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Vol. 1 No. 6

October 1985

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The man  
behind  
the myth

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Vol. 1 No. 6 October 1988

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## Two budget packages launched

ATARI UK has launched two budget packages for both the 8000X1 and the 1300X which effectively slash the prices of both machines in the run up to Christmas.

The 8000X, - voted 'Home Man of the Year' in the British Microcomputing Awards 1985 - has been bundled with a joystick and game cartridge at £70.

This combination would previously have cost in excess of £100.

Even bigger savings can be realised with an offer which links the 8000X with a data recorder, joystick and software pack.

Although the usual price would have been in the region of £180, this is now being offered at £95.

"You can't find better value for money anywhere", insists a leading dealer. "It will be a runaway winner at Christmas."

However it all points to Atari wanting to get rid of all their back stock of 8000Xs, cease production and then concentrate on the 1300X.

A company spokesman was quick to deny this suggestion. "We just want it to be the most competitive in the marketplace this Christmas," he said.

On the 1300X front, there are also two new low-cost packages.

The first involves the machine, the 1050-disc drive and four pieces of software for £231, involving a saving of around £70.

But the star package of all sees the 1300X, 1027 letter quality printer and word processing software, together with three other pieces of software for £300.

In all the savings here would be in the region of £280.

"It is our intention to make this product the top-selling 129k computer this Christmas", says Floo Harding, Atari UK's sales and marketing manager.

# Atari's aiming to clean up at Christmas

**ATARI is already dreaming of a bonanza Christmas with the ST range buckling brightly atop the corporate tree.**

The company is forecasting that it will sell up to 30,000 of its latest machines in the UK alone before the end of 1985.

And it is reporting "significantly increased demand" here in Britain for the 8000X1 and 1300X1 models.

"We thought the season would start late this year but we've been proved wrong", Mas Barnbridge, Atari UK's general manager told Atari User.

"According to our dealers, the run up to Christmas is well under way with some excellent results."

"It all adds up to an extremely bullish market for Atari."

Of the 50,000 ST machines shipped by Atari world-wide by

early September the UK received less than 3,000 machines, and a large percentage of these went to software houses.

However the month saw the arrival of 6,000 STs in Britain and this month's deliveries will be in the region of 10,000.

"We will they be on the shelves too long", said Mas Barnbridge. "For once though the ST is not a seasonal machine, it just happens to have arrived here at this particular time of year."

"As a result it will prove to be an even better Christmas than we otherwise would have expected."

Germany is currently the number one market for the ST range outside the United States, followed by the UK, France, then the Benelux countries and Italy.

However the UK is expected soon to overtake Germany which is only ahead because of

the earlier launch of the ST there.

To ensure this, Atari's UK sales force are currently vigorously targeting sectors of the market for the ST.

It is known they have considerable interest in the 1.2 million shopkeepers on Britain's high streets who have a weekly turnover of between £1,000 and £3,000.

"We now find ourselves in the position with the ST of being able to offer them something really worthwhile they have never been able to afford before", says Mas Barnbridge.

"The UK has always been known as a nation of small shopkeepers, but now we intend to make it a nation of small shopkeepers equipped with an ST computer."

"That's the best Christmas present they - and we - could possibly have".

## Low key arrival for baby

ALMDSST unannounced in the equipment comprising the consumer launch of the 520ST at the PCW Show, its baby brother - the 260ST - slipped quietly onto the scene.

The model was on display but behind glass doors, so preventing the possibility of hands-on testing.

And the only information available about the 260ST was that it has 256k of memory and a built-in half megabyte disc drive.

While revealing that the



machine will be on sale in the UK, shortly - mainly through high street chains - an Atari official was not prepared to put a price tag on it.

It was up to a leading dealer to indicate that he believed it

would sell for less than £500. Meanwhile the 520ST, mouse controller, half megabyte disc drive and disk and white high resolution monitor will retail for £682, before VAT is added.

# ST software comes flooding in

**SOFTWARE** buyers both sides of the Atlantic have rallied round the Atari banner in the impending battle for market dominance by the new ST machines.

It is now estimated that by Christmas there will be more than 300 titles available for both the 520ST and its baby brother, the 280ST.

"Never before has a new machine had so much software available", claimed Rob Harding, sales and marketing manager for Atari UK.

"With immediate support we are confident the ST will become the leading 16 bit machine in the UK."

The ST range received a major boost in the arm when leading business software giant TCI revealed that some 180 of its titles are now available for the machines.

Yet another boost came with the news that the 80286 operating language will now enable the ST to run more than 80 IBM's business software packages.

At the same time, it is now known that 30 UK software houses are currently nearing completion of almost 100 additional titles for the ST.

The PCW Show in London provided the first public showcase for much of the new software, some completed, some still only in prototype form.

"We have been delighted

with the response from the software houses", says Max Barnbridge, Atari UK's general manager.

"It has been said that the ST would rise or fall depending on the amount of good software available for it. Well, we certainly

**UK software houses are currently number one in the world so far as production of programs for the ST range are concerned.**

**At the consumer launch of the ST in London it was revealed that three times more British software than American is available for the machines.**

**"It's very impressive", observed Jack Tramiel, chairman of the Atari Corporation, "but you do have the best software people in the world, thanks to being the most computer minded nation".**

know which way we are going now".

On the ST software front at the PCW Show Atari UK said:

■ A QEM emulator from GSI

running a number of programs including dBase 3, Microsoft Basic and Wordstar.

■ Three spreadsheets, two databases and three word processors.

■ The full range of Intecom adventure packages, including The Hitch-hiker's Guide to the Galaxy.

■ An title type package being developed for the ST from British Telecom's software house, Flexlink.

■ Lambda of Mando from Microsoft, which has the distinction of being the first software package to be converted for the ST here in the UK.

■ The much praised small business package from Quest International, Cash Trades. This has been nominated for a major newspaper award.

■ K-Spread from Kung Computers, a blend of mouse and keyboard driven functions providing a spreadsheet.

■ A complete cross development environment for programmers wishing to transfer IBM PC software from Minicomplex. This will allow both new and existing application programs to be developed using the PC and then downloaded to the ST.

**A GREAT deal has already been written about Jack Tramiel, chairman of the Atari Corporation. And so often happens with coverage of such larger than life celebrities, fiction has often tended to take the myth.**

**So when Mike Cowley was granted an exclusive interview with Jack Tramiel he set out to discover the man behind the myth.**

TO some, he's the saviour of the world computer industry by providing people with what they want - in a price they can afford. After all, the grandson of Auschwitz built Commodore into a billion dollar business by offering value for money.

Now he's doing the same for Atari.

But to others he is little more than a ruthless opportunist with all the strokes of a contemporary Apple the Hun.

However it was simply a hunch, around middle aged man who likes to greet me in a private room behind the Atari stand at the PCW Show in London.

The success of the ST launch ballroom going an outside had obviously permeated the inner sanctum. Jack Tramiel was leaning as he extended a warty hand in welcome.

It is difficult to imagine that here is a man who can see two thirds of the Atari workforce within days of taking over without batting an eyelid.

On that he has been locked in some of the bloodiest board room battles the industry has ever seen, walking away from most the unopposed winner.

But on closer inspection it's the eyes that seem to hold the key to Jack Tramiel. Heavily hooded, gleaming shined, the danger signs are there for all to see.

The Atari boss has even dropped his gear in public, preferring to fester the his man image for the benefit of the media.

So in order to get a glimpse of the private Jack Tramiel, I asked him to describe a typical

## BBAS..link between ST and BBC

A 20-year-old student at the University of Kent has achieved a technological breakthrough to enable the ST range to run almost all programs written in BBC Basic.

Tristan Mabley, who is studying computing, was called in to Atari because he is considered to be an expert on the BBC Micro.

Although a prototype of his BBAS Basic Interpreter was on display at the PCW Show, Tramiel is currently leaving out the bugs prior to its anticipated release later this month.

"It provides an environment

for us deliberately been made as close as possible to that of a BBC computer", he told Atari UK.

"The programs written for the BBC Micro should run directly on the ST, provided that they do not use machine code routines other than those provided by the operating system".

Despite the close likeness to the BBC environment, the user

of BBAS still has access to special features of the ST, including windows and the mouse.

"These features are incorporated into the pseudo-operating system so that existing programs may easily be modified", explained Tramiel.

"Naturally, though, this means that these modified programs will not run correctly if copied back to BBC machines".

# Jack Tramiel

## The man behind the myth



day in his life.

Here, with a few aides, is how he described it:

Each morning he sleeps in late — or so he sees it — until around 8am. "That's one luxury I allow myself," he says.

Surprisingly he could be at any one of four addresses and still qualify to be getting up at home.

The reason for this is that he is a self-confessed house collector, owning three homes in the United States and a condominium in Toronto, Canada.

More likely than not he'll be at his temporary Lake Tahoe home some 7,500 feet above sea level.

Or there again, he could be at his splendour in either San Diego, just 20 minutes drive from his office, or Santa Cruz, overlooking the Pacific Ocean.

"I choose the home I'm at on the basis of who I have to see on business", he confided.

But does that not get rather confusing for his wife?

"Not really", he replied. "My children have grown up, so my wife Helen, who is also my partner, travels with me wherever I go".

He usually breakfasts simply on half a grapefruit, yogurt and coffee.

"I travel as well as when I'm at home, I'm always trying to diet", he admits.

The Atari chief also uses his breakfast period to catch up on the business world by reading the Wall Street Journal. However he always puts half an hour aside to talk to Helen.

From Lake Tahoe he is flown by private plane to Santa Fe airport and then drives himself to the Atari headquarters.

Once in his office he is brought up to date on what the current problems are and decides which one to tackle that day.

"It could be anything from purchasing to designing, production to distribution", he says. "I like to be involved in the total business.

"You see I'm a generalist, not a specialist. Although I understand the engineering from the firm's viewpoint, I could not design a computer myself.

"That's why I'm lucky to have those some who are specialists. And it's very nice to have the family involved".

Having arrived at the office at

around 9.30am he goes through matters raised by his secretary, then starts to contact the outposts of his empire by phone or computer.

"I do not believe in mail", he insists, "after all, we are in the communications and information world".

Each day when at the office he usually holds a working lunch with his management team — but only when they are free of potential customers.

They drive some five miles from the office to eat always at the same place, a seafood restaurant.

Jack Tramiel again dines sparingly at lunch — usually a piece of halibut — does not allow himself alcohol, not even a glass of wine.

"I do not drink most of the time because I suffer from gout", he says.

Back in the office he spends up until 5pm making phone calls out to the Far East to his manufacturing facilities.

Most days he will dine with a customer in the evening before returning to one of his homes.

It is only then that Jack Tramiel insists on having some time alone, relaxing by reading

computer magazines, including his own copy of Atari User.

Although he admits he never really turns off as far as business is concerned, he does have one hobby, deep sea fishing. And he's proud of his biggest catch so far, a seven-foot blue Marlin.

But does he will not get irritated by his short working regime?

"I always try to have her around me to make up for it", he admits, "but I still get back from her every now and again. That's only natural".

Jack Tramiel admits to two real loves in his life, his business and his family.

But he provided a fascinating insight into his true character the day he fired his eldest son Sam, now president of Atari.

"He felt money gave air to his nose, so I fired him", he recalls. "So he went into business on his own.

"One day he went to write a cheque to pay his payroll but found he had nothing in the bank.

"So he found out that money doesn't grow on trees. Now he is back working for me".

Now that is the real Jack Tramiel talking.

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FIGINA Simmons' sea captain husband Tony is nearing the end of a seven month voyage to the other side of the world and back.

But as the wife his ship has been sailing round the Pacific Ocean he has been only seconds away from his wife and children in Genoa.

This remarkable feat of communications is made possible by Mrs Simmons' Atari 800XL and modem, the MicroLink electronic mail service and the international satellite system.

She has been able to send and receive weekly text messages that have kept the family in touch and eased the heartache of the long separation.

Before MicroLink, Mrs Simmons had to contact her husband — a Merchant Navy officer for 22 years — via the marine radio station at Portofino, near Genoa.

And although the technicians there were always very helpful this meant having to telephone her twice and have it taken down manually and sometimes having to queue to get into the system, never being sure when the information would reach her husband on the high seas.

"With MicroLink I can do the job all by myself", Mrs Simmons told *Atari User*. "The message is transmitted in seconds to anywhere in the world Tony might be."

"The system lets us be in contact with each other much more than before and that is

## Atari keeps family together

very important to me living in an isolated part of the country with my three young children.

"Not only do I feel closer to my husband while he's away, if any problem crops up here I know I can have the benefit of his advice within a short time via his ship's telex facility".

Mrs Simmons said she had been pleasantly surprised to find out how easy it was to use her Atari to send text messages.

"The *Up* file makes a computer expert", she said. "In many ways I have been having to learn from my mistakes, such as occasionally truncating a message unintentionally and somewhat exceeding my telephone budget."

"But I can't speak too highly of the MicroLink help line team. They have been absolutely super, taking a lot of time and



Keeping in touch with Dad... Mrs Simmons and her children

trouble to put me on the right track when I was having teaching troubles with the system.

"I believe a lot of women are frightened of computers, probably because they are afraid of making embarrassing mistakes. But my advice to them is not to be — females should be just as involved in the world of computers as males.

"It was because of this belief that I bought the Atari for my daughters, so they wouldn't get left behind by the boys at their school."

"Now I'm learning along with them and loving every minute — particularly that part of computing that keeps me in such close contact with Tony".

## 32 bit launch at Comdex?

THE long-awaited 32 bit machine from Atari is almost certain to take its bow at a major American computer show in November.

Comdex in Las Vegas is being touted as the launching pad for the new computer.

Asked when it would be unveiled, Max Barnbridge, Atari UK's general manager told *Atari User*: "Just make sure you are at Comdex in Las Vegas. There's going to be a lot happening there..."

## Game 'breakthrough' for the ST

A TRIO of top UK software authors who have known both overnight success and overnight failure have got together again to write for the 520ST.

David Lawson, Ian Hetherington and Eugene Evans believe the megagame they have developed — *Stratoscan* — will establish them at the pinnacle of the computer games world.

Once the driving force behind the Liverpool based Imagine software house, all three saw fame and fortune flourish from them when the company spectacularly crashed with staggering debts last year.

"We are on our way back with this", David Lawson, who claims to have personally lost

£150,000 in his company's crash, told *Atari User*.

In all, it has taken the authors some four months to write the 400,000 lines of machine code needed for *Stratoscan*.

An adventure game, it is being hailed as a technological breakthrough in that it allows the players to become characters in a seemingly infinite number of alienia type roles.

"We always wanted to create our own movies", says David Lawson. "So we've done just that and put it on a computer. We just drop the player into it".

But will success once again kick the trio from Liverpool if *Stratoscan* goes as well as they believe it will. After all, they are

the first to admit that back in the days of Imagine, the money simply went to their heads.

This time it looks unlikely. For the software house for which they now work, Progress, is firmly in the control of Talbot Smith, a hard headed Mersey-

side entrepreneur.

His empire stretches from steel stockpiling to housing.

"This time when success comes the fact's courtesy of the 520ST, it'll be counting on to the punk strings", he told *Atari User* meekly.

## More on the way

ATARI has three more computers in the pipeline to follow the successful launch of the 520ST and 260ST machines. This was revealed by chairman Jack Tramiel during his recent visit to London. "We are already working on three new machines that will be better than the ST", he told *Atari User*. "We will not allow ourselves to get stale".

