actively pioneering third party software for the ST", says Max Barnbridge, Atari's new European head of sales.

"And to help achieve this, we will be supporting software houses in every possible way".

However, the support does not include providing them with free development systems for the ST.

Instead, the software houses have had to pay \$4,500 for the privilege of being able to write programs for the new machine.



Bob Harding ... "companies realize they are backing a winner"

And it seems to be working. According to Bob Harding, Atari UK's sales boss, at least 60 major companies based in the United States are currently writing software for the 520ST.

"It doesn't stop there, either", he says. "For here in Britain companies are also queuing up to pay for development systems."

There is absolutely no doubt now that the ST will be more



Jack Tramiel ... "the more there are the better"

than well supported by good software. After all, the companies realize they are backing a winner.

And the final word from Jack Tramiel ...

"Eventually we would like to see the youngsters in the UK get in on the act."

"What would be better than turning lots of bright, 15-year-old programmers into millionaires ..."



GUESS who's reading the Atari User? Find out on Page 9.

Exciting, says W.H. Smith

The Atari 1050 has made a big impression at leading High Street chain W.H. Smith.

The new computer/terminal sold at Smith's top 40 branches has been described by the buying team as "one of the most exciting new products to be launched this year".

Atari technicians accompanied the first machines delivered to Smith's and conducted on-the-spot staff training in the stores.

Atari has also set up a help line so that Smith's branch staff can ring with technical problems and customer queries.

W.H. Smith is also expecting big sales of the Atari 1050 program recorder.

The Atari 1050 also drive is being stocked on a trial basis by five branches - Birmingham, West Coast, Croydon, Manchester and Stratford.

Probe into cut price games

LEADING software houses are currently investigating a mail-order operation offering top-selling games at rock-bottom prices.

Popular Atari titles like Pole Position, Ghostbusters and Jet Set Jack are involved.

The software publishers were started by mass users who had received in the past an offer from a firm calling Atari AI Software Services of Hainchinch, Essex.

The mail shot invited people to choose one game from a list of 20 well-known titles which

would then be theirs for only the cost of postage and packing - 25p.

The offer continued: "When you have received your free tape you can buy the following" and gave details of three packs, each containing 15 top games.

Price for one pack was £20, for two packs £30 and for all three £40.

Another version of the mail shot offered a choice of 21 packs containing five games each at prices ranging from £5 for one pack to £30 for 10 packs. The offer stated: "All

titles are the ones from the well-known software houses. All copies are first-class quality and we will exchange any non-readers. Please be very despatched (sic) with this list".

Atari Mail tried to contact AI Software Services by telephone. Directory enquiries could find no listing in Hainchinch for the firm, nor for an "A. Craft" named as "proprietor" on the mail shot.

A visitor to the address given found it to be an accommodation agency-cum-sport agency in a run-down shop.

SHARING THE GOODIES

The Commodore disc drive for the 620 ST will eventually be made available - with the appropriate interfaces built in - for other computers.

Good deal, says Atari

ATARI has hit back at allegations by a prominent UK distribution company that a deal offered by the corporation was "economic suicide".

The claim was made by Joe Woods, sales and marketing director of TBD, after his firm announced that it would no longer be handling Atari hardware.

"Conditions demanded by Atari - in terms of margins and stocking commitment - were quite simply unacceptable", he said.

"In the current market climate it would have been commercial suicide to go along with Atari's proposals.

"Atari has a good product and we took the decision to cease distribution with some reluctance".

Up until the announcement, TBD had in fact been distributing Atari hardware under what the company describes as an "arrangement".

However, it was when TBD pressed Atari for a formalisation of the relationship that the storm blew up.

Over at Atari, Max Barnbridge, head of European sales, saw the "problem" in a somewhat different light.

"We made a genuine offer in good faith", he told Atari User. "And this was made at the request of the distribution company itself."

"As far as we are concerned, if we are to get into bed with

someone, we need to judge that level of commitment.

"We have a very hot product coming over in the 620 ST and so we intend to do business the right way.

"There is no question that we'll find ourselves in the position of giving the baby away with the bathwater..."

Heir of the dog

AFTER ditching the popular DOS 2 in favour of the DOS 3, which failed to appeal to users, Atari has now launched the new DOS 3.5.

The 3.5 version has the ability to format both enhanced and single density and is compatible with DOS 2 and 3.

"Our problem was that after DOS 2, which was very popular, DOS 3 turned out to be really a bit of a dog", admitted an Atari technical spokesman.

"So now we have incorporated all that was best in DOS and added a few enhancements and came up with DOS 3.5.

"This didn't present too many problems as it has been written by the same people who came up with DOS 2".

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130 ST misses Hanover Show

ALTHOUGH the 130 ST officially took its bow at the Hanover Show, there was no sign of the 128K version, the 130 ST.

Was it anyone at Atari prepared to give a firm date as to when the machine will appear?

"It may be at the end of the year or possibly even later", said one Atari UK source. "At the moment we see as much in the dark about it as anybody".

One person who admitted to being disappointed by the absence of the 130 ST at Hanover was Tony Deane, a director of Silica Shop.

"To be quite honest, one of the reasons we came over was in the hope of seeing that particular machine", he said.

"We now believe it will be well worth waiting for".

Mystery monitor

A NEW colour monitor with a built in disc drive made its appearance on the Atari stand at the Hanover Show.

Known as the PS 3000, it carried no price tag and there was no indication of when it would arrive in the UK.

Good reception

REACTION to the new Atari 130XE has been exceedingly good according to Max Barnidge, the corporation's European sales and marketing chief.

"It is early days yet, but it is felt enough to say we are very pleased with the reception it has had", he told Atari UK.

A major selling point for the 130XE is likely to be the fact that it is able to run all the software currently available for the 800XL - estimated at around 3,000 titles.



Precision Software rewrites for XE

A LEADING UK software house has jumped on to the Atari bandwagon.

Precision Software has announced it will be rewriting most of its titles for the new Atari 130XE.

However the company is taking its time before launching versions for the 130ST.

Already in the pipeline for the 130XE is the company's well known Superbase range - the Superbase Database, Superprint, a combination of word processor, calculator and mailfile facility, and Superbase, a keyboard trainer.

However the ST version, with extended series of applications templates for Superbase, are well likely to follow immediately.

"If software is made available for the ST (and it is becoming very popular)", said John Tramiel, marketing director at Precision.

"We are certainly looking very keenly at the ST. I myself feel very confident that it will be popular and we have the resources, as we do demand, to

schedule development for it".

Precision Software started its operations in 1980 and since then has produced 18 titles for the C64, 14 for the Apple II.

The company prides itself on specialising in high performance "productivity" software such as word processing and other database products.

These include Base Script and Spell, which have sold 200,000 copies, and Superbase 84, which has sold 70,000.

Reflecting its worldwide market, Precision produces titles in several languages.

Its recent move into the Atari market was explained by Tramiel.

"We sell serious software for the smallest computers", he said, "and because of this most of it goes to the small businessmen who cannot afford more than £1,000 for a system."

"The ST fits into this market. It is extremely well-engineered and its price offers a new level of technology to the serious home user or businessman."

"I think it will be a very successful product".

Seal of approval from the man at the top

ATARI's Atari has already found its No. 1 fan. He turns out to be none other than Jack Tramiel, the battling boss of the corporation.

Presented with a copy of the first issue of the Hanover Show, the man who intends to do for Atari what he did for Commodore - \$1 billion in sales - gave it his seal of approval.

According to one of his top aides: "We showed it to everybody - and I mean everybody".

In fact, at the request of Atari, copies of the magazine were inserted in all the press packs for the international journalists visiting the corporation's stand at the show.

The launch issue's cover depicted Tramiel's head carved out of stone alongside the likenesses of the four United States presidents to be faced on Mount Rushmore.

And this prompted the comment from one US Atari executive: "Gee, I recognise this guy" (looking at Jack) "but who are these other four?"

Keep y and y into



THIS month we are going to begin to write our own programs. Nothing spectacular mind, but enough to give you a quiet glow of satisfaction. Finally, let's discuss what we did last month.

We learned that to "talk" to the computer we had to speak to it in a language it already understood, called Basic. We also learned how to get the Atari to do sums for us and to print out messages, or strings as they are known.

One Basic word we used quite frequently was PRINT, which instructs the micro to write or print things out on the screen. For instance, to do the sum 4+4 we typed:

```
PRINT 4+4 [Return]
```

where [Return] means you should press the Return key - this sends the message we have typed to the computer. Hopefully it then responds by printing the correct answer, 8.

Similarly, we could do subtraction, multiplication and division - the symbols for which are -, * and / respectively. Notice particularly the division symbol.

We also learned that to print out messages we had to surround them

with quotes, as we do when recording speech. So, to print the message "GOOD MORNING" on the screen we type:

```
PRINT "GOOD MORNING"  
[Return]
```

which causes the message to be written on the screen. Now we can use lower case or small letters, so we can print "Good Morning" by using:

```
PRINT "Good Morning"  
[Return]
```

provided we use our Caps properly. Notice that PRINT itself remains in capitals. This is because it is a special Basic word - a keyword. For the Atari to realise that it has a special meaning, it must be written in capitals, as must all other Basic words. For the moment, stay in capitals all the time - this will prevent you from falling into this error.

So far we have given the computer one instruction at a time, which it carried out immediately after we pressed Return (assuming we'd typed it correctly).

Sometimes, though, we want to give the micro a series of instructions

and then tell it to carry them out. For instance, suppose we want the message:

```
PROGRAMMING  
IS  
EASY
```

to appear on the screen. With our step-by-step method, we would have used:

```
PRINT "PROGRAMMING"  
[Return]  
PRINT "IS"  
[Return]  
PRINT "EASY"  
[Return]
```

But, as you'll see if you try it, this doesn't produce the required effect, since each successive instruction spoils the layout.

We need to give the computer the instructions so that it:

1. Prints out PROGRAMMING
2. Prints out IS
3. Prints out EASY

in sequence, without stopping to ask us what to do next. Such a sequence of instructions is called a program. Notice also that the sequence is numbered - after all, the computer needs to know the order in which to

your CAPS on you won't fall error!

Start to write your own programs in PART TWO of MIKE BIBBY'S guide through the micro jungle

carry them out.

Now let's write a program to print out

PROGRAMMING IS EASY

We were on the right lines with the first attempt, but this time, let's try numbering our instructions as we enter them.

First of all type:

NEW [Return]

NEW is a basic keyword that clears out the computer's memory. If you don't do this the program you are typing in might get jumbled up with a previous one - you'll see more clearly how this can happen later.

You probably think that you haven't got a program in at the moment, but use NEW anyway, because it is possible that you might have entered a line or two by chance.

Then type:

```
10 PRINT "PROGRAMMING"
[Return]
```

Notice two things:

- The first instruction is number 10,

not number 1. In computing we tend to number our instructions in steps of ten for reasons that will become blindingly obvious later. We call the number of an instruction its line number.

■ The computer didn't immediately carry out the instruction - it didn't print out PROGRAMMING after we pressed Return. This is because of the line number. It tells the computer that what follows isn't to be done immediately but is to be remembered for later as it is just one in a series of instructions. I'll prove that the computer actually does remember it in a moment.

Now type:

```
20 PRINT "10" [Return]
30 PRINT "EASY" [Return]
```

What I'm going to ask you to do next should test your faith in me! Clear the screen by typing:

[Shift+Clear]

All your typing should have disappeared, but don't worry - your work hasn't been wasted. Because of the line numbers, the computer has kept

a list of your instructions in its memory. To see the list, type:

LIST [Return]

and your program should respond. We'll call it Program 1:

```
10 PRINT "PROGRAMMING"
20 PRINT "10"
30 PRINT "EASY"
```

Program 1

An important point coming up now. We have entered a program in numbered sequence of Basic instructions into the Atari's memory and have got the computer to display those instructions with LIST. We have not, however, told the computer to do those instructions. It's like having written a shopping list - you still have to go out to the shops and turn your list into reality.

So to get the computer to actually do, or as we say, run the program in its memory, we type:

RUN [Return]

and, if we've typed it in properly, we should see printed out:

```
PROGRAMMING
IS
EASY
```

If you've managed it, congratulations on running your first program. If not, don't worry, it's probably some simple error. List your program and look for the mistake. You might actually have a message telling you that there is an error in a particular line. What will be about to do next, although it assumes that you have been successful so far, will in fact show you how to correct your mistakes!

Now let's try to alter our program so that it prints out:

```
PROGRAMMING
IS
SIMPLE
```

If you look back at the first program you will see that you need to alter line 30.

Changing line 30 couldn't be

simpler — just type in the new line 30, remembering to start with the line number 30, then press Return. The latest version will replace the old version in the computer's memory.

To demonstrate this, type:

```
30 PRINT "SIMPLE" (Return)
```

and then:

```
LIST (Return)
```

You should obtain Program II which is:

```
10 PRINT "PROGRAMMING"  
20 PRINT "IS"  
30 PRINT "SIMPLE"
```

Program II

An examination of this listing should reveal that the new version of line 30 has indeed replaced the old one. (Notice also that we didn't precede LIST with a line number — we wanted the micro to do it immediately.)

As a final proof that our amendment has been accepted, type:

```
RUN (Return)
```

You should now get the revised message.

If you accidentally typed line 10 as:

```
10 PRINT "PROGRAMMING"
```

then, when you tried to run it you would get an error message.

To rectify such mistakes, simply retype the correct version of line 10 and press Return to enter it into the computer.

There are more sophisticated ways of correcting, or editing, a line, but they can wait for a while. For the moment we shall simply retype the line, with its line number, and press Return. Of course, if you notice a mistake while you are entering a line, use the Delete key to erase it, then continue typing from that point.

So far I have given you just two programs to run. However, using these as models, you can print out virtually any message you want on the screen, just use line numbers in increments of 10, each line printing out part of the message you want out on the screen, by enclosing it in quotes after PRINT.

An important point about this series is that I'm going to give you lots

of example programs to type in. Virtually all of them have two things in common:

- They make vital teaching points (otherwise they wouldn't be there in the first place).

- The output — that is, what appears on the screen — is trivial in content and in many cases there are far easier ways of doing it.

Programming is a skill like driving — you can only improve by doing it, not reading about it. Please carry out the examples, however silly or obvious they may seem to you.

Also, and this is far more important, I want you to go beyond the programs — try to alter, adapt and extend them, just to see what happens.

Adopt an experimental approach and a healthy scepticism for my pronouncements. If you are wondering whether something will work, go ahead and try it — you can't hurt the computer from the keyboard, so let your imagination run riot.

You'll learn far more from your own examples than you will by merely copying mine. And the good thing is that you get such prompt feedback from a computer. If what you write isn't acceptable you'll soon get an error message.

So what I'd like you to do now is to spend a good time writing simple "message" programs for the computer to run. For some reason, in my experience in computing classes the messages tend to become coffee snuffboxes. There's one thing I've never been too sure of — is it slander or libel when it appears on a VDU?

Remember, type NEW before each new program, and use line numbers for each instruction. It's also good policy to LIST your program before you RUN it, just to make sure that all is as you intend.

Now suppose we wanted to alter Program II so that it printed out the message:

```
PROGRAMMING  
IS  
RATHER  
SIMPLE
```

We need a line in there between 20 and 30 to print out RATHER. Well, 25 is a number between 20 and 30, so let's try:

```
25 PRINT "RATHER" (Return)
```

If you feel it you'll see that the program

has now become Program III:

```
10 PRINT "PROGRAMMING"  
20 PRINT "IS"  
25 PRINT "RATHER"  
30 PRINT "SIMPLE"
```

Program III

So line 25 has "crept in" between 20 and 30. Even though we entered it out of order, the Atari stores it in memory in its correct numerical position. Try running the program as final confirmation.

This ability to insert lines into programs is the reason our line numbers go up in steps of 10 when we are writing programs — it leaves us plenty of spare line numbers in between for when we are patching them up.

Now enter Program IV:

```
10 PRINT "NEW LINE"  
20 PRINT "RATHER"  
30 PRINT "NEW"
```

Program IV

remembering to press Return after typing each line.

Now LIST it. Is there a phantom line 25 in there? If so, you didn't type NEW after the last program — the lines 10, 20 and 30 of the latest program have replaced those lines in the old program. But as the new program doesn't have a line 25, the old one remains to ruin your program. The moral is to use NEW before entering a new program.

If you have got an unwanted line 25, don't worry — you can easily get rid of it by typing:

```
25 (Return)
```

This will delete the line since you replace the old line 25 with a new line which contains nothing — which the computer then "forgets". This method holds good for deleting any line from a program — simply type out the line number, then press Return.

I'd better explain what line 10 does: it clears the screen. I don't want to devote much space to it here, so let's just accept it for the moment — we'll explain it fully later in the series. You'll soon see that it works when you run the program.

Now let's try to print out all

message with blank lines between. We can use a line containing just PRINT to obtain a blank line, so Program V should do the trick:

```
10 PRINT "HELLO"
15 PRINT
20 PRINT "WORLD"
25 PRINT
30 PRINT "HELLO"
```

Program V

Now try Program VI:

```
10 PRINT "HELLO"
20 PRINT "HELLO!"
30 PRINT "HELLO!!"
40 PRINT "HELLO!!!"
```

Program VI

The output you will get is:

HELLOUTHERE

That is, each successive string is printed after the preceding one. The semicolon stops the next string being printed on a new line, "gluing" it to the end of the previous string printed.

Notice that since there are no spaces inside the strings, none appear between the words when they are printed out together.

Try to get the message to appear legibly by rewriting the program with appropriate spaces in the strings. Also notice that you can obtain the same output, far more simply, with Program VII:

```
10 PRINT "HELLO"
20 PRINT "HELLO AND THERE"
```

Program VII

However, as I said above, the programs I present to you are for making teaching points, which does not necessarily imply obtaining you the most efficient methods.

Experiment with joining up the output of successive PRINT statements with the use of the semicolon until you feel confident about it.

And now for something completely different.

Try running Program VIII. I think the effect is pretty impressive.

So far all our programs have

The ability to repeat a simple operation rapidly is what gives the Atari much of its power

```
10 PRINT "I"
20 PRINT "FEEL"
30 PRINT "HELLO!"
40 PRINT
50 PRINT
60 GOTO 10
```

Program VIII

merely copied back onto the screen what you have typed in. This program shows how, with the addition of one line (line 60), you can obtain a huge increase in the amount of output. It is this ability, to repeat a simple operation rapidly, that gives the Atari much of its power.

If things are happening a little too fast for you, you can temporarily suspend action by pressing:

[Control] + 1

This freezes the action until you press:

[Control] + 1

once more.

