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Vol 1 No 1

May 1985

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# ATARI USER

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to the Atari  
User



Tramiel heralds a new era  
in personal computing

Vol. 1 No. 1, May 1985

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## Let's introduce ourselves...

WELCOME to the first edition of Atari User – the exciting new magazine for the whole range of Atari machines, written by Atari users for Atari users.

For years now we Atari aficionados have known that Atari's tremendous graphics and sound capabilities – plus the wide variety of add-ons and software – put them in a league of their own.

Now many more discerning micro-users are waking up to this fact, and interest in Atari is soaring.

The latest Atari machines promise to totally dominate both the 8-bit and 16-bit fields. They are the most exciting microcomputer developments we've seen for a long time – as you'll gather from our previews. The tremendous interest shown

in these new models can only benefit users of the established range of Atari micros.

Certainly, Atari User will be catering for all Atari machines, old and new. Each issue will be packed with informative features, full length listings, hints and tips, hardware and software reviews, and all the latest news from the ever-expanding world of the Atari. Beginner or experienced user, you'll always find something of personal interest to you in our pages.

Don't forget, though, this is your magazine. We're always willing to listen to your suggestions, so let us know what you want to see in our pages.

And we're on the lookout for new writers, too. If you have an article or program that would interest us, please let us know.





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The dramatic change in Atari's fortunes has been due to one man — Jack Tramiel. This human dynamo is the best-known figure in the world of personal computing — and the most outspoken. The ex-inmate of Ansbach who created Commodore, built it into a computing giant, initiated vigorous price-cutting, and rescued Atari with \$30 million of his own and a guarantee of an additional \$45 million. The story of Tramiel and how he fought his way to the top — and intends to stay there — is told by

MIKE COWLEY



## The Man...aiming for another billion

**A FORMER Commodore employee who ran afoul of Jack Tramiel was asked whether or not his ex-boss would make a good President of the United States.**

"The trouble with Jack", he replied, "is that while he certainly has the ability, he just isn't democratic enough. Although he likes to do things for the people, he wouldn't want to be answerable to them".

This may simply have been a case of sour grapes. After all Tramiel's footprint still showed on the seat of the executive's trousers. But even those closest to Jack readily admit that he sometimes comes across like a wounded elephant, trampling underfoot everyone and everything in his path.

And this is why the new boss of Atari has the reputation of being the most feared — yet at the same time most respected — personality in the computer industry today.

When Jack Tramiel is around, he isn't just a man in the language of the ghetto, he's THE man — and you'd better believe it.

At the end of a corporate battle

involving the head of the Tramiel clan it is said that he will not walk away until his victims' blood is splattered on the walls and the ceiling as well as the floor.

It is this ruthless approach — some would argue it's just good business — which enabled him to lead Commodore to become the first personal computer company to pass the magic \$1 billion turnover milestone.

And now he intends to serve up the same for Atari, the company which he had previously helped to bring to its knees.

Not that Jack Tramiel is overly concerned with what people say about his methods. He only cares for being a winner — so that end result for him will always justify the means.

"I believe business is war", is one of the Atari chief's favorite sayings. No one who knows him doubts his word.

Once asked to comment on the high turnover of executives while he was at Commodore — the standing joke at the time was you get a gold watch at the time you get a gold watch if you lasted a year — he said "Our generals are all in the trenches —

so more of them get killed".

However when Jack Tramiel comes out on top he's not the only winner. For his entire business philosophy is based on the belief that the only way to make money is to give the customer true value.

"It is this more than anything else about Tramiel which bodes well for anyone who ever bought an Atari or is even thinking about buying one", an industry observer told me.

"With Jack, you know he'll be in your corner fighting all the way. He's a street fighter from way back, and if he loses a few more executives than most along the way, he won't lose any sleep about it".

However those of his lieutenants who survive the rigours of the campaigns are richly rewarded for the absolute loyalty, supreme expertise and total commitment demanded.

More people at Commodore ended up millionaires in their own right than in any other high tech corporation in Silicon Valley. Bonus payments of up to 100 per cent of salary plus



substantial allocations of shares saw to that.

"There's a touch of the godfather about Jack", said yet another Commodore man whose name never made the corporate roll of honour.

"His generosity knows no bounds, but neither does his wrath. You may not end up wearing a concrete overcoat, but the message is much the same".

Bald and round, at 55 years of age Jack Tramiel could be mistaken for somebody's favourite uncle. In fact he would not seem out of place dishing out bagels and kasha behind the counter of a delicatessen.

It's only those heavily hooded shrouded eyes which provide the clue that here is a man whose character has been forged on the anvil of adversity — a man to be reckoned with.

As benefits a former New York cable, it doesn't take long to figure out that doing business with him will mean paying full fare — and not getting any change.

Yet those people who expect Jack Tramiel to surrender himself with synchroplasts would be way off mark. For he enjoys nothing more than confrontation — "the more, the better" — with members of his team.

Constantly punctuating his remarks by banging his fist on the desk top, he demands ever more from his hard pressed executives. And with him it is argument he seeks, not discussion.

The people he most likes to have around him are the brilliant mavericks who do not always follow the rules.

Jack Tramiel, you see, is not entirely sold on rules. For rules often become orders which must be obeyed. And these, in turn, have been known to become obstacles for some of the worst excesses of human behaviour.

And the young Jack knew only too well about these. Born in Poland, he was provided with a "ticket to hell" at the age of 11 when a number was burned into his flesh as entering Auschwitz.

He managed to survive the war as a slave labourer working on road construction — "they had to feed us or we wouldn't have been able to work".

Some what surprisingly Jack Tramiel insists he does not hate either the Germans or Germans today. In fact he chose to build a factory there

close to an autobahn on which he had worked.

Asked why he would provide employment for the people who persecuted his race, he answered simply: "I live in the future".

At the end of the war he moved to the United States, joined the army there and learned to repair typewriters. It was this skill which was to set him on the road to joining the ranks of North America's self-made immigrant millionaires.

His wasn't to be an overnight rags to riches story however.

Once he became a civilian again he used his newfound skill to launch his



***"We make computers for the masses, not the classes"***

own typewriter business in the tough, teeming Bronx neighbourhood much loved as the backdrop for gangster films.

Always an opportunist, he became one of the first to realise the potential of electro-mechanical adding machines.

In the mid-fifties Jack Tramiel and his wife Helen headed north to Toronto to open Everest Office Machines.

Securing the rights to a line of Czechoslovakian typewriters made the fledgling company so successful that it went public in 1963. And so the Commodore Portable Typewriter Corporation was born.

Three years later it nearly collapsed when its major backer, C.P. Morgan, was found to have built his business empire on fraudulent loans. In the wake of the adverse publicity Commodore was unable to get credit.

It was only an appeal by Jack Tramiel to financier Irving Gould

which resulted in the company being bailed out at the eleventh hour.

To persuade the money man to come up with the lifeline, Jack turned over all of his stock with the proviso that some of it — an undetermined amount — was to be returned once Commodore was back on its feet.

It was only a matter of months before Jack Tramiel found himself once more with a place of the action. So he adjusted his corporate gun shield and came out of the Commodore corner fighting.

Steering the company into the lucrative but volatile calculator market, he suddenly found himself at war for the first time with the big boys.

Texas Instruments was to eventually win the ugly battle for the main American market, leaving Jack Tramiel bloodied but unbowed. For he had already conceived the idea which was to enable him to make a triumphant comeback — a cheap computer for the masses.

Having at one time briefly considered buying Apple, he opted out in favour of setting up his own development team. And such was the equipment generated when he eventually unravelled the Commodore Pet that customers fell over themselves to pay for it in full in advance — then wait six months for delivery.

It wasn't long after that he decided to invade Europe, a place for which he has always had a soft spot.

Jack Tramiel remains convinced that the Europeans are much more appreciative of value for money than their brash American cousins — and that is what he was offering.

With no real competition facing Commodore in Europe in the late 70s, he was soon able to capture 80 per cent of the market in the UK and Germany.

So with booming sales on both sides of the Atlantic, his much quoted saying "We make computers for the masses, not the classes", became a fact of life.

In fact it was during Commodore's heyday that Jack Tramiel earned himself the reputation of being the source of memorable phrases.

"Business is like sex", he once told an interviewer. "You have to be involved".

And when discussing the possible threat of the MSX machines, he was moved to utter: "The Japanese are



coming – so we will become the Japanese”.

Yet it is his almost God-like commandment to Moses phrase – “It will be done” – which still echoes in the ears of his former colleagues.

When Jack Tramiel resigned from Commodore after an apparent disagreement with Gould, shock waves reverberated through the industry for months.

Now that Jack is back – this time at Atari – nothing much seems to have changed. Already members of his former Commodore clan – even some he unceremoniously dumped – have been clamouring to get back on board, such is the charisma of the man.

When Warner Communications relinquished control of Atari to Tramiel few tears were shed. After all, the company had lost \$500 million in

1983. But the new boss is already forecasting billion dollar profits.

To achieve this he was soon seen to be resorting to his well proven methods. Within a month of taking over he had taken up the hatchet to reduce Atari's world-wide staff from 5,000 to 1,500.

“Bodies were strewn everywhere”, moaned one of the dear departed. And of the 40 buildings in the far Flung Atari empire only seven still remain.

To ensure he maintains a permanent armlock on his new company, Jack Tramiel has placed his three sons in key executive positions.

Not that nepotism influenced this decision as Sam, Leonard and Gary are all time-proven executives in their own right. But their arrival has satisfied his Jewish desire for a close knit family unit. Yet his “family” is not

simply restricted to blood relatives. For he looks on every member of the Tramiel “war cabinet” as part of his immediate household.

No one – and that includes himself – will ever be found flying first class on company business.

In essence this is a reflection of the private face of Jack Tramiel, the man who enjoys nothing better than being at home with his wife eating Polish “parent” food.

But a very close second comes his enormous appetite for business.

Now that he is armed with his new ST range of computers, he exudes the confidence of the general who has just been provided with the world's first nuclear missiles.

And with his finger on the button, the Apples of this world had better watch out.

## Future looks very, very rosy

The Atari computer is designed from the outset to be a complete personal computer, where virtually no extras are required to give you the facilities you want and need in a home computer.

For example, this article was written on an Atari 800XL 64k computer – whose keyboard is a joy to use – using Atariwriter, the excellent cartridge-based word processor program which even works on a 16k Atari using only cassette, if necessary, for data storage.

Many Atari owners are already aware of the checkered history of the company in the US, where the cut-throat competitive nature of the home computer market has seen the exit of Texas, Timex and Matriel from this battlefield over the last couple of years.

Now with Jack Tramiel's takeover of Atari, with his “business is war” philosophy, the company's expansion plans are based upon a distinct value-for-money policy where popular pricing rules the roost.

In Britain, unfortunately, Atari has always been regarded, purely in terms of computer sales, as less successful than other UK based companies, probably due to the old pricing policy where £200 to £800 was the Atari norm.

So the best home computer

By PHILIP MORRIS,  
Director, English Software

available last out to the Spectrum, the Vic 30 and the Commodore 64. Sounds unbelievable doesn't it?

Anyway, the Lord works in mysterious ways, to name a famous computer hacker, and the rest is now history.

Jack Tramiel moves in, takes over Atari, brings down prices in one or two fell swoops, making the best personal computer accessible to almost everybody.

OK, so Atari remains labelled with the games tag when, in fact, most home computers are used for entertainment anyway... rendering this label now pretty meaningless.

If you feel the need to use your computer for something other than games playing, and believe me, we all feel that need sometimes, then the Atari will help you compose music, design multi-colour graphic images, type letters (and articles) and much, much more.

This is the perfect place to encourage correspondence from readers who are using their Atari computers for applications that others might not have even dreamed of.

Let us now shatter some common

myths – that for instance the Atari cannot reproduce digitised sampled sound in the same way the Commodore 64 can. Well, in fact, yes it can. Games and other programs should be on the market this year that do feature high quality speech as an integral part of their action. Just wait and see.

Also, with the growth in the market for disc drives, the British Atari owner will fully begin to appreciate the great advantages of owning a reliable test-access disc drive – fast, easy loading, and much more versatile than cassette.

Of course technology never stands still for more than 10 microseconds and the new Atari ST range represents a major step forward for Atari.

The future may lie in Atari's hands still... so where does that leave you, the user?

Well, obviously the software companies will always provide an ample supply of exciting and interesting software, with more and more UK companies now starting to manufacture add-ons and peripherals in much the same way as they do for other computers... cheaper RAM packs, cassette recorder interfaces, printer interfaces, and so on.

The future for Atari looks very, very rosy indeed. Roll on 1986.



# THE ANATOMY OF THE ST

**BRYAN WILLIAMS finds out why the new Atari ST machines are about to set the micro marketplace on fire**

THE excitement surrounding the Atari ST range has not been seen in the computer industry for a long time. So what is it that has set the micro market on fire?

At the heart of the machine is the powerful Motorola 68000 microprocessor, already the de facto standard in 16/32 bit CPUs. Running at 8MHz, power and speed combine to give remarkable performance.

The new keyboard features a full typewriter layout with the addition of a cursor control section, a numeric keypad and 10 special function keys.

With the ST, Atari users have a built-in choice of language. The machine features not only a new version of Atari Basic but also Logo, the language much favoured in education because of its ease of use.

For machine language programmers, the 68000 is the obvious choice for the new generation of machines feature not only a new addressing modes and five different data types.

The three graphics modes give a choice of resolution. The intense colour display uses 320 x 200 dots with 16 colours on screen. The high resolution colour display uses 640 x 300 dots with four colours. For really high resolution, the monochrome

display offers a staggering 640 x 400 dot display.

Sound is also prominent on the ST's list of features. The sound generator has three separate voices, each with its own pitch and volume settings. Waveform shaping controls make the notes sound as if they were played on a real instrument.

Another first for the ST is its built-in MIDI interface which allows it to control many synthesizers used by today's musicians.

There's also an RS232C serial port

WHEN it arrives in Britain within the next few weeks the 520ST is expected to retail at between £500 and £700. The price will include a separate 500k 3 1/2in floppy disc drive. This compares with £2,500 you have to pay for the 512k Macintosh, which has a similar operating system (but only allows a monochrome display), plus built-in disc drive and monitor. With the 520ST the monitor has to be purchased separately.

for modems and other serial devices and a Centronics parallel port suitable for dot matrix printers.

The ST can handle both floppy and hard discs. For floppies it has a built in port compatible with the 500k Sony 3 1/2in drive. There's also a high speed hard disc interface with a data transfer rate of 1.3 mbytes per second.

Of course it wouldn't be an Atari without a joystick port, and the ST has two - one for the mouse which comes with the machine. With this, complicated keyboard instructions are a thing of the past. Simply use it to pull down a menu and select the item you want. If you've never used a

## Language

Choose between Basic, the language of millions, or Logo, the educator's choice. Both are built in.

## Microprocessor

The Motorola 68000 running at 8MHz gives a combination of power and speed.

## Cartridge

Slot for programs and easy ROM expansion.

## Keyboard

A full typewriter keyboard PLUS cursor and editing section, numeric keypad and ten special function keys.

IF there is one single feature of the ST that has caused most headlines in the computer press - and created most consternation in the boardrooms of rival manufacturers - it is GEM.

The revolutionary, easy-to-use Graphics Environment Manager brings to the ST a new dimension in personal computing. What it is all about is described in the following pages.

mouse before, you'll be surprised at how much it simplifies your interaction with the machine. No more trying to remember whether it was Ctrl-K or Ctrl-Q that did what you wanted to do. Just point and click. It's that simple.

First in the range to arrive in Britain will be the 520ST, which has 512k RAM. Both it and the 128k 130ST have 192k ROM, expandable via the cartridge slot to a maximum of 32k.

With a list of features like these and a price well below comparable machines, it's no wonder the ST is causing such a lot of excitement.





## Monitor + GEM

Choose between high resolution RGB monitor, TV, or high resolution monochrome monitor. See the GEM operating system in all its glory.

## Expansion ports

RS232C serial port, Centronics parallel port, 3 1/2" floppy disk port and hard disk interface port cater for every need.

## Mouse + joystick

Two joystick ports, one configured for the mouse — the latest in user-friendly input devices.



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## New XE looks good – and it IS good!

**FIRST** of the new-look Atari machines to hit the British market is the 130XE. Like the previous generations of Atari – the 400/800, 1300XL and 800/800XL – it is based on the 6502 chip.

In actual fact, the new machines use the 65C02, a more modern version of the chip which has a few extra commands and uses less power.

The 130XE is far more than just a good-looking version of the 8000X. For one thing it has a massive 128K of RAM – together with many other new features, product improvements and manufacturer's cost reductions.

All of which will help to make it a winner right from the start.

It has a great degree of flexibility in its screen display found in no other product line. It has 16 screen modes – 11 graphics and five text – player/missile graphics and four voice sound.

On the outside there's a bright new design. The keyboard has been improved and feels better than ever, and the familiar function keys – Select, Option and so forth – are now positioned across the top of the keyboard.

If you're wondering about the cartridge slot – don't, it hasn't been forgotten. It has switched from the top of the machine to the back. So you'll still be able to run all your familiar cartridge software.

Another major difference between

the 130XE and the 8000X is that the new machine doesn't have the parallel input/output (PIO) connector on the back. However it should hardly be missed – Atari didn't use it for anything!

There will be two other machines in the XE range – the 65XE and the 65XEM.

The 65XE will have 64K RAM, and the 65XEM has a similar specification in everything except the sound.

You can think of the M as standing for Music, because instead of the standard four sound channels the XEM has eight channels and 64 harmonics. The superb quality sound is achieved by using a sampling rate of over 30KHz.

You may have read elsewhere of a 65XEP model. This was intended to be a portable version of the 65XE, but will not now be produced. However for those of you on the move, you may like to know that a 16-bit portable is promised instead.

One vital feature common to all in the XE series is compatibility with previous Atari machines – which means that the existing base of software, peripherals and applications will survive without growing obsolete.

**MENTION** the Atari ST range and the chances are that within the next few seconds someone will say "GEM". The acronym on everyone's lips looks set to become the operating system of a whole new generation of micros, and with good reason.

Digital Research, the company that gave us what is arguably the least user-friendly operating system in the form of CP/M, is now set to unleash its Graphics Environment Manager and show that the leopard can indeed change its spots.

So while we're looking at the ST, let's look at GEM and what it will mean for Atari users.

In the days when CP/M was developed most programs had nothing more than text output. Consequently, it wasn't too difficult to capitalise on the 286 architecture and produce an operating system which could be implemented on practically any 286-based micro.