# Understanding the ST

Following the launch of the Atari 520ST we can expect to see many books devoted to every aspect of the machine. Here we present extracts from the first such book – "The Atari ST Companion" by Jeremy Vine, published by Sunshine Books.

## A guided tour of the hardware

THE ST has been hailed as the "power without the price", but what exactly is that power? This section is designed to guide you around the insides of your ST system.

Understanding how a computer works is not essential to using a machine – you could quite happily never know what's inside that box and still make the most of your ST system.

However, understanding the workings of a micro is not as hostile an idea as it seems and can go a long way to enhancing the user's understanding of and interaction with the machine.

Many users new to computing find it hard to imagine what is actually happening when they press a keyboard button (or mouse) and feel

they are communicating with an alien presence. What we aim to do is give you an idea of what each component part does and how it interacts with the rest of the machine.

The ST series of micros is based around the Motorola MC68000 microprocessor, which can be considered as the heart of the machine.

Much is made of whether these chips are 32 or 16 bit in size. The 68000 has an internal structure of 32 bit but externally the arrangement is 16 bit. The 68000 in the ST contains a 24-bit address bus and a 16-bit data bus.

The chip is very fast, running at a clock speed of 8MHz. This speed is especially impressive when compared with other systems.

The MC68000 CPU (Central

## The exciting ST

Processor Unit) chip has eight 32 bit file registers, nine 32 bit address registers, 14 addressing modes, memory mapped I/O and a 56 word instruction set. In addition, the chip can address 16 Mbytes of memory directly without any need of bank switching.

The Atari ST has been described in superlatives since it was announced and the chances are if you're reading these words, you agree too!

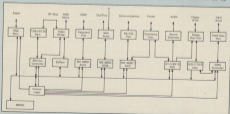
What makes the ST exciting, beyond all else that has gone before and for that matter for the future, is far as one can tell, is the great range of applications the machine can

Processing Unit) chip has eight 32 bit file registers, nine 32 bit address registers, 14 addressing modes, memory mapped I/O and a 56 word instruction set. In addition, the chip can address 16 Mbytes of memory directly without any need of bank switching.

Supporting the CPU is the MC68801 MFP (Multi Function Peripheral), which sorts out various interrupt control messages (interrupt tables are shown later in this section).

Atari have designed their own custom built microprocessors, of which there are four. These chips are a DMA (Dynamic Memory Access) controller for use with a hard disc.

The purpose of the DMA is to look after mass storage and this directly interfaces with a very fast parallel port for the hard disc. The transfer rates will be up to 8 megabits a



A global view of the ST's components, taken from *The Atari ST Companion*

integrated.

Because of its price, the ST has a vast appeal matched only by its power. At long last there is a machine which offers state-of-the-art technology at a price which transcends the home/business market barrier which has eluded micro manufacturers until now.

The ST is as true a business machine as any on the market and with the GEM operating system as standard offers the latest in keyboard mouse control.

The Atari ST Companion is intended for a varied readership. For those new to the concepts of GEM, or indeed new to the concept of computing, this book sets out to

provide you, the user, with information that will help and guide you through the first stages of using your ST.

For the more experienced enthusiast who wishes to delve deeper, the ST system is looked at in great detail including TOS, the Intelligent Keyboard Controller and a guided tour around the ST hardware. Even if you're a beginner the text has, I hope, been presented in such a way as to give you an idea of what goes on inside 'that box'.

I've called this book the 'ST Companion' because that's what I hope it will become to you. The first section covers all that is necessary to get your ST up and running. Even if

you're acquainted with the idea of using a mouse, section 1 contains all the information needed for the everyday tasks of maintaining a computer system.

The rest of the book looks in detail at specific parts of the ST and provides in the first instance a library of reference material, and secondly what I hope is a better understanding of the different component parts that go towards making the ST the machine it is.

I have intended since the inception of this book that the 'Companion' should be a book that serves both as a comprehensive introduction to the ST and its workings, and as a source of reference.

second.

The DMA is also interfaced to the floppy disk drives through the WD1770/1772 FDC (Floppy Disc Controller).

The DMA removes the need for data to be moved through the main processor when it is being transferred between the main memory and a peripheral device. The main memory (RAM) access channel is shared to allow for both slow speed (250 to 500 bits a second) and high speed (which can be up to 8 megabits a second) bit device controllers.

The second custom built chip is a Memory Controller unit. It can be considered as a management system for the ST's memory and some timing functions. This unit runs at a very fast frequency and this is put to good use.

The memory controller can use memory for both the CPU and the video, without the former being slowed.

The output to video is put through the third custom chip, a Video Shifter which is, in effect, a video controller for the screen modes provided by the ST. This chip handles all the information about graphics.

Finally, the fourth custom chip is the Control Logic. Its task is to put in order and watch over everything in the machine. The Control Logic manages the jobs that would normally be handled by TTL's, except in the case of the ST this would be a tremendous amount.

The control logic chip is in communication with almost every part of the machine and is a key element in the structure of the ST.

## The Atari ST Companion

Jeremy Vine



You can buy this book direct from Atari User for £9.95 (post free). Please use the order form on Page 61.

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# The 68000 Operating environment

So far we have looked at the instruction set and the addressing modes of the 68000 microprocessor. Now we'll take a look at its third significant aspect: the operating environment presented to the user.

In most other microprocessors this is so simple that it can be ignored. But in the 68000 there are so many different ways the processor can act that the design and operation of a computer is a very sophisticated affair.

Basically the 68000 can run in two modes, a supervisor mode and a user mode. In the supervisor mode there are certain privileged instructions allowed that cannot be executed in the user mode. The usual arrangement is to have the operating system run in the supervisor mode with the programs or languages running in the user mode.

It is even possible to arrange this multi-user operation using these modes. The key to understanding the usefulness of these two modes lies in the interrupt structure.

An interrupt is something which changes the normal flow of a program. All microprocessors will respond to two or three different interrupting conditions but the

**In Part III of his series examining the powerful 68000 chip at the heart of the Atari ST, MIKE COOK explores the operating environment presented to the user**

68000 greatly enlarges this concept — so much so that the conventional interrupts become just a special case of the much wider concept of exceptions.

An exception means an event — that is, something happening. This triggers off the execution of a program that is said to perform exception processing. The majority of the time an exception is something which should not have happened. Exception processing can correct this or at least prevent the situation getting out of hand.

For each exception condition there is a vector. A vector is a memory location that contains the address of the exception processing routine.

Each vector has a unique address depending upon the exception. There are so many of these that they occupy the first 1k of memory in the microprocessor, each vector occu-

rying four bytes.

The first is the reset vector, so in memory location 0 you will find the address of where to start when the machine is powered up or the reset line is pulled. This needs to be in ROM because it has to be available on power-up.

However it would be somewhat limiting to have all the exception vectors frozen in ROM where, committed to a task, they can't be changed. Therefore most computers designed with the 68000 have to switch this area of the memory map between ROM and RAM as part of the reset procedure. This makes the designing of the memory address decoding more complex than the average computer.

Exceptions can be divided into two types, internal and external. An

internal exception is one that has been generated by the program being run, and an external exception is one generated by a signal from outside the microprocessor.

All exception processing takes place in the supervisor mode. In fact the only way to enter the supervisor mode from the user mode is by an exception occurring.

Let's look at internal exceptions. If you try to access a word or long word quantity at an odd address, this generates an addressing error exception. This is usually a result of your pointers getting out of alignment and the normal source of exception processing is to inform the user and then return to the user ready.

With a privilege violation exception, the processor has attempted to execute an instruction which can only be used in the supervisor mode.

There is also an illegal opcode exception which occurs if you try to execute something which is not an instruction. This is very useful for catching programs which have gone out of control and started executing your data.

A closely allied exception is the unimplemented opcode. This is caused when you try to execute an instruction starting with a hexadecimal value of A or F, as no instructions actually start with these values. You can use this to write your own macro instructions.

The Apple Macintosh computer makes extensive use of this exception to allow user programs to tap into the operating system ROM. The value following the A is looked at by the exception processing routine and the appropriate operating system call is made. In this way you never need to know the address of a routine (and so the same programs can work with different versions of the operating system ROM).

There is a trace flag in the status register which, if set, causes a trace exception to occur after each instruction has been executed in the user mode. This makes the implementation of single stepping debuggers very simple. It will even single step through ROM, something that other microprocessors need special hardware to do.

There are also exceptions that

occur when something goes wrong with an instruction. For example, if you try to divide by zero an exception will occur. Also, some overflow conditions (when the result of an operation is too big to fit in the register) will trigger exception processing.

There is, however, one set of instructions whose sole function is to cause exception processing — the TRAP instructions. There are sixteen of these, each with its own vector that can be used by the operating system for many reasons. For example, one computer uses TRAP instructions to perform all the inputs and outputs.



thus providing a consistent interface for all programs.

Of the external exceptions perhaps the simplest is the reset signal. When this is triggered, the processor vectors through memory location zero and enters the supervisor mode. This is used on power-up or as a panic button, hopefully situated at some remote place on the computer.

The interrupt request will be familiar to those acquainted with other processors. However the 68000 has three of these lines. All three are involved with the request, thus giving seven different kinds of interrupt. Each kind is given a number or level depending upon the state of these lines.

Every level has its own priority, the higher levels having higher priority. The processor can mask out levels it does not want to respond to by the use of its status register, an extension of the normal single maskable

interrupt. Again each interrupt level has its own vector.

The final external exception is the bus error input. This is a single input to the processor and despite its name can be used for any purpose. The most common use is the detection of non-existent memory.

Most microprocessors give the external memory a certain time to respond to any request for access. If the memory device is slow it can send a signal back saying that it wants longer.

The 68000, however, works the other way round. It requests memory access and then waits for the memory to say that it is ready. This carries the disadvantage that if memory is slow which does not mean then the whole system hangs up. So to prevent this, most 68000 based computers have a timer and if memory has not responded within (for example) one second the bus error line is triggered causing an exception.

This is not the only use of this line. There are outputs on the 68000 which reflect the type of process going on. They will, for example, indicate whether data or an instruction is being fetched from memory and whether the processor is in the user or supervisor mode.

The Sega computer uses three signals together with the address bus to trigger a bus error exception if access is made to a certain area of memory from the user mode. This area of memory contains all the input/output devices. Thus the only way to interact with the outside world is through the supervisor mode, forcing user programs to use the appropriate TRAP vectors to perform input/output operations.

As you can see, the designers allow a considerable degree of sophistication to be built into the operating system of any computer containing the 68000 microprocessor. It offers facilities more like a mini-computer than a microcomputer. In these three articles I have only been able to outline this complex device but I hope you now have a picture which will allow you to make sense of any book written about the 68000. It truly gives power to the programmer.

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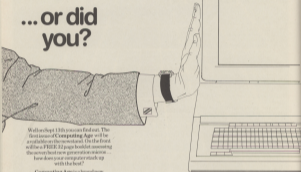
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# POTTOON

If you've ever played card games the chances are that you've played Pottoon at one time or another. Maybe you called it 21, but the game remains the same. This program lets you play the game against your Atari.

After the title screen has been displayed you'll have to wait just under half a minute while the lower case alphabet is redefined to show the multicolored numbers displayed on the cards.

Once you've entered your name you're ready to play, so roll up your sleeves and pull down the eyeshield.

The first two cards are displayed and you are asked to bet. You cannot bet a negative amount because if you lose, your score would increase - think about it!

Once you've entered your bet you have the options of twining - getting another card - or adding - accepting your present total. The T and B keys are used to select your choice of action.

In the version of the game played by the program, a five card trick beats everything except Pottoon itself. As is customary in gambling dens, if you and the dealer have the same hand, including Pottoons, the dealer wins.

The computer doesn't cheat - it decides whether it should twist or stick without looking at your cards.

The program was written on an Atari 800 and has been tried successfully on a 800XL, 800XL and 130XE. It runs in 16k.

Try your hand at **STEPHEN BOXLEY's** challenging Atari card game



## MAJOR VARIABLES

OPCT	Has human got five card trick?
PCF	Computer five card trick.
C	Card.
S	Suit.
H	Horizontal position of card.
V	Vertical position of card.
DL	Display list.
TOTAL	Computer's score.
SCORE	Human's score.
BET	Amount bet.
MONEY	Amount of money left.

## SUBROUTINES

500	Prints cards on screen.
600	Chooses a card and prints it so it won't be used again in this game.
1000	Adds up score and checks to see if you've busted.
1010	Human has lost.
2000	Computer's go.
3000	Prints computer's score.
3020	Computer busted.
3025	Computer has lost.
5000	Bet entered.
6000	Who's won?





# Keeping track of the memory situation

## UPDATE

SINCE writing RAW, the 6502 assembler which appeared in the August issue of *Aster User*, I've made a few modifications which greatly improve its performance.

An extra variable has been added, *SHOW*. This indicates whether a listing is required. If *SHOW* is zero then nothing is printed on the screen. If it is not zero then a listing is given.

When the listing is disabled it assembles the code 25 per cent faster. Place it at the start of the assembly listing like this:

```
IF SHOW=0
```

The other major change is that it no longer uses any of page 6 for its workspace. This leaves an extra 56 bytes free for your own routines. The machine code sub-routine it uses is placed in a string and the start of the string is called.

To convert the assembler, load it and enter Listing 1 then save the modified form.

```
0001 0 "PROGRAM..."  
0002 00 000000  
0003 00 0000 0000 0000 0000 0000  
0004 0000 0000 0000 0000 0000 0000  
0005 0000  
0006 00 000000 0000 0000 0000  
0007 0000 0000 0000 0000 0000 0000  
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0090 0000 0000 0000  
0091 0000 0000 0000  
0092 0000 0000 0000  
0093 0000 0000 0000  
0094 0000 0000 0000  
0095 0000 0000 0000  
0096 0000 0000 0000  
0097 0000 0000 0000  
0098 0000 0000 0000  
0099 0000 0000 0000  
0100 0000 0000 0000
```

Listing 1

ROLAND WADDILOVE presents a hexadecimal/Ascii memory dump utility

REGULAR readers of *Aster User* should by now have quite a powerful toolkit consisting of an assembler, disassembler and data maker. To complement these, here is a hexadecimal/Ascii memory dump utility written entirely in machine code.

Although memory dump utilities are fairly common, this little routine is far from standard. The program is written in machine code and resides in page 6. This area of memory is not used by Basic or the operating system, so is free for utilities such as this.

The machine code is unaffected by LOAD, SAVE or NOW. This makes it possible to run Basic programs at the same time and examine how they are stored in the memory. The operating system can be examined and the system variables can also be monitored.

The routine displays 192 memory locations on a Graphics G screen in both hexadecimal and Ascii. When it has completed this task it goes back and displays the same 192 locations again. This is repeated until one of the cursor keys is pressed.

You might imagine that printing 192 memory locations in hex and Ascii would take a long time. However, remember that this is machine code. The routine updates the screen 30 or 40 times a second.

The advantage of constantly displaying the same area of memory

over and over again is that locations that change are instantly updated and can be seen quite easily. The system clock, for instance, can be seen rapidly ticking away in page zero.

To monitor any section of memory enter:

```
1=0001000,63
```

where *x* is the address from which to start displaying. To return to Basic press the space bar.