What is happening is that the computer follows lines 10, 20 and 30 and prints out:

```
I (line 10)
FEEL (line 20)
HELLO! (line 30)
```

followed by two blank lines. If you encounters line 60, which tells it to go back to line 10, it duly does so and prints out:

```
I (line 10)
FEEL (line 20)
```

and so on, until it reaches line 60, when it goes back to line 10 and so on ad infinitum. Notice that when the screen is full, it scrolls up to make more room.

Now the name for such a condition in a program, where you keep on repeating lines of code for the program lines are known, is a loop.

We say here that we are in an unconditional loop because we haven't given the program any conditions for it to cease repeating itself. This is bad programming

practice - completely unresponsive computers are not useful machines!

To stop such unconditional loops you have to interrupt them from "outside" by pressing the Break key. As you'll see, you get a message telling you which line the program stopped at.

If you want to have some fun with an unconditional loop, try Program IX. It repeatedly prints out an arrow composed of asterisks such as:

```

*
***
*****
*****
*****
***
***
***
***
```

which will scroll upwards off the screen.

Finally, apart from its being an unconditional loop, which is always

```
10 PRINT " "
20 PRINT " ***"
30 PRINT " *****"
40 PRINT " *****"
50 PRINT " *****"
60 PRINT " ***"
70 PRINT " ***"
80 PRINT " ***"
90 PRINT " ***"
```

```
100 PRINT
110 PRINT
120 PRINT
130 PRINT
140 GOTO 10
```

Program IX

might, can you see what else is going wrong with Program X?

◆ Next month we'll discover new ways to create programs.

```
10 PRINT "HELLO!"
20 PRINT "THIS IS!"
30 PRINT "YOUR HELLO!"
40 GOTO 10
```

Program X

130XE:



Part of the new Atari generation

THE first Atari computers, in the days when Acorns were only found on trees, were revolutionary to say the least. The 400 and 800 — both initially with 8k and subsequently with a massive 16k — featured such undreamed-of features as 256 colours, multiple sprites and a four channel sound chip.

Four years later a much upgraded unit — the 800XL, boasting 8k, enhanced graphics and a new operating system — was released.

Now Atari has done it again with the extensively re-styled 130XE. This 1.28k machine is based on the 800XL, so software written for that machine should work correctly on the new one.

Since the operating system is identical to that used on the 800XL, the "Translator" program will still be required for those programs which used "illegal" routines on the old 400 and 800 computers.

The Translator can be loaded from cassette or disc before running any program which works fine on a 400 or 800, but won't work otherwise on an XL/XE machine.

The 130XE is one of a series of computers in the proposed XE range — some of which will possibly not be seen in the UK, in the near future at least.

The 85XE is re-packaged 800XL; will probably not see daylight while the 800XL is still in the shops. The rumours say that the 8 bit portable 650XP has been scrapped in favour of

Assessed by ANDRE WILLEY

a 16 bit portable, and that the 65KEM music computer is in doubt too, since the 16/32 bit ST range will have MIDI music interfaces built in.

Atari could neither confirm or deny this, but did confirm that currently all production efforts are being channelled into providing good stocks of the 130XE, and in getting ready for the launch of the new 520ST in May/June.

The XE range will support a whole host of new peripherals, including three printers and four disc drives varying in storage from 130k to 15mbyte capacities.

The disc drives will be driven by DOS 2.5, an upgrade of the old DOS 2.0. It will allow access to all of the new densities, the extra RAM of the 130XE and files from the absorbent DOS 3.

The 130XE itself is a very sleek light-grey unit, looking similar to the keyboard portion of an IBM. The keys have a soft but positive feel and are slightly sculptured, which makes typing a joy.

The function keys (Start, Option, etc) now lie just above the main keyboard, somewhat inconveniently for a previous Atari user.

I would have hoped that the

System Reset button would have had a stronger spring than the others, as on the XL, but this has not been the case.

One interesting point is that the graphics symbols are now printed on the front of each key, making typing programs very much simpler.

The power switch is at the rear, adjacent to the socket which takes the transformer lead. Also provided on the rear panel are TV and video outputs, the serial bus connector for tape recorder, disc drives, printer, etc, and the re-styled cartridge and expansion ports.

The XE will support all of the add-ons for the XL range using the serial bus, and although there is no parallel bus interface, the expansion connector along with the cartridge port provide a supposedly compatible alternative.

These expansions designed for the XLs will hopefully work on the XEs with little or no modification and vice-versa. Such is the theory.

Switching on the machine behaves just like an 800XL. Basic will greet you with its "Ready" prompt and you may start to program, load games and so on.

The implementation is standard Atari Basic, although existing users will be glad to note that it is Revision C, the bug-free version.

It gives you, in addition to the normal PRINT, GOTOs and FOR ... NEXT loops, commands to handle the 16 graphics modes and 256



colours, the four sound generators, long strings (up to 32k) and complex input/output operations.

Although this Basic is somewhat dated now, it is still a good match for Spectrum Basic, and is vastly superior to the CBM 64.

If you require a much more sophisticated Basic, don't despair — try Basic-XL from OSS. This provides structured programming, full sprite/player/missile graphical control, advanced record handling and formatted PRINT statements, high speed memory access and transfer, full string handling, full error messages and much more.

It comes as an 8k cartridge and is upwardly compatible with Atari's own Basic — in fact it was written by the same programmers. This works fine with the XL, and provides so many useful features that since I received mine I have never used built-in Basic again.

The screen display is excellent with a normal TV and the graphics are sharper and more steady defined than on the XL range. However I found that when used with a monitor, there were vertical lines over the whole screen and the colour saturation was very poor — giving a generally waxy-waxy picture.

I hope that this was just a fault with my review machine, as Atari assured me, but I have heard stories of similar problems from some dealers.

My other gripe is the location and construction of the cartridge socket. It is very difficult to insert cartridges into the back of the machine, since you don't even see the socket without leaning over the computer. Also third-party cartridges have a tendency to wobble alarmingly. While this wasn't quite as bad as the famous Sinclair "Ram-Pack-Wobble" and it caused me no problems during testing with AtariWriter, Action!, Basic-XL, and Atari Artist, it could well cause problems as the unit gets older.

I was, however, pleasantly surprised by the manual. It is well laid out and a good introduction into programming in Basic.

It clearly explains the keys and how to write simple programs, with examples throughout and a set of

complete programs to type in at the end.

The appendices cover pin connections, accessing the extra RAM and Error messages. I feel that the book still doesn't go far enough and that some mention at least should be made of file handling (such as OPEN, CLOSE and KIO), PEEKs and POKEs, ARRAYS, maths functions and the memory map.

Still, all credit to Atari for listening to the customers' complaints regarding the pretty little colour pamphlets which were enclosed with the XL instead of an instruction book.

Taking the cover off and looking inside, the main circuit board is actually quite spacious and superbly laid out. The number of chips has been reduced wherever possible, which should make for a very reliable machine.

All the chips are inside a metal shield, thus reducing interference. The keyboard itself is backed by a solid metal plate and there is no tendency to sag in the middle.

Perhaps Sir Clive Sinclair could get a hint or two about how computers should be made?

Unfortunately, the report in last month's issue that the XL would contain the new CMOS 6902C chip was over optimistic and Atari has fitted the same CPU chip as used on the old XL range — the 6902C. This is a pity, but the difference would only be noticeable to a machine code programmer, anyway.

Overall, then, the 130XL is

basically a 128k version of the 800XL, and is upwardly software compatible. The styling, keyboard and documentation have been vastly improved and let's hope that the rather minor video problems will soon be sorted out.

Still, at £169.99, it is a very good buy indeed, offering far more for the price than the equivalent CBM, Acorn or Amstrad offerings. I don't really think that the Spectrum is quite in the running.

How to use that extra RAM power

WHEN you power up the computer, loading

PRINT PRICES

will print the number of bytes of memory available for your Basic program. This will normally read 32768 with nothing else loaded. This is about 37%, so what's all this about 128k?

Well, the 6902 chip, or Central Processing Unit (CPU), which does all of the hard work inside your machine, can access a maximum of 64k of memory at once. But the book said 128k...!

This means that within that 64k, memory must be the operating system (16k), Basic itself (8k), your text display (1k), various special information and pointers required by the OS and Basic (just under 2k). You



can put your program in the 37k that's left. (But what about...)

However, there is a loophole that Atari has exploited in the 13000. The 6502 can access up to 64k at a time. Why not, for instance, have two sets of 64k, storing your program in one set and perhaps data or display information in the other? This is basically what has been done.

We must always leave the operating system intact for programs to function correctly - that means leaving 48k to 64k well alone. Also, if we are using Basic then the area from 40k to 48k containing Basic itself must be left intact.

Screens will normally be in the 30k to 40k area, although we can change this to our advantage (see program listing on next page).

Your Basic program will start at about 3k, which leaves a nice block from 19k up to 32k or 34000 to 37FFF in hex, relatively free.

You can tell the computer to use either the "normal" 34000-37FFF memory, or one of four other "hidden" blocks inside the machine, four lots of 16k being the extra 64k of course. Let's see how it works in practice.

In Table 1 you can see the eight blocks of memory available for use and how they are allocated - think of them as two sets of four blocks. You may tell the computer that whenever you access memory between 34000 and 37FFF, you really mean to talk to one of blocks 0, 1, 2 or 3.

This will allow, for instance, a program that extends throughout most of the 37k free memory to "switch off" its middle portion and

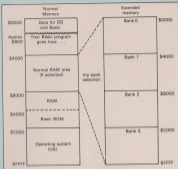


Table 1: Memory allocation

"switch on" an empty block of memory. You may then manipulate data, set up screens, or anything else you wish within that area.

After you have finished working with the extra block you give another POKE and your Basic program is back intact.

By the way, DO remember to make sure that you don't want to use any

lines of program that may be in that middle block while you've got it switched off! This would cause a disaster and Basic would probably crash or lockup.

The safest way is to write a small routine at the start of the program to handle the memory switching and usage, then GOSUB to it whenever you want to use the additional

Bit	Value	Description
*0	1	Operating system select 1 = Operating system ROM enabled at 50000 0 = RAM enabled at 50000
*1	0 from Basic, 1 from m/byte	Basic ROM select 1 = RAM enabled at 50000 0 = Basic ROM enabled at 50000
2	1	Memory bank select (bit 0) (See text for full description) (Named: 340 - 150 of secondary bank address)
3	1	Memory bank select (bit 1) (See text for full description) (Named: 341 - 151 of secondary bank address)

Bit	Value	Description
4	1	CPU bank enable (CBE) 1 = 6502 uses Normal memory bank at 34000 0 = 6502 uses Extended memory bank at 34000
5	1	Video bank enable (VBE) 1 = Arnie uses Normal memory bank at 34000 0 = Arnie uses Extended memory bank at 34000
*6	1	Reserved for future use (Unused on the 13000)
*7	1	Self-test ROM select 1 = RAM enabled at 35000 0 = Self-test ROM enabled at 35000

*Don't change these bits unless you know what you're doing

Table 2: Use of memory location 34017 (35000)

memory (see example program).

So far we have treated this switchable bank of memory as being simply normal memory, or one of four other extended blocks of memory. In fact, just to make the whole issue more complicated, it can be both at the same time.

This is not quite as daft as it sounds, and is easier to understand if you remember that an Atari actually has two, not one, CPU chips. The 6502 is the main one, which does all of the work for Basic and input/output.

However, there is a second processor called Antic which is solely devoted to generating the screen display. This also accesses memory in order to do its job. You can tell Antic and the 6502 to access different banks of memory.

For example, in the above case, if you wanted to use the Basic program at \$4000 while you were displaying a screen from bank 1, you couldn't. But by telling Antic to use bank 1 for its display, and the 6502 (which handles Basic programs, remember?) to use normal memory, you have accomplished both tasks at the same time.

You can't of course tell the CPU to change the display data while you're in this mode - it doesn't see the same memory as the display chip.

This means that any graphics commands, PLOTs and DRAWTDs, etc., must be done when the CPU is accessing the memory containing the screen data, and the middle of the Basic program is switched off. You can still use SETCOLOR, though, which doesn't actually change the contents of the display area.

One memory location is used to control all of the switching. This is location \$4017 (\$D001 for machine code users). Each individual bit within that location does a different job, as described in Table II (see last month's Bit Wise article if you're not familiar with bits and bytes).

Bits 1, 2 and 8 must always be 1, and bit 1 must be 0 (from Basic; that is - do what you like from machine code, but remember to take over system control from the OS before you switch it off). This gives a base value of $128+64+1$ (or 193) to POKE into \$4017. The extra bit values to add on are worked out as follows.

Bits 2 and 3 tell the computer which of the four alternative blocks to

use. Bit 4 tells the 6502 CPU to use either Normal or Extended mode (that is normal memory, or the extra block selected by bits 2 and 3). Bit 5 tells Antic whether to use normal or extended memory for its display (assuming Antic wants to use the 16k - 32k area, that is).

Thus, for:

Bank 0, add 0 to the POKE,
Bank 1, add 4 to the POKE,
Bank 2, add 8 to the POKE,
Bank 3, add 12 to the POKE.
CPU 'Normal' Mode: add 16 to the POKE,
CPU 'Extended' Mode: add 0 to the POKE.
ANTIC 'Normal' Mode: add 32 to the POKE,
ANTIC 'Extended' Mode: add 0 to the POKE.

To set the memory usage, use:

**POKE \$4017,128 + Bank Value
(Bank) + CPU Mode + ANTIC Mode**

To reset the memory back to normal, use:

**POKE \$4017,128+128+16
or POKE \$4017,253**

Example 1: To set the CPU to 'Normal' memory, and ANTIC to Bank 0:

POKE \$4017,128+0+128+0

Example 2: To set the CPU to Bank 1, and ANTIC to 'Normal' memory:

POKE \$4017,128+4+128+0

Example 3: To set the CPU and ANTIC to Bank 3:

POKE \$4017,128+12+128+0

You will quite quickly get used to working with location \$4017 as a matter of course, and it is far easier to use and more versatile than trying to get all the extra 16k on the 6502.

If anyone finds any interesting applications for the extra memory write in or send a listing of your program.

Above all, don't be afraid to experiment. Once your programs is saved, no matter what you do to the memory you can always switch off and start again if things go wrong. Have fun!

My special thanks to Software Express, of Basingstoke, for the kind loan of the very first 1200k II Plus!

Example program

This program can only be used on a 1200k computer. If you haven't got one, add the line:

END SCREEN

or try using the pattern drawing routines separately to see some pretty displays.

Type in the listing, check it is correct, and SAVE it. When you run it a pattern will quickly be drawn. This will be left on the screen while the computer draws more patterns in other banks of memory (the screen will flash to let you know it's still working).

Once the screen has stopped flashing press keys 1 to 6 to view the pictures. Press Esc to stop the program. Try not to use Break to stop it, as you will confuse the computer into displaying the wrong screens, giving strange rubbish all over the screen.

You may experiment with the five pattern-drawing sections. Try changing some of the numbers in the loops to get different patterns. Start by setting one of the FOR 1-1 to 300 loops to a step value of 30.

```

100 REM
110 REM
120 GOTO 330:REM Jump to next program
130 REM
140 REM
150 REM *****
160 REM *****
170 REM *****
180 REM *****
190 REM *****
200 REM *****
210 REM *****
220 REM *****
230 REM *****
240 REM *****
250 REM *****
260 REM *****
270 REM *****
280 REM *****
290 REM *****
300 REM *****
310 REM *****
320 REM *****
330 REM *****
340 REM *****
350 REM *****
360 REM *****
370 REM *****
380 REM *****
390 REM *****
400 REM *****
410 REM *****
420 REM *****
430 REM *****
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450 REM *****
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770 REM *****
780 REM *****
790 REM *****
800 REM *****
810 REM *****
820 REM *****
830 REM *****
840 REM *****
850 REM *****
860 REM *****
870 REM *****
880 REM *****
890 REM *****
900 REM *****
910 REM *****
920 REM *****
930 REM *****
940 REM *****
950 REM *****
960 REM *****
970 REM *****
980 REM *****
990 REM *****

```

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VARIABLES

CPU Sets CPU mode for subroutine at 200.
ANTIC Sets Antic mode for subroutine at 300.
BANK Sets Bank number for subroutines at 200.
I Angle value for graphics drawing loops.
J Repeat value for graphics drawing loops.
CR Ascii code of last key pressed if valid, converted to a number between 1 and 50.

FUNCTIONS

100 Jumps past subroutine.
200-280 Check values, and set bank select. Could be re-used for your own ideas. Just set variables Antic, CPU and Bank, and GOSUB 200.
300 Sets screen to 20k and draws patterns in depress.
370-450 Set normal memory and draw pattern 1.

470-550 Set CPU to Bank 0, leave Antic on normal memory and draw pattern 2.
610-690 Set CPU to Bank 1, leave Antic on normal memory and draw pattern 2.
730-810 Set CPU to Bank 2, leave Antic on normal memory and draw pattern 3.
850-930 Set CPU to Bank 3, leave Antic on normal memory and draw pattern 4.
1010 GOSUB to set colours.
1070-1120 Get a key. If 1-8, GOSUB accordingly, if Esc, exit to Basic. Otherwise get another key.
1170-1190 Set Antic and colours for picture 1.
1240-1260 Set Antic and colours for picture 2.
1310-1330 Set Antic and colours for picture 3.
1370-1390 Set Antic and colours for picture 4.
1440-1470 Set Antic and colours for picture 5.
1520-1530 Subroutine 1 to set colour registers.
1580-1600 Subroutine 2 to set colour registers.

```

380 GOSUB 1111
390 FOR I=0 TO 500 STEP 5
400 COLOR 0:PRINT 0$,0:GOTO 1001
1001FOR I=0 TO 500 STEP 5
430 NEXT I
450 GOTO 1001
460 GOTO 1001
470 LET CPU=ANTIC:GOTO 1001:GOTO 200
480 GOSUB 1111
490 COLOR 1:FOR J=0 TO 70 STEP 2
500 PRINT 11,PRINTING:FOR I=0 TO 500
510 ...
520 PRINT 12,PRINTING:FOR I=0 TO 500
530 FOR I=0 TO 500 STEP 50
540 PRINT 13,PRINTING:FOR I=0 TO 500
550 ...
560 PRINT 14,PRINTING:FOR I=0 TO 500
570 FOR I=0 TO 500 STEP 50
580 PRINT 15,PRINTING:FOR I=0 TO 500
590 ...
600 PRINT 16,PRINTING:FOR I=0 TO 500
610 GOTO 1111
620 FOR I=0 TO 70 STEP 2
630 PRINT 17,PRINTING:FOR I=0 TO 500
640 ...
650 COLOR 0:PRINT 18,0:FOR I=0 TO 500
660 FOR I=0 TO 500 STEP 50
670 PRINT 19,PRINTING:FOR I=0 TO 500
680 NEXT I
690 GOTO 1001
700 NEXT J
710 GOTO 1001
720 GOTO 1001
730 PRINT 20,PRINTING:FOR I=0 TO 500
740 ...
750 LET CPU=ANTIC:GOTO 1001:GOTO 200
760 GOSUB 1111
770 COLOR 0:FOR J=0 TO 70 STEP 2
780 PRINT 21,PRINTING:FOR I=0 TO 500
790 NEXT I
800 GOTO 1001
810 GOTO 1001
820 PRINT 22,PRINTING:FOR I=0 TO 500
830 ...
840 PRINT 23,PRINTING:FOR I=0 TO 500
850 ...
860 PRINT 24,PRINTING:FOR I=0 TO 500
870 ...
880 PRINT 25,PRINTING:FOR I=0 TO 500
890 ...
900 PRINT 26,PRINTING:FOR I=0 TO 500
910 ...
920 PRINT 27,PRINTING:FOR I=0 TO 500
930 ...
940 PRINT 28,PRINTING:FOR I=0 TO 500
950 ...