On the wings of this operating system such programs as Wordstar flew to fame. While it was undoubtedly a good program, it could never have achieved the eminence it did without CP/M.

Then came graphics. Suddenly the world was brighter for the user, but infinitely darker for the commercial programmer.

For while most machines incorporated primitives to print characters to the screen, the number of systems for handling graphics was almost equal to the number of brands of micros.

In crude terms, GEM is a graphics equivalent of CP/M, but this time not tied to a particular chip. However in order to do justice to GEM we need to consider another historical strand.

That is the one which stretches back from Apple's Macintosh to the research conducted by Xerox at Palo Alto. As Jack Hamill has pointed out, GEM doesn't copy Macintosh so much as draw on the "desktop metaphor" which came out of the Xerox research.

Whatever way you look at it, the result is the WMF philosophy – Windows, Icons, Mouse Programs. Because they share the same underlying ideas, GEM screens and Macintosh screens have a definite similarity.

Of course the major difference is



# It's a GEM of an operating system!



portability. The mistake which Apple seems to have made is in assuming that the user-friendliness is a function of the Macintosh, whereas it is actually a function of the underlying philosophy.

While the Macintosh is a delightful "one-off", GEM has the advantage that programs can be easily ported between machines which support the operating system – and this time GR haven't died it to a particular chip.

For while Atari's ST range is the most publicised supporter of GEM, the system will become available on other 68000/68010 based machines. In

fact, since it's largely written in C, it could be implemented on any machine which supports a C compiler – which includes the Macintosh.

The advantages of a portable operating system might not be immediately apparent to the owner of a single mind. However when it comes to buying software the advantages become obvious.

Ian Turner, Ashton-Tate UK's technical director, neatly summarises the advantage: "GEM offers an up-to-date, very user friendly environment vital to the continued development of complex integrated packages

like dBase III and Framework.

"For Ashton-Tate, which is not committed to a sole machine or system, GEM's easy portability strongly supports our future development strategy".

This means that with GEM on the Atari ST you can look forward to a wealth of powerful software while enjoying the same of user-friendliness.

More than 70 UK software companies ordered the GEM Programmer's Toolkit on the first day it was available in this country. Hence the ST shouldn't need to rely on imported – and therefore artificially expensive – software, as has the Macintosh.

All in all, the value for money offered by the Atari ST range and the advantages of GEM in terms of user-friendliness and software availability look like producing a winning combination.

In the words of Sam Tsimbali: "We chose the GEM interface because it represents the most advanced microcomputer technology for consumers to learn and use personal computers. It will help place Atari in a position to offer a powerful, easy-to-use personal computer at a low cost".

Unusually in the micro industry, this time the hype has an awful lot of truth in it.

As an operating system, GEM intervenes between the user and the machine. However, what makes GEM different is its extreme user-friendliness.

Traditional computer commands and keyboard entries have been replaced with easy-to-understand graphic images and an easy-to-use pointing device called a mouse.

Across the top of a GEM screen you'll see Menu Bars. Without ever touching the keyboard, you can use the mouse to "pull down" one of the menus and make a selection from it. It's as simple as that.

Organising your work is so much easier with GEM. By manipulating the screen display with the mouse, you can collect a set of files into a folder, just as

you might in your traditional filing cabinet. You can even put folders within other folders.

The GEM desktop also gives you access to the sort of tools you'd normally have on your desk like a calculator – no more searching through the desk drawers when all you want to do is one quick calculation.

Spreads and paperclips are also there, along with the most vital part of any office – the waste paper basket!

With GEM, moving information between files becomes much simpler. You can write the bulk of a report with your word processor, then cut and paste into it information from your spreadsheet and database files.



**To help you make the most of your Atari.**

**Why you should  
give your Atari**

# Disc Power!

Look what you get when you link your Atari to the versatile 1050 Disc Drive:

**It's speedy!** You'll be amazed at how quickly your programs load and save. No more tedious waiting!

**It's sure!** Disc systems are inherently more reliable and flexible than cassettes. No more lost files!

**It's simple!** Despite its amazing capabilities, using the disc drive couldn't be simpler. It's easy to fit and even easier to operate!

With the 1050 comes DOS 3, Atari's latest disc operating system. Featuring a wide range of utilities, DOS 3 supports both single and dual density modes, so you'll be able to take advantage of the wealth of disc software that is now available.

And to get you going, we're offering £17 off this special disc starter pack!

**The Pay-Off.** An exciting adventure game that makes you to explore the dangerous streets of downtown New Jersey.

**Home Filing Manager.** A powerful database program that turns your Atari into a home filing cabinet.

**Sound & Graphics Demonstration.** See and hear - your Atari at its very best. Programs that stretch the power of your Atari to its very limits. An incredible experience!



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**Join the most powerful database on disc**

## MicroLink

### What MicroLink can offer you:

- Registration on Telescan Gold - plus your own mailbox and security password - for only £5 compared to the normal £40.
- The biggest bulletin board of them all - with no waiting to take your place in the queue of callers.
- Direct contact, via electronic mail, with other users.
- The ability to send and receive text messages, both within Britain and all over the world.
- Free access to Microsearch, our unique product locator - an easy-to-use index of products, prices and availability. With powerful keyword searching, you find what you want within seconds.
- A chat service for real-time keyboard-to-keyboard communicating. Meet people with the same interests as yourself, share ideas and experiences.
- The latest news about all that's happening in the world of microcomputing. Read it on your own screen long before you see it on the printed page.
- Free software you can download directly into your micro - and save for your own use.

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teach you  
French, German,  
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Yes, you can turn your Atari into the world's most patient language teacher! Each pack in the "Conversational" series consists of five cassettes. Designed to give you a thorough understanding of the language - ideal for studying before you go on holiday.

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Our price **£18.99**



## Let your Atari be your passport into the exciting world of telecomputing!

**Miracle  
modem  
Software  
Interface  
ONLY £195  
Save £20!**



Price includes VAT, post & packing

...designed for Atari users...

in association with

**TELECOM GOLD**

COMBINE the enthusiasm of thousands of micro users with the mainframe power and versatility of Telecom Gold and the result is a vast, nationwide communications link that will open up an exciting new world for you to explore.

Go online to MicroLink and you're immediately connected to a rapidly-developing network of information and personal computing power. And all you need to become part of MicroLink is your Atari computer and an appropriate modem and software, such as the Miracle package described on this page.

Communicating the MicroLink way is not only fast - it's much cheaper than you might expect. For instance, even if you live outside the London E5, call area you can still get direct access to the Telecom Gold mainframe computer at local call rates.

You can use your electronic mailbox to send a whole-page letter for less than the cost of a first class stamp. And you can send the same message to 500 different destinations in the UK for no extra charge. (It would only cost you 50p more to send 50 copies to your friends in Australia!)

And you don't need to be a computer genius to use MicroLink! You get instant access to dozens of services with plain English commands, or by selecting what you require from a simple menu.

And the cost of using MicroLink? Just £3 a month. Plus small additional access charges which are fully detailed in our information pack. To obtain your copy, just tick the appropriate section of the coupon on Page 61.

<sup>1</sup> Telecom Gold is the trademark of British Telecommunications plc.

IT'S the fastest growing field in micro computing. Allow the world micros are talking to each other over the telephone line. As well as to the ever-increasing number of public and private databases, bulletin boards - and even giant mainframe computers.

We want all Atari Users readers to share in the new technology that makes all this possible. So we're offering a unique starter pack at an unbeatable price. It gives you everything you need to get in touch with the big wide world outside.

- Modem
- Software
- Serial Interface

The modem is the amazing Miracle Technology WS2000. One of the most powerful on the market, it provides all the facilities you require. Yet it's simplicity itself to use. Just plug it into a standard British Telecom pack and you're away!

The package also features the superb Datalink serial interface, which links the modem directly to the Atari's peripheral port without the need for the 8550 serial interface.

The best hardware deserves the best software to drive it, and with the comprehensive Multi-Userware programs the package is complete. It supports all the standard baud rates - 1200/75, 75/1200, 1800/1800 and 300/300 full duplex.

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

You will be able to join Microworld/Protest, which will immediately open up to you a vast menu of 700,000 pages of information - instant world news, sports, holidays, hotels, train and airline timetables, all regularly updated.

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

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

## Experience the thrill of a REAL arcade game at home!



Remember how many video games you've played, you've never seen anything like Q&A. And no matter how many times you play Q&A, you'll never play the same game twice - because there are billions of possible patterns to play with. This is the game every Atari user ought to have by his machine - so we're offering our readers £2 off the normal price.

**£7.99**

You don't just play Q&A - you FEEL it!

**Use the order form on Page 61**



# A message from ENGLISH SOFTWARE™ to all owners of ATARI, COMMODORE 64, BBC B, ACORN ELECTRON and AMSTRAD Computers...

Software companies grow on trees... at least that's the way it seems from the number of new companies springing up every week!

**ENGLISH SOFTWARE** was launched three years ago with a smashing title game for Atari Computers called **ATARI SMASH HITS 1**, which quickly became one of the most popular U.K. programmed games for the Atari.

Then, as now, Atari Computers were amongst the most advanced on the planet, but they were a **TRIPLE expensive!** But we knew that prices would come down, and that more people would soon appreciate the great range of Atari software produced by **ENGLISH SOFTWARE**. But Atari owners **used** to be a funny lot, being used to utter such gems as:

"It can't be any top, it's cost less than £20!"

Honestly, that's what they used to say! Anyway, in the face of this rather strange attitude, we went ahead and committed the ultimate sin:

## ATARI GAMES AT £9.95!

We expected some slight resistance to these prices from Atari owners who only equated high quality with high prices, but we were wrong. Everybody thought the prices were great, and the games too!

We even produced the fantastic **ATARI CASSETTE ENHANCER** at £7.95, an superb utility program for BASIC programmers.

So now, for those of you who might have missed out on all our excellent Atari titles, we are releasing something very very special!

## ATARI SMASH HITS Volumes 1, 2 and 3 from ENGLISH SOFTWARE.

Five great games on one cassette for only £14.95, or on disk at £17.95!

Each cassette features our top-rated **JET-BOOT JACK** plus four other popular titles. So now you have NO excuse to miss out on the best range of U.K. produced Atari 800/8000/800XL/800XL software for 32K machines. If your dealer does not yet have them in stock, ask him to order them from his nearest Atari wholesaler. It will be the best Atari buy you'll make all year!

We have also released **COLOSSUS-CROSS 5.0**, the best chess program available anywhere for Atari 800/8000/800XL/800XL computers with 48K. Very powerful, with lots of excellent features.

For our good friends with other home computers, our programmers are busy producing original games for you as well. They are all illustrated on this page. **HENRY'S HOUSE** on the Commodore 64, and **JET-BOOT JACK** on the Electron are now available at selected branches of M.H. Smith.

Selected English Software titles are available at: **MAPPODS** and selected branches of: **LADY'S, NOODS, SPANISH COMPUTER STORES, CO-OP STORES, THE SLICK SHOP**. Mail Order and Personal and all good software stores.

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# New deal on prices promised

A NEW deal for Atari users world-wide has been pledged by Jack Tramiel, the American entrepreneur who recently took control of the ailing corporation.

The man who turned Commodore International into a billion dollar success story has now predicted he will achieve the same for Atari.

And, along the way, he has promised continuing price benefits for the 21 million users of the corporation's products.

"I place my money where my

mouth is", he insists.

"Since I acquired the Atari Corporation, prices of our computers have been nearly halved. And that is entirely as it should be.

"We're in the business of people's technology. And as Henry Ford said before me, 'For every dime you remove from the cost pyramid a whole new stratum of buyers is revealed'.

"I believe it and that's how this business is going to be from now on".

The reason for giving a public

undertaking to his customers is that Jack Tramiel is angry about what has been going on in the personal computer marketplace.

"Too many people have got too fat off this business", he insists. "But the consumer is catching on".

## Warning

And to also took time out to issue a warning to the would be competition here in the UK, that Big Jack Tramiel has their initials right.

"There are one or two people who think they can outsell or out-produce me", he says. "Well, let me tell you that just one of my worldwide plants churns out more than the next top three UK companies put together.

"Technology is what this decade is about", he adds. "I've given this nation ten my factories out in the far East. They're gonna produce it at the price the man next door can afford".



Massimo Rossi, Atari's European general manager

## Big sales ahead

ATARI's newly-appointed European general manager, Italian Massimo Rossi, has forecast spectacular results for his "patch" during 1988.

"Next year the European market is going to be bigger than the States", he claims. "It should top around six million units".

## SOFTWARE ON THE WAY

AN impressive list of software houses is working on products for the ST range, according to reports from the US.

Heading the list is Microsoft, which issued to be converting its range of Macintosh software to take advantage of the ST's superior colour display.

Several of the country's top games companies have taken to the ST - among them renowned producer of flight simulators Sublogic, leading education software house Spinmaker, graphics specialist Penguin Software, and Microprose whose games have been brought to Britain by US Gold.

## DRIVE FOR EFFICIENCY

ON the day he started out in business more than 25 years ago, Jack Tramiel devised his own work ethic. And he has followed it religiously every day since. It is this:

"Never settle for doing things the way they were done in the past, always

find new ways to do things better, more efficiently. Our customers are mature and intelligent people; we must give them the best for their hard-earned money. Success, if we don't, they will know we have cheated them".

# All aboard the Atari bandwagon

MANY leading high street retail chain stores are lining up to board the Atari bandwagon once the ST range starts rolling off the production line this summer.

Among the big names likely to be stocking the new Atari line are W.H. Smith, Boots, Currys and Lasky's.

All four have expressed interest in, or have been engaged in negotiations about, the Atari ST range.

John Rowland, computer merchandising coordinator at W.H. Smith, was very enthusiastic about the Atari's chances when interviewed recently on TV.

He said he would be selling

the ST range in his retail outlets first, "then if it proves itself and lives up to its promise I think we'll put it into our business centres as well".

A Lasky's spokesman said: "It seems very likely that we'll be stocking the new computers, but then we are a bit biased as we already sell more Ataris than Spectrums.

"The Atari 8000, has done extremely well and we expect the same from the new products, judging by their specifications".

Boots confirmed it was discussing the possibility of

stocking the new range with Atari, and Currys's merchandising operations director Simon Williams said: "The product looks extremely interesting.

"We are hopeful about stocking it and at the moment are in the process of finalising our negotiations with Atari".

Meanwhile, Atari chief Jack Tramiel maintains his company will have captured a quarter of the British home computer market by the end of the year if not sooner.

He predicts sales of 200,000 Atari ST computers here in the next 12 months.



# Atari Logo nominated for top award

GRAPHICS language program Atari Logo has been nominated for the British Microcomputing Awards 1985 in two major categories.

It has been shortlisted for both the Home Software class and Thames Television's Database Home Software of the Year award.

Recognised as the Oscars of the computer industry, the British Microcomputing Awards this year attracted more than 1,000 entries.

Organised by Personal Computer World, The Sunday Times and Thames Television, the awards seek to define technological excellence and value

for money for the consumer.

All the shortlisted products are to go before a panel of judges who will then select the top three finalists in each category and ultimately the outright winner.

Judges for this year's awards include Robin Bradbury, David Fairbairn, director NCC, Dr Ewan Page, president NCC, Janet Barthwell, NCC, John Turnbull, NCC, Philip Vingo, manager NCC Microsystems Centre, and Ian Warblaw, president Computing Services

Association.

The winners will be announced at a ceremony hosted by Sir Austin Burrell in The Park Lane Hotel, London, in June.

At that time each finalist will receive a framed certificate, with specially designed award trophies for the eventual winners.

The proceeds of a souvenir brochure to commemorate the ceremony are to go to the Concerned Mission in Education and Training charity.

## Now link up with Prestel

THE 300,000 pages on Prestel have at last been fully opened up for Atari owners by modern manufacturers Missile Technology.

The new Multi-Viewmate Database modern interfaces and software package makes all Prestel facilities available to Atari users who previously have had to make do with the limited access afforded by the 850 interface. Now the older inter-

face - restrictive because of its inability to handle split band rates - is no longer necessary.

The package allows local rates of 1200/25, 75/1200, 300/300 and 1200/1200 and includes both Atari 13-way peripheral port plug and standard 23-way plug to fit the world standard modem from Missile themselves, as well as many other modems.

The Database interface and

Multi-Viewmate disc-based software also give the Atari owner access to other previously inaccessible videotext systems, electronic mail, telex, databases and user-user communications, plus teleconferencing downloading.

The package can be used with Atari models 400, 800, 600XL, 800XL, 8600, 9500M and 1300X and costs £59.95.

## Does your micro go bump in the night?

It seems that Atari computers - along with ghouls and goblins - may be among the things that go bump in the night.

A scientific body which normally investigates strange phenomena ranging from the Loch Ness monster to UFOs has turned its attention to the machines.

Roger Morgan of the Association for the Scientific Study of Anomalous Phenomena (ASSAP) has written to Atari User for help with his research.

"Can I appeal to readers for any information, at first or second hand, no matter how bizarre, concerning unexplainable malfunction or unexpected

output?" he asks.

Contacted at his London home, he explained: "We are looking for things like strange messages suddenly appearing on screens".

ASSAP, founded three years ago, has some 300 members across the country who devote much of their spare time to serious investigation of the paranormal and related fields.

It was recently called in to investigate reports of hauntings at Marylebone magistrates court and has developed an infra-red video-recorder to assist in its work.

"Why has ASSAP suddenly become interested in com-

puters?"

"We feel they are a valid subject in the light of the fact we have collected some very interesting data from things run on electricity", says Roger Morgan.

Secretary of ASSAP is Dr Hugh Pincock who also believes computers may well act as vehicles for psychic phenomena.

"A particular interest of mine is regression hypnosis where people reveal what apparently happened to them in past lives."

"Now one of the areas under investigation is the possibility of a cosmic database - a sort of big computer in the sky".

## Atari - good moos for cows

ATARI technology is helping Britain's dairy farmers manage their herds more efficiently.

The 80000, is at the heart of a computerised animal husbandry system designed by milk yield monitoring and feeding technology experts Humley Electronics.

The C1485 Humley Bate system - which includes computer, printer and software - is for dairymen with small herds of 20 or more cows who can't afford more expensive technology.

Humley says it provides 90 per cent of the benefits of larger computerised dairy management packages and should pay for itself inside two years.

### Efficient

The system, linked to electronically operated feeders, monitors yield and feed for each cow, enabling the farmer to set the most efficient feed supply for his animals individually.