Pressing the cursor up key will increment the start address by 8 and the display scrolls up. Cursor down decrements the start address by 8, scrolling the screen down. The screen continues scrolling until any other key is pressed. Return is the most

```
10 000 Memory Dump/
```

```
20 000 By R.Waddilove
```

```
30 000 00 0000 0000
```

```
40 000 00000000,00
```

```
50 000 00 00 00
```

```
60 000 0000 00000, J
```

```
70 000 0
```

```
80 000 000 000,001,1,000,0,00,000,00,00,
```

```
001,0,000,000,0,0,000,000,000,000,000
```

```
000 0000 00,000,000,000,000,000,000,000,
```

```
001,000,000,000,000,000,000,000,000,
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001,000,000,000,000,000,000,000,000,
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```
001,000,000,000,000,000,000,000,000,
```

Program 1



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# MicroLink

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**MicroLink PMS service:** 2p per minute or part (1200/75 local), 3.5p per minute or part (1200/75 local).

Only applies to users outside the UK, Luxembourg and

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Date \_\_\_\_\_

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Position	<input type="text"/>
Company	<input type="text"/>
Address	<input type="text"/>
Postcode	<input type="text"/>
Telephone	<input type="text"/>

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Please indicate month of commencement  
After 30 days for validation of mailbox

to

### Payment

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<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

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Account Number	<input type="text"/>

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### C. Please invoice the company/authority.

If you select this option, which is ONLY AVAILABLE to government establishments and public limited companies, you will be sent an invoice-form for completion which will require an official order (noted to accept specified amounts).



# Mode 8 offers superb detail, but it really is a right little memory muncher

**THIS** month we're going to look at Mode 8, which has the highest resolution of all the modes. In its full-screen form, Mode 8 offers 192 rows x 320 columns — or, to put it another way, 61,440 pixels.

With this many pixels, we can't "afford" any memory to hold colour information, so we can only display a single colour, although the border and background can be different colours.

Plotted points are the same colour as the background, but we can set the luminance of the plotted points — just as well really, otherwise we'd never see them . . .

Colour register 2 controls the colour and luminance of the background. Type **GR 2** to get to an empty Mode 8 screen. It looks like a regular Mode 0 screen but the word **Ready** is positioned close to the bottom. Now enter:

```
SETCOLOR 2,4
```

and the screen will turn purple.

To demonstrate that you do have Mode 8 and not Mode 0, press **Reset** three times. All text has now disappeared out of the text window, leaving only the cursor on the bottom line.

The colour and luminance of the border are controlled by register 4. We can demonstrate this by entering:

```
SETCOLOR 4,2
```

which should yield a blue — colour 8 — border with luminance value of 2 around the purple screen.

If we want to plot to the screen, we still need to precede the **PLOT** command with a **COLOR 1** command. In Mode 8 this gives the same colour as the background but takes the luminance from colour register 1.

Try entering:

```
COLOR 1: PLOT 20,20:  
DRAWTO 100,100
```

This should produce a thin sloping line which is a bit faint and therefore difficult to see.

To improve visibility, we need to raise the line's luminance either much lighter or much darker. That is, we need to increase the constant

between the line and the background.

The luminance of plotted points is taken from the information in register 1, so to get a darker line we can enter:

```
SETCOLOR 1,1,2
```

and to get a lighter line we can enter:

```
SETCOLOR 1,1,14
```

Notice that the text in the text window is the same luminance as the plotted points. It goes dark and light as the line goes dark and light.

You'll remember that the second parameter in the **SETCOLOR** command specifies the colour to be used. However in Mode 8 the colour specified in register 1 is ignored. Only the luminance parameter is used.

This means that you can use any number. Try:

```
SETCOLOR 1,82,14
```

and you shouldn't see any difference. Hence, I tend to use a 1 as the colour parameter because my fingers are

```
10 GRAPHICS 0  
20 SETCOLOR 1,82,14  
30 DRAW 0  
40 FOR C=0 TO 100 STEP 1  
50 FOR L=0 TO 100 STEP 1  
60 PLOT C,L  
70 NEXT L  
80 NEXT C
```

*Program 1*

already at the 1 key in order to specify the register. Lazy, aren't I?

The **COLOR 2** command has the same hue and luminance as the background so it can be used to write a section of the display as we saw last month.

For example, enter:

```
COLOR 2: PLOT 20,20:  
DRAWTO 50,50
```

and you should see the upper section of the line disappear.

Mode 8 has at least one interesting effect that you might not predict and we can demonstrate it with the aid of Program 1. Enter the listing and then Run it.

This simple program does nothing

**Part Six of DAVE RUSSELL's  
Atari graphics modes series**

## Keep telling yourself that 8 is a single colour mode

more than draw a series of vertical lines. However, you should see an effect which you might not expect to see in a single-colour mode.

In fact, it is a well-documented effect called "aliasing" and is a result of the way in which television handles colour.

You may have noticed the effect if you entered the Mandala program from the Microscope article in the August issue of *Atari User* since it used Mode 8 to draw the patterns. You can experiment with it by inserting a line 25 to alter registers 1 and 2.

The effect can be seen here

```

10 GRAPHICS 0:0
20 SETMODE 0,1,24:STORER 0,0
30 FOR I=0 TO 255:FOR J=0
40 GOTO 170:170:STORER 0,170
50 GOTO 170:170:STORER 0,170
60 NEXT J
70 GOTO 10

```

Program 10

dramatic on an American television because of the different system used to produce a coloured image.

Program 11 gives one of the best demonstrations of the effect I've seen on a UK set, but I can't take any credit because it was written by Jason Pevzner for *Computer* magazine. While you're looking at it, keep telling yourself that Mode 8 is a single colour mode . . .

Incidentally, line 70 may confuse you if you've not used a full-screen mode before.

Normally, Mode 8 has a Mode 0 text window at the bottom. For any of the split-screen modes we can display a full screen by adding 16 to the GRAPHICS statement, as in line 10. This could have been written as

```

10 SET MODE:0,1
20 GRAPHICS 0:16
30 GOTO 170:170:170,170
40 FOR I=0 TO 255:FOR J=0 TO 255:170:170
50 GOTO 170:170:170,170
60 GOTO 170:170:170,170
70 GOTO 170,170
80 GOTO 170:170,170
90 GOTO 170:170,170
100 FOR I=0 TO 255:FOR J=0 TO 255
110 GOTO 170

```

The Mandala program illustrates the aliasing effect

QR.24 with the same result.

The problem with removing the text window in this way is that the system will revert to Mode 0 when the program finishes. You can see the effect by typing QR.24 when you're in Mode 0. The screen flashes as Mode 8 is displayed, but then you're back in Mode 0.

All line 70 does, then, is stop the program from ending by creating an endless loop. Press Break or Reset to get out of the loop.

Mode 8 has another characteristic which can also be used to advantage.

As a map mode, writing text is not all that easy. However, by one of those happy accidents that occur now and then, the pixel size in Mode 8 just happens to be the same as in Mode 0.

You can't "write" direct to the Mode 8 screen as you can in Mode 0, but all the data required to generate the Mode 0 characters are held in ROM.

If you've been following this series you'll remember that in the July issue we copied the data down into RAM in order to redefine some of it.

Program 11 uses this fact in order to put Mode 0 characters on a Mode 8 screen.

It does this by converting each character in STRINGS into internal code, finding that character in the ROM character set and then poking the data for that character directly into the screen area of RAM.

In fact, if you run Program 11 as listed, it suffers from exactly the problem that we discussed in July's

article. We could combine the redefining program from July with Program 11, but as a temporary "kludge" try adding line 145 as follows:

```

145 IF X=64 THEN POKE
LOC+8*Y+48,0:GOTO 160

```

Dave Russell doesn't just talk about level programming — he shows you how to do it . . .

This technique of writing the Mode 0 character data to the screen will only work with Mode 0 because the two modes have the same pixel size. However, if you're adventurous you might like to devise ways of writing text to other map modes.

After all, the data for 8x8 matrix characters are already in ROM and it seems a shame to waste them. Maybe there's a way of using them in a modified form for other modes. If you find a way, I'm sure the folks at *Atari User* would love to hear from you.

Mode 8, then, offers you the best possible resolution of your Atari modes at the cost of about 8% of RAM memory. Therefore, applications that use it will be those which need the resolution for fine drawing but don't need a lot of memory for calculations.

If you think this is an unlikely combination, look back at Ken Ware's *Tablet-0* program in the August issue of *Atari User*. It's a fine example of just such an application.

```

10 DIM TABLE(255,255)
20 STRING="0123456789"
30 FOR I=0 TO 255
40 GRAPHICS 0
50 GOTO:POKE 160+I*256+I*256+I*256
60 LOC+I*256+I*256
70 FOR J=0 TO 255:POKE I*256+J,0
80 STRING=CHR$(I)+STRING
90 GOTO 10
100 IF I=127 THEN I=0:GOTO 10
110 IF I=127 AND I=127 THEN I=127
120 IF I=127 THEN I=0:GOTO 10
130 GOTO:POKE I*256+I*256
140 FOR J=0 TO 255
150 POKE LOC+J*256+J,CHR$(I)
160 NEXT J
170 LOC+I*256
180 NEXT I

```

Program 11

JUST outside the factory where I earned my apprenticeship were two of the three "hallowed halls". Right next door to the pub was the betting shop, and more a lunch hour was spent sliding between the two.

I was never wildly successful as you can tell from the fact that I'm writing this review from sunny Stockport and not my seat on the Mead.

Of course, the rigours of mortgages put paid to my gambling career as I was filled with nostalgia when *A Day At The Races* arrived from Amiga Software.

The game allows up to five punters to place bets on horses which then race from one side of the screen to the other.

Although that may not seem very far, the animation is such that each race takes about 90 seconds with the horses appearing to have galloped all the way.

There are 10 races an each

## Odds - on favourite?

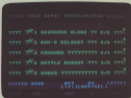
day's card. For each race the program randomly picks five horses from its database and gives the starting prices.

The odds are the only indication of form that you have, although the instruction sheet advises you to "pay careful attention to the race results to pick up hints and clues that might be useful to your future forecasts".

Once you've placed your bets, the race starts and you can do nothing more than watch. Well, that's not quite true because, like in the real thing, you can jump up and down shouting "come on" or "good, and generally get involved.

Another realistic element is the fact that you can't get credit. When your money runs out, you just have to sit and watch.

*A Day At The Races* costs



£2.99 for the cassette version and only £1 more for the disc version. I wish more software houses had a similar small difference between the two prices.

Although you could play the

game on your own, I'd recommend getting a few mates of yours in - purely to sit on, of course - in order a few mates round and having a bit of fun.

Cliff McKnight

## IT'S A SHOOT-EM-UP HUMDINGER

HOT from the gods of USA games, *Rescue On Praxalus*, a superb new space shoot-em-up from Epic and Tascadeo Games.

The game has long been available - in its early form it was called *Behind Juggo Lines* - but had been held up for

release owing to legal problems.

Since I had heard many superlatives being bandied around about its quality, I was anxious to secure a copy as soon as it became available.

Thanks to the fast and efficient services of Software

Express of Birmingham, a review copy thudded on to my doorstep within hours of the game's release for the UK. Numerous of its excellence are well-founded - *Praxalus* is a humdinger.

The Juggies, with whom you are at galactic war, have dug themselves in on an inhospitable planet called Praxalus. The war is not going well for you. Many of your interstellar pilots, including some ace officers, have found Praxalus a little beyond their capabilities and have crashed on to the planet.

You can't blame them. The terrain on Praxalus consists of wild, rugged mountains, craggy peaks and ridges, and deep canyons. The atmosphere is no less harsh - thick cyanotic acid which will dissolve a standard issue flight suit within minutes.

And as if that weren't enough, Praxalus rotates so fast that daylight only lasts for nine minutes. Barely worth

getting the deck-chairs out.

Your mission is to rescue as many of your stranded out-laguard as possible. As long as they stay inside their manpowered single-manual fighters, they are safe. Once they venture out into the atmosphere they have only seconds to live.

The game begins with a breathtaking title screen of your mothership, one of the most impressive introductory screens I have ever seen.

Incidentally, there is a Commodore 64 version of the game available with a different title screen. The Atari version leaves the Commodore version standing, thus confirming what we always knew about Atari software - only the best for the best!

You start inside your fighter, above the mother-ship. The display shows the forward view through the main window of your cockpit and



below is a detailed instrument panel.

The panel gives helpful visual and audio information and warnings on such things as compass bearing, wingtip clearance from solid rock — handy for canyon flying — altitude, thrust, artificial horizon, energy, shield and air tank activation, range to slinked pilot, number of enemies destroyed and number of pilots you are expected to rescue and have weapons rescued.

There's more. An altitude stove both the altitude of the terrain and your altitude above it. A long range scanner will pick up a pilot's emergency beacon and display its position.

An enemy lock-on indicator lets you know how near you are to getting blasted by alien fire while a targeting scope helps you to drive an accurate lead on enemies and downed pilots.

This whole array appears clattering at first but it is very clearly and neatly set out and seems not to be quite so intimidating as it appears to be at first.

So much for the technical stuff, now to the action. Under automatic control, your ship is buffeted along a tunnel at hyperspeed and descends towards Fractalus. From there on, you're in control.

Through your cockpit window you'll see a bright yellow heaven (most be all that cyanotic acid) and a display of sinuous brown drags.

Controlling your ship is mainly a matter of joystick movement, while increases and decreases in speed are handled by the left and right arrow keys.

Any Jaggi gun emplacement shows up as a small green dot on top of a peak. Being fussy of green, says it out. You can take evasive action or try to break it out.

A cross-hair sight will be overlaid on the scene whenever the enemy is near. To blow a Jaggi smothered off the mountain, you must line up the cross-hair and fire one of your torpedoes.

A slinked pilot is shown as a flashing green beacon on the

surface of Fractalus. Watch for a dip on your long range scanner and fly low towards the pilot. Once near enough, you have to land your craft by pressing L. When done, pressing B turns your systems off and you will be told whether or not you are close enough to rescue the pilot.

If you are not, you'll just have to take off again and land a bit closer. When you're near enough, you'll see the pilot leave his ship and toddle towards you. When you hear him knocking on the door, you must open the airlock — press A — and you'll be rewarded by the sound of him stumbling up the stairs.

Should you be in a multi-tious mood, by leaving the pilot outside, he'll start to knock more eagerly, then more weakly until at last you hear him topple over. The cyanotic air has got him, you snort!

From time to time, a

beeping sound will alert you to the presence of the marso-ship. Pressing B fires your launchers and relays you there where you'll receive replenishment and, if you've rescued your quota of pilots, move to the next level.

When you begin a game, you can elect to start at any of 18 levels, although the game progresses very beyond these. When you complete a level, you continue at the next higher one but if you're really feeling tough or want more bonus points you can skip up to three levels at a time.

Levels 1 to 3 are for training — no signs of the Jaggies on level 1 and just a handful on levels 2 and 3. On levels 4 and above, the Jaggies are more numerous, pugnaclous and accurate, and are joined by kamikaze flying saucers.

Level 18 has the Fractalus nine-minute day coming into play so prepare for some night flying. You won't see anything

out of the window and must act just your instruments and beeps.

A bonus mode is provided and there are some other interesting little wrinkles to the game, including one where you inadvertently pick up an alien instead of a pilot. I'll leave the pleasure of discovering these to you.

Sound effects, including the sizzling theme tune, are first rate. The graphics are clean and clear and although the solid mountains resemble all coloured the same (brown with black ridges), the exceptional scan, multi-directional scrolling more than compensates.

Rescue On Fractalus with its mixture of simulation and arcade elements is a top-notch game, packed with action and excitement. It will hook you from the word go and keep you coming back for more. Cost of the disc is £24.95.