```

```

790 PRINT 29,PRINTING:FOR I=0 TO 500
800 FOR I=0 TO 500 STEP 50
810 PRINT 30,PRINTING:FOR I=0 TO 500
820 ...
830 NEXT I
840 NEXT J
850 GOTO 1001
860 GOTO 1001
870 LET CPU=ANTIC:GOTO 1001:GOTO 200
880 GOSUB 1111
890 COLOR 1:FOR J=0 TO 70 STEP 2
900 PRINT 31,PRINTING:FOR I=0 TO 500
910 ...
920 PRINT 32,PRINTING:FOR I=0 TO 500
930 ...
940 PRINT 33,PRINTING:FOR I=0 TO 500
950 ...
960 PRINT 34,PRINTING:FOR I=0 TO 500
970 ...
980 PRINT 35,PRINTING:FOR I=0 TO 500
990 ...
1000 NEXT I
1010 GOTO 1001
1020 GOTO 1001
1030 PRINT 36,PRINTING:FOR I=0 TO 500
1040 ...
1050 PRINT 37,PRINTING:FOR I=0 TO 500
1060 ...
1070 PRINT 38,PRINTING:FOR I=0 TO 500
1080 ...
1090 PRINT 39,PRINTING:FOR I=0 TO 500
1100 ...
1110 PRINT 40,PRINTING:FOR I=0 TO 500
1120 ...
1130 PRINT 41,PRINTING:FOR I=0 TO 500
1140 ...
1150 PRINT 42,PRINTING:FOR I=0 TO 500
1160 ...
1170 PRINT 43,PRINTING:FOR I=0 TO 500
1180 ...
1190 PRINT 44,PRINTING:FOR I=0 TO 500
1200 ...
1210 PRINT 45,PRINTING:FOR I=0 TO 500
1220 ...
1230 PRINT 46,PRINTING:FOR I=0 TO 500
1240 ...
1250 PRINT 47,PRINTING:FOR I=0 TO 500
1260 ...
1270 PRINT 48,PRINTING:FOR I=0 TO 500
1280 ...
1290 PRINT 49,PRINTING:FOR I=0 TO 500
1300 ...
1310 PRINT 50,PRINTING:FOR I=0 TO 500
1320 ...
1330 PRINT 51,PRINTING:FOR I=0 TO 500
1340 ...
1350 PRINT 52,PRINTING:FOR I=0 TO 500
1360 ...
1370 PRINT 53,PRINTING:FOR I=0 TO 500
1380 ...
1390 PRINT 54,PRINTING:FOR I=0 TO 500
1400 ...
1410 PRINT 55,PRINTING:FOR I=0 TO 500
1420 ...
1430 PRINT 56,PRINTING:FOR I=0 TO 500
1440 ...
1450 PRINT 57,PRINTING:FOR I=0 TO 500
1460 ...
1470 PRINT 58,PRINTING:FOR I=0 TO 500
1480 ...
1490 PRINT 59,PRINTING:FOR I=0 TO 500
1500 ...
1510 PRINT 60,PRINTING:FOR I=0 TO 500
1520 ...
1530 PRINT 61,PRINTING:FOR I=0 TO 500
1540 ...
1550 PRINT 62,PRINTING:FOR I=0 TO 500
1560 ...
1570 PRINT 63,PRINTING:FOR I=0 TO 500
1580 ...
1590 PRINT 64,PRINTING:FOR I=0 TO 500
1600 ...
1610 PRINT 65,PRINTING:FOR I=0 TO 500
1620 ...
1630 PRINT 66,PRINTING:FOR I=0 TO 500
1640 ...
1650 PRINT 67,PRINTING:FOR I=0 TO 500
1660 ...
1670 PRINT 68,PRINTING:FOR I=0 TO 500
1680 ...
1690 PRINT 69,PRINTING:FOR I=0 TO 500
1700 ...
1710 PRINT 70,PRINTING:FOR I=0 TO 500
1720 ...
1730 PRINT 71,PRINTING:FOR I=0 TO 500
1740 ...
1750 PRINT 72,PRINTING:FOR I=0 TO 500
1760 ...
1770 PRINT 73,PRINTING:FOR I=0 TO 500
1780 ...
1790 PRINT 74,PRINTING:FOR I=0 TO 500
1800 ...
1810 PRINT 75,PRINTING:FOR I=0 TO 500
1820 ...
1830 PRINT 76,PRINTING:FOR I=0 TO 500
1840 ...
1850 PRINT 77,PRINTING:FOR I=0 TO 500
1860 ...
1870 PRINT 78,PRINTING:FOR I=0 TO 500
1880 ...
1890 PRINT 79,PRINTING:FOR I=0 TO 500
1900 ...
1910 PRINT 80,PRINTING:FOR I=0 TO 500
1920 ...
1930 PRINT 81,PRINTING:FOR I=0 TO 500
1940 ...
1950 PRINT 82,PRINTING:FOR I=0 TO 500
1960 ...
1970 PRINT 83,PRINTING:FOR I=0 TO 500
1980 ...
1990 PRINT 84,PRINTING:FOR I=0 TO 500
2000 ...

```

```

1100 GOTO 1001
1110 GOTO 1001
1120 GOTO 1001
1130 GOTO 1001
1140 GOTO 1001
1150 GOTO 1001
1160 GOTO 1001
1170 GOTO 1001
1180 GOTO 1001
1190 GOTO 1001
1200 GOTO 1001
1210 GOTO 1001
1220 GOTO 1001
1230 GOTO 1001
1240 GOTO 1001
1250 GOTO 1001
1260 GOTO 1001
1270 GOTO 1001
1280 GOTO 1001
1290 GOTO 1001
1300 GOTO 1001
1310 GOTO 1001
1320 GOTO 1001
1330 GOTO 1001
1340 GOTO 1001
1350 GOTO 1001
1360 GOTO 1001
1370 GOTO 1001
1380 GOTO 1001
1390 GOTO 1001
1400 GOTO 1001
1410 GOTO 1001
1420 GOTO 1001
1430 GOTO 1001
1440 GOTO 1001
1450 GOTO 1001
1460 GOTO 1001
1470 GOTO 1001
1480 GOTO 1001
1490 GOTO 1001
1500 GOTO 1001
1510 GOTO 1001
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1600 GOTO 1001
1610 GOTO 1001
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1630 GOTO 1001
1640 GOTO 1001
1650 GOTO 1001
1660 GOTO 1001
1670 GOTO 1001
1680 GOTO 1001
1690 GOTO 1001
1700 GOTO 1001
1710 GOTO 1001
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1880 GOTO 1001
1890 GOTO 1001
1900 GOTO 1001
1910 GOTO 1001
1920 GOTO 1001
1930 GOTO 1001
1940 GOTO 1001
1950 GOTO 1001
1960 GOTO 1001
1970 GOTO 1001
1980 GOTO 1001
1990 GOTO 1001
2000 GOTO 1001

```

Well-named Colossus

ENGLISH Software just ran what you'd call modest about their **Colossus Chess 3.0** package. In all their literature, and even in the manual, it's billed as "the best chess playing program for Atari computers".

Maybe that only makes it a big fish in a small pool, because there aren't that many alternative chess programs for the Atari.

However, before I see how it would fare in the bigger pool that includes other micros, let's look at what it offers.

I was glad to see that the program allows you to use a cursor to specify your move. You simply position it on the piece to be moved, press Return, position it on the square to move to, and press Return again.

I find this much easier than the more common "a2-a4" format. However, if you want to do it that way, the program will allow it.

As chess programs go this one is very comprehensive. I'll consider its standard of game faster, but the extent of its features is very impressive.

An enormous variety of levels can be selected by varying the amount of time the program has to select a move.

Full tournament mode can be selected or you can play an all-the-moves game in which the total game time is specified.

You can even introduce a handicap for the program or yourself if you're that good by putting some time on one of the clocks before the game starts.

There's an "equality" mode in which the program will try to keep its clock as close as possible to your own, so if you can move quickly you can force the program to do the same.

There are plenty of other features too, like the replay facility enabling you to see how the game got to its present state. A useful tutorial feature is the "legal moves" option which will show all such moves for any piece selected.

The program can also be

used to set up and solve chess problems, and not just the usual "white to move and mate black in five moves" type.

It claims to be the first home computer chess program ever to be able to solve castles and rookmates, and as far as I know the claim is true.

On features alone then, it's probably fair to say that Colossus is the best chess program available for the Atari.

The manual gives a good description of all the features and how to use them, and fully describes all the different sections of the screen display. In fact there's only the manual that I found to criticize. The content is fine, but the presentation is awful. It's printed in black on red paper — not a pretty sight.

It looks to have been photo-reduced to this size from A4 dot matrix printer output, which doesn't help, and you'll need a magnifying glass to read the loading instructions.

To consider whether the program is anything more than a big fish in a 48K pool we need to look at the standard of its game.

Rather than describe in detail how the program here me to check, which doesn't

say much, there's a table at the end of the manual which gives the results of Colossus v The Real.

The program was tested against over 30 other programs in a variety of machines ranging from the IBM to the Apple. Against each one a series of 16 games was played on various levels with an equal number of whites and blacks for each program.

Colossus beat them all — most of them by 16 games to nil. Sargon II, widely recognized as an excellent program, went down 10-6. Parker Chess, another Atari version, went down 12-4, while Atari's own version lost 15-11. White Knight III it won only three of its 16 games.

About a year ago Colossus Chess 3.0 for the Commodore 64 was advertised as "the finest chess program ever written". I'd have been interested to see how 3.0 fared against its predecessor.

Since both were written by Martin Bryant we can assume that 3.0 would win ... but by what margin? How much improving can he do?

As the manual points out, the same set of results could not be guaranteed in every set of 16 games. Nevertheless, even if the results are taken as only a rough guide, they show

Colossus to be up there with the best of them.

Colossus Chess 3.0 comes on 48K cassette or disc, with prices of £9.95 and £12.95 respectively. To call it the best chess program for the Atari might just be damning it with faint praise!

Dave Russell

One for joystick jockeys

AS they say on all the best awards shows, "It takes their in reverse order". Last month we reviewed Smash Hits volumes 1 and 2, this month it's look at Volume 1.

Like the other two volumes, it opens with **Jet-Set Jack**. This is probably the best known of the English Software games, which is presumably why they include it on all three volumes. It's a good game, so I'm not complaining.

Next is **Don Dillman Back**, the sequel to Diamonds from Volume 2. English Software

obviously watch the same events shown. Once again Dan rallies forth (or rather slouch with his spoils as he dips his way to the diamond on level 6. Of course like the Bob, and a variety of other names are out to stop him.

For the money this is miles better than the original. It's been a smash hit in our household—we've played it for hours and nobody's got beyond level 5 yet.

Next comes **Hypertalk**, which is exactly what you'd expect a game of that name to be. If it moves, blast it!

These sort of games are great if you like them, and I classify it as moderation. **Hypertalk** will give your joystick and thumb plenty of exercise as you dodge the enemy, although it has the simplest space warp I've ever seen. Still, you only step between levels so the quality of play isn't affected.

In **Captain Blotky's Gold** you play the first of the captain's hapless crew member who gets to die for the gold. Level 1 starts off nice and easy, with only some fish and an air tank to avoid while you're grabbing the gold.

Of course your oxygen is being used up all the time you're under water. You replenish your tanks by replenishing, but there is also a time gauge which shows how long you have left to complete the level.

When you've collected 10 bars of gold you move to the next level, where things are a

little harder. If you can complete eight levels you move to the next difficulty zone.

If **Hypertalk** is for the social addict, **Captain Blotky's Gold** starts off simple enough for the novice or the younger members of the family.

Finally, **FireHeat** calls for arcade reactions with a high level of precision. Your task is to steer your space cruiser through a series of canyons populated by tanks. It's a sort

of vertical *AirStrike*, with the steering being really well done.

I found it a bit strange at first, because the game starts from bottom to top, giving the impression of downward motion. Most other games start in the other direction.

The game requires a bit of strategy, a fair amount of selective shooting, and a lot of precision steering. If you hit the wall you're dead, and sometimes there's not much

room. Fortunately, response to the joystick is excellent.

FireHeat is a difficult game—it took me a few minutes to get anywhere—and the frustrating thing is that you are returned to the beginning when you get killed off. If you like a challenge, this one's for you.

All in all, if you're a joystick jockey that Volume 1 is good value for money at £14.99 for the tape and £17.99 for the disc.

Pat Cookson

KEEP AN EYE OPEN FOR LUIGI

ONE of the features of the new Atari disc package is the inclusion of a new adventure game, **The Pay-Off**. Fortunately for this reviewer, who already owns a complete Atari library, the game is also available in its own right from "all good Atari stockists".

The game is a double first for Atari, being both their first disc game and also their first adventure. Based on this worthy effort, we can only hope that it won't be their last.

Despite the recent trend towards graphic adventures, Atari chose to launch a text-only game, billed in publicity as "an adventurous adventure". This may be seen in some quarters as Atari once more swimming against the tide, but the tide is mightier than the gale, as any real adventure will assert.

You start out as a small time hoodlum determined to stake your last few dollars on a hopeless nag, a tank outside that only an out-and-out bear would tank. Unfortunately, as you quickly discover, Luigi, it whose overly biting shop assistant it is no need to extend your credit. In fact he's calling in your marker, and boy does he mean business!

Leaving the shop, Society it needs for, the threat of a quick trip to the bottom of the river ringing in your ears, you begin a search for some quick cash—\$5,000 greenbacks to be exact.

The lack of immediate exits soon had me climbing the wall,

but the writers were one jump ahead and the real route to success was nothing more than a pipe dream.

Once over these initial obstacles I soon found plenty of real life places to explore and objects to use. I also discovered a mischievous sense of humour lurking beneath the surface. Just my climbing the fence is the car park.

In fact I found myself nose and more saving my game-position and deliberately "dying" in order to enjoy the author's sense of humour.

The beauty of this adventure is that the more you think yourself into the character the easier it is to solve the various problems. A desperate situation calls for desperate measures, and at least two of the obstacles which confront you require a degree of violence to overcome them. Not so much though, or you will provoke a swift reprisal.

The game has several distinct phases, ranging from "What on earth am I supposed to be doing?" which is not entirely clear at the outset, to a phase where everything is proceeding in a straightforward manner.

This leads the astute adventurer to think that the solution to the game is a fairly obvious one. Many objects and places are found which

lead the villain of the piece, you, to the rear of the Bank of New Jersey in search of a fabulous gem which, used on the street has it, could be the answer to all your problems.

Yet the greatest crime has been perpetrated (ironically I might add) by the programmers, who have allowed the adventure just enough rope to hang himself.

While it is possible to gain access to the bank—and to explore it, despite the duty guard—one very important piece of equipment is recovered where only the most persistent adventurer will locate it without difficulty. In fact, you've been fooled!

The problem with reviewing an adventure such as **The Pay-Off** is that the game revolves around solving problems after problems, each new success allowing more of the adventure to reveal itself.

It evokes a unique atmosphere so essential in preventing such games from becoming mere exercises in problem solving, and yet it fails to solve the problem. Suffice it to say that Luigi left this adventurer peering warily over his shoulder for any sign of Luigi and his boys as he crunched at the wall door, propping his last coin bar.

Eric Gibson



A micro version of Indiana Jones?

FITFALL II from Activision is a follow-on from their original *Fitfall* game. And what a follow-on it is — a levels-and-ladders game with extra surprises.

The best surprise came in the form of an instruction booklet in French, German, Italian, Spanish and Dutch.

Not a mention of English — but from my scanty knowledge of French I managed to establish that you were Harry around a sort of Minoan-Ionian-Jonoid, searching a huge underground cavern for his steed, Rhinoceros.

You must also find his pet cat, Geronimo, a big diamond and a stone rat.

Collecting gold bars on the way to boost your points score seems to be the heart of the matter.

The quest starts on a red cross at the edge of a forest and as you progress to the cave you start to meet the enemy — the most vicious bunch of creatures that you could ever hope to see ever in.

They take the form of frogs, ducks, bats and scorpions to name but a few, and they're all out to make life extremely unpleasant for you.

On the first level the frog

do their utmost to prevent you going down ladders to the next platform.

The bats and ducks are out to stop you in your tracks by flying across the screen with your head as the prime target, while the scorpions are continually attracted to your rather exposed for the same reason.

This is certainly not a game for the faint-hearted.

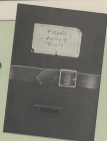
At the bottom of the cave there is an underground river full of different varieties, but to collect all the gold bars you must take your chance with these sooner or later.

You can in fact end up taking an unexpected ducking by misjudging some of your earlier leaps. There's no harm in that, though, as our hero is an excellent swimmer with a mega-lung capacity.

I'd keep an eye open for the cat, though — they're a few strokes in size.

In another part of the cave a waterfall clearly conceals one of the gold bars and you can only get at it by fishing a bit on a passing balloon. A quick grab for the rope and it's up and away.

And it's here that those infernal bats turn out to be a



Missing in *Cligulot*.

If you can manoeuvre the balloon into the path of one of them, the balloon bursts and you drop off on the ledge below.

Your ultimate target, a gold ring, can only be accessed by a well-judged death-defying leap from one of these ledges to a small platform halfway down the cave.

