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THE MICRO USER

Volume 4
Number 7
September 1986
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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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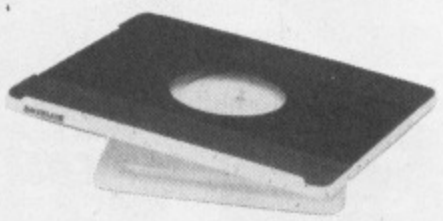

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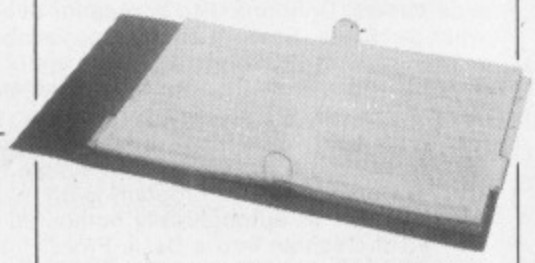

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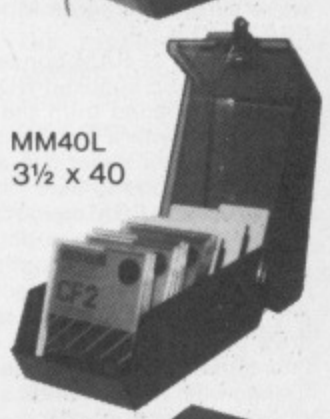

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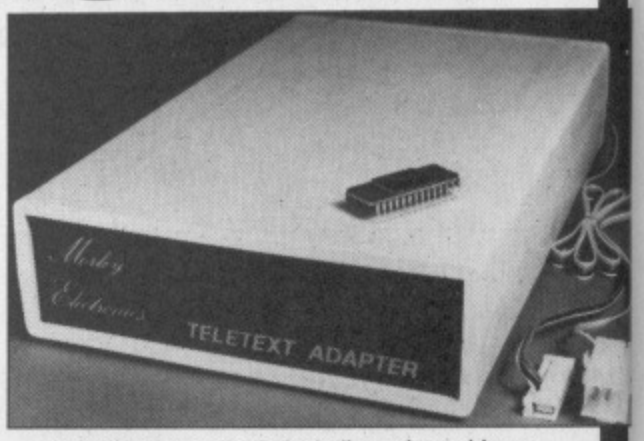

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FEATURES

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The 'filing system wedge' ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter, verifier and 'sector' editor for use with the RAMdisc.
Catalogue structure allows up to 2,709 files.

APPLICATIONS

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Accessible through the user's software for direct storage of eg: basic procedures, variables, large arrays etc which can be downloaded into the BBC's RAM or read directly. (We are hoping to be able to supply an extended basic ROM late this year, to allow 'transparent access' to the Ramdisc, which will effectively expand the BBC's RAM to about 1020k.)

OPTIONAL SIDEWAYS RAM UTILITY (suitable for use with any 16k SWR)

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THE MICRO USER NEWS

September 1986

Is Baby BBC on its way?

ACORN is on the verge of delivering the latest addition to its machine range – the Baby BBC Micro. Weighing in at around £500, it is expected to arrive any day – despite the fact that company officials are still denying its existence.

The Baby BBC – top secret codename BB – is believed to come bundled with monitor, 3½in drive and software.

As such, some experts are already viewing it as a potential Amstrad basher in the low end of the business market.

Usually informed sources suggest that the new Baby will be highly compatible with existing Acorn models, the main drawback being possible lack of user ports.

It is claimed that it will look very much like the Master, but will lack interfacing apart from an expansion bus.

The Baby is likely to incorporate a revised ROM and will come bundled with specially written software from Acornsoft and other companies.

It is being viewed as a successor to the BBC B or as a low-end Master targeted at Acorn's stronghold – the education market.

However not everyone feels that the Baby BBC will be an overnight success.

"It depends entirely on the user port situation", a leading educationalist told *The Micro User*.

"If they are limited – as rumour has it – then it might well turn out to be a case of having to throw the baby away with the bath water.

"Mind you, if there is an ample number, then we could have a new child star on our hands".

One report, yet to be confirmed by either party, is that Acorn has already made an arrangement for Dixons to market it during the critical pre-Christmas period.

Asked about the Baby BBC, an Acorn spokeswoman told *The Micro User:* "It's very interesting speculation".

Listings on-line

ALL program listings contained in *The Micro User* will from this month be made available for free downloading on MicroLink, the UK's fastest growing electronic mail service.

They will join hundreds of programs already available on the national computer network.

Commstar for BBC

THE long awaited enhanced Commstar II comms package is about to be released.

Top Pace programmer Andy Hood has expanded Commstar Is 8k ROM into 16k of code.

It provides advanced communications options such as rapid access pull-down menus, full 80 column scrolling Ascii terminal with a switchable onscreen help menu, plus an offline text editor.

Prestel emulation facilities on Commstar II have been improved also, with the inclusion of an off-line mailbox editor, thus saving on telephone connect time charges.

Curry quits Acorn

CHRIS Curry has resigned from the board of Acorn – the company he helped found – amid reports that he had felt restricted since Olivetti took control.

However the man who started it all off with Hermann Hauser back in 1978 has not totally severed his links with Acorn.

General Information Systems, a company he set up earlier this year, is to market Acorn's Communicator workstation.

Nor will he be short of expert advice about the machine. For GIS already employs 12 former Acorn people instrumental in developing the Communicator.

While Acorn itself sells the machine to large systems houses, the GIS team will offer it under their own label for specific market applications.

One area in which they hope to make major inroads with the Communicator is in the printing industry.

Curry is reported to have reduced his shareholding in Acorn in order to help finance the new operation. Back in December, 1985, his holding had dropped to 5.8 per cent of Acorn's shares.

BARGAINS GALORE AT THE BIG SHOW

THE great northern showcase for the BBC Micro is shaping up to be a treasure trove of new products and bargains galore.

September 26, 27 and 28 are the dates when the Electron & BBC Micro User Show lifts the curtain on the great pre-Christmas shop window at the Renold Building, UMIST, Manchester.

Upwards of 75 manufacturers and suppliers will be exhibiting, and most have already indicated they will be bringing new products along to the show that traditionally marks the start of the busiest buying season for BBC Micro owners.

Hobbyist, business and education users will find plenty to interest them among the latest hardware and software developments – and of course there will be the usual bargain price offers of former top sellers.

Care Electronics promises it will have its own Master cartridges "readily available at about half the price of Acorn's" and a ZIF socket version for users who want to change eproms quickly.

Also from Care will be a non-volatile Ram in cartridge format for the Master and an extender to take old BBC ROM cartridges and make them work on the new machines.

Viglen will be releasing a Master console unit priced £79, a £16.95 system allowing use of ROM cartridges via an adapter and providing four easily interchangeable cartridges on the Master, and a £700 Winchester system which holds up to 112Mb and is capable of being dualled to allow back up.

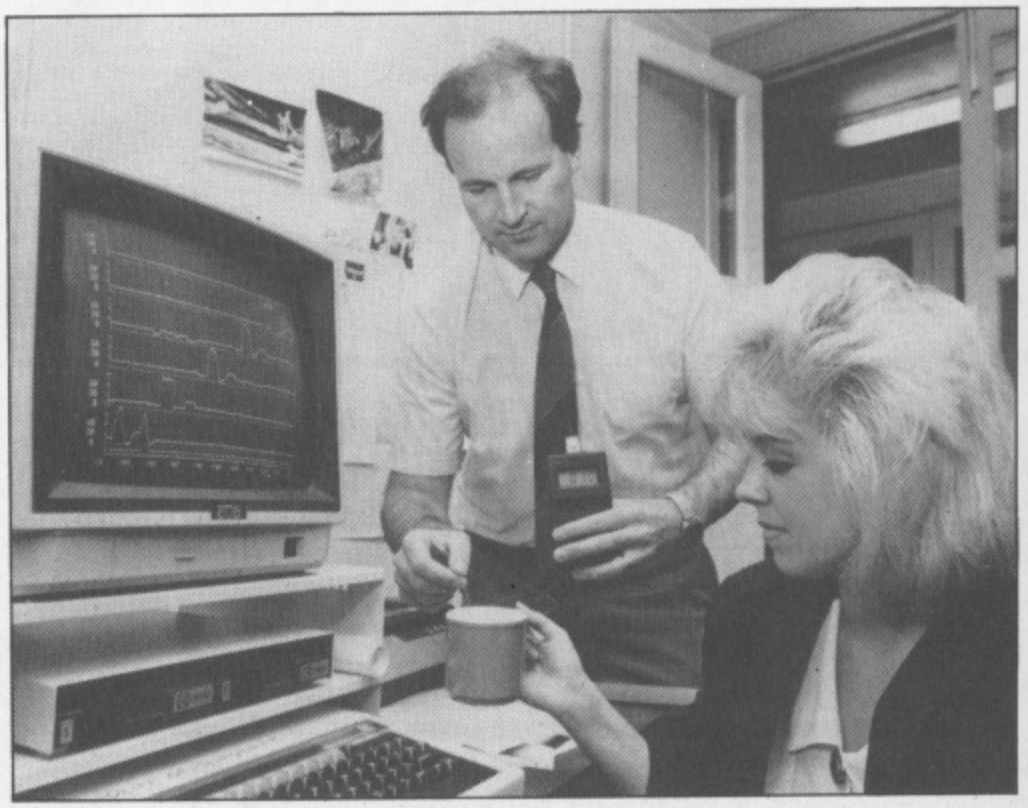
Norwich Computers will have a new utility ROM for Wordwise Plus called Pen-Friend which provides many of the drop down menu facilities normally associated with more powerful word processors, and will be offering the Complete Wordwise Plus handbook at a special show price.

Amcom Software will be demonstrating its edu-

Turn to Page 14

NEWS SPECIAL

The BBC Micro is playing an increasingly important role in medical research throughout the UK. Here MIKE COWLEY investigates the way it is being used in a unique project to establish whether or not the traditional British cuppa can cause ulcers – or even cancer.



Robert Pearson checks the temperature of the coffee being drunk by secretary Melissa Jeffreys

BBC Micro plays vital cancer research role

IT was a routine operation for surgeon Rory McCloy. But it led to a discovery which may well send shock waves through medical circles worldwide.

The patient that day was a 25-year-old inmate of a mental hospital. He found himself in theatre as a result of having swallowed a clinical thermometer six months previously.

Using a flexible telescope, McCloy had little difficulty removing the foreign body from the stomach.

As a matter of course – as he explained later – he wiped off the "green slime" which by now had coated the thermometer.

To his amazement it read 43.5 degrees centigrade – a temperature at which you can cook an egg.

"It occurred to me that this must have been the highest reading recorded during the time the instrument had been in there", recalls McCloy.

"For as with any clinical thermometer, it would reach its maximum temperature then remain there until it was shaken down".

The revelation led him to postulate on the possible problems that might be caused by such extreme temperatures in the stomach or other sections of the gastro-intestinal tract.

"I was well aware that extreme hot or cold can cause changes in cells, so I began to consider the possible links between these and ulcers and even cancer.

"And that naturally made me think that if there was any connection then it may well be that the actual imbibing of overly hot drinks or food could well be harmful. Or for that matter very cold drinks or solids.

"If you follow that train of thought to its logical conclusion, you can soon appreciate the inherent danger of drinking that traditional British cuppa too hot".

The theory remained very much just that for quite some time. In the interim the surgeon found there was precious little research available on the subject of stomach temperatures.

Experiments

Naturally over the years doctors had occasionally given it some thought. Round the time of Hippocrates it had been generally decided that the human gut acted as some form of fermenting vat or stew pan.

This was accepted until the 1800s when an unfortunate by the name of Alexis St Martin found himself the victim of a Wild West style gunfight.

While removing a bullet from the stomach, US army surgeon Willie Beaumont decided to seize his chance and carry out a few experiments.

He came to the conclusion that stomach temperature is only subject to mild fluctuations, and there the matter rested until quite recently, when fresh evidence began to suggest he was wrong.

One report which persuaded McCloy he was on the right track involved an Indian tribe in South America.

Medical teams discovered an unusually high incidence of cancer of the gullet among the natives, whose favourite pastime is to drink their tea very hot indeed.

This was just one of the factors which influenced the Manchester surgeon to attempt to seek the medical link.

However it wasn't until two years after he had removed the offending thermometer from his patient that he was able to initiate a research project.

At this time he teamed up with Robert Pearson, a tutor at Manchester University Department of Surgery, where McCloy is senior lecturer and honorary consultant.

Both men, as it turned out, believed there was cause for concern in this area. "We agreed that as humans are the only species that actually heat their food, this lent at least some substance to our hypothesis," says Rory McCloy.

But it was the third member of the research group that was to play the most critical role – the department's BBC Micro.

"It would have been impossible to undertake a research project like this without it", claims Robert Pearson. "In fact the micro is helping to achieve major advances throughout medicine in the UK".

Rory McCloy is also outspoken in praise of the machine. "It wasn't so many years ago that to get to use a computer meant having to plug into the university mainframe", he recalls.

"And normally the only time it wasn't busy was between 10pm and 2am, so that wasn't exactly conducive to research. The BBC Micro is cheap, simple to use – in fact the perfect tool for medical research".

Probes

The critical task that has been assigned to the machine is to record stomach temperatures during trials.

In order to achieve this, the Manchester team approached colleagues in the electrical engineering department at Imperial College, London.

What they needed – and what they eventually got – were a number of electrical probes which could be swallowed in a tube and would then provide accurate readings of temperature fluctuations during eating or drinking.

The device which was made available to them in fact contains six temperature probes with which to take readings down the oesophagus and inside the stomach walls. In addition, there is an acidity gauge.

Yet even while awaiting delivery of the equipment, the Manchester experiment had been launched.

With only a small grant from the Central Manchester Health Authority available, the researchers at first decided to capitalise on the resources at hand.

Suddenly their departmental offices became one of the most popular meeting places in Manchester Royal Infirmary where it is located.

The reason? Any one who dropped in could have a free cup of coffee as long as they agreed to take part in the first stage of the experiment, which involved recording the temperature at which they most enjoyed their drink.

The first startling fact that emerged was that some people drink their coffee in excess of 70 degrees – when people can rarely tolerate getting

into a bath at around 40 degrees.

"We soon got to appreciate that the tissue inside the mouth could well withstand extreme temperatures", says McCloy.

The researchers were in for even bigger shocks when they began to monitor stomach activity, for the BBC Micro began to record fluctuations of up to 25 degrees on either side of the normal body temperature of 37 degrees.

Harmful

"If you can imagine ending off a meal with ice cream, then followed by hot coffee, you can appreciate how this comes about", says Rory McCloy.

"All of this lent more credibility to our speculation that if such temperature extremes were taking place regularly, they could well be potentially harmful".

Each person who drops into the team's office for coffee is asked to fill in a form giving details of any stomach disorders from which they suffer.

Then the BBC Micro is used to cross match this data with the temperature at which they most prefer to drink their favourite beverage – and the frequency at which they drink it.

The medical men have also been able to call on patients at Manchester Royal who are suffering from ulcers – and in some cases cancer – to collate details of their drinking and eating habits in relation to temperature.

Already six months into the research programme, which they expect to take in all two years, the team now hopes to improve its techniques.

"We've really been testing the equipment up to now", says Bob Pearson.

The next stage will involve monitoring the temperature of food as it enters and leaves the mouth, then at various points as it makes its way down the gullet and finally into the stomach.

"We hope to place a probe in a lump of mashed potato or something similar and read its temperature all the way down", explained Pearson.

The sensors attached to the probe will transmit readings to the BBC Micro in digital form through the user port, with all the information subsequently appearing in the form of a graph on the monitor.

"This is now on the verge of turning into a major research project," says McCloy.

Although both researchers are naturally reticent about making any definite claims at this stage, they believe they already have found some evidence to support their hypothesis.

"It looks as though there may well be some association between consuming very hot drinks and food – or alternatively very cold drinks and food – with stomach ulcers", confided surgeon McLoy.

"But it is still far too early to draw any real conclusions. Nor do we want to be seen as yet more killjoys who claim things people enjoy can cause drastic conditions without any positive proof".

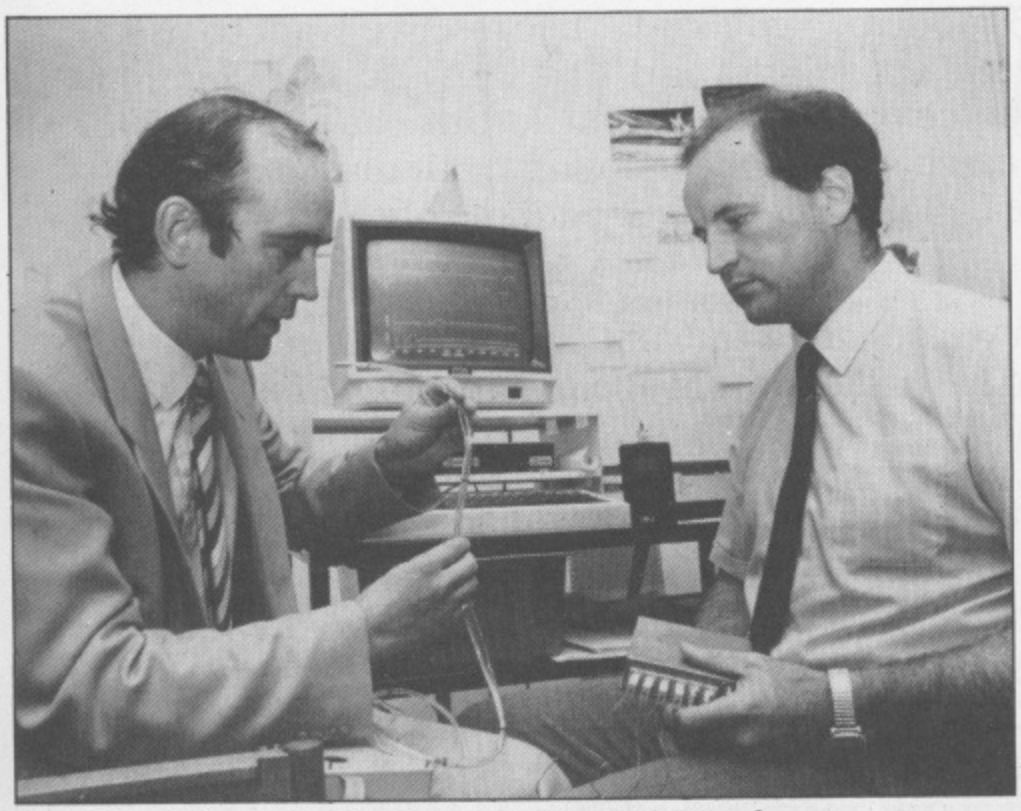
Pressures

However the surgeons do suggest that people might already like to consider the possibility that hot cuppas may be harmful and try drinking them just a few degrees cooler.

Both admit to preferring their coffee "cool". The medical men suggest that many people tend to take their drinks and food too hot because of social pressures.

"When you think about it, people are always saying, "Now drink up before it gets cold", said McCloy.

"What they obviously feel is being helpful may well in turn eventually become seen as harmful. But we'll have to wait for the final word from the BBC Micro on that one".



Rory McCloy (left) and Robert Pearson examine the probes being used for their investigation into possible links between hot drinks and cancer

THREE YEARS AGO

THREE years seems scarcely the flicker of an eyelid in the course of history – unless you are very young that is. And that's just the case with the BBC Micro.

So from this issue we'll be taking a regular look back at what *The Micro User* covered just 36 months ago, presenting what we hope will be a fascinating stroll down Memory Lane. Now return with us to September, 1983...

Acorn invades USA

Acorn, buoyed up by its UK success story to date, is busily laying plans for its invasion of the lucrative, yet fiercely competitive – as the company was soon to find to its cost – United States market.

The new face at Acorn charged with ensuring Acorn makes it out there is Tom Hohenberg, the marketing manager. "There is so much happening at Acorn that my only real problem is deciding what to do first", he tells The Micro User.

A British software house plans to open a subsidiary company in the United States simply to cater for the BBC Micro market there. DACC has selected Chula Vista near San Diego, California as its base. "The BBC Micro is the Rolls Royce of computers and Americans can't wait to get their hands on it", says managing director Derek Ashton. "Every model sold in the United States will be grabbed up and I want to be first on the scene to meet the demand for software".

Three new languages – Forth, Lisp and BCPL – are now available for the BBC Micro. According to a spokesman for Acornsoft, they turn the machine into a powerful tool for the professional software developer.

Although not officially launched until the middle of this month, the BBC Micro has already started a full service of downloading software over Ceefax. To pick up the software off the air, you need a Model B, an ordinary TV set and a teletext adapter costing (would you believe) £196.

Have you ever wanted to jump on your micro? Crofton Electronics has released a replica of the BBC Micro case made of sheet steel. It claims that it is strong enough to support the weight of an eleven stone man.

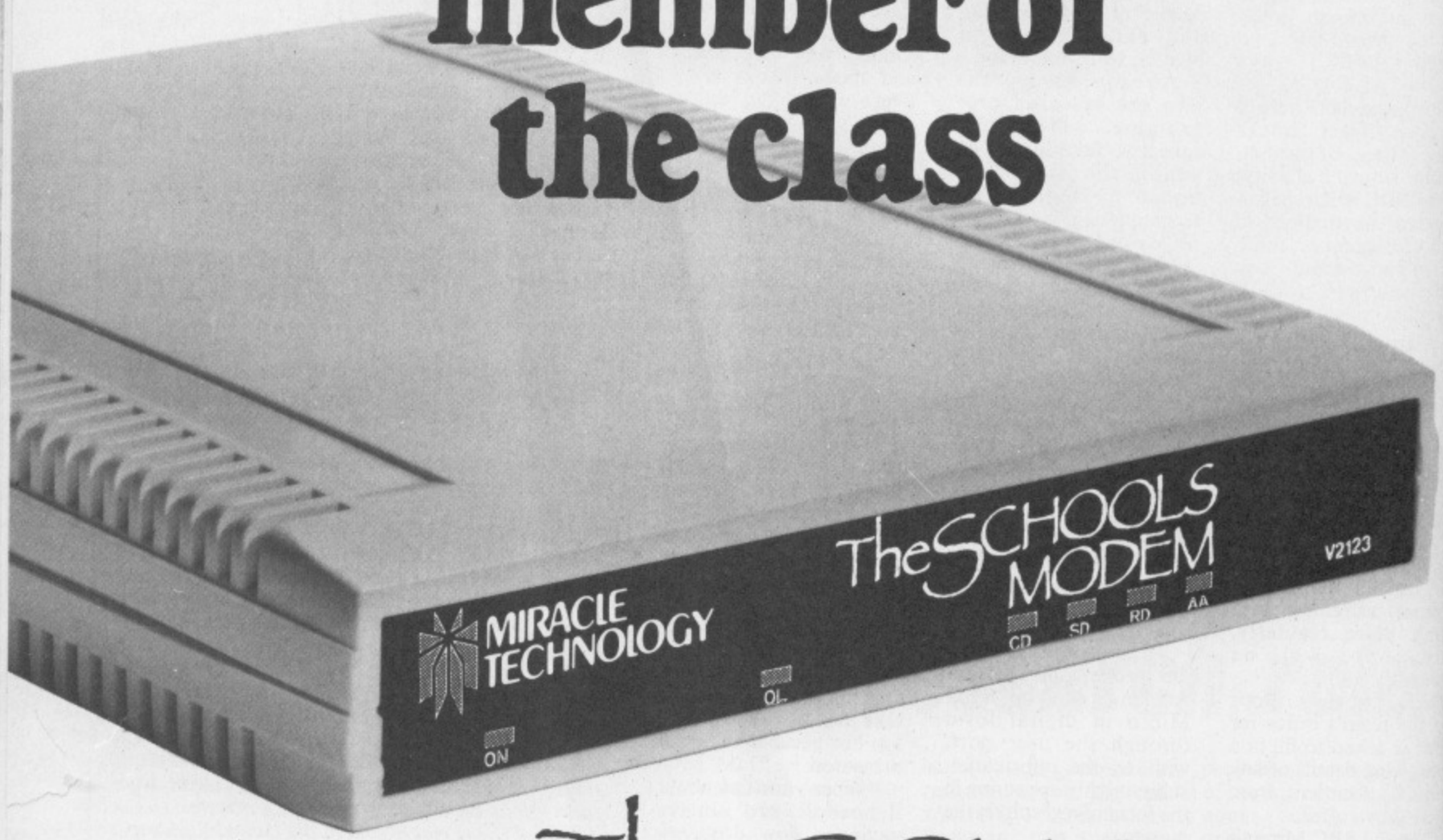
The BBC Micro is turning out to be one of the most popular prizes in competitions being held around the country. Newspapers, in particular, have seized on the idea of giving the machine away as a star prize. These include the Lancashire Evening Telegraph, the Mail on Sunday, the Watford Evening Post-Echo and The Guardian.

Watford Electronics' new DFS is described as "a very worthwhile package" by reviewer Jim Notman.

The low dealer margins offered by Acorn on sales of the BBC Micro have raised the hackles of the Computer Retailers Association – the watchdog body for the micro trade. Acorn's margins are notoriously small, and the CRA says it is very concerned and wants to do something about it.

A BBC Micro for £3.99 (no, certainly not in 1983)? You can buy a laminated photograph of one for this price. The plastic pictures are being sold to schools by Computer Training Aids. They claim pupils can get keyboard practice without needing to go near a real machine.

An intelligent member of the class



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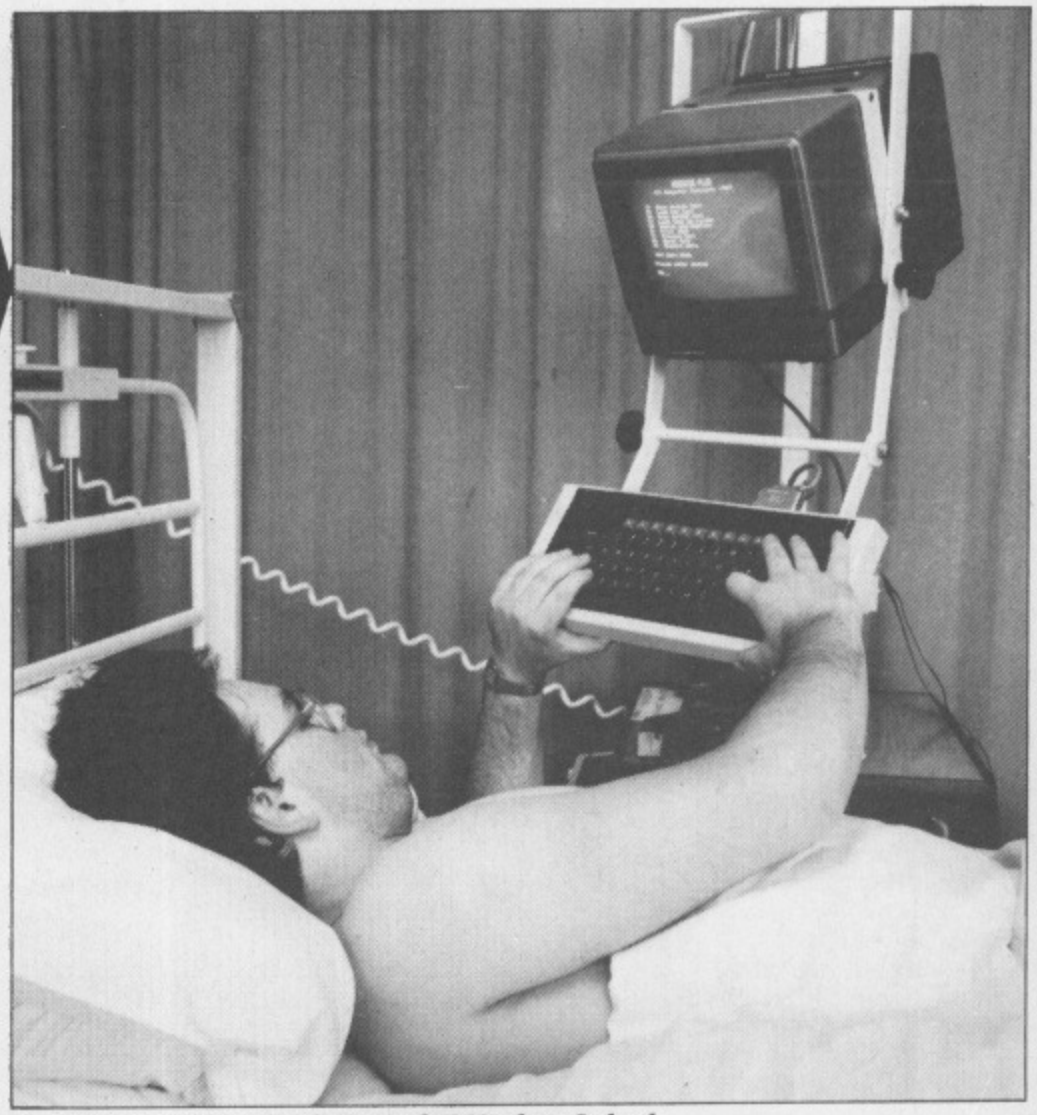
BBC Micro aids spinal patients



A patient at Musgrave Park Hospital in Northern Ireland uses a BBC Micro mounted on an over-bed trolley.

A REHABILITATION project involving BBC computers is achieving exceptional success in enabling people with spinal injuries to enjoy a normal working life.

Of the first 100 patients to undergo computer training more than half bought a micro within a month of leaving hospital and 40 were working – 10 times the employment rate for spinal patients without computer skills.

The project is funded by the Department of Trade and Industry and the EEC Social Fund.

Skills

It uses course material and micro-based self-teaching aids developed by Julia Schofield Consultants to provide occupational therapists with computing skills they can pass on to their patients.

Use of BBC computers as an aid to rehabilitation and re-employment of spinal injury patients first began at the famous Stoke Mandeville Hospital and Odstock Hospital near Salisbury.

It has now been extended to Hexham near Newcastle-on-Tyne, Rookwood in South Wales, Oswestry, and Eden Hall in Edinburgh.

A similar scheme is underway at Musgrave Park Hospital in Northern Ireland.

In each location BBC Micros and Masters are used throughout the project, and in the final stages of training patients learn to apply computers in their chosen field of employment.

Patients who formerly spent the first six to 12 weeks of treatment flat on their backs watching TV are now provided with meaningful activity and mental stimulus through computers.

A special trolley has been designed which suspends the screen and keyboard above the bed so that even tetraplegic patients can operate the micro with a mouth stick.

They play games, learn basic computer skills and receive instruction from self-teach discs.

Once patients are mobile again they use the hospital's computer workshop either for entertainment or to further develop their skills.

A high proportion of those who leave and find work are home-based – thanks to the medium of computer communications – a reversal of the usual pattern.

The project has attracted interest from other countries, particularly Australia, Canada and the Far East.

Julia Schofield, who earned a PhD in computer science despite being blind from birth, is setting up a similar scheme in hospitals throughout Australia.

PROFESSIONAL RANGE LAUNCHED BY WATFORD

WATFORD Electronics has entered the serious software field for the BBC Micro range.

The Watford Professional Range is being developed to cater for those machines serving the top-end of the market.

Spearheading the campaign is a View printer driver ROM which supports a range of print features including underlining, italic and superscript.

Each printer driver offers an XDRIV – Extended Drivers – facility which can specify characters and lines per inch numerically by sending a control code sequence to the printer.

It also defines a pad character to stop closely associated words being split during formation, resets all printer driver functions, selects new printer fonts and text colour.

Print-out can be paused at any stage and users can be prompted to change daisywheels mid-print. Text prompts can also be shown on the screen during a print.

A full specification printer driver generator is included for other models which allows specification of control codes.

It also generates a fully functional printer driver.

Printer drivers contained within the ROM can be downloaded for modification, saved to disc and loaded into View in the normal manner.

Price: £32.

Colour graphics card

A NEW colour graphics card for the BBC Micro has been launched by Wild Vision.

Palettemate allows 16 colours to be selected from a range of 4,096 and displayed simultaneously in Mode 2.

Colours are set up using separate palettes for red, green and blue which can be individually programmed using VDU 19.

Software - selectable options allow the palette to be used in any mode.

ROM-based utilities software are included in the package, which costs £127.50.

Micros collect pledges

THE BBC Micro played its part in the recent Dragon Aid spectacular for Ethiopia.

Coordinated by Adrian Mars, the Dungeons and Dragonathon was held at the Trafalgar Square Community Centre in London.

Two teams of nine took part in the stamina sapper, which lasted a record-breaking 100 hours. Only five minutes rest was allowed each hour.

Acorn's loan of BBC Micros, disc drives, colour monitors and second processors enabled visitors to follow progress and a bulletin board ran throughout to take pledges. Free support was given from most of the on-line industry.

Also two major events were held at Aberdeen and Basingstoke, and many mini marathons took place in family living rooms.

The total raised, which goes direct to the Band Aid trust, topped £5,000.

Stargazers take to the BBC

THE stars at night may be shining bright deep in the heart of Texas, but all too often UK astronomers are frustrated by cloud and haze when they train their telescopes on the heavens after dark.

To the rescue has come BBC Micro owner Barry Spencer, who lives in Sidcup, Kent.

He has set up a free public viewdatabase called Prometheus which ensures British stargazers have something to look at every night of the year.

It contains an astronomical database with more than 400 records, and features a monthly discussion of the night sky.

Extensive use is made of graphics with charts, maps of stars and other astral bodies. But because Spencer wants the database to appeal to casual gazers and serious amateurs alike he has also included an on-line quiz, a space adventure and a users' art gallery.

He told *The Micro User:* "If you live in Britain the only thing overhead most nights is cloud and haze.

"Therefore I set up Prometheus to appeal to frustrated astronomers and casual stargazers alike.

"It isn't intended to be a definite answer to the problem, or a particularly academic work. However I believe it is a flexible and evolving system that will tailor itself to the user, given a degree of participation and feedback".

Prometheus can be accessed on 01 300 7177.

BB soft upgraded

YOUTHFUL systems operator Marcus Anselm has upgraded his FBBS bulletin board software for the BBC Micro and intends to make it available commercially.

Marcus, who runs Marctel on 01-346 7150, told *The Micro User* that version 2.1 has many new features and is also available on ROM.

The software supports both 300 and 1200 baud, most BBC Micro DFSs and versions have been produced for Le Modem, WS2000, Demon and Nightingale.

Among the bulletin boards using FBBS software already are Musictel on 01-455 0843, Malcomm on 01-458 9704, and Sixth Dimension on 091-417 3562.

New models . . . the M19 and Master 512

NEW FROM ACORN

Acorn has unveiled two new machines – one that is IBM compatible, the other a more powerful version of the Master 128.

The first micro is a badged version of Olivetti's M19, the second the Master 512 which boasts MS-DOS.

At £1,499 the Acorn M19 will find itself thrown in at the deep end of what is increasingly becoming a cut-price marketplace.

It comes with graphics capabilities, serial and parallel ports, high resolution monitor, twin 360k disc drive, tutorial demonstration discs and three months telephone Helpline support.

As a PC compatible, the M19 will run all the popular software packages including Lotus 123, DBase III and MSWord.

"With the continued growth of personal computers as a tool in both business and vocational training markets, Acorn recognised the need to complement its computer product range with a true PC compatible", said a company spokesman.

Aimed at the other end of the market, the Master 512 has taken its bow at £345.26.

Apart from offering MS-DOS, the machine comes with a mouse, Digital Research's Gem Collection and DOS Plus, but falls short of full IBM compatibility.

New products lined up

From Page 9

cational networking system E-net and selling ADFS Winchesters and tape streamers for E-net and ADFS Winchesters.

Trafford Computing will be launching its £32 Fileman random access database management system to the general public following its successful trials in connection with GCSE computer studies courses.

Electronics giant GCE will be selling its Datachat 1223 modem and software package bundled with BBC Micro comms pack and subscriptions to MicroLink, Prestel and Micronet for £79.95.

Shards Software will have a new BBC disc compilation of 11 games, educational programs and utilities "at budget price", a sound and light bargain utility disc including sound and painting routines, and hopes to have its major new adventure Operation Safras ready for the show.

Opus Supplies promises "disc drive bargains galore", including the best selling Challenger system now being offered in two versions – 256k or 512k of RAM with up to 1.2Mb of useable capacity.

The company also hopes to tempt visitors with 5¼in disc drive and double density disc interface packages starting at under £100, and special deals on the Organiser computer desk.

Micro Media will have special prices on its large selection of discs, printer ribbons, disc boxes and other computer supplies.

Micro-Aid says it will be the only exhibitor selling the new WIZ Card cursor controller for the BBC Micro which has eight angled directions and sensitive fire buttons, and the new Viziflex keyboard protector.

All this, plus the Acorn Theatre where each day leading BBC Micro and Master experts will be describing all the exciting new products from Cambridge – as well as the new machines currently in the pipeline.

The show is open 10am to 6pm Friday and Saturday, September 26 and 27 and 10am to 4pm. Sunday September 28.

Viglen expands

ONE of the leading suppliers of Acorn-related products, Viglen, has set up a new company to serve the business and education sectors of the market as well as home users.

Viglen Products will be headed by experienced industry figure Cliff Musson, formerly with Cumana and Akhter Computer Group, and will be offering a number of new products.

"Already we have established a wide product base and are about to launch our own range of disc drives and range of computer peripherals", Musson told *The Micro User.*

Hard disc trio

THE Akhter group has released three high capacity storage units for the BBC series of Micros.

Archive is a £999.95 10Mb tape streamer for the BBC Micro which interfaces with the disc port on the Model B, B+ and Master, thus freeing the user port for a hard disc unit.

Nucleus 20 is a 20Mb hard disc unit, plus 10Mb tape streamer, in a similar monitor stand to Archive, again complete with integral PSU.

Onboard this Nucleus unit is a 40/80 switchable double-sided 5.25in disc drive, thus making the unit a complete storage system for the BBC Micro series for £2,175.95.

Also available in the Nucleus range is the Nucleus 40, which offers a 40Mb hard disc costing £2,299.95.

BATTLE SIMULATIONS

TWO war games for the BBC Micro come from Design Design. Tanks, a two player tank warfare simulator re-enacts Second World War conflicts.

Set against a large scrolling background players control 12 different tanks, each with different strengths and weaknesses. Combat is resolved arcade-style.

In Nelson players fight three of the admiral's sea battles – Nile, Copenhagen and Trafalgar.

Each is of increasing complexity, and the number of ships to control gradually increases from 30 to 60.

Both games will be available on disc only at around £14.

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If you're a serious micro user you need the Supervision III high quality monitor from TAXAN.
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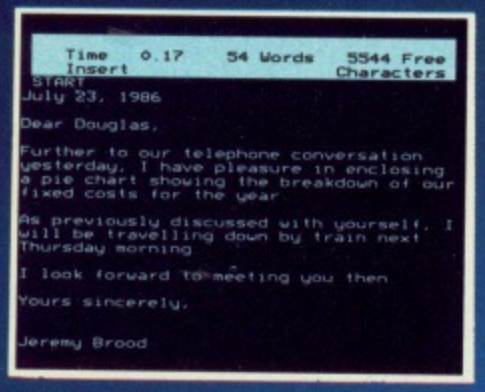


WORD PROCESSOR
Compose a letter, set the print-out options using embedded commands or menus, use the mail merge facility to produce personalised circulars – and more!

DATABASE
Build up a versatile card index, use the flexible print out routine, do powerful multi-field sorting, perform all arithmetic functions, link with the word processor – and more!

LABEL PRINTER
Design the layout of a label with the easy-to-use editor, select label size and sheet format, read in database files, print out in any quantity – and more!

...and at a price t

Mini Office II offers the most comprehensive, integrated suite of programs ever written for the BBC Micro – making it the most useful productivity tool yet devised.

A team of leading software authors were brought together to devote a total of 26 man years of programming to the development of Mini Office II. What they have produced is a package that sets new standards in home and business software.

The sample screenshots above illustrate just a few of the very wide range of features, many of which are usually restricted to software costing hundreds of pounds. Most are accessed by using cursor keys to move up and down a list of options and pressing Enter to select.

Is it that easy to use? Several leading reviewers have already sung its praises on this very point.

Yet possibly the best advertisement for Mini Office II is that it comes from the same stable that produced the original Mini Office package back in 1984.

That was so successful it was shortlisted in two major categories of the British Microcomputing Awards – the Oscars of the industry – and sold in excess of 100,000 units!

It was up to Mini Office II to take over where the first Mini Office left off, with 32 extra features, two additional modules, a program to convert existing Mini Office files to Mini Office II format, and a 60 page, very easy to follow manual.

This is the package thousands of BBC Micro owners have been waiting for – and at a price everyone can afford!