Rob Chappell

## Get down to the bare essentials

I'd sitting here shivering in my underwear while the young lady opposite grins smugly at me. Just a minute while I switch her off.

There, now I can concentrate. I've just been playing **Strip Poker**, the latest import from US Gold, and I'm not doing so well this time.

The program is a conversion from the Atrox classic which I first encountered on the Apple II a couple of years ago.

You have a choice of two opponents, Melissa or Best. On the cassette version, one is on each side of the tape. Since the loading time is about 15 minutes, I tended not to switch from one opponent to the other.

The two girls play different strategies and I'm not going to spoil your fun by revealing their styles. Both play a good game of Poker.

Although the graphics are good, only a real wizard would buy the package to see naked ladies. Having managed to strip both opponents, I have to say that the magazine's need to the computer magazine in the average newspaper's leaves less to the imagination.

The cassette will only run on a 84K machine and costs £19.95. It will not work on an Atari 400 or old series 800. The loading instructions tell you to press Start while you switch on, but in fact XL owners will need to press Start and Option. The disc version



costs £14.95.

Otherwise the instructions are clear and the terminology used and relative values of the hands are explained adequately.

Ultimately, it's the quality of the game played that determines the value of a program. In this respect, I can recommend the game.

... As far as I can tell it doesn't cheat, although you can cheat by not removing your clothes when you lose. But you wouldn't do that, would you?

Peter Cookson

# ZOOMSOFT

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- E—ERASE** Erases any pixel over which the centre of the cursor cross passes. Exit by pressing the button.
- F—FILL** Defines the outline of a shape using the draw or line modes. Place cursor in the middle of the shape and press the F key to colour in the shape. Complex shapes may require more than one fill command to be executed. Beware of "leaks".
- L—LINE** Pressing the L key causes a pixel to be plotted at the present cursor position. Move the cursor to any other position on the screen and press the fire button. A line will be drawn from the first cursor position to the present cursor position.
- 1 to 3** There are three playfields or colours available. Pressing keys 1 to 3 will change the current playfield.

Of all the media available to the artist, the computer is perhaps the most versatile, for no other medium gives the artist such complete control.

The VDU screen, unlike the painter's canvas, is almost infinitely flexible. Images can be created or erased instantly and, unlike the photograph or motion picture, there can be interaction between the image and the viewer.

Computer art is still in its infancy and is rarely taken seriously by the art establishment. This will probably change in the future, so that perhaps one day a computer artist will achieve the same status as a Picasso or a Goya.

It is interesting to speculate that if Leonardo da Vinci, with his interest in geometric design and science, were reincarnated today, he would be among the leaders of those artists experimenting in computer art.

The art gallery of the future may be a room full of large flat screen monitors displaying computer-generated images.

When holographic photography is perfected these displays need not be restricted to two dimensions. They could, instead, become moving three-dimensional environments through which the viewer can wander.

In the United States companies with futuristic sounding names like Digital Productions, Synthvision, Magi, and The Industrial Light and Magic Company, are setting the best

Colour	Number
Grey	0
Light Orange	1
Orange	2
Red-Orange	3
Pink	4
Purple	5
Purple-Blue	6
Blue	7
Blue	8
Light Blue	9
Turquoise	10
Green-Blue	11
Green	12
Yellow-Green	13
Orange-Green	14
Light Orange	15

The brightness range is from 0 to 14

available equipment such as the Gray supercomputer, are experimenting with advanced techniques of computer graphics.

Examples of their work can be seen in the films *Trox* and *The Last Starfighter*.

In Britain many excellent examples of computer graphics can be seen on our television screens, mainly in the sequences and commercials.

The Atari user, denied access to expensive computer graphic equipment, may feel limited in his book "Computer Images, The State of the Art". Joseph Deben includes two frames of a "moving painting" developed by researchers at Atari alongside images created by artists using far more sophisticated equipment that show something of the scope of the Atari system.

The Atari boasts the best graphics system that I have encountered in home computers thanks to the Antic and GTIA chips. Play Polo Position,

Droptone or the Jeff Mirner's Colourspace program to experience some of the Atari's capabilities.

The Atari has a palette of 256 colours, though it is normally only possible to have a maximum of 16 on the screen at any one time using graphics modes 9 or 11.

Atari's trump card is the use of display list interrupts which can increase dramatically the number of colours displayed at any one time. The creative artist/programmer can create high resolution images in a multitude of colours.

As an introduction to the world of computer art I have written a graphics utility that converts the screen into a computer canvas on which the budding computer Picasso can draw his or her pictures.

The program, though fairly simple and a little slow, being in Basic, displays some of the principles of the computer graphic workstation that

professional computer artists work with.

On first running the program a graphics mode 11 screen (160 x 160 pixels) is set up and a small area will appear at the top left hand corner of the screen.

This is a player missile graphic and acts as a cursor which can be moved around the screen using a joystick in part 1. In the text window at the bottom of the screen is a list of the valid commands used in the program. They are accessed by pressing the first letter of the command only.

There is no facility to save a picture once it has been drawn. The easiest way to do this is to videotape your work using a video recorder and an aerial splitter.

You could try writing a subroutine to save a picture as a file to disc or cassette, but as each screen area occupies about 6k a single save routine may take some time to execute.

## PROGRAM STRUCTURE

40-89	Main program loop. Executes draw commands and moves cursor.
90-100	Send program to various command subroutines.
200-220	Line drawing routine.
300-400	Colour changing routine.
500-620	List valid commands in text window.
1000-1005	Fill routine.
2000-2005	Initialise program. Set up player missile cursor. Put machine code routine starting at address 1536 that handles movement of player missile cursor.

## MAIN VARIABLES

HD	Horizontal position of cursor.
HY	Vertical position of cursor.
FL3	Flag to test whether in line mode.
CD	Colour of current playfield.
X,Y	Coordinates of plotting routine.

# Silicon Chip

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Part IV of MIKE ROWE's series on how to give your program displays the professional touch



# Do a back flip and go for a vertical scroll

**WE** have examined the nature of the display list and how to alter it to create more professional displays. Now let's move on to using the display list to create special effects, in this case vertical scrolling and page flipping.

Page flipping is a term used to describe an action directly comparable with turning over the page of a book — instantly switching from one page or screen of information to a different one.

On many computers the screen memory is restricted to a set area of memory and somewhere else. On Atari computers any portion of memory can be used as the screen memory even including the ROM area. As these cannot be altered this is of little practical use, but illustrates the versatility of many machines.

Thus for many machines to change from one displayed screen to another you would need to erase the screen memory and rebase or replot the new screen.

On the Atari you can just simply skip to a new area of memory, which is almost instant even by machine code standards. The procedure to

accomplish this is unbelievably simple.

You may remember in the first article in the series I described the construction of the display list. I mentioned that the fifth and sixth numbers in the list were the memory location from which the screen display would be taken in the order low byte, high byte.

It follows then that changing these two numbers would, with only two pokes, change the area of memory being displayed, that is page flipping. Program 1 demonstrates this.

This program skips through three areas of ROM, displaying them on a Graphics 0 screen. The speed is impressive, but the display is practically endless. More useful would be a program skipping through previously created screens.

Program 11 is a very simple demonstration of this. It creates 10 simple Graphics 2 screens identifying each one differently.

This is done by using a Graphics 2 call from Basic which makes the operating system create a Graphics 2 screen at the top of memory and then the message printed on the screen.

The machine is then made to think that the top of memory is 0.5k lower by changing the value in location 106.

This number indicates the top of the available memory in pages — one page in memory terms is 256 bytes. Therefore if you subtract two from this location you get the top of memory lowered by 0.5k. You can then make another graphics call and the screen will be located 0.5k below the previous screen.

This has been repeated 10 times in the example to give 10 Graphics 2 screens. The values for the screen memory for each screen are stored in the variable arrays SCREENLO and SCREENHI and it is a simple matter to update these values back into the first display list to give the effect of flipping through the screens 1-10 as in the example.

This can now be seen to be more practical. However it is not greatly faster than subsetting each screen. Where the technique really comes into its own is in the higher resolution graphics modes.

Here it can take several minutes to draw a screen, or to load a screen

```

4 SET ADDRESS
14 SET ADDRESS
100 GRAPHICS 0
100 BLIP(BLIP)PTR=PTR+PTR+PTR+PTR+PTR
BLIP(BLIP)PTR=PTR+PTR+PTR+PTR+PTR
100 DISPLAY LYST SCREEN MEMORY
100 7 "DISPLAY AND AREA OF 000,"
100 OVER 1000
100 PEEK 0+0,100-000000000000000000
80 "DISPLAY LYST SCREEN MEMORY POINTED
TO LOCATION OF 000"
100 OVER 1000
100 GRAPHICS 0
100 7 "DISPLAY A DIFFERENT AREA OF 000"
100 OVER 1000
10 7000 0+0,100-000000000000000000
7 000

```

Program 1

```

4 SET ADDRESS
14 SET ADDRESS
100 SET SCREEN(0)+0,SCREEN(0)+100
GRAPHS BLENDED 100 0 READ EFFECT OF 000
ON LOCATION
100 FOR 100 TO 100000000000000000
100 GRAPHICS 0+0,000-000,000-0000
80 "DISPLAY TO ENDING PLATTING 000
ON"
100 BLIP(BLIP)PTR=PTR+PTR+PTR+PTR+PTR+PTR
100 DISPLAY LYST
100 SCREEN(0)+PTR+0+0,SCREEN(0)+
PTR+0+0-000 000 100 0 READ EFFECT
OF SCREEN MEMORY
100 POSITION 1,111 00,"SCREEN 10"
100 POSITION 1,1111 00,"PAGE FLIPPING"
100 OVER 1000
100 7000 POINT DIFFERENT MESSAGE ON
EACH SCREEN
100 PEEK 0+0,PEEK(0000)-EVEN LOWER 000
000 FOR 000 SCREEN LOCATION
100 NEXT 1
100 PEEK 000,000000000000000000 000
0
100 FOR 0+0 TO 00
100 PEEK 0+0,SCREEN(0)+000 0+0,10
SCREEN(0)+000 FLIP THROUGH THE SCREENS
10 0000
100 OVER 1000
100 NEXT 1
100 NEXT 100
1000 000 000000
0000 FOR 0+0 TO 000000000000

```

Program 1

from data stored on tape or disc and to redraw the screen even in real-time code.

Each time a change is made can be very slow and useless for animation. Here page flipping can provide a technique for giving animation to very detailed drawings.

The drawbacks become more pronounced however. First memory limitations, if you use a Graphics II screen then five screens have already consumed 40k, not to mention where your program and DOS will go.

In practice two or three screens of Graphics II are the limit. The new Atari 130XE credit, of course, ease this problem somewhat by providing in one or different blocks of memory for the screens.

A second problem is that the 8k modes have a second set of numbers pointing to screen memory half way

down the display list, as explained in previous articles, to avoid screen memory crossing a 4k boundary.

You must remember to calculate the new values for these and also to alter these when flipping.

Thirdly, drawing the screens in Basic is both slow and also memory-hungry, especially if using data statements.

This can be avoided by either loading previous screens off tape or disc directly into memory - used extensively in commercial programs - or by having a separate program for drawing the screens which then loads in the second program in which the flipping takes place.

For this reason Program II even a very simple Graphics II picture just to demonstrate the possibilities.

Those who are thinking ahead will perhaps have realised that if you can

fit to anywhere in memory why not flip just one screen line. Do it repeatedly and voila - scrolling!

This is shown in Program IV, which scrolls through ROM using 35 byte line screen line in Graphics II page flipping. The scrolling is, however, jerky and quite unprofessional in appearance.

Believe it or not, some software manufacturers released Atari programs commercially with scrolling of this type.

Those who have seen programs with good quality vertical scrolling, such as Cavemen of Mars or Firefall, will know that the Atari can produce superb scrolling.

You will remember from my first article in the July issue of Atari User that a 32 added to the display list graphics mode number gives vertical scrolling. However this does not give instant scrolling with that single change - in fact alone it makes no difference.

Also an operating system memory location is involved - decimal 84277 (8D40E), in Program V the vertical scroll is enabled in line 3 of a Graphics 1 screen by adding 32 to that line in the display list and then 84277 is altered and thus it is - smooth scrolling. But only of one line and only to the height of one character.

If all the graphic mode numbers in the display list are altered by adding 32 to them then all the lines will scroll together. However it is only to a maximum of 18 scan lines - two characters height in Graphics 1.

Now a bit of lateral thinking will provide the full answer, if you combine the two techniques of coarse and fine scrolling you will have true, full screen line scrolling.

In other words the scan of the lines one character high lines in Graphics II by incrementing 84277 from 0 to 7. Then do a coarse scroll by one character by pointing the display list screen memory one line on and simultaneously poke 84277 back to 0.

Repeat this continuously and you have your scrolling, all in Basic, no machine code in sight. Program VI shows this technique.

But wait a minute - the screen

```

0 REM *****
10 REM *****
20 REM *****
30 REM *****
40 REM *****
50 REM *****
60 REM *****
70 REM *****
80 REM *****
90 REM *****
100 REM *****
110 REM *****
120 REM *****
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 *****

```

```

100 SCREEN=100:POKE 1640,SCREEN:GOTO
POKE 1640
200 GOTO 3:PLAT 40, 10:SCREEN 10, 10
300 POKE 160,POKE 1600-10
400 REM *****
500 SCREENS 710:SCREEN 1
600 GOTO 10:POKE 1600-10
700 GOTO 1000
800 SCREEN=100:POKE 1640-SCREEN:GOTO
POKE 1640
900 GOTO 3:PLAT 10, 10:SCREEN 10, 10
1000 POKE 160,POKE 1600-10
1100 REM *****
1200 SCREENS 710:SCREEN 1
1300 GOTO 10:POKE 1600-10
1400 GOTO 1000
1500 SCREEN=100:POKE 1640-SCREEN:GOTO
POKE 1640
1600 GOTO 3:PLAT 10, 10:SCREEN 10, 10
1700 POKE 160,POKE 1600-10
1800 REM *****
1900 SCREENS 710:SCREEN 1
2000 GOTO 10:POKE 1600-10
2100 GOTO 1000
2200 SCREEN=100:POKE 1640-SCREEN:GOTO
POKE 1640
2300 GOTO 3:PLAT 10, 10:SCREEN 10, 10
2400 REM *****
2500 POKE 160,POKE 1600-10
2600 GOTO 10:POKE 1600-10
2700 GOTO 1000
2800 GOTO 3:PLAT 10, 10:SCREEN 10, 10

```

```

400 POKE 160,POKE 1600-10
500 REM *****
600 SCREENS 710:SCREEN 1
700 GOTO 10:POKE 1600-10
800 GOTO 1000
900 SCREEN=100:POKE 1640-SCREEN:GOTO
POKE 1640
1000 GOTO 3:PLAT 10, 10:SCREEN 10, 10
1100 POKE 160,POKE 1600-10
1200 REM *****
1300 SCREENS 710:SCREEN 1
1400 GOTO 10:POKE 1600-10
1500 GOTO 1000
1600 SCREEN=100:POKE 1640-SCREEN:GOTO
POKE 1640
1700 GOTO 3:PLAT 10, 10:SCREEN 10, 10
1800 REM *****
1900 POKE 160,POKE 1600-10
2000 GOTO 10:POKE 1600-10
2100 GOTO 1000
2200 GOTO 3:PLAT 10, 10:SCREEN 10, 10
2300 REM *****
2400 POKE 160,POKE 1600-10
2500 GOTO 10:POKE 1600-10
2600 GOTO 1000
2700 GOTO 3:PLAT 10, 10:SCREEN 10, 10

```

#### Program 12

flickers or flashes occasionally. Well, if you are a perfectionist — and with a perfect machine shouldn't we be? — it does flash occasionally.