Success automatically transports you to level two, which is a larger cave with more enemies and, I suspect, more gold bars and other treasures.

I say suspect because, as yet, I haven't been able to get any further. It's got something to do with the plants and giant ants — different hazards to contend with on this level.

Contact with any of these, as well as the earlier enemies,

results in your return to the last red cross you walked over, and you lose some of your points.

One thing you don't lose, though, is your life, and this means the game can't last as long as you want it to.

A catchy tune plays throughout — quite entertaining in its own right, however, I was a little disappointed with the graphics, as I don't think they use the Atari's capabilities to the full.

Another game only supports joysticks, which is a shame and obviously rules out a lot of Atari owners who can only access the keyboard.

When played apart, the game is extremely addictive, great fun to play, and the number of levels to come will maintain a mystery to me until I get some more practice.

David McLachlan

OUTDO THOSE GREMLINS



All is peaceful in the garden, in this US state offering. **Mr Do** is going about his normal business harvesting the cherries when from behind a toadstool a hideous creature suddenly tears its ugly head.

Can it have eaten a P? Well this year's cherry harvest be in ruins? Will Mr Do end up caught by the gremlins?

You mean Mr Do around the garden is an attempt to control all the cherries. As you move through the long grass you clear a path behind you.

The gremlins, these 'em, appear at regular intervals from a central toadstool, and normally travel along the clear pathways in heri pursuit.

You can corner them for a while but when things get tough, and believe me they will, you can always send your crystal ball zig-zagging along the pathway in an effort to dispose of them.

Scattered around the garden are several large apples, and by clearing a path underneath them you can

make them drop, hopefully onto an orange that you've advanced to entire undergrowth.

If you lack anything like wine you'll finish up squashed more often than the meemie.

If you're feeling brave you can always try an all out assault on the central toadstool to pain extra points.

This is an extremely addictive game, great fun to play, and is a must for the repertoire of any serious arcade addict.

Paul Hewitt

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ARCHON is brilliant. There's something in it for all games addicts; arcade, adventure and strategy are all here. My only complaint is that it's best played against a human opponent - the computer's just too good and you can't give it a handicap.

Bryan Skinner
Personal Computer News

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Find out how to use your Atari to link up with the world network of communications in this special 12 page section

DO you remember the days when you got your first Atari? It was love at first sight, wasn't it? Those rapturous hours at the keyboard, those agonies of frustration coupled with the mind-bending moments of triumph when you actually got the thing to do something.

Happy days, or at least they were for me. Still, like all infatuations it gave way to a more mundane love-hate relationship. Mirrors were still existing, but the first things had gone, never to be revisited. At least that's what I thought until I was introduced to the world of comms. Then that was it. Coms was the debaucher, "man of the micro world". "I can take Atari or leave them" attitude. I was hooked, demented, crazed, I'd joined the hacking fraternity!

If you're wondering what comms means, it's short for communications - in this case, communications between micros via the telephone lines. It sounds so innocent, doesn't it? Then I suppose harpin doesn't look too bad, but once you get hooked...

It started when a friend of mine who works for Atari User lent me a modem - that's the gadget for attaching a micro to the phone system - and his black book of bulletin board numbers.

A bulletin board is just an electronic notepad that you can leave messages on. And, of course, you can scan the messages other users leave.

It appears innocuous enough, doesn't it? But it's not. From my first session I was in its grip.

The messages are absolutely fascinating. There are people asking for (or supplying) help with programming problems, people swapping their experiences with various software packages (especially adventures), people airing their opinions on everything from politics to piano playing.

There are second-hand and swap pages - everything from cars to wines, pages of micro-news, gossip... the list goes on and on. You can even see job advertised.

In my quieter, reflective moments (when the wife insists on using the phone) I think the attraction is the fact that microcomputing is normally such a lonely business.

As soon as you get into comms you're freed from your isolation. It's amazing how many interesting, like-minded fellow maniacs there are out there!

And then there's the free software. Most bulletin boards have software for downloading, as it's known.

A lot of it is excellent quality - and it's free! Even if I've no need for it I can't resist having it. The boards also

carry the phone numbers of other boards, which carry numbers of yet other boards... and so on ad infinitum.

Of course, as with all addictions, you move on to harder stuff. My encounters with bulletin boards led inexorably onto flirting with Prestel. No hobbyist bulletin board this, but a nationwide commercial network based on a series of powerful mainframes.

It's got scorefuls of information, latest news, special interest groups and software to download - although this time you have to pay. (My habit was getting serious by now.)

Still, you can get everything from train timetables to holiday bookings, electronic shopping to interactive adventure games. You can spend days on Prestel (I did) and not exhaust the possibilities.

And then I discovered Telecom Gold. It's not a dinky product, no matter how it sounds. It's an incredibly sophisticated electronic mail system, a sort of mega-bulletin board.

I was lucky to get in at the beginning of MicroLink, one of the latest developments in Gold, as aficionados refer to it. This is a joint development between Telecom Gold and the people behind Atari User and promises to be the most addictive comms source yet.

For a start, everyone gets their

own electronic mailbox. If, like me, you can't wait to open your mail in the morning, you'll enjoy logging onto the system (as simple as it is to know). There's a fresh crop of letters every few hours.

When I first logged onto it, MicroLink was in the development stage, so there were only magazine editors and the like to write to. By the time you read this, though, there should be hundreds of real people sharing the fun.

Mind you, MicroLink isn't just restricted to sending letters to people, although there are extremely powerful facilities for doing so - I haven't even touched on.

There's a notice board and a mass powerful bulletin board. You can chat with anyone who happens to be "on-line" to the computer at the same time as you are. You can find out which dealer's selling the equipment you want at the price you want. The list of facilities goes on and on.

How could I resist? The truth is I didn't even try. Every spare minute I got I'm on the Atari communicating! I suppose really I should start mauling:

Go mother, tell your children,
Never do what I have done

Or suggesting that every modern should have a government health warning.

Perhaps I should... but I won't. Comms is just too much fun.

Hooked on hacking

PETER ATKINSON confesses his communications addiction!

PETER TOOTILL
explains the
advantages of
using your
Atari computer
for interactive
communication

ONE of the most interesting of modern methods of communication is the bulletin board system — often referred to as a BBS.

So what is such a system? The idea started in the USA, when a computer club decided that pinning messages to other members and notices onto a cork board on the wall was a bit too much behind the times for a high technology club like theirs.

They decided to hook a computer to a telephone and allow people with modems and minis, or even ordinary terminals, to dial in and leave their messages on the computer instead.

As modems were even then priced within the reach of the hobbyists in the USA, the idea was very successful.

It was soon taken up by other clubs and also by individuals, with the result that today there are at least 1,000 public and private BBSs operating in North America — and probably considerably more.

Since those early days the software that controls such systems has developed enormously and you can run a BBS on most of the popular minis available in the USA.

British BBS software is still on the ground as yet, but some programs are being developed.

Bulletin boards will allow users to do a wide range of things, but the main emphasis is still on the traditional message and mailbox facilities.

For example, on most BBSs messages can be private or public, general interest or collected into special categories. They will tell you if you have a message waiting when you call, and also let you search for messages on a particular subject.

Other features that you will find on a BBS include information and news files, help for inexperienced users, software to download, games and diversions, commercial sections and even advertising.

The reason I prefer using bulletin boards to Prestel or Microtel, which are the other systems readily

Get your across bulletin

available to the home micro user, is that they provide a very interactive type of environment, completely different in character to viewdata systems such as Prestel.

With a BBS you are always able to respond to the information on the system.

If you see something that interests you, you can leave a message about it, either to the originator of the item or to anyone else who calls the system.

In fact exchanging messages is really what BBS are all about.

There will always be a good bit of straightforward information on such systems, but it is usually there in a secondary role. For example there will probably be:

- Information about the system itself and how to use it.
- Information about particular subjects in the special interest sections.
- Files you can download into your own micro.
- Telephone numbers of other systems.

But unless the system has a particular theme of its own, you are unlikely to find much information of general interest on it.

If you are looking for train times, weather reports, financial information, hotel bookings and suchlike the large commercial systems such as Prestel are the place to go.

There is, of course, a certain amount of overlap between Prestel systems and BBS. You will find some news about the micro scene on Microtel and Newfile 258 on the Prestel system, and also on some

message on a board

BBOs. But on the whole the Prestel systems are very much more one way.

They do have response frames, or places where you can leave messages to the operators of the database concerned, but they don't normally have the public message areas that BBSs have.

The other advantage of BBSs is that they are open to anyone with no subscriptions or membership, and are free of charge (except for the cost of the phone call).

On the other hand ordinary Prestel will cost you £8.50 a quarter (1 VAT), and Microw Prestel (which has the software and some other features from the Microwad system on it these days) is a further £10 a quarter.

However most people can get Prestel with a local call, which is something that cannot be said for a BBS. A long distance call can soon chalk up a couple of quid.

If you are choosing a modem my advice would be — if you can possibly afford it — to look for a multi-mode type that will allow you to use both V.21 (300 bit/sec — most BBS) and V.22 (1200/75 bit/sec — Prestel) systems.

The same applies to software. Buy a terminal program that will enable you to use both systems, but remember that to use both you need the right modem AND the right software.

There's no such thing as software that will allow you to use a V.21 system via a V.22 modem, or vice versa.

Happy communicating!

Board	Synop	Phone no.	Hours
SAREB	Nick Ainslie	0104-824034	24 hrs
LEBB	Ray Apperell	0500-38524	24 hrs
WABBS	Mark Temperley	0223-23278	21.00-06.00 weekdays 0723-842324
WYABBS	Dave Frost	(Ring-back)	21.00-24.00 daily
Forum '84	Dave Harvey	(Ring-back)	24 hrs
Bashon ITCC	Tony Dwyer	0900-42013	24 hrs
		(Ring-back)	
		0286-25132	24 hrs

All the above boards operate at 300 baud

Ring-back procedure

When a board is listed as "ring-back", it is important to use the following procedure:

- Dial the number of the board.
- Let the phone ring once and then HANG UP.
- Dial the number again and let it ring until you hear the carrier tone.
- Switch your modem into "connect mode" and converse with normal procedure.

About 90 per cent of people who ring these boards let the phone ring several times. Then when the tone answers, assuming it to be a voice call, they hang up. Synops find this very irritating!

Standard 65 232 writing for use with an 80080101
P 44 word

Invoking parity 049
Even parity
1 stop bit

Alternative writing that should work with most BBS:

8 bit word
No parity
1 stop bit

I discovered that you can do almost anything, at least terminal software just ignores parity errors, and it will normally work satisfactorily.

It also gives the author possibility of transferring binary data using standard CYM protocols or XMODEM protocols which give even less file transfer — and which aren't just for CYM systems.

Trainees call link Basildon

BASILDON ITEC is a training centre in Basildon, Essex set up to offer courses on Information Technology, primarily for the Youth Training Scheme (YTS). The ITEC opened for trainees in February 1984 and has been extremely busy ever since.

Courses in office skills, such as word processing and database management, programming and electronics are available to trainees, using a variety of different computers. Currently we have four computer networks as well as many stand alone devices.

We have been using an Atari computer since the ITEC opened, initially this was an Atari 900, but it has recently been replaced with an 800 XL, which is used for a variety of tasks, including the trainee and staff journals.

The Atari is used as both the manager, Malcolm Bridges and myself have Atari's at home and can transfer data easily from one machine to another.

However the Atari's primary task is communications. It was initially used in this way in the summer of 1984 when we acquired some modems and a simple terminal program. This enabled us to log on to many private and commercial bulletin board systems. This stimulated considerable interest, particularly on my part, and our phone bills jumped through the roof.

Basildon ITEC's bulletin board runs on an Atari 800XL with a 1050 disc drive and an 850 interface to handle the signals to the modem and printer (an Epson MX100).

It uses software from the USA known as Aris. This was sent to us by the Rainbow Computer Company in Deland, Florida, after we had logged into their system and had a chat with the systems operator (me).

The system operates at 300 baud (300 bits per second) transmit and receive, accepting calls from any computer system operating in Ascii at that rate. However it is rather clever in that it can recognise Atari computers. This is because Atari can operate in an enhanced character mode known as ATAscii or Atari Ascii.

When a user logs on it checks for the value transmitted by the Return

key. The system will then allow the user to download Atari programs from our database.

Calls can leave messages for each other, and privately for us to read. All incoming calls are logged to the disc and printer and all messages are printed out. Private messages to the sysop, however, are not logged to the disc.

The system is very easy to use and offers help menus for the inexperienced. The information on offer is in the main about Basildon ITEC.

By TONY DWYER

although we do get some interesting messages.

If you would like to call our BB, you will need the following (assuming that you are an Atari user):

- An Atari computer (at least 48K)
- A disc drive (510 or 1050)
- A modem (I recommend Hayes 3000 or Pace Nightingale). Set it at 300 baud. Depending on the modem you choose, you may also need an Atari 850 interface unit.
- Terminal software
- A telephone line
- A printer would be handy

(Readers might like to take advantage of our special communications offer on Page 35.)

Having connected it all together and managed to get the software to run, you are ready to go.

Dial our BB number - it is Basildon 0288 25122. You will hear a ringing tone for a couple of seconds, then you will hear a continuous high pitched tone. This is the carrier tone.

At this point switch on your modem - its carrier detect light should come on. Press the Return key on your Atari a few times. A display

will appear asking you to press Return again.

At this point it is testing to see whether it has an Atari on line or some other computer. It will then start transmitting pure text, asking you some polite questions. As soon as you get clear, readable text, put your phone down.

After you answer it will log your call and let you in to the system. If you call during the day you might like to try the Yell command (enter option 'Y'). It will send a bell at our end and one of us may break in for a chat via the keyboard. We have made many new friends this way.

Once you get into our system you will find information which we hope you find interesting and useful. One file in which you may be particularly interested is a list of other bulletin boards in the UK (Brewer). If you don't permit text for more than two minutes you will be timed out and disconnected!

Our system permits the downloading and uploading of programs using Xmodem protocols. Xmodem will ensure that you get a clean download of data.

It does this by sending a block of data and checking a checksum value returned by the receiving computer. If an error is detected it sends the block again. In this way complex programs can be sent. Even machine code is transmitted safely.

Many terminal programs are available for the Atari - commercial ones such as Telnet and the excellent Home Term. There are also some public domain programs around including Term and Amodem.

Our Atari is also used for other tasks. For example, we manufacture a light pen for the Atari computers. Each one is tested on our machine using our own software and sent out with a disc of introductory programs written by myself. The pens are made in our electronics laboratory by our

on Atari to to the world!

YTS trainees

As our working day is very full I often work at home in the evenings on my own Atari 800. It is used to check out the bulletin board system and for hashing away at ideas for use at work.

One of these is a recently completed program called Joe Bailey. This is an action maze game working in 80 column mode.

The main program consists of a file handler which reads in a file from the disc. In the file it does which the handler uses to identify the new available files (possible choices of nine). The user makes the choice — a

one-finger press and the next screen is displayed.

In this way it is possible to have nine different combinations from any of the 64 files available. The idea of the game is to demonstrate how a manager's decision affects the actions of others in a subordinate role. We use it as part of the "Life and social skills" training for our YTS trainees.

In addition to our normal daytime activities our computer club meets on Friday evenings. Most of the members are Atari owners. It is not a formal environment like some clubs, more a social gathering of interested

people. We even allow them access to some of our computers.

We have many plans for the future. One involves more Ataris — we have eight 800 XLs on order. These will be used to train primary school children in computer use, making use of the Atari touch tablets and probably Logo.

We plan to involve local schools in this project, intending to give large numbers of young children access to computers under supervised conditions. We also plan to run computer camps during the school summer holidays, again using the Ataris.

Children will be able to spend up to a week, maybe longer, on our premises with guidance on how to use, and possibly program, the computers. We feel that Logo will be very important in this activity. This idea has already been very successful in the USA and we hope to achieve similar results here. I hope to keep you posted in Atari User later in the year.



Join the communications revolution

We've found the missing link!

By **DEREK MEAKIN**
 Managing Editor
 Atari User

MANY months ago we knew that 1985 would be the Year of Communications. And so it is turning out.

Sales of modems are soaring. More users are joining Prestel to share databases. Bulletin boards are springing up all over the country.

But what was one thing has been missing.

What has been desperately needed was a national database for microcomputers that would combine a low-cost electronic mail service with a giant bulletin board you could access first time every time, that would allow you to chat freely with other users, that would have no restriction on the length of material you could send or receive — and would also enable you to send files and telemessages from your own micro.

All this, and much more, now you can do with MicroLink. For this new comprehensive service is the missing link in Britain's communications network.

And the center through which all MicroLink facilities are being

offered is the most respected name of all — Telecom Gold.

Until now, Telecom Gold has been the preserve of big business — used by the giants of industry, commerce and finance to link their operations in Britain with the rest of the world. And Telecom Gold's charges reflected its elevated status.

That has now changed. Thanks to MicroLink, every Atari user can afford to log into Telecom Gold and make use of its growing range of services. For less than the cost of a first class stamp you can have a message the size of this page delivered to one destination or hundreds... all in a fraction of a second. And that's just one example of the time and money you'll be able to save with MicroLink.

All of us at Atari User are very excited about the enthusiastic reception the new service has been given by our readers — and about its unlimited potential for future development.

Come and join us — and explore with us the whole new world that is being opened up by MicroLink.



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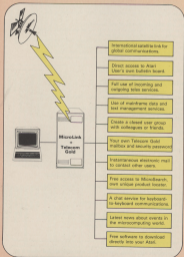
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MicroLink is this year's most exciting - as well as most ambitious - development in the rapidly-expanding world of telecomputing.

For the first time, it combines the enthusiasm of many thousands of computer users with the power and versatility of Britain's national database, Telecom Gold.

The result is an international communications link that is your passport to new realms waiting to be explored, new experiences to be shared with kindred spirits who enjoy telecomputing just as much as you do yourself.

Communicating the MicroLink way is ultra-fast - and much cheaper than you might expect. Wherever you live, you get direct access to the Telecom Gold computer at local call rates.

With your own electronic mailbox you can send a message to one destination - or to 5000 - for less than you would pay for a first class stamp.

You can send and receive telex messages worldwide, or have a two-way chat with other users in real time.

And the cost of using MicroLink? Just £3 a month. Plus usual additional access charges as detailed overleaf.

Join MicroLink now - and let you and your Atari be in the forefront of the new revolution in communications!

These are some of the innovative features
you'll be able to use when you join...