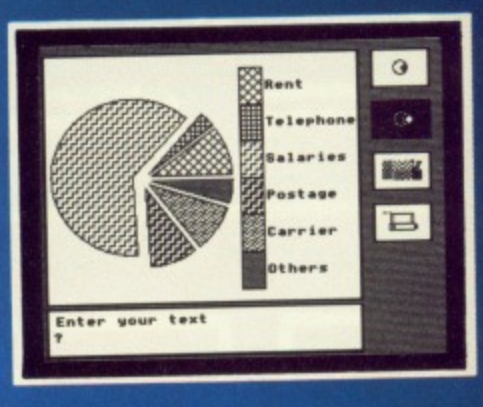
t ONE package!

SPREADSHEET

Prepare budgets or tables, total columns or rows with ease, copy formulae absolutely or relatively, view in either 40 or 80 column modes, recalculate automatically – and more!

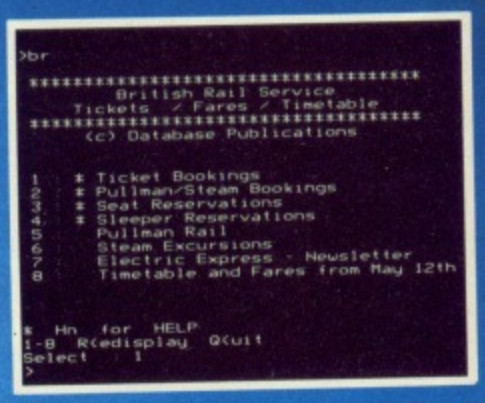
GRAPHICS

Enter data directly or load data from the spreadsheet, produce pie charts, display bar charts side by side or stacked, overlay line graphs – and more!



COMMS MODULE

Using a modem you can access services such as MicroLink and book rail or theatre tickets, send electronic mail, telex and telemessages in a flash – and more!



ce that can't be matched!

Here's what some independent reviewers say about Mini Office II:

Menus throughout the program were abundant and well structured, allowing complex choices to be made with hardly a glance at the pocket-sized spiral-bound manual, and offering a wealth of user-defined functions . . . For the money it really is unbeatable. Dedicated word processors, spreadsheets and comms packages may offer some extra facilities, but some are so full of whistles and bells you may find yourself forever in the manual or even not using half of their power. What you get with Mini Office II is a valiant attempt to provide an all-embracing small business package at a down to earth price; it fulfills all its promises, and there's nothing cut-rate about the facilities it provides. – **Viewfax 258 (Prestel)**

BBC Model B and B+	
Cassette	*£14.95*
5¼" disc	*£16.95*
3½" disc	*£19.95*

The original Mini Office has been recognised as an astonishing bargain for anyone looking for a low-cost introduction to serious software. Now the four programs which made it up have been substantially enhanced and two new programs have been added. The result, Mini Office II, is more than just an introduction to serious software applications. It's good enough to fulfill the entire software needs of many a small business! . . . The range of features in each program is astonishing for a package of this cost . . . The spreadsheet is every bit as good as a program such as MasterCalc which costs more than the entire Mini Office II . . . This delightful little program [Graphics] allows you to produce professional looking charts to illustrate a set of figures. – **Amstrad Action**

The word processor is literally overflowing with excellent features . . . The database is very easy to use yet extremely powerful . . . The spreadsheet program is the next little gem . . . Having used Mini Office II for the past few days I cannot praise it too highly. – **Popular Computing Weekly**

DATABASE SOFTWARE

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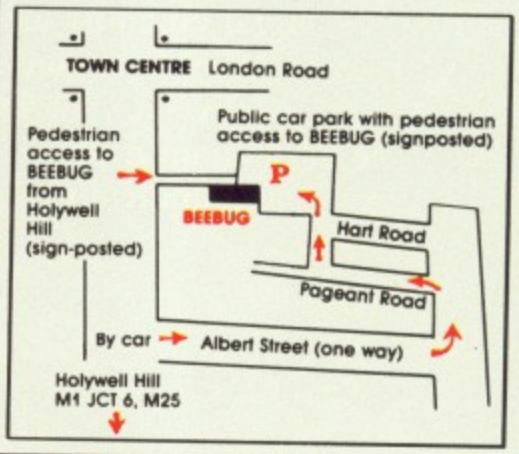

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COMPUTERS

The 80186 16-bit Co-processor for the Master 128 is now available. It features DOS+ and the Gem Collection as bundled software and is priced at £395.Basic II, which offers extra commands over the original, is now ex-stock at under £20

Code	Description	Price Inc VAT
0200G	Master 128	489.00
0202G	Master ET	389.00
0230C	65C102 Co-Processor "Turbo"	119.00
0231D	80186 Co-Processor	395.00
0232D	32016 Co-Processor (when available)	899.00
0234B	M128 Econet Module	47.00
0235B	M128 Eprom Cartridge	14.00
0240C	M128 Reference Manual 1 ADJ22	14.50
0241C	M128 Reference Manual 2 ADJ23	14.50
0203F	'6502' 2nd Processor	189.00
0204F	'Z80' 2nd Processor	365.00
0205F	Acorn Prestel Adaptor	134.00
0206F	Acorn Teletext Adaptor	144.00
0237F	Acorn IEEE Interface	315.00
0217B	1770 Disc Interface Kit	48.00
0218A	ADFS Upgrade for 1770 DFS	29.00
0209A	1.2 DNFS Rom	19.50
0207A	Basic II Rom	19.50
0208A	1.2 Operating System	5.35
0210A	A to B Upgrade Kit	69.00
0212A	Acorn Speech Upgrade	46.00
0225B	Econet Upgrade for Model B	48.00
0226B	64K Upgrade Kit for B+ 64-128K	39.00

PRINTERS

The Taxan KP810 is still our most popular dot matrix printer, we highly recommend it for graphics, quick listings and NLQ-type letters, making it one of the most versatile printers available. Used in conjunction with the Fontaid package it becomes a very powerful tool.

Code	Description	Price Inc VAT
0311G	Taxan KP 810 Printer	255.00
0304G	Epson LX 80 Printer	225.00
0313C	LX80 Tractor Feed Unit	22.00
0315D	Cut Sheet Feeder for LX80	55.00
0316G	Taxan KP910 15" Printer	390.00
0319G	Epson FX85 NLQ Printer	438.00
0320D	FX85 Tractor Feed Unit	30.00
0321D	FX85 Sheet Feeder	130.00
0300G	Brother HR15XL Parallel Daisywheel	400.00
0301G	Brother HR15XL Serial Daisywheel	400.00
0310G	Juki 6100 Daisywheel	360.00
0309F	Ibico LTR1 Letter Quality	132.00
0303G	Canon PJ1080A colour	520.00
0308G	Epson JX 80 colour	520.00
0318G	Epson HI 80 Plotter	380.00
0355A	Plotmate Software Rom Version	40.00
0400A	Printer Roller Cleaning Kit	6.00
0401A	2M Printer Lead	8.00
0402A	Epson FX/RX/MX80/FX85 Ribbon	3.00
0403A	Epson FX/RX100/FX105 Ribbon	4.00
0408A	Canon PW/Kaga Taxan Ribbon	5.00
0409A	Black Cartridge PJ1080A	7.00
0410A	Colour Cartridge PJ1080A	10.00
0413A	LX 80 Replacement Ribbon	4.50
0414A	Ibico Ink Roller	4.60
0415A	Epson JX80 Ribbon	14.90
0418A	Juki 6100 S/S Ribbon	1.55
0406D	11"*9.5" Paper 2000 70gsm	14.50
0453G	2-part NCR Listing Paper (1000)	23.00
0407C	3.5"*1 7/16" Labels 1000	4.00
0416A	Dust Cover KP810/PW1080A	5.45
0419C	"Fontaid" ROM & Disk 40T	30.00
0420C	"Fontaid" ROM & Manual 80T	30.00
0421B	"Fontaid" Extra Disc "A" 40T	15.00
0422B	"Fontaid" Extra Disc "A" 80T	15.00
0432B	TCS26 Printer Sharer	22.50
0435C	MX80 Printhead Assembly	41.00
0436C	FX80/85 Printhead Assembly	52.00
0437C	RX80/80FT Printhead Assembly	41.00
0438C	FX100/105 Printhead Assembly	57.00
0439C	LX80 Printhead Assembly	41.00

MONITORS

The Taxan green and amber monitors are still the best monochrome monitors available, although the Zenith range offer a budget alternative. The Supervision III is by far the best colour monitor available and is well priced at £378.

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0501G	Taxan KX1202 Hi-res Green Monitor	116.00
0502G	Taxan KX1203 Hi-res Amber Monitor	116.00
0556A	Taxan 1201/2/3 Lead BNC	3.90
0571D	Stand for KX Series KTS1	29.00
0503G	Zenith 123 12" Green	83.00
0504G	Zenith 122 12" Amber	87.00
0530G	Microvitec 1431 Stan-res Monitor	206.00
0531G	Microvitec 1451 Med-res Monitor	260.00
0550A	1.0m Monitor Lead RGB	5.75
0535G	Supervision III RGB	378.00
0555A	Supervision Monitor Lead	7.00
0570D	Stand for Supervision KTS2	29.00
0551E	Single Master Plinth	16.10
0552E	Single Plinth for Monitor	12.65
0553F	Double Plinth for Monitor	23.00
0554A	Memorex TV and VDU Cleaning Kit	4.65

DISC DRIVES

Cumana disc drives are on special offer for a limited period and whilst stocks last. The CD800S is exceptional value at only £274. The Disc Starter Pack, which is all you need to upgrade to disc, contains a Cumana CSX100 drive, Acorn 1770 Disc Interface and 10 48tpi discs all for £163.

Code	Description	Price Inc VAT
0600F	Cumana 100K CSX100 40T	104.00
0610F	Cumana 100K CS100 40T	125.00
0602F	Cumana 400K CSX400 40/80T	141.00
0603F	Cumana 400K CS400 40/80T	160.00
0604G	Cumana 800K CD800S 40/80T	274.00
0614F	Cumana CS100E excl accessories	117.00
0615F	Cumana CS400E excl accessories	155.00
0222F	Disc Starter Pack	163.00
0611A	Cumana Disk Drive Guide	1.50
0622G	Acorn 10MB Winch + f'server	1250.00
0623G	Acorn 30MB Winch + f'server	1850.00
0650B	Memorex discs S/S D/D 48TPI 5210	15.50
0651B	Memorex Discs D/S D/D 96TPI 5420	25.50
0652A	Memorex Disc Head Cleaning Kit	9.65
0653A	Library Case – 10 discs	2.25
0654C	Disc Storage Box -up to 50 discs	9.00
0656D	Lockable Disc Box (80)	17.00
0657B	10x 48TPI SS DD Discs	13.90
0658B	10x 48TPI DS DD Discs	18.90
0659B	10x 96TPI SS DD Discs	18.90
0660B	10x 96TPI DS DD Discs	19.90
0661E	25x 48TPI SS DD Discs	33.50
0662E	25x 48TPI DS DD Discs	43.90
0663E	25x 96TPI SS DD Discs	43.90
0664E	25x 96TPI DS DD Discs	46.20
0665E	50x 48TPI SS DD Discs	53.90
0666E	50x 48TPI DS DD Discs	77.90
0667E	50x 96TPI SS DD Discs	77.90
0668E	50x 96TPI DS DD Discs	84.90

SOFTWARE

New items this month include Movie Maker as reviewed in Beebug Vol5 No2 and the latest game from Superior Software, Thrust at only £11. AMS enter the games market with Mind Games and Zap Zone, both of which are mouse driven.

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1022C	Acornsoft View 3.0	69.00
1000B	Acornsoft View 2.1	45.00
1013B	View Printer Driver Cassette	8.00
1014B	View Printer Driver Generator Disk	9.00
1001B	Acornsoft View Sheet	45.00
1002B	Acornsoft Hi-View	45.00
1019B	Acornsoft Viewstore Rom	45.00
1021A	Acornsoft Viewindex Disc	11.00
1043B	Acornsoft Viewspell Rom/Disc	33.00
1007C	Acornsoft ISO Pascal	65.00
1028B	Pascal Standalone Generator	32.00
1008B	Acornsoft Basic Editor	28.00
1012B	Acornsoft Elite Disc Version	17.00
1023B	Acorn Elite Cassette	14.00
1015B	Acornsoft Revs Disc	17.00
1024B	Acornsoft Revs Cass	14.00
1016B	Acornsoft Aviator Disc	17.00
1044B	Acornsoft Aviator Cassette	14.00
1017B	Acornsoft GXR B	28.00
1018B	Acornsoft GXR B+	28.00
1027C	Micro PROLOG	74.00
1029A	Revs 4 Tracks Disc	11.95
1032B	Revs 4 Tracks Tape	9.00
1031B	Acornsoft Termulator Rom	30.00
1033B	Microtext Disc	53.00
1034C	Microtext Plus Rom	240.00
1035B	6502 Development Pack	45.00
1039B	Creative Sound Disc	19.00
1040C	Micros in Business Disc	65.00
1100C	Wordwise Plus	46.00
1112A	Hi Wordwise Plus Disc	5.75
1102A	Wordwise	28.00
1103B	C.C. Graphics ROM	25.00
1104B	Printmaster (Epson)	28.00
1105B	Printmaster (Star)	28.00
1106B	Accelerator	56.00
1115B	Speech System inc TTS	33.50
1108A	Acorn Speech Processor (With 1115)	10.00
1109B	Disc Doctor	28.00
1110B	Intersheet	47.70
1111A	Hi Intersheet Disc	5.75
1113B	Caretaker Rom	28.00
1114B	Interchart	29.90
1117B	Interword	47.00
1123A	SPEECH! Disc 40/80T	11.95
1124A	Citadel 40/80 Track Disc	11.95
1125A	White Knight Mk12 Disc	18.40
1126B	White Knight Mk12 Cassette	9.50
1127A	White Knight Mk12 for 1770 DFS	18.40
1128B	Slippery Slug Movie Maker	29.00
1011B	BBCsoft UltraCalc 2	70.00
1129A	Thrust Disc 40/80T Disc	11.00
0703B	AMX Mouse	69.00
1150B	AMX Desk Disc	19.00
1151B	AMX 3D Zicon Disc	19.00
1152B	AMX Database Disc	19.00
1153B	AMX XAM	19.00
1154C	AMX Pagemaker Plus	40.00
1155B	AMX Superart Rom	40.00
1156B	AMX Paint Pot Disc	11.00
1157B	AMX Mind Games Disc	14.50
1158A	AMX Zap Zone Cassette	4.90
1160B	AMX Utilities	11.00
1170D	Fleet Street Editor 40T	34.00
1171D	Fleet Street Editor 80T	34.00
1172A	Mini Office II Cassette	14.50
1173A	Mini Office II 40T	16.50
1174A	Mini Office II 80T	16.50

HARDWARE

The ATPL Sidewise board is still the best way of adding extra rom space to your model B, although the Watford 12 Rom board is a cheaper equivalent. As the Voltmace joysticks are proving so popular we have extended the special price for this month.

Code	Description	Price Inc VAT
0701A	Aries B32 RAM Card	86.00
0702A	Watford 32K RAM Card	65.00
0704A	ATPL ROM Board for Model B	39.00
0735A	ATPL Battery Backup kit	17.00
0740B	Aries B12 Rom Board	45.00
0749A	Aries B12C Adaptor	5.75
0705A	2764 8K eprom	3.45
0706A	27128 16K eprom	4.60
0707A	6264 8K ram	4.50
0708A	Eprom Extractor Tool	3.45
0709D	Watford Eprom Eraser	32.20
0710B	Softlife Eprom Blower	75.90
0713A	Phone 2 into 1 adaptor	6.30
0714A	BBkey Function Key Labels	2.00
0715A	Dust Cover for BBC B/B+	2.99
0734A	Dust Cover for Master 128	4.60
0716F	Music 500	114.00
0717A	Watford Sideways ZIF	17.25
0718B	Voltmace Delta 3B Single J'stick	10.00
0719B	Voltmace Delta 3B Twin Joystick	17.00
0720B	Voltmace Delta 14B Joystick	12.50
0721B	Voltmace Delta 14B/1 Interface	12.50
0741A	Voltmace Delta ASC/B	8.50
0742A	Delta Driver Disc 40T	9.00
0743A	Delta Driver Disc 80T	9.00
0736A	Watford 12 Rom Board	36.80
0762C	Beebug Magic Modem	95.00
0763C	Beebug Magic Modem + Software	109.00
0810D	BBC Replacement Keyboard	52.90
0811A	Video ULA Chip	17.25
0812A	A to D D7002C Chip	5.29
0814A	Keyboard Connector	5.75
0815A	65C02 CPU	13.80

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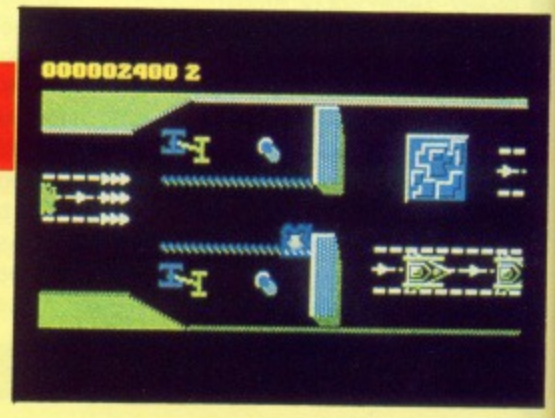
Zap those aliens



Program: Psycastria
Price: £7.95 (cassette)
Supplier: Audiogenic Software, 12 Chiltern Enterprise Centre, Station Road, Theale, Berks. RG7 4AA. Tel: 0734 303663

YES folks it's time once again for some good old zap and blast. Why communicate with alien life forms when you can incinerate 'em? The alien command bases are located on land, at sea, on the moon and in space. Your task is to decimate all four.

Play is limited to a narrow window in the middle of the screen, best described as Zaxxon viewed from directly above the ship. This provides you with a bird's eye view of the buildings and weapons which constitute the enemy base.

Your ship – always positioned in the middle of the screen – is allowed to move from side to side in order to avoid buildings. The screen scrolls continuously from right to left, or vice versa, depending on which way you are facing. Scenery and enemy forces are drawn using good detail and are animated faultlessly.

You begin your attack from the left of the command base, flying at ground level dodging to each side, shooting tanks and ammo dumps. If you haven't destroyed everything by the time you reach the right of the base your ship flips over automatically and you fly back to destroy the remaining defenses.

The enemy is present in the form of numerous fast moving UFOs. These ships come screaming in to view trying to ram or shoot you down. Owing to their high speed you cannot wait to see the whites of their eyes before firing. You should adopt the age old technique of continual rapid firing whether the enemy are on the screen or not.

While on the subject of the enemy craft, do watch out for the tail gunner. On several occasions I nipped into an alien's slipstream only to receive a laser salvo from its rear end.

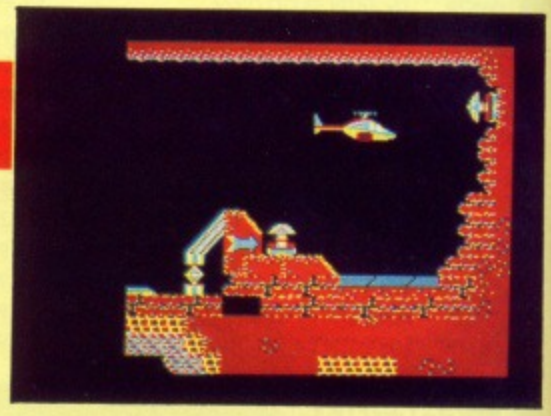
An annoying feature of the game is that when your ship is destroyed you are returned to the start and all the enemy tanks and ammo dumps are replaced. This means that the only way you are going to reach screen two is to wipe out the enemy using a single ship. There is no way you are going to achieve this in your first few minutes: The aliens come thick and fast, and their aim is deadly.

Were it not for its excessively difficult gameplay, Psycastria would be a cracking arcade game.

James Riddell

Sound	8
Graphics	9
Playability	7
Value for money	8
Overall	8

Fly to the rescue



Program: Airwolf.
Price: £9.95 (cassette) £14.95 (disc).
Supplier: Elite, Anchor House, Anchor Road, Aldrige, Walsall WS9 8PW. Tel: 0922 55852.

AIRWOLF is based on the popular TV series of the same name. The evil General Zaranov has kidnapped a team of brilliant scientists and is holding them captive in his underground fortress. You, as Stringfellow Hawke, must fly your helicopter into this subterranean base and rescue the scientists. With a bit of luck you may even get the girl.

You start in the base with an impenetrable force shield to your left and a fast moving laser bolt to your right. Having side-stepped the laser you find that it is bouncing between three security units set in a triangle.

A large red arrow points to the base of the bottom unit, and a few well placed missiles fired here will immobilise the laser. When you return to your starting point you'll see that the force shield is now down.

One tricky little manoeuvre which has to be mastered is flying the helicopter with one hand while manipulating the cursor keys with the other. These keys allow you to scroll the screen to take a quick peek at what's around the corner before you blunder in blindly.

The enemy defences are present in numerous forms – large and deadly fireballs, security droids which follow specific paths through the caves and the laser bolts.

You are provided with four shields. However your only indication of the shield status is an occasional flash on the screen as each packs up.

There is no set path through the caverns and you will often be faced with a choice between two routes. It's not that difficult a decision really as you can guarantee that both are going to be fraught with danger.

Airwolf combines a good arcade game with a liberal helping of strategy. The copter and backgrounds are drawn on a grand scale with good use of colour. This game will tax the brain as much as the trigger finger.

Steve Brook

Sound	6
Graphics	8
Playability	8
Value for money	6
Overall	7

Caveman capers

Program: Cavey
Price: £2.99
Supplier: Player Software, Mercury House, Callevsa Park, Aldermaston, Berks. RG7 4QW. Tel; 07356 71145

LONG long ago when dinosaurs ruled the Earth the task of hunting for food to feed your wife and 2.4 kids was a risky business. If you weren't man enough to pinch a couple of steaks from the rear end of a brontosaurus when it wasn't looking you could always take a few pot shots at the pterodactyls. As Cavey the caveman you choose the second option, but soon find that it isn't as easy as it looks.

The action takes place in a deep valley bordered by two steep cliffs. You stand alone in the middle of the valley, with five spears stuck in the ground nearby. The pterodactyls begin to congregate overhead preparing to attack. As the first of the huge beasts launches itself from the cliff top you must run and pick up a spear.

Hitting the Return key results in a spear being launched skywards. The first time I did this I just sat there admiring the shot, only to become a caveman kebab as it fell back to earth. Adopting the hit and run technique will avoid such mishaps.

The pterodactyls don't take kindly to your aggressive nature and begin a bombing campaign. The reptiles attack in unison and the air is filled with flying dino doos. The instructions say they are rocks but you can't fool me, I know a dino doo when I see one.

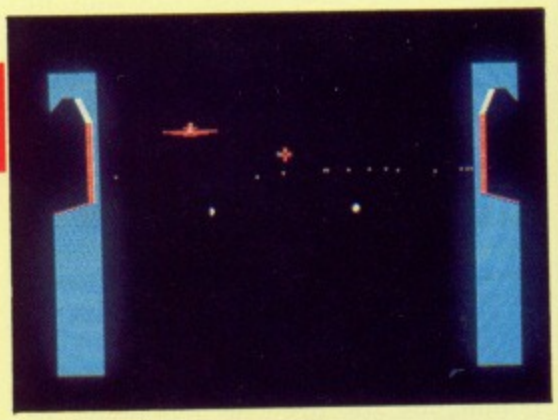
It goes without saying that being struck by such a projectile is fatal – the pterodactyls were pretty big beasts, you know. Not only are these falling deposits a nuisance, they also cause problems on the ground. There is a two second delay between them hitting the ground and then disappearing. If you tread on one during this time you slip and break your neck.

Cavey does not use state of the art graphics, nor does it have the benefit of an expensive advertising campaign. What it has got is that special something which keeps you coming back for more, and at £2.99 who can argue with that?

Jon Revis

Sound	7
Graphics	8
Playability	8
Value for money	8
Overall	8

Bombs without bounce



Program: Dam Busters
Price: £9.95
Supplier: US Gold, Unit 2 & 3, Holford Way, Holford, Birmingham B6 7AX. Tel: 021-356 3388

ONE of the most famous films of the Second World War documented the flight of 617 Squadron when it bombed the German dams. With the release of Dam Busters you, too, can accompany the heroes on this historic mission.

You can either fly a practice bomb run over one of the dams, or fly the mission from a starting point over the English Channel. The original Commodore version allowed you to take off from RAF Scampton, thereby tackling the full mission. As I continued to play the game I discovered that this was not the only omission.

During play you can switch between eight different screens. The first one gives you a pilot's eye view of the surroundings. The display is crude. There are only two instruments, and neither the altimeter nor air speed indicator have any markings. This is no help whatsoever when the instructions insist that the bomb is dropped at exactly 232 mph.

Selecting either the front or rear gunner options is about as close as you are going to get to any real action in this game. Once again an exceptionally poor display appears consisting of a few stars and a red cross. Pressing the fire button sends a trail of bullets in the direction of this cross while enemy aircraft float around the screen.

Destruction of a plane is even worse – there is no explosion, it just disappears.

Selecting the navigator option causes a map to be displayed, the engineer option draws a series of speed controls, and the second engineer and status options produce two blank screens.

It came as no surprise that once the bomb was finally dropped a picture was drawn and I was told that I'd missed. I suppose a little animation was too much to ask for.

The more astute of you may have guessed that I am less than impressed by the BBC Micro version of Dam Busters. Don't be seduced by the impressive packaging, the software inside is not of the same standard.

James Riddell

Sound	4
Graphics	4
Playability	4
Value for money	4
Overall	4

Adventures made easier

Program: Graphic Adventure Creator.
Price: £22.95 (cassette) £27.95 (disc).
Supplier: Incentive, 54 London Street, Reading RG1 4SQ. Tel: 0734 591678.

AFTER several years of playing adventure games I was convinced that writing one would be simple. The result, maybe not up to top standard at first, would definitely be better than most.

However there was one drawback, I can't produce more than an elementary Basic program so it looked like my adventure writing flights of fancy would not amount to much at all. Even worse, I prefer graphic adventures and the idea of working one out pixel by pixel rather cramped my style.

So it was with eager hands that I grabbed the opportunity to review the Graphic Adventure Creator (GAC) from Incentive. It comes with a sample adventure which shows off the graphics capability and makes you dream of becoming Leonardo overnight. The pictures are well worth studying for hints to get the best from the system.

One problem which I hadn't realised from the sample pictures, but which became apparent when I tried drawing my first picture, was that you can only use four colours. You can choose which you want in any one screen, and can mix them to get a range of effects.

The graphics editor is reasonably easy to use, particularly if you've used other graphics packages. There are commands for drawing rectangles or circles as well as the usual lines and dots. The fill routines are quick and are better than some others I have used.

One interesting feature is a "merge pictures" option. This was used very nicely in the sample to get an elaborate border on each frame, coloured according to the pallette chosen.

The part that ties everything together is the adventure creator. Here you can write the gripping text to accompany your works of art, as well as all the messages and other little touches which make an enjoyable game.

The difficulty comes in making it all do what you want. I found the adventure creator as powerful as any other adventure writing package, more so in places, but I was glad I'd seen the others first so that I could understand the manual.

Admittedly I'd been spoilt with a adventure writing program on the Apple. The manual led you keypress by keypress through writing an adventure, explaining as it went. The BBC Micro version of the Quill doesn't do this, nor does GAC and I found the manuals for both hard to follow from cold.

One section I found particularly difficult to get used to was the conditions section where you give the program instructions on how to interpret the player's actions. Unlike the Quill, GAC uses a much more formal system which uses brackets, mathematical symbols and numerical values for the verbs and nouns. The end result is every bit as good, but I feel easier with a system that approximates to English.

On a more positive note, GAC has a very good parser, better than the Quill's. Your finished program will easily cope with inputs like "get the frog, kiss it, throw it in the pond then run quickly".

The parser does not truncate words, so you can use drag and dragon or have your hero eating saveloy without the programs assuming you want to save the game each time.

When you've written something you can play test it by simply pressing Return at the main menu. There's even a diagnostic section to tell you when an error occurs – like trying to move to a non-existent room. An easy-to-use print option means that you can see your complete database at a glance in order to plan the change entries.

At the end, when you've tested and modified to your heart's content, the game can be saved as a runnable adventure to disc or tape. The result can be sold without seeking permission from the authors of GAC, provided acknowledgement is made.

Finally, I suppose I ought to say how easy it is to write a graphic adventure game. Well it isn't. However the fault isn't with the program but in the process.

Writing an adventure game is a complicated business and doesn't stop after you've drafted out your map of locations and thought about the plot. You have to consider all the objects in the game, like keys and jewels, as well as anticipating what the players are going to try and do.

Using a program like Graphics Adventure Creator brings home all the complexity of adventure writing. I definitely wouldn't ever like to try writing one without an aid like this.

However with GAC I did write an adventure. It is six locations long with four objects to get and use. It took me an evening to draw the pictures and another couple of evenings to input all the data.

The game is hardly a threat to the Level 9 team, in fact I wouldn't show it to anyone, but it works. There's a great satisfaction in playing an adventure you've created, and the speed of the program and efficiency of the graphics give even my humble effort an air of professionalism. I look forward to seeing some of the new games writers who will take this program and give us some good graphic adventures to play. After all, anyone can write an adventure . . . can't they?

Denise McKnight

Sound	*N/A*
Graphics	*8*
Ease of use	*8*
Value for money	*8*
Overall	*8*

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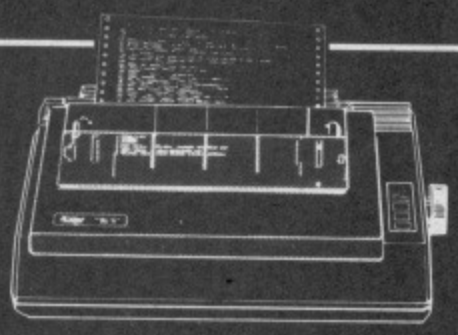

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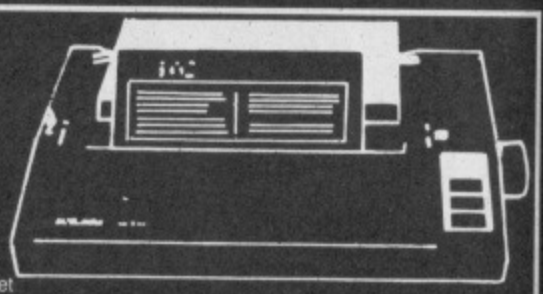

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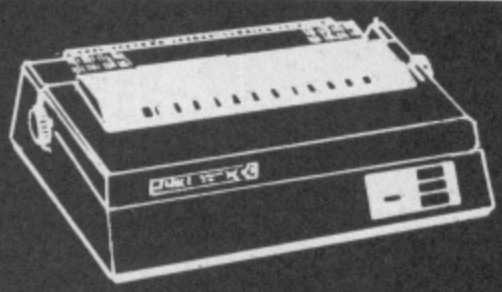

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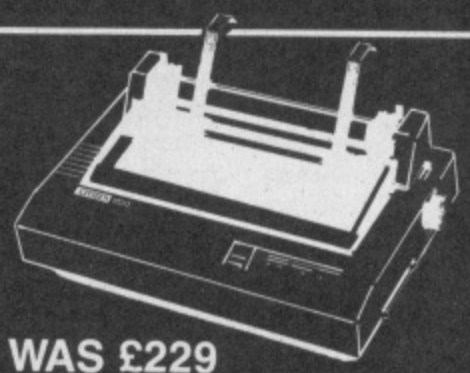

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If you purchased a Master 128 or ET between January-May 1986 please read on.

This is an important message for users of BBC Master Series micros purchased between January and May 1986. You should read this announcement carefully then contact your Acorn dealer if you have not already done so.

It has been found that when the battery in the above models is close to exhaustion, the microcomputer may attempt to recharge it. This is contrary to the recommendations of the battery manufacturer.

An upgrade kit which prevents this happening has been developed and is now available from any Acorn dealer at no cost. Fitting can be carried out easily either by you or free of charge by your supplier. This will not invalidate your guarantee.

If you have difficulty in obtaining a kit, please call 0223-214411 and ask for Department A2.

In the meantime, we suggest you follow standard electrical appliance guidelines and keep the power switched off when your microcomputer is not in use.

We apologise for any inconvenience that this upgrade will cause but we hope that Acorn's customers will be assured by our desire to maintain a high standard of product in the field.

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Product: Speech System.
Price: £39.90.
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Speech System has command of the language

IAN WHITMORE reviews a package from Computer Concepts that uses two ROMs to great effect

THE Speech System package from Computer Concepts is compatible with the BBC B and B+ models and contains two 16k ROMs, a 64 page manual and a seven page text to speech supplement.

It requires the TMS5220 speech processor chip as fitted in the standard Acorn upgrade, but not its accompanying TMS6100 phrom vocabulary ROM. However the Speech System works well even if the phrom is already fitted, and Computer Concepts will supply the TMS5220 chip with their Speech System at a reasonable price.

The relative position of each ROM is unimportant and they are available in one 32k ROM for the B+.

Unlike the Acorn Speech System, which is limited to phrases stored on the phrom, the Computer Concepts system is based on phonemes. These fundamental speech units are 44 in number and provide all the sounds required to speak English.

The first ROM, the speech chip, is available separately and drives the speech processor chip. It accepts five star commands and supports a *HELP facility.

The ROM is activated by *SPON followed by Break which raises page by &200, activates Event 4 and uses memory at &9C0-&9FF. Although it also makes use of zero page locations, it replaces the original data and so should not cause clashes.

*UTTER is the key command in Speech System and must be followed by one or more phrases consisting of a single intonation code and a sequence of phonemes.

Twenty four intonation codes, represented by a value in angled brackets, are supported, providing intonations showing surprise, emphasis, question, pleading and many others.

Phonemes are represented by one or two letters in upper or lower case. Vowel phonemes, 20 in number, all contain a written vowel and appear as "E i e ER AR" for example.

Consonant phonemes all contain only written consonants and are all in upper case, such as "P B T DH NG". In addition three lengths of silence can be entered and individual phonemes stressed. Thus to produce the phrase "BBC Micro computer" a typical *UTTER command would be:

```
*UTTER <1> B E B E S E M *I K R O K
UH M P Y +OO T UH
```

*VOICE sets the pitch for *UTTER, choosing from only five pitches.

*SYNC prevents the next part of a program continuing until the spoken part is complete.

*SING allows the speech chip to sing, albeit only in the key of C. The command must be followed by a sequence of notes each expressed by a chosen pitch and note length and the correct phonemes. The limitations of frequency generation in the speech processor mean that the quality of song is somewhat limited.

In addition to 21 pages in which commands are described the manual has 35 pages explaining and listing the individual phonemes and intonations. Two appendices provide a sector program for Wordwise+ to edit speech and a spelling test program in Basic.

The second ROM in Speech System is the text to speech ROM, which provides access to the speech ROM from commands with much simpler syntax.

A further 15 star commands are implemented in addition to *HELP. The first pair *TEXON and *TEXOFF switch both speech ROMs on or off. Whereas the speech ROM alone claimed &200 bytes the whole system claims &400 bytes.

The core command for text to speech is *SAY which is similar to *UTTER. However instead of requiring data to be placed after the command in tones and phonemes it is accepted as ordinary text.

The text to speech ROM converts the written text into the form used in

→

PROBLEM

I WISH to use my BBC Micro for a serious application and to detach and extend the keyboard from the main machine to use as a stand alone keyboard in a shop.

While I appreciate that some decoding may be necessary to fit the BBC's keyboard port or even the user port, do you know of anybody that produces a membrane type keyboard, similar to some of the modern cash registers, or, dare I say, the ZX81, that I might be able to use? – K.D. Everett, Hemel Hempstead, Herts.

SOLVED

The best bet would be to get a membrane keyboard with a serial interface and then plug it into the serial port of the BBC Micro. You can then run the computer from the remote keyboard by typing *FX2,1.

To switch over to the computer's keyboard type *FX2,0 on the remote keyboard. A suitable cased serial keyboard can be obtained from Farnell Electronic Components, Canal Road, Leeds, order code 170-611 and it will set you back £197.92.

From Page 27

*UTTER and passes it to the speech ROM. Taking the example quoted for *UTTER above, for *SAY it would be:

```
*SAY B.B.C Micro Computer
```

The *SAY command may be used both in command mode and within programs. Variations of this command allow the computer to speak inputs (*SAYIN), outputs (*SAYOUT), printer outputs (*SAYPRT), everything that is already on the screen (*SAYSCR), an area of memory (*SAYMEN) and the contents of a disc file (*SAYFILE).

*SAYOFF ends the *SAY facility in any of its modes. Using *SAYOP you will be surprised to hear the computer speak everything sent to the screen, including any error messages. An interesting exercise is to catalog a disc.

*SAY interprets the written text according to a set of rules contained in the ROM. Due to the vagaries of spoken English it will not always get the pronunciation and intonation right.

A further command, *PHONS, displays the phonetic translation as converted by the text to speech ROM in the form of a *UTTER command while speaking the text.

Thus when the translation is incorrect it may be edited by altering the stressing, phonemes or intonation, and executed as a *UTTER command which will be spoken by the speech ROM.

*SHUTUP immediately stops speech, clearing the speech buffer at the same time.

Three further commands control the interpretation of carriage returns, sentence ends and initials. *SMODE selects between spelling out all text letter by letter, pronouncing lower case words while spelling upper case letters, and pronouncing all words containing at least one vowel.

If the system cannot interpret a word it will be spelt out letter by letter. *RMODE allows carriage returns to be ignored, or treated as spaces or full stops.

*TMODE controls the recognition of sentence ends. Either three consecutive spaces or punctuation marks are treated as sentence end.

Punctuation marks are important for the text to speech system as it treats individual phrases and sentences according to their construction, modifying pronunciation to match the meaning.

The Acorn Speech System provides high quality speech, but is severely limited in its vocabulary. Computer Concepts' speech ROM provides access to any word in the English language, spoken or sung, at the expense of some of the quality of speech.

However the speech ROM alone is slow and tedious to use. The addition of the text to speech ROM to form Computer Concepts' Speech System is a great improvement, and I can heartily recommend it to anybody. ■

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The BBC Micro at 4MHz easily surpasses the new MASTER 128K on benchmarks.
For example, it runs the benchmark using Basic 4 in only half the time taken on the MASTER 128K.
If you have too many ROMs to plug in at once, the Fourmeg 256 offers TWO ways out. First, it includes additional high capacity (and fast) ROM sockets. Moreover, two or four normal ROM images can be stored in one high capacity ROM chip (by "Vertical Paging") — so more can be made immediately available at your fingertips.
Secondly, ROM images can be stored on discs and loaded into any one of the eight Sideways RAM banks available.
If you need more room in "languages" such as VIEW or BASIC, you may use any of the eight SHADOW RAM banks. No user memory is then lost to the screen, whatever the screen mode (while machine coded programs can access RAM right up to &FC00!).
Two frequent uses of the extra memory are as a RAMDISK or a printer buffer.
Star commands in the ROM can turn the extra RAM into a silicon DISK of 200K, compatible with both the Solidisk DFS and ADFS formats. The RAMDISK is at least 10 times faster than physical disc drives as it has no moving parts.
The printer buffer saves you time, it lets you use the computer while feeding your printer in the background.
In addition, the MANAGER ROM offers over 30 star command utilities to save time and effort using the computer.
To complement such a powerful product, Solidisk has arranged with Computer Concepts to bundle the famous WORDWISE PLUS wordprocessor ROM and manuals. This excellent product, worth £45.00 on its own, became the best selling wordprocessor for the BBC computer last year.
All in all, the Solidisk Fourmeg 256 offers an unmatched combination of speed, power and built-in facilities, while still having room for even further expansion. It is the most logical next step for the owners of any Sideways ROM board or of Solidisk Sideways RAM, who can trade in their present boards for the excellent Fourmeg 256.

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105	128K Sideways RAM with S/W pk1	125.00	3.00
106	Fourmeg 256 with WW+	175.00	3.00
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406	UVIPROM (16K)	19.00	2.00
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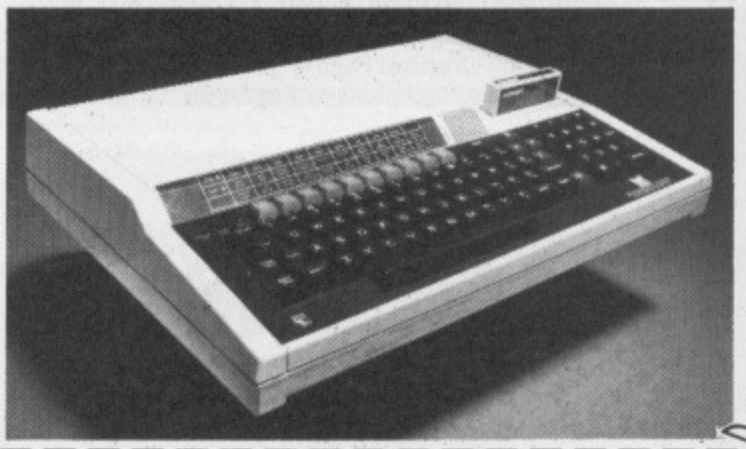

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1) ..... Date ..... by .....