This is because Basic is not instantaneous with its alteration in the values in the display list and in location \$4277.

If the screen is in the middle of being drawn when a change is made a flicker occurs or the wrong line is displayed for a split second. Don't despair, there is a solution, but it means machine code.

In Program VII the same technique as Program VI is used but instead of Basic poking the changes a small

machine code subroutine is used. This does several jobs at once with machine code speed shortening the time lapse between the jobs, thus essentially decreasing the glitches produced on screen.

As you will see, this is the case, but they still occur. In fact the only way to prevent the flicker completely is to make sure that the changes do not occur just way down as the screen is drawn.

This means doing the dirty work during the vertical blank interrupt (VBI). As briefly explained in my previous articles, this means a short machine code routine which runs each time after the screen has been drawn and before the next starts.

Vertical blanks are a subject deserving of an article of their own, so I will go into no further detail than this at present.

At last you have it. True vertical

scrolling as good as any arcade game.

The only snag left is screen memory. Of course you are covering a much bigger area than one screen, so simple Plots and Points will not really be adequate at such.

You have three real choices as to how to design your screens. Firstly you can use a long string to hold the data. This has the advantage that it relocates itself automatically and thus memory management is taken care of.

The snag is that you may accidentally cross a 4K boundary and cause chaos when the scroll washes this point.

Another method is to calculate an area of memory you know is free and directly poke (or load off disc or tap) the screen data into that area. This is the method used in Program VI.

Finally, you can use a similar method to the page flipping demo in

```

0 REM *****
10 REM *****
20 REM *****
30 REM *****
40 REM *****
50 REM *****
60 REM *****
70 REM *****
80 REM *****
90 REM *****
100 REM *****
110 REM *****
120 REM *****
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 *****

```

#### Program 13

```

0 REM *****
10 REM *****
20 REM *****
30 REM *****
40 REM *****
50 REM *****
60 REM *****
70 REM *****
80 REM *****
90 REM *****
100 REM *****
110 REM *****
120 REM *****
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 *****

```

#### Program 14

```

0 SCREEN 100:SCREEN READY
10 GOTO 1000
20 NEXT 1
30 FOR I=0 TO 4:STEP -1
40 POKE 16077,I:POKE 16078,I:POKE 16079,I
50
60 GOTO 1000
70 NEXT I
80 REM *****
900 FOR I=0 TO 4:STEP -1
1000 POKE 16077,I:POKE 16078,I:POKE 16079,I
1100 NEXT I
1200 GOTO 1000

```

```
000000000000000000000000000000000000
00 0000 0000
000000000000
00 000 010 0 1 2000 -10000 00 00 00
0000
000 000 010, 0000,0000 0000 010, 0000
000000000000
00 0000 0000
000000000000
000 000 0
00 000 000
0000 000 0000000000000000000000000000
0000 000 0000 00, 000000
0000 000 010 0 000 0000 00
0000 00000000000000000000000000000000
0000 000000000000000000
0000 00000000000000000000000000000000
0000 0000 0, 0
0000 0000 0
0000 000000
0000 0000 00000
0000 000 00000000 0000000 0000 0000
0000 0000
```

```
0 000 00000000000000000000000000000000
00 000 00000000000000000000000000000000
00 000 00000000000000000000000000000000
000 00000 0100
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 000 010 0 01000 000, 00000000
0000 000 00 00 000000 0100 0000 00
0000 0000000 00000000
000 000 000, 0000000
000 00000000000000000000000000000000
000 0000 010 0 00000000 000, 000000
000 000 010 0 00000 000000000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
000 000 010 0 00000 000, 000000000000
```

```
000 0000 0000
000 0000 0000 0000 0000 0000 0000 0000
000 000 010 0 0
000 0000 0000, 0
000 0000 0000
000 000 0000 0000 0000 00000000
000 000 00000000 000 000000 000000 00
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
```

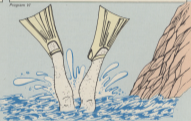
## Program 02

Program 02 - that is, repeated graphics calls after lowering the top of memory pointer.

This is not straightforward and will also involve playing around with the display list memory pointers and locations 00 and 01 to ensure that the screen data is continuous with the previous screen's data, thus avoiding garbage showing up between the screens as you scroll over them.

The advantage is that you can use Plot and Drive from Basic, I recommend the first two methods.

There you have it - your vertical scrolling completed. What? Your favorite games use horizontal or diagonal scrolling? Don't worry, next month I'll show you how to handle this.



There you have it - your vertical scrolling completed!

```
0 000 00000000000000000000000000000000
00 000 00000000000000000000000000000000
00 000 0000 0000000000000000000000000000
00 000 00000 0100000000000000000000000000
00 000 000 000, 000, 000, 0, 000, 000, 000, 0
00, 000, 000, 000, 000, 0, 000, 000, 000, 000, 0
00, 000, 000, 000, 000, 000, 000, 000
000 0000000 0100
000 00000000000000000000000000000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
000 000 010 0 01000 000, 00000000
```

```
000 00000 0100
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
000 00000000000000000000000000000000
```

```
000 0000 0000
000 0000 0000 0000 0000 0000 0000 0000
000 000 010 0 0
000 0000 0000, 0
000 0000 0000
000 000 0000 0000 0000 00000000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
000 000000000000 00 000000000000 0000
```

## Program 02

# The masked bytes are taking control

In this series so far we have learnt a lot about the binary system — the numbers our micro works in.

We have seen that its memory is divided up into bytes — a set of eight two-state, binary units called bits. Each bit can have the value 1 or 0.

If a bit has the value 1 we say it is set. If a bit has the value 0 we say it is clear.

As we're dealing with eight bits at a time, we can use various combinations of the bits in a byte to code any whole number (integer) in the range 0 to 255.

To do this we associate a code number with each bit. Figure 1 shows the scheme.

Our eight bits are labelled b7 ... b0 and the numbers associated with each number are shown above each bit. (The most mathematical among you will see that they're in ascending powers of two.)

To discover the value coded in a byte we simply add the numbers associated with every bit that is set (1), ignoring all clear bits (0). So:

**%10101000**

codes the number:

$$128 + 32 + 8 = 168$$

We also learned to do tricks with, or to put in more properly, manipulate, binary numbers. We could create the complement of a number — a sort of binary opposite — by changing every clear bit to set ("setting" the bit) and changing every set bit to clear

**MIKE RIBBY**  
continues his series  
on binary numbers

("clearing" the bit).

So the complement of the number:

**%10101000**

gives us:

**%01010111**

We can add and subtract binary numbers, as well as multiply and divide. We learned other ways of combining them too, with the logical operators AND, OR, EOR.

EOR, which stands for Exclusive OR, is also called XOR.

When combining two binary numbers, under the influence of these operators we compare each bit in one number with the corresponding bit of the other.

Then, according to a rule which depends on the operator we're using, we decide whether that particular bit (the result bit) in the "answer" byte is set or clear. Table 1 shows the rules for the operators.

As we've said, a micro's memory is divided into byte-sized compartments, called memory locations. Each location has a number associated with it so we know which one we're talking about.

These numbers are known as

memory addresses.

Much of what a microprocessor does involves moving information — in the form of binary numbers — from one location to another.

If you cast your mind back to earlier articles, I said that each bit was like a switch — its two values 1 and 0 could be used to signify that the switch was on or off respectively.

Imagine that we could wire up one

**AND** Sets the result bit only if both bits compared are set, otherwise the result bit is clear.

**OR** Sets the result bit if either or both the bits compared are set. Only if both bits compared are clear is the result bit clear.

**EOR** Sets the result bit if the bits being compared differ in value. If the EOR bits compared are identical, the result bit is clear.

Table 1: Rules for logical operators

of our bits to a machine's on/off switch. Then, by setting that bit we could switch the machine on, and by clearing it we could switch it off.

This sort of thing is possible, though we'd need to use some clever electronics. In fact, since we deal with eight bits at a time, we could arrange things so that a single byte controlled the on/off status of eight separate machines — each machine m7, m6 ... m0 corresponding to an individual bit of that byte, b7, b6 ... b0. We'll leave that byte the control byte.

We call such arrangements memory-mapped output, since what we put in memory maps, or sets the pattern for, what happens in the outside world. Most microprocessors support this or some similar sort of

128	64	32	16	8	4	2	1
b7	b6	b5	b4	b3	b2	b1	b0

Figure 1: Values associated with bit positions



Figure 11: Binary mapped control

output. Figure 11 shows the type of scheme we mean.

Assuming we've got things connected up properly, if we then load the control byte with:

```
%01111111
```

all the machines would be on. Remember that if a bit is set the corresponding machine is on. If we want to switch all the machines off, we can load the control byte with:

```
%00000000
```

And, of course, we can have any on/off pattern of machines, setting or clearing the relevant bits by loading the control byte with new numbers, loading it with:

```
%11110000
```

is one way of switching off half the machines.

Sometimes, though we might want to switch a particular machine or two on or off without knowing for certain whether the others are on or off.

This means we need some way of affecting only the bits controlling those machines, while leaving the others unchanged.

Suppose we wanted to switch off a machine – say m0. We can do this by making bit 0 of the control byte zero.

To clear that one bit to zero we AND the control byte with another byte – called the mask – the bits of which are set (1) except for 0, which will be 0. That is, we AND the control byte with:

```
%10111111
```

We then make this result our new control byte, and off the machine goes.

To see how it works in practice, let's assume that initially all the machines are on, so the control byte is:

```
%11111111
```

To switch machine m0 off we must AND it with:

```
%10111111
```

The sum is:

```
%11111111 control byte
AND %10111111 mask
-----
%10111111 New control byte
```

As you can see, the outcome is that when we update the control byte with the result, m0 is switched off while the others remain on.

The trick isn't hard to see. Let's consider things from the point of view of bits in the mask. If the bit is a 1, when you AND it with the relevant control bit the resulting bit is the same as the control bit. That is, ANDing a bit with 1 leaves that bit unchanged.

Think about it. If the control bit were 1, then as  $1 \text{ AND } 1 = 1$ , you're left with 1. The bit's unchanged.

If, on the other hand, the control bit were 0 then, as  $0 \text{ AND } 1 = 0$ , the bit remains unchanged as 0.

In other words bits in the mask with 1 in them leave the corresponding control bit unchanged.

So for machines whose on/off status we don't want to alter – we may not even know if they're on or off – we set the corresponding bit in the mask to 1.

However if the bit in the mask were clear (0) it would mean what the state of the original control bit was – the result would still be 0.

Say the control bit was 1, then as  $1 \text{ AND } 0 = 0$  the resulting bit is a 0. Alternatively, if it were 0, since  $0 \text{ AND } 0 = 0$  the resulting bit is again 0.

So bits in the mask with 0 in them set the corresponding bits in the result byte to 0.

This means to switch specific machines off we construct a mask consisting of 1s for the machines we wish to leave unchanged and 0s for

the machines we want off – in the appropriate bit positions.

We then AND the mask with the control byte and then make the resulting byte the new control byte.

Fine, but how do we switch on specific machines?

Well, we update the control byte by ORing it with another mask. This time we put 1 in the bits corresponding to the machine we want on, and 0 in the bits corresponding to the machines whose on/off status we wish to leave unchanged.

This works, since when you OR a bit (whether 0 or 1) with another bit whose value is 1, the answer is 1. That is  $0 \text{ OR } 1 = 1$  and  $1 \text{ OR } 1 = 1$ .

So using a 1 in the relevant bit of an OR mask will set the corresponding result bit. When this becomes the new control byte the corresponding machine will be turned on/left on.

On the other hand, ORing a bit in the control byte into another what varied with 0 leaves that bit totally unchanged since  $1 \text{ OR } 0 = 1$  and  $0 \text{ OR } 0 = 0$ .

So when we OR the bits of the mask that are 0 leave the corresponding bits of the control byte unchanged.

This means, to switch specific machines on we use a mask consisting of 0s for the machines we wish to leave unchanged, and 1s for the machines we want on – in the appropriate bit positions.

We then OR that mask with the control byte and make the resulting byte the new control byte.

Incidentally, to ensure that m0 is definitely on, we OR the control byte with:

```
%10100000
```

For example, if m0 is off, and all the rest on, to switch m0 on we do the following:

```
%10111111 control byte
AND %00100000 mask
-----
%11111111 New control byte
```

Of course, both AND and OR have uses for the micro-enthusiast other than controlling machines.

Next month we'll have a look at some, as well as uses of XOR/EXOR.







## PROGRAM STRUCTURE

<b>2000-2120</b>	Display opening page on first run. Load 2040 onwards prompt user to enter number of players, speed, and start. Start players in graphics mode 3 in random directions. Use 2090 onwards in game in action with test for collision. Calculate changes in direction. Plot next pixel in the trail. Test for computer's path collision.
<b>2130-2170</b>	Calculate moves for player 2. Read joystick port data and control direction.
<b>2180-2240</b>	Evaluate coordinates for next pixel. Error-handling routines for wrap-around screen.
<b>2250-2320</b>	Collision routine. Sound and colour effects. Display scores.
<b>2330-2390</b>	Opening display page data.