MicroLink

What facilities you can use - directly from your micro:

- Access at any hour of the day or night to Microsearch, our exclusive product locator, which is constantly updated by Britain's major distributors. Powerful, easy-to-use keyword searching means you should find what you want within seconds.
- Direct contact, via electronic mail, with other users throughout the world. And because you're connected via FTS, and not the normal phone links, it's usually much, much cheaper.
- Full use of the closed user group bulletin board - with a special section for Atari users.
- Full service of news about new products and events. All presented in easy-to-read form to keep you right up to date with what is happening in the world of microcomputing and communications.
- Send and receive mailbox messages of any length with other Telecom Gold mailbox users, the number of which is rapidly growing.
- Send and receive telex messages, both within Britain and all over the world.
- Send telemessages to any address in the UK. If sent before 10pm they will get guaranteed delivery the next working day, including Saturday (This service commences shortly.)
- If you live outside the 01- local call area, use of FTS at local phone call charges, including access to the International Dialcom system. (This covers nearly 90 per cent of the population of the UK.)
- Use, should you require it, of the Telecom Gold mainframe for storage of your own data.
- Encouragement to combine with friends or colleagues to set up your own closed user group within MicroLink.
- Provision of free telesoftware, which you can download into your Atari.

What you will receive when you join MicroLink:

- Free registration on Telecom Gold - and your own private mailbox.
- Free password, which you can change at any time you like. This gives you a high level of security in order to preserve confidentiality, and is known only to you.
- Free instructional manual to introduce you to Telecom Gold and its many services.
- Free Help facility should you require additional assistance.
- Free newsletter to keep you informed of future developments in this ever-expanding service.

What you need to access MicroLink:

- Any personal computer, portable computer, hand-held device or electronic typewriter with communications facilities.
- Appropriate communications software.
- Modem (you can use 300/300, 1200/75 or 1200/1200 baud as you wish).

What will it cost?

- Monthly standing charge of £3 (compared to Telecom Gold's normal £10 a month minimum charge).
- Connect charges: 3.5p a minute (cheap rate); 10.5p a minute (standard rate). Plus 2p a minute FTS charge if calling from outside the 01- call area.
- Once-only telex registration fee (if required): £30.
- Dangling telex: 5.5p per 100 characters (UK), 11p (Europe) and 16.5p (USA).
- Incoming telex: 50p.
- International mail: 30p for first 2,048 characters, then 15p for each additional 1,024 characters.
- Telex-messages: £1.25 for a maximum of 350 words or 35 single spaced lines.
- Online databases on Telecom Gold: charges as indicated at time of log-on.

To secure your immediate registration, complete the form opposite and return it to
MicroLink, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

MicroLink

In association with
TELECOM GOLD

Application Form

On receipt of this application form you will be sent:

- your personal station number and initial password
- a Green (Dial) or Red (Local) card
- customer 161 260 telephone number
- the station and station number of your Telecom Gold contract
- Personaliser 28 days pre-paid post* applications

Charges

Initial Registration fee: £25

Standing Charge: £3 per calendar month or part

Customer charge for station reconnection, for any payment to the Service, Personaliser call charge at 17 pence

Standard Rate

16001 12610 MF (excluding public holidays)
16101 per minute or part

Class of Rate

(all other times)

20 p per minute or part

Exchange charge for change of information: 20p per call of 2500* characters per month

Prefer: The number of local calls is an average calculated by reference to a daily average. Calls will be incurred by the use of rates, short codes and mail filing.)

Information Database

It may vary by destination and is charged at the rate shown below per 10000 access

MicroLink 2000 service

2000 board 2p per minute or part

2000 board 21p per minute or part

Personaliser

For each message generated £1.25

* Telecom Gold contract subscribers
Telecom Gold Ltd, 40, Aldgate St, Cannon Street, London EC3A 3DF

International Mail

Charges for the transmission of information by the Database service to other Telecom Gold systems outside the UK and the list of 36000

	Per Address (not common area numbers)	Per Address (not common area numbers)
USA, Australia, Canada, Hong Kong, Japan	20p	20p
Germany, Denmark	20p	20p

Note: Information rates in address transmission systems may incur any over transmission of data.)

Billing and Payment

Billing is prepared on receipt of VAT Certificate at this one payment monthly and payable on receipt of invoice

Telex

Telex registration: £10

Telex out-going for the generation of rates by the Database service

UK

14p per 100 characters sent

18p per 1000 characters sent

Post of overnight £1.50 per 400 characters and

PERSONALISER 28 7 days pre-connection at

A 10% discount will apply to calls delivered by overnight transmission using "Night" key send

Telex handling: For the delivery of a correctly addressed telex into a station, depending of telex with correct number, response time under 20s

Service charge for delivering telexes: reduction from standard 30p

Note: A 10% discount without a station reference for telexes sent by address and answered to provide a station address. It is not possible to deliver a telex under a station reference.

Customer Telexes: Gold for charges relating to other services used additional documentation. Each User Location addressed and using the telex facility will incur a charge of 1 minute per word. Further charge changes will also be incurred each month depending on the size of the telex queue and per minute of the start code and message for location

Database

For details contact the British Telecom Database by the Database service

No charge

Name

Position

Company

Address

Telephone

Signature

Under Database Publication Limited is the holder of all the rights to you, the corporation and billing format will be handled by Telecom Gold as agents for Database Publications Ltd

Payment

Please complete the billing information here below

Direct Debiting Payment (Enter full postal Address of Post Account)

To

After entering your full further option to writing is change to machine service with you on or immediately after. The size of each month's scheduled amount which may be debited from to the balance of British Telecommunications plc - TELECOM GOLD by Direct Debit

Date of First Payment in or within one month from: 19

Name of Account to be debited: _____ (enter name of company/account)

Account Number:

Terms and conditions: Use have read and accepted the terms and conditions set out on the document and hereby apply to you MicroLink

Signature

Name: _____ Position: _____ Date: _____

Company

Signature application should be signed by a partner in the firm. (For self used personal Application by limited companies should be signed by an authorized person on behalf of the company. Banks may decline to accept signatures to company Direct Debit to certain types of account other than current accounts.

I enclose my cheque payable to Database Publications Ltd for the application fee

TELECOM GOLD

Mobile Assigned: _____

Host Station: _____

Telex Code/agent: _____

Service: _____

Personal: _____

MicroLink

Database Publications Ltd

Europe House

44 Charter House

115-117 Strand

London WC2R 0AR

MicroLink (UK) 2897

This contract is made between Continuum Publications Ltd, of Europa House 68 Chester Road, West Green, Macclesfield (Suff) SK9 5DF (EPL) and the subscriber whose name and address appears hereafter.

Whereas EPL has agreed with British Telecommunications plc (BT) through its agent Telenor Guld Limited to sell and distribute the Official Ask Service (the Service) and BT through Telenor Guld Limited has agreed to supply the Service to customers of EPL.

It is agreed as follows:

1. Access

EPL shall cause the subscriber to have such access (including a number as indicated here) to allow the Subscriber and persons associated with the subscriber access to use the Service.

2. The Service

The Service shall be BT's Telecom Guld Standard Service, and shall comprise such services and facilities as EPL, shall in its discretion from time to time provide or arrange, subject to the supply by BT of such services and facilities.

3. Charges

BT shall cause the subscriber to have such access (including a number as indicated here) to allow the Subscriber and persons associated with the subscriber access to use the Service, and for the transmission of any mailboxes created by EPL, to the Subscriber. All charges are payable as follows:

- (a) EPL shall pay to the Subscriber not less than business days within notice of any alteration to the applicable charges for the Service. The charges applicable at the date of the Subscriber's request are not null and void.
- (b) Subject to any provision of this contract which is applicable to long distance or premium rate numbers, unless BT notifies the subscriber to the contrary with effect from the first day of the month in which BT has created services available to the customer.

4. Limitations on use

The Subscriber shall not use or permit any persons use the Service otherwise than in paying to connections granted by EPL, or BT, existing for the time being and in particular shall not use the Service for the purpose of sending obscene, defamatory, defamatory, indecent or menacing communications, or for sending communications which cause annoyance, inconvenience, or needless anxiety.

The Subscriber shall not permit any person to use the Service by means of a mailbox number issued by EPL, unless the name and identity of that person to the Subscriber has been disclosed to EPL.

5. Termination

This contract may be terminated by either party giving not less than one month's written notice, such notice to expire on the last day of any calendar month.

EPL may terminate this contract without notice if the Subscriber shall

- (a) fail to pay any sums payable under this contract or payable under any other contract with EPL, to which the Subscriber is a party;
- (b) be unable to meet any obligations or any arrangements in connection with the contract; or if a trustee is appointed of any part of the Subscriber's assets (not including any assets held in trust) or if arrangements are made for the winding up of the Subscriber for more than seven days, not to comply with any terms of this contract, or any conditions imposed by EPL, or BT under clause 4 of this contract.
- (c) EPL may terminate this contract without notice in the event that BT and/or its agent Telenor Guld shall cease to supply the Service.
- (d) if the customer fails to comply with any provision of the contract for a substantial number of times to a level for all charges due and to become due for services provided during any period of such failure.

6. Assignment

The subscriber shall not, without the written consent of EPL, assign this contract, or any rights or obligations arising under this contract.

7. Limitation of liability

Neither subscriber nor EPL nor BT has any obligation, duty or liability, contract or tort, for breach of which the subscriber could claim or bring an action, in respect of any loss or damage resulting from the use of the Service, except in respect of any loss or damage occurring through any act or omission of EPL or BT which is caused by the negligence or default of EPL or BT.

BT shall not be liable in respect of any loss or damage resulting from the use of the Service, except in respect of any loss or damage occurring through any act or omission of EPL or BT which is caused by the negligence or default of EPL or BT.

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The best hardware deserves the best

software to drive it, and with the specially written Multi-Viewterm program the package is complete. It supports all the standard baud rates - 1200/75, 75/1200, 1200/1200 and 300/300 full duplex.

Your Atari User package will allow you to talk directly to other computers, to send your own telex messages, to go tele-shopping - even to download free software programs directly into your Atari.

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And you can become one of a growing number of enthusiasts who are joining MicroLink, the giant database set up in conjunction with Telecom Gold, which is described more fully in this issue.

But first, send for the Miracle package - and enter the fascinating, limitless world of communications!

Use the order form on Page 61

ROBIN HUDSON says: Forget the past, get on to the right number and . . .

COMMUNICATIONS is, perhaps, the most interesting area of microcomputing that has yet to be explored by the majority of home computer users.

For many years now the public telephone network has been used to transfer data between computers which are often many hundreds of miles apart.

For companies using computers in this way the advantages are obvious. Large volumes of data, including programs, can be transferred between various establishments very rapidly and without the necessity to physically transport discs, tape or any other storage media.

It is only recently however that the additional equipment — both hardware and software — that was needed to take advantage of the telephone in this way has become sufficiently inexpensive to be used widely in the home.

So let's examine the possibility of using the *Atari* to communicate via the telephone system.

There are many advantages in doing so.

One major application is the ability to access data which is held on either, often very large, computer systems. The best known example of this is the *Teleview* (old service, although many other public database systems exist).

This is an area which is currently arousing great interest, and which will no doubt become one of the more significant aspects of computing in the future.

The transfer of files to other computers, in the same way as is done between mainframe installations, is another area that has great potential in the home.

You've just written a new utility program which you would like a friend, who happens to live at the other end of the country, to test for you.

Instead of sending a fragile disc, which could take days to arrive, you could simply send a copy of the file over the telephone in the space of a phone call.

Another type of system, the "bulletin board" is peculiar to micros. Bulletin boards were first developed

Serialise, modulate, communicate!

in America where micro communications has progressed to a more advanced state than in Europe.

It is simply a micro which accepts telephone calls from other micro users and allows them to access its files, download programs, and, as with electronic mail systems, leave messages for other callers.

It is quite common to find that such systems operate on a worldwide basis with users calling from countries as far apart as Australia, Britain and America.

There are just a few of the possible applications. But what about the equipment required to use the telephone network in this way?

Fortunately the rapid development of large and very large scale integration technology in recent years has made it possible to produce suitable equipment at prices which are no longer prohibitive.

The obvious starting point is some form of interface. In the case of the *Atari*, until recently this has meant the

960 serial interface module.

The reason for using a serial interface, as opposed to a parallel interface such as that used with Centronics-type printers, is fundamental to the whole area of long distance transmission of data.

Since the telephone network uses only two, three or four wire circuits, data must be transferred in serial form, one bit at a time, in sequence.

However data within a computer is transferred between different components in parallel. This means that in an 8 bit machine such as the *Atari*, eight individual wires, known collectively as the data bus, are used to move information around a byte at a time. This is termed parallel transfer because eight bits are transferred simultaneously.

We have noted that the primary reason for serialising data for transmission over the telephone network is simply that there are insufficient wires to transmit eight bits at a time. Indeed, it would be

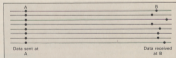


Figure 1: Data done in parallel transfer.

extremely expensive to lay eight cables instead of one, and even if this were possible there are further complications with respect to parallel data transfer.

There revolves around the fact that the individual bits of data tend to travel at different speeds within the wires and introduce what is known as data skew. The result is that the data becomes garbled.

This effect, illustrated in Figure 1, is more noticeable over greater distances. It is one of the reasons that data cables used with parallel printers are rarely longer than about a metre.

We see then that the function of a serial interface is to convert data from a computer into serial form so that it may be transmitted via a circuit consisting of as little as two wires.

The parallel transfer of n data bits requires $n+1$ individual wires, n wires for the data and one ground line.

In addition to the obvious economies of using fewer wires, serial data may be transmitted over longer distances than is possible with a parallel interface due to the absence of the skew effect in serial circuits.

What are the other advantages of a communications system?

Consider the type of signals that a computer generates. These are digital in nature. The 1s and 0s are represented by two separate and distinct voltage or current levels, generally the former.

The public telephone network however was developed for a different application – the transmission of the human voice which is analogue, as opposed to digital, in nature.

The difference between the two types of signal, analogue and digital, can be seen in Figure 2.

The point is that the square waveforms produced by digital computers will not pass through the telephone network because of the nature of the network itself and various filters and switching equipment used in telephone exchanges.

To overcome this problem a further piece of equipment is required that will convert digital data into analogue form so that it can then be transmitted via the telephone net-

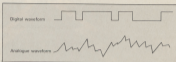


Figure 2. Analogue and digital waveforms

work. This task, termed modulation, is the function of a modem.

In practice a modem carries out two jobs. Digital data for transmission is modulated into analogue form before being passed to the telephone system.

Conversely, received analogue data is demodulated into digital form before being given to the computer.

Hence a modem is used to both Modulate and Demodulate electrical signals.

The final element involved is the software.

The facilities offered by communications software may vary greatly, but essentially it provides the means by which the serial interfaces, and the data passed between them, can be controlled.

Just as a disc filing or disc management system is used to store and retrieve information from disc, communications software may be regarded as the communications management system.

Thus, although the hardware provides the physical means by which data and files can be transferred, some form of protocol is required in order that each computer can understand and use the signals it receives from the other.

These protocols may be regarded as the equivalent of word, sentence and paragraph structure in a spoken language.

In the case of written text, punctuation is used in order to ensure that it makes sense to the reader. Similarly a protocol structure of some form is required to allow two computers to communicate sensibly with each other.

It is the software that provides this

structure, along with the facilities for storing and manipulating received data or data to be transmitted.

So we can see that three basic elements, apart from the computer, must be present in a communications system using the telephone network – a serial interface, a modem and the appropriate software.

On a smaller scale, within a particular room for example, it is perfectly possible to link the two computers together without using the telephone system.

In this case a direct wire link between the two serial interfaces is sufficient to allow communication to take place and no modulation is required. Provided that the distance between the computers is not too great there should be no problems.

Using a hard-wired link in this way, however, reveals a further advantage of using the telephone system.

When a hard-wired connection is used only the two computers involved can communicate with each other. The telephone system, however, offers far greater flexibility in that any two computers with access to a phone may be linked.

The 850 module allows a wide variety of modems to be used. Also, modems are now being marketed which don't require an 850 module.

Modems themselves may be obtained with various levels of sophistication, ranging in price from as little as £70 to several hundred pounds.

Communication between your Atari and almost any other type of mainframe, mini or micro is possible, so give it a try.

Serials, modules and communi-



Go Space-hopping with your Atari - plus a little help from TeleLink

TeleLink, Britain's pioneering communications magazine, is full of helpful advice about all the fascinating things you can do when you link your Atari to your telephone.

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SUBMARINE

YOU are a destroyer captain alone in a hostile sea surrounded by a pack of submarines which are travelling secretly to a rendezvous. The submarines cannot track radio signals or send for help and must not attack you for fear of giving their position away but you can sink as many of them as you can - with as few depth charges as possible.

On the screen will be shown a board divided into 100 squares. The submarine is hiding in one of these squares. The bottom (horizontal) line is called X and the upright (perpendicular) line is called Y.

Each line of boxes goes from 0 to 9 and you have to give the box numbers to the computer when it asks for your entry. You will be

asked to type in a number for the X and Y lines. If you think that the submarine is in a box 8 across and 5 high then return 8 and 5 when the X and Y positions are asked for.

Remember you must press Return after each number.

If you make a direct hit you will hear a noise and the screen will show you how many tries you took to sink the submarine.

If you miss, the computer will tell you if your shot was North,

South, East or West of the target and you must then plan your next shot. As soon as the submarine is sunk your computer will search

SUBROUTINES

370	Draw grid.
375	Header.
410	Print score.
500	Submarine hit.
610	Submarine released.

```

10 REM SUBMARINE
20 GRAPHICS SCREEN 321,1,UPPER
40 SCREEN=0:GOTO 10
50 SCREEN=1:GOTO 10
60 REM LOOP
70 SCREEN=SCREEN+1:GOTO SCREEN=0:GOTO 10
80 GOTO 170
90 GOTO 170
100 GOTO 600
110 PRINT "PRINT SCREEN SCREEN FROM 0
120"
130 PRINT "PRINT TO 9,1,SCREEN SCREEN
140 IF SCREEN=0 GOTO 170 THEN GOTO 11
0
150 PRINT "PRINT TO 9,1,SCREEN SCREEN
170 IF SCREEN=0 GOTO 170 THEN GOTO 11

```

```

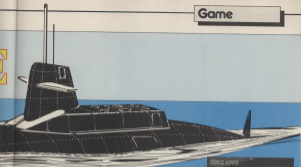
0
100 GOTO 400
110 IF SCREEN=0 GOTO 170:GOTO 170
120 GOTO 500:GOTO 500
130 GOTO 610:GOTO 70
140 IF SCREEN=0 GOTO 170 THEN GOTO 11
150 SCREEN=0:PRINT "5,1,PRINT SCREEN
170:GOTO 110
180 POSITION 0,1:PRINT "0,1,000 000 1"
190
200 POSITION 0,1:PRINT "0,1,000 000 1
210 IS THIS SUBMARINE HIT?"
220 POSITION 0,11:PRINT "0,1,000 000
PRINTED TO SCREEN?"
230 GOTO
240 REM GOTO 500
250 GRAPHICS SCREEN 321,1,UPPER

```

```

260 FOR I=0 TO 10
270 POSITION 1,0:PRINT "0,1,0,000000
1,10:PRINT "0,1,0"
280 NEXT I
290 FOR I=0 TO 10:POSITION 1,1:PRINT 0
0,1:PRINT "0,1,0,000000"
300 POSITION 1,10:PRINT "0,1,0,000000 1
310 NEXT I
320 REM REMAKE 500
330 POSITION 0,0:PRINT "0,1,00000000"
340 POSITION 0,1:PRINT "0,1,00000000"
350 REM
360 REM MAKE 500
370 POSITION 0,1:PRINT "0,1,00000000
71,0"
380 POSITION 0,10:PRINT "0,1,00000000"
0

```

and detect another target.