2) ..... Date ..... by .....

3) ..... Date ..... by .....

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1) ..... Date ..... by .....

2) ..... Date ..... by .....

3) ..... Date ..... by .....

Service history:

: : has never gone wrong, never serviced.

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YOUR introduction to today's ever-widening world of communications!

TeleLink

If you've ever linked your BBC Micro to a modem – or if you are intending to do so – you'll want to find out all you can about the exciting world of communications that lies at your fingertips.

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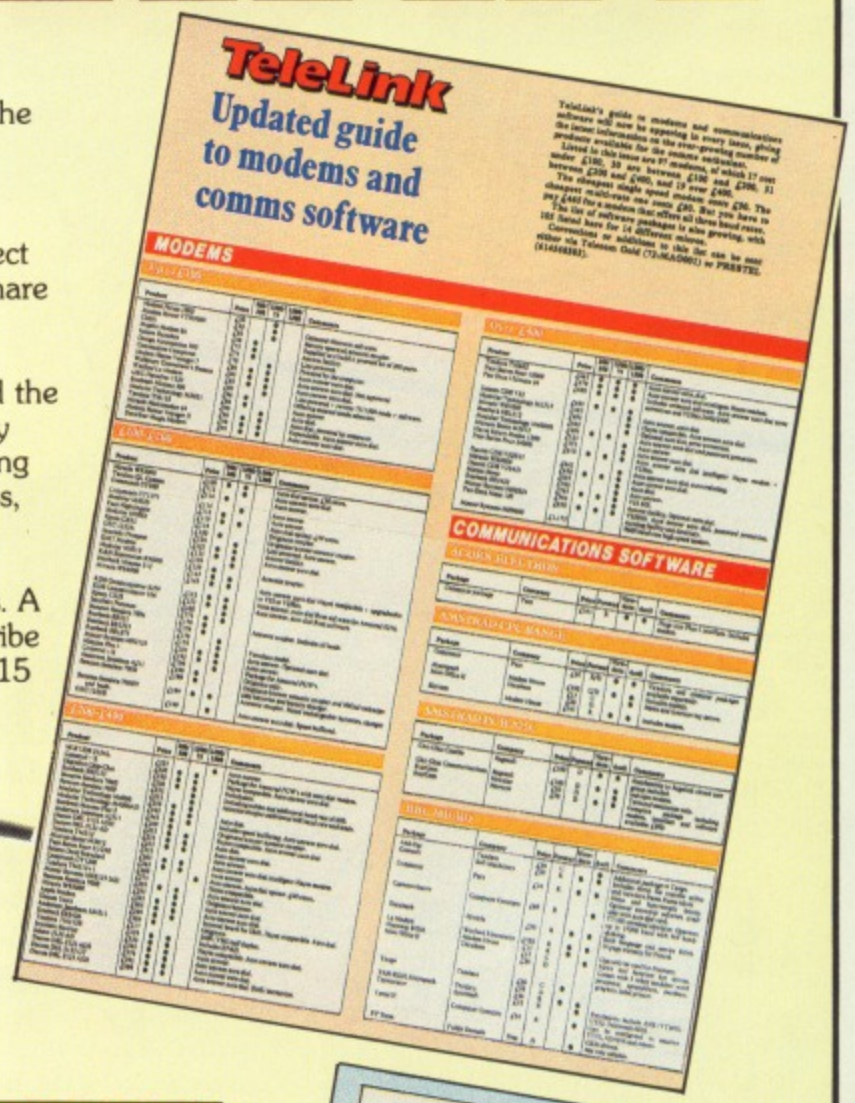
Steve Gold, the UK's top comms. operator, heads TeleLink's team of expert writers.

TeleLink is published every two months. A single copy costs £1.50, or you can subscribe for the next 12 issues, post free, for just £15 – *a saving of £3!*



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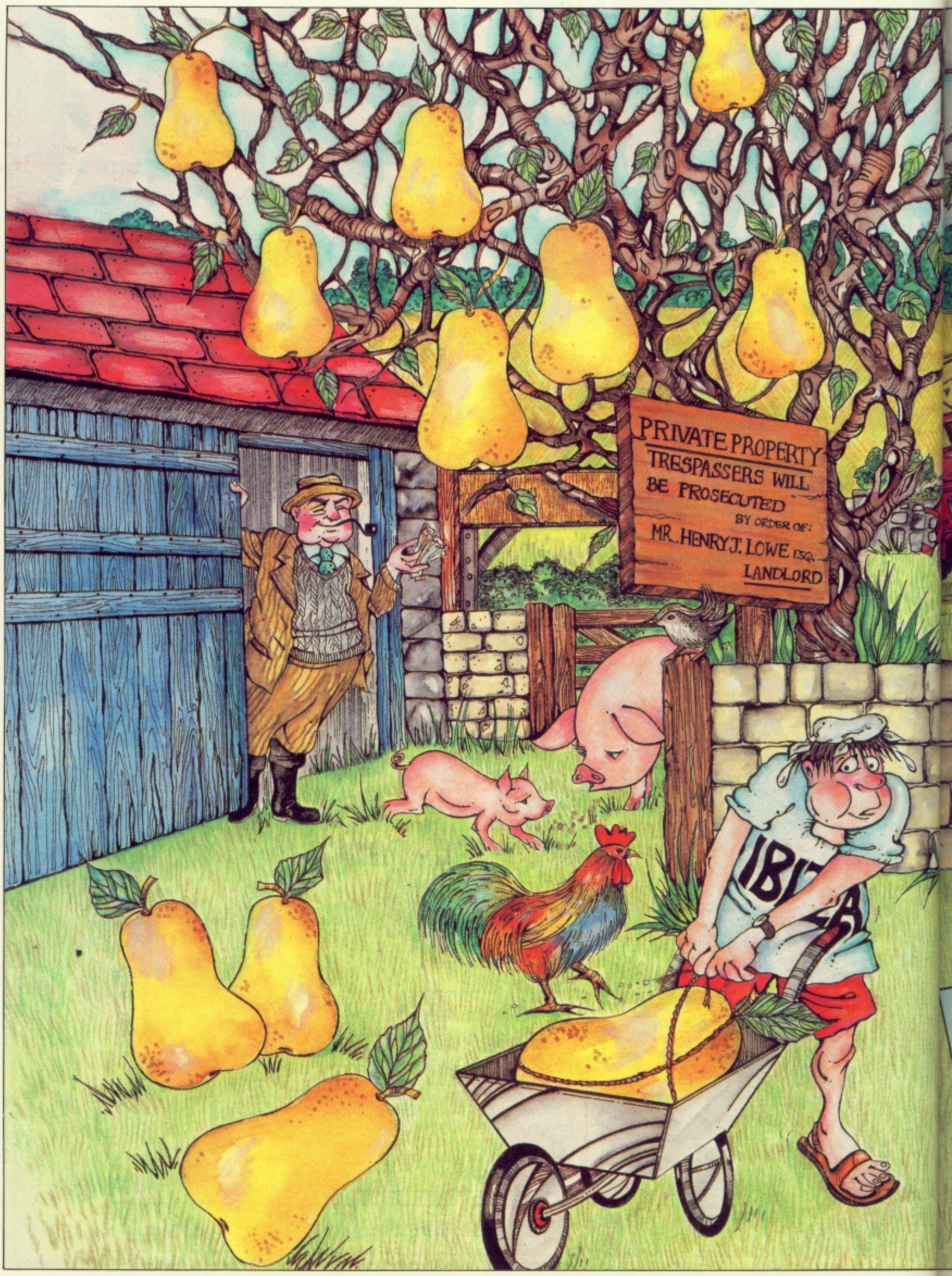
Every new subscriber to TeleLink is offered a free first quarter's subscription to Micronet – the biggest and most successful part of Prestel – absolutely free of charge. *Saves you £10!*

Please use the order form on Page 151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LANDLORD

PEARPICKER

IN this game you are a professional pear picker currently holding the world record for picking 50 pears in a minute.

However at the moment it is not the pear picking season, so you have had to accept a job from the miserable farmer Landlord Lowe, who grows a winter variety called Mat's Massive Pear.

To collect these you have been given a wheelbarrow which, when placed under a pear, magically makes it fall.

Once you have a pear you must try to get it to a tractor. Unfortunately Landlord Lowe's son Plastered Patrick is at the wheel and he drives very erratically. You will be given £2 for every pear given to Patrick, but as the wheelbarrow can only carry one pear at a time you won't strike it rich quick.

Once you have collected eight pears you are promoted to a more fruitful field where the pears grow rapidly, but for every pear you fail to collect now the miserly landlord deducts £1 off your wages.

You will, however, receive a £25 bonus that he is required to give you by an act of parliament.

If at any time there are 20 or more pears on the trees you will be fired.

MAIN VARIABLES

SC%	Income (score).
LIMIT%	Time period between each pear.
M%	Number of pears.
SCL%	Income acquired on this level.
X%,Y%	Wheelbarrow's coordinates.
TX%,TY%	Tractor's coordinates.
TX1%,TY1%	Tractor's directions.
X1%,Y1%	Wheelbarrow's directions.
W%,E%	Nearest tree to the wheelbarrow.
MAN$	Character of wheelbarrow (full or empty).
RY%,RX%	Coordinates of random tree chosen to add a pear to.
PLACE	Your place in the top ten.

MAIN PROCEDURES

setup	Sets the screen ready for playing.
move	Main procedure that moves the characters and takes keyboard entries.
addapple	Randomly adds a pear to one of the trees.
test	Checks if a pear should fall when the wheelbarrow is directly underneath a tree.
appledrop	Drops a pear into the wheelbarrow.
cd	Helps the tractor move randomly.
cleared	Called when enough pears have been picked and updates the score.
hiscores	Hi-score table routine.
intro	Prints the instructions from data statements.

Full listing starts on Page 124

Take control – by the appliance of computer science

MIKE COOK looks at the CMS 6502 second processor/controller

THE CMS 6502 second processor is a major breakthrough in the use of dedicated microprocessors. A dedicated microprocessor system is one that will only do one task like the controller in your washing machine or video recorder. Each contains a microprocessor dedicated to performing just one function.

In order to make a dedicated system you usually have to design your hardware with inputs and outputs suited to the task and then develop the software using machine code. The software is then blown into eprom or ROM and plugged into your hardware.

There are development systems available to make the task easier, but these are expensive and the whole process requires a lot of skill and is time-consuming.

The alternative approach to creating a dedicated system is to make one out of a general purpose computer. There are several ways of doing this with a BBC Micro.

You can have the application stored in a sideways ROM set to run on power-up. Alternatively, you can store the application on disc and get it to run on power-up or when you press Shift+Break. Using sideways ROM you have to develop your application in machine code, but using discs your application can be written in any language.

Using a high level language is obviously a great advantage with regard to development time. A program can be written and debugged with all the convenience of the high level language.

However there is one snag to using a BBC Micro as a dedicated system, and that is cost. You see, most applications just do not need a full keyboard, disc storage, graphics display and serial interface.

All right, some applications may need some of these, but not all, and therefore you are wasting a lot of money.

Suppose you want an intelligent central heating controller. All that requires in terms of hardware is a microprocessor, some memory and input/output devices. So a program to act as a controller would be easy to develop on a full BBC Micro but would be very wasteful.

It is exactly this dilemma that the CMS 6502 second processor addresses. It will allow you to develop an application on your full system and then transfer it into the second processor. This can then be detached from your main computer and your program will continue to run.

This is achieved by using a battery back-up static RAM as the memory. You can then directly test you application in situ. After testing an debugging if you want to make sever dedicated controllers your program ca be transferred to eprom for adde security.

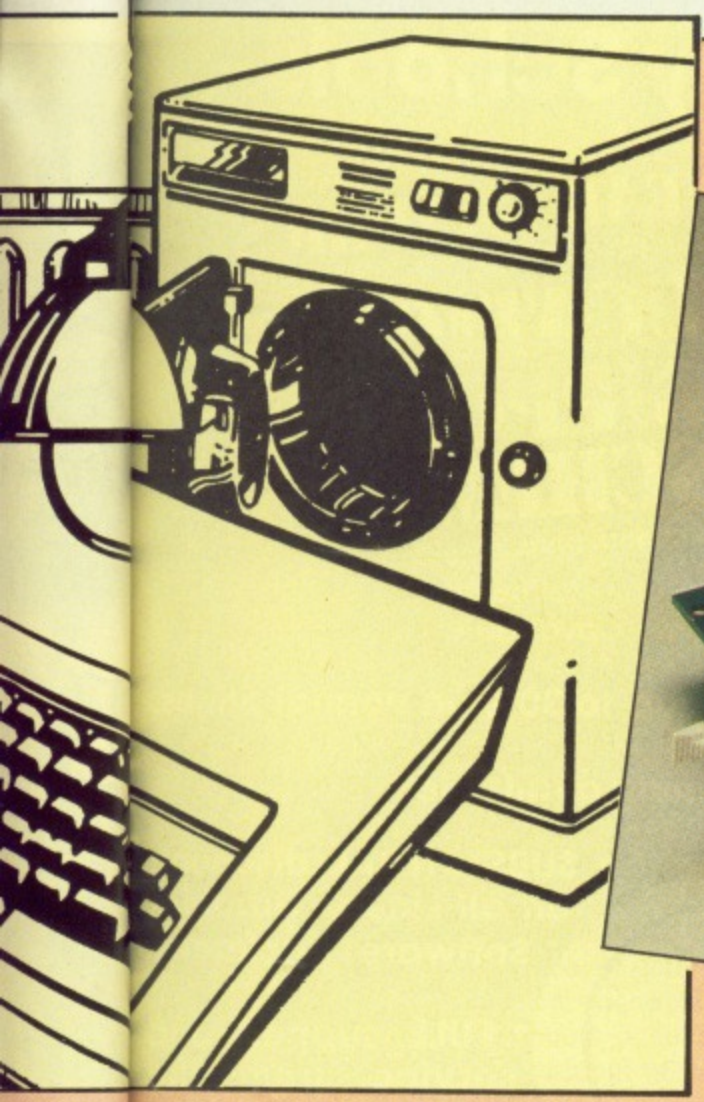
As you are only using a minimu system your costs are considerabl lower than using a full system.

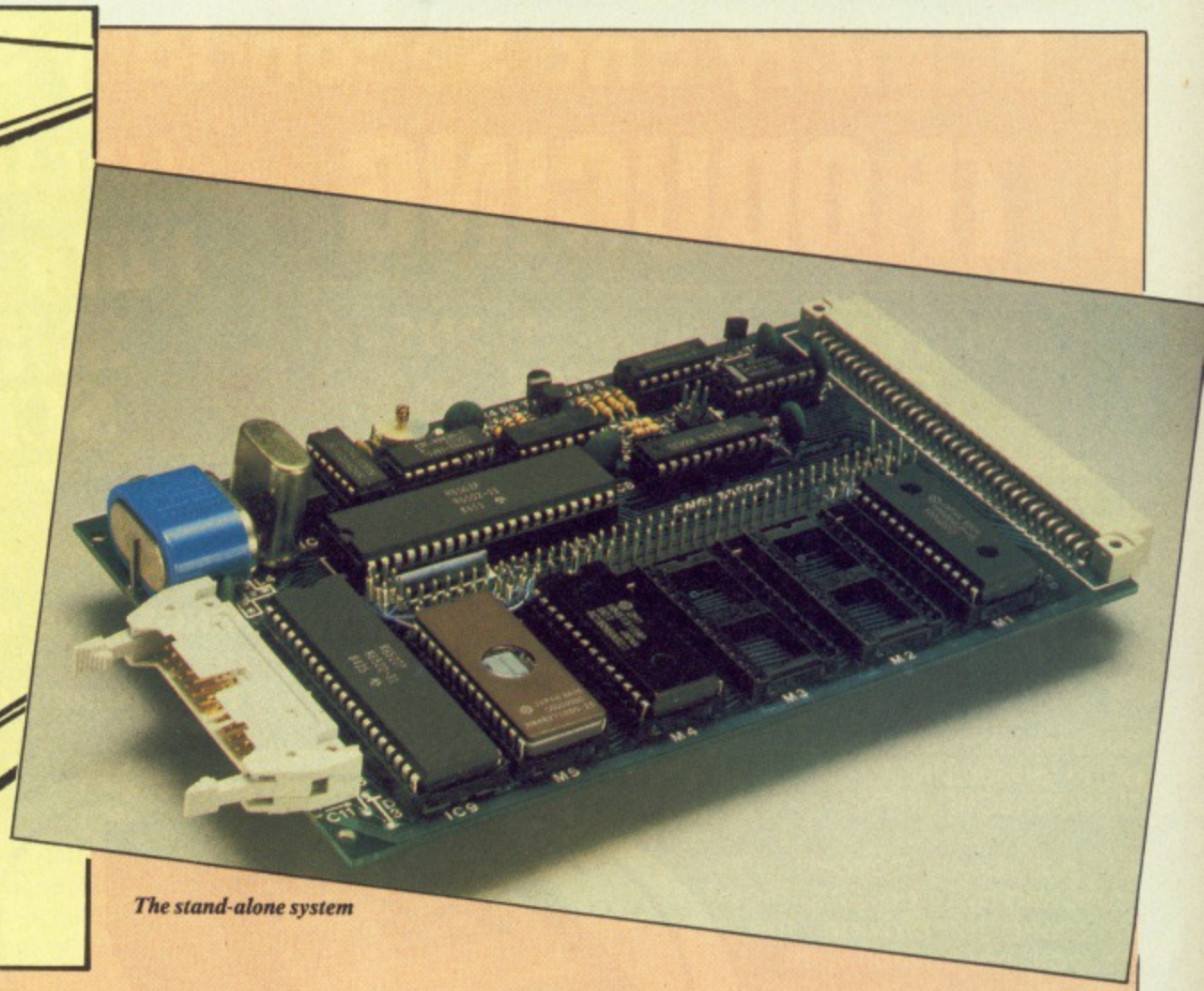
Let's see what this 6502 secon processor contains. It is built on a sing Eurocard – 100 by 160mm – an contains a 6502 microprocessor, a VI battery backed up real time clock, an 8k RAM. There is also an operatin system and Basic language.

The address decoding is performe by a fuse link prom. This coupled wit the extensive number link pins ensure that the system can be configured t take almost any combination o memory devices in the five 28 pi sockets.

At one end of the board is a 26 wa IDC plug. This can be connected to th Tube plug on the BBC Micro via supplied transition board. In th stand-alone mode this plug gives acce to the VIA.

At the other end of the board is a 6 way DIN direct connector used f linking other modules. There is also sideways ROM called CMS Link install in your BBC Micro. The memo





The stand-alone system

map does not make use of sideways paging but places the memory devices directly in linear order. For applications requiring over 64k of memory a paging register can be obtained to increase the memory space to 500k.

The operating system of the CMS 6502 second processor contains a monitor to help in the debugging of machine code programs. This contains the usual memory examine and change functions along with dumps and breakpoints.

A program that is executed on power-up is known as a turnkey because you just turn the key and there it is. When the CMS 6502 second processor powers up it searches each 4k block starting at &1000 looking for a turnkey header.

If it does not find one the operating system assumes it is connected to a BBC Micro. Therefore once you have written a program it needs to have a turnkey header attached. If the program is written in Basic this is quite simple.

The CMS Link ROM has a command *TURNKEY. This takes a program file and loads it into the CMS 6502 second processor, adding the correct turnkey header. Therefore with one command you can turnkey and install a program.

What if you have an application that needs a little more than the basic system? For example an input/output intensive application could use more than one VIA. Or what about a system that needs a display to output information graphically?

Well not to worry, CMS has thought of that with add-on cards containing the extras you need. These can be connected together easily using a card frame.

Indeed it is possible to implement a full BBC Micro system using these cards, but this would cost more than the micro itself.

The point is you can mix and match cards to create a system that covers your needs, no more and no less.

In a stand-alone application the CMS 6502 second processor will need to be powered from an external 5 volt power supply. The most convenient way of achieving this is to have one built into a card rack so that it can supply any other module as well.

So the CMS 6502 second processor allows the creation of an economical dedicated stand-alone control system. It can however be taken a step further.

If you have several stand-alone systems they can be networked together with the CMS network system. This means that units performing different control functions can exchange data and receive commands from a central controller.

The mind boggles at the complexity that you could build into such a system. In the jargon this is known as a distributed intelligence system – each separate controller performing its task but able to report back to a supervisor.

With all the variations and complexities of the CMS 6502 second processor you do not simply buy one off the shelf but rather talk to CMS and they will advise you on what configuration you need.

I believe they can even supply expertise in programming for any application. The cards are made to the highest standard and work well. The manuals are a little sparse, but contain all the relevant information along with some examples.

All in all the CMS 6502 second processor allows you to convert your BBC Micro into a full development system, and thus save thousands of pounds.

Product: CMS 6502 second processor/ controller
Price: £259
Supplier: Cambridge Microprocessor Systems, 44a Hobson Street, Cambridge CB1 1NL. Tel: 0223 324141

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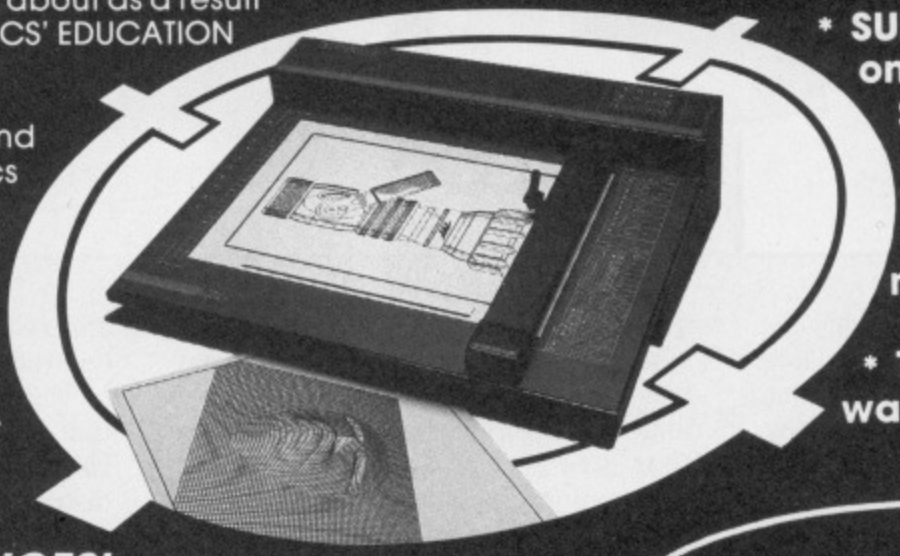

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No. 1 September 1986

Modems in schools: On the wrong lines?

Philip Andrews considers the future of viewdata in schools

AT first sight viewdata systems for use in education seem to be an excellent idea. The ability to tap into a huge resource of data for little more than the cost of a local phone call is an exciting prospect for schools, who for years have had to make do with out of date books in depleted libraries.

All that is needed is a computer, a modem, some suitable software and a phone line. A modem is an electronic box of tricks which links a computer to a telephone line so that one computer can "talk" to another computer similarly linked to the line. The computer also needs special software to enable the modem to be used in this way. Using a modem, a micro can "talk" to a large mainframe computer thus enabling large databases to be accessed.

Almost all schools have at least one computer and a phone, so all that is needed is the modem. As if in an answer to a prayer, in February the Department of Trade and Industry (DTI) offered each secondary and middle school a free modem, so at last they could exploit this new medium.

But is it such a wonderful thing? Have schools been sadly misled by the DTI? Will it enhance the quality of education, or will it just get rid of surplus end-of-year funds for the DTI and reduce the massive stockpile of unsold modems?

I believe that this is an initiative which has little to do with education. Local education authorities were given just two weeks to bid for these modems. Hardly any information was given about the offer, and there was no advance warning, yet all the modems were sat there ready to be delivered within weeks with no questions asked; all very strange.

With time so limited, authorities could do little but accept the offer and demand as many modems as they thought that they could get away with.

The Times Network for Schools (TTNS), who clearly know little about tact, in an advert in the Times Educational Supplement stated that the offer was due to close that day, and advised teachers to contact their adviser to check whether they had seen the offer. This ensured that for weeks afterwards advisers were plagued with teachers phoning up to ask if their authority had applied for the modems and if so when would they arrive.

When the modems did arrive, the problems really started. They came without leads or software, yet the application form asked for the type of computer that these modems would be used with.

So the first headache for schools or LEAs then is to obtain the computer-to-modem leads (£5), and buy some suitable software. The two main educational databases, Prestel and TTNS, both have software to sell. Prestel software costs £19.95 and TTNS software £30. Already the offer is looking a little tarnished.

The next headache is the telephone line. Many schools have only one or two lines into them. Usually these are desperately overloaded, and the thought of tying one of them up for long periods at a time is out of the question. In any case the viewdata system needs to be in a resources area, and not in the school office.

Therefore someone will have to foot the bill

→

THIS new educational section of The Micro User *welcomes contributions from teachers who believe they are using the micro in an interesting way in the classroom and would like to share their experiences.*

We are also interested in your dealings with software or hardware suppliers. Have you found them to be very helpful? Let's have your comments.

A disc too soon

THE 3.5 inch disc drive has so far been received like a lead balloon. Few if any educational software houses will supply discs in this format.

Yet the 3.5 inch disc is robust and can safely be handled by young children without any damage and they work in exactly the same way as with the normal 5.25 in floppy.

Many computer firms are starting to change to this disc size – the Electron interface was fitted with one – and it is likely that any new Acorn computer for schools will have one.

It is perhaps with this in mind that Cumana has just released a hybrid disc drive. This is a twin switchable drive with a 5.25in disc in one side and a 3.5in in the other.

A useful touch is a 40/80 track switch on the front of the drive together with indicator lights.

At the moment there is very little use for such a drive, but maybe this is what is needed to start the swing over to the smaller format.

This is probably a resource that LEA computer centres will want to have, but it is doubtful if it will be necessary for schools to buy one, not yet at least.

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Multi-Font NLQ

NEW

Converts most printers to NEAR LETTER QUALITY in user definable Fonts.

For EPSON & EPSON Compatibles, including MX/RX/FX/LX 80/100, STAR DP510/Gemini 10X/SG10/NL10 & Citizen 120D.

Simple to use, standard EPSON codes for Underline and Doublewidth used.

After initialising Multi-Font NLQ with a '*MFNLQ', Multi-Font NLQ is normally transparent to the user. Multi-Font does claim some memory for workspace and storing font data.
Multi-Font NLQ comprises of MFNLQ ROM for the BBC, and utility disc containing the FONT definer, ten fonts, BASIC demonstration program, VIEW demo text file and Driver.
Multi-Font NLQ is compatible with nearly all software, including most BASIC programs, VIEW, WORDWISE & InterWORD (SCRIBE & Printer Buffer software currently not supported).

Ten fonts are supplied or create your own using the font definer supplied.

Fonts included are :- Standard NLQ, Courier, Italic, Gothic, CompTS, Bold, Shadow, Outline, Broadway E., Theatre

Additional Font Disc MF 'B' contains:-
Hand, Script, Stencil, Broadway, Caps, Italic-Plain, Meccano, Plain, STD large, Wire, Greek/Maths and Inverse.

For Canon & Taxan Kaga users we recommend FONTAID in preference to Multi-Font NLQ.

Multi-Font NLQ (ROM and 40/80 Disc)	**£30.00**
Additional font disc 'MF-B' (12 fonts)	**£15.00**
P & P on MFNLQ	**£ 1.00**

This is Standard
This is COURIER
This is ITALIC
This is GOTHIC
This is COMPTS
This is BOLD
This is SHADOW
This is OUTLINE
This is BROADWAYE
This IS THEATRE

EXAMPLE OF MFNLQ FONTS

Additional disc 'A' gives an extra 11 fonts including:-
Greek/Maths, Plain, Hand & (Elite, Condensed, & Super Condensed).

Now included is a facility to issue '*' commands within a VIEW document.
To download new fonts within VIEW documents, the FONTAID ROM needs to be fitted in the BBC. (All other FONTAID facilities are available on both the FONTAID ROM & DISC). Fonts are always downloaded from Disc.

Fontaid is recommended to Canon & Taxan Kaga owners in preference to Multi-Font NLQ. As downloadable NLQ is a built-in facility of the Printer, full access to all the printers control codes is still allowed. The resolution of the FONTAID NLQ is also slightly higher than that of Multi-Font NLQ.

FONTAID

ENHANCED!

NLQ Definer for Canon & Taxan Kaga NLQ Printers.

Design your own NLQ Fonts or 'download' one of our 40+ predefined fonts.

Fonts can be downloaded within Wordwise, Inter Word or VIEW Documents allowing different fonts to be used for different paragraphs, or even individual lines of text. During downloading your Program or Text will not be corrupted.

On the FONTAID standard font Disk are the following eight fonts:- Square, Outline, Italic, Gothic, Computer Type Style, Bold, Shadow, and Broadway Engraved.

FONTAID requires 6264 RAM chip in printer.

FONTAID ROM & STD Font disc	(40 or 80 track)	**£30.00**
FONTAID ROM & STD Font disc with 6264 RAM	(40 or 80 track)	**£36.00**
FONTAID Additional Font DISC 'A' (11 fonts)	(40 Or 80 track)	**£15.00**
FONTAID Additional Font DISC 'B' (13 fonts)	(40 or 80 track)	**£15.00**
FONT ROMS of individual fonts are available eg "Square".		**£18.00**
P & P on FONTAID		**£ 1.00**

INFORM

A UNIQUE NEW POWERFUL USE FOR SIDEWAYS RAM

INFORM has been developed specifically to take full advantage of the Sideways RAM facility that many BBC micro users now have. Inform is compatible with most SIDEWAYS RAM units including ATPL Sidewise with RAM, Solidisc SWR, BBC B PLUS 128K & BBC MASTER series.

INFORM is a very powerful facility, which allows the user to display text information, of any kind, from Sideways RAM. This information can be readily accessed by using '*' commands from the keyboard or from application programs. In this way, much information can be displayed on the screen without stopping the current task, such as entering text in WORDWISE or VIEW.

NEW

The information in the RAM can be changed dynamically at any time.

Some of the possible applications for INFORM are:—

An on screen help manual can be created for your application, so that a reminder about more obscure points can be displayed at the users request. Information on your program or datafile contents, can remind you of their purpose.

Address and/or telephone numbers can be held and displayed quickly even while other applications are running. Very useful if you need to quickly display information about a client while he is hanging on the end of a phone!

Current prices for your products or stock position can be recalled instantly and readily modified using a wordprocessor. Similar files may be created from most databases such as VIEWSTORE.

In fact, any information to which you frequently refer can be displayed immediately without running another program. Your use of INFORM is only limited by your imagination, as they say!
There are three Inform Data Files (I.D.F.), of often used information, supplied on the disk to give an indication of the use of INFORM.

To use INFORM you must have Sideways RAM.

INFORM on 40/80 track disc. P & P on INFORM £1.00 **£20.00**

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Citizen 120D	**£180.00**
JUKI 5510	**£260.00**
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CJE micro's

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for a new telephone line to be installed (another £50 plus). Then there is the cost of the telephone calls and the annual rental. The two main databases can both be accessed for a local call from most parts of the country, but even so the cost soon mounts up when one is logged on for a whole morning.

What has happened in many LEAs is that the DTI's modem offer has alerted the various education administrators within the LEAs to the cost, and many are now debating how the extra charges can be accommodated.

Had the offer not been made I suspect that those schools who wanted to go along the path of on-line databases and electronic communication would have been free to do so without interference. The result of all this has been that many of the modems are still locked away in council offices while the solutions to these problems are being found. Meanwhile teachers are wondering where their modems are and when they will be able to use them.

Another problem that the DTI has quietly ignored is that of in-service training. Many LEAs have their in-service training planned and budgeted months ahead, and the way this offer has been sprung on them has not given them time to prepare and stage adequate training so that schools get the best out of viewdata.

When all these problems are sorted out and schools get their modems with leads, software and training, what are they going to do with them? They can subscribe to either Prestel (about £80 a year plus a time charge of 4p a minute, plus a frame charge for some pages) or TTNS (about £150 a year). Yet more costs.

Both systems can offer access to ECCTIS, the Educational Counselling and Credit Transfer and Information Service, the higher and further education courses guide. Prestel also has the SEND special educational needs database, the Signpost careers guide from COIC and the Schools Link educational computing magazine.

Both systems will support the new database NERIS (the National Educational Resource Information Service) when it becomes available towards the end of the year. This database will provide information about educational software. The first curriculum areas covered by the database will be mathematics, science and geography.

Prestel Education is part of Prestel, British Telecom's national public videotex service. It is essentially a commercial information service. Therefore the data provided is mostly of use to those businesses such as travel agents, farmers and stock brokers that require instant access to up-to-date information. Thus much of the information has little real relevance for general school use.

There is detailed information on current share prices, but I have yet to find any information on Henry VIII. Thus geography and economics are quite well catered for, but the sciences, for instance, will find little that is of use to them.

TTNS at one time operated a system that actively put many LEAs off subscribing. Recently they have changed their operating procedures to make their service more attractive.

Essentially theirs is an electronic mailbox system. This is the system of using a remote computer to store messages that can then be received by the addressees when they log-on to the system. LEAs are being encouraged to use TTNS to develop their own local databases. This is a very time consuming task both to implement and update and one must really question the effectiveness and efficiency of such a medium, especially as it is very limited in its method of operation and its versatility.

TTNS also offers an electronic mailbox system, as does Prestel. Thus schools can communicate with each other using a mailbox. Again this seems a most worthwhile idea. The ability to establish a link with another school, perhaps even in another LEA, and communicate regularly with it has many attractions, but if this is such a useful link then why is it not already being done using good old fashioned telephones or even letters?

Then there is the idea that schools can be kept informed of the latest developments in the LEA and elsewhere using electronic mail. This, too, seems to have many advantages, but in reality how many schools would make a habit of logging on each day to see the information, in the same way as post is regularly opened, or the telephone answered?

Clearly children are going to need a familiarity with viewdata systems but it is going to be expensive for schools to provide and maintain such a facility. What priority should viewdata have with all the other pressures on a school's finances?

When all these problems have been overcome, the initial costs and the running costs weighed up and the advantages of the system have been evaluated, the modem offer seems a little hollow. There have been few if any checks to ensure that LEAs have got the right number of modems. Many, I suspect, will have modems to spare. In addition these modems are not cheap: It is possible to buy quite adequate units for less than half the price.

The money the DTI has spent is paid for out of our taxes, money that education is desperately crying out for. If a cheque for £130 had been given to each school, how many of them would have considered a modem the first priority?

If the DTI is prepared to spend money to promote information technology in schools it should try to find out where the need is greatest, and then provide a complete package of resources to enable that aim to be achieved without imposing still further on the overstretched resources of the LEAs. ■

Atari attack

ATARI is planning a BBC Micro emulator for its ST machine in a bid to enter the UK education market.

The company's technical manager, Les Player, says the emulator "runs standard BBC Basic as fast as the Acorn machine itself".

The device has already been supplied to some schools for testing purposes. Player says: "They're very pleased with it".

Science in video

THE coming way of learning science is a package including a double-sided videodisc and computer software operated in conjunction with a Laservision player and a BBC Micro.

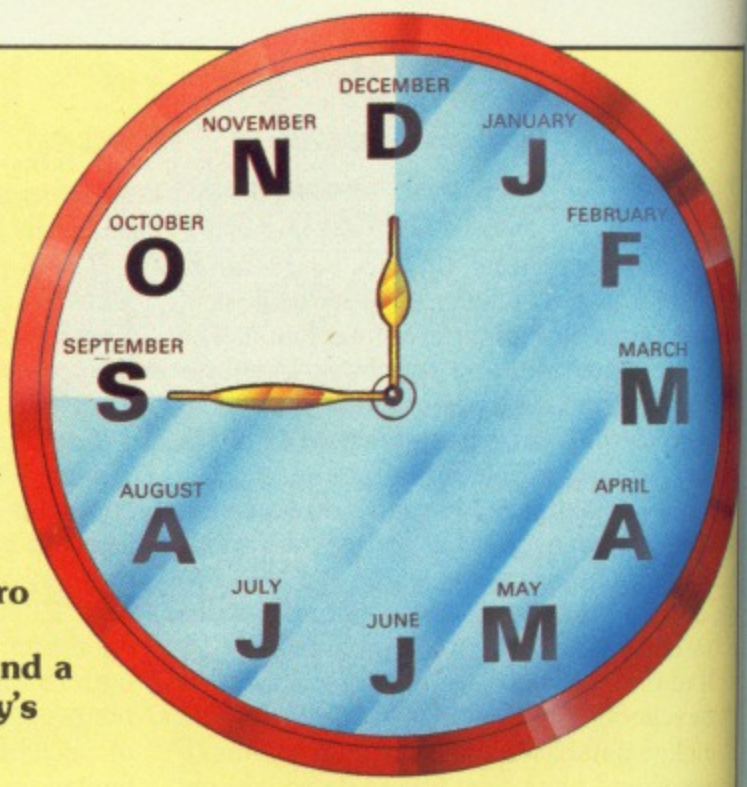
Interactive video specialists Futuremedia is putting the finishing touches to its new Interactive Science Laboratory which will soon be marketed by John Wiley and Sons.

The sophisticated facilities, with voice, sound and moving pictures, allow the user to conduct hitherto specialised and costly experiments using only the interactive science disc, keyboard and monitor.

The videodisc images do what the user tells them to right down to the smallest factor in a complicated exercise such as simulating control of a £15,000 gas chromatograph, or conducting a potentially hazardous experiment involving electrolysis.

And because the entire process is on disc, it's as safe as houses to use.

Yes – it's bargain-hunting time again!



For BBC Micro and Electron users this is the start of the top buying period of the year – the time when they stock up with all the latest hardware and software that will enhance the versatility, power – and just sheer fun! – of their micros.

And the ideal time to hold the Electron & BBC Micro User Show, where they get the best of both worlds – a first look at all the fascinating new-season products, and a chance to pick up really worthwhile bargains as yesterday's top sellers are sold at rock-bottom prices!

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Easy introduction to word processing

Joe Pritchard reviews PenDown

PENDOWN is a ROM-based word processor for the BBC Micro aimed at the junior and infant age range – a group capable of vast amounts of imaginative written work. Word processing is a means by which children can produce clear and structured work without repeatedly rewriting the work, allowing the child to concentrate on the content of the piece and not the mechanics of producing it.

As Linda Spear of the Walsall Logo Project says in the documentation of this program,

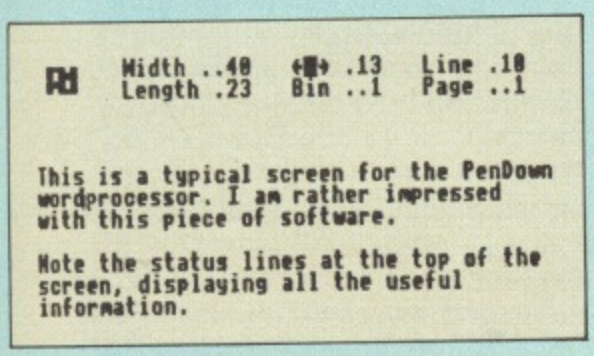

Figure I: The editing screen

word processing "should be seen as a new way to think about writing, easing a child's transition from oral to written communication", a statement with which I wholeheartedly agree.

PenDown is entered with the command *PD, and we begin with the Mode 7 screen shown in Figure I. Text typed in is displayed on a 40 column screen. This is the maximum screen width, so you have a WYSIWYG – What You See Is What You Get – word processing system. Text will be printed out as it is shown on the screen, but it's not possible to display the optional fonts or text sizes available, as we're operating in Mode 7.

The cursor, delete and Return keys have their usual function. Shift+cursor keys allows you to move to the top or bottom of pages or the start or end of lines with one key combination. In addition block copy and block delete are supported. Two status lines at the top of the screen keep you informed about what's happening – screen width, page length, current line position, page and line number all being displayed in an easily understood form.