It provides herd summaries showing cow performances, feed requirements and margin over concentrates. Individual cow records and action lists for day-to-day herd management.

Humley managing director Nick James told Atari User: "We chose the 80000, because we wanted a machine with a high level of programming language and a variety of software."

In other words, the farmer is able to also run business software like accounts and word processing from sources other than computers.

"An additional bonus with the Atari is that while the farmer can use our system to manage his dairy herd more efficiently, the computer is also a family entertainment device on which his kids can play games when it isn't being used to monitor the herd".



## ST range on schedule

AT&T has officially dismissed Sir Oliver Brockle's claims that its ST range may never reach the marketplace. In a recent interview Sir Oliver said: "I'd bet you £100...£10...£10-£10...not a chance. I don't think it will appear at all".

But Atari UK product manager Jan Dean countered: "It's a great one to

talk about products not being delivered on time.

"There is no foundation for Sir Oliver's comments whatsoever. The product will be available here late June or early July as we have said all along".

Dean also scoffed at Sir Oliver's comment that the ST "doesn't have any software". He recalled that Atari

boss Jack Tramiel said as long ago as January that "by May we will have 25 to 30 ST software packages ranging from graphics to entertainment". That still holds.

And Dean added that so far 50 of the £4,500 development machines have been supplied to UK software houses and would soon be available in the UK.

## Minding the store

Atari computers play a vital role in the day-to-day operations of leading retail order house Maplin Electronics.

An 80081 ensures efficient stock control in each of the firm's five high street branches.

And another Atari "minds the store" at weekends down at the company's Essex HQ.

Software for the system was custom designed by Keith Henderson, stock controller at the Manchester branch.

He told Atari User: "Although it's written in plain-old Basic, the software runs fast enough for our needs and has been a big help in terms of efficiency.

"At the times in stock duty a clerk and every Friday we check the shelves to see what we're low on. A list of what we need for the following week is compiled and sent via our 8000L and modem to our mainframe at Rayleigh.

"The PDP computer at headquarters also handles orders placed directly by clients who own 300/305 based modems and use our Cashlink facility.



THE Atari starter pack, which offers £200 worth of value for only £129.95 is creating record sales.

The pack combines an 80081 64k computer with a 1610 program recorder and cassette versions of Invitation to Programming, Pure Position and a graphics demo.

Recognising that many customers want to see the greater flexibility and durability of disc drives compared with cassettes — but at prices they can afford — Atari also combined an 80081 with the 1280 disc drive and two discs containing Waste Piling Manager along with the Play-off game and graphics demonstrations.

An £249.95 this means a

## Pack hits jackpot

saving of £110 on the individual price.

Atari UK marketing manager Rob Harding commented: "We believe that the first-time customer is no longer satisfied with anything less than a 64k machine. They also require a package that can be used immediately — like our starter packs.

"A major Atari objective this year is to increase disc drive penetration of the market because of their superior performance".

## Chat show goes live on Prestel

MICROMET has launched a major innovation in interactive videodata — the first live programme on Prestel to be scheduled on a regular weekly basis.

Celebrity Chatline gives users access their first chance ever to interview well known personalities direct from their home computers with the Micromet system.

The service is a development of the highly successful Late Night Chatline which is second only to Micromet itself in the Prestel Top Ten of most popular areas accessed.

Celebrity Chatline is similar to Late Night Chatline's Citi-style on-screen chat facility, except that Micromet editor David Babsky travels to the homes of selected celebrities.

As Micromet members electronically send questions on special message frames, the night's celebrity replies arrive straight away via his own home computer.

One of the first guests on Celebrity Chatline was Denis Macklin, managing editor of Atari User who commented: "It was gratifying for Database Publications to be chosen to help launch this exciting new development.

"This is yet another example of the pioneering spirit behind the Micromet operation and helps to explain why more users are joining in ever-increasing numbers".

Celebrity Chatline is on Micromet 800-screen Wednesday between 7 and 8pm.

## Rotterdam HQ for European operation

A MAJOR reorganisation of Atari Corporation was undertaken before the European launch of the new range of personal computers.

This has included centralisation of all European warehousing, distribution and administration functions in Rotterdam.

Atari Corporation chief Jack Tramiel explained: "From now

on we are treating the European market in exactly the same manner as we treat the United States — that is as one single market.

"We believe the market will be dominated by multi-national companies achieving world wide economies of scale and with access to world-wide resources. Our structure will

reflect that objective with the most modern, efficient and cost effective central distribution and administration system capable of handling volume sales".

Steve Westbrook, UK managing director, said: "All the other European operations of Atari have now adopted this pattern, with the UK being the

last to do so.

"The requirements of our trade customers in terms of deliveries will be met through computerised call-off procedures linking factory production with the Rotterdam warehouse.

"In this way inventory control will be extremely tight and will slash inventory carrying, and therefore total costs".



# Attack Squash!



THIS is a fast version of the original computer squash game, but much enhanced by the addition of sound – a cheery beep every time the ball bounces either on the sides of the court or against the bat and a repeated tone every time a ball goes out of play.

Its other feature is that as you improve in skill the game gets more difficult and if you then start to get worse it gets easier.

This means that your Atari will always give you a challenge that is suited to your ability – which makes it the perfect opponent.

At the start of the game the ball is at the bottom of the screen and in the centre. You control the left and right movement of the bat by pressing the appropriate arrow keys.

Every time you hit the ball the position of the bat changes. It moves nearer to the top of the

*Attack Squash is just one of over 20 games stored in "The Atari World of Games" by Mike James, D.M. Gray and Kay Eubank. We're grateful to Granada Publishing for permission to reprint it here.*

```

10 REM ATTACH SQUASH
20 REM BASIC
30 GRAPHICS 0:G0
40 CIRCLE(200,100),200
50 LINE(0,100)-(200,100)
60 FOR I=0 TO 10
70 PLOT C0+1,P0+C0+1
80 NEXT I
90 GOTO 1000
100 REM
110 REM
120 REM
130 REM
140 REM
150 REM
160 REM
170 REM

```

```

180 BALL=BALL*2
190 IF BALL>10 THEN GOTO 200
200 A=1:P0=C0+1
210 REM
220 REM
230 REM
240 REM
250 REM
260 REM
270 POSITION 1,1
280 PRINT "BALL: ";BALL:
290 GOTO 1000
300 POSITION 0,1:PRINT "0:1"
310 POSITION 10,1
320 PRINT "0:10:1"
330 GOTO 100
340 GOTO 100
350 IF B=0 THEN GOTO 270
360 GOTO 1000
370 POSITION 0,1
380 PRINT "0:1:1"
390 GOTO 100
400 POSITION 0,0:PRINT "0:0"
410 IF B=1 THEN GOTO 350
420 REM
430 REM
440 GOTO 100
450 REM COURT

```

```

460 FOR I=0 TO 10
470 POSITION I,0:PRINT "0:0:0"
480 NEXT I
490 FOR I=0 TO 10
500 POSITION 0,I
510 PRINT "0:0:0"
520 POSITION 0,1
530 PRINT "0:0:1"
540 NEXT I
550 REM
560 REM
570 REM
580 REM
590 REM
600 IF B=0 OR B=1 THEN B=1-2*B:GOTO 100
610 IF B=1 THEN B=0:GOTO 1000
620 IF B=0 THEN GOTO 100
630 POSITION 0,0
640 PRINT "0:0:0:0:0"
650 REM
660 REM
670 REM
680 IF B=0 OR B=1 THEN GOTO 100

```



screen - which makes returning the ball more difficult. If you then miss a shot the ball will move back one position, making it easier.

You score a point for every hit and you will be scored a total of 10 hits. Information about the number of hits played and hits scored is displayed on the screen continuously.

This program is a fairly straightforward application of the Atari's user-defined graphics. Only two new characters are defined - the solid block for the court sides and the round ball shape - so you should be able to follow the details quite easily.

Another feature to note is the way the sound is used to make the bounce of the ball seem more realistic.

If you want to see the effect of leaving the sound out change the field to RETURN



## SUBROUTINE

- ## ROUTINES
- |      |   |
|------|---|
| 15   | Set up variables and graphics character.                  |
| 155  | Set up court and balls.                                   |
| 200  | Main play loop.   |
| 455  | Draws court.  |
| 525  | Bounce routine.   |
| 775  | Moves ball up screen.                                     |
| 885  | End of game - prints final score and offers another game. |
| 1010 | Subroutine to move ball.                                  |
| 1105 | Blanks left of ball.                                      |
| 1255 | Blanks right of ball.                                     |
| 1505 | Defines graphics character for solid block.               |
| 1655 | Defines graphics character for hole.                      |
| 1755 | Change to RAM character set.                              |
| 2005 | Sound routine for hit.                                    |
| 2505 | Sound routine for miss.                                   |

```

700 000000
710 000001
720 000002
730 000003
740 000004
750 000005
760 000006
770 000007
780 000008
790 000009
800 000010
810 000011
820 000012
830 000013
840 000014
850 000015
860 000016
870 000017
880 000018
890 000019
900 000020
910 000021
920 000022
930 000023
940 000024
950 000025
960 000026
970 000027
980 000028
990 000029

```

[illegible][illegible]

**Tired of typing?**  
Take advantage of our  
finger-saving offer on Page 84



*Programming is easier  
than you think – and  
doubly so if you follow  
MIKE BIBBY's crystal  
clear guide through  
the micro jungle*

I DON'T know who you are. You might be a wife whose Atari owning husband is away at work, or a father who is trying to come to terms with his daughter's Christmas present. Alternatively you might be a teacher who has just been "computerised".

Whoever you are, the fact that you are reading this article tells me your guilty secret: You want to be able to program the Atari micro.

But how to begin? You must have noticed that some people take to computing like ducks to water, or an output port to an interface, as they would say.

Words like byte, strings and user-defined functions flow freely from their lips. They pass parameters and handle interrupts with ease, then get their hands on the peak and poke in a way that beggars belief!

You, I take it, are not like that. You are not a computer "natural". But you would dearly like to be. Well fear not, this series is for you, and it was written by one of your kind.

I, too, have sat at a keyboard, watching the cursor without having any idea of what to do next (or even knowing it was called a cursor).

I also know what it's like to have someone explain something to me in the "simplest possible terms" and still find it way above my head. Yet I now programme reasonably well... and so can you. Read on!

Let's assume for a start that you are seated in front of the computer which is already plugged in, connected to the TV and tuned in correctly.

Some versions of the earlier Ataris



will need a Basic cartridge plugging into the left cartridge slot. If your Atari is of this sort, make sure the cartridge is in. And that is the end of our assumptions.

The "On" switch is a rocker switch at the rear of the computer on the left. Reach over and switch on (and the TV if necessary). You'll hear some buzzing from the speaker of your TV and then the message READY will appear, together with a rectangular blob, the cursor.



If you're lucky enough to have a disc drive attached, keep it switched off for the moment – you won't need it.

The READY message is called the prompt. This indicates that the micro

is ready for you to type in some information. Try typing in two or three letters – just part of the alphabet for the moment, please.

You should soon see that the cursor indicates the position at which the next letter will be printed on the screen.

Before we type any more, let's examine the keyboard. Fundamentally, it is a standard typewriter keyboard surrounded by several additional keys. Notice that the computer has a Q (zero) key and another key for the letter Q.

You must keep the two separate O for numbers, Q for words. I guarantee that a lot of your early errors in programs will be caused by typing O instead of Q!

On the same line, notice that there is a 1 (one) key. Make sure you do not use it. (Incidentally, a lot of your other early errors in your computing career will be from mistaking 1 as I and vice-versa.)

Other keys are labelled by words such as Shift, Esc and Return. Let's



introduce a convention to make life easier: If I want you to press the key labelled **Return**, for instance, I will ask you to press:

[Return]

If I ask you to type **RETURN** you have to type **R**, then **E**, then **T** and so on. The symbols [] enclosing a word indicate that you are to press one key with that word on it. You do not spell it out.

Now **Return** is quite an important key. We use it in a similar manner to the return key on an electric typewriter, to ensure that the typing continues on a new line. It is far more important than that, though. **Return** not only gives you a new line but also sends the message typed into the computer to be acted upon.

If you have been following so far, you should have typed a few letters on your screen so that it looks something like:



If not, type a few letters now. Next, press [Return]. Oddly, on, you'll get a message back from the computer saying:



Don't worry about the **ERROR** message. You can't hurt the computer by accidentally mistyping something, so feel free to experiment.

All that **ERROR** means is that the computer doesn't understand the words you've just sent it. You see, it needs to be spoken to in its own language, which is called **Basic**.

However learning **Basic** isn't like learning a genuinely foreign language. **Basic** is very similar to English but it only allows selected English words – called keywords – to make things simpler for the computer.

This, by the way, is the reason I

**As far as the computer is concerned "end" and "END" are different words ...**

said that it was odd as you would get **ERROR** returned from the computer.

You might, by chance, have hit on a **Basic** word. For example, in **Basic** you can mark the end of a program with **END**. The people who designed **Basic** could have chosen the word **FINISH** to do this. Type:

**END**

and press [Return]. Then try:

**FINISH**

and press [Return]. Note the difference:



Admittedly, **END** doesn't accomplish very much – after all, you haven't anything in there to end, have you? – but at least the computer doesn't hurt the message **ERROR** at you as it did with **FINISH**. This is because **END** is a **Basic** word, while **FINISH** isn't.

So far, your typing should have been appearing in upper case, that is, capitals, only. Let's investigate.

If you look at the lower right-hand corner of the keyboard you will see the keys **Cap** and **Shift**. All the letters of the alphabet that you type will appear in capitals, unlike a typewriter which prints in lower case unless you hold down the shift key.

In this state, which we call "Caps Locked", pressing a key with two characters marked on it will cause the lower character to appear on the screen. To obtain the upper character, press the key while at the same time

holding **Shift** down. For example, pressing:



will give you **B** on the screen while pressing:



and [Shift] will give you **b** on the screen.

Now I introduce a convention: if I want you to press two keys at the same time, I join these keys with +. To enable the keyboard to function as a normal typewriter press [Cap]. If you type now, you will find that the alphabet appears as lower case unless you press [Shift] down with it, when it will appear as capitals. Remember, if you want to get onto a new line, just press **Return** and ignore any resulting **ERROR** message.

If you press [Cap] once more you'll be back to the situation when you switched on, with the alphabet appearing in upper case whether you press [Shift] or not.

Press [Cap] once more and the letters will once more appear in lower case until shifted, and so on.

At the moment the keyboard should be acting like a typewriter – giving upper and lower case. If not, press [Cap] once more.

Get onto a new line by pressing [Return] and type:

**end [Return]**

You should get **ERROR**, which proves that, as far as the computer is concerned "end" and "END" are



different words. It recognises "END" as the basic keyword but not "end". This is the reason for the Caps key. If you have this on, you automatically type in letters of the alphabet in capitals, so preventing you from mistakenly entering "end" instead of "END". For the present I am going to assume that all of your typing is done with Caps on. If it is not on at the moment (which it won't be if you have been following), just press that key once to rectify the situation.

You've probably noticed that holding a key down for more than a fraction of a second causes that letter to repeatedly type itself out on the screen, if you haven't try it now. This behaviour is known as the auto-repeat.

By now you may have probably filled up a screenful of text and seen the scrolling action demonstrated. If not, press (Return) several times in succession or, more sophisticatedly, hold (Return) down and let the auto-repeat do the work for you. As

you'll soon see, scrolling is when the top of the screen rolls up to allow more typing at the bottom.

You could, if you wanted, clear the screen like this, by keeping (Return) down until everything scrolls off the screen.

An easier way to do this is to press the (Shift) key together with the key marked (Clear), which you'll find in the top row of keys on the right. Try it.

You can achieve the same effect by using the (Control) key instead of (Shift). So (Control) + (Clear) will see the screen off, too.

(Control) is quite an important key. Just as we can combine shift and the alphabet keys to alter what we get in the screen capitals instead of lower case), so we can combine (Control) and other keys to give special effects.

Try (Control) + 2. The micro should beep at you. We'll look at other uses of Control later.

To conclude this preliminary examination of the keyboard, I

suggest that you clear the screen if necessary, then type in a few letters (without pressing (Return)). Now press (Delete) once. The last letter you typed should disappear, its position being taken by the cursor.

If you keep (Delete) down, the auto-repeat will function and erase your whole line. You can use this to correct typing errors. Simply erase back to the mistake and retype.

This is just one form of what is called screen editing. There are other ways, involving the ←, →, ↑, ↓ and (Insert) keys, but these can wait a while.

Right, it's a computer so let's get it to compute. But don't worry, this isn't going to turn into a mathematical treatise. After a brief but necessary foray into simple sums, this article is thoroughly non-mathematical.

Before we start, let me give you a warning. The computer will do exactly as you tell it but only what you tell it. It's a very literal machine and in this respect is like my daughter on a

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When asked to put on her pyjamas for bed she did exactly as she was told. Of course, I hadn't asked her to take her other clothes off first, had I? You can imagine the results.

Similar things happen with the computer. Say we want the computer to calculate  $2+2$ . First only do we want it to do the sum but we want it to tell us the answer when it's done it

We instruct the Atari to write things on the screen with the Basic word PRINT. This is a relic from the days when the computer's output, as it is called, was actually printed out on paper rather than on the screen as it is now.

So, to use the prover to  $2+3$ .

[PRINT 3x3](#) | [Revised](#)

Note that you don't need the `-` sign as you do on a calculator. (Rexx takes care of that. Before continuing, try a few simple additions.

Just as the computer does not allow you to use  $\square$  for  $\square$ , so it does not permit you to use  $\times$  for multiply. The computer uses the symbol  $\cdot$  instead. For example,  $10 \cdot 3$ .

**Abstract**

Minus (-) is straightforward. You'll find it sharing a key with an underline character and a vertical arrow. Divide, however, is not a full-on oblique stroke. [1]

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Though this may seem at first a little odd to you, you have met it when dealing with fractions:  $3 + 4$  is equivalent to the fraction  $3/4$ .



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From now on I am going to assume that you accept that before the micro can act on your instructions, they must be sent to it by `Return`. I may therefore omit `Return` from my examples. Make sure that you don't.

Before experimenting with further sums of your own devising, I'd like you to try the following exercises:

interprets sequences of sums in the order you learned at school. You do whatever is inside brackets first, then multiplication and division, then finally addition and subtraction.

1000

```
PRINT 2/3
PRINT 1000*1000*1000
PRINT 1/1000
```

If you have done this correctly, your screen should display:



The point to stress here is that the computer works to a limit of accuracy. For example,  $2/3$  is not exactly 0.666666666. The error is well under a millionth, though. Still, it counts for finance in interest.