## VARIABLES

<b>I</b>	FOR ... NEXT loop control
<b>X,Y</b>	General coordinates for setting up screen display.
<b>J</b>	Inner (nested) FOR ... NEXT loop control.
<b>S</b>	Speed/Inlay loop control.
<b>XP, YP</b>	Coordinates of player 2 on computer.
<b>P</b>	Player number - 4000 = 1 player, 5000 = 2 players.
<b>S1, S2</b>	STICK(0) value for player 1.
<b>S1, S2</b>	STICK(1) value for player 2.
<b>XA, YX</b>	Store the next coordinate for player 1.
<b>W</b>	Identifies crashed player for scoring.
<b>XA, YJ</b>	Store next coordinate for player 2 on computer.
<b>Z</b>	Data LOCATED at the pixel with coordinates X,Y.
<b>ERROR</b>	Stores line number where cursor-out-of-range error occurred.
<b>SC1</b>	Player 1 score.
<b>SC2</b>	Player 2 score.
<b>SC3</b>	Player 3 score.

```

2000 FOR I=3 TO 1000 :I
2010 PLOT 40,0:GOTO 2040
2020 LET D=10000000/INT(1000-RND(1))
2030 FOR J=1 TO 80:LET D=D+(D/256)*RND(1)
2040 LET S1=INT(256*(RND(1)-.5))
2050 FOR K=1 TO 256:LET S1=S1+(S1/256)*RND(1)
2060 GOTO 2090
2070 LET S2=INT(256*(RND(1)-.5))
2080 FOR K=1 TO 256:LET S2=S2+(S2/256)*RND(1)
2090 LET X=INT(256*(RND(1)-.5))
2100 FOR Y=1 TO 256:LET X=X+(X/256)*RND(1)
2110 LET Y=INT(256*(RND(1)-.5))
2120 FOR X=1 TO 256:LET Y=Y+(Y/256)*RND(1)
2130 LET XA=X+1
2140 IF XA=256:LET XA=1
2150 LET YJ=Y+1
2160 IF YJ=256:LET YJ=1
2170 LET XP=X+1
2180 IF XP=256:LET XP=1
2190 LET YP=Y+1
2200 IF YP=256:LET YP=1
2210 IF XA=XP AND YJ=YP:GOTO 2230
2220 LET SC1=SC1+1
2230 GOTO 2250
2240 LET X=XA
2250 LET Y=YJ
2260 LET XP=XP
2270 LET YP=YP
2280 LET S=S1
2290 LET S=S2
2300 LET S=S1
2310 LET S=S2
2320 LET S=S1
2330 LET S=S2
2340 LET S=S1
2350 LET S=S2
2360 LET S=S1
2370 LET S=S2
2380 LET S=S1
2390 LET S=S2

```

```

NEXT I
2400 IF 100000-RND(1)<50000
2410 LET S=1:LET SC2=SC2+1:GOTO 2430
2420 LET S=2:LET SC3=SC3+1:GOTO 2430
2430 GOTO 2400
2440 IF 100-RND(1)<50:LET P=2:GOTO 2460
2450 IF 100-RND(1)<50:LET P=1:GOTO 2460
2460 IF P=1:LET X=X+1
2470 IF X=256:LET X=1
2480 IF P=2:LET Y=Y+1
2490 IF Y=256:LET Y=1
2500 LET SC=P*1000
2510 LET S1=INT(256*(RND(1)-.5))
2520 FOR K=1 TO 256:LET S1=S1+(S1/256)*RND(1)
2530 LET S2=INT(256*(RND(1)-.5))
2540 FOR K=1 TO 256:LET S2=S2+(S2/256)*RND(1)
2550 LET X=INT(256*(RND(1)-.5))
2560 FOR Y=1 TO 256:LET X=X+(X/256)*RND(1)
2570 LET Y=INT(256*(RND(1)-.5))
2580 FOR X=1 TO 256:LET Y=Y+(Y/256)*RND(1)
2590 LET XA=X+1
2600 IF XA=256:LET XA=1
2610 LET YJ=Y+1
2620 IF YJ=256:LET YJ=1
2630 LET XP=X+1
2640 IF XP=256:LET XP=1
2650 LET YP=Y+1
2660 IF YP=256:LET YP=1
2670 IF XA=XP AND YJ=YP:GOTO 2690
2680 LET SC=P*1000
2690 GOTO 2550
2700 LET X=XA
2710 LET Y=YJ
2720 LET XP=XP
2730 LET YP=YP
2740 LET S=S1
2750 LET S=S2
2760 LET S=S1
2770 LET S=S2
2780 LET S=S1
2790 LET S=S2
2800 LET S=S1
2810 LET S=S2
2820 LET S=S1
2830 LET S=S2
2840 LET S=S1
2850 LET S=S2
2860 LET S=S1
2870 LET S=S2
2880 LET S=S1
2890 LET S=S2
2900 LET S=S1
2910 LET S=S2
2920 LET S=S1
2930 LET S=S2
2940 LET S=S1
2950 LET S=S2
2960 LET S=S1
2970 LET S=S2
2980 LET S=S1
2990 LET S=S2

```

```

3000 LET SC1=SC1+1
3010 GOTO 2900
3020 LET X=X+1
3030 IF X=256:LET X=1
3040 LET Y=Y+1
3050 IF Y=256:LET Y=1
3060 LET XP=X+1
3070 IF XP=256:LET XP=1
3080 LET YP=Y+1
3090 IF YP=256:LET YP=1
3100 IF XA=XP AND YJ=YP:GOTO 3120
3110 LET SC=SC+1
3120 GOTO 3020
3130 LET X=XA
3140 LET Y=YJ
3150 LET XP=XP
3160 LET YP=YP
3170 LET S=S1
3180 LET S=S2
3190 LET S=S1
3200 LET S=S2
3210 LET S=S1
3220 LET S=S2
3230 LET S=S1
3240 LET S=S2
3250 LET S=S1
3260 LET S=S2
3270 LET S=S1
3280 LET S=S2
3290 LET S=S1
3300 LET S=S2
3310 LET S=S1
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3390 LET S=S1
3400 LET S=S2
3410 LET S=S1
3420 LET S=S2
3430 LET S=S1
3440 LET S=S2
3450 LET S=S1
3460 LET S=S2
3470 LET S=S1
3480 LET S=S2
3490 LET S=S1
3500 LET S=S2

```



## Part VI of MIKE BIBBY's guide through the micro jungle

LAST month we looked at how to create loops using a conditional statement and a GOTO. However, if you just want your micro to do something a fixed number of times, there is another technique you can use, the FOR...NEXT loop.

If you have a number of lines of a program that you want repeating for a definite number of times you mark them out by putting the FOR statement at the beginning and the NEXT statement at the end of those lines.

When the micro reaches a FOR it knows it has a loop on its hands. It will repeat the lines (or code, as the professionals say) between the FOR and the NEXT as many times as needed. To do this, the micro needs to use a variable as a counter to keep track of how often the loop has been performed.

In our previous loops we've always used a numeric variable for our counter - number. Each time the loop was performed we increased number by one until we reached our finishing condition.

In a FOR...NEXT loop the variable you use for your counter increases automatically on each repetition of the loop. However, you need to tell the micro where to start and where to finish. To see how we do this in practice, let's look at Program 1, which prints out HELLO 10 times.

Lines 30 and 50 mark out the lines we want repeating line 40. Line 30 reads:

```
30 FOR NUMBER = 1 TO 10
```

The FOR indicates the beginning of the loop. This is followed directly by the counter variable, in this case number. After the "=" sign the 1 to 10 tells the micro to start number at 1 and keep on increasing it by one each



# And now FOR my NEXT trick...

```
30 FOR NUMBER = 1  
40 PRINT "HELLO"  
50 NEXT NUMBER  
60
```

Program 1

time the loop is repeated until it gets past 10.

The loop is then finished and the micro carries on with the rest of the program, in this case line 60. The outcome of all this is that HELLO is printed 10 times followed by a final GOODBYE.

The micro's thought processes go like this:

```
NUMBER = 1 PRINT "HELLO"  
Increase NUMBER  
NUMBER = 2 PRINT "HELLO"  
Increase NUMBER  
NUMBER = 3 PRINT "HELLO"  
and so on until
```

```
NUMBER = 9 PRINT "HELLO"  
Increase NUMBER  
NUMBER = 10 PRINT "HELLO"  
Increase NUMBER  
NUMBER = 11 But the loop is to 10  
so go on to line 60
```

Let's learn some jargon:

- What we've called the counter variable is, not surprisingly, called the loop variable.
- The "limits" of the loop - in this case 1 and 10 - are called the loop parameters.
- The lines of the code to be repeated are termed the body of the loop.
- When you finish a loop and continue with the rest of the program we say that you have dropped out of the bottom of the loop.

Notice that we've put the loop variable, number, after NEXT in line 50. Some BASIC let you leave this out - not so the Atari.

All the above has been a rather long-winded explanation of a simple method of getting the computer to do something a fixed number of times. Try the following versions of line 30, and keep a careful count of the number of HELLOs you obtain. Are they what you expected?

```
30 FOR NUMBER = 1 TO 20  
30 FOR NUMBER = 0 TO 20  
30 FOR NUMBER = 0 TO 20  
30 FOR NUMBER = 1 TO 20  
30 FOR NUMBER = 0 TO 11
```

As will be obvious from the above,

the loop variable doesn't have to start at 1. Just to warn you of a possible source of future errors, try changing line 20 to:

```
20 FOR COUNTER = 4 TO 10
```

Assuming that you haven't changed line 90 from the original Program I, you'll get an error message. This is because the loop variable you've specified in the FOR statement (counter) doesn't match the one after the NEXT (number).

Now try Program II.

```
10 REM PROGRAM II
10 PRINT CHR$(123)
10 FOR LOOP% TO 40
10 NEXT LOOP
```

Program II

If you recall, the loop parameter increases by one each time the loop is repeated. In a burst of wild originality I've called the loop parameter *loop*. The first time through the loop, *loop* is 1, so line 40 prints out the value 1. Then *loop* is increased to 2 since it is the counter, so line 40 prints out 2, and so on.

Once you've worked out what is happening here try adding:

```
40 PRINT LOOP
```

The new line prints out the value of *loop* after the loop has ended. Can you explain the result?

```
10 REM PROGRAM III
10 PRINT CHR$(123)
10 FOR LOOP% TO 10
10 PRINT LOOP * LOOP * LOOP * LOOP * LOOP * LOOP
10 NEXT LOOP
```

Program III

Program III prints out the squares and cubes of the numbers up to 10. Rather nice isn't it? Of course, there's no need for you to stop at 10 - try increasing it to 100. That's the good thing about loops - you can get the micro to do a considerable amount with very little coding on your part. Program IV will print out whatever multiplication table you want.

Can you alter line 90 of Program II

so that the output starts with a 10 and decreases to 1?

```
10 REM PROGRAM IV
10 PRINT CHR$(123)
10 PRINT "
10 PRINT "MULTI TABLE OF TWO NUM "
10 PRINT "
10 FOR LOOP% TO 10
10 PRINT LOOP * " ; CHR$(65) ; " = " ; LOOP * LOOP
10 NEXT LOOP
```

Program IV

Now try running Program V.

```
10 REM PROGRAM V
10 PRINT CHR$(123)
10 PRINT CHR$(65)
10 PRINT CHR$(66)
10 PRINT CHR$(67)
10 PRINT CHR$(68)
```

Program V

Even if you don't fully understand what's going on, I bet you can still guess what

**PRINT CHR\$(65)**

would give you!

CHR\$( ) stands for "Character String" though I always read it as "Chris", so I would pronounce:

**PRINT CHR\$(85)**

as "print Chris eighty-five". The code number can be stored in a variable, so:

```
NUMBER = 45
PRINT CHR$(NUMBER)
```

will work. You see, every character you can put on the screen has its own code number. The code for A is 65, for B is 66 and so on. CHR\$( ) takes the code and turns it into a character string - that is, a string a single character long.

These numbers have been standardized in a table called, rather grandly, the American Standard Code for Information Interchange. It's known as ASCII - pronounced "Ashkey" - for short. It, however, like me you can never make head nor tail of tables of information, you'll be glad to know that you can use a Basic word called ASC( ) to tell you the number, or ASCII code, of the

character you're interested in.

You just put the letter you want inside the brackets - in quotes of course, as we always do with strings. For example, we ask the micro to print out the code for A with:

**PRINT ASC("A")**

which, if you remember to press Return (and I'm not going to remind you from now on), will give you 65, the code for A. ASC stands for *ASCII*, so read the example above as "PRINT Ashkey A".

```
10 REM PROGRAM VI
10 PRINT CHR$(123)
10 FOR LOOP% TO 122
10 PRINT "ASCII CODE FOR " ; CHR$(LOOP) ; " IS " ; LOOP
10 NEXT LOOP
```

Program VI

Program VI generates the ASCII code for the character you input. Try inputting a string of more than one character and see what happens. Program VII shows the printable ASCII codes between 32 and 122. These are others, but for the moment we'll ignore them. Notice the loop parameters in line 20.

```
10 REM PROGRAM VII
10 PRINT CHR$(123)
10 FOR LOOP% TO 122
10 PRINT CHR$(LOOP) ;
10 NEXT LOOP
```

Program VII

Remember, you don't have to start a FOR...NEXT loop with the value 1. However, it's sometimes easier to visualize what's going on if the loop does start with 1, or perhaps zero. For instance, Program VIII prints out the whole alphabet in capitals!

```
10 REM PROGRAM VIII
10 PRINT CHR$(65)
10 FOR LOOP% TO 90
10 PRINT CHR$(LOOP) ;
10 NEXT LOOP
```

Program VIII



However, I prefer Program 10, which performs the same task.

```
10 NEW PROGRAM 10
20 PRINT @CHR(64)
30 FOR I=1 TO 24
40 FOR LOOP=1 TO 24
50 PRINT CHR(64+I*LOOP)
60 NEXT LOOP
```

Program 10

What happens is that, since offset is 64 throughout the loop, line 60 prints out the CHR(64) of loop plus 64. For example,

for loop = 1, CHR(65) is printed.  
for loop = 2, CHR(66) is printed  
and so on.

I admit there's a bit of mathematical eggery-pokery involved, but when I'm dealing with the alphabet the numbers 1 to 26 mean far more to me than 65 to 90.

Granted there's one more line than in Program 9, but it is far easier to alter the program if, say, I happen to get my figures wrong. To demonstrate this, change line 30 to:

```
30 @CHR(64 + I)
```

Hey presto, lower case! The codes for the lower case alphabet lie from 97 to 122. Try altering Program 9 to print out in lower case, and you'll see it involves much more work.

Of course you could have had offset = 65 and loop from 0 to 25, but that doesn't mean as much to me — I always think of the alphabet in terms of 26! While we're on the subject of offsets, let's have a look at Program 8. This prints the numbers from 10 down to 1 rather than from 1 to 10.

```
10 NEW PROGRAM 8
20 PRINT @CHR(10)
30 FOR LOOP=10 TO 1
40 PRINT @I
50 NEXT LOOP
```

Program 8

What happens is that instead of just printing out the loop variable line 30 subtracts 1 from 11 first. So: when loop = 1, 10 is printed (11 - 1) when loop = 2, 9 is printed (11 - 2) and so on until:

```
when loop = 10, 1 is printed (11 - 10)
```

Here we are using 11 as a sort of offset.

Try using this idea of taking the loop variable from a number to alter Programs 9 and 10 to print the alphabet in reverse, Z to A. Before we leave Program 8, I must make the point that I would normally write line 40 as:

```
40 PRINT @I - LOOP
```

The brackets do not affect the outcome. They're used here simply as a "container" for the mathematics. I prefer this latter approach, even if it's not strictly necessary.

Sometimes, however, the use of brackets is vital. For instance:

```
PRINT @ - 2 + 1
```

and

```
PRINT @ - (2)
```

give totally different results. What happens is that the micro performs the sums inside the brackets first, then does the rest.

So in the first example the micro sees to itself 0 minus 2 is 0, multiplied by 2 gives 0, whereas in the second it sees 2 multiplied by 2 is 4, subtracted from 0 leaves 2. So my amended line 40 tells the computer to do the sum first, then print the answer. As I've said, in this case it's not strictly necessary, but such good habits may prevent you inadvertently dropping into error later.

```
10 NEW PROGRAM 31
20 PRINT @CHR(65)
30 FOR LOOP=0 TO 24 STEP 2
40 PRINT @I
50 NEXT LOOP
```

Program 31

Have a look at Program 31. This prints out the numbers 0, 2, 4, 6, 8,

10. That is, we go from 0 to 10 in steps of 2. Line 30 holds the secret. You see, we've assumed that in FOR...NEXT loops the loop variable — we've always used loop — increases, or steps up by one, each time through the loop.

Actually we can tell the computer how much is added each time by taping STEP into the end of our program FOR line. In line 30 we have specified a STEP of 2, so 2 is added to the value of the loop variable each time. Change line 30 to:

```
30 FOR LOOP = 1 TO 10 STEP 2
```

and you get 1, 3, 5, 7 and 9 printed out.

Notice that 10 is never printed — this is because when loop is 9 and you come to NEXT loop, you increase it by 2, obtaining 11. This is outside the loop parameters, so you drop through the bottom of the loop — that is, the loop ends. You can actually use the idea of STEP to decrease the loop variable — you just use a negative STEP.