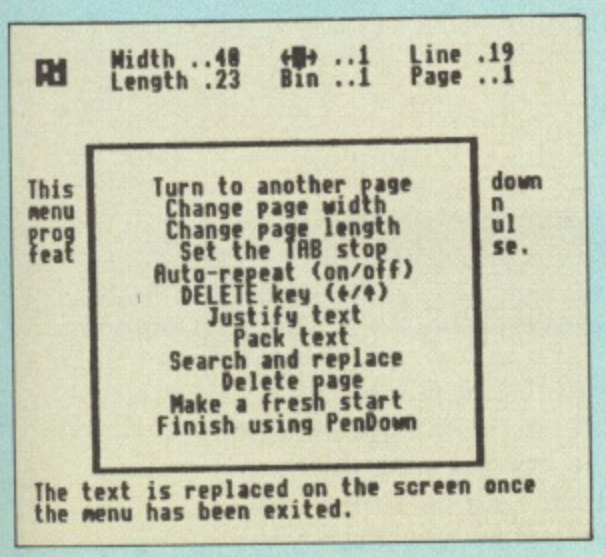

Figure II: The writing menu

You can enter text up to 255 lines long which should please all but the junior Tolstoys set to recreate War and Peace. Page length is initially set to 23 lines, with the top and bottom indicated by a line of arrows on the screen.

My only complaint about the program operation and the way it is documented is that at the end of a page pressing the down arrow key will take you to the next page, removing the previous page from view. However, provided you've read the documentation you'll be ready for it and using up-arrow will recover the previous screen.

Word processing also involves setting up justification, line width and so on. PenDown does this in a friendly and succinct way, using window menus triggered by the function keys. The cursor and Return keys are then used to change the various parameters of the program.

For example, f0 replaces the central area of the text screen with a menu called the writing menu – see Figure II. Once this menu is left the text is replaced on the screen, which is very nice indeed.

With this particular menu it's possible to change page length and line width, set the position of the tab stop, perform a search and replace operation, and disable the keyboard repeat. As youngsters often leave their fingers on keys for a little bit too long I thought that the latter was a particularly good feature.

Other function keys access disc filing, printer control, cut and copy, help, a dictionary and a planner. The latter is simple tree-structured writing facility, intended for use as a means of getting your ideas in order. A heading can be expanded to form a series of new sub-headings, each of which can then form the basis for a piece of writing.

Dictionary is not a definition list or a spelling checker. It gives a means of providing word lists. They can be accessed by the first letters of words or by a particular topic.

The cursor keys and Return can select a word from the displayed list and it can then be

Religious education

ONE area of the curriculum that is very poorly supported with software is Religious Education. To help remedy this Lion Publishing, well known in RE, circles, have produced two packages, Bible Places and Bible People, which link to the Lion Encyclopedia of the Bible.

The company's first venture into educational software, the packs are aimed at secondary level and while not cheap are worth every penny.

The software is very well written with great attention to detail, and each pack has been designed so that the software can be used in a variety of ways.

The maps in the Places pack are very good, bringing it alive. A minor niggle is the use of blue text on a black background, but this is only used for the mundane instructions.

The handbooks for each pack are clear and simple, and are very well produced. Lion has made a good entry into the educational market with some original and innovative software.

Helpful system

THE recently-formed educational software house Edusoft has released a low cost CAD/CAM system for the BBC Micro.

The packages are designed for user friendliness, having on-screen menus with explicit prompts and messages throughout.

The CAD package, which costs £80, includes standard facilities for construction and modification of both geometric and schematic drawings, including a window command for detail work and a font editor which allows characters and symbols to be designed.

The CAM package, at £35, provides tool path/profile definition and verification functions plus a tool path animation process. Tool/profile clashes are also detected.

Part geometry is extracted from geometric drawings created by using the CAD package.

Activity eggs

ALL About Eggs, produced by the Egg Marketing Board, is aimed at 9 to 13 year olds and contains a video, a poster, a pupil booklet, computer programs, teachers' notes, lesson plans and activity cards.

It is a comprehensive teaching pack, beautifully presented, with a varied, well thought out series of activities about eggs. The video was most interesting, and very professional.

The software is designed to be used with the Tandy Electronic Book, a touch-sensitive keyboard that can have overlays placed over it. It costs about £20 with the BBC adapter from Tandy shops. (Tandy usually give an educational discount for computer items.)

The software can be used from the keyboard without the Electronic Book.

In stark contrast to the rest of

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copied over to the main text – excellent for checking spelling. Dictionary files can be edited or new dictionaries can be made using the utility disc or from within PenDown.

Help allows useful information regarding the system to be provided from within the running program. Teachers can provide help files of their own for use with the program.

Parallel and serial printers are supported, and users of Epson compatible printers can print out the text in a large print or in a specially selected font. This feature allows pieces of work to be printed using different styles, although it's not possible to mix fonts on a page.

A font design program on the utilities disc makes production of new fonts an easy, if time consuming, job. For each font character size can be specified, although with large characters the number of characters in the font is reduced.

Larger characters also occupy a greater width of screen than smaller ones, thus limiting screen width to 10 letters for the largest characters. An 80 column printout is available, so it's possible to use PenDown as a straight word processor. However you're still limited to a 40 column screen and I found this mode to be a little awkward to use.

It's nice to see a program supporting the Concept keyboard as fully as this one does. This keyboard is an input device which can be seen as a user definable keyboard. A paper or card overlay on this board, together with suitable software, allows the keyboard to be configured for whatever application is desired.

An editor utility allows the teacher to define how specific areas of the keyboard behave and it's possible to assign whole words to particular areas of the keyboard – invaluable for younger children or those with special educational needs.

The documentation was excellent, with clear text and diagrams. Keystrips are included, reflecting the wide use that is made of function keys. Also provided is a disc of utility programs.

This impressive package gives an excellent environment for the development of written work. The versatility of such a program is obvious, allowing the computer a role in any school activity.

The introductory section on word processing in the primary and middle school classroom should fire up the enthusiasm of teachers, and give them confidence to let their charges loose with PenDown. Go on, give it a try – you won't regret it.

Product: PenDown
Price: £39.10
Supplier: Logotron, Ryman House, 59 Markham Street, London SW3 4ND. Tel: 01-352 1088

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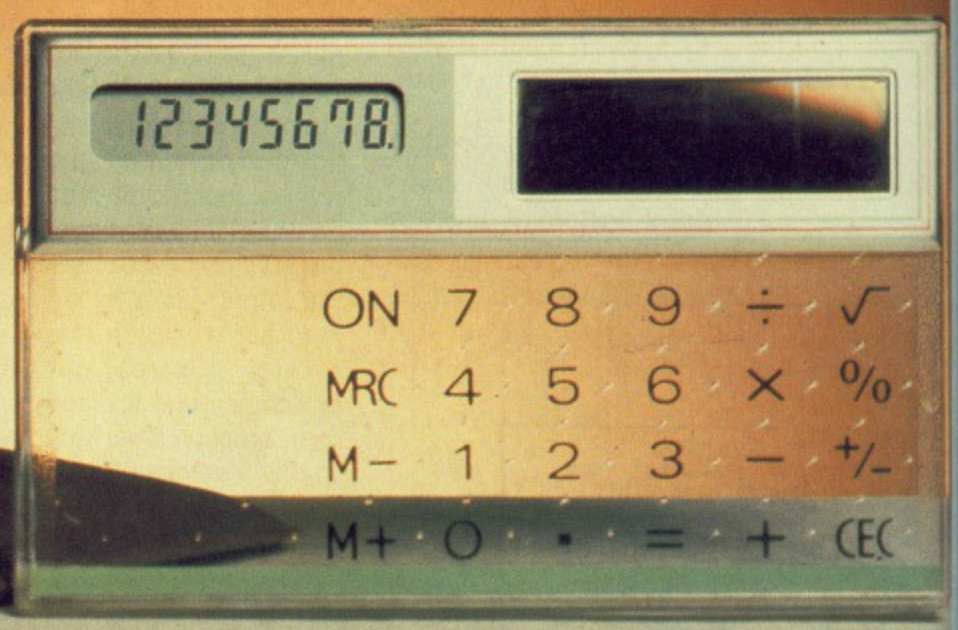

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IN recent years educationalists have become more aware of the problems of dyslexia, the rather mysterious handicap often mislabelled word blindness.

While its cause is still uncertain, its effects can be devastating giving rise to immense difficulties in reading and writing for otherwise intelligent and articulate people.

One simple manifestation of the problem in writing is letter reversals, such as writing dat for bat. In fact, in the past dyslexia has been dismissed as an inability to spell rather than recognised for the wide reaching cognitive disability it is.

The British Dyslexia Association aims to further the study of dyslexia and is actively involved in seeing how micros can aid sufferers.

Computer aid for dyslexics

By Jean Hutchins

While computer programs are not a magic remedy for dyslexia, they can be a very worthwhile teaching aid when you need many ways of reinforcing each teaching point.

In this way it can add a new dimension to dyslexia teaching, not by replacing carefully structured tuition, but by complementing the basic lesson.

For instance, the BBC Micro is unbelievably motivating. Pupils work hard in order to have time for the computer, and are often reluctant to go when time is up. And the micro channels this motivation well.

Pupils need to read accurately in order to respond correctly. On suitable programs they get a quick response to each entry, with praise if correct, or immediate practice of errors.

Pupils work hard at the tasks to get success. In fact, it may be the first time they have enjoyment in a language task, and this boosts their self confidence.

Of course, in order to handle language programs they have to type in words from left to right, working through each word. This may seem to be stating the obvious, but for dyslexics, getting letters and words in the right order is no simple task. Often you can see them mouthing the letters by name or sound as they search for them on the keyboard, which must reinforce the spelling.

And there's the flexible nature of the media to take into account. Most pupils do not mind making mistakes on the computer because they know they can correct them, or try again. None of them can read the word delete but they know what to do with that key!

In this respect a word processor is extremely valuable for dyslexics. They can enter their own writing and have help with correcting it. Alternatively they can dictate a story or account or homework. And the printout looks so good.

BBC Micro users are fortunate in this respect. There are far more good educational programs for the BBC Micro than for any other computer. There are useful ones for dyslexics in the skill areas of letter recognition, keyboard skills, letter formation, directional skills, alphabetical sequence, reading, spelling, punctuation and text on the screen.

When evaluating programs for use with dyslexics you must bear in mind that it is not possible to give reading, spelling or interest levels for programs. These can vary immensely according to whether the situation is supervised or not, individual or group, the first time learning of the skill, or fast revision of a previously taught skill and so on.

As a guide to working with dyslexics on your BBC Micro, I've included two lists of do's and don't's. These should help you to choose suitable software and even devise your own. To get you started I've included my own list of helpful programs. Notice I haven't included a word processor – there are many simple ones on cassette and disc.

● *If you'd like more information on the subject, the British Dyslexia Association computer subcommittee is producing booklets of information about computers and dyslexia. For details, send an sae to the BDA, Church Lane, Peppard, Oxfordshire RG9 5JN, or to Mrs J. Hutchins, 13 Hurstleigh Drive, Redhill RH1 2AA.*

Useful programs

TARGET. Dyslexics often find it difficult to learn and remember the alphabet sequence. In Target, the alphabet is displayed in the top part of the screen. You have to return lost

→

the pack the graphics are poor and seem to be there only to liven up otherwise very dull and dry material, though at least it was possible to switch off the amateurish sounds.

The final game is a simulation where the child has to drive a delivery van round to several shops. This was particularly annoying as the van was most difficult to control, even when set to "easy", and the speed of the action precluded any useful decision-making activities.

A super resource pack, well worth the money, but you might as well leave the computer in the cupboard.

Dinosaur eggs

THE educational game Dinosaur Discovery originally published in Australia, has been released in Britain by 4mation Educational Resources.

Designed for upper junior/ lower secondary level, the program requires users to locate a lost dinosaur egg and incubate it until it hatches.

An accompanying teachers' manual contains ideas and suggestions for setting up a Dinosaur Discovery cross-curricular project.

Dinosaur Discovery comes on disc for the BBC Micro, B Plus and Master for £16. A 3in disc version costs £19.95.

GCSE French

THE first new title from LCL in more than a year is Micro French for the BBC Micro. It is claimed to be the first complete GCSE course with real speech ever produced for the BBC Micro.

A complete self-tuition course taking beginners through to O-level in 24 programs, it emphasises practical French, both spoken and written, and incorporates real speech and animated graphics elements.

Micro French comes on two discs, 40 or 80 track, with manual and audio voice tape, or three cassettes and manual. Price £24.

Research program

A PROGRAM has been developed for the BBC Micro which will control and monitor the work of a bench top mini-fermenter designed by the Welsh Biotechnology Centre as a teaching and research instrument.

The low cost, small scale fermenter is intended to offer schools and colleges an affordable version of equipment which normally costs up to £10,000.

The centre is hoping to produce an interface and instrumented fermenter that will sell for about £700.

Keynote of the design of the fermenter's computer control is simplicity and clarity.

Uncluttered displays in both digital and analog format indicate temperature, stirrer revolutions, pH and dissolved oxygen percentage.

Each operation is independently set and maintained, the set point being displayed on the same scale as the actual reading.

The digital set point is displayed immediately below the actual digital reading, making comparative checks simple.

Because of the interactive nature in setting the operating variables the user has his instructions validated at each stage.

Rejecting all errors, while at the same time providing guidance through the use of help screens, readings can be displayed at any time to give the current position.

The centre plans enhancements to the program, including a facility to record the fermentation process into floppy discs which can be recalled later in the form of graphs and histograms.

Revision, games

A BROAD range of educational software ranging from games to O level revision has been published by Audio-Visual Productions for the BBC Micro and Master series.

Powergraph is a utility suite for plotting experimental points, all the options being contained in

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DO be certain to:

1. Choose programs to reinforce skills which have been taught.
2. Know the pupil and the program well.
3. Give just enough hints to ensure success.
4. Make the experience multisensory, by asking the pupil to read aloud to you everything on the screen, and the letters he enters.
5. Keep records of programs used, and whether they need to be repeated, or whether the pupil can progress to the next stage.
6. Encourage pupils to improve their own time or score, rather than competing with other pupils.
7. Choose interesting spelling programs into which you can enter the words the pupil needs.
8. Use programs flexibly in ways perhaps not intended by the authors.
9. Consider the usefulness of a word processing program and printer.
10. Join your local dyslexia association and work together to give dyslexic youngsters access to computer facilities.

DON'T offer dyslexics:

1. Incorrect spellings to be shot at or corrected.
2. Anagrams or jumbled letters.
3. Nonsense words, or the need to decide if a group of letters makes a real word.
4. Hangman programs.
5. The wrong interest level – a 10 year old may need easy but not babyish programs.
6. Boring programs or skills that can be done better in another way.
7. A lot of reading but little interaction.
8. Non-priority areas.
9. Visual approach spellings. For example, "meat, head, bear" in one list.
10. Programs that fail to show the right answers if errors are made.

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letters to their cards before the barrier closes in an arcade game type format.

DOORS. Many dyslexics confuse left and right, and do not read accurately. Here you choose whether to open the left or right door to get weapons – axe, flyspray or a dagger – to kill enemies such as skeletons, spiders or snakes before you lose your three lives.

BREAK IN. Dyslexics need to learn to read and spell words using the soft sound for c and g before e, i or y. In this program they guide policemen to look for robbers behind the soft c or g in words. Children can read the words they know, or be told the words and listen for the soft sound.

CAESAR'S TRAVELS. Dyslexics need interesting reading practice. After every four lines of text, they can choose what Caesar the Cat will do next, so there are many possible stories in this program.

TOPS AND TAILS. Dyslexics do not have good visual memories for words, so they have to perceive sounds in words and spell them. Tops is a snakes and ladders game. If you land on a picture, you have to type in the initial consonant blend or digraph. In Tails, you type in the final consonant of three letter words to set cats or dogs wagging their tails.

PODD. This helps language development by the understanding of verbs and spelling, all of which are useful skills for dyslexics. They have to think of actions Podd can do. Let them spell the words or parts of words which they can manage. They can also dictate letters of harder words, for dyslexics need practice in remembering letter strings long enough to write or type them.

COMPLEAT SPELLER. While dyslexics usually improve their reading, handwriting and maths, spelling always remains vulnerable. This American program presents words in three different ways for practice. It is very easy to enter your own words.

SPEECH! You are always looking for a variety of ways of reinforcing skills for dyslexics. Children enjoy hearing the computer read their writing – copying, spellings or dictation. They can even look and listen for the few mistakes the program makes in pronunciation! It is excellent for reinforcing phonic rules such as "tap/tape", "was, want, what" and so on.

STORY. Putting pen to paper is so hard for dyslexics. They are delighted to choose pictures, write about them and have a printout of the pictures and the writing.

Program	Skill/subject	Supplier
Target	Alphabet	East Court
Doors	Reading	IEC
Break In .	Reading	Highlight
Caesar's Travels	Reading	Mirrorsoft
Tops and Tails	Spelling	MacMillan
Podd	Spelling	ASK
Compleat Speller	Spelling	Nisbet
Speech!	Text	Superior
Story	Text	H & H

Useful programs: Skills and suppliers

Expand your German vocabulary

Program: Deutsch Direkt!
Price: £22.95 (disc).
Supplier: BBC Soft, BBC Publications, 35 Marylebone High Street, London W1A 4AA. Tel: 01-580 5577.

DEUTSCH Direkt! is the title of a BBC TV programme aimed at newcomers to the German language. It is also the name of a computer program which is intended to complement the TV series. If you have never seen the series don't despair, the manual says that the program is of use to any students of German wishing to expand their vocabulary.

The package consists of the program disc, an audio tape containing pronunciations of every word, and an instruction booklet. Booting up the disc will present you with a menu, the first option being Words. Having loaded up Words you select which of the 69 groups of words you wish to study, each group containing 15 related words.

A German word plus its English equivalent is displayed on the screen and you are asked to type in the German word. Hardly an innovative teaching exercise, but it serves to familiarise you with the words on which you will be tested in later programs. The Review option lists the words of a specified group, with English translations if required.

The program Square is based on the popular word square puzzles. A 15 × 15 grid of letters is displayed within which are the 15 words of one particular group. You must locate and trace out each of the words, and as you find each one it is displayed in a list at the side of the screen.

Should you find difficulty in locating all of the words a Help key has been provided. This will give you the English meaning of one of the remaining words.

The final option is Quit. This displays a complete list of words, highlighting the ones you failed to identify. It then re-displays the grid minus the dummy letters.

The Deutsch Direkt! program is purely a tool with which to increase the size of your German vocabulary – it does not profess to tackle verbs and tenses – and as such it succeeds very well.

Thomas Brown

Adventure leads to worthwhile projects

Program: Monkey
Price: £17.25 (cassette) £18.40 (disc).
Supplier: C & C Company, 9 Ettrick Place, Ayr KA8 9HH.

MONKEY is an interesting program showing the new approach to educational software using the micro as the heart of an independent project around which other work may be based. It is an adventure based on an ancient Chinese childrens' fairy tale about the exploits of the Monkey God, the Buddhist priest Tripitaka, and their quest for the holy scriptures. The player moves by solving a series of problems in the search for the scriptures.

The game is divided into three parts with all text clearly displayed in double height teletext characters, accompanied by the occasional tune, which may be turned off. The first section lists out the complete story for the pupil. The second deals with the early exploits of the Monkey God before he begins the quest for the scriptures, and includes solving logic problems, anagrams and so on. Successful completion of this section displays two secret words which are used to begin the final section.

This is the quest itself, which takes you into the caves, past the Great Wall of China, across a desert and up a mountain, stopping only to acquire objects and answer questions required to let you proceed. It took a friend and myself about 20 minutes to complete the adventure, but the teachers' notes suggest additional classwork allowing it to become the centre of an extensive project including art and drama work.

The package is well presented and comes in a hard-backed wallet containing disc, wall chart and separate booklets of student and teacher notes. The teachers' notes have additional sections containing the answers to the problems set in the program as well as suggestions for more work.

Despite the lack of outstanding graphics and philharmonic sound, the program is enjoyable to use and certainly covers a wide range of different problem solving techniques. It is a bit on the expensive side, but nonetheless a very worthwhile addition for anyone considering computer-based project work.

Tarquin Thomas

one menu. Points can be plotted directly or functions of values plotted, and points joined by direct straight lines, best fit lines or smooth curves. Disc price is £17.

Matrices is a suite of three teaching and testing programs. The first deals with order, addition, subtraction and multiplication of matrices, the second with finding the inverse of two by two matrices, and the third program contains questioning routines on all sections of the first two. Available on disc or cassette for £15.

Trigonometry O Level is a revision suite covering Pythagoras, sine, cosine and tangents, sine rule, cosine rule, 3D geometry and typical exam questions. Disc price £15.

Darts Games comprises seven programs with varying degrees of arithmetical difficulty and assistance using a dart board simulation. Disc or cassette price is £15.

Six French Games is aimed at pupils in their first year of learning the language but can also be used for revision by more advanced students. Each game has a basic and an advanced version. Disc or cassette price is £15.

Canal Builder is an historical simulation in full colour which requires the user to build a canal between two towns as profitably as possible. Disc price £17.

Teletext editor

A NEW teletext editor targeted for the BBC Micro educational market has been launched by Watford Electronics.

TED is an advanced system for the editing of teletext screens and their presentation. It consists of a special 32k ROM, a detailed manual and a function key strip.

The TED package is able to modify frames suitable for direct downloading to Prestel or display pages in an advanced carousel system called a show or a scroll.

A scroll is effectively a 600 line screen, with the current display acting as a 25 line window. Virtually any situation where the need to scroll information is required can be

solved with this option.

An alternative to the scroll is the show option which is used to display a series of teletext screens with the timings and routings user specified. Shows, however, may be converted to scrolls to enable easier viewing.

Other features in the package range from an XY cursor position status display to line, block and column buffer for quick copying and recovery. The ability to convert edited screen to Prestel format for mailboxes is also provided.

It requires a single ROM socket. To gain the maximum from TED it is recommended that both disc interface and a ROM board is fitted to the BBC Micro.

A price has yet to be fixed, but once it has, educational discounts will be available for quantity purchases.

Micro project

THE popular Body Building Course run by Technical Editor Mike Cook in *The Micro User* for the past three years has inspired a 10 week night school course.

It starts at the end of this month at Manchester Polytechnic and will cover the theory and practice of adding electronic equipment to the BBC Micro to expand its usefulness.

In the first part of each session, Mike will go through the theory of a project from conception to realisation. Software requirements will be explained and background information supplied.

The second part will take advantage of the extensive laboratory facilities of the Poly's physics department to allow students to build their own circuits under the expert guidance of Mike Cook.

Participants will learn how to make printed circuit boards, how to solder delicate electronic components, and how to use test equipment to ensure that their project is working correctly.

Students can enrol for just the theoretical sessions or both these and the practical sessions, by applying to the Department of Maths and Physics, Manchester Polytechnic, Oxford Road, Manchester.

SOFTWARE

Logging experiments at your leisure

Product: Result
Price: £10 (cassette) £12 (disc).
Publisher: AVP Computing, Hocker Hill House, Chepstow, Gwent NP6 5ER.
Tel: 02912 5439

ANYONE who has ever performed even the simplest of science experiments will know that once the fun of performing the experiment and noting down the results is over, there is then the slog of writing it up. This is where Result can help you. This program will accept a sequence of results and perform simple pre-defined calculations on them. Finally the results can be plotted and the gradient of the best straight line calculated.

The program is booted by Shift+Break and you are given the choice of whether to use a printer or not. An empty grid is drawn and you are asked for the title of the first two columns where you will enter your results. Next you are asked what formula to use for the remaining three columns. These formulae are predefined and shown in the accompanying table they cover most simple relationships found in experiments.

Then you can enter your results – you have to enter a minimum of three and a maximum of 15. Once this is done a menu allows you to perform some simple editing or plot the results. When you select the plot option you are asked which column you want to use for each axis. In this way you can juggle the figures to obtain a straight line response. Each point is then plotted as an asterisk with the point number next to it. You can then get a plot of the best straight line with its gradient calculated.

By returning to the main menu, the columns of data can be sent to a printer and a simple representation of the graph using printer characters will be produced.

That, basically, is what you get. There is no way to store your results or to get a screen dump of the better graph you see on the screen. There is no way of entering your own formula for the columns or using more than 15 data points. I found the numbers next to each point tended to overlap when using the maximum number of points. Also there are no error bars associated with each point.

Nevertheless what this simple program does do, it does well, and should be suitable for most experiments up to GCE O level.

A good solid program with no frills or complications.

Mike Cook

Formulae used by Result
Column A: Variable
Column B: Variable
Column C: 1/A A^2 $1/A^2$ SIN(A) A+Constant LOG(A)
Column D: 1/B B^2 $1/B^2$ SIN(B) B+Constant LOG(B)
Column E: A*B A/B B/A C*D C/D D/C

Some tests are murder

Program: Forensic
Price: £17.50 (disc only)
Supplier: Chalksoft, PO Box 49, Spalding, Lincs. PE11 1NZ. Tel: 0775 69518.

ONE of the basic skills of a chemist's trade is the ability to identify unknown substances. To provide the level of practice required to acquire this ability without boredom creeping in is a problem. That was until Chalksoft released Forensic, a subtle blend of chemical analysis, murder and detective work.

The program is menu driven and provides three main options. Option one describes and demonstrates the tests at your disposal involving flame, hydrochloric acid, barium chloride, silver nitrate, heat, and finally some chromatography on the inks in the suspect's pens. The results given by various groups of chemicals are also described in this section. For example all carbonates give carbon dioxide when subjected to the hydrochloric acid test.

Option two presents a mystery chemical which you can subject to any or all of the tests. If you decide that you can identify the chemical you do so. If you are correct the time taken to come to your conclusion is displayed. This competitive element adds to the game's appeal.

Finally we have a full blown murder investigation to perform. The victim is murdered in an area which contains a large proportion of one specific chemical, lucky eh! Each of four suspects will present an alibi which mentions their proximity to one specific chemical. Samples are taken from everyone's shoes and you must analyse them and decide whether the results of the tests support the suspect's alibi.

All of the results obtained can be recorded on a special sheet which is supplied with the program. When you are satisfied that you know the identity of each chemical you can make your report. If you are correct the time taken to solve the murder is entered into a high score table.

I found Forensic to be a quick, clean, and safe supplement to experimental classwork.

Thomas Brown

ANY Questions

By PETER DAVIDSON

EXHAUSTED by incessant questioning from your pupils or offspring? Unable to cope with their constant interrogation? Well here's a program to turn the tables on them.

An ideal testing or revision aid, Any Questions allows you to create your own set of multiple choice questions that should keep your persecutors busy for hours.

And you're not restricted to just one test – the program allows you to create and re-load whole libraries of questions.

For those of you who are unfamiliar with multiple choice tests, they are the type where you are given a question and several – usually four or five – answers to choose from. You answer by writing down the letter that corresponds to the correct answer, by putting a tick in the appropriate box, or as in our computer version, by just pressing the appropriate letter.

In class, individual pupils can use the computer alone and after the whole class has done the test, the teacher can analyse the results. If you are using the program at home, you can enter, say, 10 for the number of pupils and see if you can do better each time.

In practice, teachers should use the program with groups who reach the testing stage at different times – for example, those working from workcards. In addition, the program forms an ideal revision aid at home or at school because the correct response appears each time a question is answered incorrectly.

When the program is loaded, the menu appears on the screen. This is primarily intended for the teacher who can return to it while a group is doing a test by replying "TEACHER" to the question "What is your name?".

The version published allows a class of pupils to be tested and their marks reviewed. However this is an abridged version of a program on our monthly tape and disc, which also contain two files of twenty O level questions – mathematics and general studies – written by qualified teachers.

The full program features a display showing exactly how pupils answered individual questions, an analysis of how questions were answered, and printout and save options for both questions and results. More files of questions, all written by teachers qualified in the appropriate subject, will be given on future monthly tapes and discs.

To allow you to make the most of the program, a routine to print a seven page booklet of instructions is also included on the tape and disc.

The programs are structured so that the main program lines fall below 99. From then on lines 100 to 199 refer to menu item 1, 200 to 299 refer to item 2 and so on. Lines above 1000 are used for other subroutines and procedures.

If you type the program in, you should note that this structure means that lines are not numbered consecutively in 10s.

Any Questions

```
   10REM ANY QUESTIONS
   20REM (C) MICRO USER
   30MODE7:F1%=0:VDU23,1,0;0;0;0;:*FX
11,0
   40ONERROR GOSUB1000
   50CLOSE#0:*FX229,1
   60CLS:PRINT'TAB(12,4)"ANY QUESTION
S"
   70PRINT'" 1.....Create file of new
 questions":PRINT'" 2.....Load existi
ng file of questions":PRINT'" 3.....C
hange a question":PRINT'" 4.....Save
 questions on tape or disc":PRINT'" 5.
....Start test"
   80PRINT'" 6.....Results":PRINT'" 7
.....Resume":PRINT'" 8.....Rerun"
   90PRINT'TAB(3)" PRESS THE REQUIRE
D NUMBER":ON GET-48 GOSUB100,200,300,
400,500,600,700,800:GOTO50
  100REM**CREATE NEW FILE OF QUESTION
S**
  110IFF1%<>0THENPROCILLEGAL:RETURN
  120CLS:F1%=1:INPUT TAB(0,5)" How ma
ny questions will be in this test (ma
ximum 30)",NQ%:IFNQ%<1ORNQ%>30 VDU7:G
OTO120
```

Business game

ACORNSOFT'S Business Games program formed the basis for a competition among 14 North Hampshire schools.

The software simulates running a business in competition with others, and includes factors such as when to invest, whether to spend on product development, fixing prices and coping with strikes, as well as profit and loss accounts and balance sheets.

Winners were John Gallagher, David Horner and Karl

Two members of the winning team, John Gallagher (left) and Karl Sternberg

Sternberg of Salesian College, Farnborough, who made the largest cumulative profit of £3½ million over two games.

Second was Farnborough Sixth Form College, followed by Heron Wood Secondary School, Aldershot, and Cove Secondary School.

The winning school received a BBC B Plus, monitor and disc drive donated by Sulzer Bros as part of British Industry Year 1986.

Notes on Ceefax

TEACHERS can now receive the programme notes issued as back-up for BBC educational broadcasts by downloading them from Ceefax in telesoftware form.

As yet only available for a limited number of programmes it will eventually transform the present system which involves writing away and paying fees between 40p and £2 for material.

The main appeal to both

teachers and education authorities is the ease of access and that the service is free.

"Our problem at the moment is contacting the authors to clear up the copyright situation", said Jeremy Brayshaw, the telesoftware organiser.

"But in future we will have it included in the original contract. Once that happens, we'll be able to offer all the notes in this way".

And to make it even more simple, Ceefax has just launched the Advanced Teletext System ROM (ATS), claimed to be the most simple yet to use for downloading software. Compatible with all BBC Micros – including the Master range – it will also work with any Acorn second processor.

It is designed as an alternative to the TFS ROM for the Acorn teletext adapter and works on single key commands.

A single keypress presents a catalog of all the software available on the current television channel, indicating the filename, file type and size. Selection of a file is made using the up or down cursor keys.

Pressing Return will automatically select the required page, download the file, save it to the current filing system then re-present the telesoftware menu. It's as easy as that.

During downloading the screen displays the filename, load and execution addresses, and the number of blocks captured and remaining.

Downloading progress is shown graphically, indicating which block has been found and whether it has been correctly received.

When all the blocks have been downloaded the catalog is displayed again for further selection.

The ATS ROM uses only one page – 256 bytes – of RAM. This means that on a BBC Micro with a disc interface PAGE will be set at &1A00 when the teletext system is in use.

Unlike TFS the ATS correctly claims private workspace in a Master, keeping page at &E00.

No RAM space is used if the ROM is disabled – a command for this is provided – or if the adapter is not present or switched off. The state of the system is shown by *HELP.

Teletext pages from any UK TV channel can be received and displayed.

The channel can be changed

From Page 47

```
  130INPUTTAB(0,10)" How many respons
es are there to each    question (max
imum)",NR%:IFNR%<2ORNR%>5 VDU7:PRINTT
AB(17,11)STRING$(40," "):GOTO130ELSE
DIMQ$(NQ%,NR%+1):DIMQD%(NQ%,NR%)
  140QN%=0
  150REPEAT:QN%=QN%+1
  160PROCinput
  170UNTILQN%=NQ%
  180RETURN
  200REM**LOAD TAPE FILE**
  210IFF1%<>0THENPROCILLEGAL:RETURN
  220F1%=1:PROCTORDIN
  230F%=OPENUPF$:INPUT#F%,T$
  240IFT$<>"Q"CLS:F1%=F1%-1:CLOSE#F%:
PRINTTAB(0,5)" YOU ARE USING THE WRON
G TAPE!!!!":PRINT:PROCPRESS:RETURN EL
SEINPUT#F%,NQ%,NR%:DIMQ$(NQ%,NR%+1):D
IMQD%(NQ%,NR%):FORI%=1TONQ%:FORJ%=0TO
NR%+1:INPUT#F%,Q$(I%,J%):NEXT:NEXT:CL
OSE#F%
  250RETURN
  300REM** CHANGE ROUTINE**
Escape at line 310
   10 REM ANY QUESTIONS
   20 REM (C) MICRO USER
   30 MODE7:F1%=0:VDU23,1,0;0;0;0;:*F
X11,0
   40 ONERROR GOSUB1000
   50 CLOSE#0:*FX229,1
   60 CLS:PRINT'TAB(12,4)"ANY QUESTIO
NS"
   70 PRINT'" 1.....Create file of ne
w questions":PRINT'" 2.....Load exist
ing file of questions":PRINT'" 3.....
Change a question":PRINT'" 4.....Save
 questions on tape or disc":PRINT'" 5
.....Start test"
   80 PRINT'" 6.....Results":PRINT'"
7.....Resume":PRINT'" 8.....Rerun"
   90 PRINT'TAB(3)"  PRESS THE REQUIR
ED NUMBER":ON GET-48 GOSUB100,200,300
,400,500,600,700,800:GOTO50
  100 REM**CREATE NEW FILE OF QUESTIO
NS**
  110 IFF1%<>0THENPROCILLEGAL:RETURN
  120 CLS:F1%=1:INPUT TAB(0,5)" How m
any questions will be in this test (m
aximum 30)",NQ%:IFNQ%<1ORNQ%>30 VDU7:
GOTO120
  130 INPUTTAB(0,10)" How many respon
ses are there to each    question (ma
ximum)",NR%:IFNR%<2ORNR%>5 VDU7:PRINT
TAB(17,11)STRING$(40," "):GOTO130ELSE
 DIMQ$(NQ%,NR%+1):DIMQD%(NQ%,NR%)
  140 QN%=0
  150 REPEAT:QN%=QN%+1
  160 PROCinput
  170 UNTILQN%=NQ%
  180 RETURN
  200 REM**LOAD TAPE FILE**
  210 IFF1%<>0THENPROCILLEGAL:RETURN
  220 F1%=1:PROCTORDIN
  230 F%=OPENUPF$:INPUT#F%,T$
  240 IFT$<>"Q"CLS:F1%=F1%-1:CLOSE#F%
:PRINTTAB(0,5)" YOU ARE USING THE WRO
NG TAPE!!!!":PRINT:PROCPRESS:RETURN E
LSEINPUT#F%,NQ%,NR%:DIMQ$(NQ%,NR%+1):
DIMQD%(NQ%,NR%):FORI%=1TONQ%:FORJ%=0T
ONR%+1:INPUT#F%,Q$(I%,J%):NEXT:NEXT:C
LOSE#F%
  250 RETURN
  300 REM** CHANGE ROUTINE**
  310 CLS:IFF1%=0PROCILLEGAL:RETURN E
LSE INPUTTAB(0,5)" Which question do
you wish to change?"''"   Enter 0 to
return to the MENU."TAB(15,10)" "QN%:
IFQN%<0ORQN%>NQ%THENVDU7:GOTO310 ELSE
 IFQN%=0RETURN
  320 CLS:PRINTTAB(0,5)" "Q$(QN%,0):F
ORI%=1TONR%:PRINT'" "CHR$(I%+64)"....
"Q$(QN%,I%):NEXT:PRINT'" Is this the
question?":Q$=GET$:IFQ$<>"Y"ANDQ$<>"y
"THEN310 ELSE PROCinput:GOTO310
  400 REM**FILE SAVE ROUTINE**
  410 CLS:IFF1%=0PROCILLEGAL:RETURN E
LSEPROCTORDOUT:F%=OPENOUT F$
  420 PRINT'"  SAVING":PRINT#F%,"Q":F
ORI%=1TO500:NEXT:PRINT#F%,NQ%,NR%:FOR
I%=1TONQ%:FORJ%=0TONR%+1:PRINT#F%,Q$(
I%,J%):NEXT:NEXT:CLOSE#F%
  430 RETURN
  500 REM**TEST**
  505 IFF1%<>1THENPROCILLEGAL:RETURN
ELSEF1%=2:PN%=0
  510 CLS:INPUTTAB(0,5)" Enter a numb
er equal to (or greater    than) the
 maximum number of people who  will d
o the test. Then press RETURN"TAB(15,
10)" "MAX%:IFMAX%<1THEN510ELSE DIMPD$
(MAX%,NQ%):DIMMK%(MAX%)
  515 REPEATPN%=PN%+1
  520 CLS:PRINTTAB(0,5)" Next person
please.....":PRINTTAB(0,7)" You are s
tudent number "STR$(PN%):PRINT" There
 will be a maximum of "STR$(MAX%)" st
udents"
  525 VDU23,1,1;0;0;0;:INPUTLINETAB(0
,11)" What is your name",PD$(PN%,0):V
DU23,1,0;0;0;0;
  530 IFPD$(PN%,0)="TEACHER"THEN565EL
SE IFPD$(PN%,0)=""THEN520
  535 FORQN%=1TONQ%
  540 CLS:PRINTTAB(0,1)" This is ques
tion number "STR$(QN%):PRINT'" "Q$(QN
%,0):PRINT'" Press the key correspond
ing to the     correct answer....."
:FORI%=1TONR%:PRINT'" "CHR$(I%+64)"..
.."Q$(QN%,I%):NEXT
  545 *FX202,32
  550 ANS$=GET$:IFASC(ANS$)<65 OR ASC
(ANS$)>(64+NR%)THENCLS:PRINTTAB(0,5)"
 ANSWER WITHIN THE GIVEN RANGE!!!":VD
```

```
U7:PROCPRESS:GOTO540 ELSEPD$(PN%,QN%)
=ANS$:IFANS$=Q$(QN%,NR%+1)THENMK%(PN%
)=MK%(PN%)+1:PROCCORRECT ELSE PROCWRO
NG
  555 QD%(QN%,ASC(ANS$)-64)=QD%(QN%,A
SC(ANS$)-64)+1
  560 NEXT:CLS:PRINTTAB(0,5)" You got
 "STR$(MK%(PN%))" right out of "STR$(
NQ%):PROCPRESS
  565 UNTILPN%=MAX% OR PD$(PN%,0)="TE
ACHER":IFPD$(PN%,0)="TEACHER"THENTP%=
PN%-1 ELSETP%=PN%
  570 RETURN
  600 REM**SEE RESULTS**
  610 *FX229,0
  620 IFF1%<>2PROCILLEGAL:RETURN ELSE
T%=0:CLS:PRINTTAB(10)" PUPILS RESULTS
":PRINT
  630 PRINT"   NAME              MARK"
  640 FORPN%=1TOTP%:PRINT" "PD$(PN%,0
);TAB(21)MK%(PN%):T%=T%+MK%(PN%):NEXT
:PRINT'" AVERAGE = "STR$(INT(T%*100/T
P%)/100)
  650 PROCPRESS:RETURN
  700 REM**RESUME**
  710 CLS:IFF1%<>2PROCILLEGAL:RETURN
ELSEPN%=TP%:IFTP%=MAX% CLS:PRINTTAB(0
,5)" All students have done the test"
:PROCPRESS:RETURN ELSE GOSUB515:RETUR
N
  800 REM**RUN**
  810 CLS:PRINT'" This destroys ALL d
ata!":PRINT'" Is that your intention?
"TAB(10,10);:INPUT" "R$:IFLEFT$(R$,1)
="Y"RUN ELSERETURN
 1000 REM**ERROR DETECT**
 1010 IFERR<>17THENCLS:REPORT:PROCPRE
SS
 1020 IF ERL<300 F1%=F1%-1
 1030 RETURN
 1040 DEFPROCinput
 1050 *FX12,0
 1060 *FX12,5
 1070 VDU23,1,1;0;0;0;
 1080 *FX202,48
 1090 CLS:PRINTTAB(0,5)" Type in ques
tion number "STR$(QN%)TAB(0,8);:INPUT
LINE" "Q$:IFQ$=""ANDQ$(QN%,0)="" VDU7
:GOTO1090ELSEIFQ$="" PRINT" "Q$(QN%,0
):GOTO1100ELSEQ$(QN%,0)=Q$
 1100 FORI%=1TONR%:PRINT
 1110 PRINT" Type in response "CHR$(I
%+64):INPUTLINE"      "Q$:IFQ$=""ANDQ
$(QN%,I%)="" VDU7:GOTO1110 ELSEIFQ$="
" PRINT"      "Q$(QN%,I%):NEXT ELSE Q
$(QN%,I%)=Q$:NEXT
 1120 *FX202,32
 1130 PRINT'" What is the correct res
ponse? (A - "CHR$(NR%+64)")":Q$(QN%,N
R%+1)=GET$:IFQ$(QN%,NR%+1)<"A" OR Q$(
QN%,NR%+1)>CHR$(NR%+64)THENVDU7:GOTO1
130
 1140 VDU23,1,0;0;0;0;
 1150 *FX11,0
 1160 ENDPROC
 1170 DEFPROCPRESS:PRINT'TAB(3)" PRES
S SPACE TO CONTINUE"
 1180 IFGET$<>" "THEN1180ELSEENDPROC

 1190 DEFPROCILLEGAL:CLS:PRINTTAB(0,5
)" YOU ARE DOING THINGS IN THE WRONG
ORDER":PROCPRESS:ENDPROC
 1200 DEFPROCCORRECT:CLS:PRINTTAB(0,5
)" WELL DONE "PD$(PN%,0)
 1210 PRINTTAB(0,8)" YOU ARE"CHR$(141
)" CORRECT":PRINTTAB(8)CHR$(141)" C
ORRECT":PRINT':PROCPRESS:ENDPROC
 1220 DEFPROCWRONG:VDU7:CLS:PRINTTAB(
0,5)" SORRY "PD$(PN%,0)
 1230 PRINTTAB(0,8)" YOU ARE"CHR$(141
)"     WRONG":PRINTTAB(8)CHR$(141)"
    WRONG"
 1240 PRINT'" THE CORRECT ANSWER TO:-
":PRINT'" "Q$(QN%,0):PRINT'" IS:-":PR
INT'"      "Q$(QN%,ASC(Q$(QN%,NR%+1))
-64):PRINT:PROCPRESS:ENDPROC
 1250 DEFPROCTORDIN
 1260 IFPAGE<1100 THEN1290
 1270 CLS:INPUTTAB(0,5)" Tape or disc
",T$:IFLEFT$(T$,1)="T"THEN1280ELSEIFL
EFT$(T$,1)="D"THEN1310ELSEVDU7:GOTO12
70
 1280 *TAPE
 1290 *OPT1,1
 1300 CLS:INPUTTAB(0,5)" What is the
tape file called",F$:CLS:PRINTTAB(0,5
)" Put in a tape & wind to the correc
t     position. Then press PLAY ";:EN
DPROC
 1310 *D.
 1320 CLS:INPUTTAB(0,5)" What is the
disc file called",F$:IFF$=""THEN1320E
LSECLS:PRINTTAB(10,5)"  LOADING":ENDP
ROC
 1330 DEFPROCTORDOUT
 1340 IFPAGE<1100 THEN1370
 1350 CLS:INPUTTAB(0,5)" Tape or disc
",T$:IFLEFT$(T$,1)="T"THEN1360ELSEIFL
EFT$(T$,1)="D"THEN1390ELSEVDU7:GOTO13
50
 1360 *TAPE
 1370 *OPT1,1
 1380 CLS:INPUTTAB(0,5)" What is the
tape file called",F$:IFF$=""VDU7:GOTO
1380ELSECLS:PRINTTAB(0,5)" Put in a t
ape & wind to the correct     positio
n. Then press ";:ENDPROC
 1390 *D.
 1400 CLS:INPUTTAB(0,5)" What is the
disc file called",F$:IFF$=""THEN1400E
LSE ENDPROC
```

This listing plus a fuller version together with two files of questions – on mathematics and general studies – are included in this month's cassette tape offer. See order form on Page 149.