Similarly, with especially large or small numbers, the computer saves space by storing them using a scientific notation called *exponent format*. Here, for example, instead of printing out the answer to  $10000 \times 10000 \times 10000$  as 10000000000000, it prints out the result as  $1E+13$ .

For  $10^8$ , which stands for exponent, you should read "multiplied by 10 to the power of 8". For example,  $16 \times 10^8$  means "1 multiplied by 10 to the power of 10" which, if your maths is up to it, gives you the correct answer.

Similarly, the answer for  $1/1000$  was returned as  $1.0E-03$  which reads as "1 multiplied by 10 to the power of -3" which is 0.001, the correct answer.

If you don't follow all of this, don't worry. I've only covered it to warn you about odd-looking results to your sums, which might pop up and confuse you.

Now let's try to get the computer to print out some words. Let's get it to print out **Hello**. If you just type it back to your schooldays (and for some of us that's an awful long thread), you'll remember that when someone says something you surround what that person said with quotation marks for quotes, for short words are like said, "Hello".

for the purpose of the study.

words, we PRINT them, but we do surround them by quotes. We omit, however, the opening and full stop. For:

**Abstract**

and the computer should print out **hello**.

Notice that the quotes are not printed. So to get the Atari Basic to print out a message on its screen we just use PRINT followed by the message surrounded by quotes.

The message inside the quotes is called a string – since the micro considers it to be just a string of letters – or a string literal. The latter is because the computer prints out literally, or exactly, what is between the quotes.



```
PRINT "Hello"
PRINT "Hello"
PRINT "Hello"
```

give different outputs since in each, different numbers of spaces precede the `hello`.

Actually, strings do not have to be words. They can be any combination of symbols, including numbers. Just give them in quotes:

**Tropenische Krankheiten**

```
PRINT "45"
PRINT "45"
```

This should convince you that the computer does print out strings – this is what is between the quotes – literally. When the calculation is in quotes the computer simply echoes the sum on the screen. When the calculation is not in quotes, the computer prints out the answer.

Experiment with printing out various messages on the screen. How long can you make them? Try lower case words, as well.

At the moment, the computer is responding to our commands as soon as we send them by passing `Return`, but in a calculation or task requiring several steps this can be rather tedious.

It would be more satisfactory to give the computer a whole sequence of instructions that it could get on with rather than spoon-feed it step by step.

Thinking like a professional:

Such a sequence of instructions is called a program and next month we will begin writing some.



# Dare YOU

AN adventure is a fantasy world which you, the hero, have to explore, often with the object of finding treasure or rescuing princesses, and generally being a hero.

Kids stuff? Not at all.

The crafty programmer who's written the game doesn't want you to win too easily. So he makes it as hard as possible, which is often very hard indeed.

Believe me, when you've spent an hour trying to find a key to open a mysterious locked door only to find that the door is locked from the other side, you'll be ready to strangle that programmer.

An adventure is like a detective novel, full of clues, puzzles and red herrings. Your job is to sift the clues, solve the puzzles and, hopefully, recognise the red herrings.

What's more, because you're in a fantasy world, with its own natural laws, you can also have goblins, magic or even aliens to cope with.

Not quite that easy after all, is it?

So where do these adventure games come from?

They owe their origins to the Dungeons and Dragons craze that swept America in the mid-1970s. Two mainframe

programmers, Crowther and Woods, wrote a program called Colossal Cave, which simulated a D&D game, but had more emphasis on problem solving and less on fighting monsters.

This quickly achieved cult status among other programmers, and might have remained on mainframes but for an enterprising man called Scott Adams.

He adapted one of these massive programs to a 16k TRS-80, published it, and the first adventure for a home micro, Adventureland, was released.

Since then many adventures have been written. They can be split into two basic types - role-playing and text.

Role-playing games tend to simulate a D&D game very closely, in that you choose the type of role you wish to play, such as warrior, cleric, barbarian, wizard and so on.

On the basis of your choice you're assigned strengths and weaknesses which you exploit to achieve the objectives set in the adventure, like collecting treasure.

Since this treasure is almost invariably in the possession of some monster or other you spend most of your time fight-





# go Adventuring?

By  
BRILLIG

ing them. The result is that your progress often seems to depend more on luck than skill.

A good example of this type is the highly-acclaimed Ultima series - I, II and III are already available, with IV due out "real soon now".

Text adventures earn their name because they originally consisted of text only, and were based on the same type of format as the original Colossal and Woods game.

The classics here, apart from the Scott Adams series, have to be the Zork trilogy. However, it's good to note an English software house, Level 9 Computing, with a well-earned reputation in this field. Their version of Colossal Adventure gives the original game with a few extras.

Some adventures are described as "graphic adventures" or "hi-res adventures". These are basically text adventures with pictures and the format is pretty much the same as for text adventures, but with only three or four lines of text visible. Effectively, the picture replaces much of the description of the location.

There was a time when hi-res adventures threatened to push pure text adventures out of the scene completely. How-

ever, the success of Infocom and Level 9 shows that text adventures have staying power. As long as there are plays on the radio, there'll be a place for pure text adventures - the best pictures are the ones in your imagination!

With adventures, you either love them or hate them, and it's very hard to drag away the adventure fanatic from his machine long enough to talk about them.

You must have seen one of these adventure freaks. They're the ones who come to the computer club bleary-eyed from playing their latest game until three in the morning.

Yes, I know you thought he was an insomniac, but now you know.

What's so special about these adventure games?

I gave you an idea earlier of the object of them, so let's give you an example from that first Scott Adams game.

The aim is to collect and store 12 treasures. To get one of them you have to wake a sleeping dragon with some bees.

The bees have to be caught in an empty bottle - after you have first covered yourself in mud to stop them stinging you.

The bottle is full at first and

and  
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sick  
but  
tem  
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ure-  
re-  
for  
led  
ess  
th  
me  
was  
res  
be  
a -  
il to  
ary  
the  
day,  
er-  
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n of  
you  
ght-







has to be emptied over some lava to get another treasure.

However once you get to the location where you empty the bottle you need a rag and a magic word to get out.

To get the rag you need to rub the lamp in another location.

Not only that, you have to climb down a hole to get the means to light the lamp, which you find by chopping down a tree, after you've first climbed it to get the key which opens the door ...

Phew! Bit involved isn't it?

But that's where the satisfaction lies, in solving the puzzles, progressing through the locations and getting that final message on the screen:

CONGRATULATIONS! YOU ARE  
A MASTER ADVENTURER

I know it must seem very complicated, but adventures are totally logical. Admittedly that logic is sometimes very obscure but all the puzzles can be solved.

And there is no greater feeling than to solve a problem that has been stumping you for hours.

Now I've got you interested in them and you're all going to rush out and buy up the shop, let me give you the bad news:

ALL adventures are very hard for ALL beginners.

The good news is that they are just like everything else. The more you do them, the better you get.

I well remember my first game, and I can assure you it was not a very unapologetic beginning.

However there are certain things common to most adventures. I will explain how to cope with them so that your first game won't be quite as traumatic as mine.

Most, if not all, adventures have a maze in them somewhere. Often these mazes are logical, so if you go North and then South you end up in the location you started from.

Others are not so logical, but the answer for both is the same — make a map.

If you cannot recognise your location from the objects present, room description or the direction of the exits, then drop some of your own objects and make a map based on them.

Some adventures have more than 200 locations, so it is a good idea to make a map of your travels anyway.

Another thing common to most adventures is ending up





in the dark, often underground or in toilet rooms. Obviously you need to get a lamp or torch or at least some matches.

Should you come across one in your travels always check to see if you can light it first. Do you need matches or batteries – or oil if it's an oil lamp?

If you do end up in **PITCH DARKNESS**, try and reverse the move you have just made. If that proves fatal, try and find the lamp and the means of lighting it before you re-visit that location.

If you've got the lamp, try **LIGHT LAMP** or **ON** or anything else you can think of before moving.

A few other things that might help you which should be obvious are to do with shovels, scenery and ropes.

If you find a shovel it's a good bet that you will have to **DIG** somewhere, either to find a treasure or to get an object that will help you somewhere else in the adventure.

Examine your surroundings. If you are in a forest, can you climb a tree? Or if you've got an axe, can you chop that tree down? Can you climb a wall, or a statue?

If you find a rope it's likely to be needed somewhere

either to climb something or perhaps to pull something.

An object that is too heavy to lift might be pulled if you **TIE ROPE** and **PULL** the object.

There are some general tips that are applicable to all adventures.

If the program allows you to save the game – that is, allows you to return to the location you have reached should something you do prove fatal – then use it before you enter any suspicious places, or before trying anything dangerous.

If something doesn't work, such as taking a bucket stuck in the mud by **haying** in **TAKE BUCKET**, then try doing it a couple of times.

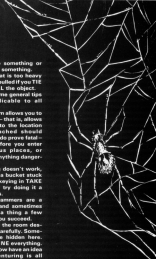
Those programmers are a crafty bunch, and sometimes make you do a thing a few times before you succeed.

Always read the room descriptions very carefully. Sometimes clues are hidden here. Always **EXAMINE** everything.

I hope you now have an idea of what adventuring is all about.

You never know, maybe we'll be seeing you staggering into the computer club with bleary eyes sometimes.

Happy Adventuring!





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100



1

10



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If you have toddlers who are just starting to spell, the delight they show when you run this program will amply repay the effort of keying it in.

The idea is that you use a crane to pick up letters being carried by the Alphabet Train in order to spell the word displayed at the bottom of the screen.

Because the word is on-screen the whole time, even children who are not yet ready for spelling can gain important practice at shape matching.

Only a portion of the train shows at any one time, but the letters are arranged in alphabetical order. Moving the joystick from side to side or pressing either of the cursor arrow keys - the  $\leftarrow$  or  $\rightarrow$  - without using Shift or Control - moves the train across the screen.

Press the joystick button or the Space bar and the crane lifts up the

## Learning to spell can be fun when you load up the...

letter, which is then deposited on a waiting dumper truck. It's possible to pick up an incorrect letter, but the efficient workers won't let it drop on to the track.

Once the word has been built up, the truck rolls off to the word factory to the accompaniment of a merry tune.

Alphabet Train was written by Stan Cokers who contributed it to the Oregon ACE public domain library. We've made a couple of changes to the original, including the facility to use the keyboard instead of the joystick.

The words are held in the DATA statements of the subroutine which

starts at line 10000 so it's not too difficult for you to include your own words of special significance to your children.

If you replace any of ours or add your own, make sure the number after the RNDWOP in line 1010 corresponds with the total number of words in the data statements. If the number is smaller than the number of words, the words on the end of the list will never get chosen.

More importantly, if the number is bigger than the number of words, the program may crash with an ERROR - otherwise known as OUT OF DATA.

Also, don't include a word which has any letters repeated because the Alphabet Train only has one of each.

Alphabet Train has already become a firm favourite with our toddlers. If they play with it for much longer they'll never get the next issue of Atari User off to the printers!

### PROGRAM STRUCTURE

143-149

169-272

280-330

340-399

400-479

480

499

500-900

900-999

1000-1100

1100-1200

1200-1300

1300-1400

Title screen.

Dimension strings and read DATA for various characters.

Initialise player missiles (PM).

Initialise player missiles letters AS, into PM area.

Map upper-case alphabet letters AS.

Map lower-case alphabet letters AS.

Move train in from right.

Points random word.

Main loop to control train and manipulate alphabet.

Test for miss, or bypass then set direction of train.

Test for miss, or bypass then set direction of train.

Test for miss, or bypass then set direction of train.

Test for miss, or bypass then set direction of train.

Test for miss, or bypass then set direction of train.

Test for miss, or bypass then set direction of train.

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Test for miss, or bypass then set direction of train.

Test for miss, or bypass then set direction of train.

Test for miss, or bypass then set direction of train.

### SUBROUTINES

910 Moves the character set.

1010 Picks a random word.

1060 Prints track.

2040 Plays tune.

### MAJOR VARIABLES

RNDWOP

DIR

PM

K

S

SCR

TRN15

TRN25

TRN35

TRN45

TRN55

TRN65

TRN75

TRN85

TRN95

TRN105

TRN115

TRN125

TRN135

TRN145

TRN155

Random word from 100.

Relative change in direction of train.

Player missile page address.

Keyboard status.

Joystick status.

Upper-left corner screen address.

Contain train's graphics.

Contain train's graphics.

Contain train's graphics.

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Contain train's graphics.



ALPHABET  
TRAIN



```

000 *****
001 *****
002 *****
003 *****
004 *****
005 *****
006 *****
007 *****
008 *****
009 *****
010 *****
011 *****
012 *****
013 *****
014 *****
015 *****
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```

[illegible][illegible]



## Early Learning

[illegible][illegible][illegible]

**Third all typing?**  
 Police advantages of more  
 computers often are. (Cont. p. 1)



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# Get in the right Mode for screen displays

First in DAVE RUSSELL's series on graphics modes

**IN this series we'll be looking at the Atari's various graphics modes and seeing what each is capable of displaying.**

You may have read some of this information before, or you may have discovered some of it by accident. If you think you've found something that nobody else knows, write and share it with your fellow readers.

If we're going to look at the Atari's graphics modes, we might as well start as the machine itself does — with Mode 0.

This is the default mode, the one which appears when the machine is switched on and no program is present. It's a large blue rectangle with a black border, and text appears on it in light blue.

Although Mode 0 is one of the graphics modes and is invoked by the command GRAPHICS 0 (or GR.0), it is more usually thought of as a text mode. It is used mostly for entering and displaying the letters and numbers which make up text, although it does have some 'graphic' capabilities as we'll see later in this series.

The blue rectangle can be thought of as the piece of paper on which you write your text. Unlike ordinary paper,

though, you can't write freely across the screen.

In fact, it's more like graph paper, divided up into little boxes. Many times that we have to fill in these days have rows of boxes where you write your information, and usually there is an instruction to write only one character in each box.

A text screen is like that, and Mode 0 has 24 rows of boxes, with 40 boxes in each row. However, you may have noticed that the word READY doesn't appear at the leftmost edge of the screen.

Unless you do something to alter it, the default setting is for only 39 characters in a row. The 'missing' two

characters form a margin down the left hand side of the screen.

If you want to count the boxes on a row, type the numbers 1234567890 repeatedly. As you type the fourth 8 the cursor moves to the beginning of the next row.

Alternatively, type in Listing 1 and Run it. This will print the numbers for you, and we'll use it again in a few moments.

It's quite easy to give yourself the full 40 characters. The size of the left margin is held in memory location 82 and you can see how big it is normally by typing:

## PRINT PEEK(82)

and pressing Return. This should print the value 2 on the screen.

We can alter the contents of a memory location using the POKE command, as long as we specify what number to enter there. So if you type:

## POKE 82,0

and press Return, the word READY will appear at the very edge of the screen.

If you entered Listing 1, it should still be in memory unless you've since typed New. Run the program again, and this time the 40 numbers will fit neatly across the screen.

We can work the same magic on