Program 32 uses this technique to print out the numbers 10 down to 1, far more simple than in Program 10.

```
10 NEW PROGRAM 32
20 PRINT @CHR(10)
30 FOR LOOP=10 TO 1 STEP -1
40 PRINT @I
50 NEXT LOOP
```

Program 32

Notice that the loop parameters now go from 10 to 1. The larger number comes first, since we are decreasing the parameters each time. Adding -1 is equivalent to taking 1 away. You don't even have to increase STEP by whole numbers. To prove it, try changing line 30 of Program 32 to:

```
30 FOR LOOP = 1 TO 10 STEP 0.5
```

Can you see what's happening?

Now that we've covered the fundamentals of loops we'll continue next month by using them in a variety of ways.

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Post to: Atari 130XE Contest, Atari Star Europe House,  
68 Chester Road, Hazel Grove, Stockport SK7 5NY.  
To enter see Atari Star October 31, 1985.



# How to use that extra 64k

If you happen to be one of the fortunate ones who has been teased by a wife who wants to keep you quiet into buying the new Atari 130XE then you may know that a new DOS is available which allows us to use the extra 64k of RAM as a RAM-disk.

Yes, it's true, good old DOS 2.0 has been upgraded to DOS 2.5 for the 130. "What's the S for?" I hear you ask.

Well, the DOS 2.0 screen format and functions have been kept almost the same, but this version comes with an extra file called RAMDISK.COM.

When you boot the disc DOS 2.5 looks for and loads this file before it looks for the AUTORUN.SYS file.

When the boot process has finished and control has been passed to Basic, assembler or to your application program, you have at your disposal an extra "disc drive" accessed with the device name D: (for name.a2).

Good, eh? Instead of saving your program to the disc every 10 minutes (just in case you crash) you are able to save a copy to the extra area of RAM.

This D: drive can be used exactly as a normal drive, loading, saving and even opening a file to get or put bytes from or to.

During the process of programming with most assemblers, for example, you often have a need to "INCLUDE" a number of disc files within the code of assembly time. How about, instead of having those files on a disc, have them in RAM and call them by changing the code to INCLUDE #D:file1...

Think about it. All the simplicity of

**MICHAEL KING presents a simple way to take the strain out of disc filing**

including binary files with the speed of a machine code byte transfer routine. Let me tell you, it speeds up the assembly stage no end - and keeps that disc from spinning, too.

Let me explain what this little program does. Type in the Basic program above. Type in the Basic listing exactly as shown. After saving it (please), type RUN.

The program will check your typing and if you just happen to have made a few mistakes in the data you have entered the appropriate message will be printed and the offending line will be listed for alteration.

Insert a DOS 2.5 disc with RAMDISK.COM into drive 1 when asked to, and press Return. An AUTORUN.SYS file will be written to the disc.

Now that has been done, let me tell you how to use the program.

If you have a number of files on disc that you regularly use - utilities, listed subroutines, or your INCLUDE files for example - how nice it would be if they were already on the RAM-disk after the boot process has done its bit. Well it saves copying them over one at a time, doesn't it?

All you have to do is rename all the files you wish to be transferred to drive B with the assembler .JOB. Quite easy to remember isn't it?

Now when you boot up using this disc - it must have RAMDISK.COM on of course - all of your files will be moved into RAM just waiting to be used.

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 1081 0479 6,107,71,1,107,11,107,71,1,1  
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 1082 0479 101,107,46,1,107,110,107,61,  
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 1083 0479 66,106,106,1,107,110,107,10,  
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 107,107  
 1085 0479 45,106,17,10,106,1,177,110,1  
 11,17,107  
 1086 0479 10,106,177,11,106,106,110,1,  
 106,66,66  
 1087 0479 11,106,11,106,1,106,110,11,1  
 10,10,106  
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 1092 0479 10,107,10,1,106,4,11,10,10,  
 107  
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 1094 0479 106,1,107,66,1,106,107,10,  
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 1105 0479 10,107,71,1,10,106,110,11,10,  
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# Danger is the name of the game

OVER the last few months I have endeavored to give as broad a perspective as possible on the various types of adventures available, as well as try to give an idea of some of the problems associated with this type of game.

In doing this some recurring names have been Scott Adams (Adventures International), Level 9 and Infocom. To date the first two have predominated for two principal reasons.

Firstly they supply entertaining adventures which tend to be both well written and of varying degrees of difficulty. Secondly they are among the most affordable of adventures, being cassette-based, thus giving them a wider audience.

Infocom stands alone from other adventure producers, and in such deserves to be considered separately. Its truth comparisons are not easy, although they can be made with the other adventures, but I think to be fair Infocom adventures are the standard to which many aspire, but few achieve.

Infocom are relatively expensive disc based text-only adventures — always have been, and hopefully always will be. One of their advertisements showed a picture of a human brain with the caption "The most powerful graphics computer known to man" or words to that effect.

No blocky pictures of woods and a cottage for Infocom. You are plunged into the most detailed and exact prose available to adventures. Screens upon screens of text are revealed as you explore the carefully crafted worlds which they bring you.

The drawback is that unless you have a disc drive Infocom games are not for you. Brillig says that this should inspire you to go out and buy your disc drive now!

As stated, Infocom adventures are not cheap. However at least the package shows some care and imagination, rather than a video case with a printed instruction sheet and

## BRILLIG explores the fascinating world of Infocom adventures

the game cassette.

High-Hikers Guide to the Galaxy, for example includes a retroscopic space fleet and peril-sensitive sunglasses for the player's use in moments of extreme danger — the glasses have opaque black lenses.

This should be standard issue in any Infocom game, where danger is the name of the game — be it from arrest for a murder that only you knew you didn't commit, to being disciplined in Planetfall for failing to evade the decks correctly shortly before the spaceship explodes.

Variety is the essence of the range. Consider the Zork Trilogy, so staggeringly popular that they have gone the opposite route to most software and had back versions made from them.

Zork charts a huge underground dungeon in three stages and, while bearing some similarities to Colossal Adventure, shows far more imagination in scene setting.

Part of the reason for this, although by no means all, is the use of disc storage, which allows your Atari to pull off new data all the time as you progress, whereas the majority of other games, being cassette based, do not have that advantage.

It is, however, the use to which they put the space available that makes games so special. It is all very well having 7,000 plus locations but if they are all the same it makes for a tedious exploration.

Similarly, there seems to be a

school of thought in adventure writing that in order to create atmosphere of that is required is a liberal sprinkling of assorted adjectives and that is it.

Infocom adds atmosphere, not only by what is included, but also by what is omitted.

On the inclusion side it allows Infocom's programmers to develop characters and responses which leave other games characters looking positively flat.

For instance, Sergeant Duffy, met only "Wags you right back" if you should strike him — a temptation most players of Witness succumb to — but also "It hurts, too", giving Duffy a strength and depth which has you wishing at his grip on your forearm as he leads you to the station.

Try following Veronica at her mansion party in Deadline to try to catch a glimpse of her real murderer as she goes off to her doom.

You are prevented, not by an almost clearly inserted device such as "Veronica disappears and you cannot see her" but by a clumsy butler in a gorilla suit who entangles you with another guest, drags you to the floor, and then obscures your view long enough to prevent you from following your best hunch.

In Planetfall the ambassador who passes by in a corridor is not only there for window dressing, he hands you a brieflet detailing the virtues of the products of his home planet.

I cannot recommend Infocom adventures highly enough. While not for the wet-and-out beginner, they are the sort of games that any player can enjoy, as much for the things he gets

**Variety is the essence of the range**

wrong as for those he gets right, and still have a bundle of laughs on the way.

Time for that inadvertent error now, it was glitch of the month competition. Following my lead at moves in Escape from Pular 7, by Brian Howarth, last month, it seems appropriate that this month's logic bomb comes from the same Mysterious Adventures stable in Wauwatah.

Simon Atfield, from Kings Norton in Birmingham, points out that once you are submerged underwater having gone through the dolphins, they strike a light, the matches still work.

A medium T light is so its way to you Simon (like possibly for not including your axe) and keep these glitches coming.

Get to keep these adventure writers on their toes.

Lords of Time keeps up again, and SAC Gaston from RAF Cosford is having trouble with the Mammoth in

Time Zone 3.

Well, if you gather up some wood and petrol and get your fall in Level 5's own brand of matches (has anyone tried these underwater yet?) you should not only get rid of a glam-locked problem (but also find something left behind that will give you a nice warm feeling).

How to get past the Crocodustors? Remembering that he is vegetarian may get you out of the pit, but you need to reflect on your acquisitions to get past him.

Lastly, to escape the gladiator, some footwear from showing faith in the temple is all you need.

Level 5 is just about to release Red Moon for the Atari in Q3/89. In fact by the time you've read this the game should be available, as a few last-minute problems were being ironed out when I spoke to Level 5 the other day.

So far all billing has received is a balloon and a poster, but the news

from the Level 5 camp is that this will be their first Atari game with graphics.

Given the Atari graphics capability, they had better be pretty good or I should imagine that the protests will be long and loud.

Pete Austin tells me that if the response is good they may well backtrack on the graphics for Atari versions. Level 5 is also expressing an interest in converting games for the ST range if it takes off.

But don't hold your breath. The same was said for the QL, and look what happened when that bit the marketplace.

Not such happy news from Adventure International, who at the time of going to press still could not supply a publication date for Caspercube 3, The Fantastic Four, originally scheduled for July.

Next month I'll take a quick look at Wizard of Akvyr and Red Moon if it arrives. Don't forget those glitches!

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There are 36 cards in all, and they cost an extra 40p. Teletextmessages that automatically set the colour for cards can also be sent to any address in the USA, from Alaska down to Hawaii, and other countries will soon be joining the system.

Meanwhile, for the rest of the world you can use MicroLink to send an international telegram, again at a cheaper rate than using the phone.

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Teletextmessage 1	UK		USA	
	MicroLink	Phone	MicroLink	Phone
Delivery following day (guaranteed)				
Up to 50 words				
51-100 words		£3.50		£3.75
101-150 words		£3.75		£4.25
151-200 words	£3.25	£4.00		£4.75
201-250 words		£4.25	£3.75	£5.25
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301-350 words		£4.75		£6.25
351-400 words		£5.00		£6.75
Teletextmessage 2				
Delivery following day (not guaranteed)				
Up to 100 words				
Multiple Teletextmessages				
Same recipient or more than one address. First message charged as above. Each additional address	£1.25	N/A	N/A	N/A
Special occasion cards	£1.50	£1.80	£2.00	£2.50
Direct response	50p	50p	N/A	N/A
If reply post envelope included with your message	50p	50p	N/A	N/A

## INTERNATIONAL TELEGRAMS CHARGES

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- The maximum length of a Teletextmessage is 100 words or 25 lines of text when its appearance is restricted to an 80 page of text.
- The addressee's name and full postal address is free of charge.
- All prices are per cent.

## Keeping in touch

FOUR Manchester fans hoping to follow the same route to Sweden at another quarter from Liverpool are planning to use MicroLink to keep them in touch with their home base during their tour of Britain and the continent.

Pop group 10 What will be armed with a portable micro and acoustic modem as well as guitars and drums when they set off for a round of gigs.

MicroLink's electronic mail service will keep them right up to date with what's happening back at the "office".

## Getting bigger!

THE host of new services now becoming available have been made possible by MicroLink being given its own dedicated 4,000,000 mainframe computer at Telecom Gold.

It now has the capacity to expand considerably, and lots of additional services are planned in the planning stage which will enable MicroLink members to participate in the many exciting developments now taking place in the world of communications.

A NEW CLASSIC

FROM PAUL WOKES  
AUTHOR OF ENCOUNTER

# YOU CHOOSE THE ACTION IN MERCENARY

Mercenary - a unique combination of flight simulation, adventure and arcade fun. You choose the action.

There is complete freedom of movement in a truly three-dimensional vector-graphic environment. Graphics of exceptional speed create a very realistic experience.

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# Trying to program without a tape

I AM glad to find at least an Atari magazine in the local shops.

It has taught my family more than what we thought the computer could do.

We bought the Atari 800X for Christmas and we were most upset when we saw it on sale with the recorder for the same price.

We do not own a recorder yet as they are so expensive in their own.

The problem we are facing at the moment is that the program in your magazine is that our computer will not take them.

We have a lot of errors when we finish the program, yet we repeat the ones that they show at the end of the program when we type RUN and press Return.

We repeat the lines that show as 011011 and the computer takes them but the program will not.

Also if we are lucky enough to print the program without any errors, the statements, it will work for a few minutes then jam.

We have tried creating Return but nothing happens. The only way we can do it is by pressing Return then typing LIST. When we do this it starts the list then jumps halfway through, so we have to do the same thing again.

Sometimes it will not recognise the list and will not allow you to print anything — not even more the error.

When this happens — which is most of the time — we have to switch off and start again.

We have come to the decision that it must be the computer. Could you please let me know if it is, as it is still under guarantee.

Also I would like to see more about errors in your magazine as the book we had with the computer doesn't explain what to do in the way we would understand. — **L. Williams, Penryn, Dyfed.**

The fault is either in the computer itself — by taking it in for service — or in your typing of FORK statements, etc.

We can't imagine the without a disk drive — without using a cassette if you have lots more

than a cartridge games machine, as you are limited to what you can enter in one session.

Please, if you want to get the most from both the computer and the magazine invest in a tape unit — even a second-hand one.

## My Logo won't run

I AM very pleased that at last I have found a magazine for the Atari.

I have been reading it each month and I have tried many programs, but in the August issue I could not get any of the Logo programs to run.

I typed: MAKE "WORDLIST PD 20 RT 30 FD 30 LT 30 FD 30 and then pressed Return.

I got ERROR — 001 ANY "WORDLIST etc.

What am I doing wrong? Is it my 800X that is faulty perhaps? — **Muriel Whiting, Madderstone, Kent.**

It sounds as though you haven't got the Logo cartridge plugged in. Consequently, the Basic interpreter built into your machine is trying to make sense of your input.

It's failing, of course, because it only understands Basic commands, not Logo.

## Syntax puzzle

COULD you please let me know if programs printed for the Atari in magazines back in 1983 should be able to be used on a new 800X Atari which I have just purchased?

I tried a couple of them but I kept getting errors. I checked through the lines but could

find none.

One of the errors came up with the line ?? which the Atari Basic book says is a syntax error. Could you tell me what a syntax error is? — **A. Leadbetter, Leitchworth, Herts.**

Although some early commercial software might not run on your 800X, unless you use a translator-type program, we would expect most magazine listings to work.

Certainly all of our listings will work fine on your machine.

A syntax error occurs when you use a Basic command incorrectly. For example, enter:

PRINT CHRBS

and press Return.

The machine will give you an error message because the syntax requires a closing bracket after the number.

## A NEXT without FOR

AFTER buying your magazine for Saturday, not to mention the Atari 800X, to go with it, I had read the instructions and then started to try in Frog Jump.

After a couple of hours at the keyboard I was finished, and when I had taken the precaution of putting it on tape I decided that it was time to start enjoying myself.

So I typed RUN and pressed Return. All I've been able to get since is an "error 13 at line 7200" message.

Now I have checked and re-checked the program against your listing and it all seems to be in order.

So I wonder if you can let me know if it is an error in your listing or a malfunction in my computer?

Now that I have got rid of the bad part, let me say that I can find no fault with your magazine. Indeed it is written in a way that is easy to understand, even by me.

The sections on Graphics and the place for Beginners — which I surely get — were both enjoyable and informative. — **Mark Disney, Dublin, Ireland.**

An error 13 means that the machine has encountered a NEXT statement without having previously seen a corresponding FOR statement. Check line 1170 very carefully.