→

by a single keypress, and page selection is equally easy. Sub-pages can be explicitly requested if required.

Pages can be kept for subsequent viewing and are updated automatically, the quantity of kept pages being dependent on available computer memory.

Full CRC error checking is carried out on all teletext pages to ensure the page displayed has been correctly received, the result being reported on the screen.

The ATS is not a filing system, which means it is easy to access files – tape, disc, Econet and so on – and teletext pages from within the same software.

It is a full level one format teletext system, capable of capturing and processing all page data including multiple row 27s, ghost rows – TSDP – and as many rows as are transmitted.

TTNS appeal

A CALL to teachers to have patience comes from Gordon Jones, chief executive of The Times Network for Schools, in the latest issue of *TeleLink* magazine.

He was replying to criticism levelled against the on-line database that it has failed to live up to its potential.

"We're still putting the pieces together", he said.

When The Times Network went live in April, 1985, it claimed to have half the country's local education authorities signed up, anticipating a start-up membership of 3,000 secondary schools.

TeleLink reveals that today it has just over 2,000 subscribers, 10 per cent of them primary schools, the rest secondary, teacher centres and other educational establishments.

The in-depth examination of The Times Network is part of a wide ranging look at on-line facilities for schools in *TeleLink*.

It also carries a full report on Prestel Education and questions whether or not teachers know how to use it.

And it puts Neris, the new government-funded database for schools, under the microscope to see if it will bridge the gap.

Softlab series

THERE will be five packages in the Softlab series from Shell, three in the yellow series for primary, and two in the red series for secondary.

The first package in each is now available and consists of a set of teachers' notes in an A4 colour booklet and a disc which can be transferred to Econet.

The yellow package, Measuring and Weighing, features a number of weighing and measuring activities, including measuring the length of rods; the area of triangles and rectangles; measuring distances on maps; making a plan of a bungalow with activities that include kitchen planning and decorating costs; supermarket scales; a weighbridge; pouring liquids and volumes by displacement.

It is not a drill and practice program, but a wide-ranging resource to supplement and extend practical measuring and weighing activities. The various projects are presented so that the teacher has a considerable freedom in the way they can be used.

There are two basic parts to the Red series DC Electricity program: industrial electrolysis and a circuits program.

The electrolysis program allows various experiments to be performed: the deposition rate for a given current; depositing a mass of copper of a given thickness on the cathode; refining an impure copper anode and determining the percentage impurity.

The circuit program simulates a Worcester-type circuit board, and allows a range of investigations.

These include Ohms law, voltmeters, ammeters, Wheatstone bridges, measuring resistivity at various temperatures, lost volts, internal resistances, fuses, cables, lamps, heaters and Kirchoff's laws.

The point is made in the teachers' notes that these programs are not designed to replace practical experience, but they should allow a variety of experiments to be simulated quickly and easily, thereby greatly extending the number and scale of scientific ideas which may be quickly and safely explored by the pupils.

Last month's announcement of a forthcoming education section in *The Micro User* resulted in a flood of enthusiastic letters. Keep them coming in – the education pages are here to reflect your interests. We want to hear your tips, ideas, experiences and suggestions. Send your contributions to:

Peter Davidson, Education Editor, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport, SK7 5NY.

Prolog group

I AM writing to inform you of the existence of a Prolog interest group operating at the Teacher's Centre, Barlow Moor Road, West Didsbury, Manchester M20 8PW. Tel: 061-434 3421. We welcome inquiries from others experimenting with Prolog on the BBC Micro. – **John Ashurst.**

Typing aid

I HAVE been trying to improve my typing and as I felt the need for something to help me achieve a better rhythm, I wrote the following program:

```
   10 REM Keyboard Tone
   20 REM David Smith
   30 *FX 14,2
   40 REM Enable Keyboard I
nterupt
   50 control%=&A20
   60 !control%=(&13 AND&FF
FF):REM Channel
   70 control%!2=(-&C AND&F
FFF):REM Volume
   80 control%!4=(43 AND&FF
FF):REM Pitch
   90 control%!6=(1 AND&FFF
F):REM Duration
  100 FOR opt=0 TO 3 STEP 3
  110 P%=&A00
  120 [ OPT opt
  130 .check
  140 CMP#2:BNE end \ Check
 for keyboard event
  150 .save
  160 PHP:PHA:TXA:PHA:TYA:P
HA \ Save Registers
  170 LDA#7
  180 LDX#control% MOD 256
  190 LDY#control% DIV 256
  200 JSR&FFF1 \ Osword &7
  210 PLA:TAY:PLA:TAX:PLA:P
LP \ Restore Registers
  220 .end
  230 RTS
  240 ]:NEXT opt
  250 !&220=(&A00 AND&FFFF)
  260 REM Set Event Vector
  270 END
```

*It works by enabling the keyboard interrupt and playing a short tone whenever the interrupt occurs. The routine can be switched off by *FX 13,2 and switched back on by *FX 14,2.*

The pitch, duration and volume of the note can be changed by altering lines 70-100, in the same way as the sound command. By changing the values at lines 50, 110 and 250 the code can be made to assemble in any free area of the memory. I hope this routine will help other readers to improve their typing. – **David Smith, Barlaston, Stoke-on-Trent.**

● Thanks for the routine – and the way it can be switched off. If anyone wants to silence a noisy program remember to type *FX210,1 before loading.

Software need

I AM extremely interested in using the BBC Micro in education, although perhaps not for the age range you intended. I work at a college of FE and, since virtually all YTS and BTEC courses now have a compulsory computing core unit I feel that there is a need for software aimed at these groups – 16 to 18 year olds whose main interest is definitely not computing. – **S. Foy, Chester.**

Tips needed

I AM deputy head at a school for physically handicapped children where I have responsibility for the use of micros throughout the school with children aged from 3 to 19 years.

I know that I speak for all my colleagues when I say that we welcome the decision to extend your coverage of the educational scene and I'm sure many of us would welcome an opportunity to submit articles on the use of hardware, peripherals and software with children with special educational needs. We feel very strongly that many of our colleagues and the majority of parents using computers with children would welcome articles in The Micro User *which would give hints, tips and advice on the efficient and effective use of micros and on which peripherals and software are good value for money and which do not in practice fulfil the claims of the manufacturers.*

There is no doubt that the world of micros can be a minefield of expensive mistakes and your magazine could offer a very valuable service in helping people to avoid these pitfalls. It could also act as a useful vehicle for the interchange of ideas on using micros in schools. – **Roger E. March, Preston.**

● As you can see from the last two letters, interest in the BBC Micro's educational potential extends across the whole of education. We aim to reflect this wide range in the pages of Education Micro User, but to do so we'll need your support. So, whatever your educational endeavour, write in and let us know what you are doing.

Fund raiser

HAVE you any ideas how we could make money using the BBC Micro at school fairs and open days? – **Derek Simpson, Manchester.**

● Our opinion is that, apart from selling the micro, you cannot make enough money to justify the wear and tear on the computer.

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UPGRADE KITS

1.2 OS ROM	£15 (d)	8271 DFS Kit	£80 (d)
DNFS ROM	£17.50 (d)	1770 DFS Kit	£43.50 (d)
BASIC II ROM	£22.50 (d)	Econet Kit	£55 (d)
ADFS ROM	£26 (d)	64K Upgrade Kit for B+	£35 (d)

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£85 (b)	£174 (b)
£29 (c)	£41 (d)
£179 (b)	£26 (d)
£10 (d)	£10 (d)

32016 CO PROCESSOR

For full specification see page 5 — £999 (a)

CAMBRIDGE W/STATION

For full specification see page 5 — £3,450 (a)

WINCHESTER DRIVES

Acorn Winchesters complete with File Server Level III and ADFS hierarchical filing system. Data transfer rate of 1Mbit/sec and average seek time of 85ms providing very fast access times.

Acorn 10 Mbyte Winchester £1,075 (a)
Acorn 30 Mbyte Winchester £1,599 (a)

See Disc Drive Section for Technomatic's Winchester range.

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with 64K RAM, CP/M operating system. Comprehensive package of bundled business software. £329 (a)

ACORN 6502 2nd Processor
with second 6502 and 64K RAM provides faster data processing speeds and larger user RAM. £160 (b)

TORCH ZEP 100
Z80 cpu with 64K RAM and TORCH's CP/M compatible MCP operating system. With FREE bundled software. Fits internally in the computer. £229 (b)

TORCH TZDP240
Torch ZEP100 with TECHNOMATIC's dual drive with monitor stand PD800P. £439 (a)

MULTIFORM Z80
TECHNOMATICs multi format Z80 system. Details on page no?? includes free POCKET WORDSTAR. £299 (b)
MS/DOS Read/Write Utility £49 (d)

ACORN IEEE INTERFACE

Allows BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard. The interface can link upto 14 compatible devices. Typical applications are in experimental work in academic and industrial labs. £269 (a)

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Converts your computer into a teletext receiver. £125 (b)

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BITSTICK II £775 (a)

Upgrade for Bitstick I to II £415 (a)

Bitstick I Multiplotter Driver (includes most popular plotters) £79 (c)

Epson FX80 Dump for Bitstick I/II £25 (d)

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100 cps, Variety of fonts, quad density bit image graphics NLQ, Standard Centronics interface. £195 (a)

EPSON LX80 Tractor Feed £20 (c)

EPSON LX80 Sheet Feeder £49 (c)

EPSON LX86
As LX80 but 120cps and IBM compatible. £229 (a)

EPSON FX85
160cps, 80 col, 80K buffer, NLQ, IBM compatible graphics Variety of fonts, multiple density bit image mode. £315 (a)

EPSON FX105
As FX85 but with wide carriage for 136 col £449 (a)

EPSON FX80 £260 (a)

EPSON LQ800
See specification on page 5 £459 (a)

EPSON LQ1000
As LQ800 but wider carriage for 136 columns £659 (a)

TAXAN KP810
140 cps, 80 col, NLQ, 2K buffer, variety of fonts, quad density hi res bit image graphics, centronics interface standard £219 (a)

TAXAN KP910
As KP810 but with wide carriage for 156 col £369 (a)

BROTHER M1409
180 cps, 80 col, NLQ, IBM graphics/Epson FX compatible, friction/tractor std, variety of fonts, multiple density bit image graphics, dual interface. £299 (a)

BROTHER M1509
As M1409 but wider carriage for 136 col £399 (a)

EPSON JX80 colour printer £420 (a)

INTEGREX Multicolour Inkjet printer £549 (a)

CANON PJ1080A printer £409 (a)
4 Colours.

BROTHER HR15 Daisy wheel printer
14 cps, 3K buffer, proportional spacing, underline, bold, shadow print, super/sub script, two colour print, parallel interface. £325

JUKI 6100 Daisy wheel printer
15 cps, 2K buffer, switchable 10/12/15 cpi proportional spacing, underlining. Parallel interface. £249

PLOTTERS

See details on page 5.

EPSON HI 80 PLOTTER £325

HITACHI 672 PLOTTER £454

GRAPHICS WORKSTATION £609

LINEAR GRAPHICS PLOTMATE A4 PLOTMATE £299

A4M PLOTMATE £399

A3M PLOTMATE £549

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Full details on page 4.

5.25" Single Drives 40/50 switchable:
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PS400 400K/640K with integral mains power supply £114

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TD800 800K/128OK £20

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TS351 single 400K/640K — **£89 (b)**

PS351 single 400K/640K with integral mains power supply — **£99 (b)**

TD352 Dual 800K/1280K — **£155 (b)**

PD352 Dual 800K/1280K with integral mains power supply — **£169 (b)**

DISC DRIVE MULTIPLEXER

Full specification on page 4.

TDM2
Dual Unit: 2 computers/one drive unit — **£75 (b)**

TDM4
Quad Unit: 4 computers/one drive unit — **£135 (b)**

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5.25" Discs in packs of 10

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747 80T DS DD	3	£16.50 (d)

(Add £1 for library case packing)

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See page 7 for modem specifications

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see page 8 for detailed specification

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Tracker Ball/Mouse Version (TM) — **£99 (d)**
TM Version & Tracker Ball — **£135 (c)**
TM Version & Mouse — **£125 (c)**
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PD 800

P2041 HT

PD 800 P

TECHNOMATIC offers a wide range of high quality, high performance drives to meet all needs of BBC micro users at competitive prices.

*All drives are fitted with MITSUBISHI's slim line ultra low power mechanisms capable of single and double density operation and offering very fast track access and head settling times.

*5.25" floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*The plinth version drives provide for a neat and compact system installation giving it a more professional look.

*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with suitably fused 13A moulded plug.

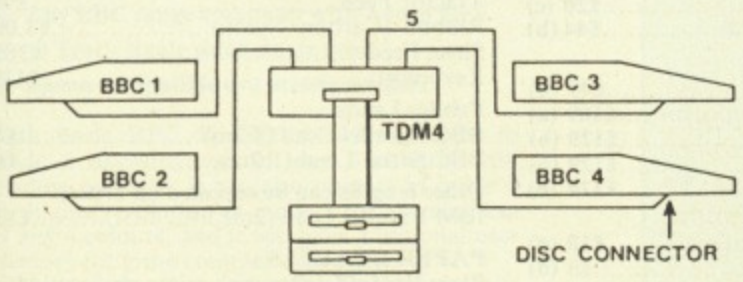
*Mass storage 20 Mbyte drives are available in the following versions:
- * P20HD Stand alone.
- * P204HP With a single floppy housed in a plinth version case.
- * P214TS Top of the range with a 10 Mbyte back up streamer and a single floppy housed in a plinth type casing and supplied with backup utilities.

All models are fully compatible with Acorn's ADFS system and include a mains psu and the necessary cable connections.

ALL TECHNOMATIC DRIVES CARRY A TWO YEAR WARRANTY AS STANDARD
(Effective 01.08.86)

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5' of cable per outlet as standard. Mains powered.



TDM4 Quad Unit (up to 4 computers)
TDM2 Dual Unit (2 computers)

SPECIAL OFFER
on
3M DISCS

FREE SWISS ARMY KNIFE
for purchasing requisite number of drives.
Hurry, this is a limited offer.

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ACW443 CAMBRIDGE WORKSTATION

*A complete self-contained workstation.
*'Bundled' software as 32016 co-processor.
*8Mhz NS32016.
*20Mbyte Winchester + 1 400K Floppy Drive.
*4Mbyte RAM as standard.
*Hi-Res Monitor *Detachable keyboard.
***Phone for detailed leaflet.**

PHONE FOR DETAILS OF RANGE OF 32BIT SOFTWARE NOW AVAILABLE

32016 CO-PROCESSOR

A second processor that brings genuine 'Mainframe' power to your BBC.

* 6 Mhz. NS32016 CPU
* NS32081 Floating Point Processor.
* Bundled' languages including: Fortran-77, Pascal, C, Cambridge Lisp, 32016 Assembler, 32Bit BBC Basic.
* 1Mbyte RAM fitted as standard.
* **Phone for detailed leaflet.**

512 CO-PROCESSOR

Brings professional software to the BBC Master.

* 10 Mhz 80186 *DOS PLUS.
* GEM Write & GEM Draw.
* 'WIMP' Environment with high quality Mouse.
* Runs many 'IBM' programs — even 'Flight Simulator'!
* Convert to/from IBM/BBC data.

DOTPRINT PLUS

A uniquely versatile NLQ ROM for the BBC Micro.

* Built-in character font generator.
* Built-in view printer driver.
* Supports microspacing for professional justification in View & with disc in Wordwise/Plus.
* True bold print as well as double width.
* 12 character pitch as standard.
* Fully variable pitch and line spacing.
* Suitable for fully **'EPSON'** compatible printers with quad-density graphics.
* **DOTPRINT PLUS** for EPSON FX/RX and compatibles.
* **DOTPRINT DUAL** for EPSON MX range.

MICROJUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their owners in the early days of the

NORMALLY JUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their owners in the early days of the

EPSON LQ800

Uses top quality 24 pin dot-matrix technology.

* Superb 'letter quality' at 67cps.
* Fast clear draft quality at 200cps.
* LQ/Draft modes selectable from front panel.
* Variety of fonts, usable in both draft & LQ modes.
* Optional 'personality' modules for Diablo and IBM emulation.
* Optional Font modules.
* Friction feed.
* Hi Res bit image graphics with hex density.

NEW STAR NL10	**£239 (a)**
NEW PANASONIC KX-P1080	**£169 (a)**

GRAPHIC WORKSTATION

A Powerful A3 3 pen plotter with unique accessories.

* Resolution of 0.1mm.
* Opto-sensor allows digitising and scanning of pictures.
* A robust drill/router attachment allows drilling of light materials.
* Scriber allows fine-line drawing on coated materials.
* Basic plotter/accessories as well as supportung software is also available separately.
* Applications software available as an option allows interfacing of the drill/router with NOVACAD.

PLOTMATE

A4 LINEAR GRAPHICS 'PLOTMATE'
*Intercepts BBC Video Calls for direct outputs.
*Plugs into the BBC user-port.
*Runs with most BBC software.
*Supporting software available.

A4M/A3M LINEAR GRAPHICS 'PLOTMATE'
*Standard computer interfaces — suits most computers.
*Available in both A4 and A3 versions.
*Supporting software available.

BBC SPARE PARTS

All Prices are Retail ex-VAT

BBC & Misc:		SAA5050	£9.00
Keyboards	£52	6845SP	£6.50
Powers Supply	£52	UPD7002	£5.00
Keyswitch	£1.75	DS3691	£3.50
Video ULA	£18	7438	£0.40
Serial ULA	£14	74LSOO	£0.24
DNFS	£18	74LSO4	£0.24
UHF MOD	£4.50	74LS10	£0.24
6502A CPU	£6.50	74LS123	£0.80
65CO2 CPU	£12	74LS163	£0.75
6522 VIA	£3.50	74LS244	£0.80
6522A VIA	£5.50	74LS245	£1.10
LM324	£0.45	74LS373	£0.90
8271	£46	74LS393	£1.00
88LS120	£3.00	**BBC MASTER:**	
BBC PLUS:		1-Mbit ROM	£39
PAL16REN	£13.50	MSI CHROMA	
64K×4 DRAM	£8.50	IC	£13.50
6512A	£12.50	65SC12P-2	£12.50

EPSON HI-80

* Low cost while maintaining precision.
* A4 with 4 colour precision plotting.
* Variety of pens available.
* Ideal for overhead transparencies.
* Powerful software commands allow complex plots.
* Superb line/bar/pie charts simply produced.

HITACHI 672 PLOTTER

* A3 four colour precision plotter.
* Serial and parallel ports as standard.
* Produces 'OHP' transparencies as well a plain paper.
* 'HP' graphics language or single characte commands.

PRINTER ACCESSORIES

EPSON ACCESSORIES:
Interfaces:
8143 RS232 — **£28 (d)**
8148 + RS232 + 8K — **£75 (d)**
8165 IEEE + Cable — £65 (d)
8148 RS232 + 2K — **£57 (d)**
8132 Apple II — **£60 (d)**
8177P NLQ for FX80 + /FX100 + — **£99 (d)**
Parallel & Serial Buffers of various size also available.
FX80/80 + /85 Tractor Attachment — **£37 (c)**
FX80/80 + Paper Roll Holder — **£17 (c)**
LX80 Tractor Feed — **£20 (c)**
LQ800 Tractor Feed — **£44 (b)**

SHEET FEEDERS:
8338 LX80 — **£49 (b)**
8333 FX100 + /105 — **£169 (a)**
8331 FX80 + /85 — **£129 (b)**
8330 RX80 + — **£129 (b)**
LQ800 — **£129 (b)**

Ribbons:
RX/FX100/100 + . FX105 — **£10 (d)**
RX/FX80/80 +, FX85 — **£5 (d)**
LX80 — **£4.50 (d)**
H180 Pen Set (Aqueous/Ball point) — **£7.50 (d)**

Dust Covers:
FX80 — **£5.50 (d)**
TAXAN/Canon KP810 — **£6 (d)**
FX100 — **£7.50 (d)** **KP910** — **£7 (d)**

TAXAN CANON Accessories:
RS232 + 2K buffer — **£78 (d**
Ribbon — **£6 (d**

JUKI 6100
RS232 Interfaces — **£65 (d**
Tractor Feed — **£129 (a**
Ribbon (Carbon) — **£2.00 (d**
Spare Daisy Wheel — **£14 (d**
Sheet Feeder — **£182 (a**

BROTHER HR15
Daisy Wheel — **£18 (d**
Tractor Feed — **£90 (a**
Ribbon (Carbon/Nylon) — **£3.00 (d**
Sheet Feeder — **£182 (d**
Keyboard — **£135 (a**

Printer Leads:
BBC Parallel Lead (1.2m) — **£6 (d**
BBC Serial Lead (1.2m) — **£6 (d**
Other lengths can be supplied on order:
IBM Parallel Lead (2m) — **£12 (d**

PAPER & LABELS
Plain Fanfold paper with micro perforations:
2000 sheets 9½" × 11" — **£13 (b**
2000 sheets 14½" × 11" — **£18.50 (£4.50**

Labels/1000:
Single Row 3½ × 1 7/16" — **£5.25 (d**
Triple Row 27/16" × 17/16" — **£5 (d**

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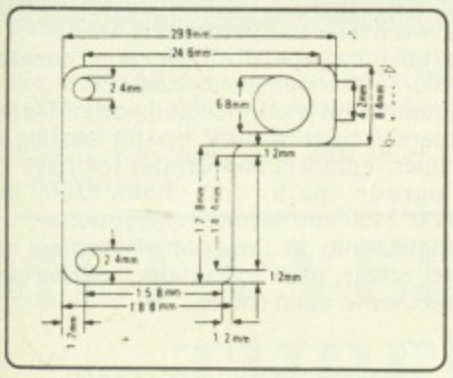
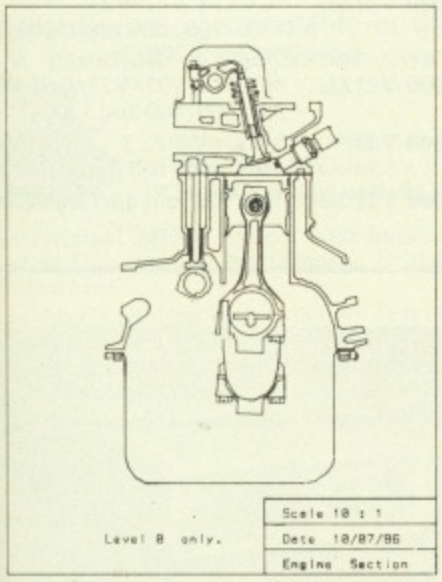
NOVACAD

Computer Aided Draughting for the BBC Micro

A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

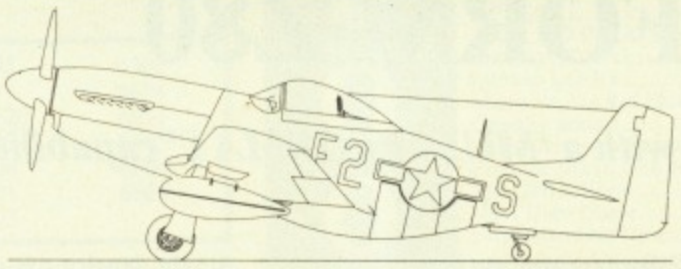
NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.

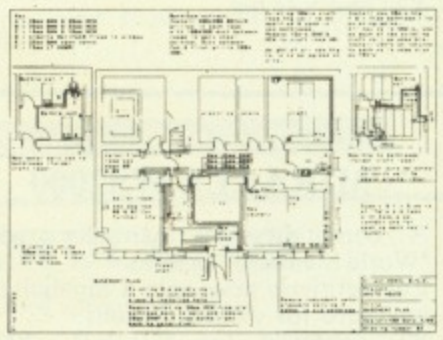


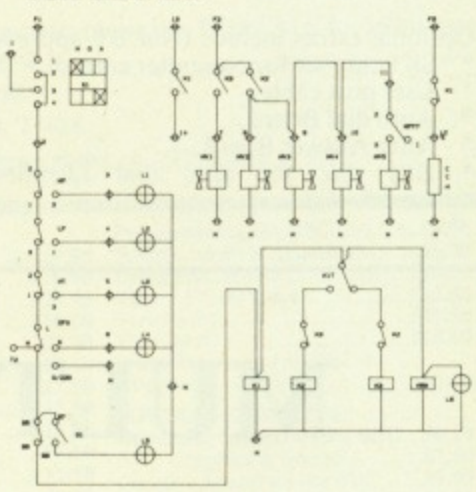


The major features of NOVACAD are:

* Simple and easy to use with logical command sequence.
* A large drawing area (approx 15 screens).
* The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
* A zoom facility allowing magnification of up to 20 times to insert finer details.
* Block copy of shapes on the screen for repetitive use.
* Text entry at any 90 orientation at any position on the screen.
* Create multi layer drawing with 8 levels available.
* Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
* Printer routine for Epson 80 and 136 column printers.
* A unique facility to output to any BBC compatible plotter.







MINIMUM HARDWARE REQUIREMENTS

- **Any BBC range computer with Acorn DFS.**
- **40 Track single sided single drive.**
- **Epson compatible dot matrix printer.**

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours with shadow memory, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will have additional user memory for more complex drawings.
6502 second processor will also increase the drawing speed.

NOVACAD is available in two versions

*BASIC version for cursor control from the keyboard.

*T/M version for cursor control from the keyboard, Tracker Ball or a Mouse.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Pre-configured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

ROUTCAD, an optional software package for our Graphics Workstation allows for production of shapes drawn using NOVACAD in 3D on suitable material and is ideal for a range of applications including template making and model building.

NOVACAD package includes a 16K ROM, Utility disc and a comprehensive manual.

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MODEMS

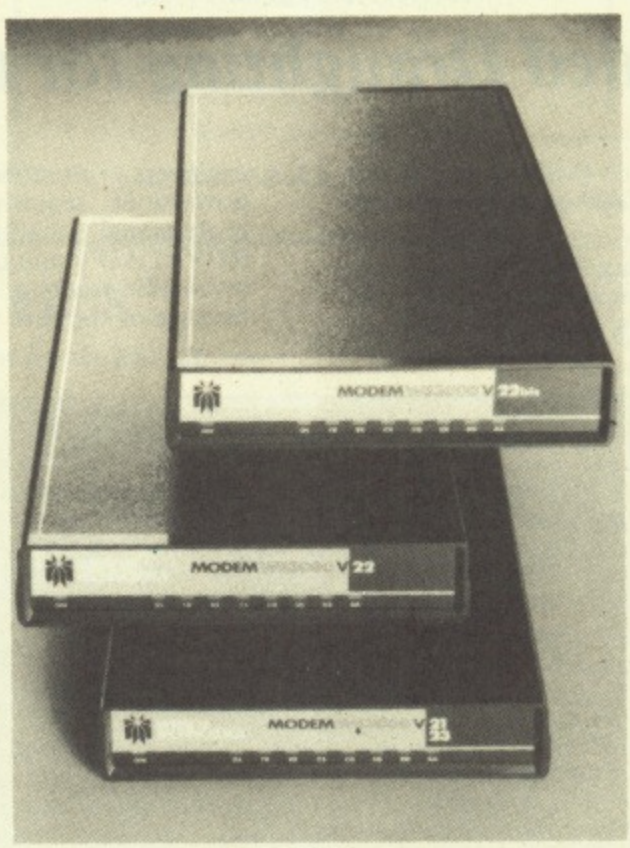
MIRACLE WS4000

* A cost effective intelligent modem that offers the best value for money bringing the world of data communication within easy reach.
* Plain English commands make it simple to use, even for the first time user.
* Latest Hayes-type protocol commands, auto dial, auto answer, auto speed seeking.
* Equalisation model in V23 for line-noise filtering.
* Many other options including upgrading to V22 and V22 bis.

MIRACLE WS2000

* A comprehensive manually switched 'World Standard' modem.
* Competitively price with a capability to be upgraded for various options.
* BT approved for V21/V23, 300/300, 1200/75 and 1200/1200 half duplex.
* Includes BEL103/113/108 standards for use outside UK.

Optional extras include (Not BT approved).
* SK1 chip set for computer control.
* User port cable.
* Auto dial Board.
* Auto Answer Board.
* DS1 disc for auto dial facilities on Commstar.



WS 3000 Range

APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them.

MIRACLE WS3000 RANGE

* A professional range of intelligent modems with full BABT approval.
* Auto Answer and Auto Dial facilities installed as standard.
* HAYES protocols implemented.
* Pulse or DTMF 'tone' dialing.
* Plain English command structure simplifies the use of the modem.
* Integral parallel printer port fitted as standard configurable for both input and output for process control applications.
* A line sharing facility to differentiate between data and voice calls.
* Intelligent speed buffering converts 1200/1200 terminals to 1200/75
* Equalisation mode for line noise filtering.
* Internal battery back up for storing 63 names, numbers and default settings.
* Upgrade path for 1200/1200 and 2400/2400 and security encryption.
* Applications in the field of graphics and text access, high speed telex, user to user, and user to main frame.

SPECIFICATIONS

WS4000 V2123:	*CCITT V21/V23. *300/300, 600 and 1200 half duplex, 1200/75.
WS3000 V2123:	*CCITT V21/V23/Bell 103. 300/300, 600 and 1200/75
WS3000 V22:	*As V2123 and also 1200/1200 full duplex.
WS3000 V22 bis:	*As V22 and also 2400/2400

MULTIFORM Z80

A unique Z80 2nd Processor with a 'MULTI FORMAT' capability.

* It is capable of running most CP/M 2.2 format applications programs on the BBC.
* Connects to the BBC via 1MHz bus, no restriction on the cable length. OS/M operating system on rom.
* Integral mains psu and 64K on board ram.
* 28 different formats including Acorn Z80, RML 380Z & 480Z, EPSON QX, Amstrad, Osborne etc, supplied on the library disc with the utility to create additional formats.
* Emulates the two of the most commonly used CP/M terminals, HAZELTINE 1500 and ADM-3a in addition to the Acorn VDU making installation of most of the software packages easy.
* Utility to inter convert ASCII text wordprocessed on a standard BBC and under OS/M or CP/M .
* Multiform is fully compatible with Acorn's 8271 and 1770 DFS on models B, B plus and the Master.
* Single density dfs allows single density CP/M format use. Double density dfs allows both single and double density CP/M formats to be used.
* Single or dual, single sided or double sided and 40 or 80 track drives can be used provided that they match the CP/M software format to be run.
* Dual drive will allow two separate formats to operate simultaneously for data transfer making it ideal for use in environment where machines with different formats are in use.
* Utility to read and write on IBM PC DOS discs available as an optional extra. Utility will also format a PC DOS disc.
* Multiform Z80 is supplied with a OS/M operating system rom, System disc and a Library disc. Please specify the DFS type and the drive format when ordering.

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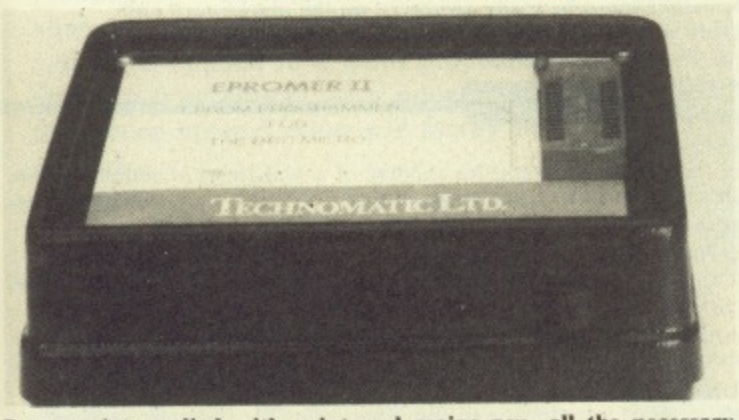
EPROMER II

Eprom Programmer for the BBC Micro Series



Epromer is supplied with a integral mains psu, all the necessary cables, a manual and software on disc. Disc also contains the rom image for use with sideways ram. Rom based software is available as an optional extra if required.
Epromer is fully compatible with Acorn DFS on the BBC B, B+ and the MASTER.

* A sophisticated Eprom Programmer that uses the latest Eprom Programming technology to simplify the use of the programmer and at the same time allowing the programmer the full control of the programming process.
* It handles the full range of popular single rail Eproms up to 28256, all except the 27256 are programmed in a single pass.
* Powerful menu driven software makes the programming of eproms simple and efficient.
* Selectable programming voltage 25/21/12.5V.
* Two programming option, standard and algorithmic for eproms capable of high speed programming. 27128 can be programmed in just over 2 mins.
* Single address to full eprom address selectable for any of the epromer function ie blank check/read/burn/verify.
* Full screen editor with input in hex or ASCII.
* Software interface for special programming requirements eg programming alternate bytes etc.
* Many other useful utilities included.

Please send for full specification sheet.

META VERSION THREE

The only package available in the micro market that will assemble 27 different processors at the price offered.

Now Available

* **Assembly for even more processors**
* **Now over 70k long on 2 16K Roms and 2 Discs**
* **Dozens of new options, features and directives**

The Original META system sold hundreds worldwide; it's being used in Universities, Polytechnics, British Telecom, the BBC, the MOD etc etc.

Now there's an even better version. It is supplied on two 16K roms and two discs and it is fully compatible with all BBC models including Master and gives you complete Editing and Assembly facilities for all the listed processors:

1802	6800	8085	6305
HD 64180	6802	Z8	6801
Z80	68HC11	68120	6803
6502 (including *all*	68000	68121	6805
CMOS varients)	8048 Series	6808	6804
65C812	8051 Series	6301	6809
65C816	8080	6303	

META uses the appropriate standard mnemonics for each, eg. LD (HL), 0ABH in Z80 and MOVE. B DO, $50 (A5, D6.L) in 68000 etc.

Full nestable Macro facilities are provided, and nestable conditional Assembly, (IF/ELSE/ENDIF), Modular source code (including parameter passing). True local and global labels, 32 bit labels and arithmatic (incl. MUL, DIV, AND, OR, XOR, SHL etc). 30 ways to send object code during Assembly, including Intel Hex, S.Record, Binary etc to Disc files, RS423, EPROM emulators etc, local reassembly and over 50 directives, including DS.X, DC.X, EQUX, FCB etc).

Wordwise-style Editor integrated in with Assembler; Search/Search-Replace, Block copy/delete, markers etc; dozens of special features and functions for Assembly code programmer. Fast and Friendly to use.

Plus special new serial Communicator Area with Complex Option page etc.

Send for your detailed spec sheet on the META Assembler and the PORTAL EPROM Emulators. Set of disassemblers and Logic Analyser coming soon.

Please specify the computer type when ordering.

PORTAL EMULATOR

* Provides real time emulation of all listed eproms at 150 ns.
* Totally software driven by (META).
* Compatible with 'piggyback' processors.
* Upto 4 portals can be used on the same BBC lead.
* Each PORTAL has a lead terminated with a 28 pin header to plug into the socket you need to emulate.
* Various options available for sending code: eg use two PORTALS for 16 bit data bus with sequential PORTAL skipping.

PORTAL is available in two versions:

PORTAL 128 for 2716, 2732, 2764, 27128.

PORTAL 512 for all of the ones listed above + 27256 and 27512.

BOOKS

No VAT
Carriage
Code
(c)

LANGUAGES:

6502 Assy Lang Prog	£19.95
6502 Programming	£16.95
8086 Book	£23.95
Acorn BCPL User Guide	£15.00
Acorn FORTH	£7.50
Acorn LISP	£7.50
S-PASCAL	£7.50
Acorn ISO Pascal Ref Manual	£12.50
Intro to COMAL	£10.00
Intro to LOGO	£7.50
Micro Prolog Ref Manual	£12.50
Creative Sound	£7.50
Introduction to Pascal	£16.50
Prog the Micro with Pascal	£8.50
The UNIX Book	£7.50
Unix User Guide	£19.95
Understanding Unix	£18.45

BBC MICRO BOOKS FOR BEGINNERS:

BBC User Guide Acorn	£15.00
BBC PLUS User Guide	£15.00
Drawing your Own BBC Programs	£6.95
Introducing the BBC Micro	£4.50
Mathematical Programs in BBC Basic	

PROGRAMMING/UTILITY

Advanced User Guide	£12.50
Adv BASIC Rom User Guide	£7.50
Advanced Prog Tech for BBC	£8.95
Applied Ass./Lang on the BBC	£9.95
BBC Micro Advanced Programming	£9.95
BBC Micro Sideways ROM's RAM's	£9.95
BBC Micro Sideways Roms B. Smith	£9.95
Guide to the BBC ROM	£9.95
Exploiting BBC BASIC	£6.95
Further Programming for BBC	£4.00
Programming the BBC	£6.50
Structured Programming	£6.50
Using BBC BASIC	£10.00
View 3.0 User Guide	£12.50
Viewstore	£12.50
Viewsheet	£12.50
Word Processing on BBC (Wordwise + Epson)	£5.25

SOUND & GRAPHICS:

Advanced Graphics with BBC	£6.00
BBC Graphics & Sound	£7.50
Creative Sound on the BBC	£9.95
Graphics on the BBC Micro	£6.00

DISC DRIVE SYSTEMS:

Advanced Disc User Guide	£14.95
BBC Micro Disc Companion	£7.95
Disc Book	£3.50
Disc Programming Techniques	£7.95
Disc Systems	£6.95

APPLICATIONS:

BBC Filing Systems & Databases	£7.95
Business Programming on BBC	£7.95
Business Applications on BBC	£7.95
DIY Robotics & Sensors	£6.95

PROFESSIONAL SOFTWARE

Wordstar made easy	£16.95 (c)
Introduction to Wordstar	£17.95 (c)
Wordstar Handbook	£11.95 (c)
dBase-II for the first time user	£16.95 (c)
Understanding dBase-II	£22.95 (c)
Understanding dBase-III	£22.95 (c)
Multiplan Made Easy	£18.95 (c)
Multimate Complete Guide	£16.95 (c)
ABC of LOTUS 123	£15.95 (c)

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Give your View a touch of the wizziwigs

VIEW is nearly Wysiwyg, but not quite. No, that wasn't a typo. Wysiwyg – pronounced wizziwig – is an abbreviation for what you see is what you get, and when applied to a word processor refers to how closely what appears on the screen mirrors what will finally be printed.