```
10 FOR A=0 TO 4
20 PRINT "1234567890";
30 NEXT A
```

Listing 1

```
10 GRAPHICS 0
20 FOR A=0 TO 10
30 SCREEN A,A,0
40 FOR B=0 TO 39:NEXT B
50 NEXT A
60 GRAPHICS 0
```

Listing 2



the right-hand margin using memory location 83. If you enter:

## PRINT PEEK83

this will usually return the value 35, indicating the rightmost column. Remember, counting starts at 0, which is why location 83 doesn't contain the value 40.

If you enter:

## POKE 83,10

and press Return, this will set the right-hand margin to column 10. Assuming that location 83 still holds the value 0 that you Poked in earlier, the effect of this poke to location 83 is to give you a screen which is effectively only 11 columns wide.

The blue rectangle stays the same size—it's just that you can't type as so much of it now. To see the effect, try running Listing 1 again.

If you've been playing about with locations 82 and 83 and want to get back to the default values, you can always press the Reset key. This will literally re-set the values without losing any program you had in memory.

Before leaving the text aspect of Mode 0, try:

## POKE 755,4

Normal service can be resumed as soon as you return location 755 to its more usual value of 2—in press Reset if you find it hard to type in Outback Mode!

The Atari has several registers which hold information about various things. Five of these contain information on colours. They are numbered from 0 to 4, and colour register 2 holds the colour in which the Mode 0 screen appears.

We could POKE particular locations to change the colour, but Atari Basic offers us a more elegant method—the SETCOLOR command.

To use this command we need to know three things: the register number which we want to affect, the colour number which we want to put there, and how bright we want the colour to be.

These three parameters must follow the command in the order in which I've given them.

The default colour for register 2 is colour 9, the blue you know and love. To change this colour, all we need to do is key in:

## SETCOLOR 2,4

If you've just entered this, your screen is now aglow with colour 4, or

pink as we call it. If you want to get rid of colour altogether, try:

## SETCOLOR 2,0

This produces a very dark grey and the Mode 0 screen blends with the border to give the effect of a much larger screen. Of course, text can still only be entered in the area which is usually coloured.

If you enter Listing 11 and Run it, you'll see the screen cycle through the range of 16 colours available before returning you to the default colour. Notice that because Listing 11 uses the same line numbers as Listing 1, it will overwrite it in memory.

Only the second parameter, the one controlling the screen colour, is varied. The luminance remains at value 8 for each colour displayed.

Incidentally, the purpose of line 40 is simply to keep each colour on the screen long enough for you to see it. If you remove line 40 and run the program your screen will appear to

**Thank Atari for a decent reset function which many other micro owners would envy**

flash as the colours are displayed at very high speed.

The colour information for the Mode 0 border is held in register 4 and we can alter this in the same way as the text screen. Enter:

## SETCOLOR 2,0

and you will have a completely black screen. Now try entering:

## SETCOLOR 4,9

This alters the register controlling the border colour so that it now contains colour 9—the colour we usually associate with the text portion of the Mode 0 screen.

Well, we've had upside-down text so we might as well have the usual colour relationships reversed too! Reset will restore the registers to their default values... or maybe you prefer having white text on a black background.

We can make the border cycle through the available colours by simply changing line 35 in Listing 11 to read:

## 35 SETCOLOR 1,4

That is, by changing the colour in

register 4, we alter the border colour rather than the screen colour.

The brightness of the letters on the screen is controlled by the contents of register 1. However the colour of the letters is always the same as the colour of the text boxes.

If we set the luminance parameter of register 1 to a bigger number than the luminance parameter of register 2, then we (probably) get 'light' text on a 'dark' background.

If we set register 1's luminance to a smaller number than register 2's, we (probably) get 'dark' text on a 'light' background.

To see this effect, press Reset and then enter:

## SETCOLOR 2,1,8

This produces a gold screen with pale text. If you now enter:

## SETCOLOR 1,1,4

the screen stays the same but the text changes to a darker colour.

So why use the word 'probably'? The luminance parameter can range from 0 to 14, but only even numbers are valid. If you enter an odd number, the luminance is set to the number you entered minus 1.

This means that if you set register 1's luminance to 9 and register 2's luminance to 8, then both are effectively set to 8.

If you change line 30 in Listing 11 to read:

## 30 SETCOLOR 1,1,4

and run the program you'll see the text cycle through the luminance values. Strictly speaking you should change line 20 to read:

## 20 FOR A=0 TO 14 STEP 2

but it won't do any harm if you don't bother. Each luminance will be displayed for twice as long as each colour was displayed previously.

For the final disappearing act, enter:

## SETCOLOR 1,1,4

Assuming you were back in the blue, the luminance in register 1 is now the same as that in register 2. This means that the text is now displayed at the same brightness as the background.

Unfortunately, the practical effect of this is that the text is rendered invisible. Unless you enjoy flying blind, press Reset once again.

And while you're pressing it, say a quiet 'thank you' to Atari for a decent reset function which many other micro owners would envy.



# HEXED

**HEXED** is a hexadecimal loader. It is a very useful utility that allows you to enter, display and execute machine code routines.

Once the program is **RUN**, a menu will be displayed with five options. They are:

1. Enter code
2. Execute code
3. Alter code
4. Set code
5. Exit program

The choice is now up to you. To select one of the options press the corresponding number key.

**Option 1** allows you to enter a series of hexadecimal bytes into memory. The first question you'll be asked is:

#### **Start address?**

You should now enter the address where your routine begins in hexadecimal without the \$ sign - this is true for all hex numbers entered.

A default address (\$4000) will be selected if you press **Return** without an address or enter a hex number greater than \$FFFF.

\$4000 is a safe area of memory and should be used to accommodate your first experimental programs.

After the start address has been entered you will be prompted with:

#### **byte?**

Here the program is asking you for the hexadecimal number that you want to store in memory, starting at the address you've just selected.

Now you can begin entering your program, one byte at a time, pressing **Return** after each byte.

After each number is entered the 'byte?' prompt is repeated, indicating that the previous byte has been entered into memory and that the memory address has been incremented by one. The program is now

***It sounds like  
the Black Arts  
... and you'll  
find something  
magical about  
KEVIN EDWARDS'  
helpful utility  
for displaying  
and executing  
machine code  
routines ...***



ready to accept another byte.

When you've entered your program you can exit by entering **5** in response to the 'byte?' prompt. This will return you to the menu.

If you enter an invalid hex number - such as 4GG1, where **G** is not a hex digit - the message 'Invalid HEX' will be displayed. After which you will be returned to the menu.

**Option 2** allows you to examine memory eight bytes at a time.

Again, the first question you will be asked is: 'Start address?'

If you simply press **Return** it will default to \$0000.

Let's assume that we've entered 4000. A row of eight bytes will be displayed. Here is a possible output:

4000 00 20 00 20 40 00 40

The four digit hex number corresponds to the memory address of the first byte in the row - the 40.

The next byte in the row, 20, is the contents of location 4001. And from this I'm sure that you can see that 4002 contains 00, 4003 contains 20 and so on.

If you wish to see another row of bytes press any key other than **5**, as **5** returns you back to the menu.

**Option 3** works in a similar way as **Option 1**. The difference being that the memory location being altered is displayed along with its contents.

As with **Option 1** the prompt 'byte?' indicates that the program is ready for a byte. Now you can begin entering numbers in the same way as **Option 1**.

**Option 4** allows you to execute one of your own programs.

Again, a start address will be requested. This is the address that will be executed.

Since this option can prove deadly a further prompt will ask you if you are



```

10 FOR ADDR
20 FOR C0 ASBNT ADDR
30 FOR
40 GOTO C0
50 FOR ADDR, ADDR, ADDR
60 FOR C0, C0, C0
700 IF "The message"
110 IF "The other code"
120 IF "The other code"
130 IF "The other code"
140 IF "The other code"
150 IF "The other code"
160 IF "The other code"
170 IF "The other code"
180 IF "The other code"
190 IF "The other code"
200 IF "The other code"
210 IF "The other code"
220 IF "The other code"
230 IF "The other code"
240 IF "The other code"
250 IF "The other code"
260 IF "The other code"
270 IF "The other code"
280 IF "The other code"
290 IF "The other code"
300 IF "The other code"
310 IF "The other code"
320 IF "The other code"
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340 IF "The other code"
350 IF "The other code"
360 IF "The other code"
370 IF "The other code"
380 IF "The other code"
390 IF "The other code"
400 IF "The other code"
410 IF "The other code"
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800 IF "The other code"
810 IF "The other code"
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860 IF "The other code"
870 IF "The other code"
880 IF "The other code"
890 IF "The other code"
900 IF "The other code"
910 IF "The other code"
920 IF "The other code"
930 IF "The other code"
940 IF "The other code"
950 IF "The other code"
960 IF "The other code"
970 IF "The other code"
980 IF "The other code"
990 IF "The other code"

```

sure that you want to execute the program at the address entered.

Pressing any key other than Y aborts the option and returns to the menu.

If your reply is Y, the message "In M/C routine" is displayed. Your routine is then called.

If the program returns successfully the message "Out of M/C routine" will be displayed. After which the menu is re-displayed.

If for some reason the second message doesn't occur and your micro appears to have "locked up" your routine has failed.

Almost certainly the cause of this is a byte left on the 6500 stack, thus upsetting the return address of the program. If you're wondering how the byte got there in the first place the answer is given by the Basic ROM.

Hexer uses the command **USR** to call the machine code routine. The syntax of **USR** is:

**USR(address, b1, b2, ... bn)**

There is an option to pass data to the routine by additional parameters b1, b2, ... bn. These parameters are pushed onto the stack in the order bn, ... b2, b1.

Therefore, the number at the top of the stack is b1 and the last is bn — the

## VARIABLES USED IN HEXER

- AS** Contains the hex number which is to be evaluated by the routine at line 1000.
- NUMB\$** Contains the hex byte which is to be entered into memory.
- A** General purpose variable.
- DFLAG** A flag indicating whether or not the machine mode is in operation. 1=yes, 0=no. This is used to change the default address to

**L, LOOP**  
**NUM**  
**RES**  
**START**

\$0FFF instead of \$4000 when return is pressed in response to the Start address prompt.

General loop variables.

Acc8 code of the hex digit being evaluated.

Result of the hex conversion.

Current memory address being accessed.



low byte of the parameter is pushed before the high byte. And below all of these bytes is the return address of the routine.

The naughty thing about `USR` is that an additional byte containing the number of parameters passed is pushed onto the stack just before the routine is jumped to, even if no parameters are specified (what it contains is 0).

Thus, even though you've pulled your parameters from the stack when the `ReTurn` from Subroutine (`RTS - $00`) is executed, the return address is incorrect and the 6502 jumps to the wrong area of memory.

The remedy to this is to pull a byte off the stack with `PLA`, before executing the `RTS` - to remove the offending byte.

So the end of all your routines should have the following two bytes:

```

00 - PLA (remove the extra byte)
00 - RTS (return back to here)
```

Without these bytes your programs will almost certainly hang up. `Option 5` allows you to exit from `Hexor`.

And that completes the deconstruction of `Hexor's` commands. Now we'll have a look at the program itself.

The problem with `Asci Basic` is that it has no command to evaluate or print hexadecimal numbers.

The subroutine starting at line 1000 and ending at 1110 evaluates a hexadecimal number held in the variable `AS` and returns with the result in the variable `RES`.

For example, if `AS="0C"` and the routine is called, the variable `RES` will contain 12 on exit.

If you remember, pressing `Return` without entering a hex number causes the program to default to location `$4000`. Line 1010 of the subroutine is responsible for this. If the string `AS` contains nothing ("") `RES` is set to 16384 (`$4000`) and the routine is exited.

Another check the routine performs is to see if the hex number has more than four digits. If it has the routine nulls `AS` and jumps to line 1010, which in turn sets `RES` to 16384 and exits. This is done because the 6502 micro-processor

character and ASCII code	result after subtract
0 48	0
1 49	1
2 50	2
3 51	3
4 52	4
5 53	5
6 54	6
7 55	7
8 56	8
9 57	9
A 65	10
B 66	11
C 67	12
D 68	13
E 69	14
F 70	15

Table 1

can only address location 0 to `$FFFF`.

Now the number must be validated. This is done by scanning through each character in the string checking to see if it is a valid hex digit (0-9, A-F).

If an invalid hex digit is found a message is displayed indicating so. The `FOR TO` loop and `GOSUB` address are then `POoped` off the Basic stack and the routine `RETURN`s to the menu - see line 1080.

As each character is accepted a number is subtracted from its `Asci` code. The number depends upon the character.

If it is a numeric character, 0-9 (`Asci` codes 48 to 57), 48 is subtracted - to get a result in the range 0-9. If it's an alphanumeric character, A-F (`Asci` codes 65 to 70), 55 is subtracted - to get a result in the range 10-15.

All this does is change `Asci`

characters, 0-9 and A-F into their corresponding numeric values. See Table 1.

The result of this is then multiplied by 16 to the power of the `LEN` of the string, `AS`, minus the actual position, minus 1 - the most significant digit is at the start of the string and not the end.

Have a look at Diagram 1.

So from the diagram you can see that  $513C2 = (5 * 4096) + (3 * 256) + (12 * 16) + (2 * 1)$ .

This is exactly what the program does with the hex digits in `AS`.

On exit from the routine `RES` has the result.

The other important routine outputs a byte in hexadecimal - lines 2000-2030.

On entry, the variable `A` contains the number to be printed. This is split into two nibbles (two 4 bit numbers). The top four bits of `A` make one nibble (the upper nibble) and the lower 4 bits make the other (the lower nibble).

Splitting the byte in this way allows us to print two hex digits because each nibble directly corresponds to a hexadecimal digit.

Now all we have to do is print the `Asci` character that corresponds to each nibble.

If the nibble is between 0 and 9 we add 48 to it to get an `Asci` character 0-9. If the nibble is between 10 and 15 we add 55 to it to get an `Asci` character A-F. This is all done by another subroutine which starts at line 2040.

Line 2010 extracts the upper nibble from `A` and prints it. The same is done in line 2020 and 2030 for the lower nibble.

The main body of the program is responsible for prompts and simple validation.

If you're wondering what line 60 in the program does the simple answer is it `OPEN`s a keyboard file for input. This is done to allow us to wait for a key depression by issuing a `GET#1,A` command. After which the variable `A` holds the `Asci` code of the key pressed.

Anyway, it's time for you to try out your own programs using `Hexor`.

Happy Coding!

hex	hex	hex	hex
0000	2560	16	16
1	9	1	2 (decimal)
9	1	10	2 (hex)

Diagram 1







**WELCOME** to the first in a series of articles in which we hope to take the mystery out of understanding the fundamentals of the Atari's workings.

All too often even competent BASIC programmers tend to shy off such topics as binary coding, hexadecimal and assembly language because it seems too "mathematical".

This is a great pity, because the Atari is so constrained that a little knowledge in these fields allows you to take full advantage of its advanced facilities.

The mathematical aspects of the subject aren't at all deep — certainly anyone who can follow BASIC should be able to cope with this series.

If you feel that despite our best efforts we still haven't explained something fully enough, please write in and tell us — we'll try to rectify the situation in later articles.

First we are going to look at binary code — a way of handling numbers essential to our understanding of what goes on inside a computer.

Binary is just a way of coding numbers in a way particularly suitable for computers. It's actually quite simple. What often confuses beginners is the fact that the binary system codes numbers in a way that can look extremely like the way we normally code numbers.

For example, if you were presented with a number 100, you would probably decode it in your normal way and say it was "one hundred".

That, however, is just one way of interpreting it. If you decided to decode it as a binary number, you would interpret 100 as a completely different way and say it meant the number "four". (Never mind exactly how you arrived at that conclusion for the moment.)

This is what often causes problems — people are so used to dealing with their numbers in the normal way that 100 is always "one hundred". In them, and they can't make the shift necessary to decode it in binary as "four".

Actually it is rather antiquated. Presented with 100, do you interpret it as "one hundred" or "four"? Our rule will be, if you mean our usual way of dealing with numbers (the hundred, tens and units you learnt at school — or put it more formally, the

# It all adds up to binary code

**Part One of MIKE BIBBY's easy-to-follow series looks at the number system at the heart of your Atari**

denary system) you write the number in the normal way.

If you wish the number to be decoded as a binary number you put the symbol % in front of it — 100 means "one hundred" while %100 means "four".

So far so good. We now have a marker (%) to warn us that we have to decode the number in a special way as a binary number.

However, before you decide you need a rule for decoding — so how do you get the number "four" from %100? What's the rule?

Let's take a detour for the moment, and think about the coins we use every day. Our currency consists of these coins:

50p, 20p, 10p, 5p, 2p and 1p.  
We can combine them to give any sum we wish: for example

75p is 50p + 20p + 5p  
or 50p + 10p + 10p + 5p  
and so on. We are all familiar with this — often we use multiples of coins to make up a sum. For example, 5p can be 2p + 2p + 1p.

Using the same coin twice, though, often means that we end up carrying unnecessary amounts of change, and I for one don't like doing that.

Sometimes, however, with our present coinage system we have to use the same coin twice to obtain certain sums. You cannot, for instance, make up the sum of 4p without doubling up on coins. To avoid repeating coins we would have to invent a 4p coin!

Let's do that; in fact, let's invent a coinage system where you never have to use the same coin twice.

First of all we would need a 1p coin and, of course, a 2p coin, because we cannot use 1p + 1p for

2p — it breaks the rule!

Now 3p can be made up of 1p + 2p, but for 4p we'll have to invent a 4p coin.

Equipped with that we can make 5p (4p + 1p), 6p (4p + 2p), and 7p (4p + 2p + 1p). In obtaining 7p we used all our available coins, so now we have to invent an 8p coin. If you work it out (and I suggest you have a go) you will find that with the coins you have at your disposal (8p, 4p, 2p, 1p) you can make any sum up to 15p. Then you would have to invent a new coin, 16p.

Notice how the coins we have created have doubled in value: 1p, 2p, 4p, 8p, 16p. No prizes for guessing what the next one is.

Let's summarise our results in a table (Figure 1). Here I have used the columns to show the coins available and the rows to show how the various totals are made up. A 1 in a particular column means that we use that column's coin, and 0 means that we don't use it. Look at the row for 5p, it has 101 on it. According to our rule, this means we pick out the coins 4p and 1p (and NOT 2p) to make up the 5p total.

	4p	2p	1p
%	1	0	1
=	4p	+	1p = 5p

Now let's get back to computers by dropping all this talk about coins and reusing Figure 1 to show the same information but without referring to money — just numbers. Figure 2 is the new table.

As you can see, there is little change, and we can use this table to encode numbers in general, not just coins. We call this method of encoding the binary system.

Remember, to show that we mean



binary number we precede it with %.  
So if you see, for example, %101  
means:

$$\begin{array}{r} 4 \ 2 \ 1 \\ \% \ 1 \ 0 \ 1 \\ \rightarrow 4 + 1 = 5 \end{array}$$

that is we add together the values of  
the columns containing 1. Look at  
row 5 of the table to check it.  
Similarly, %1101 would mean 13 in  
the binary system since

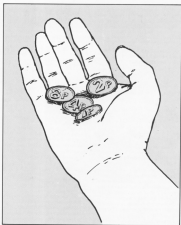
$$\begin{array}{r} 8 \ 4 \ 2 \ 1 \\ \% \ 1 \ 1 \ 0 \ 1 \\ \rightarrow 8 + 4 + 1 = 13 \end{array}$$

By now you should be able to work  
out for yourself why %1000 represents  
four. From the table, or by using the  
addition method I've just illustrated,  
see if you can decide the binary  
values of the following binary  
numbers:

%1001  
% 101  
% 11  
%1101  
% 111

You can use the program  
accompanying this article to check  
your results. You've probably noticed  
by now that in the binary system you  
only use two symbols, 0 and 1, to  
encode numbers - hence binary, bi-  
for two as in bicycle.

You can encode any number that  
you want in binary - just use more



	COINS			
	8p	4p	2p	1p
1p				1
2p			1	0
3p			1	1
4p		1	0	0
5p		1	0	1
6p		1	1	0
7p		1	1	1
8p	1	0	0	0
9p	1	0	0	1
10p	1	0	1	0
11p	1	0	1	1
12p	1	1	0	0
13p	1	1	0	1
14p	1	1	1	0
15p	1	1	1	1

Figure 1

Binary Value	Column or Bit Value				Binary Value
	8	4	2	1	
1				1	%1
2			1	0	%10
3			1	1	%11
4		1	0	0	%100
5		1	0	1	%101
6		1	1	0	%110
7		1	1	1	%111
8	1	0	0	0	%1000
9	1	0	0	1	%1001
10	1	0	1	0	%1010
11	1	0	1	1	%1011
12	1	1	0	0	%1100
13	1	1	0	1	%1101
14	1	1	1	0	%1110
15	1	1	1	1	%1111

Figure 2



columns for "bits" as we say in computer jargon, remembering that each new bit is worth double the preceding bit.

However, it does get terribly cumbersome. For example, 100 (denary) encoded in binary is %1100100 since:

```

      64 32 16 8 4 2 1
%    1 1 0 0 1 0 0
→ 64+32+4=100

```

It is much easier to handle the number in our normal system. To a computer this presents no problem, and the fact that binary only uses two symbols is a bonus because you can represent numbers with a sequence of "switches".

Switches are what we call "two state" — they're either ON or OFF. If we have a sequence of four switches, together we can encode numbers by having them either ON or OFF. We could use ON to mean a 1, and OFF to mean a 0 in a particular column:

```

      8      4      2      1
ON  OFF ON  OFF ON  OFF
→ 1  1  0  1  1  1 = 17

```

Each of these "switches" represents a bit, and a computer memory is full of bits. The 6800, which is the microprocessor at the heart of the Atari system, deals with many thousands of them.

To make things simpler the 6800 handles the bits in groups of eight bits at a time — the group of eight being called a byte.

With this type of organization the largest number you can store in a byte is 255 since:

```

      128 64 32 16 8 4 2 1
%    1 1 1 1 1 1 1 1
→ 128+64+32+16+8+
  4+2+1=255

```

Of course the computer can handle

larger numbers (and not just whole numbers) but to do so it must use more than one byte.

Converting a byte from binary to denary is fairly straightforward. Simply write it down under the appropriate column for bit values and add together the value of all the columns in which a 1 occurs. For example, given %10010101 you translate as follows:

```

      128 64 32 16 8 4 2 1
%    1 0 0 1 0 1 0 1
→ 128+16+4+1=149

```

Going from denary to binary is not at all difficult, but is rather hard to put into words. You do it by subtracting from the number you want to encode the value of each column in turn, starting with the highest i.e. 128, 64, 32 and so on.

If you can subtract a particular column value you put a 1 in that column and continue to subtract the next lower column value from the remainder.

If you cannot manage the subtraction you put a 0 in that column and try to repeat the subtraction with the next lower column number.

So, starting with the highest column number (128 in our case), you:

1. Attempt to subtract the relevant column number (highest first).
2. If you succeed THEN put a 1 in that column number and continue to subtract other columns from the remainder. Otherwise, put a 0 in that column.

Figure 31 should make it clearer. In practice, when faced with encoding a number from binary to binary I tend to do it in my head, seeing which column values will add together to make the sum required, starting with the highest first.

For example, if I want to encode 161 in binary I would say, "Well, I can use 128, so that leaves me 33 to find. 33 can be made up of 32 and 1 so that does it: 128+32+1=161. So I encode it as:

```

      128 64 32 16 8 4 2 1
%    1 0 1 0 0 0 1
= %10100001

```

After a while you'll find this way quite simple.

To finish off, I'll leave you with a program to print out the binary value of a number between 0 and 255 (i.e. that can be stored in one byte). Try it with various values and see if you can

```

10 REM *100
20 DEFINT B
30 OPEN "01,4,4,0,0"
40 ? COM=11200
50 POSITION 0,1
60 PRINT "NUMBER:"
70 INPUT NUMBER
80 IF NUMBER<0 OR NUMBER>
  255 THEN GOTO 40
90 POSITION 0,10
100 FOR LOOP=7 TO 0 STEP -1
110 ANSWER=NUMBER/2:LOOP
120 IF ANSWER=1 THEN NUMBER=
  ANSWER/2:1:1:PRINT 100
130 ? " ";
140 NEXT LOOP
150 POSITION 0,10
160 ? "ANY KEY FOR NEXT NUMBER"
170 GET KEY:GOTO 100
180 GO TO 40
190 CLOSE 01

```

accept the results.

The program itself uses one or two ideas that may not be too familiar to you as yet.

Worry not, future articles in *Atari User* will cover them. Watch this space...