## Calling Cornwall

I BOUGHT the July issue of your magazine and was so impressed I placed an order with my newspaper. I also got back issues 1 and 2.

Is there an Atari club group in the Cornwall area? If so when? Also, for my stepfather who also owns an Atari, is there one in the St Austell area?

When I bought my Atari 800X in April I had a paradise on the Silco Stop order form of an immediate membership in the Atari Owners club, with bulletin and magazines every now and again.

It's now the end of July and still I get my member pack 2 I've had nothing.

Can you help by informing me as to why this is?

I'm not the only one — my stepbrother has the same problem. — **Michael Dawson, Tazewell, Cornwall.**

We don't know of any groups in Cornwall. If there are any, perhaps someone could let us know.

The Owner's Club Member only appears quarterly.



## Summit of success

AM I your highest reader? The picture shows me reading your fantastic magazine at 11,715 feet above sea level at the top of Mount Kincaid in the Lake District. Do I win a prize? - **Philip Abbott, Bradford.**

- You're holding the prize in the photograph I believe we get a spare of photos like this, we ought to want readers that anything less than forest won't be printed!

## Start off in hex

HAVING bought the last three issues of your magazine I thought I should put pen to paper to congratulate you on them. AM I just a distant magazine for Alan users?

I especially liked the subscriber articles in the July and August issues.

As I cannot yet afford the Amstrad/Euro carriage they both come in very useful.

I thought you might be interested in the modifications I have made. It would be useful to be able to enter the user address in hex as well as binary, which is what the modification listing does.

These modifications allow the user to input a hex user address simply by pressing it with a "3".

One last modification is to use "RAMDISK" in the OS/memory statement to use 60.

One last thing I need to be able to start when the Break key has been pressed in a program I'm working on. How can any suggestions on how I can achieve this? - **Geoff Miles, Chelmsford, Essex.**

- See André Willey's article on Page 38 of the August issue for information on disabling the Break key.

## Round the clock

HAVING read your article concerning a Defender score I would like to submit my score for the game.

I have clocked the score by exceeding 2,500,000 when the score returns to zero and stays at Level 88.

The game lasted for two days whereas I finished with numerous tries.

I would also like to know if there are any user groups in the Merseyside area or as far

as Chester.

I am writing to enquire whether your offer on your published magazine listings will ever be available on cassette as well as disc. I have spent many hours typing in listings which have failed to work through typing errors or bad listings.

Having listings on cassette would be extremely welcome because like most others I do not have a disc drive - **Peter Barry, Birkhead.**

- The Liverpool Amstrd User Group can be contacted c/o Mr Baxter, 19 Gillingham Crescent, Liverpool L15 9PR.

There is also a Merseyside club via Mr R. Gibson, 3 Dunning Close, Uphall, Wirral, Merseyside L49 3RN.

Many people have written requesting a monthly tape. This is now available. See the order form on Page 82.

## The right connections

I OWN an Amstrd 600 and need the following information - details of the right cartridge socket connections and details of the cassette socket connections.

I wonder if you, or any of your readers can help?

I have tried writing to Amstrd despite enclosing a SAE received to reply.

It's nice to see your magazine on the market, it fills a need. I have found the first two issues very interesting and the adverts have been most useful.

I know hardware and software were available but never knew where to go before.

It would be great if you could devote at least some space to direct yourself solutions for the Amstrd as it is such a versatile machine as far as application is concerned.

I am confused if you'd read the BBC before for serious use if any details of the connections were available at Amstrd - **Stephen Foreman, Reading, Berks.**

- You need to get a copy of the "Technical User Notes for the 400/600" from Amstrd at a cost of about £12.

This gives all details of I/O ports and full circuit diagrams plus software details and the full operating system listing.

## Yellow peril screen

I HAVE programmed the enclosed example listing into my computer and saved it on to cassette.

It worked wonderfully, all suddenly a yellow screen appeared, with a white line through the middle.

Clearly afterwards an error message appeared on the screen - "Error: call on disk 500".

I have tried various ways to get the program to run past line 500.

But I am defeated. Could you therefore let me know what it is that is stopping the program at line 500?

I suspect that line incorrect statement has been put in.

All my efforts proved one thing - that it is the last part of the disc which is stopping the program from running further - **F.J. Winfield, Dulwichfield, Cheshire.**

- At least two of the example tapes you included with your letter had a "0" in place of a "1" which obviously affects the program's operation.

Once you've corrected

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these errors that you've introduced the program should work fine.

## The future of 16k games?

*I OWN a 8000C with 16k memory.*

*Usually when I go in a shop to get a game 90 per cent of them are more than 16k.*

*I will have to wait a long time before I get a memory expansion.*

*Do you think any of the games like Progress, Beach Head or Bruce Lee will reduce in memory and come down to 16k?*

*I hope the makers of these games will think about it. — Christopher Finn, Borehamwood, Herts.*

■ As games get more and more sophisticated, it gets less likely that they'll be crammed into 16k.

If it's games you want, our advice would be to upgrade to a bigger machine.

Incidentally, Drop Zone only requires a 48k machine — US Gold labelled the tape insert incorrectly.

## Missing symbols . . .

*AS a dedicated Atari user, I was very pleased to see that a magazine has been produced specifically for the Atari computer — unlike some others which, although fully explained, carry one Atari listing at most.*

*However, upon receiving the August issue I am very distressed to find the listings provided for ourselves to be of bad quality, for example, Total Gambler.*

*Having tried to input the listing I came across many obstacles which, with regard, I could not overcome.*

*The main problem is that the graphic symbols used could not be found I own an Atari 8000C.*

*I would be very grateful if you could explain at the top of your listings the method for obtaining such symbols so it would make the search simpler*

# ATARI USER Mailbag

WE welcome letters from readers — about your experiences using the Atari mailers, about tips you would like to pass on to other users . . . and about what you would like to see in future issues.

The address to write to is:

**Mailbag Editor  
Atari User  
Europe House  
68 Chester Road  
Hazel Grove  
Stockport SK7 5NY**

for the person doing it input such a program.

*Also I would like to point out that I have noticed at the bottom of each listing an advertisement to encourage people to purchase the whole magazine on-disk.*

*I assume this is to save people like myself the aggravation of debugging the programs caused by incorrect interpretation and deciphering of the graphic symbols which is an time-consuming and unnecessary if explained properly. — M. Springer*

## . . . causing problems

*I HAVE just received the August issue of Atari User and was copying out Proffy Gambler when I got to the 210 and noticed some strange symbols.*

*My 8000C does not appear to have them.*

*Should I have them or can I use something else instead? — B.A. Corby, Exeter.*

■ Your 8000C does have these characters, it's just that the lovely "manual" supplied with the machine doesn't mention them.

The arrows are obtained using the cursor keys but entering ESC first, so to get + you type ESC CONTROL +.

Press and release ESC then press + while holding down the CONTROL key.

The special characters are often the cause of problems, which is why we prefer

readers — about your experiences using the Atari mailers, about tips you would like to pass on to other users . . . and about what you would like to see in future issues.

the address to write to is: Mailbag Editor Atari User Europe House 68 Chester Road Hazel Grove Stockport SK7 5NY

contributions to use the appropriate CHR#.

We hope to be printing a complete list of how to obtain these characters.

In the meantime, try experimenting with ESC CONTROL (held) combinations.

## Computer camp

*AS a result of Tony Dwyer's article in your June issue, not only did I purchase back you the 8850000 system with Keyboard software, but I am now a trustee at the YWC where I am enjoying immensely.*

*The first "Computer Camp" was held recently and was a great success — all of the children enjoyed themselves very much. I also enjoyed helping Tony and Mike, another student, with the teaching of Logo, which went very well.*

*There was just one problem that I had when I received my monitor and software. That was the Keyboard manual program, which kept crashing and transmitting garbage. You only need to take a look at the YWC's Bulletin Board (KBBS) 022170 to see that I'm not the only one having problems.*

However Mike & I are apparently working on a new terminal program which will support 01C and 01E on Bulletin Boards (maybe Keyboard programs), and hopefully they will improve the actual terminal part of the

program also. — Sean Morris, Carvey Island, Essex.

## LET there be keywords

*IN your Beginner's section Mike Gibby says "usually shouldn't start with basic keywords, as they confuse the Atari", and cites:*

**10 PRINTERS="EPSON"**  
*as an example.*

*Because of the way Apple Basic is formatted, it is actually possible to use PRINTERS as a variable, even though it does contain a keyword, simply by typing LET in front of it.*

**10 LET PRINTERS="EPSON"**

*is a valid 4 line Basic line. So is:*

**55 LET PRINTERS="PRINT PRINT"**

*The only token where this doesn't seem to work is 80C. Why?*

**30 LET NOTE="10 PRINT NOTE"**

*and see what happens. — Jack Buchanan, Sutton, Surrey.*

■ Thanks for getting the record straight, Jack. However we thought LET had gone the way of antimacassar, elephant's foot umbrellas stands and the ZX80.

## Latest Bulletin

*I HAVE seen in past issues of your magazine that you have listed telephone numbers of Atari Bulletin Boards and I wondered whether you would include mine.*

*My system is run on an Atari 800 and the Bulletin Board is called ThruZone. The telephone number is 0244 877879.*

*It works on a log-book system, so you have to dial the number and let the phone ring twice, then hang up and call again and the 800 will then answer (300 calls).*

*The operating times are weekdays 18.00-23.00 and weekends 08.00-23.00. — Paul Gaulton, Chester.*

## Bomb Run for all

CONGRATULATIONS on an excellent magazine which, from what we've seen so far, promises to be a great success.

I am writing about your Bomb Run game from the July issue and although I assume you've already had several letters about it I thought I'd drop you a line anyway.

I recently typed in the program and ran it on my Amiga 4000 where it ran without error.

Why am I writing, you might wonder? Because I then realised this game with my father who had memorably been playing in the *Discworld* from the same issue.

and when he tried it on his IBM Atari 400 he found that it would not run correctly.

After carefully examining the listing I made the following alterations which will enable the program to work on any Atari model.

You'll probably recognise the character redefinitions routine from Dave Russell's excellent article - also in the July issue.

Keep up the good work always, and perhaps it might be an idea to ask people to state which Atari machine their programs are written and tested on. - **Peter Appleton, Liverpool.**

```

020 IF PIPE THEN GOTO
0300 POP:R000=00000000:R01:R0:R000
0400 PIPE R-1,2:PIPE R,1
0500 BAREX:PIPE:LINE:PIPE:LINE:PIPE-
4
0600 OR00:BAR0F-4:000:OR00:R00
0700 PIPE 0000:R:PIPE:R:R:R:R:R:R
0800 GOTO 3:PIPE 0000:R:R,1
0900 PIPE 750:OR00
  
```

## Putting the record straight

THANK you several times and misappreciations in Bryan Williams' review of the Atari ST machines in the May issue of Atari User.

The Basic interpreter will not be a new version of Atari Basic, but Digital Research's Advanced Basic, originally developed for the CP/M-86 operating system and supplied to them by Microsoft of Bristol, with professional enhancements for graphics support, etc.

Personal Basic was written in BASIC, and therefore will be easy to port on to the ST.

IBM is not an operating system, or 'the graphics equivalent of CP/M'. It sits on top of DOS, which is really nothing more than CP/M-86, which is IBM 2.2 for the 8086/286, rewritten in C for the MCR8000, so that it is

several times the size and isn't any faster.

DOS is a multi-tasking, and won't be far at least a year or so, when DR hope to produce a version of Commercial CP/M for the MCR8000.

A very serious omission on the ST is the apparent lack of a bus expansion connector, which means that there will be very little, if any, third party hardware sold-out produced for it, although it might be possible to cut the hard disk interface part for this purpose.

Actually, I think the ST is a very attractive machine, and while too expensive for most home users in this country and Europe, will probably sell well to the market in the States where the average disposable income is much higher. - **L.P. Walker, Newport Pagnell, Bucks.**

## Information, please

COULD I have more information on the Atari 8000? I'm a personal computer junkie because I am thinking of buying one? - **James Robinson, Poyers.**

■ We suggest you go to your local dealer and get a full demonstration.

Alternatively, you could write to Atari for their promotional literature, but it's no substitute for a hands-on test.

## Smash hit and miss

MY brother and I recently bought an Atari 8000 computer with 2070 recorder. We also bought "Atari Smash-Hits 3".

When we got home we immediately loaded a game and played it. The problem was that the Pole Position cassette would not load.

Later that evening we discovered that the keyboard was faulty and changed the entire pack.

In the new pack everything worked perfectly except Pole Position. We followed instructions very carefully but it would still not load.

All our other games load so could you please enlighten us?

I am also a keen if not very good programmer and I like to write very basic games.

Whenever the number of games I can write is limited as I have not been able to find a command or routine that will allow me to check a certain screen position to see if there is anything there.

Because of this I can only have one space invader on the screen at a time. - **Matthew Gills, Guelph, London.**

■ To find the contents of a location on the screen, use:

**LOCATE X,Y,A**

where X,Y is the position on the screen you want to check, and A is a variable.

After execution, A will

contain the colour value for that position, for example in GR.1 that would be 0 for black or 1 for a dot.

Be aware LOCATE moves your cursor about if you use it on a text screen, and will return the Ascii number of the character at that position.

Pole Position should load with Start and Option pressed on power-up. Then press Play on your recorder and Return.

If it doesn't work send the tape back to Atari to replace it.

## GR eat colours

THANK you for bringing our magazine for those of us who don't own a Spectrum or Commodore.

I've just started to use GR.11 and have finally figured how to get 18 colours on to the screen at the same time.

However another problem has arisen. How do I print text on to the screen at the same time, as GR.11 doesn't, as far as I know have a text window.

Using GR.11 I found I could use 18 colours in your 18-colour program. You can do this by adding and changing the following lines:

```

180 C=0
190 GRAPHIC 11
200 C=0:Y=0
210 IF STRIG=C THEN C=C+1
220 IF PERIOD=2791=C THEN GR.11
230 COLOR C
  
```

To clear the screen press Start and to change the colours press the fire button.

Also do you think you could do a Top 10 of Atari software, or I would like to know the most popular software for my computer.

Keep up the good work. - **Alan Mafford, Tergouy, Devon.**

■ No, there isn't a text window with the GR software. The only way to get normal text is by using a "DU" (Display User Interface) routine, written in machine code.

Mike Power's series should give you some ideas in this direction.





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**June issue:** In-depth analysis of the 130XE, Submarine, Advertising, Random numbers, Software review, Frog Jump, Microscope, Sounds, Atari Insights - regular series of tutorials: Bit Wise, Beginners and Graphics, special 12-page feature on Communications.

**July issue:** December, Bomb Run, DOS 2.5, 17 Commandments, Advertising, Display List Tutorial, Software review, Power Functions, Treasure Hunt, Key

board Sounds, Microscope, Insights - Regular series of tutorials: Bit Wise, Beginners and Graphics.

**August issue:** In-depth analysis of the 6809T, program protection routines, Fruit Gambler, Assembler, Touch Tablet program, first look at Logo, Baster 1997, Dos 2.5 upgrade offer, Display List Tutorial, Microscope, Software review, Insights - regular series of tutorials: Bit Wise, Beginners and Graphics.

**September issue:** 8-page special on the 6809T, Mode 8 screen during routine, Maze March, Date Maker, Display List Tutorial, 68900 add timing modes, file processing with Logo, Software review, Insights - regular series of tutorials: Bit Wise, Beginners and Graphics.

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