The Wysiwyg part of View extends to on-screen formatting of text, but doesn't go as far as expanding macros and highlights on the screen or showing where page breaks will occur.

You can get an idea of what the pagination will be like by using the SCREEN command. However, this isn't very satisfactory because the screen can only show at most 32 lines, whereas a printed page is often 66 lines.

I describe here a printer driver for View which lets you see the layout of a whole page on the screen at once, complete with the effect of on/off-type highlights.

Being able to see the format of the text without printing it out is what makes this such a novel idea. This is not the type of printer driver you're used to using but a screen driver which turns a graphics mode screen into an image of what the text will look like.

Of course you can't actually read the text because of the limitation mentioned above. In fact each character is represented by a single pixel on the screen.

Mode 1 displays the preview screen. This gives three colours plus the background, enough to show plain unhighlighted text and two highlight colours. All even highlights – 128, 130 and so on – cause subsequent text to be shown in red and odd highlights – 129, 131 and so on – turn the text yellow. If both an odd and even highlight are active at once the text turns black and is indistinguishable from spaces.

To use the printer driver call up View and enter the screen mode you require for the default ruler, such as Mode 3. Then type NEW and load the driver using the command PRINTER PREVIEW, assuming you've assembled the program at the end of the article. Next, type Mode 1. Note that a mode change doesn't alter the default ruler.

Type the appropriate PRINT command. For example, it could be PRINT on its own to print from memory, or PRINT f1 f2 f3 to print three files. The screen will clear and a white border will be drawn marking the approximate page area.

The lines of text will be printed within the border unless your files start with a PE stored command, in which case you will have a press a key. In any case when the text gets to the end of the page press a key to continue.

It should be obvious from looking at the lines on the screen where page breaks occur at unfortunate places, such as in the middle of tables and where matching highlight codes have been omitted.

There is the small problem that if your files have been written using the Acornsoft Printer Driver Generator highlight sequences, which aren't always symmetrical when enabling and disabling a given effect, you may find half of your text coming out in yellow or red – or black. C'est la View, as they say.

The program incorporates quite a lot of trickery necessary to fit it into the measly 256 bytes allocated for it. Note that you need Basic II or above to assemble the program as it uses offset assembly and EQUBs, neither of which are supported in Basic I.

The start of the object code is the usual jump table to various printer driver routines – this is where the first bit of craftiness occurs. The jumps to the print character and enable printer routines are all right, but the next three jumps – to disable printer, return options and get HMI (horizontal motion increment) – are replaced with single byte RTS instructions.

If the JMP instructions were used instead they would only jump to an RTS, so there's no harm done. The benefit is that there are now six spare bytes corresponding to the three missing JMP addresses. Five are used as workspace, the other one is spare.

When View starts to print it calls the printer driver's *printerOn* routine. In our case this sets the graphics colour to white, plain text, and then falls through to the routine page. This initialises a line counter to zero, clears the screen and draws the border around the screen.

To draw the border the graphics cursor is moved to the position *0, maxy* at the top left hand corner of the screen, and a sequence of bytes is loaded from the string at the label *plotTab* and sent

→

See a whole page layout on screen . . .
with this program by PETER JOHNSON

From Page 61

to the VDU. These bytes form four PLOT commands.

The width of the page is derived from the scaling factor *sx* and the constant *chars*. The depth is always the height of the screen. PLOT 2 – draw relative in inverse colour – is used to make sure that the border is always drawn in white regardless of any current highlighting.

The character printing routine is called *printChar*. This starts by saving A and X. These registers are corrupted and must be preserved according to the View printer driver specification. The character is examined and if it is a carriage return, a routine to move on to the next line, *doCr*, is called.

If it is a space a black pixel is drawn and a pixel in the current foreground colour is drawn if it is a printable Ascii character. The routines to do this are *doSpace* and *doChar* respectively, which are simply a relative move/draw *sx* pixels to the right. If the character is a highlight code and below the limit called *maxHt* it changes the current colour. The current colour number is EORed with 1 if the highlight code is odd, or 2 if it is even.

Thus even highlights change the colour from 3 (white) to 3 EOR 2 = 1 (red). Odd highlight codes change it from 3 to 3 EOR 1 = 2 (yellow). The next highlight of the same type changes it back again, such as is the nature of EOR operations.

The reason for having the highlight code upper limit is to get round the problem associated with printer driver generator highlight sequences. By setting *maxHt* to 130 only the bold and italic highlights will affect the screen.

The *doCr* routine increments the line counter called *lcount* and, if it is equal to the current page length, calls the *doSheet* routine which waits for a key press and then calls *page*. Finally it restores the registers.

If *lcount* doesn't equal lines – the page length – *doCr* just moves the graphics cursor to the start of the next line down. The page length is held in location &26 in View 2.1 and 3.0. Whether this is true of 1.4 I'm not sure, as I haven't got that version to hand.

That covers the main routines. There are some small routines such as *move0y* which moves the cursor to (0,A*256+X), the Y coordinate is held in X – low byte – and A – high byte – on entry. *doGcol* updates the colour stored in *col* from A on entry and performs a GCOL 0,col operation. *nulWrch* just does a VDU 0 and *nulWrch2* does a VDU0;.

Once you've typed the program in or loaded from the tape RUN it. It will save the object file, called preview, and print the length of the printer driver. This is currently &EC, so there are 20 bytes free for expansion.

One possible enhancement is to make the printer driver do the Mode 1 – VDU 22,1 – from the *printerOn* routine. The trouble with this is that it upsets View's idea of what the mode is.

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```
10 REM Preview printer driver
20 REM for VIEW
30 REM By Pete Johnson
40 REM (c) The Micro User
50 DIM code &200
60 origin=&400
70 sx      = 8
80 sy      = 16
90 maxy    = 1020
100 oswrch  = &FFEE
110 osrdch  = &FFE0
120 white   = 3
130 cls     = 12
140 cr      = 13
150 gcol    = 18
160 mode    = 22
170 plot    = 25
180 moveRel = 0
190 drawRel = 1
200 moveAbs = 4
210 maxHt   = 144
220 lines   = &26
230 chars   = 90
240 FOR pass=4 TO 6 STEP 2
250 P%=origin
260 O%=code
270 [ opt pass
280   jmp printChar
290   jmp printerOn
300 .printerOff
310   rts
320 .savex
330   EQUB 0
340 .savea
350   EQUB 0
360 .setOpt
370   rts
380 .col
390   EQUB 0
400 .lcount
410   EQUB 0
420 .getHmi
430   rts
440 .y
450   EQUW 0
460 .printerOn
470   lda #white
480   jsr doGcol
490 .page
500   lda #0
510   sta lcount
520   lda #cls
530   jsr oswrch
540   ldx #maxy MOD &100
550   lda #maxy DIV &100
560   jsr move0y
570   ldx #0
580 .pageLp
590   lda plotTab,X
600   jsr oswrch
610   inx
620   cpx #endTab-plotTab
630   bne pageLp
640   rts
650 .doPlot
660   lda #plot
670   jmp oswrch
680 .move0y
690   stx y
700   sta y+1
710   jsr doPlot
720   lda #moveAbs
730   jsr oswrch
740   jsr nulwrch2
750   txa
760   jsr oswrch
770   lda y+1
780   jmp oswrch
790 .doGcol
800   sta col
810   lda #gcol
820   jsr oswrch
830   jsr nulwrch
840   lda col
850   jmp oswrch
860 .nulwrch2
870   jsr nulwrch
880 .nulwrch
890   lda #0
900   jmp oswrch
910 .printChar
920   sta savea
930   stx savex
940   cmp #cr
950   beq doCr
960   cmp #ASC" "
970   beq doSpace
980   tax
990   bpl doChar
1000 .doHt
1010   cmp #maxHt
1020   bcs printRet
1030   and #1
1040   bne doHt1
1050   lda #2
1060 .doHt1
1070   eor col
1080   jsr doGcol
1090   jmp printRet
1100 .doSheet
1110   jsr osrdch
1120   jsr page
1130 .printRet
1140   lda savea
1150   ldx savex
1160   rts
1170 .doCr
1180   inc lcount
1190   lda lcount
1200   cmp lines
1210   beq doSheet
1220   sec
1230   lda y
1240   sbc #sy
1250   tax
1260   lda y+1
1270   sbc #0
1280   jsr move0y
1290   jmp printRet
1300 .doSpace
1310   ldx #moveRel
1320   beq doSpace1 ;Always
1330 .doChar
1340   ldx #drawRel
1350 .doSpace1
1360   jsr doPlot
1370   txa
1380   jsr oswrch
1390   lda #sx
1400   jsr oswrch
1410   jsr nulwrch2
1420   jsr nulwrch
1430   jmp printRet
1440 .plotTab
1450   EQUS FNplot2(sx*chars,0)+FNpl
ot2(0,-maxy)+FNplot2(-sx*chars,0)+FNp
lot2(0,maxy)
1460 .endTab
1470 ]
1480 NEXT
1490 PRINT"(";~P%-origin")"
1500 IF P%-origin>&100 THEN PRINT"To
o big..."
1510 OSCLI"SAVE PREVIEW "+STR$~code+
" "+STR$~O%
1520 END
1530 DEF FNplot2(x%,y%)=CHR$plot+CHR
$2+CHR$x%+CHR$((x%AND&FFFF)/&100)+CHR
$y%+CHR$((y%AND&FFFF)/&100)
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

This listing is included in this month's cassette tape offer. See order form on Page 149.

6502 MACHINE CODE Part 8

More power to your branching

By MIKE BIBBY

ALL right, I'll admit straight away that Program I isn't perhaps the most amazing one in the world, but at least it works – and it illustrates several points that all assembly language programs have in common.

For those of you who haven't worked out what it does, it simply loads the accumulator with the Ascii code for an asterisk then prints it out with a call to *oswrch*.

As we learned last month, we assemble the code twice – a two pass assembly – using different values of OPT each time. To do this we bury the code we want assembled in a FOR . . . NEXT loop with a step of three, so that the first time through we have no listing or errors shown, but on the second pass we get both.

Notice that we set *P%* – the variable which decides where our code should go in memory – to &900 inside the loop, to make sure that our second assembly goes on top of our first.

Also, we've used *oswrch* as a label for the value &FFEE. This type of labelling really does make your code more readable.

```
JSR oswrch
```

is far more meaningful than:

```
JSR &FFEE
```

The only new feature of this program is the line:

```
LDA # ASC("*")
```

Previously we would have written this as:

```
LDA # &2A
```

but as the assembler is part of Basic, we can include functions such as:

```
ASC("*")
```

as the arguments of our code.

By the way, the hash sign (#) shows that the LDA is immediate. That is, we load the accumulator with the value of the byte immediately following the opcode for LDA. If we omitted the hash and wrote:

```
LDA ASC("*")
```

the result would be to load the accumulator with the contents of memory location &2A, whatever they may be.

Having printed out one asterisk, the next step is to print out more. Naturally our mind turns to looping, so we might be tempted to construct a loop using JMP, as shown in Program II.

At first sight it looks reasonable. We load the accumulator with the Ascii code for the asterisk we want printing, and then print it out with a call to *oswrch*.

As we want to repeat this part of the code we label it as *print* so we can jump back to it. To do this we simply precede our mnemonics with:

```
.print
```

That initial full stop is important – the assembler needs it so it doesn't try to interpret *print* as a mnemonic.

What actually happens here is that *print* takes the value of the location of the opcode it's labelling. To prove this add:

```
130 PRINT ~ print
```

to Program II and run it. You'll see that *print* has the value &902.

Be warned: You can run the program as it is, since all it does is to assemble the code. Don't try to run the actual code, though, since it contains a major flaw. Well come to that later. So, having labelled our call to oswrch, we loop back to it with a:

```
JMP print
```

The way JMP works is quite interesting. As a machine code program runs it keeps track of the address it's up to in a special register called the Program Counter (PC). This is a two byte register since it has to hold a full 16 bit address.

As it deals with the various opcodes and their data, the PC is automatically updated to point to the memory address of the next opcode to be done (though this isn't quite true for JSR). Normally this goes in a sequential fashion. Once one opcode has been dealt with the PC points to the next opcode in memory, so that is then done.

What happens with JMP is that, instead of being updated so that it points to the following opcode, the PC has its contents altered to those of the address specified in the two bytes following the JMP opcode.

So when the 6502 looks at the PC to find the address of the next opcode to do, it finds that it's been switched away from its straightforward progress to a completely different point in the program.

In this case, on encountering:

```
JMP print
```

the value of the PC is set to &902, so the 6502 looks for its next opcode there. This is the address of:

```
JSR oswrch
```

so we once again print out our asterisk,

```
10 REM PROGRAM I
20 oswrch=&FFEE
30 FOR pass%=0 TO 3 STEP 3
40 P%=&900
50 [
60 OPT pass%
70 LDA # ASC("*")
80 JSR oswrch
90 RTS
100 ]
110 NEXT pass%
```

Program I

and then move onto our next instruction which is the JMP back to *print* and so on.

This achieves our objective. By looping back we're printing out more than one asterisk. Unfortunately, though, there's no way of stopping the loop. Once we've started printing out asterisks we're locked into our loop until we make an emergency stop with Break.

What we've created is known as an unconditional loop, since we haven't given any condition for leaving it. As you've probably gathered, unconditional loops are not a good idea.

So what we want to do is to give our program a condition for leaving after we've printed out a fixed number of asterisks. Program III shows the ideas involved.

We've still got the fundamental loop involving the jump to *print* but we've included an exit condition with the:

```
INX
BEQ return
```

What these two lines do is to increase the X register and branch, or divert, to the code at *return* if the X register is zero.You see, BEQ stands for Branch if EQual to zero. Never mind exactly what's supposed to be equal to zero – we can take it as meaning roughly the result of the last operation of the 6502.

In this case the last sum the 6502 has done is to add one to X for the INX. So if the X register initially contained the value &FF (255), the INX would take it "round the clock" to zero.

Since the X register would now be zero, the branch would be taken and the program would continue from *return*. If the X register is non-zero, however, we carry on to the next instruction which is our JMP back to *print*.In effect

```
10 REM PROGRAM II
20 oswrch=&FFEE
30 FOR pass%=0 TO 3 STEP 3
40 P%=&900
50 [
60 OPT pass%
70 LDA # ASC("*")
80 .print JSR oswrch
90 JMP print
100 RTS
110 ]
120 NEXT pass%
```

Program II

then, the loop continue until X reaches zero.

As you'll see from line 70, we enter the loop with X equal to zero. So the first time through the loop we print an asterisk and then increment X. Since this gives the result one, the branch isn't taken (the last sum didn't give zero) so we continue with our code, encountering the JMP back to *print*.

This will continue until the value of X has gone from zero up to 255, each time printing out an asterisk, giving us 256 asterisks in all – think! After asterisk 256 is printed though, the INX will take X back to zero. This is what the BEQ has been waiting for – since the result is now zero it can take its branch to *return*.

Mind you, it's a bit of an anti-climax. All that *return* labels is – surprise, surprise – an RTS to take you back to Basic.

Still, it doesn't have to stay that way. Why not add a beep to *return*? You should be able to do that backwards by now.

To explain a bit more about BEQ, we need the concept of flags. These are, in a sense, the 6502's own internal variables and are as vital to monitoring its function as pulse and blood pressure are to ours. Actually, they're very limited variables, only taking the values one and zero. When a flag has the value one we say it is set, when it's zero we say it's clear.

The flag we're concerned with at the moment is the Zero flag, which, as I've said, is affected by many of the 6502's operations. When the result is zero the flag is set, otherwise it is cleared.

If you've been paying attention you'll realise that this is rather topsy-turvy – if the result is zero, the flag is set to one, if the result is non-zero, the flag is cleared to zero.

In practice the actual values of the flags don't matter too much – it's what they tell you about what's going on.

When it encounters a BEQ the 6502 looks at the Zero flag. If it's set – that is, we did get a zero – it branches to the address specified. If the flag is clear the 6502 simply carries on with the next instruction after the BEQ.

So far we've been used to specifying addresses with two bytes, as for JMP. However with BEQ we use something called relative addressing.

The idea's quite simple: The 6502 already knows where it's up to in the program thanks to the Program Counter. So to tell it the address we

```
10 REM PROGRAM III
20 oswrch=&FFEE
30 FOR pass%=0 TO 3 STEP 3
40 P%=&900
50 [
60 OPT pass%
70 LDX # 0
80 LDA # ASC("*")
90 .print JSR oswrch
100 INX
110 BEQ return
120 JMP print
130 .return RTS
140 ]
150 NEXT pass%
```

Program III

want it to go to we just tell it how many more bytes past the address in the PC it has to go – the offset.

We call this relative addressing, since we give the 6502 the address relative to where it's up to.

Specifying addresses in this manner is like saying "second on the left" rather than "number 4". Both get you to where you're going, but the first is relative to where you start from.

When Program III is assembled you'll see that the last part of the output appears as:

```
0908 F0 03    BEQ return
090A 4C 04 09 JMP print
090D 60       .return RTS
```

The opcode for BEQ is &F0, which is followed by the number of bytes to be added to the Program Counter in order to determine the address to branch to if necessary. In this case it's &03.

If this seems a bit odd, remember that the PC will be pointing to the opcode of the *next instruction after* the BEQ. That is, it will contain the address &090A. Now we want the branch to be to &090D and, if you do some counting from &090A, you'll see that this is three bytes further on.

In practice we don't do the calculations for branches, we use labels and let the micro work out the sums.

Also, since the offset only occupies one byte, you've probably seen that the distance you can branch is limited. We'll go into the exact restrictions next time.

● *In fact, that's all for now. Next month we'll be learning more about flags and branching. In the meantime, why not convert Program III so that it uses the Y instead of the X register?*

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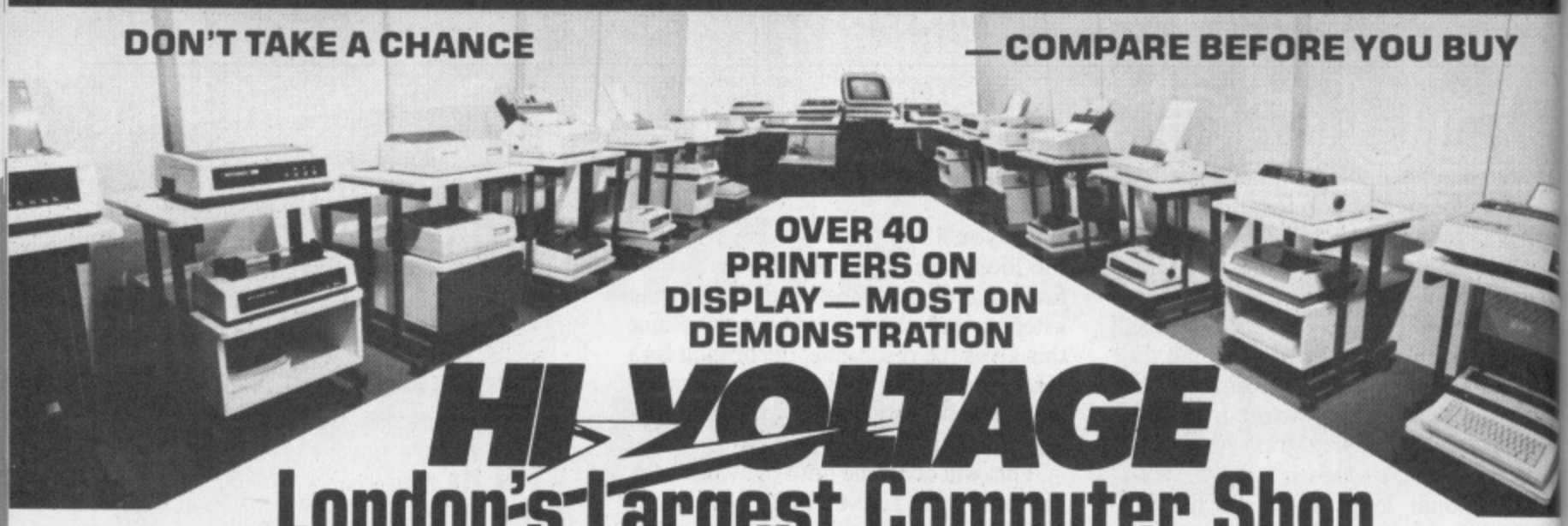

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Making an early start in Hampstead

FOR starters this month we'll take a look at the early moves in Hampstead. Not too much though, just enough to give Alex Plant, George Carey and others who can't get started an introduction to the game proper.

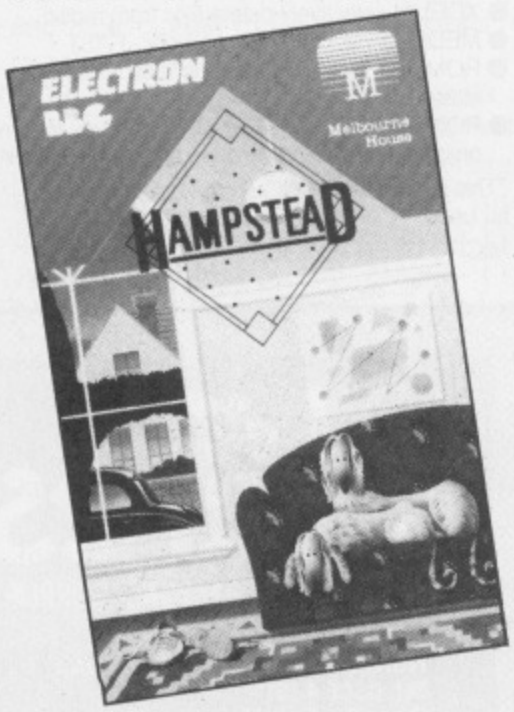
It should set them on their way to a secure niche on the pseuds social ladder.

It took a little while for me to figure out the importance of the SEARCH command. Entirely my fault, as I've been too accustomed to using only LOOK and EXAMINE, and in Hampstead SEARCH is not the same as EXAMINE.

It's all there on the cassette inlay. Do you remember what I wrote about a careful reading of the inlay before starting? It really is time I took my own advice more seriously.

At any rate there you are in that grotty lounge, in front of the TV set. SEARCH LOUNGE first of all and you'll find something called a UB40. I'm ashamed to say that I had to ask for help over this straight away.

"What's a UB40?" I asked my elder son. "Pop group", was the muttered reply. "And it's also an unemployment benefit form", he added helpfully. Thus TAKE UB40 was the next thing to enter.



One thing deliberately lacking in the descriptions is the little matter of any indication of visible exits from a location. It means that a tactic I have mentioned before has to be employed more or less constantly.

Test for exits in every direction: N, NE, E, SE, S, SW, W, NW, U, and D. I also tried IN and OUT briefly, until I became convinced that the parser did not recognise these words. UP from the lounge is a bathroom, E from the bathroom is a bedroom and it contains a wardrobe.

OPEN the wardrobe, and inside is revealed a tracksuit. TAKE it and WEAR it. Remember what they said about being decent? W again to the bathroom, D to the lounge and E to that ghastly kitchen full of the debris which is well worth a SEARCH.

You need what you find there to get safely mobile – using the bike inside the locked shed – and thus out of the immediate area.

Once you are out of the garden the gate closes behind you. The next task is to explore your surroundings very carefully.

I found a social security office and exchanged my UB40 for a girocheque. I discovered a job centre but failed to get a job. I found a post office and cashed the girocheque, and so on.

Look out for the Oxfam shop – an essential stop on the way to success. Avoid the betting shop, but visit the newsagents. You should think carefully before catching a train. Some truly awful things happened to me before I got to the right destination.

Finally there is the industrial estate – in other words a maze – and you need to go in there to get a rather unusual artefact without which you'll not go a lot further.

So here is the way in to reach the artefact, but you must find the way out for yourself. From the main entrance to the industrial estate go N, then E,E,NE,E,E,NE and N.

To get out use the 'drop an object' technique. DROP something, try each direction in turn until the object you have dropped vanishes and then you know you have actually moved.

In this simple version of the maze there is only one permitted direction of movement, unlike the mazes in more sophisticated games such as Enthar Seven from Robico. Keep on doing this until either you have run out of objects or you are out in normal surroundings again.

Don't forget to SAVE your position outside the main entrance before starting in on the maze, and if you run out of objects go back to the beginning and start again.

This time you can do the moves you have mapped without dropping anything. Start dropping things at your last known location, and off you go again. I had to do that to reach the artefact. Although I can solve mazes I still dislike them intensely.

Next month I'll drop a few more hints on how to succeed in the snob stakes and how to be first home in the city rat-race.

Last thought for this month on Hampstead – how do we get that final 2 per cent? Come on you newly knighted nobs, drop me a line and prove you've returned to the source and finished the game.

I've decided to let you into the secret of why Alice departed this column in a

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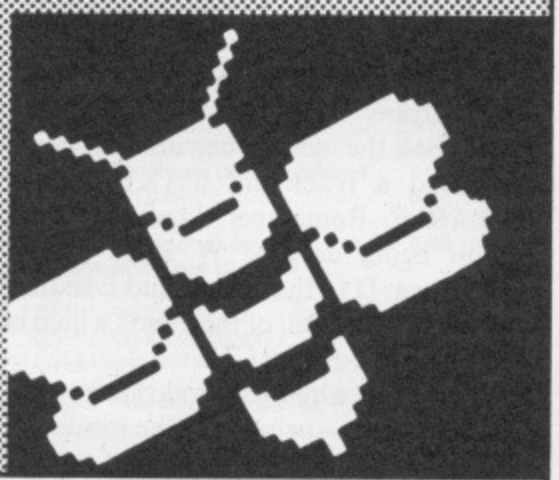

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From Page 67

marked manner. Firstly she was turned down by Gary Woolerton, aged 15, who asked if she had an older sister. I pointed out to Gary that Alice's older sister was 103 last birthday.

Secondly there was this poem by way of a puzzle solution. It started: "Dear Al, You've done it, you and Pete – you set my brain to working. You made me tackle, 'gainst my will, a matter I'd been shirking.

"With gratitude I proudly gaze – no trembling now, no fear – at bitwise AND and likewise OR that used to cause such fear.

"The answer to Pete's problem? Let's try this – five eight two three. That's A, of course, and then it's one seven four six nine for B.

"Confounded? Nearly? Once again then, this time just for kicks – for A, five eight three two. For B it's one seven four nine six.

"And how to find these numbers? 'Twas the Beeb that got it right with just a little help from Yours sincerely, Gabriel White".

By the time you read this I hope to have begun a serious look at The Price of Magik – the sequel to Level 9's highly acclaimed Red Moon.

The latter was a great game, fully deserving of the title Adventure of the Year in 1985, and so I shall not rush myself into a hasty review of its sequel. The kind of top-rate games that Level 9 and their closest rivals produce deserve to sell and sell and sell.

Thanks to Alice I've come across a new software house – Robico Software.

A first look at their offerings immediately suggests another top-quality adventure software house like Acornsoft, Level 9 and Magus. I've briefly seen three games – Island of Xaan, Rick Hanson and Enthar Seven.

I like the packaging. The games are supplied on good quality discs or tapes in heavy duty wrappings, together with an adventurer's notebook in a special cover – a nice touch – and an SOS card for when you are stuck.

Robico don't provide complete clue sheets, preferring to cultivate customer feedback for the present.

Island of Xaan and Rick Hanson are available on tape at £7.95 and £9.95, and disc at £9.95 and £11.95. You state whether you prefer 40 or 80 tracks and they will supply – but Enthar Seven is on disc only, and has just been made available in slightly modified form on the Electron as well.

I have had a quick look at Enthar Seven. It's much more sophisticated than Island of Xaan, certainly so far as the parser is concerned, because multiple-word input is coped with. It's available on either two 40 track discs at £17.95 or one 80 track disc at £16.95.

If you join their Software Club for £1 you are put on their mailing list and offered discounts, so you would only pay £16.50 or £15.50 for the game. Unfortunately there isn't room for the review in my column – you'll find it in Software Scene next month.

If there is such a thing as a league table in adventure games then those from Robico, Level 9, Magus and several Acornsoft offerings are well and truly in division one. Incidentally I've seen a circular which suggests that piracy is hitting adventure games hard.

A personal comment – loonies who pirate copies deserve to be kicked. They kill the programmers' desire to give us new games to play, and ruin the market for everyone. This is particularly so with the BBC Micro because of the sophisticated machine we have.

Mind you I have little sympathy with anyone who tries to overcharge – there's a delicate balance that it's time we all reached, and thus show our respect for one another. ■

YOUR ADVENTURE QUERIES ANSWERED

In Bored of the Rings Antony Lowe can neither prise the map off that pixie nor open the solid door at the pixie's location – he's also not sure how to use the battery and the mat from the vending machine area.

You have to buy the map with the coin that you get from the vending machine by inserting the battery. To call Bored of the Rings an adventure spoof is an understatement. What is sometimes hidden under mats? Try moving it.

The ironic thing is that when Antony wrote to me I didn't know the answers. So here is a word of encouragement to everyone – if I have to write and say that I don't know the answer to your problem it doesn't mean I shall stop looking.

You may well find that an answer appears in this column some time later.

I have to confess that arcade games aren't my scene at all, the only one I've got is Elite. I've gained Elite status twice – once on the tape version and then again on the disc. Has anyone else bothered to do that?

Paul Wright of Milton Keynes had a problem with Superior Software's Citadel. He wanted to know how to get into the freezer and how to get the crystal in the room above the main hall. Paul I hope that you have now seen the excellent letter from Rohan Smith in the June issue of The Micro User *giving full instructions on how to deal with Citadel. If you missed it order a back number.*

R. Allen of Romford has a problem that took me back a bit. It was with Twin Kingdom Valley – how do you kill the dragon, and where is the giant?

As far as I can remember the giant is in the castle, shut up in a dungeon. Set him free, then take him to Watersmeet, and he'll be your friend for life. He will carry things for you, including that heavy chest.

HIT the dragon with the wooden staff and he will bother you no more.

It's good to know that some of these older games are still being played. Twin Kingdom Valley is available now at around £3, which undoubtedly makes it better value for money than ever.

R. Allen also had a problem with a newer game. Again it's one that deserves to be called a classic – Level 9's Return to Eden. To control the ants you need the stalk with twigs – play it and lead the army ants East through the fence.

Until next month happy adventuring.

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Plotmate A4	**£299**
Plotmate A4M	**£399**
Plotmate A3M	**£549**
Linscan	**£150**

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	**£3.50**
BBC Master	–	**£4.00**
FX100	**£7.00**	**£5.25**
FX80/MX80/FX85	**£4.50**	**£4.95**
RX80	**£4.50**	**£4.50**
LX80	**£4.00**	**£4.50**
GP80	**£4.50**	**£4.00**
GP100/GP250	**£5.95**	**£3.95**
Centronics GLP	**£4.00**	**£3.75**
KAGA KP810	**£5.25**	**£4.75**
CANON PW1080	**£5.25**	**£4.75**
Microvitec Metal Monitors	–	**£5.50**

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" × 11" Fanfold Paper	**£7**
2,000 Sheets 9½" × 11" Fanfold Paper	**£12**
1,000 Sheets 15" × 11" Fanfold Paper	**£9**
Teleprinter Roll (Econo paper)	**£4**

Carriage on 1,000 Sheets £1.50

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90×36mm (Single Row)	**£5.00**
1,000 90 ×36mm (Twin Row)	**£4.90**
1,000 90×49mm (Twin Row)	**£7.50**
1,000 102×36mm (Twin Row)	**£6.25**

Carriage on 1,000 Labels £1.00

Acorn/Olivetti JP101 Spark Jet Printer

Special Clearance Offer **£65**
Pack of 4 refills **£9**

Special
Sparkjet Dump Rom
£15

HITACHI 672 PLOTTER
Only: £450 (Carr £6)

We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

MICROVITEC 14"

- 1431 – Medium resolution as used on the BBC television computer programme **£172**
- 1451 – High resolution, suitable for word processing in mode 0 ..... **£225**
- 1441 – High res, exceeds the capabilities of the BBC micro **£365**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£259**
- **TOUCHTEC** Touch Screen Pack **£250**
- Dust Cover for Microvitecs **£5.50**

KAGA/TAXAN 12"

- KAGA KX1201G Hi-res Green Monitor **£90**
- KAGA KX1202G Long persistance Hi-Res Green Monitor **£105**
- KAGA KX1203A Ultra-Hi-Res Amber Monitor **£105**
- **KAGA Super Vision 3,** Ultra Hi-res, RGB Colour; Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£320**
- PHILIPS 12" Hi-Res Amber Monitor **£69**

FIDELITY COLOUR MONITOR

- Medium Resolution, attractively finished, 14" RGB and Composite VIDEO/AUDIO Input. Has a detachable anti-glare screen.

£169

ZENITH

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith Micro Systems.)
Green (New Design) Hi-res **£69**
Amber (New Design) Hi-res **£79**

LEADS
BNC Lead for Zenith or Philips **£3**
RGB lead for KAGA **£3**

N.B. Carriage on Monitors **£7** (securicor)

CREDIT CARD
Orders (ACCESS or VISA)
Simply phone
(0923) 33383/50234
24 Hour Ansaphone Service

SWIVEL BASES

for Video Monitors

Adjust your Monitor/VDU, Up, Down, Right or Left to provide utmost in operator flexibility & Viewing comfort. It improves your sight lines & reduces stress & eye, neck and back strain. Available in 2 sizes:

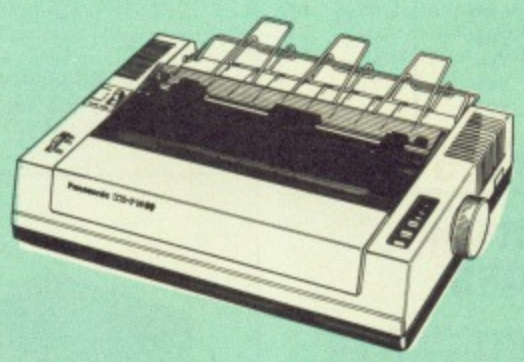
for 12" Monitors **£12** (carr. £2.50)
for 14" Monitors **£16** (carr. £2.50)

GRAPH PAD

Ideal for educational use. Supplied complete with Cables, Manual and software cassette.

Special Offer £49 (carr £3)

Panasonic KX-P1080



From the prodigious Japanese Stable of Panasonic comes this fabulous new NLQ Dot Matrix Printer

Available NOW at a superbly realistic price, the KX-P1080 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy 100 cps of clear Draft text backs up the crisp 20 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

The draft text is implemented with a 9 x 9 matrix, with Near Letter Quality effected by means of an 18 x 18 matrix.

As an extra special bonus to all Watford customers purchasing the KX-P1080 NLQ Printer, we are currently providing not only 1,000 sheets of fanfold paper completely FREE of charge but also a printer lead to connect the marvellous KX-P1080 to a BBC Micro, absolutely FREE. These gifts alone are worth £15.

Introductory Price: **£165** (carr. £7)
(Price includes 1,000 sheets of fanfold paper and a 4' Printer lead)

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS £2.00
27128-250nS £2.40

RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £3.00
2 x 6264LP (16K) £5.90

BBC MICRO WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in at our retail shop to discuss your particular requirement and a demonstration.

EXAMPLE PACKAGE
BBC Master 128K Micro, View wordprocessor, Viewsheet, Basic Editor, Terminal Emulator, Twin 800K 40/80 track double sided Disc Drives, Zenith Hi-Res green monitor, Brother HR15LX professional quality Daisy Wheel printer, Gemini Database, Spreadsheet, Beebplot Graphics, Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, and Stock Control packages on disc with manuals.

Only £949

THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'

This book describes in plain, easy to understand English, how to use and make the most of your KP810, Canon PW1080A or any Epson FX80 compatible Printer with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

Superb Value at **£5.95** (No VAT)

MARK 2 LIGHT PEN

You no longer have to fiddle with the brilliance control or work in the shade as this NEW Mark II Light Pen is totally insensitive to local lighting conditions. It only operates on high frequency light from the TV or Monitor.
The red LED Indicator on the Mk II pen, lights up when valid video data is available. Your program can have access to this signal allowing computer verification of target for high res drawing. The conveniently located switch on the pen body allows the computer to ignore any stray signals. Supplied complete with the sophisticated PEN-PAL Software on Cassette or Disc. Please specify.

Mark II Light Pen **£19**

Continued →

The ULTIMATE DFSs for the BBC MICRO

WATFORD TOPS THE DFS CHART

Watford's Ultimate DFS has scored highest points in ACORN USER's unbiased DFS's Review of July 1985.
In concluding, the reviewer writes "It must be said that Watford's DFS certainly offers a comprehensive range of facilities at a very attractive price".
(Please write in for comprehensive details.)

Just compare the features:

Features	Acorn 1.20	Watford Single Density	Watford Double Density
Max nos. of files per disc side	31	62	62
Max disc capacity	800k	800k	1440k
Tube compatible	Yes	Yes	Yes
Built-in Editor	No	Yes	Yes
Built-in Formatter	No	Yes	Yes
Built-in Verifier	No	Yes	Yes
MRUN a file	No	Yes	Yes
MLOAD a file	No	Yes	Yes
Extended RENAME	No	Yes	Yes
Selective COPY	No	Yes	Yes
Default file name	No	Yes	Yes
Disc space distribution	No	Yes	Yes
40/80 Software Switchable	No	Yes	Yes
Wide catalogue	No	Yes	Yes
Close open files	No	Yes	Yes
Improved OPENOUT	No	Yes	Yes
Copy between densities	N/A	N/A	Yes
OSWORD &7F	Yes	Yes	Yes
Full entry point compatibility	Yes	Yes	Yes
Retain information over a break	1.20	1.43	1.53
	partial	Yes	Yes
Games compatibility	Yes	Yes	Most
Econet file server	Yes	Yes	Yes
Econet station	Yes	Yes	Yes
Full wildcard facilities	No	Yes	Yes

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for three years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. (P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS).

PRICES

- *Complete Disc Interface Kit incl. DFS ROM & fitting instructions* **£54**
- *Acorn's 0.90 DFS Kit complete* **£52**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs)

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£46**
- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£35**

Watford Electronics DDFS PLUS for the BBC B Plus

The Watford DDFS Plus, written specifically for the BBC B Plus Microcomputer, replaces the 1770 DFS from Acorn. It not only provides BOTH, single and double density operations in DFS mode, but the DDFS Plus also permits the use of an extended catalogue, giving 62 files per catalogue. It also incorporates all those excellent features of the popular Watford DFSs, and more.

N.B. SRAM and Tube functions not duplicated.

DDFS PLUS (for BBC Plus) **£30**
(Price includes comprehensive manual)

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

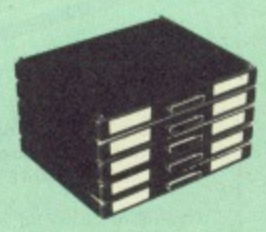
Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4



STAK-PAK

The unique computer program filing and storage system. Made of tough black plastic, these compact drawer sections hold two cassettes each and lock together vertically to form miniature cabinets of any height. Each drawer section has two C12 Data Cassettes with labels plus external index card.

Five twin Packs incl.
10 Cassettes Only: **£5**

FLOPPY HEAD CLEANER KIT

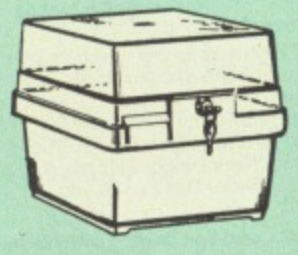
The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

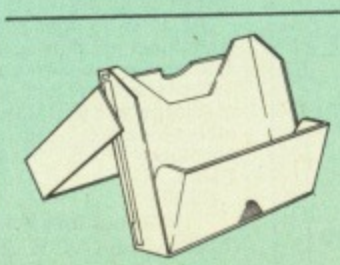
£8

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

M35 - holds upto 40 discs **£9**
M85 – holds upto 95 discs **£11**





PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE
holds 10 Discs. **£2.00**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

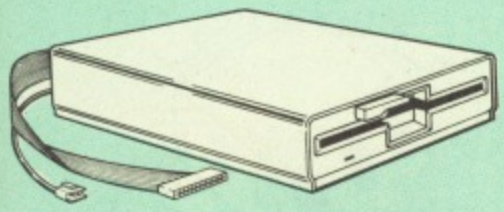
The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). Both are of Japanese manufacture.