```

148
-128 128 goes - set bit 1
  20 64:32 can't go - set bit 0
-16 16 goes - set bit 1
   4  4 can't go - set bit 0
   -4 4 goes - set bit 1
   -8 8 can't go - set bit 0
   -1 1 goes - set bit 1
   0

```

128	64	32	16	8	4	2	1
1							
	0	0					
			1				
				0			
					1		
						0	
							1
%	1	0	0	1	0	1	0

Figure 31





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**PETE BIBBY** examines the  
**Atari's sound chip and**  
**reports, regretfully . . .**

AS you'll already know, your Atari micro is a clever little beast. One of the cleverest things about it is the sound chip it contains which allows all manner of wonderful (and not-so-wonderful) noises to accompany your programs.

However there's always a fly (or is it a bug?) in the ointment of microcomputing. With Atari sound it's the fact that, at first sight at least, using the sound facilities needs an ID somewhere near genius.

In point of fact, when you take the time and trouble to get to know it you'll find that although the sound chip is complex, using it needn't be all that complicated. You just have to take it one step at a time.

However, at first sight all the PEEKs and POKEs and registers can be quite offputting to the would-be Atari musician. This is a pity because you can achieve a fair command of Atari sound using just one simple Basic command, the aptly named **SOUND** command. This is the one we'll be exploring in this article.

The **SOUND** command takes the form:

**SOUND channel, pitch, duration, volume**

Don't worry too much about the parameters following the **SOUND**. We'll deal with those later in the article. For the moment, drill to the sound of your Atari by typing:

**SOUND 0,200,10,0**

and pressing Return.

Unless you're deaf, you'll notice two things. The first is that the note produced comes from the television. If you don't believe me, try turning the TV's volume control and hear the difference.

The second thing you (and the rest of the family) will become aware of is the fact that the note carries on. And on. And on.

A quick glance at our formula for

# It sounds easier than it looks

the **SOUND** command shows that there is no parameter controlling the length of the note it produces.

Other micros have a duration parameter. The Atari has none. So when you enter a **SOUND** command directly into the micro the note just carries on.

By this time the note produced by:

**SOUND 0,200,10,0**

will probably be getting on your nerves. There are three ways to stop it, not counting a sledgehammer. The first two are either to switch off the micro or hit the Reset button. The trouble is that these are a bit drastic.

A much more elegant solution is to use:

**SOUND 1,0,0,0**

which in effect tells channel 0 to shut up. But now I'm getting ahead of myself, as we haven't met channels yet.

As you'll know from some of the games you've played, your Atari isn't limited to playing just one note at a time. It can produce some quite complex harmonies using up to four notes simultaneously.

This is possible because the Atari's sound chip has four channels, each channel being able to produce a separate note.

The channels are numbered from 0 to 3 and we select which channel a **SOUND** command uses by putting the appropriate number in its channel parameter. So ignoring the other

parameters which we'll come to shortly:

**SOUND 0,200,10,0**

used channel 0 while:

**SOUND 2,200,10,0**

plays its note on channel 2. Notice that to switch off the sound, you have to use:

**SOUND 0,0,0,0**

for channel 0 and:

**SOUND 1,0,0,0**

for channel 2.

The more suspicious of you may think I'm cheating. After all the note was the same on both channel 0 and channel 2. Maybe there's only one channel.

For the Doubting Thomases among you I'll jump ahead a little and use some of the other **SOUND** parameters to play a short using notes on all four channels.

**SOUND 0,245,10,0**

**SOUND 1,192,10,0**

**SOUND 2,342,10,0**

**SOUND 3,128,10,0**

Now do you believe me? If you switch off the notes with:

**SOUND 0,0,0,0**

**SOUND 1,0,0,0**

**SOUND 2,0,0,0**

**SOUND 3,0,0,0**

you'll not hear the four channels, if you see what I mean.

So to sum up, we've found that we



can use the **SOUND** command to make a noise on one or more of four sound channels. This noise carries on until we switch it off with the appropriate:

**SOUND channel, R, I, J**

where channel takes a value from 0 to 3.

Incidentally, have you tried using other channel numbers such as 5 or -12? It's not allowed. You'll find you get an error 3 message.

When we played our four note chord earlier you may have noticed that each **SOUND** command had a different pitch parameter. Channel 0 had a pitch parameter of 242, channel 1 had one of 193 and I leave it to you to figure out the pitch parameters for the remaining two channels.

It's the pitch parameter that decides how high or low the note is going to be. It can take values from 0 to 255. The bigger the number the lower the note produced, the smaller the number the higher the note. Enter:

**SOUND 2,246,18,0**

and, after a short delay:

**SOUND 1,14,18,0**

and you'll hear what I mean.

For the musically inclined, the range of values from 0 to 255 gives over three octaves with middle C being equal to 121.

The trouble is that there is no standard increment or decrement in the pitch parameter which corresponds to a semitone. You either have to look them up in a table or play them by ear. I prefer the second technique.

There is one rule that the pitch parameter does follow, and that is the rule of octaves. If you halve the value of a pitch parameter you get the same note an octave above. If you can't follow that, or don't know what an octave is, playing:

**SOUND 0,246,18,0**

followed successively by:

**SOUND 0,123,18,0**

**SOUND 0,58,18,0**

**SOUND 0,29,18,0**

should show you.

The more inquisitive may wonder what happens if you carry on the above experiment and enter:

**SOUND 0,12.5,18,0**

Try it and see. The Atari expects

whole numbers in the pitch parameter. In this case it rounds 12.5 up to 13.

As we've said, the pitch parameter can vary from 0 to 255, with 255 giving the lowest note, 1 the highest and 0 silence. What happens if we wander outside this range?

If we use a negative pitch parameter, the micro doesn't like it and comes back to you with an error 3 message. However, if we use a number higher than 255 then, rather than bring things to a halt, the micro keeps on taking 256 away from the excessive pitch parameter until it is within range. More technically, it takes the pitch parameter MOD 256.

Hence:

**SOUND 2,246,18,0**

produces the same note as:

**SOUND 2,44,18,0**

and:

**SOUND 2,254,18,0**

even though the pitch parameters involved are vastly different.

Now that we've got halfway through the parameters of the **SOUND** command, let's use them in a program such as Program 1. Type it in and Run it.

**10 RUN PROGRAM 1**

**20 SOUND 0,242,18,0**

**30 SOUND 1,193,18,0**

**40 SOUND 2,182,18,0**

**50 SOUND 3,128,18,0**

Not very exciting, is it? It's all over in a flash.

What has happened shows us the way the **SOUND** command differs according to the circumstances in which it is used. When it's entered directly into the micro, as we were doing up until Program 1, the notes produced just carry on and on until we stop them or play another note on that channel.

However when we use them in a program the notes produced last only as long as that program. When the

program ends, so does the note.

Try extending the life of Program 1 with a delay loop such as:

**40 FOR DELAY=10 TO 10000: NEXT DELAY**

and you'll hear the chord.

This is the method of getting round the afore-mentioned lack of a duration parameter. Careful use of varying delay loops can ensure that the notes produced by a **SOUND** command are as long or short as we desire.

But enough of this making up for a parameter we lack, there are still two parameters we haven't discussed yet, involving distortion and volume.

The distortion parameter actually distorts the sound played by a channel. Taking values that range from 0 to 14 in steps of 2, it's the distortion parameter that allows the Atari to produce all the special effects sounds like explosions and machine guns.

Program 1 will let you hear it at work. Try it out with notes of pitch other than 255 and hear its effect.

**10 RUN PROGRAM 11**

**20 FOR DISTORT=0 TO 14: STEP 2**

**30 PRINT DISTORT**

**40 SOUND 0,246,DISTORT,15**

**50 FOR DELAY=10 TO 10000: NEXT DELAY**

**60 NEXT DISTORT**

You'll notice that a distortion of 10 gives an almost pure note, hence I've been using it in the examples so far. A distortion of 14 is also acceptable as an undistorted tone.

As before, if you use a negative distortion you're rewarded with an error 3 report for your pains. If you use values outside the range you'll find that the Atari uses the distortion MOD 15. This means that:

**SOUND 0,246,24,15**

produces the same note as:

**SOUND 0,246,9,15**

The final parameter in the **SOUND** D

## ERROR 3

*If we use a negative pitch parameter the micro doesn't like it*



If you've enjoyed Pete Kirby's introduction to the SOUND command, here's a program to give you some ready-made sounds.

We've included 12 sounds, but you can easily alter them to suit your own tastes.

The names displayed in the menu can be altered in lines 130-150 and the sounds themselves are identified by a REM statement. They start at line 600 and are pointed to by the GOTO SOUND in line 180.

# SOUNDS INTERESTING

```

10 REM SOUNDS INTERESTING
20 REM (REM)
30 SCREEN=12800
100 GRAPHICS BYMODE 700,1:MODE 710,170
110 GOSUB 1200:MODE 710,170:GOTO 2100
200 BY 1,0:MODE 700,15
310 POSITION 17,0:PRINT "SOUND"
410 POSITION 12,0:PRINT "CONCENTRATION"
510 MODE 81,10
600 POSITION 10,7:PRINT "BOUNTING BALL"
710 PRINT "COMPUTER THINKING"
800 PRINT "COMPUTER"
900 PRINT "CAR ENGINE"
1000 PRINT "SOUND"
1100 PRINT "SOUND"
1200 PRINT "SOUND"
1300 PRINT "SOUND"
1400 PRINT "SOUND"
1500 PRINT "SOUND"
1600 PRINT "SOUND"
1700 PRINT "SOUND"
1800 PRINT "SOUND"
1900 PRINT "SOUND"
2000 PRINT "SOUND"
2100 GOTO 200

```



## From Page 47

statement governs volume and it ranges in value from 0 to 15. The loudest note is given by a value of 15, the quietest by a value of 0 (unless you count 0, which gives silence, as the quietest).

A negative volume brings the old familiar error 3 report, while volumes of 16 and over just produce silence.

One point to remember is that the 0 to 15 range is relative. The actual loudness of the note produced depends on how loud you have the volume on your TV. If you don't follow that, try turning the TV sound down very low and playing:

**SOUND 1,100,10,15**

and then turning the volume up. The note gets louder even though the volume parameter is still the same.

And that's more or less the end of our exploration of the SOUND

command. Table 1 sums up the values that the parameters can take.

As you've seen, and heard, it's not that hard to grasp, and simple tunes should be within the scope of beginners to programming.

And if you can't be bothered to write your own tunes, Program 18, a random music generator, will do it for you. What seems utter rubbish at first becomes surprisingly soothing as you listen to it.

If you're feeling adventurous, try distortions other than 10. You could become a big noise in the world of Atari sound!