Expert captains should be able to detect and sink the enemy within six moves.

VARIABLES

SHOTS Number of shots.
HITS Number of hits.
SHOTX X coordinate of shot.
SHOTY Y coordinate of shot.
SUBX X coordinate of sub.
SUBY Y coordinate of sub.

SUBMARINE is just one of the games listed in "40 Educational Games for the Atari" by Vince Appas, price \$5.95. We're grateful to Granada College for permission to reprint it here.



VINCE APPAS

40 EDUCATIONAL GAMES FOR THE ATARI



```

400 RETURN
410 FOR S=0 TO 500
420 PRINT S;S/10;S/100
430 POSITION 8,1:PRINT S;S/10;S/100;S/1000;S/10000
NEXT S
440 RETURN
450 FOR S=0 TO 500
460 PRINT S;S/10;S/100
470 POSITION 8,1:PRINT S;S/10;S/100;S/1000;S/10000
NEXT S
480 FOR S=0,1,100,10,1000,100,10000,100000,1000000
490 PRINT S;S/100,10,10000 S/1 TO 49000
NEXT S
500 FOR S=0,1,100,10,10000,100,100000,1000000
510 PRINT S;S/100,10,10000 S/1 TO 490000
NEXT S
520 FOR S=0,1,10,1,1000,100,100000
530 PRINT S;S/100,10,10000 S/1 TO 490000
NEXT S

```

```

570 POSITION 8,1:PRINT S;S/10;S/100;S/1000;S/10000
580 PRINT "NUMBER OF HITS HAS BEEN DETECTED"
590 FOR S=0 TO 490000
600 RETURN
610 FOR S=0 TO 500
620 PRINT S;S/10;S/100;S/1000;S/10000
630 POSITION 8,1:PRINT S;S/10;S/100;S/1000;S/10000
640 PRINT "YOUR SHOT HAS "
650 IF S=0 THEN PRINT "HITTED "
660 IF S=1 THEN PRINT "HITTED "
670 IF S=10 THEN PRINT "HITTED "
680 IF S=100 THEN PRINT "HITTED "
690 IF S=1000 THEN PRINT "HITTED "
700 PRINT "OR THE ENEMY SUBMARINE, THE TARGET"
710 RETURN
720 PRINT "PRESS 0,1,10,100"
730 GOTO 60,61,62,63

```

740 POSITION 8,1:PRINT S;S/10;S/100;S/1000;S/10000

Tired of typing?
 Take advantage of our
 Ergo-typing offer on Page 61.

MIKE BIBBY
 continues his series
 of articles aimed at
 lifting the veil of
 mystery cloaking
 the fundamentals
 of the Atari's
 workings

We have seen that we can code our numbers in ways other than our usual binary, or decimal, system. We also looked last month at a way of coding known as the binary system, which uses the digits 0 to 1 to represent any number — unlike the decimal system which uses the digits 0 to 9.

To distinguish the two systems, we decided to prefix binary numbers with the symbol "B".

The number "two hundred and sixty two" is encoded in each system like this:

In decimal:

$$162 = 100 + 60 + 2$$

In binary:

$$128 \ 64 \ 32 \ 16 \ 8 \ 4 \ 2 \ 1$$

$$\% \ 1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0$$

$$= 128 + 32 + 2$$

Each column in the binary system, known as a "bit", contains either a one or a zero.

Although the binary representation of a number is rather cumbersome to write, this simple two-state system is easily represented by electrical circuits — which are either **on** or **off**.

We saw that the computer handles bits in groups of eight at a time. Such a group is called a byte. Thus a byte contains eight bits labelled, somewhat perversely, bits 0 to 7. (See Figure 1.)

Bit 0, as you can see, is the "1" column. As this is the smallest value

bit we say that bit 0 is the least significant bit (LSB). Bit 7, the "128" column, is called the most significant bit (MSB).

The reason for using the numbers 0 to 7 to label the bits instead of the more logical 1 to 8 has to do with powers, a subject you almost certainly covered at school.

2 to the power 2 is $2^2 = 4$
 2 to the power 3 is $2^3 = 8$
 2 to the power 4 is $2^4 = 16$
 and so on. "2 to the power 8" would be eight twos all multiplied together.

Notice that as the powers of two increase — that is, as we multiply more twos together — the answers are doubling, just as our column or bit values do.

Also, 2 to the power of 2 is 4, the value of bit 2, while 2 to the power of 3 is 8, the value of bit 3. It shouldn't come as any surprise to you to find that 2 to the power of 7 is 128, the value of bit 7.

You can verify this on the Atari by

using the symbol "B" which stands for "to the power of". It shares a key with the " sign.

Try:

```
PRINT 2^4
PRINT 2^7
```

Be sure to try 2^0 , which will show you why bit 1 has the value 2. Also try 2^0 . The answer may surprise you. The fact is that any number to the power 0 is 1!

Hence bit zero has the column value of one. Figure 1 illustrates this. Look at this sum:

$$\begin{array}{r} \% \ 1 \\ + \% \ 1 \\ \hline \% \ 10 \end{array}$$

If you think about it, that is correct, since the sum adds one and one, and the answer %10 is binary for two.

One way of relating this to our usual way of doing sums is to see that we carry when we get to two, instead of ten as we do in our normal, decimal, sums.

Another way to look at it is that we have to carry when we get to two because we aren't allowed to use the digit "2".

If you remember, last month we had a rule forbidding two "coins" of the same value.

Try this sum:

$$\begin{array}{r} 4 \ 2 \ 1 \\ \% \ 1 \ 1 \ 1 \ \text{in} \ 3 \\ + \% \ 1 \ 0 \ \text{binary} \ 2 \\ \hline \% \ 1 \ 0 \ 1 \ 1 \end{array}$$

Here we carry from the second column to the third.

Addition is not very hard at all — just make sure that you always "put 0 down and carry 1" when you get a two.

If you get a three then "carry one for two and put one down".

For example:

$$\begin{array}{r} 8 \ 4 \ 2 \ 1 \\ \% \ 1 \ 1 \ 1 \ \text{in} \ 7 \\ + \% \ 1 \ 1 \ \text{decimal} \ 3 \\ \hline \% \ 1 \ 0 \ 1 \ 0 \end{array}$$

Subtraction is a little more complicated, and depends on whether

There are two schools of thought on subtraction — do you borrow

you borrow or decompose! The latter phrase doesn't describe the current economic climate. It's just that there are two schools of thought on the way subtraction should be taught — the borrowers and the decomposers.

Fortunately, we can ignore binary subtraction since we can manage without it — as does the microprocessor inside your machine.

If you want to do some binary subtraction it is straightforward enough provided that you remember that it is two you're borrowing or taking, not ten. Figure 3 illustrates the process — without any attempt to explain it.

Before we leave the realm of simple sums, look what happens if we shift everything in a binary number over to the left, putting a zero into bit 0, which would be left vacant otherwise.

For example:

8 4 2 1

% 1 0 1 which is 5

becomes

8 4 2 1

% 1 0 1 0 which is 10

This shifting to the left doubles the number automatically. This isn't too hard to visualise, because the value of each bit is transferred to the next higher bit, which is of course double in value — so the end result is that the whole number is doubled in value.

Similarly, we can do the binary equivalent of 12 divided by 2 by shifting to the right.

For example:

8 4 2 1

% 1 1 0 0 which is 12

becomes

8 4 2 1

% 1 1 0 which is 6

and, of course, 12 divided by 2 gives you 6.

As each bit is moved to the right, it occupies a column exactly one half lower in value, thus the sum total of all the bits is one half lower. Note the original bit 0 has all disappeared altogether. The loss of this bit can

Bit number	7	6	5	4	3	2	1	0
	1	0	0	0	1	1	0	1
Bit value	128	64	32	16	8	4	2	1

Figure 2: The bit pattern for 147

Bit number	7	6	5	4	3	2	1	0
Bit value	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	128	64	32	16	8	4	2	1
	1	1	0	0	1	1	0	0

Figure 3: The bit pattern for 304

cause some inaccuracies. After all, if it were 1, when it's halved it should contribute 0.5 to the answer. As it is, it's ignored.

For example, if we try to do 12 divided by 2 in binary by shifting each bit right, the equivalent of 12,

8 4 2 1
% 1 1 0 1

becomes

8 4 2 1
% 1 1 0

which is 6 in decimal. Now 12 divided

by 2 gives 6.5, not 6, so what happened to the 0.5?

Well, when we shifted over the original bit 0 (which had the value 1), we shifted it "out of the byte". If you like, it dropped off the end, and doesn't appear in the answer.

Of course, it's this disappearing 1 that should give us the missing 0.5 when it's halved.

This sort of division, where you're only concerned with the wholes in the answer, and ignores any remainders, or decimal parts, is called integer division.

Well, that's enough binary for one month. Next month it's hexadecimal

	4	2	1		4	2	1	
%	1	1	1	0	%	1	1	1
-%	1	1			-%	1	1	0
%	1	1			%	1	1	
Decomposition				OR				In decimal
								6
								-3
								3

Figure 4: Binary subtraction

Now or just decompose?

PETE BIBBY strikes a chord with his Atari

Have fun with these musical experiments...

LET'S start off this month with four notes played at once by four entries:

```
SOUND 0,121,10,0 : SOUND 1,70,10,0
SOUND 3,11,10,0 : SOUND 2,10,10,0
```

While not likely to make Beethoven roll, the above should refresh your memories of the structure of the SOUND command. As you'll remember, it takes the form:

SOUND channel,pitch,duration, volume

Here's the SOUNDS we've just entered in contrast mode produced a note on each channel with loudness 0, and duration 10. Each note had a different pitch parameter. The result was the chord you heard and are still hearing if you haven't done anything about it.

If you're still plagued by the chord you can bring things to an end with

```
END
```

or, more elegantly, with:

```
FOR CHANNEL=0 TO 3:
SOUND CHANNEL,0,0,0:
NEXT CHANNEL
```

which switches off each channel in turn. Table I summarizes the SOUND parameters.

Program 1 produces the same chord, but this time the length of time it plays for is limited.

As you can see and hear, lines 20 to 60 produce the familiar sounds. Line 60 does nothing, it's just a delay loop.

While the program is still going, working its way round the loop, the

```
10 REM PROGRAM 1
20 SOUND 0,121,10,0
30 SOUND 1,70,10,0
40 SOUND 2,10,10,0
50 SOUND 3,11,10,0
60 FOR DELAY=1 TO 60:NEXT DELAY
```

Program 1

notes still sound. When the loop finishes, the program comes to an end and so do the notes.

Try changing the values of the loop variables in line 60 or even leaving it out altogether and see what happens.

And, while you're feeling experimental, try altering the volume parameters. So far, I've had the total volume parameter of each note adding up to 32 (0+0+0+0).

If you start playing notes with volume parameters that total over 32, strange things can happen. You have been warned!

Program 2 has us entering the world of music by playing the scale of C. If you don't understand what a scale is, don't worry too much. Just listen to the notes played and I think you'll agree that the sequence has a "complete" feeling to it.

This is because the series of notes follows a common pattern, the pitch rising by a standard unit known as a tone, then by another tone, then a half tone and so on.

Don't be too concerned with the musical terms, just compare the pitch parameters of the notes in Program 2 with the names of the notes in Table II and you'll see the pattern.

Because the first note played in C (pitch parameter 121), the scale is known as the scale of C (or, more

properly, C major). The pitch range it covers (from 121 to 201) is called an octave.

We could start the scale on D or F and, provided we follow the same

NOTE	PITCH PARAMETER	
C	121	} OCTAVE 1
D	131	
E	141	
F	151	
G	161	
A	171	
B	181	
C	191	} OCTAVE 2
D	201	
E	211	
F	221	
G	231	
A	241	
B	251	
C	261	} OCTAVE 3
D	271	
E	281	
F	291	
G	301	
A	311	
B	321	

Table II

channel	pitch	duration	volume
0 to 3	0 to 255	0 to 255 (in 2's)	0 to 255

Table I

```

10 REM PROGRAM II
20 SOUND 4,121,18,0
30 FOR DELAY=1 TO SOUND1 DELAY
40 SOUND 4,180,18,0
50 FOR DELAY=1 TO SOUND1 DELAY
60 SOUND 4,71,18,0
70 FOR DELAY=1 TO SOUND1 DELAY
80 SOUND 4,91,18,0
90 FOR DELAY=1 TO SOUND1 DELAY
A0 SOUND 4,71,18,0
B0 FOR DELAY=1 TO SOUND1 DELAY
C0 SOUND 4,51,18,0
D0 FOR DELAY=1 TO SOUND1 DELAY
E0 SOUND 4,81,18,0
F0 SOUND 4,71,18,0
100 FOR DELAY=1 TO SOUND1 DELAY
110 SOUND 4,54,18,0
120 FOR DELAY=1 TO SOUND1 DELAY
130 SOUND 4,88,18,0
140 FOR DELAY=1 TO SOUND1 DELAY

```

Program II

pattern of increases in pitch, we'd end up with the scale of D or F. It leaves that to you as an academic exercise.

One thing you'll notice about Program II is the inordinate number of delay loops. There's one after every SOUND command, each one determining how long the note is going to last.

The note plays until the following loop is finished, then the program goes on to the next SOUND and its delay loop and so on.

Apart from the first delay loop, they're all the same.

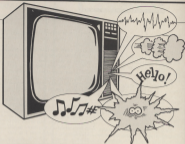
The situation begs for a subroutine

```

10 REM PROGRAM III
20 SOUND 4,121,18,0
30 SOUND 1800
40 SOUND 4,180,18,0
50 SOUND 1800
60 SOUND 4,71,18,0
70 SOUND 1800
80 SOUND 4,91,18,0
90 SOUND 1800
A0 SOUND 4,71,18,0
B0 SOUND 1800
C0 SOUND 4,51,18,0
D0 SOUND 1800
E0 SOUND 4,81,18,0
F0 FOR DELAY=1 TO SOUND1 DELAY
1000 DELAY
1100 FOR DELAY=1 TO SOUND1 DELAY
1200 DELAY
1300 FOR DELAY=1 TO SOUND1 DELAY
1400 DELAY
1500 RETURN

```

Program III



If you start playing notes with volume parameters that total over 32 . . . strange things can happen

to do the work of all these loops. Program III delivers the goods.

Here each delay loop, apart from the last, has been replaced by one single loop. This is coded in a subroutine at line 1000.

Now, when the SOUND commands produce a note, the program GOES to 1000 to produce the delay that will allow us to hear it.

It's not great programming, but it's a lot neater than Program II.

Incidentally, the END of line 100 isn't there to stop the notes. Those will end after the final delay loop flashes.

The purpose of the END is to prevent the program crashing into the lines defining the subroutine and so causing problems. Try leaving it out and you'll see what I mean.

Despite the use of GOSUBs for the delay loops, Program III will leave a lot to be desired.

Do we really need all those SOUND statements, one after another? After all, apart from the pitch parameter changing, they are all the same.

Wouldn't it be better to use just one in a FOR . . . NEXT loop, reading the various pitch parameters from a DATA statement? Program IV supplies the answers.

Here the FOR . . . NEXT loop

formed in lines 30 to 50 cycles 13 times. Each time round, the READ of line 40 takes a value from the DATA statement of line 2010 and stores it in the variable PITCH.

Line 50 produces a note using PITCH while the GOSUB of line 60 brings the delay loop into play.

Looked at musically, the program plays a series of 13 notes, forming an octave.

The gap between the pitch of each note is called a semitone.

The semitone is the standard unit of Western music, two semitones joining together to form a pitch gap of

```

20 REM PROGRAM IV
30 DELAY=1800
40 FOR SEMITONE=1 TO 12
50 READ PITCH
60 SOUND P,PITCH,18,0
70 SOUND DELAY
80 NEXT SEMITONE
90 END
1000 REM DELAY LOOP
1100 FOR DELAY=1 TO SOUND1 DELAY
1200 DELAY
1300 REM PITCH DATA
1410 DATA 64,57,52,48,45,42,40,37,35,32,31,29

```

Program IV

one tone.

The whole series played by Program M is known as a chromatic scale.¹

Again, don't worry too much about the theory—just listen to the program as it works its way from a note with pitch parameter 80 to one with a parameter of 255.

Although it's hardly musical, there's a certain inevitability to it. Compare the pitch values in the DATA statement with the notes in Table II and you'll see the pattern.

Try creating a chromatic scale starting on another note, say one with pitch parameter 100 or 144.

We've not just restricted to scales. Program N uses the same technique of READING from DATA statements to produce an eight-note tune.

You'll see that the structure of the program is more or less the same as Program M.

What's different is the DATA statement, which now holds the pitch parameters of the tune. As before, these are read one by one and used to produce the notes.

Using this method, it's easy to write tunes, placing your own values

```

10 REM PROGRAM N
20 DELAY=1000
30 FOR TUNE=1 TO 8
40 SOUND PITCH
50 SOUND 1,PITCH,10,0
60 SOUND DELAY
70 NEXT TUNE
80 END

1000 REM DELAY LOOP
1001 FOR SLONG=1 TO 1000:NEXT SLONG
1002 RETURN

10000 REM PITCH DATA
10010 DATA 121,100,121,100,71,71,88,121
    
```

Program N

in the DATA line.

Table II, trial and error, experimentation and inspiration in equal parts should go a long way to making you an Atari musician. However, one thing that you'll notice before long is that no matter how nice your tune is, it's boring.