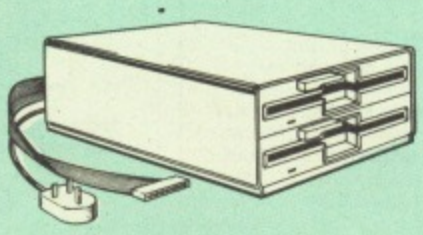
With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them.

All our Disc Drives (except CLS100) are Double Sided and will operate in both Single and Double Density modes. *Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. We are now able to supply all single Disc Drives with Power Supply, in either single or dual cases. (Dual cases with a blanking plate, allow easy expansion at a later date.) Prices stated in the pricing box below for single drives in a single case. Single drives with dual cases cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space; your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 8th page of our advert for the Plinths).





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS 100 £95		CS 100 £116	
200K (360K)	CLS 200 £102	CLD200 £185	CS 200 £116	CD200 £199
400K (720K)	CLS 400 £104 / £105 CLS400S	CLD 400 £185	CS400 £123 / £124 CS 400S	CD400 £205
800K (1.44M)		CLD800 £194 / £195 CLD 800S		CD800 £218 / £219 CD 800S

● TWIN Disc Drive Case, complete with Power Supply & Cables **£35**
Securicor carriage on Disc Drives £6

Prefix **C** = *Cased Drive*
L = *Less PSU*
S = *Single*
D = *Double*

Suffix **S** = *40/80 Switchable*

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- *10 × 5¼" S/S D/D 40 Track Diskettes* **£10**
- *10 × 5¼" D/S D/D 40 Track Diskettes* **£12**
- *10 × 5¼" S/S D/D 80 Track Diskettes* **£17**
- *10 × 5¼" D/S D/D 80 Track Diskettes* **£17**
- *Hi-Density 1.6M D/S D/D for IBM* **£32**

3½"
- *10 × 3½" S/S D/D 40/80 track Discs* **£25**
- *10 × 3½" D/D D/D 40/80 track Discs* **£35**

TOP QUALITY 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 ×* **M4** *S-S D/D 40 Track Discs* **£9**
- *10 ×* **M5** *D/S D/D 40 Track Discs* **£11**
- *10 ×* **M7** *D/S D/D 80 Track Discs* **£15**

- **3"** *Double Sided Discs* **£4** *each*

Special BULK OFFER on 5¼" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

Type	Description	Pack of 20	Pack of 50
M4	Single/Side Double/Density 48TPI	**£16**	**£40**
M5	Double/Side Double/Density 48TPI	**£20**	**£52**
M7	Double/Side Double/Density 96TPI	**£27**	**£65**

DUST COVERS (For our Disc Drives)

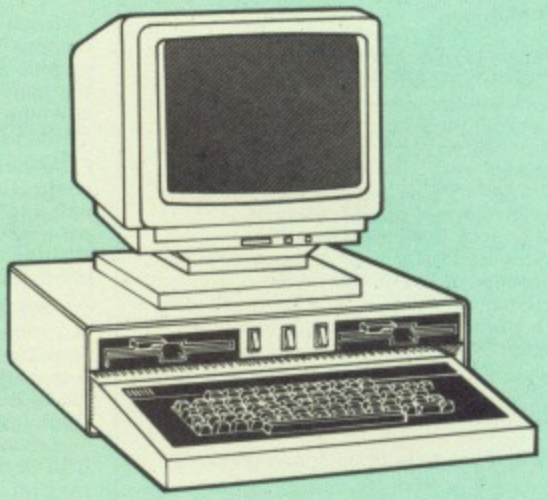
Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

10 Megabytes **£1050;** 30 Megabytes **£1549**

CDP 800S



Twin 800K Double sided 40/80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

Introductory price: £239
(Securicor Carr. £7)

Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00
(Hi-View compatible)

THE NLQ DESIGNER

KAGA KP810/910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted. Now BBC Master compatible.

A 40 or 80 track (please specify) disc containing 3 example fonts is included in the package.

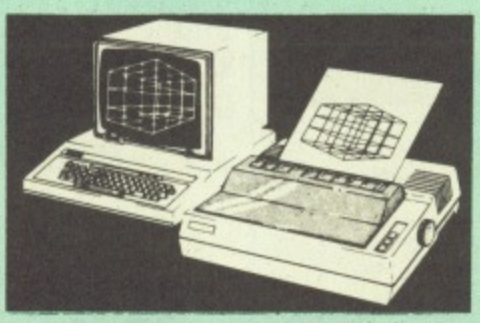
(P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

ALL PRICES EXCLUSIVE OF VAT

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

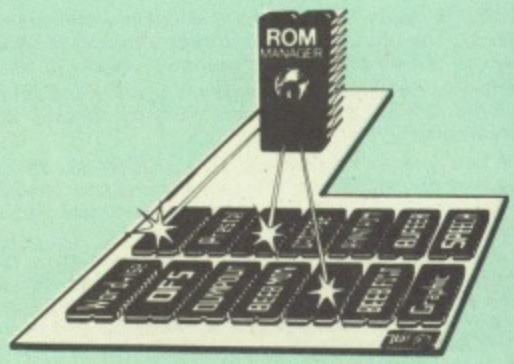
"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Mannesman Tally etc.
Price including comprehensive manual

£25

ROM MANAGER



Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)

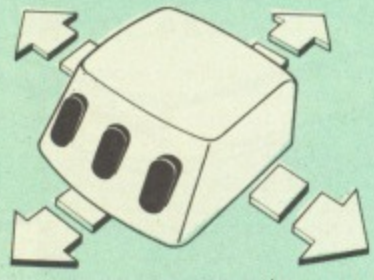
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

SPECIAL OFFER £18

THE AMX MOUSE

The AMX Mouse needs no introduction. It is simply the best.



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £65 (carr £1.50)

FREE With every AMX Mouse package purchased from us, we are giving away, absolutely **FREE,** our popular Colour Art software package worth **£15.**

AMX DESK Package	**£19.00**
AMX UTILITY Package	**£11.00**
AMX SUPERART Package	**£42**
AMX PAGE-MAKER Pack	**£42**
AMX 3D ZICON Disc	**£20**
AMX Database Disc	**£20**
AMX XAM Educational	**£20**

RB2 MARCONI TRACKER BALL

This popular unit is supplied complete with software.

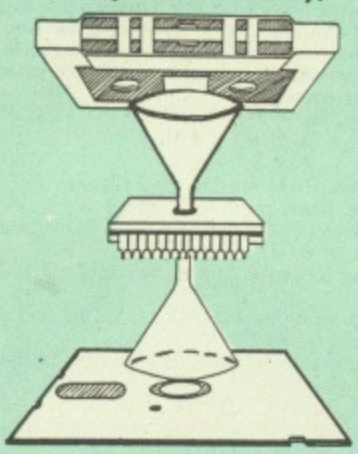
Price: **£50**

FLEET STREET EDITOR

Software pack **£35**

TRANSFEROM

(Tape to Disc Utility)



Not compatible with 1770 DFS.

This advanced and sophisticated utility ROM for the BBC Micro has the following features:

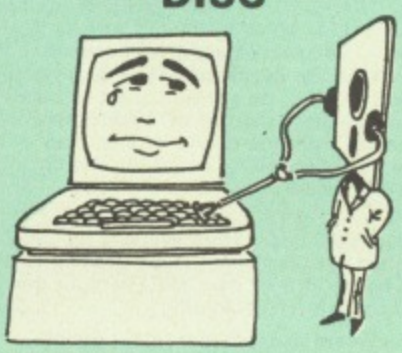
- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£25.00

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8
P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £45**

Please specify 40 or 80 track disc when ordering.

ROM-SPELL

"way ahead of any competition"

ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".

". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".

". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP/M and MSDOS, namely Spellstar and has a speed/performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

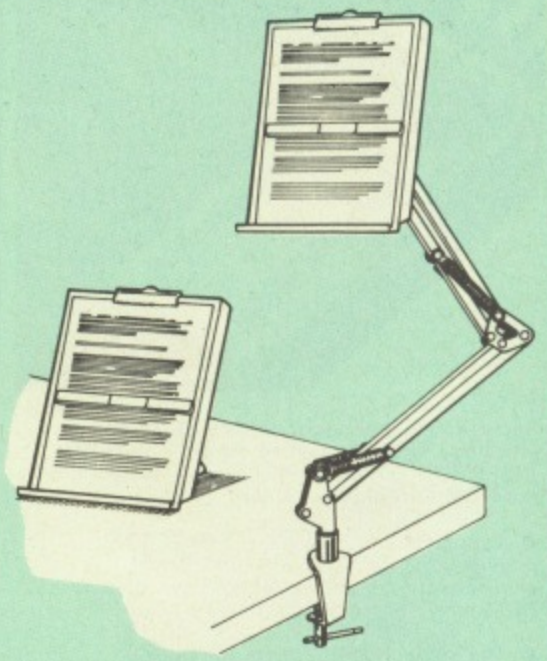
Compatible with: View, Wordwise & Wordwise

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic ruler and a clip grip.

Mounting to a convenient flat surface, the two joint anglepoise Manuscript Holder allows the paper to be positioned at virtually any convenient angle whilst only taking up a fraction of the surface area that the paper being held does.

The smaller desk resting Manuscript Holder is useful for the more organised desk where the problem is simply holding the paper at the right angle.

Whatever desk arrangement you use, surely you deserve a Watford Manuscript Holder!

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** *(carr. £3)*

All prices in this advert are exclusive of VAT.

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24.**

DISASSEMBLER ROM

ONLY **£16**

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

Continued

SIDEWAYS ZIF SOCKET

Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

Complete System	**£12**
Spare Cartridges	**£2.50**
Spare Rack	**£1.50**

16K Sideways RAM Modules

This is it! The revolutionary design RAM Module you've been waiting for. Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

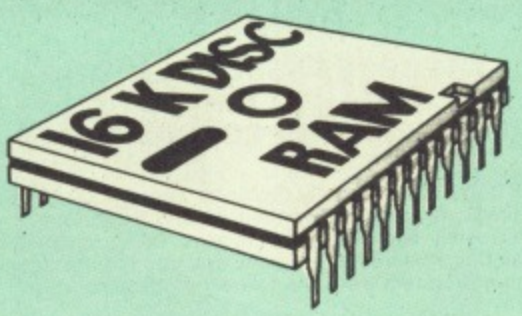
- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

All prices exclusive of VAT



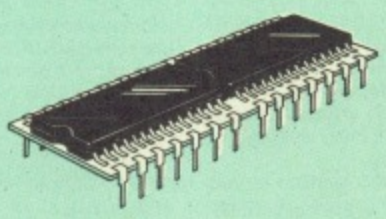
This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

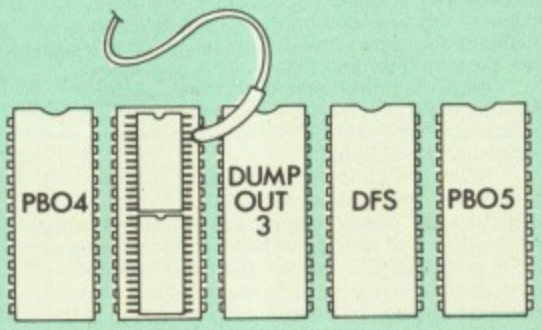
- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £30 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM





This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

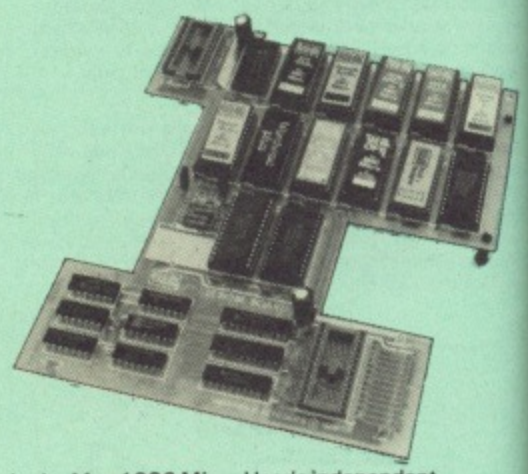
Only **£28** (carr 2)
Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.
Do you require:

- Sideways RAM for a BBC B? Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- An easy to use utilities disc? Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16. Also permissable, are various configurations of RAM (up to 16k) and different sized EPROMs (see below).

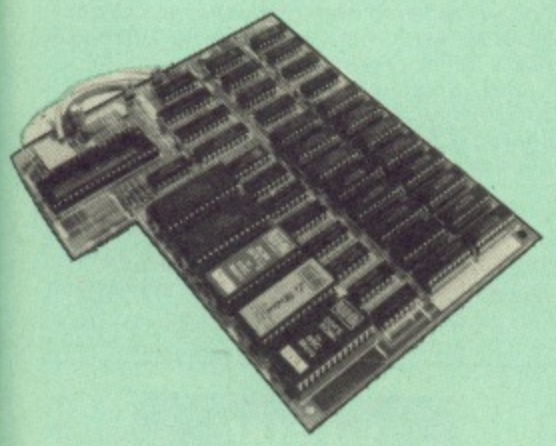
Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 can take the following chips: 2716, 2732, 2764, 27128, 6116, 6264.
- Read protect to make RAM "Vanish"; allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM/RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM/RAM Board.

The ROM/RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, should the user wish to upgrade in the future. Please write in for further details.

INTRODUCTORY PRICES:

- *ROM/RAM card with 32k dynamic RAM* **£45**
- *ROM/RAM card with 64k dynamic RAM* **£65**
- *ROM/RAM card with a massive 128k dynamic RAM* **£99**

(carriage on ROM/RAM Card £3)

OPTIONAL EXTRAS:

- *16k plug-in Static RAM kit* **£6**
- *Battery backup* **£3**
- *Read and Write protect switches* **£2 each**

Complete ROM/RAM board (all options installed) **£115**

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World/wide data transfer system.*
- *Auto Dials, Auto Answers, and is completely controlled by your Micro There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- *FREE 3 months subscription to MicroLink.*
- *BT Approval applied for.*

Price: **£89** (carr £3)

PROHIBITED from direct or indirect connection to any telecommunication system run by British Telecommunications. Action may be taken against anyone so connecting the apparatus

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£115

(carr £3)

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Nightingale Modem without software	**Only £99**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial/Auto Answer Board	**£48**
Auto Dial Utilities Disc	**£9.50**
OBBS Bulletin Software	**£20.00**

Viglen Console Unit

Enhance the appearance and convenience of your BBC Micro with the Viglen console unit.

£42 (carr. £4)

BT TELEPHONE CONNECTORS

LJU	1/4A Mini Line Master	**£4.50**
LJU	1/6A Mini Line Slave	**£3.00**
LJU	2/4A Line Master	**£4.00**
LJU	2/6A Line Slave	**£2.50**
LJU	3/4A Flush Master	**£3.95**
LJU	3/6A Flush Slave	**£2.75**
LJU	10/3A Dual Splitter	**£5.50**
	4 Way BT Plug	**£0.75**

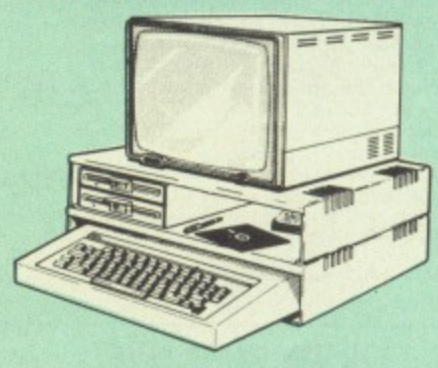
Versatile BEEB SPEECH SYNTHESISER Unit

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

Continued

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£27
Graphics ROM	£23
Disc Doctor ROM	£24
TERMI	£27
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise £25

Wordwise plus

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text/segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET £40

INTER-CHART ONLY: £26

Computer Concepts' long awaited

Inter-WORD

Only: £49

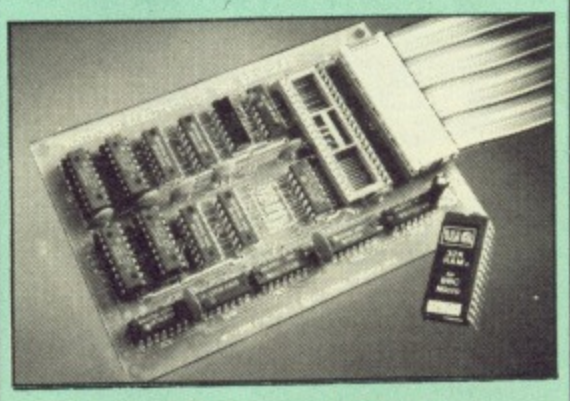
Special price to Wordwise Plus owners. Please quote your reg. number and pay.

Only: **£39**

All Prices Exclusive of VAT

32K

SHADOW RAM- Printer Buffer Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B+ or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!
- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only: £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

A Watford's 32K RAM Card (offering printer buffering and shadow screen RAM facilities) with the well known WORDWISE PLUS Word processor.

32K Shadow RAM Card/Printer Buffer and Wordwise Plus (a very powerful package) for the absolutely astounding price of:

Only £75 (carr £2)

(P.S. For an extra £14, we will include Word-Aid ROM package for the Wordwise Plus, if bought at the same time.)

VIEW

VIEW WORDPROCESSOR 2.1 ..... **£37**

VIEW 3.0 ROM

Price: Only **£56**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£36

VIEWSHEET (Acornsoft)	**£37**
VIEWSTORE	**£37**
VIEWSPELL	**£50**
VIEWPLOT Disc	**£25**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER HR15 PRINTERS

Only £10

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

Only: £10

SPECIAL OFFER

Acorn's Speech Synthesiser Package

Complete with manual in its original packaging

Clearance price Only: **£19**

ARIES CORNER

Aries Computers was the first company to commercially market what is now known as SHADOW RAM. As part of it's continued expansion policy, Watford Electronics is proud to announce that the Aries range is now available exclusively from Watford Electronics and their dealers.

The Aries range, designed by experts offers you the solution to your upgrade nightmares. All the Aries products are compatible with double density disc controllers, modems, second processors, ECONET, hard discs, EPROM programmers and of course, other members of the Aries family and most of the much wider Watford family (some products advertised here perform identical functions and hence cannot be used together). Several major companies now test all their products to ensure compatibility with the Aries B20 & B32.

In quality of construction, the Aries range sits alongside the Watford range in setting a standard against which others are judged. Custom made connectors eliminate the damage to the BBC machine caused by inferior products.

The Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20; the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many othr applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) sofket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on he board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

THE ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

THE ARIES RANGE HARDWARE REQUIREMENTS

Aries B-32 – BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 – BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234/33383

النور ARABIC ROM for the BBC Micro

The ALNOOR ARABIC ROM converts your BBC into a bilingual computer. New keytops provide both English and Arabic symbols. Two sets of Arabic symbols are provided for use in either context sensitive or insensitive operation.

20, 40 and 80 column operation. Compatible with ASMO (449). English/Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

OFFICE MATE

Database – Set up a computerised "card index" system and add record/data to the file your way. Features include search, sort, mathematical calculations, printer routines, data summaries, etc.

SPREADSHEET – Offers a wide range of invaluable calculation and editing features. Beebplot will take files created by Beebcalc to provide data portrayal in graph, histogram or pie chart format.

BEEBPLOT – Provides an easily assimilated visual representation of numerical data.

WORDPROCESSOR – Provides many routines found in large and expensive packages.

OFFICE MATE Only £10
(Cassette or Disc)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock value, current gross margin, cost of bringing stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21**
(Cassette or Disc)

Money Management

This disc based software allows individual transactions to be stored and retrieved for upto 5 Bank a/c and 5 Loan accounts.

Price: Only **£11**

L.B.O. Rom
Life & Business Organiser

Use LBO to organise your life from today until 1999! It can handle literally hundreds of multi-line messages, as many as you are ever likely to need. Despite the very wide range of facilities offered, this professional program is VERY easy to use and requires absolutely NO knowledge of computers. A vital aid to your everyday life, LBO is GREAT FUN TO USE!

Price only: £17

DDD Suite
Integrated Software System

-BASE **£15**
-CALC **£15**
-PLOT **£15**

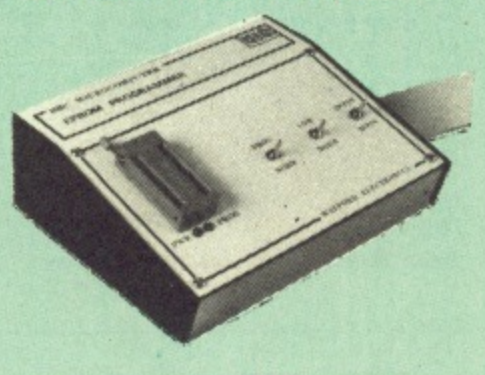
COMBO PACK All 3 together **£36**

Continued

BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development System	£7.50
68000 Assembly Lang. Programming	£19.95
68000 Machine Code Programming £12.95	
68000 Programming the	£22.95
6809, Programming the	£16.95
A User Guide to Wordwise Plus	£9.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£14.95
Advanced BASIC ROM User Guide	£9.95
Advanced Machine Code Technique for BBC	£7.95
Advanced Programming for BBC	£6.95
Advanced User Guide for BBC	£13.50
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Advanced Programming Techniques for the BBC Micro	£8.95
Adventure into BBC BASIC	£6.95
Applied Assembly Lang. for BBC	£9.95
Assembler Routines for the 6502	£7.95
Assembly Language Programming FOR the BBC Micro	£9.95
Assembly Language Programming on the BBC & Electron	£8.95
Basic Programming on the BBC Micro	£6.95
Basic ROM User Guide	£11.95
Basic User Guide for BBC Micro	£10.00
BBC B+ User Guide	£14.95
BBC BASIC	£5.95
BBC Forth	£7.50
BBC Machine Code Portfolio	£7.95
BBC Master 128 High Flyer	£10.95
BBC Micro Advanced Ref. Guide	£10.95
BBC Micro Advanced Programming	£9.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro ROM Book	£9.95
BBC Micro Disc Companion	£8.95
BBC User Guide	£10.00
BCPL User Guide	£14
Complete FORTH	£6.95
CP/M - 86 User's Guide	£19.95
CP/M Bible	£16.50
CP/M Handbook with MPM	£9.95
CP/M Plus Handbook	£13.95
CP/M Soul of	£16.50
CP/M The software BUS	£8.95
Creative Animation & Graphics	£7.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£9.95
Discovering BBC Micro Machine Code	£6.95
Disc System for the BBC Micro	£6.95
Exploring FORTH	£6.95
FORTH on the BBC Micro	£7.50
Functional Forth for the BBC Micro	£5.95
Games BBC Micro Play	£6.95
Graphics for Children	£6.95
Graphs & Charts on BBC Micro	£7.50
Guide to BBC ROM	£9.95
Hackers Handbook	£4.95
Hackers Handbook - New	£6.95
Handbook of Procedure & Functions for the BBC Micro	£6.95
Interfacing & Robotics on BBC	£15.95
Interfacing Your BBC Micro	£8.95
Into View	£4.50
Introduction to COMAL	£9.50
Introduction to LOGO	£6.95
Introducing 'C'	£9.95
Introducing CP/M on the BBC Micro Z80 2nd Processor	£9.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£17.95
ISO -PASCAL Reference Manual	£9.95
Let your BBC teach u to program	£5.45
LISP 2nd Edition	£14.95
LISP, A Beginners Guide to	£10.95
Logo Programming	£9.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering CP/M	£17.95
Master Advance Reference Manual	£19.95
Master Reference Manual Part 1	£14.95
Master Reference Manual Part 2	£14.95
Micronet Handbook	£6.95
Programming the 6502	£16.95
Programming the Z80	£19.95
Sencing & Control Projects for BBC	£5.95
S-PASCAL on BBC Micro	£7.50
Structured Basic	£7.95
Structured Prog. with BBC BASIC	£6.50
Termulator Manual	£4.95
The Complete FORTH	£6.95
The Complete Programmer	£5.95
The Epson FX/KAGA PRINTER Commands REVEALED	**£5.95**
Turtle Graphics on BBC Micro	£7.50
Using Floppy Discs with BBC Micro	£5.95
View 3.0 User Guide	£10
View Guide	£4.50
Viewsheet User Guide	£10
Viewstore User Guide	£10
Using BBC Basic	£4.95
Wordprocessing BBC Beginners Guide	£7.95
Wordstar & CP/M made easy	£7.45
Wordwise Plus Guide	£9.95
Z80 Assembly Language Programming	£19.95

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

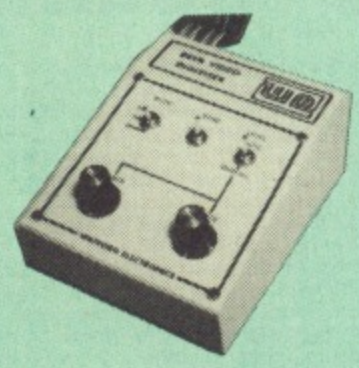
SPECIAL OFFER £69 (£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

BEEB VIDEO DIGITISER



Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£110 (Carr. £3)

(Price includes: Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)

A combination of the AMX Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within AMX Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£129.00** (carr. £3)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£16
Delta 14B Single Joystick	£12
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc/Tape	£7

ROM EXTRACTION TOOL

This extremely useful tool allows you trouble free chip removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

Price: **£2**

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only **£8.75**

ATTACHE CARRYING CASE for BBC Micro

The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price **£13** (£2 carr.)

28 pin ZIF SOCKET (Textool) **£6.95**

28pin DIL HEADER PLUG

SOLDER type	£1.50
IDC CRIMP type	£1.95

SPARES for BBC Micro

Keyboard	£46	Keystrip	£2
UHF Modulator	£4	Case	£25
Speaker Grill	£1	Speaker	£2
Power Supply	59	Keyswitch	£1.50

Replacement FLEXIBLE KEYBOARD CONNECTOR £3

8way DIP SWITCH **£0.85**

CONNECTING LEADS

(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
to 7 pin DIN Plug	£2.50
to 3 Jack Plugs	£2.00
6 pin DIN to 6 pin DIN Plug (RGB)	£2.50

DISC DRIVE POWER LEADS
Supply from BBC power supply to standard Disc Drive connector.
Single **£3.00** Dual **£3.75**

DISC DRIVE INTERFACE LEADS
BBC to Disc Drives Ribbon Cable
Single **£4** Twin **£6**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles (15 pin 'D')	80p	200p
BBC Power Plug 6 way	80p	–
Disc Drive Plug 4 way	75p	–
BBC Power Socket 6 way	80p	95p

Watford Electronics' Dealer's List

UNITED KINGDOM

Akhter Instruments Ltd, Akhter House, Perry Road, HARLOW, Essex

BEEBUG, Dolphin Place, Holywell Hill, St. Albans, Herts

Cambridge Computer Store, 1 Emmanuel Street, Cambridge

Citkit Distribution Ltd, Park Lane, Broxbournea, Herts.

Dennis Spitz Computers Inc, 86 Golders Green Road, London NW11

Greenbank Electronics, 92 New Chester Road, New Ferry, Wirral, Merseyside

Gemini Marketing Ltd, Exmouth, Devon

Microman Computers, Rainford Industrial Estate, Mill Lane, Rainford, St. Helens

Peartree Computers Ltd, Falcon House, High Street, Huntingdon, Cambs.

Twillstar Computers Ltd, Apex House, Blandford Road, Norwood Green, Southall

Verospeed Ltd, Boyatt Wood, Eastleigh, Hants.

OVERSEAS DEALERS

Absolute Electronics, 483 Centre Road, Bentleigh, Victoria, Australia 3204

Alpha Computer Co, Shop 314 Chi Fu Commercial Centre, Chi Fu Fa Yuen, Hong Kong, Tel: 5-506592

Computer Distribution Company, Parklaan, 47, B-9300 Aalst, Belgium

ECD BV, Voldersgracht 26, 2611 EV Delft, Holland

LENDAC DATA SYSTEMS, 8 Dawson Street, Dublin 2, Ireland

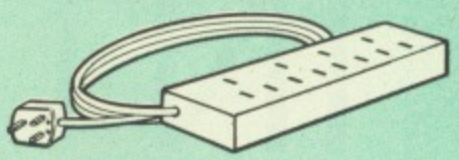
Scientex P.V.B.S., Zilversmidstraat 2, B-2000 Antwerpen, Belgium, Tel: 03 233 59 06

Techno-Matic Data, Holbergsgade 19, 1057 Kobenhavn K, Denmark

Velobyte, Scheaedyksadyk 5A, 3011 EB Rotterdam, Holland, Tel: 4138197

Viking Tecno, Vestergade 12.1, 9620 Aalestrup, Denmark, Tel: 08 642522

4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug. **£9.50** (carr £1.50)

ACORN MUSIC 500

The Acorn Music 500 System is probably the most powerful piece of music generating hardware available for the BBC Micro.

£72 *(carr £4)*

Software Disc 'Mu-500' has 13 tunes **Only: £6**

CHIP SHOP

8271	£36	Acorn BCPL	£42
DS3691	£3.50	BCPL Calc Pack	£15
DS88LS120	£3.00	BCPL Stand Alone Generator	£36
LM324	£0.45	Basic Editor	£25
SN76489	£5.50	BROM	£28
SAA5050	£8.75	Buffer & Backup	£20
UPD7002	£4.40	Beebmon	£22
2764-250nS	£2.00	Beebfont	£25
27128-250nS	£2.50	Acorn COMAL	£36
27512	£18	Acorn FORTH	£32
4013	60p	Acorn Graphics	£25
4020	£0.90	Graphics Extension Rom	
4464	£8	GXR-B	£21
4816 RAM	£1.75	GXR-B+	£22
6264LP-8K RAM	£3.00	Acorn LISP	£35
6502A CPU	£5	Acorn LOGO	£42
65C02 CMOS	£10.00	ISO Pascal	£42
65C12	£9	ISO-Pascal Stand Alone Generator	£30
6512A	£10.00	ICON Master	£28
6522	£3.40	Logotron LOGO	£52
6522A	£5.00	Micro Prolog	£62
6845SP	£6.00	Microtext ROM	£48
7438	40p	ROMIT	£29
74LS00	25p	Serial ULA	£13
74LS04	25p	Video ULA	£15
74LS10	25p	TERMULATOR	£25
74LS123	80p	MUROM	£21
74LS163	70p	SLEUTH ROM	£24
74LS244	80p	STUDIO 8 Disc	£18
74LS245	£1.00	Toolkit Plus	£31
74LS373	£1.00	Communicator	£49
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INTER-WORD

INTER-WORD is the third in the ROM-LINK series of application programs for the BBC Micro-computer and this is the most ambitious suite of programs to be written for this machine. Each part of the suite offers a superior alternative to the competition. As a complete integrated suite of programs there is nothing better available for any micro computer.

INTER-WORD is the newest and the most comprehensive word processor ever produced for the BBC Micro.

•Part of the only truly integrated suite of programs for the BBC micro. This enables **INTER-WORD** to run alongside the other members of the ROM-LINK family such as INTER-SHEET. Multiple documents (together with sheet data etc.) can be held in memory at the same time and data transferred from one to another.

•Truly WYSIWYG. i.e **INTER-WORD** shows an accurate screen representation of the final printed page at all times.

•Supplied on a special 32K ROM, the chip is compatible with all machines.

•Supports 40,53,80 and 106 column screen modes with either 25 or 32 lines on screen.

•Compatible with BBC B, B+, Master, Aries, Watford and now Solidisk shadow RAM boards.

•Multiple column printout and multiple copy options.

•Mail merging facilities built in. Allows merging from another **INTER-WORD** document or from other INTER programs such as INTER-BASE.

THE NEW WORDPROCESSOR FOR THE BBC MICRO

The ROM-LINK suite, of which INTER-WORD is an important part, is a uniquely flexible set of integrated ROMs, compatible with all models of the BBC micro.

MONEY-BACK Guarcantee

Buy INTER-WORD—if you don't like it—send it back for a full refund!

(Available when purchasing direct from Computer Concepts)

The first published review of INTER-WORD says:

"the most significant program since WORDWISE"

"INTER-WORD on the BBC Micro compares favourably with word processors costing five or ten times as much running on the IBM PC and the like."

"INTER-WORD was a real pleasure...a truly worthy successor to WORDWISE"

Gordon Taylor A&B Computing

•Built in support for different printers. There is no need for additional printer drivers, as the user can define the codes required for bold, underline etc. Once defined for a particular printer these codes can be saved for later use. Like WORDWISE, INTER-WORD also has the ability to send any control codes to the printer at any point in the line, thereby giving access to all its features.

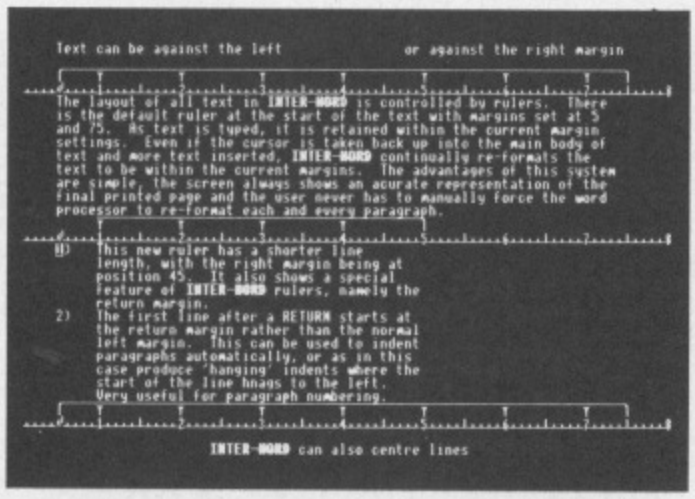
•Powerful search and replace facilties include wildcards, and a case sensitivity control. There is also a quick 'go to' search option.

•Special attention has been paid to screen update speed, ensuring this is one of the fastest screen editors around. There is no waiting around for the text to reformat.

•If the page size is changed, or the margins are altered, all text is re-formatted to the new settings instantly.

•Any specified part of text, page or range of pages may be printed (or spooled to disc) via simple to select menu options.

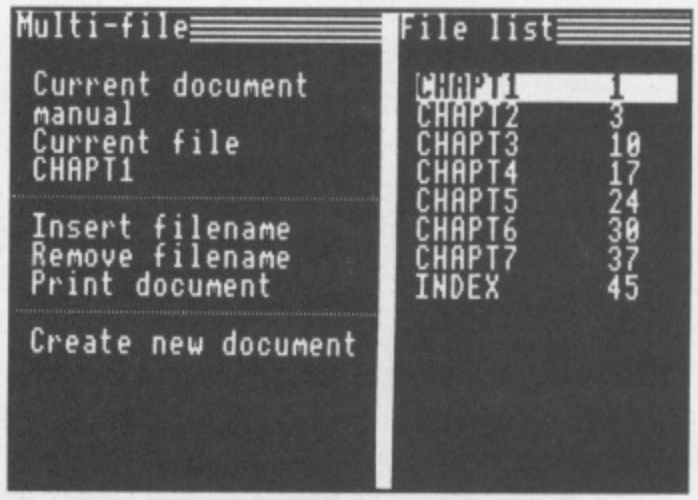
•Fully compatible with DFS, ADFS, ECONET and any other Acorn compatible filing systems.

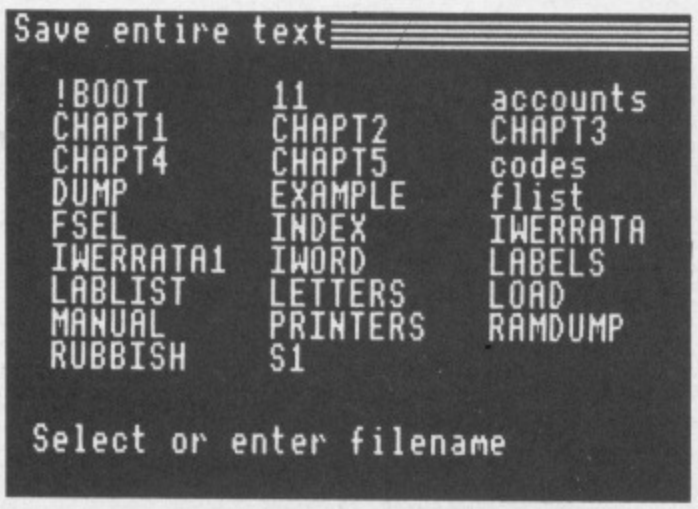


The format of text in **INTER-WORD** is controlled by rulers rather than embedded commands. A ruler can be inserted at any point simply by pressing a single function key. This ruler will affect the format of all text after it. By simply dragging the margin or tab indicators on the ruler all text controlled by this ruler is instantly re-formatted to the new settings.

INTER-WORD supports documents much larger than memory. This special 'multi-file' mode is both simple to use and far superior to other forms of continuous processing. By linking a list of files together INTER-WORD is able to treat these as if they we just one long piece of text.

The multi-file menu allows the insertion and deletion of any file and the printing of the whole document.





A special file selector is used whenever a filename is requested. Instead of having to remember and type the required filename, INTER-WORD will display a list of all the filenames. The user simply has to move the highlight to the required one and press RETURN.

When text is saved, all the current options are saved with it, including cursor position, screen mode and colours, current page layout etc.

Computer Concepts have been producing top quality software for the BBC machine since its launch. We designed and produced WORDWISE the most successful program ever produced for this machine. It is with this background that we can guarantee INTER-WORD is the best word processor for the BBC Micro. If you do not agree then just return it for a full , no quibble, refund.

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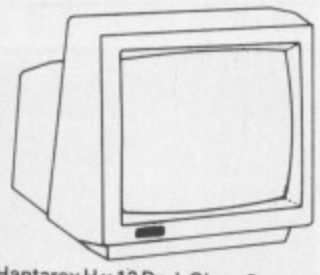

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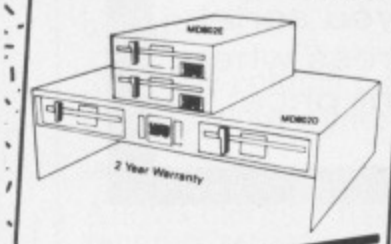

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* PRINT SPEED, DRAFT: 100 NLQ: 20 COMPRESSED: 86
* 9 PIN PRINT HEAD

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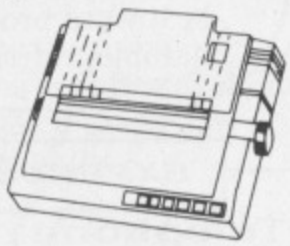

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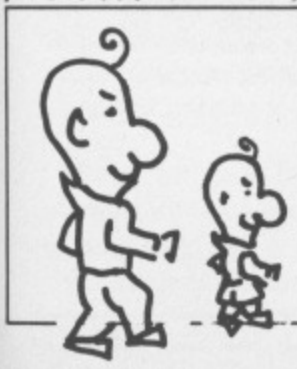

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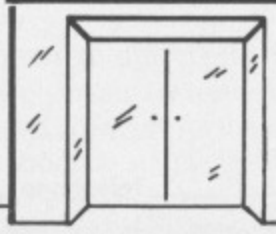

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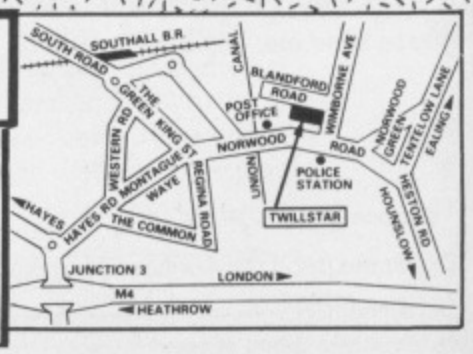

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WHERE IS ACORN GOING?

JO STORK looks into his crystal ball – and finds little cause for optimism

MY day to day work brings me into close contact with four different micros and two mainframes. Since I regard all the variants of the IBM PC and its compatibles as being a single micro and besides these I also regularly work with another couple of micros and a further mainframe, I am forced to take a keen professional interest in most areas of the computer industry, not just the BBC Micro sector.

This broad-based viewpoint has resulted in my becoming deeply concerned about the long term future for users of the BBC Micro. While the following is particularly directed at those who are considering using it as a business tool, parts will have relevance to scientific, educational or technical users.

I believe these fears are well founded despite the BBC Micro having many merits. There is an immense pool of people familiar with its capabilities. Tens of thousands of students leave schools and colleges each year having learnt their basic data processing principles on this micro, while similar numbers use them in homes and small businesses.

Many technical departments, whether educational or industrial, use the BBC Micro with the same ease and familiarity as if it were a ballpoint pen. Add to this the huge quantities of software available, albeit much of it junk, plus the fact that it is one of the very few genuinely British computers on the market, and you would think that I would be recommending it to many of my clients.