```

10 REM PROGRAM 111
20 FOR I=1 TO 100
30 CHANNEL=(INT RAND*10)
40 PITCH=(INT RAND*1000)
50 VOLUME=(INT RAND*10)
60 DELAY=(INT RAND*1000)
70 SOUND CHANNEL,PITCH,10,VOLUME
80 FOR LOOP=0 TO DELAY:NEXT LOOP
90 NEXT I

```

Program 11

channel	pitch	distortion	volume
0 to 9	0 to 2000	0 to 14 (in 2's)	0 to 15

Table 1: SOUND parameter values





# STING...

399 T CHIRPCHIRPCHIRP 1/8  
400 BGM BOUNCING BALL  
405 FOR T-1 TO BGM T-1 TO 5  
410 SOUND B,1/8,1/8,1/8  
415 NEXT 0  
420 SOUND B,1/8,1/8  
425 FOR T-1 TO BGM NEXT 7  
430 NEXT 1  
440 RETURN  
450 BGM COMPUTER THINKING  
460 FOR 111 TO 100  
470 SOUND B,1/8,1/8,1/8,1/8,1/8,1/8,1/8  
475 NEXT 2  
480 SOUND B,1/8,1/8  
490 RETURN  
500 BGM JACK HAMMER  
510 FOR 111 TO 100  
520 SOUND B,1/8,1/8,1/8,1/8  
530 NEXT 2  
540 SOUND B,1/8,1/8  
545 RETURN  
550 BGM FOOTSTEPS  
560 FOR 10001 TO 10  
565 SOUND B,1,1/8,1/8  
570 FOR 101 TO 100 STEP 5  
575 SOUND 1,1/8,1/8  
580 FOR 111 TO BGM NEXT 5  
585 SOUND B,1/8,1/8  
590 NEXT 1  
595 SOUND 1,1/8,1/8  
600 RETURN  
605 BGM CAR HORN  
610 SOUND B,1/8,1/8,1/8  
615 SOUND 1,7/8,1/8,1/8  
620 SOUND 2,1/8,1/8

640 FOR 111 TO BGM NEXT 5  
645 SOUND B,1/8,1/8,1/8,1/8,1/8,1/8,1/8  
650 RETURN  
655 BGM HORN  
660 FOR 111 TO 10  
665 SOUND 2,1/8,1/8  
670 FOR 111 TO 10  
675 NEXT 1 NEXT 1  
675 FOR 111 TO 5 STEP 11  
677 SOUND 2,1/8,1/8  
680 FOR 111 TO BGM NEXT 1  
685 NEXT 2  
690 SOUND 2,1/8,1/8  
695 RETURN  
700 BGM GUNSHOTS  
705 FOR T-1 TO 1  
710 SOUND B,1/8,1/8,1/8  
715 FOR 111 TO BGM NEXT 1  
720 SOUND B,1/8,1/8  
725 FOR 111 TO BGM NEXT 1  
730 NEXT 1  
740 SOUND B,1/8,1/8  
745 RETURN  
750 BGM HORN  
755 FOR 111 TO 10  
760 FOR 111 TO 10  
765 SOUND 2,1/8,1/8  
770 NEXT 1  
775 NEXT 1  
780 NEXT 1  
785 SOUND 2,1/8,1/8  
790 RETURN  
800 BGM APPLAUSE  
805 FOR 111 TO 10  
810 SOUND B,1/8,1/8,1/8

815 FOR 111 TO BGM NEXT 5  
820 SOUND B,1/8,1/8,1/8  
825 FOR 111 TO BGM NEXT 5  
830 NEXT 1  
835 SOUND B,1/8,1/8  
840 RETURN  
850 BGM POLICE CAR  
855 NEXT 1  
860 FOR 111 TO 100  
865 BGM  
870 IF 10000101 THEN 875  
875 SOUND B,1/8,1/8,1/8,1/8  
880 NEXT 1  
885 SOUND B,1/8,1/8  
890 RETURN  
900 BGM FALLING MISSILE  
910 FOR 111 TO 100  
915 FOR 111 TO 1  
920 SOUND 2,1/8,1/8,1/8  
925 NEXT 1  
930 SOUND 1,1/8,1/8  
940 RETURN  
945 RETURN  
950 BGM GUNSHOTS  
955 FOR 111 TO 100  
960 SOUND B,7/8,1/8,1/8  
965 SOUND 1,7/8,1/8,1/8  
970 NEXT 1  
975 SOUND B,1/8,1/8,1/8  
980 SOUND 1,1/8,1/8,1/8  
985 RETURN



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



ENGLISH Software has released three volumes of *Atari Smash Hits*, but we've only had Volumes 2 and 3 seen for review so I won't be saying much about Volume 1.

All three volumes contain Jet-Boot Jack, probably the best-known of the games. In fact, if you haven't already got Jet-Boot Jack it might be worth buying one of these volumes to fill the hole in your collection.

In addition to being a good game, it has several features which other manufacturers would do well to copy, like the facility to set the skill level and the option to skip lower levels.

As well as Jack, Volume 2 contains four other games to keep you amused. There're not all arcade games either.

*Scatter!* is an adventure game in which you play the part of Special Agent Sam — even if you are a woman! You've been dumped on a strange planet and your mission is to return home safely.

The game uses fairly simple line drawings on the top half of the screen, with the location descriptions and commands appearing on the lower half.

There's a Help facility if you're stuck, although the hints aren't always very useful, and the game can be saved and retrieved at any point.

Meanwhile, back at the joystick, *Diamonds* casts you in the role of Digger Dan the prospecting man. Your task is to collect all the diamonds while avoiding such characters as Blaise the Blob and Phil the Filth.

There are 18 levels so it will keep you busy for some time. There's a pause facility which I found essential so I could have a rest — not, because the game seems to be very slow at reading the joystick — as though it's written in Basic! This resulted in my applying extra pressure, hence the need for a break.

The *Adventures of Robin Hood* is not actually an adventure game. Robin's task is to collect the bags of silver and kiss Maid Marian while avoiding the arrows of the Sheriff's men.

He moves along a horizontally scrolling landscape and

# SMASH HITS 3 COLLECTS THE LOLLIPOP



has an amazing ability to climb up trees and buildings. As the levels increase, so do the number of bags of silver to be collected. The skill level can be selected.

I must admit I got bored very quickly with this one, despite the interesting Old English computer music.

*Chained Warrior*, the last of the lot on Volume 3, is a two-dimensional scrolling maze which you must explore in order to defuse the cyclotron bombs. Since only part of the maze is visible on the screen, you've got to remember where the fuel dumps are.

Your fuel is used up at an alarming rate — a bit like driving a Range Rover. Also, coming into contact with the walls uses more fuel, and there

are security robots to avoid.

It's a familiar theme, reasonably well implemented. The only thing which spoiled the game for me was the fact that when you come in contact with the wall, the whole screen judders. After a while, this had a horrible effect on my eyes. Still, I'll play it a bit and ask one eye!

After the obliging Jet-Boot Jack, Volume 3 gets under way with *Alphabike 2* by Rocket Raid, out of Birmingham. Unlike some versions, this one gives you a limited supply of missiles and bombs.

It's a good game if you like that sort of thing — which I do. What a pity the demo mode crashes by flying through every obstacle, otherwise you might have gleaned some hints on

strategy. Still, it's nice to see what evil awaits you at the further reaches.

*Barry Ballant* was a delightful surprise since I hadn't encountered it before. It sounds simple — you have to build a wall by catching bricks as they fall off a conveyor belt.

However, to be successful requires speed, accuracy and some strategic thinking. The bricks drop quite fast and are deadly if they hit you. In order to catch them, you must be directly below with your arms raised.

There are four shades of brick and in order to maximise points you must build the wall in a set pattern. If you don't throw the bricks accurately, they don't always end up where you intended and may



well spoil the pattern.

You must also consider the pattern in deciding whether to catch any particular brick, or be quick to move out of its way.

On level 1 you only have the bricks to contend with. On higher levels — there are eight altogether — there are boxes of TNT (moving around) your legs to make life difficult.

The TNT makes level 2 a lot harder than level 1 — I would have preferred a more gradual transition between levels. Even so, it's still a good game.

By including *Breakin' Dr. the Dragon*, Volume 3 uses a technique borrowed from the record industry. It's not uncommon for a 'greatest hits' album to contain one previously-unreleased track, so why should software houses be any different?

The game is a sort of adventure game but requires arcade-type skills. You are trapped in the inner circle of a double maze which you must explore in order to find enough provisions to see you through the water maze — always assuming you can find the door.

The dragon is just one of the hazards to be avoided as you roam around. The walls and ceilings are fatal to the touch, as are the middle false teeth, the giant spiders and other assorted nasties.

It's one of those games which take a while to develop since you learn the various skills by jumping over the obstacles without hitting the ceiling.

The instructions leave you to work out the various possible movements and it was a while before I realised I could be down... not be me at all.

Once you get the hang of it there are six selectable skill levels to keep you busy into the night.

Finally on Volume 3, *Hyperion's Daughters* await rescue by an intrepid aquaman who abducts anyone "through the gills on the side of his neck". I suppose if you're going to have gills, you might as well have them there.

You are armed for battle I see (lance?) with an unlimited supply of harpoons with which

to do battle. The foes include sucker plants, an octopus which only gets stunned by the harpoons, and killer amoebae.

The action obviously takes place off shore from *Saltfield* because the amoebae are as big as the aquaman himself. Biology aside, though, the game is challenging enough to

be fun.

The cassette version of each volume costs £14.95 with the equivalent discs being £17.95. Of the two volumes I've looked at here, I prefer Volume 3 and would consider it much better value. It contains five games that I'd play again, which works out at

about £3 a game on the tape.

I'd only go back to four of the games on Volume 2, but because it contains a 'traditional' adventure it might well appeal more to some people than Volume 3. Either way, you play your money and you get a fair bit of choice.

Dave Russell

## The Silicon Dream gets off to a pretty good start

If you go by the number of locations, *Snowball* must be one of the biggest adventure games ever. It boasts over 7,000 of them, but fortunately you don't have to map the complete set.

According to Level 9, the action takes place aboard a starship that could actually work. Not having the facilities to check this statement, I'll take their word for it.

The *Snowball* is an aptly-named interstellar freighter ship containing two million frozen colonists. You play the part of Special Agent Kim Kimberley, woken while the ship is in transit.

The fact that you've been woken means that something is wrong. It's your job to find out what's happened and save the lives of the passengers.

Being based on a 'waking reader', the procedures to be saved in *Snowball* are logical rather than magical. However, as the manual suggests, some of the technology used might be described as magical in 1980's terms.

You start the game in your cabin and your first problem is to get out of it. Pretty soon you

encounter the flightingales, a lethal variety of robot that polices the starship corridors.

The game follows the classic adventure style in that you are awarded points for certain actions. There is a maximum score of 1,000, but you can complete the game with a less than perfect score so it's not like having to collect a given number of 'treasures'.

Level 9 have developed a powerful gaming system, so your input can be a bit more than Get Saved or Kill Dragon. You can even use IT to refer to the object of the previous command, which saves a lot of time in the long run.

Having said that I noticed some anomalies. If you want a break from the game itself, find a safe location and try typing in the alphabet a letter at a time.

Some care has obviously gone into creating the character of Kim because even with a picture on the cover of the manual and a personality profile inside, it's not clear whether Kim is male or female. This means that no matter who is playing the

game they can think themselves into the role.

I really appreciate this aspect — you've no idea how fed up I am of pretending to be a baby-armed yobbo.

In fact I really enjoyed playing *Snowball* and would recommend it to anyone who likes a good adventure and is fed up with chesses and words.

My only complaint is that BBC Micro-owners get a better deal. Presumably for the use of some clever interrupt programming, the best version of the tape plays a lovely tune while loading.

Given that the official *Level 9* tape deck has an audio channel as well — which the 'conversional' series of language manuals put to good use — Level 9 could have included the tune without even needing the clever programming.

*Snowball* is the first of a Silicon Dream trilogy. The second in the series, *Return to Eden* is now available and it's as enjoyable as *Snowball* it's be out of circulation for the next few weeks.

Elizabeth Dennis





# Life gets hectic when Drop Zone is running

ONE of the best measures of a good arcade game is the crowd that builds up around you while you're playing it.

Every time I loaded **Drop Zone** from U.S. Gold, people gathered around me in the office and wanted to play it. Some of them even scored more than me, which meant I had to keep playing just one more time.

The object of the game is to protect the man on the planet from the invading aliens and return them one by one to the Dragonair where the landing pad is located.

As the press release admitted, the game comes out of the Defender mould. Instead of the usual space-ships, though, you have a Jetpod type of character who shoots from the tangle!

The 3-D landscape looks like it was constructed from the pictures that the Mariner (or was it Voyager?) mission sent back. It's a Martian red, and it looks beautifully as you zoom around.

Not that you get much chance to zoom around once the alien forces catch sight of you. The explosion when you catch up is what the blurb calls a "volcano" - like an expensive firework - and had several of the onlookers asking me to get killed off so they could see it again.

Beyond the landscape is your "high speed scanning vision" - a sort of radar in which you can see where the aliens are. I decided it's called "high speed" because unless I looked at high speed the aliens caught me while I was still taking the information in.

You need to sit close to the keyboard in order to make use of the cloak and mine bombs. Although you have unlimited fire-power, the cloak runs out quite quickly and you only get three bombs.

Score over 10,000 points and you get another life and another bomb. The cloak is replenished as you complete each level.

You'll need to exceed 10,000 to get in the hall of fame too, but it's worth the effort to see the colour display



as you enter your initials.

If you're an arcade freak like me, you'll love **Drop Zone**. It will set you back £14.95 for the disc version or £9.95 for cassette, and you need at least 40k. I fail to see why the disc should cost £5 more, but the tape is worth it if you can stand the 15-minute wait while it loads.

Come to think of it, you might as well use the waiting time to relax - life will be pretty hectic once **Drop Zone** is up and running.

**Curt McNeigh**



I THINK it's true to say that there aren't that many games around where you can bounce off a 60 foot high camel while trying to blast it with your speedster's neutron cannon.

If there are other games in which you can do this, chances

are that they come from Jeff Minter's UtopiaSoft, as does **Attack of the Mutant Camels**.

This is a simple shoot-em-up arcade game, simple in concept if not in play. You have to shoot the six camels before they overrun the sector. It's the difficulties which make it a challenging, and therefore enjoyable, game.

For a start, control of your speedster is not easy. Moving the joystick to one side turns the ship and starts it accelerating in the corresponding direction. Trouble is, once it is moving the ship has inertia. Suffice to say that control takes a bit of practice.

The camels need shooting more than once, and they shoot back. If you collide with one, you bounce off with tremendous force. If you're between two camels when you collide, you can be bounced back and forth. Bouncing is not to be recommended because it depletes your shield.

If you can clear the six camels you then enter hyperdrive. Whereas in most games this would simply lead to the next level, in **Mutant Camels** the hyperdrive is a challenge in itself.

After a warning, you start to accelerate across the landscape and a rocket barrage comes toward you. If you don't successfully dodge all the rockets you lose a ship and must clear the same sector again.

Before play starts you can choose from six levels of difficulty ranging from "Real Cool" to "Like Worm". The colour of the landscape reflects the level, from an icy blue to a scorching crimson.

**Attack of the Mutant Camels** is a difficult game to master even at the lower levels, and I enjoyed trying. The tape costs £7.50 and is for as I know it isn't available on disc.

**Tony Larkin**



HAVING seen the Commodore 64 version of **Haver Beaver**, I jumped at the chance to review it for Atari Quest. Maybe my expectations were too high, but I have to say I didn't like it.

I loved the storyline and the introductory cartoon. The music was fine for the first hour anyway. It's just that I found the game almost unplayable. It didn't seem to respond to the joystick, so much so that I even began to think my joystick was faulty.

But as soon as I loaded another game the joystick seemed fine, so I have to conclude it was **Haver Beaver**. The game is set in the English garden where Gordon Bennett is trying to mow his lawn. He's borrowed his neighbour's machine, and the neighbour wants it back.

There's a whole strategy to be worked out based on the behaviour of the various people, the nature of the mower to overhaul, and the necessity to keep an eye on the Dog Laysies and Dog Tolerances displays at the bottom of the screen.

I don't think the loss of **Haver Beaver** is good and I can appreciate the strategic elements even though I hardly get chance to try them out.

The packaging boasts "You've never played a game like this before", and I have to agree! At £7.90 you should try before you buy.

**Pat Coakley**







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# 6502

## **MIKE COOK takes you on a conducted tour of the Atari micro's power house**

**LIFT** the bonnet of many Formula 1 racing cars and you are likely to see the same engine. OK, the chassis is different, the suspension, gearbox and body are all different, but most of the engines are the same.

This is also true with personal computers. The microprocessor, the power house of your computer, is the same on many different models. So let's take a look at it and see how it shapes the rest of our machine.

There are two microprocessors which go to make the vast majority of computers — the Z80 and the 6502. In the Atari range the 6502 is used.

This is the same microprocessor as used in the Apple II, Pet, BBC and Electron, to name a few. They all share the same engine.

A beginner is often puzzled why they don't all share the same software. Well the answer is simple. They all have different electronic "bodies" wrapped round them, just like the racing cars.

This makes software written for one machine totally incompatible with any other machine. Let's see how this comes about by looking a little deeper into the structure of the 6502.

The 6502 microprocessor was first manufactured by MOS Technology in the early 70s so it is now well over 10 years old. However that does not mean that it is out of date or old technology, as some so-called experts think. The processor was so advanced when it was designed that only recently has technology been able to make full use of all its features.

It was designed as an improvement on the Motorola 6800 and made some radical changes. The

improvement which was to prove the key to its success was not the power of its software instructions but the ease in which it could be made into a system. That is, it could be made into a computer with the addition of very few extra chips.

This made it the natural choice for early computers like the Apple (yes it really did exist) and the Apple II. Eventually the company that made it was bought out by Commodore, the makers of the Pet.

Given this foothold of popular computers using the processor, quite a number of people became very proficient at programming it and so they chose it for the next generation of computers.

This was possible because the software instructions the processor obeys have turned out to be remarkably powerful. These instructions are known as the instruction set, and ultimately govern the power of the machine because everything the computer does must eventually be broken down to these basic instructions. The fewer instructions you need to express a problem the faster the machine will go.

These instructions are very simple, involving operations like moving data from one place to another or adding up two small numbers. Most real things you want to do need lots of these "mini" instructions.

Take, for example, a program to print "Hello" on the screen. It is likely that this would take about 30 instructions. To see why this is so we will need to look at how the microprocessor views the outside world.

To a 6502 the rest of the world looks like lots of different pigeon

holes or memory locations. It can only cope with one of these at a time.

It signals to the electronics surrounding it which location it wants to access by setting the address of the location on 16 signal wires.

Each signal wire can be in one of two states, with a voltage on it (5 volts) or with no voltage on it (0 volts). We call these states one or zero. Yes, 0 volts is called zero! You see, if we called it 5 then that would imply there was 4, 3, 2 and 1.

These voltage levels cannot exist in the circuit. The circuit can only be in one of two states — that's why we call it a binary condition.

As there are 16 of these address signal wires there are a lot of combinations of zero and one that they can be in. In fact if you walk it out this comes to 65,536, or as we say in the jargon 64k. This is because 1k is 1024, a sort of baker's dozen version of 1000.

So anything connected to the microprocessor must fit into this 64k of address space. The wires that signal this address are known collectively as the address bus.

Up till quite recently 64k was a vast amount of memory, quite over and above anything that was practicable or affordable.

I remember in 1978 getting a memory board for one of my computers containing 4k of memory which cost twice as much as the Atari 800.

Even so I was impressed at how cheap it was, as it represented quite a big breakthrough at the time.

Nowadays you can get 64k of memory in just two chips, so you see



that technology has only recently caught up with the capabilities of this microprocessor.

The microprocessor examines the memory locations by means of eight signal wires. These carry information to and from the locations in the same sort of binary (one and zero) signals used on the address bus.

As these wires carry the information or data they are known collectively as the data bus. So if the microprocessor wants to look at a memory location it puts the address onto the address bus and reads the contents off the data bus.

Conversely, if it wants to store some information it again places the address on the address bus and the data it wants to write onto the data bus.

It is up to the electronics surrounding the processor to service its needs by taking or placing the data on the bus.

So the processor sees everything simply as memory locations. All the devices that make up the computer have to be allocated their own unique address or range of addresses.

This applies to the keyboard, the screen, cassette recorder, joystick and whatever else goes to make up your particular computer. If designers choose to put these components in different places, or have a different role of components, their invariable software becomes incompatible.

As well as the external memory locations, the processor has inside it some internal memory locations. These are called registers, and each one is not given a numbered address but a name.

Admittedly they are not very imaginative names, but they suffice. They are called A (or the accumulator), X, Y, PC (program counter), S (stack) and SP (stack pointer).

Each has its own use and every instruction that the processor can execute involves one or more of these registers. They are shown in Figure 1. Let's take a look at what they are used for.

The program counter is the only 16 bit register, and it is used to hold the address of the next instruction. The processor puts this out onto the address bus and fetches the data in that location.

This is in the form of a coded

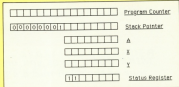


Figure 1: The 6802 registers

instruction but before that instruction is executed the program counter is incremented to point to the next instruction.

This can be complicated by the fact that a complete instruction can be stored in one, two or three successive memory locations.

The first part of the instruction contains the information concerning how many other locations are involved. In this way the program counter looks after itself without any intervention from the programmer.

If any data needs to be moved or manipulated then the accumulator is used. There are instructions to move data from a memory location to the

accumulator and vice versa.

The X and Y registers are known as index registers and are used to point to other memory locations. This means that the program can calculate the memory locations to operate on instead of them being fixed when the program was written. This gives the instruction set most of its power.

The way the address of memory to work with is arrived at is known as the addressing mode. The 6802 has quite a few of these and they are at the root of its power.

The stack pointer is a bit like the program counter, only it points to an area of memory used for temporary storage. It is restricted in that it can only cover 256 memory locations at a fixed address. This register looks after itself most of the time and can usually be left alone.

The status register is different from the rest in that it does not contain numbers as such but a collection of bits. Each bit has its own name and significance.

Whenever any operation takes place the individual bits in the status register change to reflect it. Suppose, for example, we subtract two numbers and the result is zero, then the zero flag (single bit of the register) would be set.

The point is that all the conditional instructions work off this status register. For example, if you want to skip a section of code if two numbers are the same, you would use a "Branch if Equal" instruction which causes a specified number of address

**“If the micro-processor wants to look at a memory location it puts the address onto the address bus”**

accumulator and from the accumulator to memory. Data cannot be moved directly between memory locations.

While data is in the accumulator it can be manipulated. This can mean having a value added, subtracted or having individual bits changed. The instruction set also allows multiplying or dividing by two. All other



locations to be skipped if the zero flag is set. This then alters the program counter and causes the next instruction to be fetched from further down the program.

The art of using the instruction set to get the computer to do anything is quite involved, and many books have been written concerning machine code programming.

Let's finally look at some of the other features of the 6502 micro-processor.

There are three signal pins on the processor which can interrupt the program currently being executed. With two of these signals the program can recover and continue executing as if nothing had happened. These are known as the interrupt signals.

The simplest unrecoverable interrupt is the reset. Whenever this is triggered the processor will go to a certain address location and look for a

number.

This number it will take as the address to start fetching and obeying instructions. This is the restart address.

The reset line is automatically pulsed on power up by the surrounding electronics. As the reset is told where to go by a memory location we say the interrupt is vectored.

Two other interrupts are also vectored, the IRQ (interrupt request) and the NMI (non maskable interrupt). The difference is that the NMI is always obeyed whereas the IRQ can be ignored if the processor has executed an instruction to set a certain bit in the status register, the interrupt inhibit flag.

These interrupts on earlier computers were ignored, but they can be made to make the computer appear to be doing many things at the same time.

For example, suppose we want to

see if a key has been pressed on the keyboard. We can arrange the program to keep looking at the memory location where the keyboard is located. Alternatively we can arrange for pressing a key to generate an interrupt, and then the program comes to see what key is pressed. Therefore we do not need to waste time looking at the keyboard when no key has been pressed.

The video display can generate interrupts to assist the smooth animation found in so many good games. Also the interrupt can be regularly triggered to keep track of time by implementing a real time clock.

Well that's a brief look at the engine inside your computer, the device that gives it the power. However remember it is the surrounding electronics that make your computer unique and give it the many added features not found on others.

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# Micro Scope

IN an occasional series we shall be taking a line-by-line look at a short program and finding out how it works.

We kick off with a program which uses the internal clock to time your reactions.

## No. 1 Reaction Timer