The reason is that the notes in it are all the same length. There's no variety. This is because we've been using the same subroutine to produce the delay that allows the notes to be heard.

One way round this would be to

have several subroutines, each consisting of delay loops of different lengths.

You could then select the particular loop needed for a note and GOSUB to that routine.

The trouble with this is that you end up with a lot of subroutines and, in long tunes, things get unwieldy. Program M shows another method that can be used to vary the length of notes.

As you can hear, the fifth and sixth notes of the tune are longer than the others. In fact they are twice as long.

This has been achieved by changing the delay loop of line 1010 so that instead of going from 1 to 800 as previously, it goes from 1 to 100 times a variable LENGTH. As the value of LENGTH changes, so will the number of times the loop cycles.

If LENGTH is 2 then the loop will cycle from 1 to 200. If it is 10, then it will go from 1 to 1000.

Obviously as LENGTH varies, so the loop cycles for a longer period. And as the period of the loop changes, so does the length of the note.

Line 60 has been changed so that it reads in both the PITCH and LENGTH of each note. Similarly the data in line 1010 has been altered to supply both the pitch and length of each note.

In this case the fifth and sixth notes have a LENGTH of 10 while the rest have a LENGTH of 5. Hence these notes last twice as long as the others.

This technique of using a variable in the delay loop is extremely flexible.

In the above example I've used LENGTH values of 5 and 10. The more-musical may prefer to use

values of 2, 4, 8, 16, to mimic Western note-structures. It's up to you.

One thing about Program M is that it's slow. Program N's shows how to speed things up, using another variable TEMPO.

Again, we've tampered with the delay loop in line 1010. Now it cycles from 1 to TEMPO*LENGTH.

Before we always had a value of 100. Now this has been replaced with TEMPO which was given the value 60 in line 20. As a result, the delay loop is shorter and the tune is played more quickly.

Notice that the effect of altering TEMPO is the same on every note of the tune. Each one plays for exactly

```

10 REM PROGRAM M
20 DELAY=1000:TEMPO=60
30 FOR TUNE=1 TO 8
40 SOUND PITCH,LENGTH
50 SOUND 1,PITCH,10,0
60 SOUND DELAY
70 NEXT TUNE
80 END

1000 REM DELAY LOOP
1001 FOR SLONG=1 TO TEMPO*LENGTH:NEXT SLONG
1002 RETURN

10000 REM PITCH/LENGTH DATA
10010 DATA 121,5,100,5,121,5,100,5,71,10,10,10,10,121,5
    
```

Program M

half as long as it did before.

However, relative to each other, the lengths are still in the same proportion. The fifth and sixth notes are still twice as long as the others.

And that's where we'll leave the SOUND command. As I think you'll agree, it's not all that difficult to use if you take it step-by-step.

Now it's up to you. Program W contains the basis of any tune you may wish to play. All you have to do is discover the notes that make up the tune and how long they last.

It sounds like fun...

I WOULD like to correct the impression given by the title of last month's article that I thought Apple owned the Atari line without in fact, the whole point was that it's not all that hard—certainly easier than it looks at first sight.

My apologies to all Atari sound freaks who felt I'd done the wrong an injection. — PB

```

10 REM PROGRAM W
20 DELAY=1000
30 FOR TUNE=1 TO 8
40 SOUND PITCH,LENGTH
50 SOUND 1,PITCH,10,0
60 SOUND DELAY
70 NEXT TUNE
80 END

1000 REM DELAY LOOP
1001 FOR SLONG=1 TO 1000:NEXT SLONG
1002 RETURN

10000 REM PITCH/LENGTH DATA
10010 DATA 121,5,100,5,121,5,100,5,71,10,10,10,121,5
    
```

Program W



Making the Most of your Atari

First Atari



Frog Jump is just one of the many simple programs in "Making the Most of Your Atari" by Paul Bono. We're grateful to Interface Publications for permission to reprint it.

SUBROUTINES

- 600 Draws the frog.
700 Frog safe zone. Adjusts score.
800 Sound routine.
850 Sprites.
860 Calculates bonus and sets up next level.
1140 Redefines character set.

```

700 IF W11 THEN COLOR 7:PAINT W1,0
704 COLOR DISPLAY 8,1:RETURN
708 FOR W10 W11 TO 10:GOTO W1,0,10,15:WAIT
W
710 IF W1:PRINT:PRINT:G1
714 FOR W10 W11 TO 10:GOTO W1,0,10,15:WAIT
W
718 FOR W10 W11 TO 1 STEP -1:GOTO W1,0,15
,15:WAIT W
722 GOTO W1,0,0,0:W1:COLOR DISPLAY W1,15
726 PURP=150:SCOR=0:IF SCOR=0 AND 010
THEN STOP:GOTO W
730 W1:0
734 IF 80:0 THEN SCOR=SCOR+W1
800 IF W11 THEN PUR=PUR+W1:SCOR=110
AND 80:GOTO W
810 FOR W10 W11 TO 10 STEP -1
814 GOTO W1,0,15,15:WAIT W
818 GOTO W1,0,0,0,0:GOTO W
822 FOR W10 W11 TO 10
826 COLOR DISPLAY 8,7:GOTO W1,0,15,15
830 FOR W10 TO 5:WAIT 10:PRINT W
834 COLOR DISPLAY 8,7:W1:0
838 COLOR DISPLAY 8,7
842 GOTO W1,0,0,0,0:W1:0
846 IF W10 THEN FOR W
850 CLEAR:PRINT:PRINT:PRINT
854 POSITION 8,10:W1:PRINT SCOR
858 IF SCOR=110:GOTO W THEN W1
862 GOTO W1
866 GRAPHIC 17
870 IF 70:0 THEN POSITION 8,10:W1:W1:0
W1:0:W1:0:GOTO W1
874 CLEAR:PRINT:PRINT:PRINT
878 POSITION 8,10:W1:0,0,0:GOTO W1
882 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
      
```

```

886 POSITION 8,7:W1:W1:0:W1:0:W1:0:W1
:0
890 FOR W10 W11 TO 7
894 FOR W10 W11 TO 6 STEP -1:PRINT W11
:GOTO W1,0,15,15:GOTO W1,0,15,15:W1
:W1:0
898 GOTO W1:GOTO W1,0,0,0
902 GRAPHIC 17:GOTO W1,0,15,15:GOTO W1,0
:15,15:GOTO W1,0,15,15:GOTO W1,0
:15,15:GOTO W1,0,15,15:GOTO W1,0
906 IF 11:0 THEN GOTO W
910 GOTO W1
914 W1:0:W1:0:W1:0:W1:0:W1:0:W1:0
918 IF SCOR=0 AND 010 THEN SCOR=110
922 PAUSE 700,SCOR=110:SCOR=0
926 GOTO W1:1:1:1:1:1:1:1:1:1:1:1:1:1:1
:1:1:GOTO W1:0,0,15:GOTO W1,0
:15,15:GOTO W1,0,15,15:GOTO W1,0
930 GOTO W1
934 GOTO W1
938 GOTO W1
942 W1:0:W1:0:W1:0:W1:0:W1:0:W1:0
946 W1:0:W1:0:W1:0:W1:0:W1:0:W1:0
950 W1:0:W1:0:W1:0:W1:0:W1:0:W1:0
954 W1:0:W1:0:W1:0:W1:0:W1:0:W1:0
958 W1:0:W1:0:W1:0:W1:0:W1:0:W1:0
962 W1:0:W1:0:W1:0:W1:0:W1:0:W1:0
966 FOR W10 TO 7:GOTO W1:0,15,15,W1
:0:0:W1:0
970 GOTO W1
974 GOTO W1
978 GOTO W1
982 GOTO W1
986 GOTO W1
990 GOTO W1
994 GOTO W1
998 GOTO W1
      
```

```

1,110,114,104,104,104,104,104,104
2000 0410 040 7,00,04,00,04,00,00,00,1
27,0,00,70,00,100,010,00,70,100,2,1,2
20,00,01,00,01,100,1
2200 0410 10,10,00,00,00,00,00,00,00
01,70,01,00,01,00,01,70,01,00,00,2,0,0,0
0
2204 0410 10,0,0,10,01,00,0,0,10,0,0
,00,1,00,0,0,0,0,0,00,00,10,00,00,0
2208 0410 00,0,0,00,100,100,100,100,00,00,00,0
0,0,10,0,0,100,00,100,00,100,00,0
2212 0410 10,0,0,00,00,00,00,00,00
2216 000 0100 10 10 10 10 10 10 10
10 10 10 10 10 10 10 10 10 10 10 10
2220 0410 01,0,00,00,00,00,00,00,00,00
00,00,00,00,00,00,00,00,00,00,00
2224 0410 00,0,00,00,00,00,00,00,00
2228 0410 100
2232 0410 00
2236 0410 00
      
```



Time's advantage of our
finger-saving offer on Page 85.

```

Welcome to "Return to Eden",
Copyright ©1988 Level 9
Company, Inc.
You are in the control room of a
crashed spaceship, a device
designed to transport plants on
Earth. There's an opening behind the
door.
What now?
You can't leave that way.
What now?
You're here because a straggler in a
massive of strange alien flowers, a
warm breeze wafts gently through the
land.
What now?
What now?
What now?
What now?
What now?
What now?
What now?
What now?

```

V



To venture forth with graphics or not, that is the question...

HAVING looked last month at the origins of adventures and examined some of the infuriating problems that adventure writers set for their victims, this month I'd like to take a closer look at the different types of adventure there are on the market.

As with most popular activities, there are two rival factions within the adventuring fraternity, and the divide between them is a small yet fundamental one.

The argument can be summarized very simply as being text versus graphics, or, put more simply, should an adventure game contain pictures or not?

The former camp, those who prefer their adventures with text only, can be described as the traditionalists of the adventuring world, arguing that the most powerful picture-creating computer in existence is the one lodged firmly inside the human skull.

On the other hand, most recent adventure releases on the Atari, Intellivision and Level 9 being the best known exceptions, have mainly tended to be of the text plus graphics variety.

Indeed, on most of the other boxes they cover, Level 9 have switched to the graphics approach.

Intellivision remain resolve. Within this framework, of course, the edges become distinctly blurred, particularly with the tendency of arcade games to have a more

Micro Scope

THIS month we look at a program which gives you an "etcha-sketch" facility. Move the joystick to draw and press the joystick button to clear the screen.

No. 2
Etch-
sketch



```
100 DIM X(200),Y(200),Z(200)
110 COLOR 1:TEXT(0,0),2,2
120 GRAPHICS 7:10
130 GOTO 1500
140 INPUT "X=";X(100):Y(100)=1
150 INPUT "Y=";Y(100):X(100)=1
160 INPUT "Z=";Z(100):Y(100)=1
170 INPUT "X=";X(100):Y(100)=1
180 INPUT "Y=";Y(100):X(100)=1
190 INPUT "Z=";Z(100):Y(100)=1
200 GOTO 1500
210 IF X(100)=0 OR Y(100)=0 OR Z(100)=0 THEN GOTO 1500
220 GOTO 1500
230 GOTO 1500
240 GOTO 1500
250 GOTO 1500
260 GOTO 1500
270 GOTO 1500
280 GOTO 1500
290 GOTO 1500
300 GOTO 1500
310 GOTO 1500
320 GOTO 1500
330 GOTO 1500
340 GOTO 1500
350 GOTO 1500
360 GOTO 1500
370 GOTO 1500
380 GOTO 1500
390 GOTO 1500
400 GOTO 1500
```

```
100 Sets up two arrays to hold the horizontal and vertical increments.
110 Sets up the colour information.
120 Selects whole-screen mode 7.
130-230 Initialise variables and set up the movements corresponding to the different joystick positions.
230 Turns off the sound.
240 Clears the screen if the joystick button is pressed.
250 Looks at the joystick position.
260 Calculates the position to move to.
270 Traps an error, most likely to be an out-of-bounds error.
280 Plots a point at the new position.
290 Checks the joystick again. The program is a perpetual loop which needs an interrupt (Break or Reset) in order to jump out of the loop and stop execution.
300 The program jumps to here if an error occurs. Since this is most likely to be an out-of-bounds error caused by trying to go off the screen, this line goes back to the last plotted position. It reverses the calculation performed in line 260.
310-340 Make a noise to signify that an error has occurred.
350 Goes back to the main part of the program.
```

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ARCHON is brilliant. There's something in it for all games addicts: arcade, adventure and strategy are all here. My only complaint is that it's best played against a human opponent — the computer's just too good and you can't give it a handicap.



Bryan Skinner
Personal Computer News



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INTRODUCING THE NEW ARCHON 10 MILLION BATTLE BECOME A COLT

ONE of the many Basic commands which is taken for granted is RND. Simple in use, it conceals some very clever goings on in the heart of your Atari.

When RND is executed the Basic interpreter generates a random number between 0 and 1. Typical results could be 0.2331448332 and 0.851782314.

One area where RND is used a great deal is in shuffling a pack of cards. Without random numbers the same cards would be dealt in the same order. This results in a very boring game - the next card can be predicted.

Any serious card game must have some random element involved in the card shuffling and dealing to make the game realistic.

Other uses include simulating dice, controlling movement in games and so on. All in all, RND is well worth exploring.

The following command will print a random number between 0 and 1:

```
PRINT RND(1)
```

The number within the brackets after the RND has no real effect on the random number returned. Try changing the 1 in the above example to 100. As you will see, it still prints a number between 0 and 1.

For the majority of cases random numbers between 0 and 1 are useless. What we need to do is turn

RaNDom thoughts

KEVIN EDWARDS considers RND - the Basic command which can produce some unexpected results

result of the RND(1) is multiplied by 6. This is done to increase the number so that it is between 0 and 5.99999999 instead of 0 and 1.

Now the INT command takes the integer part of the result. This means that 1.999 would become 1 and 2.23478 would become 2. You see, INT doesn't round the number, but chops off all the digits after the decimal point. In our case the resulting integer will be between 0 and 5 (inclusive).

Now the final part of the command, the +1, is executed. This adds one to the result and produces a number between 1 and 6. It's as easy

as pie to implement in machine code.

Location 53770 (\$D3DA in hex) is a random number generator that produces random values between 0 and 255 (a byte). To prove it try the following program:

```
10 PRINT PEEK(53770)
20 GOTO 10
```

This is the same as the more long-winded program given below:

```
10 PRINT INT(RND(1)*256)
20 GOTO 10
```

An obvious drawback of PEEKing



them into more useful integers (whole numbers). For example, to simulate a six-faced die we would use the following program:

```
10 PRINT INT(RND(1)*6)+1
20 GOTO 10
```

This will print random integers between 1 and 6. Let's take a closer look at line 10. As you can see, the

as that. And there's as much chance of getting a 1 as a 6 - no loaded dice here!

There are two other ways of generating random numbers which come into play when working in machine code, when Basic's RND is unavailable. One is to write your own random number routine and the other is to PEEK location 53770, the latter

```
seed=40770
4000 00 04      random 101 04
4002 01 00 3F  001  10h seed,1
4005 40 04 3F  00C  seed+2
4008 00 0F 3F  00F  seed+1
400B 00 04      101  04
400E 20 04 3F  004h  00L seed+2
4010 50 00 3F  000  seed,1
4013 01 00 3F  00C  seed,1
4016 00 00 3F  000  seed,1
4019 00      000  0
401C 00 00 3F  000  seed,1
401F 00      001
4022 10 00      00L  00h
4025 00      00T
4028 00 00      000  00h
402B 00 00      00L  00h
402E 00      00T
```

Listing 1. Random number generator source program.

location \$377D is that only random bytes can be generated, limiting us to numbers in the range 0 to 255. Problems arise when we want to use this PEEKing method to generate a random number between, say, 1 and 52. Unfortunately there is no simple way of doing this.

Anyway, PEEKing ready-built random number generators is cheating. It's more of a challenge to write your own routine to create such numbers.

The next program we'll look at is a machine code equivalent to PEEKing location \$377D. Take a look at Listing 1. This is the source listing of the random number routine.

Those of you with last month's issue can enter the program using Hever. The code should be entered at location \$4000 (16384). Remember, all you enter is the hexadecimal bytes at the right of the memory locations. If you are one of the unfortunate people who do not have Hever type in Program 1.

Hever users should use the remote option to test the routine. The execution address is \$4000. When the routine has finished five random bytes will have been stored in memory starting at location \$3FF8 (16376). Use the examine option to see them.

If you've typed in Program 1 and RUN it the random numbers will be printed out automatically. Now each



byte printed may look very random, but in fact the numbers are identical each time you RUN the program.

Write down the first few bytes generated by the new routine and compare them with the numbers printed when the program is re-run if you don't believe me.

What we have done is to generate pseudo-random numbers. By this I mean the sequence of numbers printed repeats itself each time the routine is executed, but individual numbers appear to have no relation to one another.

If the numbers printed had been 1,2,4,8,16,32 we would reject them automatically — we could easily predict what the next number is, 64, and could therefore say the numbers are not random.

Creating a routine to generate pseudo-random numbers is very awkward. What we have to do is perform several operations as a series of numbers to produce another set of numbers (random) so that both sets bear no obvious relation to each other.

There is, of course, a relationship between the two sets, but it is so complex that it cannot be readily calculated from a list of numbers generated by the routine.

To produce different sequences of random numbers you can seed the random number generator with different values before calling the routine.

Seeding means setting up the initial values of the set of numbers used by the routine. Changing these initial numbers causes the sequence of numbers generated to be different.

In Program 1 line 40 seeds all the bytes with the value 20.

If you're using Hever you can change the seeds by altering the contents of locations \$3FF8 to \$3FFC.

If you change the seed number in line 40 from 20 to 3D and RUN the program, the number sequence will be different. In fact, if you delete the line which seeds the random number generator you'll get different random bytes each time you RUN the program, since your "new" seeds are what's left over from the last time it was called.

The Atari computers are very intelligent because they always generate true random numbers. If you see a friend's micro, such as a BBC, and you turn it off then on and enter the command:

PRINT ONE!!!

you'll always get the same number. This is because it always seeds the random number generator with the same values.

I hope this has thrown some light on random numbers for you. I'm sure you'll agree that working through random numbers routines can be a lot of fun. It's always interesting to see how each routine differs.

Why not try writing one yourself? Be careful though, you often find your generator has a bias in it. For example, some routines seem to pick a lot of 0s and 255s.