```

10 GOSUB 1000:PRINT "R"
20 PRINT "How fast are your reactions?"
30 GOTO 10
40 PRINT "When a letter appears in the
   control it is fed the screen, press an
   y key to see fast as you can." GOTO 10
45 PRINT "Press any key to start."
50 IF PEEK(254)=0 THEN GOTO 55
55 POKE 254,0
70 POKE 254,1
80 POKE 76:GOTO 100:GOTO 100:GOTO 100
90 FOR DELAY TO 1000:DELAY
100 POKE 254,0
110 POSITION 25,18:PRINT "R"
120 POKE 25,8:POKE 25,8:POKE 25,8
130 IF PEEK(254)=0 THEN GOTO 135
140 TIMER:POKE 100:POKE 100:POKE 100:POKE 100
150 POKE 254,0
160 POKE 254,0
170 PRINT "POSITION 6,4:PRINT "You
   took "TIMER" seconds." GOTO 10
175 PRINT "Another go?" INPUT Q
180 IF Q=0,1 THEN GOTO 10:GOTO 10:GOTO 10
190 IF Q=0,1 THEN GOTO 10:GOTO 10:GOTO 10
200 GOTO 100
210 GOTO 100

```

10 Dimensions the string Q5 and clears the screen.

20-40 Present instructions.

50 Waits for a key-press.

60 Clears out the value of the key pressed.

70 Inhibits the cursor so that it doesn't make the display messy.

80 Clears the screen and picks a random number between 1000 and 3000.

90 Waits for a delay determined by the size of the random number. If you wait for the same amount each time, people can quickly anticipate the onset of the signal and artificially reduce their reaction time.

100 A precautionary clear-out of the key-press location in order to avoid cheating.

110 Prints the signal letter in the middle of the screen.

120 Sets the clock to zero.

130 Waits for a key-press.

140 Looks at the clock location and calculates the elapsed time.

150 Clears out the key-press again.

160 Clears the screen and gives the reaction time.

170-190 Offer another go. Assumes that if the reply starts with the letter Y (upper or lower case) then the answer is "yes", and if it starts with an N (upper or lower case) the answer is "no". If it starts with anything else, ask the question again.

200 Ends politely.



*AFTER my micro has been sitting undisturbed for some time, why does my television begin cycling through a series of colours?* — **Steve Temple, New Ebbwasi, London.**

■ This cycling through a series of colours is called the "attract mode". This term is a left-over from the coin-operated games where it was previously used to attract customers.

Atari incorporated this feature, not to attract, but rather to protect the television screen from being permanently "burned" by any bright stationary image, which could only happen after many hours of displaying an image.

Atari designed to ensure your screen would be protected by including this feature in the design.

Thus, if you do not press a key for approximately nine minutes (even if you are using other inputs, for example joystick), your system will automatically initiate the attract mode and your screen will begin cycling through a series of colours.

This will not occur with Atari programs that only utilize input from the joystick or paddle controllers. These have been designed to go into the attract mode only if there is no joystick or paddle activity within the nine minutes.

## Cleaning up the heads

*DO I need to clean the heads of my disc drive? If so, how do I do it?* — **P. Jones, Bedford.**

■ The heads of your Atari disc

# What makes a micro get on its bike...

drive can be damaged by some disc head cleaning kits. We advise owners of these disc drives not to use any head cleaning disc.

Clean the head much as you would the head of a tape deck. Gently wipe the head with a bit of cotton, soaked in denatured alcohol.

Let it dry for 30 minutes before using the drive.

## Unattractive attract

*If I have designed my own game, how can I eliminate the annoyance of the attract mode when I am only inputting data into the system via the joystick or paddle controllers?* — **Quentin Brooks, Donborough, Northants.**

■ All you need to do is periodically reset the attract mode clock so that it never reaches the end of its nine-minute count. To do this, simply add a line with PEEK 17.0 at various points in your program.

Since this feature is an important one, you should not eliminate the attract mode entirely. Instead, you should include a routine in your program like the following pair of lines to determine if a

joystick has been used recently.

These two lines should be included at various points in your program.

```
IF J STICK=0 : IS THEN
  IN POK 17.0
```

The first line checks to see if the joystick is in the upright position (in other words, unmoved). If it is, the program will remain on this line and, after nine minutes, the attract mode will begin and thus protect your television screen.

If you have moved the joystick, the program will continue automatically to the next line. This line resets the counter so the attract mode will not begin for another nine minutes.

## Random selection

*I READ somewhere that the argument to the random function can be anything — it's a "dummy" argument. If this is the case, why does everyone use RND(0)?* — **Shawn Williams, Canterbury, Kent.**

■ You're right, the argument is a dummy so you could have RND(555) or even RND(333,333). Using a zero is purely convention, but it does have the advantage that it's quick to type, being on the same key as the right-bracket that you need to contain the argument.

## It doesn't blind you

*MY mother keeps telling me that I'm getting too close to the television screen. She says that it will make me go blind. Is this true?* — **Kevin Black, Opreighton.**

■ Only if you keep banging your head on the screen.

Kevin. To be serious, you shouldn't get too near as you could suffer eye-strain. Of course, the knob on the side of your TV can be used to control brightness. As with everything, moderation is to be recommended.

## Testing, testing

*I'M a bit confused about my 8000. Is it self test program.*

When I type BYE and put the memory test on, only 40 little green boxes appear under the word RAM. But the handbook says I should see 48.

Does this mean that some of my RAM is not good, and should I take my micro back to the shop where I bought it? — **Jim Connell, Prescott, Massachusetts.**

■ Your RAM probably isn't bad because if you type BYE you are already using some of it — the "missing" eight blocks are taken up by the Basic language which is built in to your 8000.

To see the full 48 blocks tested, use the other method which the manual gives by turning your micro on while holding down the Option key. This will produce 48 green blocks — unless some of the RAM really is bad, in which case the block will be red.

If this is the case, you should take the micro back to the shop where you bought it.

## User group hints

*I THOUGHT your readers might be interested in a few little tips I picked up recently at the local user group.*

The clicking sound from the

# ATARI USER

## Mailbag

We welcome letters from readers — about your experiences using the Atari micros, about fun 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 5NF



For each time you press a key can be suppressed with:

**POKE 731,255**

You can turn it back on again with:

**POKE 731,0**

To activate the international character set with:

**POKE 755,255**

To use the set displayed on screen, hold down Control as you press each key. To turn it off and return to normal use:

**POKE 755,254**

To slow down the rate at which the text screen scrolls, type in:

**POKE 632,255-63,0**

To turn it to normal, use:

**POKE 632,5**

You can alter the speed at which the cursor scrolls again as follows:

**POKE 730,1 Super fast**  
**POKE 730,2 Fast**  
**POKE 730,5 Normal**

I hope your readers can find some use for these. — David Scherberg, Tuley, Hunts

## Instant eradication

I WAS delighted to hear about the forthcoming magazine and wish you well. I decided to try and be one of the first people to write to you, but never expected fast as perhaps I am being a little ambitious.

I thought you might be interested in this little routine I wrote to enable unwanted lines to be deleted from a program.

The lack of a **DELETE** command on the Atari is a bit of a pain, and I've found this program (below) very useful.

All you do is attach it to the end of your listing by loading it

## Curses, no flashing cursor

I AM a BBC Micro owner but my son has an Atari and I quite often dabble on his machine. I am used to having a flashing cursor on the screen as I come up with this routine to put into the Atari.

I've had a good look round and this machine seems to be the only one without. — P. Jones, Bradford, Yorks.

■ Thanks for your offering. When testing it we also noticed that any inverse-video characters also blinked away quite nicely, which should give readers a hint about what you're doing.

If you want to make this into a subroutine, don't forget

```
10000 FOR C=0 TO 255:PRINT C:GOTO 10000
20010 READ B:B=7+7*B
20020 IF B=0 THEN GOTO 20020
20030 POKE 16392,B:GOTO 10000
20040 IF C=255 THEN GOTO 10000
20050 B=163,162,161,160,159,158,157,156,155,154,153,152,151,150,149,148,147,146,145,144,143,142,141,140,139,138,137,136,135,134,133,132,131,130,129,128,127,126,125,124,123,122,121,120,119,118,117,116,115,114,113,112,111,110,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,93,92,91,90,89,88,87,86,85,84,83,82,81,80,79,78,77,76,75,74,73,72,71,70,69,68,67,66,65,64,63,62,61,60,59,58,57,56,55,54,53,52,51,50,49,48,47,46,45,44,43,42,41,40,39,38,37,36,35,34,33,32,31,30,29,28,27,26,25,24,23,22,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,568,569,570,571,572,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588,589,590,591,592,593,594,595,596,597,598,599,600,601,602,603,604,605,606,607,608,609,610,611,612,613,614,615,616,617,618,619,620,621,622,623,624,625,626,627,628,629,630,631,632,633,634,635,636,637,638,639,640,641,642,643,644,645,646,647,648,649,650,651,652,653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668,669,670,671,672,673,674,675,676,677,678,679,680,681,682,683,684,685,686,687,688,689,690,691,692,693,694,695,696,697,698,699,700,701,702,703,704,705,706,707,708,709,710,711,712,713,714,715,716,717,718,719,720,721,722,723,724,725,726,727,728,729,730,731,732,733,734,735,736,737,738,739,740,741,742,743,744,745,746,747,748,749,750,751,752,753,754,755,756,757,758,759,760,761,762,763,764,765,766,767,768,769,770,771,772,773,774,775,776,777,778,779,780,781,782,783,784,785,786,787,788,789,790,791,792,793,794,795,796,797,798,799,800,801,802,803,804,805,806,807,808,809,810,811,812,813,814,815,816,817,818,819,820,821,822,823,824,825,826,827,828,829,830,831,832,833,834,835,836,837,838,839,840,841,842,843,844,845,846,847,848,849,850,851,852,853,854,855,856,857,858,859,860,861,862,863,864,865,866,867,868,869,870,871,872,873,874,875,876,877,878,879,880,881,882,883,884,885,886,887,888,889,890,891,892,893,894,895,896,897,898,899,900,901,902,903,904,905,906,907,908,909,910,911,912,913,914,915,916,917,918,919,920,921,922,923,924,925,926,927,928,929,930,931,932,933,934,935,936,937,938,939,940,941,942,943,944,945,946,947,948,949,950,951,952,953,954,955,956,957,958,959,960,961,962,963,964,965,966,967,968,969,970,971,972,973,974,975,976,977,978,979,980,981,982,983,984,985,986,987,988,989,990,991,992,993,994,995,996,997,998,999,1000
```

to change the END in line 20030 to RETURN.

in four seconds at disc, and then enter GOTO 20000.

You'll obviously have to increase the line numbers if they are not higher than those of your program.

Type in the first and last line numbers that you want deleting and the program does the rest — instant eradication.

You can, of course, use it to delete itself once you have deleted the last two lines (it'll have to be removed manually). — George Parker, Long Eaton, Notts.

## Breaking a bad habit

CONGRATULATIONS on the new magazine — I heard about it at the User Group. Can I be your first letter? I've got a problem that I don't like to admit to the wider bits of the group.

I'm a novice in computing and am having difficulty

with the keyboard. For being a typist, I seemed to do a bit better than the usual two-finger job as I've been trying to touch-type programs.

The trouble is I keep hitting the Break key by mistake when I mean to hit Return. Why do they put it like Break key so close to the other keys? It would have been much better away from everything else, wouldn't it?

Is it worth me making a cover for the Break key to stop me hitting it, or does someone sell one already? — John Cavanagh, Swinton, Manchester.

■ Sorry, you can't be our first letter — the grapevine is obviously very efficient in these parts.

Your problem will be solved once you've learned to touch-type, to keep practicing. In the meantime, the following routine incorporated into your programs will disable the Break key so that its accidental use won't jump you out.

```
10 SUPERFIND
20 IF PERIODIC THEN GOTO 30
30
40 POKE 16,0:GOTO 40
50 POKE 16392,0:GOTO 40
60 GOTO 16392,0:GOTO 40
70 GOTO 16392,0:GOTO 40
80
```

You can still use the Break key to jump out of a program, but you're not likely to hit it one accidentally.

If your program changes

graphics mode or writes to a disc drive or printer you'll need to execute this line again in order for the Break key to stop disabled.

If you do need to execute it several times, use the Global ... Return command to save repeating the lines.

As far as we know, nobody markets a cover for the Break key — if you move quickly you could corner the market!

## Noisy messages

MSG'S is a little program that prints out your messages one letter at a time in Mode 0,1 or 2.

The printing is also accompanied by some weird noises.

It isn't anything startling but the routine might come in useful for someone.

```
10 REM MSG'S
20 COMPACT 1
30 REM MSG'S
40 REM MSG'S
50 REM MSG'S
60 REM MSG'S
70 REM MSG'S
80 REM MSG'S
90 REM MSG'S
100 REM MSG'S
110 REM MSG'S
120 REM MSG'S
130 REM MSG'S
140 REM MSG'S
150 REM MSG'S
160 REM MSG'S
170 REM MSG'S
180 REM MSG'S
190 REM MSG'S
200 REM MSG'S
210 REM MSG'S
220 REM MSG'S
230 REM MSG'S
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**Abstract**

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<b>Operating Revenues</b>	\$7,000,000	\$7,000,000
Operating Expenses:		
Depreciation/Amortization	\$2,000,000	\$2,000,000
SG&A - Selling Costs & Admin. Exp.	\$2,000,000	\$2,000,000
Operating Income - Before Income Taxes	\$3,000,000	\$3,000,000
Income Tax Expense - (Income Multiplier 30%)	(\$900,000)	(\$900,000)
<b>Operating Profit</b>	<b>\$2,100,000</b>	<b>\$2,100,000</b>
<b>Operating Profitability</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit Margin</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Sales</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Assets</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Equity</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Debt</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Capital</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Assets</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Equity</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Debt</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Capital</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Assets &amp; Liabilities</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Equity &amp; Debt</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Assets &amp; Liabilities &amp; Equity</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Assets &amp; Liabilities &amp; Equity &amp; Debt</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Assets &amp; Liabilities &amp; Equity &amp; Debt &amp; Capital</b>	<b>30.00%</b>	<b>30.00%</b>
<b>Operating Profit to Total Assets &amp; Liabilities &amp; Equity &amp; Debt &amp; Capital &amp; Total</b>	<b>30.00%</b>	<b>30.00%</b>

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Accounting Period	Revenue	Expenses
Quarter 1	\$100,000	\$80,000
Quarter 2	\$120,000	\$90,000
Quarter 3	\$110,000	\$85,000
Quarter 4	\$130,000	\$95,000

Contractual period in years		2008-2009		2009-2010	
Median in sample	10	10	10	10	10
Median in subsample	10	10	10	10	10

	1999-01	1998-99
Gov. of Massachusetts	\$250.00	\$250.00
Gov. of New York	\$250.00	\$250.00
Gov. of New Jersey	\$250.00	\$250.00
Gov. of California	\$250.00	\$250.00
Gov. of Texas	\$250.00	\$250.00
Gov. of Florida	\$250.00	\$250.00
Gov. of Illinois	\$250.00	\$250.00
Gov. of Michigan	\$250.00	\$250.00
Gov. of Ohio	\$250.00	\$250.00
Gov. of Pennsylvania	\$250.00	\$250.00
Gov. of Washington	\$250.00	\$250.00
Gov. of Wisconsin	\$250.00	\$250.00
Gov. of Minnesota	\$250.00	\$250.00
Gov. of Indiana	\$250.00	\$250.00
Gov. of Kentucky	\$250.00	\$250.00
Gov. of Tennessee	\$250.00	\$250.00
Gov. of Mississippi	\$250.00	\$250.00
Gov. of Alabama	\$250.00	\$250.00
Gov. of Georgia	\$250.00	\$250.00
Gov. of South Carolina	\$250.00	\$250.00
Gov. of North Carolina	\$250.00	\$250.00
Gov. of Virginia	\$250.00	\$250.00
Gov. of West Virginia	\$250.00	\$250.00
Gov. of Maryland	\$250.00	\$250.00
Gov. of Delaware	\$250.00	\$250.00
Gov. of Connecticut	\$250.00	\$250.00
Gov. of Rhode Island	\$250.00	\$250.00
Gov. of Massachusetts	\$250.00	\$250.00
Gov. of New York	\$250.00	\$250.00
Gov. of New Jersey	\$250.00	\$250.00
Gov. of California	\$250.00	\$250.00
Gov. of Texas	\$250.00	\$250.00
Gov. of Florida	\$250.00	\$250.00
Gov. of Illinois	\$250.00	\$250.00
Gov. of Michigan	\$250.00	\$250.00
Gov. of Ohio	\$250.00	\$250.00
Gov. of Pennsylvania	\$250.00	\$250.00
Gov. of Washington	\$250.00	\$250.00
Gov. of Wisconsin	\$250.00	\$250.00
Gov. of Minnesota	\$250.00	\$250.00
Gov. of Indiana	\$250.00	\$250.00
Gov. of Kentucky	\$250.00	\$250.00
Gov. of Tennessee	\$250.00	\$250.00
Gov. of Mississippi	\$250.00	\$250.00
Gov. of Alabama	\$250.00	\$250.00
Gov. of Georgia	\$250.00	\$250.00
Gov. of South Carolina	\$250.00	\$250.00
Gov. of North Carolina	\$250.00	\$250.00
Gov. of Virginia	\$250.00	\$250.00
Gov. of West Virginia	\$250.00	\$250.00
Gov. of Maryland	\$250.00	\$250.00
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