Has anyone out there come up with a program to test how random a particular generator is? If so — or if you've got any "random contribution" to make — we'd love to hear from you.

```

10 RUN RANDOM NUMBER
20 RUN 01 0000 0000
30 RUN 02 0000 0000
40 FOR L=0001% TO 00000000 L,20
  NEXT L
50 FOR L=0000 TO 00000
  60 0000 0000 L,0
  70 NEXT L
80 00000000
90 FOR L=0 TO 4
100 PRINT PRINT;L;" "
110 NEXT L
120 PRINT
130 GOTO 80
140 0000 000,0,000,000,001,000
150 0000 00,00,000,000,0,00,000
160 0000 00,00,000,00,000,00,000
170 0000 000,00,00,000,000,00,000
180 0000 000,000,000,000,000

```

Program 1

Second in DAVE RUSSELL's series on the Atari's graphics modes

LAST month we looked at Graphics Mode 0, the text mode that appears when you switch on your mire. This month we'll take a look at two other text modes, Graphics 1 and Graphics 2.

As you might expect, there are some differences between Modes 1 and 2, but they're similar enough for us to consider them together.

You may recall that the Mode 0 screen was like a piece of graph paper with 40 columns and 24 rows.

If you imagine the columns slunk together in pairs, you've got something similar to Mode 1.

To be more accurate, the Mode 1 screen has two pairs. The top part is like pairs of Mode 0 columns slunk together, while the bottom part is exactly the same as Mode 0 columns.

That is, Mode 1 has a 20 rows by 20-column section, immediately underneath which are four rows of 40 columns.

The conceptual move to Mode 2 simply requires you to imagine the Mode 1 "Tet" rows slunk together in pairs. This gives a 10 rows by 20-column section, again with four rows of 40 columns beneath.

You can see the way these sections are separated quite clearly by typing GRAPHICS 1 and pressing Return.

Assuming you were in Mode 0 before you did this, your screen has suddenly been transformed into a large black area with a small strip of Mode 0 like at the bottom.

This strip is four lines deep, and you should see the word READY on the second line and the cursor immediately beneath it on the third line.

If you press Return a few times, the word READY will move up the screen. On the third press, it will disappear.

If you had a program in memory and typed LIST now, the listing would be displayed on these four lines only.

It's not very useful being able to read only four lines of a program at a time, which is why program writing and debugging tends to get done in Mode 0.

The four lines are what is sometimes called a "text window" and anything you PRINT will appear here.

Try the simple exercise in Program

TAKE A LOOK AT MODES 1 and 2



1 When you Run it, the cursor will end up on the bottom line.

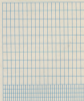
```
IN GRAPHICS 1
DE PRINT "MODE 1 TEXT WINDOW"
```

Program 1

This means that if you'd had another line of print, the first would scroll out of the window. Add a line 40 to Program 1 as follows:

```
40 PRINT "YES IT'S AN EXTRA LINE"
```

When you Run the program now, the first line of print scrolls off, leaving



only the output from line 40 visible.

At this point, you might be tempted to ask what use the text window is if it can only display the last line to be printed.

We can make better use of it by causing the program to wait after it has written something to the text window.

In this way, the text already there won't scroll off until we want it to do so.

For example, type in and Run Program 2. You should now have these lines of text in the window and


```

10 RUN:40:0
20 GRAPHICS:1
30 PRINT "MODE 1 TEXT WINDOW"
40 PRINT "MODE 15 AN EXTRA LINE"
50 PRINT "MODE 15 RETURN"
60 INPUT AS

```

Program 4

The cursor should be on the fourth line, just after a question mark.

The reason the text stays there is because the program is waiting for something before it continues.

Line 60 tells the machine to expect an input from the keyboard, and it will wait until it gets the signal that an input has been made—the signal that is sent when Return is pressed.

If you now press Return, all the text scrolls out of the window to make way for the Ready message and the cursor.

I wouldn't want to claim Program 4 as a major contribution to programming, but it should illustrate one possible use of the text window.

You can print simple messages and take inputs while all the main action is happening on the rest of the screen.

Oh yes, I'd forgotten about the top 20 rows of the screen which are what Mode 1 is all about! Getting something on there is almost as easy as getting it into the text window.

Program 4 shows how you can write some text to the main part of the screen.

Instead of a simple PRINT, you must use PRINT#6. That's 6 (read as hash-six) means 'print to channel six'.

If you Run this program you'll see our name in lights. Note the orange colour of the letters.

```

10 GRAPHICS:1
20 POSITION:5,5
30 PRINT #6;"MARK 1500"

```

Program 5

Now, type in line 30 again, only this time put our name in lower case as follows:

```
30 PRINT #6;"mark 1500"
```

When you Run this version, the name still appears in upper case (capital letters), but the colour has

changed to green.

Try typing our name in inverse upper case or inverse lower case and see what colours are produced.

This illustrates two aspects of Mode 1. Firstly, it's a five-colour mode, and secondly only half of the character set is available.

We'll take a closer look at the character set next month, but for now let's look at controlling the colours.

Our use of PRINT#6 followed by upper case letters meant that register 3 was selected and this register defaults to orange.

By using lower case letters, register 1 was selected and this defaults to green.

If you typed the message in upper case letters, this selects register 3

Mode 1: A five colour mode with just half the character set available

and so it should have appeared in blue.

Finally, using lower case inverse selects register 2 and as the message should have appeared in red.

You'll notice that no matter how you type it in, our name still gets printed in upper case letters. That's what I mean by saying that only half of the character set is available.

We can access the other half and get lower case letters, but we'll leave that for next month.

Register 4 controls the background colour and this defaults to black. You can change this using the SETCOLOR command as we did in Mode 0.

If you are in Mode 1, enter SETCOLOR 4, 2, 6 and press Return to see the effect of changing the background colour.

The 4 selects register 4, the 2 selects colour 2 (orange) and the 6 sets the luminance.

The SETCOLOR command is the key to changing the other registers from their default values. You can see the effect of this by entering Listing IV and running it.

Because the message in line 60 is

```

30 GRAPHICS:1
30 FOR A=0 TO 5
30 FOR B=0 TO 25
40 POSITION:5,5
50 SETCOLOR:4,2,6
60 PRINT #6;"MARK 1500"
70 FOR DELAY:1 TO INVERSE:DELAY
80 NEXT B
90 NEXT A

```

Program 6

In upper case, we can change its colour by altering register 0.

Line 60 performs the alteration and the loop set up by line 30 cycles through all the available colours.

The luminance is kept at a constant value of 6, and line 70 simply keeps each colour on the screen long enough for it to be seen.

There is another way to get a character on the Mode 1 screen, by using the COLOR and PLOT commands.

For example, with a clear Mode 1 screen (which you can get by pressing Reset and typing CR, TL, type COLOR 65 PLOT 5,5 and press Return.

The slightly confusing aspect of this method is that the COLOR command doesn't select a colour in Mode 1.

Instead, it selects the character to be PLOTTed, in this case character 65 or A as we know it.

Hence, if you entered the line as suggested, you should have an orange A at screen position 5,5.

You can still use SETCOLOR to change the colour of the character that you plot. If you change line 60 in Program IV to read:

```
60 COLOR:65:PLOT:5,5
```

and delete line 40 (because it isn't needed), you can see the A cycle through the same colours as our name did.

If you want to put a large piece of text on the Mode 1 screen, it's obviously easier to use PRINT#6 than lots of COLOR/PLOT combinations.

However, there are times when you might need to use COLOR, so Program V shows how to produce a familiar result with line 30 READING

```

10 GRAPHICS 1
20 FOR A=1 TO 10
30 READ B
40 COLOR B
50 PLOT A*10,B
60 NEXT A
70 DATA 10,14,18,22,26,30,34,38,42,46,50
    
```

Program V

the character DATA from line 70.

Selecting a colour register is not quite as straightforward with **COLOR/PLLOT** as it is with **PRINT#6**. It covers it in detail next month because the difficulties are connected with the missing half of the character set.

However, to see the sort of thing you can do, change line 40 of Program V to read:

```
40 COLOR A*10
```

The message should now appear in green.

Instead of adding 32 to all the numbers in the DATA statement, you

can use the method selectively to produce a mixed colour display.

For example, retype line 40 as it originally appeared in Program V and alter line 70 to read:

```
70 DATA 17,24,17,32,38,6,25,32,
    65,104
```

If you compare the two versions of line 70, you'll notice that I've added 32 to some of the values, causing those characters to be printed in green while the remainder are still printed in orange.

So far, I've not discussed Mode 2 at all. That's because everything I've said about Mode 1 applies to Mode 2.

If you change the **GRAPHICS 1** in all the programs to read **GRAPHICS 2**, you'll get very nearly the same results.

The only differences will be the size of the text and its position on the screen.

As I said earlier, Mode 2 rows are like two Mode 1 rows slung together, so Mode 2 characters are twice as

Mode 2 characters are twice as high as those of Mode 1

high as those of Mode 1.

This in turn means that the command **POSITION 5,5** will refer to a different point on the TV screen depending on whether Mode 1 or Mode 2 is in use.

Mode 1 and 2 also differ in terms of the amount of memory they require - Mode 2 needs less than Mode 1 - but that needn't bother us here.

The programs we'll use won't be long enough to worry about memory considerations!

Next month we'll look at how to access the missing half of the character set and how to select a colour register with **COLOR/PLLOT**.

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Just a little DIY can save you quite a lot!

I HAVE just purchased issue 1 of Atari User after weeks of hawking at its impending launch. Congratulations! You have immense potential - I hope your aim is to become the British version of the brilliant Analog.

I am not going to give a list of suggestions for you to consider. I just want to try you out to go elsewhere on the games aspect of the Atari, since very few magazine listings can approach commercial programs for quality and durability (and persistence, even these don't keep my interest for very long).

Actually, the Atari utility was a superb start to what looks like becoming an institution in the magazine world.

Hopefully - in the near future when I have managed to get one or two rather important extras out of the way - I will submit some of my own programs and hardware reviews for publication.

That point brings me to my only suggestion. Please keep your cover open for DIY peripherals: MS20, printer, cassette interfaces, and other assorted devices that cost an arm and a leg to buy ready built even when the manufacturers claim great value.

I don't want to put any one person down, but commercial moderns cost well over £100. For example, whereas Maplin Electronics' Supplies supply a colour 512K for around £80-£70 and a nice little interface can be built for less than £50. That is what you call value!

Finally, my copy of Atari

Use came from a company called Software Express in Birmingham who advertises in your pages. Can I use your page to thank them for a really express service, and incredibly helpful and polite staff to obtain working items that would be hard to - Martin Sisson, Nottingham.

■ We hope to bring you a range of hardware projects - everything from left-handed joysticks to complete piano-style keyboards.

Even so, some people just don't feel confident about using a soldering iron, so it's why there is a market for ready-built moderns.

A turn of the screw . . .

I AM the proud owner of an 80000. On April 23 I ordered the new £3990 from the fabulous Silice Shop. It arrived 72 hours later on the Friday.

Now this is not just a letter of congratulations to Silice Shop, my point is that already having an SE I know what the SE is going to be like. So as soon as I turned on my new SE, I knew that something was wrong.

Basically the colours were

extremely dull. Even with the TV colour knob turned on full, the user bright colours were still dull. I rang Silice Shop to find out what was wrong with my new SE. They told me "Well you're in all right mate, if you want it in use will either fix it or send a new one".

Well I was extremely disappointed at the prospect of having to send the SE back after all the attention that had been paid to work about this brilliant machine.

But luckily at the last minute I discovered a small hole on the base of the computer giving access to a screw adjustment, that enabled me to change the colour output of the computer.

If only Silice Shop had told me that in the beginning. Please tell all your readers about this so that they do not have the same disappointment that I had - A.L. Bishop, Chesham, Herts.

■ Well spotted! You must have some very small screwdrivers. In general, though, it's best not to go poking about but you do some damage and simultaneously invalidate your warranty.

How a group can help

CONGRATULATIONS on a first class magazine. The first issue was very informative and useful. I can't wait for the next.

I am really writing to express my thoughts regarding Atari-developed user groups. I am very proud to be a listed member of the Lee Valley Atari Users Group (LVAUG), and have been since it started two years ago.

I was at first an Atari 800 user, but was fired with the keyboard and so upgraded to an Atari 800.

I soon became bored with playing games, and began to

use my computer as it should be used - to program with.

I started learning Basic with great help from the group, and an even programming guide well (not as good as the officials of the group, but good within my potential).

It was I for the help and advice given at the fortnightly meetings of the LVAUG I would still be a 400 owner playing 100 games, instead of an using a 486 800 and making my own games.

This week I bought a Gemini printer with the help of Matthew, the group's vice president and main consultant. He helped me select a printer for my specific needs and within my price range, and so far I haven't had a problem.

I feel that many people around the country just have 1 bothered to send at a local group. They feel it will be boring, too difficult and expensive, or just too demanding. Instead, I have found it none of these.

The LVAUG I feel has done me a good job in educating me in the computing world, giving me advice, hints, tips, ideas, and most of all, knowledge of what to do.

It is one of my main social events of my week, and I look forward to it. If the officials see too tired or with problems at the meeting, they are always pleased to see me at their own homes, or even at the pub afterwards - Mr. Saunders, Broomers, Herts.

Can I use these games?

I've got an Atari 800 and I keep seeing people advertising to sell the VCS game cartridges, paddles and joysticks.

Can I buy them will I be able to

ATARI USER

Mailbag

We welcome letters from readers - about your experiences using the Atari micros, about tips you would like to pass on to other users . . . and about what you would like to see in future issues.

The address is write to us

Mailbag Editor

Atari User

Europa House

66 Chester Road

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use them on my 600? — **Brian Fargueson, Wilmet, Massachusetts.**

■ The good news is that the paddles and joysticks are compatible with all Atari computers, so you can buy some of those.

The not-so-good news is that the 100% game cartridges are different from the cartridges that your 600 accepts, so it's no good your buying any of those.

Crashing the buffers

I agree with you that Alphabet Train (Atari Game, May, page 127) is a delightful little program... when it works!

I typed in the listing as printed and it works fine as long as you don't try to go further than the end of the alphabet. If you try to move the train to before A or after Z, the program crashes rather spectacularly.

Is this a deliberate feature, or was there an error in the listing? I hope it's not deliberate because it spoils an otherwise great game, but my engine abilities in Basic can't spot anything obviously wrong. — **B.H. Millington, Uxbridge, Middlesex.**

■ One man's feature is another man's bug, which is what there was in the Alphabet Train listing. It crashed in where we added the keyboard space and results from the order of precedence of the logical operators in Basic.

All that is required to fix the bug is to add some parentheses to lines 600 and 610 as follows:

```
600 S=STR$(CHR$(S+1))
610 IF (S="Z" OR S="A") AND I
  610 THEN S=" ":GOTO 610:
610 GOTO 610
610 IF (S="Z" OR S="A") AND
  610 THEN S=" ":GOTO 610:
610 GOTO 610
```

With the parentheses added the program works fine and doesn't allow the user to go beyond the end of the train.

High in the Drop Zone

CONGRATULATIONS on a great new magazine. Your articles are all very good, up to date and interesting. Also special offers are a draw and very good idea. For the July now we *Atariists* have had it too rough, with software being so expensive.

What I would like to see in your magazine are high score tables and tips on adventures. My high score on Drop Zone is 67,810 and I really need some help on levels of those!

Also here is another good idea you may wish to consider which no other magazine offers — a pile of a piece of software for every letter and program published.

Please keep your magazine the same size as format. It's too often an excellent magazine is ruined by half ideas. — **D. Sutton, Leicester.**

■ We suspect you must have those levels if you scored 67,810 on Drop Zone!

The only way we could get a score like that was with one of us operating the joystick and another pressing the appropriate keys.

The problem with high score tables is that they take up a lot of space, particularly when there are a lot of games around. Also, there's no way of telling that the scores were genuinely obtained — although we're sure that no Atari user would disagree!

Tips and tips on adventures will form part of Billig's Advertising section, so do send them in. Please try to ask a specific question and we'll try to print the answers in a way that doesn't spoil the game for other people.

There's a good reason why so many magazines give a piece of software for every letter. Some have tried similar things and quickly dropped the idea because the cost gets too high. We'd rather keep the cover price competitive.

However we do pay for articles and programs published. You won't get rich writing for *Atari User* (well, we

Check - sum routine needed

I AM pleased to say that I have purchased my first copy of *Atari User*, Vol. 1, No. 1 and I am even more pleased to tell you that I will be one more of your many readers, for many issues to come.

If it continues, as I am sure it will, to keep to issue No. 1 standards, it will be, I am sure, the number one magazine for Atari.

To be honest with you I have gone over it several times to see if I can make any complaints. I can find none. Excellent, please keep it up.

There is however one thing I would like to see, that is some kind of code listing type, similar to what we are used to in magazines like *ASIC*. This is a great help to the many, many new Atari users. Is this possible for you to do? — **Les**

Boatook, Lee Village, Birmingham.

■ All this praise has the editorial team positively blushing! No more, please, or it will go to their heads.

We're still pondering on the question of a check-sum routine. Like most things in life, there are advantages and disadvantages.

For example, it could be argued that they confuse the people who need them most and that it's good to get some practice at debugging.

On the other hand, a good check-sum routine can save some time since you've entered the routine itself. We'd welcome reader's opinions on this while we're pondering.

haven't, so why should you? but at least you'll have the satisfaction of knowing that you're helping fellow users.

A way? There are two!

I've finally managed to get enough money together to buy a 1060 also drive. My friends usually have after drives — they saved up faster than me — and so ran DOS 2.

I know there's an option on my DOS 2 that will let me take files off their discs onto one of mine, but we can't work out how to do the opposite.

If I write a program and save it on a disc, how can I give it to my friends?

There must be a way, for we can't work it out. Can you? — **Wayne Selby, Burgess Hill, Sussex.**

■ There are two ways to transfer files from DOS 3 to DOS 2. The easiest is to load the program from your disc, save it to cassette, switch the drive off and then reload from one of your friend's DOS 2

discs. With DOS 2 loaded, you can load the file from cassette and then save it to disc.

The other way is to find a utility program which enables the transfer without going via cassette. Such programs have appeared in print and indeed we hope to print our own version in a few month's time.

Of course, DOS 2.5 may solve all these problems.

This chip is on our menu

I FOUND Mike Cook's article in the May issue of *Atari User* on the 6502 chip very interesting and informative.

Might I suggest you get him to write a similar article on the 68000 chip which will be used in the new ST machines? I'm sure many of your readers would find it interesting as well as me. — **Frank Robinson, Milton Keynes, Bucks.**

■ Would you believe Mike has already written such an article? It should appear in next month's issue.

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much of
a chore?



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