Despite these many attractions, the sad fact is that in the last 12 months I have only once selected it for a short list, and then it fell by the wayside. Much as I would like to consider it more frequently, I cannot maintain my reputation and propose BBC Micro-based solutions, except where it is already being used for some other purpose. This is because in the commercial sector the BBC Micro's value for money or price/performance is now far worse than the market will tolerate. In this respect I do not merely include it against stock clearances such as Apricot with its F1.

If you want the proof of this point, consider what £1,000 will get you once you have bought a monitor, disc drives and printer for the BBC Micro, and compare this with its competition. Despite recent price reductions, it is with deep regret that I conclude Acorn are badly over-pricing their products for the commercial sector. I assume that they are not taking too big a profit margin.

Also the computer sectors have had difficulties, even if they have not been as well publicised as Sinclair's fall from grace or Acorn's recent salvation from the liquidator. Giant, multi-national mainframe manufacturers also struggle and eventually fail to maintain their independent existence. Only recently Sperry was swallowed up by the not overly-successful Burroughs. Even the mighty IBM cannot claim to be enjoying an unhindered road to profit. Tales abound of vast warehouses bulging with unsold PCs. I can only guess what will happen if and when these are dumped on the market.

This picture is repeated amongst the chip, component and peripheral manufacturers. Far more have gone to the wall than have made fortunes for their shareholders. As for the software suppliers, the road to ruin has seen far more travellers than the road paved with gold.

This situation is not new. When I studied economics, the car industry was the normal example chosen for demonstrating the principles of "economies of scale". Now, 20 years on, I would use micro production for the case study. Massive sales are needed to generate the purchasing clout required with component suppliers in order to hold production costs down. Only a very low selling price or a particularly leading edge product can generate these sales. This gives companies with a broad worldwide market a considerable advantage over those such as Acorn, whose main sales are in a single country or sector.

The car analogy goes deeper. The computer industry is currently in the same phase of maturity as the motor industry of the 1920s, that is totally fragmented. Sixty years later there are a handful of massive groups, several in the second division struggling to keep in profit, and a shoal of minnows filling specialist and frequently grossly over-priced niches.

The bulk of the dropouts were perfectly competent products whose vendors fell off this vicious economies of scale roundabout. Curiously enough, Acorn's parent company, Olivetti, fully understands this principle. Now that it has got its build quality sorted out, the extremely competitively priced IBM PC clone, the M24, figures very highly in my recommendations.

It will probably take less than 10 years, not 60, for the same situation to be repeated in the computer world. The IBMs and Digital Equipments look secure, the Crays will find their specialist niches, but what will become of Acorn? Will it go the same way as the Singer, Rudge or Duesenberg? Will it struggle along like Alfa Romeo or Austin Rover? Will it emerge as one of the big five like Ford or General Motors?

There is a further major consideration influencing micro manufacturers. Because there appears to be a regular cycle of glut then famine for chips, Acorn has little to fear if the market is saturated with components. However when the next shortage occurs suppliers are

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hardly likely to favour Acorn in preference to other manufacturers ordering dozens of times more units. Olivetti's umbrella can only partly shelter them.

Despite the very volatility of the market, several trends can be clearly seen. While by no means the complete list, the following five are particularly relevant to commercial BBC Micro users. They are:

- Costs are tumbling.
- Processor power is rising dramatically.
- The software being developed for newcomers is drying up.
- The installed user base is remaining static.
- The areas into which micros are being heavily marketed is widening steadily.

Putting on my management consultant's hat rather than my writer's cap, I'll take a closer look at these criteria and see how you are likely to be affected by Acorn's performance in these areas.

In my estimation the Master series is still 33 per cent overpriced for the commercial sector. Consequently unless this is brought back into line with the market it is likely to be very short-lived. If you think back to the economies of scale comments, this view becomes easier to understand.

Despite there being hundreds of different micros on the market, the vast majority use only a handful of processing chips. More than 200 vendors use the Z80 8 bit and the same number use the 8086 16 bit. Put another way, because of the millions that have been produced, computer users are getting a $10 chip with hundreds or thousands of dollars worth of capability, marketing and profit packaged round it. Much the same applies to all the chips on a micro's motherboard, as well as the other bought-in components such as keyboards. The present levels of BBC Micro sales give Acorn minimal influence over suppliers.

> ***'The Master series is still 33% overpriced for the commercial sector'***

Dropping the price and ramping up production in anticipation of the increased sales is a very high risk game. If the sales do not materialise, the warehouses bulge and any anticipated profits are squandered in storage costs and interest charges. Holding the production levels down again will only play havoc with the costings and further alienate the suppliers. Not surprisingly Acorn is reluctant to go this route, given its recent experience. Sadly it may very soon have no option.

Software development is exceptionally expensive, especially so if proper care is taken over the testing and documentation. Unit sales need to be high before the investment is recovered. It therefore makes far more sense to make this investment in an assuredly large market rather than a tiny one. For people born and bred on BBC Micros, it takes some believing when they are first told that despite manufacturing 50,000 units a month it is insignificant as a world force. The problem is compounded since in some respects it has a decidedly odd-ball Basic language.

If you could manufacture and sell a Rolls Royce Corniche at a showroom price of £1.50 while showing a healthy profit, you would still struggle to find a customer if there were no roads for it to run on. Similarly just as the railways became locked into the curious 4 foot 8 and a bit inch guage, and the GWR 7 foot guage quickly passed away, precisely the same applies for anyone attempting to produce a new computer or software package. It requires an exceptional new machine or an assured market before the software suppliers will venture forth and desert an entrenched commercial position.

Programs reaching me for review have almost dried up, which can only mean one or more of the following:

☐ The BBC business/office market has become saturated, and the software suppliers do not feel confident they will recoup their development costs.

☐ The BBC business/office market is shrinking and the software suppliers are beginning to look to other markets.

☐ The BBC business/office market is due to take a major new direction and the software suppliers are waiting to discover where to direct their next initiatives.

If this situation does not improve, then no matter what Acorn does, its machine is doomed to eventual commercial failure. Many fine products have gone to the wall as a result of software starvation.

To a certain degree the BBC Micro has been the victim of its own success. In all probability it would not be here now if it had not gained Sir Keith Joseph's favour, but conversely this resulted in its securing a niche which is now very difficult to break out of. Faced with the kind of prices Acorn charges, new business users are going to look to companies with a long standing product line of commercial computers, or to those which can run the brand leading packages.

Unfortunately for Acorn, many of the BBC Micro's merits are of no significance to them. The fact that it may have gained a fine reputation as a technical machine and that programming it holds no terrors is unimportant. Few businessmen have the desire to spend the 100 hours needed to develop even the simplest of book-keeping systems, whether they have the ability or not. Consequently they hunt out the packages to suit them. As soon as they do the tour of the High Street they find that most of the software available is very much geared to the occasional user rather than serious office systems.

The expression vertical markets has recently become accepted to describe the placing of a product into specialist commercial areas. When I was with Honeywell, we more or less cleaned up in two of them – water authorities and TV companies – and yet I do not recall using the term once.

When the Master series was first announced there were large advertisements for it, and some of their thrust was in the commercial sector. They gave me confidence that Acorn was trying to break out of the vertical markets in which it had found itself –

education, domestic and technical. I did not expect Acorn to do what Amstrad had done with its PCW, which virtually single handed created a new market, but I did believe that diversification was in the wind.

Sadly over the last six months, Acorn appears to have subsided quietly into its old ways. Whether it is the Olivetti bosses or a combination of all the effects described earlier which have enforced this attitude I can not ascertain, but the retreat is clear to see.

In an industry where six months is half a generation, 1986 makes me suspect that Acorn has given up on the business sector.

It will naturally pick up what spin-off sales it can from its strength in other areas, but every sign is that it is going to become a specialist supplier in its current vertical sectors.

All the signs make it apparent that the best Acorn can hope for is to become the Porsche of the micro world, and will never make it even as far as a Volvo, let alone a Ford.

I realise this piece makes depressing reading, and not just because it saddens me to report that yet another British company is facing a gloomy future. It makes no difference to my main line of work whether Acorn survives or goes under, but I do have a small vested interest in its future nonetheless: Lack of interest or development in the commercial sector makes it extremely difficult to write a lively column.

I therefore throw out this challenge to users, software producers and even Acorn itself. Please swamp me with material and/or prove to me that if I only wait a little longer, Acorn will become a wide spreading oak under which everyone will wish to shelter. ■

Impressive package, but limited market

MANY of the issues I have raised are illustrated by the excellent little package Micro-Aid Extended Payroll. It is well coded, powerful, offers all the basic facilities a small organisation could require and comes with a well written hand-book. Incidentally the manual is being revised, though I can think of few changes that are necessary.

Even so, despite all this hard earned praise, I am left with a curious feeling of dissatisfaction. None of it is Micro-Aid's fault and I wish it every success, but the more time I spent with the package the more convinced I became that it was the wrong system for the wrong machine.

Depending on the disc drives you possess, Extended Payroll handles between 125 and 400 employees, including leavers during the current tax year. All the possible variations of tax codes and NHI tables are covered. Employee record cards, P35s, simple personnel records, payslips, weekly summaries, employee summaries, period summaries and coin analyses are produced. Since this is all you could require, the obvious question is why do I have doubts?

Firstly I intensely dislike payroll being handled by micros in small organisations. With the exception of the coin analysis, it is not such a chore that it must be computerised. A manual system can be handled by several members of the staff, such as the proprieter, book-keeper and senior secretary, consequently holidays or sickness do not result in staff mayhem when they fail to be paid.

Organisations with a single operator or sole computer leave themselves potentially naked if the sole member of staff goes off to Brittany or the micro off for repair. In my view the potential for disaster totally outweighs the minor benefits.

The converse also applies. Once a computerised system becomes practical, innumerable bureaux are falling over themselves for your business. About 50 pence per person per week to rid yourself of the whole headache strikes me as excellent value for money. Alternatively if you decide to keep payroll in-house, the fact that 30 staff earning an average of £100/week gross represents an annual salary bill of £3,000/week or £150,000 a year may prove enlightening.

Taking even the most unlikely of situations, an office cleaning service using 30 part-time staff, each earning an average of only £40 a week, still represents a turnover of at least £120,000 a year. Given this turnover, I cannot understand anyone using a BBC Micro in such an organisation, even if it was originally bought to help a child's O level computer studies.

This turnover certainly justifies a computerised system, and depending on the billing/book-keeping load could involve a large, powerful micro. My doubts are all in the area of whether a BBC Micro with a single 40 track drive, £180 of dot-matrix printer and a hook-up to a colour TV is the right one to use. Using a decent colour monitor, NLQ printer and twin 80 track drive puts you in the price league of the better known IBM PC clones. True, the packages available are far more comprehensive and massively more expensive, but the long term suitability of a system other than a BBC Micro cannot be denied.

With my provisos understood, I return to Extended Payroll in more detail. This system is about as easy to use as it is possible to make it. Within five minutes of loading the package I had the start menu on the screen. Simple selections and data entry soon loaded the two employee files. When it comes to actually running the payroll each employee can be handled in one of three ways.

The first and most likely is where a regular weekly wage, without overtime or absenteeism, is to be paid. The record is presented on the screen, a single key is

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pressed and within a couple of seconds the deductions are calcuated, the record is updated and the payslip starts printing off.

Secondly, where special payments or deductions are required you can select any field on the record, enter the appropriate non-standard value for that week or month and then update as above.

The third method is to use either of the above but actually run forward a number of extra weeks during the current period. This overcomes to some extent one of my earlier objections.

Let us assume that this is week 16 and a member of staff is to be away for a fortnight. You would call up the weekly run as normal, but before automatically moving on to the next employee request a further two runs. Consequently in week 16, weeks 17 and 18 would also be produced. If this applied to only a single member of staff the following week the record for that employee who had been paid and was on holiday would be automatically by-passed with no specific action having to be taken by you.

There is no operational reason why this method could not be used to allow you to take a three week cruise to the West Indies, by executing payroll runs in advance, thereby having some money calculated for the employees. However I dread to think of the adjustments you would face on your return or the cash flow problems you might create.

The system is full of nice touches. A typical example is that if a record cannot be found, since its works number is forgotten, then the name, or even part of it can be used, such as SHAN for SHANKLEY W.

One of the biggest bugbears in any payroll system is that the NI rates and tax bands are changed at least once a year. Micro-Aid offers an updating service for those who do not wish to do it for themselves, although there is a menu option followed by simple question and answer sequences to enable you to do this for yourself. It is so easy that I wonder how many people will pay the annual fee.

Those of you who have read this far will see that I am highly impressed with Extended Payroll. I can therefore recommend it to those who feel that despite everything I have written, they wish to use a computer system. Since the areas with genuine need are likely to be limited, I urge Micro-Aid to commence conversion to other computers in order to maximise their sales. ■

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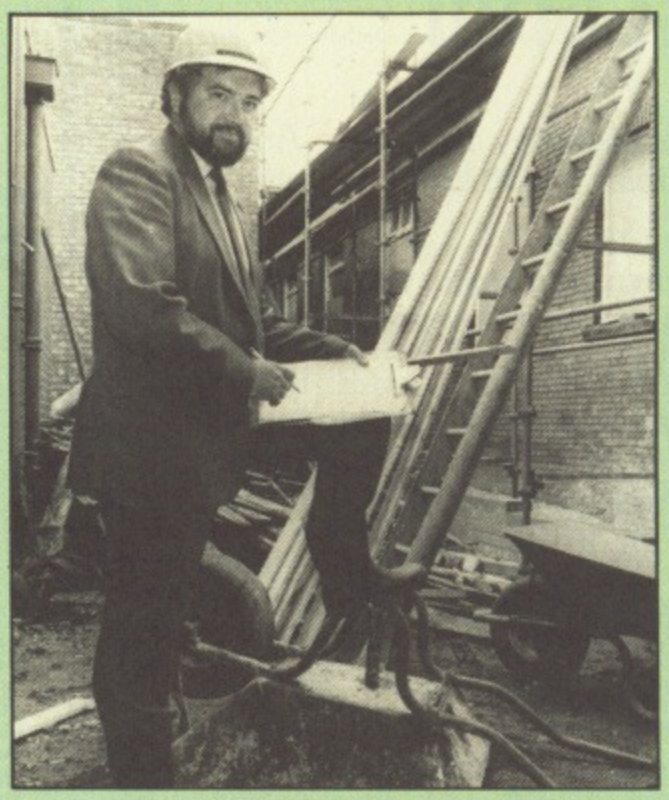
Surveying the scene with the BBC Micro



By Andrew Williams FRICS

IT is amazing what you can do with 32k. That was the conclusion that I came to after buying my first BBC Micro about three years ago. I say my first one because I now have two computers, the original model B and a new Master.

I first became interested in computers about four years ago when I was asked to organise a lecture for my institute (the Royal Institute of Chartered Surveyors) concerning computing. At the time the possible use of computers in surveying was all the rage. Except for one or two enlightened souls who had purchased Apples, Tandys and Superbrains, most of the surveyors that I talked to could not see any real use for these machines in their present state of development.

That might seem amazing, but don't forget a lot has happened in the last four years.

During the course of organising the lectures I became smitten by the computer bug (and no doubt annoyed most of my friends by continually talking about the machines) and I knew that it was only a matter of time before I bought one. But which one?

After a while I decided to go on a short programming course at Liverpool University to see if I could really appreciate what it was all about. The experience did not dampen my enthusiasm and I knew that I would have to invest my hard-earned money.

How did I come to choose the BBC Micro in the first place? Well it wasn't by chance. It took approximately six months of reading various magazines before I made my decision. Even three years ago 32k was a somewhat small memory compared with some computers that were available but the BBC Micro won on expandability, a proper keyboard and a decent word processor (Wordwise).

Part of my job is to prepare lengthy reports and I am afraid that I am a typist's nightmare. I always want to draft and redraft sentences. Before getting the computer I would go to my typist rather shamedfaced and ask for amendments to be made, which resulted in a complete retype, but with a word processor I now have no fear of changing anything. I dump my thoughts into the word processor, run off a draft and then proceed to insert sentences. By the time I have finished there are more arrows on paper than in a Red Indian encampment.

This facility alone is well worth the cost of a computer for anyone preparing structural reports, technical reports, long letters and the like.

I was sensible enough at the time of purchasing to realise that my first computer might end up consigned to a corner collecting dust – I had seen this happen in the office of a friend of mine who bought a second hand Apple with dual disc drives.

My next purchase was a Tec 25 daisywheel printer. The reason for buying the Tec was that the Juki had only just appeared and was an unknown quantity, and after consideration I decided that a wide printer might possibly be a better buy for my work.

The first use I made of the initial set up was purely for word processing. As part of my work I prepare plans for houses and extensions and as anyone knows who regularly prepares plans there is a great deal of specification writing to go on each drawing and I immediately saw the advantage of making the machine carry out this laborious task.

Now all my plans have computerised specifications and I estimate that approximately eight hours work a week is saved merely by using the computer for this purpose.

After I had had the first computer for six months I realised that I did not have the time to program it to do all the things that I wanted of it and I decided to advertise locally for a part time programmer. That is how I first met Steve LeGuen, my partner in our marketing company, W.L. Computer Services.

His first task was to write a program for simple structural steel design. I was finding that the Building Control Department were asking for calculations every

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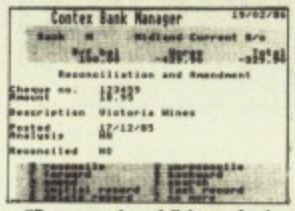

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From Page 91

time that a steel beam (RSJ) was specified on my jobs and once again I could see that here was a means of utilising the computer and saving myself the cost of either laboriously working out the details or employing an engineer.

It took Steve about three months to produce the first version of his Pocket Engineer. Afterwards a number of revisions were made in the light of use in practice, including adapting the program for timber beam calculations. To date we have had no queries from local councils when we have submitted printouts produced by our program and I am happy that it is carrying out a very useful function in my practice. Figure I is a typical printout obtained from Pocket Engineer.

Another of my function is to prepare estimates for small to medium size builders and each one tends to pay his operators slightly different rates of pay. To simplify this problem we developed the All-in-rate calculator.

As programs go it is fairly simple. The standard information is held on disc and the operator can move the cursor around the screen and alter any figure that is non-standard (this normally only takes a few minutes) and then the machine quickly recalculates the rates. In other words, it acts like a specialised spreadsheet. The program then also allows several "gang rates" to be produced. Figure II shows a typical printout.

When I bought the first BBC Micro it had always been my intention to put my accounts through it, for two main reasons. The first was that like most small

```
BEAM MOMENT CALCULATION FOR  Demonstration Purposes
BEAM LENGTH IS  2.00 metres
Beam size is    176 x 102        OR     7 x 4

LOADING CALCULATION FOR LOAD     1.00

 ROOF LOAD          2.00  x   3.50  x   95.00 KG        =    6.52  KN
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 FLOOR WEIGHT       2.00  x   2.00  x   30.00 KG        =    1.18  KN
 LIVE FLOOR LOAD    2.00  x   2.00  x  150.00 KG live   =    5.89  KN
 WALL LOAD          2.00  x   3.00  x  244.80 KG        =   14.41  KN
 WATER TANK         1.00  x   1.00  x  100.00 KG        =    0.98  KN
 WATER LIVE LOAD    1.00  x   1.00  x  184.00 KG live   =    1.81  KN
                    0.00  x   0.00  x    0.00 KN        =    0.00  KN

Total weight excluding beam is     39.41 KN
Total live load is 12941.04 N
Loading stresses are:-

Load     1.00
Dead load is          39.41  KN
Live load is          12941.04  N

Bending moment is        Weight x Length        = 19.70 KNm
                            4.00

Shear stress is           Weight                = 20.89  N/mm2
                     2.00 x Web Area

Deflection is        Weight x Length3           = 0.68  mm
                48.00 x Elastic modulus x Moment of Inertia

Total bending moment is   19.70  KNm
maximum allowed bending moment is          28.21 KNm
Total shear stress is     20.89 N/mm2
Allowable shear stress is  100 N/mm2
Total deflection is       0.68   mm
allowed deflection is              L(mm)/360 = 5.56 mm

The bearing width is 203.00mm
To produce a compressive stress of 0.28N/mm2
The length of the padstone/spreader shall be 346.64mm
(assuming central loading)
```

Figure I: Typical printout using Pocket Engineer

Item			Craftsmen rates		Labourer rates	
Wages at standard basic rate productive time		52.88 wks	93.21	4928.94	79.56	4207.13
lost time allowance		1.06 wks	93.21	98.80	79.56	84.33
Non-productive overtime		4.38 wks	93.21	408.25	79.56	348.47
Allowance for bonus	Plus	30.00%		1630.79		1391.97
Extra payments under National Working Rule 3		46.80 wks	1.34	62.61	0.49	22.74
Sick pay		1.00 wks		0.00		0.00
CITB levy		1.00 wks		71.00		18.00
Public holiday pay		1.60 wks	108.03	172.84	92.04	147.26
Employer's contribution to: annual holiday pay scheme		47.00 wks	11.25	528.75	11.25	528.75
pension and death benefit scheme		47.00 wks	0.90	42.30	0.90	42.30
National Insurance		47.80 wks	16.26	777.22	13.85	662.03
Severence pay and sundry costs	Plus	1.50%		130.82		111.79
Employers liability and third-party insurance	Plus	2.00%		177.04		151.29
Total cost per annum				9029.36		7716.06
Total cost per hour				4.37		3.74

For the ratio of
1 foreman 0.00 craftsmen, and 6.00 labourers
the all-in-rate is £4.05
For the ratio of
1 foreman 4.00 craftsmen, and 0.00 labourers
the all-in-rate is £4.90
For the ratio of
1 foreman 6.00 craftsmen, and 4.00 labourers
the all-in-rate is £7.04
For the ratio of
2.00 craftsmen, and 1.00 labourers
the all-in-rate is £6.24

Figure II: Sample from All-in-rate calculator

companies, keeping track of "aged debtors" is always a problem, but I could see that with the correct program bad payers could easily be recorded and statements sent out. The other reason is that one of my faults is I am not trained at book-keeping and double entry might just as well by hieroglyphics as far as I am concerned. I have to confess that my attempts at finding the right program for my accounts cost me a lot of money. I tried a small accounts package from one well known company and found it disappointing. I then tried another package and this was also ineffective.

I finally decided to lash out and buy the package from Meadow Computers and we immediately struck gold. Like Victor Kiam – no, I didn't buy the company – we were so impressed that we asked if we could market the program ourselves, and Meadow agreed. Steve now processes all our accounts using the Meadow program and we are looking after the books of another company using this system.

In the meantime Steve had been busy writing a price book program which would automatically update rates for my use when preparing estimates, and we are now integrating this with a package aimed at quantity surveyors and estimators.

So what is my evaluation of the BBC Micro as a computer suitable for small business? My answer, as you have probably guessed, is "excellent". We have, as previously indicated, now bought a Master, and it is already earning its keep. The standard packages View and Viewsheet are very well thought out in my opinion. So much so that I am now putting all my valuations on Viewsheet and I reckon that a valuation which normally would take me two hours can now be worked out and printed in under five minutes.

Will I be upgrading the Master with one of the second processors? Probably, but it is amazing what you can do with 128k. ■

Plus and minus are smooth operators

In part 5 of his series on spreadsheets NIGEL PETERS looks at how formulae are put together

BY now you should have formulae and their relatives springing up absolutely everywhere on your spreadsheets. But while we've used formulae and duplicated them we've never really said what can go into making them up.

This month we'll take a closer look at how the formulae are actually put together using operators. These operators are the signs like + and – which tell the spreadsheet what we want doing to the values in its cells.

The formulae used in our first spreadsheet, shown in Figure I, should cause no anxiety.

Columns A and B are filled with data while column C is used to label the formulae that lurk unseen in the cells in column D. Remember that you don't see the actual formula inside the cell, just its result.

However it's not hidden away beyond recall. If you make the cell the active cell by moving the cursor there the formula appears in the status area above the grid.

It's not hard to see that the values in D1 and D2 are the results of an addition and subtraction respectively. If you remember that the computer uses * for multiply and / for divide the origin of the numbers in D3 and D4 is no mystery, either.

So the formulae for simple sums are simple, and we've seen from previous examples how we can have more than two cells in a formula linked by pluses and minuses such as:

```
A1+B1-C1+D1
A3-B2+B1
B2-C3-D1
```

However when we get to using multiplication and division signs in formulae made up of three or more cells there can be a bit of a problem. To see what I mean, consider this: What is the result of 2+2*2? Is it 6 or 8? It all depends on which we do first, the adding or the multiplying.

If we do the adding first we have 2+2 giving 4 which the *2 then turns into 8. If we do the multiplication first the 2*2 results in 4 and this is added to the first 2 to give 6.

There has to be a rule to sort out this confusion and it is grandly named as the rule of operator precedence. Basically this says that the second way of doing things – the multiplication before the addition – is the right way of doing things.

In fact it's the way you normally do things without thinking. The rule also says that if you want a bit of the formula done out of order you surround it with brackets. So (2+2)*2 would give us 8 as the brackets mean "do the enclosed bit before all else". If you want to know more about operator precedence take a look at the panel opposite.

	A	B	C	D
1	1.00	2.00	A1+B1	3.00
2	3.00	4.00	B2–A2	1.00
3	5.00	6.00	A3*B3	30.00
4	4.00	8.00	B4/A4	2.00
5				
6				

Figure I: Facile formulae

As I said it's the way most of us do our sums anyway, and it's the way Mini Office tackles its formulae. So why have I mentioned it? The answer is that some spreadsheets DON'T do it that way.

They just take each pair of terms starting from the left and apply whatever operator is between them, then pair that with the next term and so on. This is the technique that has 2+2*2 giving 8.

It's based on the way a pocket calculator works – though who counts pockets? – and since a spreadsheet is a glorified calculator, I suppose there is some justification. Still it does produce confusion at times.

The moral of all this is if you've got a spreadsheet other than Mini Office and you find that some of my formulae give weird results check the manual for the operator precedence it uses. Don't worry, you can always apply a liberal dose of brackets to any formulae to force the spreadsheet to use the terms in the order you want. Figure II shows some simple examples.

The formula in A4, A1+B1*C1, takes the values from the specified cells and does the sum following the normal operator precedence. So the multiplication 4*6 is done first, then the 2 is added, giving the 26 that appears in A4.

The formula in A5 gives a very different result even though it uses the same figures and operators – the + and *. This is because the brackets change the order in

Operator precedence

This is a rather grand name for what is at this level usually common sense. Don't worry if you don't follow it first time. It's one of those things that you will understand when you need to.

It should be fairly clear that 1+2+3 and 3+2+1 will give the same results. The order of the figures and which plus is dealt with first doesn't matter when the signs – or operators, as they are called – are all pluses.

The same applies to expressions with all minuses or a mixture of plus and minus. The order of the operations isn't important. Try solving:

```
2-3+6
2+6-3
-1-2-3
-3-2-1
```

in your head, on paper or using your spreadsheet and you'll see this. The same applies when the expression's operators are all multipliers or dividers or a mixture of both. Try:

```
2*3*4,3*2*4
64/2/4,64/4/2
6*2/3,6/3*2
```

and you'll find that the operations can occur in any order. They give the same result.

However when the plus/minus and multiply/divide operators are mixed up in one expression we've got problems. What if we are asked what is six plus eight multiplied by two?

Is it 14 – six plus eight – multiplied by 2, giving 28 as the result, or 6 plus 16 – two times eight – giving 22? We get two different results depending on which operator is obeyed first. To sort this confusion out we have to have a rule, and the rule is:

Starting from the left do anything in brackets first, then do all the divisions and multiplications and finally do the additions and subtractions.

To put it another way:

```
() comes before * and /
which come before + and -
```

This is the rule the spreadsheet applies when it comes to evaluate formulae that contain a lot of operators such as +, – and so on. In fact it's the way we normally do our calculations without thinking about it.

The trouble is that when we do start thinking about it, the reasons for doing it this way seem a bit obscure. Take comfort in the fact that if you do your sums following the rule you'll get the correct answers. So applying this rule to six plus eight multiplied by two we have 6+8*2 giving 6+16, which gives the answer 22. Get your spreadsheet to confirm this. If we'd wanted six to be added to eight and the result of that to be multiplied by two we should use brackets as in:

```
(6+8)*2
```

The part in brackets is done first, then the multiplication. Try using the rules to solve the expressions:

```
4*8+8/2+2
4*(8+8/2)+2
4*(8+8)/(2+2)
3*-7+21*2/7
1+2*2+3/3-3
```

and have your spreadsheet check your results.

which the expression is evaluated.

Now the addition is done first, producing 6, and the multiplication is done next, giving 36. It's the same with the formulae in A6 and A7. The brackets affect the way the formula is tackled by the spreadsheet and hence the result.

Let's move on from operator precedence and take a look at another aspect of our formulae. After all so far we've stuck to +, –, * and / with the odd bit of bracketing here and there. There are three more operators we can use in Mini Office II. Figure III shows them in action.

Looking at row 2 it's easy to see that cell E2 holds

	A	B	C	D
1	2.00	4.00	6.00	
2	60.00	10.00	5.00	
3				
4	26.00		A1+B1*C1	
5	36.00		(A1+B1)*C1	
6	11.00		A2/B2+C2	
7	4.00		A2/(B2+C2)	
8				

Figure II: Operators, brackets and precedence

```
.....A.....B.....C.....D.....E.....F.....G.....H
1   UNIT   COST  ITEM A   20.00          PRICE  ITEM A   19.00
2   UNIT   COST  ITEM B   10.00          PRICE  ITEM B   11.00
3   UNIT   COST  ITEM C   15.00          PRICE  ITEM C   17.00
4
5   UNIT PROFIT  ITEM A   -1.00 (H1-D1)
6   UNIT PROFIT  ITEM B    1.00 (H2-D2)
7   UNIT PROFIT  ITEM C    2.00 (H3-D3)
8
9         SALES  ITEM A  100.00
10        SALES  ITEM B  200.00
11        SALES  ITEM C  150.00          TOTAL  PROFIT  400.00
12
13  GROSS PROFIT  ITEM A -100.00          MOST   PROFIT  300.00
14  GROSS PROFIT  ITEM B  200.00
15  GROSS PROFIT  ITEM C  300.00          LEAST  PROFIT -100.00
```

Figure V: Profit calculations using the new operators

From Page 95

the sum of the three cells to the left. Now I could have got this result by putting the formula B2+C2+D2 into cell E2. However what I used was B2 # D2 which does exactly the same thing.

The hash sign, # , tells the spreadsheet that it is to add all the values found in the cells between the cell numbers specified to its right and left, inclusive. In this case the range is from B2 to D2, so the values in B2, C2 and D2 are summed and put in E2.

It's a very useful operation to have in a spreadsheet. Time and time again rows of numbers are summed and being able to use # between the extreme cells of the range saves a lot of typing. You can avoid lines like A1+B1+C1+ . . . +N1+O1 with A1#O1.

It's not just stuck to rows – you can use it to add columns of figures, as you'll see if you look at column B of Figure III. Here I could have used B2+B3+B4 but instead I made a hash of it with B2#B4. In this case it didn't save me much typing but in practice it's invaluable.

Still with Figure III, take a look at cell E3 and see if you can work out how it relates to the other ones on that row. It is in fact the largest value in that row and was found with the formula >[B3D3].

The > tells the spreadsheet that you want the largest value while the cells inside the brackets give the range, in this case from B3 to D3 inclusive. Incidentally if your micro is in Mode 7, which it is at power-up, then the square brackets [and] appear as arrows. Don't be worried, it still works.

Not only does it work with rows, it also applies to columns. The >[] operator is in use in column C of the spreadsheet. I think you'll agree that 9 is the largest value in 7, 2 and 9.

It seems logical that if we can find the largest figure in a row or column of cells we should also be able to find the smallest. This is done with the <[] operator. In row 4 the formula <[B4D4] is used to pick out the lowest of the values and place it in E4.

Similarly D5 contains <[D2D4] which plucks the minimum value from the D column. Figure IV shows all the formulae used. While the actual symbols used may vary from spreadsheet to spreadsheet you'll find these operations on most of them.

While operator precedence may seem a bit academic – until you run into problems of your own – I hope you can see how the three new operations we've learnt come in useful. After all most financial calculations involve adding rows of columns and figures, and who isn't looking for the lowest cost and largest profit?

Figure V is a simple but practical use of a spreadsheet to show how the profits from three product lines vary with unit costs and sales. Can you figure out how the profit figures are arrived at? It should come as no surprise to learn that the formulae involve our three new operators.

● *That's where we'll leave it for now. More next time as we move from formulae to manipulating the spreadsheet itself.*

```
.....A.....B.....C.....D.....E
1
2          1.00   7.00   6.00  14.00
3          8.00   2.00   4.00   8.00
4          3.00   9.00   5.00   3.00
5         12.00   9.00   4.00
6
```

Figure III: Three new operations

```
.....A.....B.....C.....D.....E
1
2          1.00   7.00   6.00  B2#D2
3          8.00   2.00   4.00 >[B3D3]
4          3.00   9.00   5.00 <[B4D4]
5        B2#B4 >[C2C4] <[D2D4]
6
```

Figure IV: Three new operators in use

What it offers the BBC Micro user . . .

Electronic mail is much cheaper than the post

Sending mailbox messages to other subscribers, whose numbers are rapidly growing, is the cheapest form of communication possible. You can send a message of any length to another mailbox for less than the cost of a first-class stamp. And it doesn't cost a penny more to send the same message to 500 different mailboxes! Even a message sent to a mailbox on the other side of the world only costs 30p.

The biggest bulletin board of them all

The number of bulletin boards is growing rapidly. The only snag is that the vast majority are single-user boards – which means lots of other people are also trying to make contact and all too often all you get is the engaged tone. But with the MicroLink bulletin board there is no limit to the number of people using it at the same time. And no limit to the number of categories that can be displayed on the board.

Give your micro mainframe power

With MicroLink your micro becomes a terminal linked directly to the Telecom Gold mainframe computer, and able to tap its tremendous power and versatility. Right away you'll be able to use giant number-crunching programs that can only run on a mainframe.

The mailbox that is always open

MicroLink is in operation 24 hours a day, every day. That means you can access your mailbox whenever you want, and from wherever you are . . . home, office, airport – even a hotel bedroom or golf club! No-one needs to know where you are when you send your message.

We're only a local phone call away

The majority of MicroLink subscribers can connect to our mainframe computer in London by making a local phone call. This is possible because they use British Telecom's PSS system, which has access points all over Britain. A local phone call is all you need, too, for direct access via MicroLink to all the other countries belonging to the international Dialcom system.

Telemessages – at a third off

The modern equivalent of the telegram is the telemessage. Send it before 10pm and delivery is guaranteed by first post the following day (except Sunday). The service was intended for people phoning their message to the operator, which costs £3.50 for 50 words. But you can now use it via MicroLink, for only £1.25 for up to 350 words! For an extra 65p your message can be delivered in an attractive greetings card.

Go teleshopping on your micro

With MicroLink you can study the British Rail timetable – and then buy your ticket in advance. You can book theatre tickets. And even order a bouquet of flowers. It's all part of the tele-shopping revolution!

Send and receive telex messages

With MicroLink you can turn your micro into a telex machine, and can send and receive telex messages of any length. You will be able to communicate directly to 96,000 telex subscribers in the UK, 1½ million worldwide – and even with ships at sea via the telex satellite network. Business people can now send and receive telexes after office hours, from home or when travelling.

What does it all cost?

Considering all the services you have on tap, MicroLink is remarkably inexpensive. You pay a once-only registration fee of £5, and then a standing charge of just £3 a month. On-line costs are 3.5p a minute (between 7pm and 8am) or 11p a minute during office hours. There is an additional 2.5p a minute PSS charge if you are calling from outside the 01- London call area. Charges for telex, telemessages and storage of files are given on the next page.

How much it costs to use MicroLink

Initial registration fee: £5.

Standing charge: £3 per calendar month or part.

Connect charge: 3.5p per minute or part – cheap rate; 11p per minute or part – standard rate.
Applicable for duration of connection to the Service. Minimum charge: 1 minute.
Cheap rate is from 7pm to 8am, Monday to Friday, all day Saturday and Sunday and public holidays; Standard rate is from 8am to 7pm, Monday to Friday, excluding public holidays.

Filing charge: 20p per unit of 2,048 characters per month.
Applicable for storage of information, such as telex, short codes and mail files. The number of units used is an average calculated by reference to a daily sample.

Telex registration: £10.

Outgoing telex: 5.5p per 100 characters (UK); 11p per 100 (Europe); 18p per 100 (N. America); £1.25 per 400 (Rest of world); £2.75 per 400 (Ships at sea).
Deferred messages sent on the night service are subject to a 10 per cent discount.

Incoming telex: No charge.

It is not possible to deliver a telex without a mailbox reference. If a telex is received without a mailbox reference the sender will be advised of non-delivery and asked to provide a mailbox address.
Each user validated for telex and using the facility will incur a charge of 6 storage units a month. Further storage charges could be incurred depending on the amount of telex storage and the use made of short code and message file facilities.

MicroLink PSS service: 2.5p per minute or part (300 baud); 3p per minute or part (1200/75 baud).
Only applies to users outside the 01-London call area.

Telemessages: £1.45 for up to 350 words.
Telemessages can be sent with an illustrated greetings card for 75p extra.

Radiopaging: No charge.
If you have a BT Radiopager you can be paged automatically whenever a message is waiting in your mailbox.

International Mail: For the first 2,048 characters – 20p to Germany and Denmark; 30p to USA, Australia, Canada, Singapore, Hong Kong and Israel. For additional 1,024 characters – 10p; 15p.

These charges relate to the transmission of information by the Dialcom service to other Dialcom services outside the UK and the Isle of Man. Multiple copies to addresses on the same system host incur only one transmission charge.

Billing and Payment: All charges quoted are exclusive of VAT. Currently all bills are rendered monthly.

Software over the telephone

MicroLink is setting up a central store of software programs which you'll be able to download directly into your micro. The range will include games, utilities, educational and business programs, and will cover all the most popular makes of micros.

Talk to the world – by satellite

MicroLink is part of the international Dialcom network. In the USA, Australia and a growing number of other countries there are many thousands of users with electronic mailboxes just like yours. You can contact them just as easily as you do users in Britain – the only difference is that the messages from your keyboard go speeding around the world via satellite.

What you need to access MicroLink

You must have three things in order to use MicroLink: a computer (it can be any make of micro, hand-held device or even an electronic typewriter provided it has communications facilities), a modem (it can be a simple Prestel type using 1200/75 baud, or a more sophisticated one operating at 300/300 or 1200/1200 baud), and appropriate communications software.

MicroLink

in association with

TELECOM GOLD *

Application Form

I/We hereby apply to join MicroLink

(✓) ☐ I enclose my cheque for £5 payable to Database Publications as registration fee to MicroLink.

(✓) ☐ I also wish to use Telex. I authorise you to charge an additional £10 to my initial bill for validation.

☐ I confirm that I am over 18 years of age.

☑ I confirm that I accept the terms and conditions for the time being in force, a copy of which are available on request.

I intend to use the following computer _____

Signature _____

Date _____

FOR OFFICE USE ONLY:

Mailbox assigned _____

Start date _____

Password _____

MU9

SEND TO:
MicroLink
Database Publications
Europa House
68 Chester Road
Hazel Grove
Stockport SK7 5NY.

* *Telecom Gold is a trademark of British Telecommunications plc.*

Name ☐☐☐

Turn yourself on (and off) with VDU 19

EVERY time I visit a night club or a disco I always seem to spend more time studying the light show than dancing. This might be due to the fact that I have never quite mastered the art of moving my extremeties in the direction I intend.

Anyhow I have long wanted to produce a simulation of a light show, and Listing I is the result.

I approached the project in much the way I assume an animator would a cartoon.

Using the art of the cartoon animator, ROBIN NIXON shows how to make your title pages flash.

As you know, an animated cartoon is made up of a sequence of frames that are shown one after another giving the appearance of movement.

To achieve this effect on a micro would require extremely high speed drawing procedures – much faster than the BBC Micro is capable of – or access to a laser disc. But then it occurred to me, why not use VDU19?

The most common use for VDU19 is to select the actual colour you wish to be displayed for each logical colour in modes that do not allow for 16 colours.

You will find a clear explanation on Page 382 of the User Guide.

VDU19 is, however, also a very powerful command for certain types of high speed animation. Using VDU19 it is possible to draw a set of frames – each in a different colour – and then "turn them on and off" at the right time.

The trick is to ensure that none of the frames overlap. The following examples use Mode 2, as this offers the widest range of colours.

I chose hexagons for the main theme as they tesselate well and can be used as building blocks for other shapes.

Line 100 of Listing I draws a board of hexagons similar to an adventure game type board. The colour of each hexagon is determined by the data in lines 150 to 230.

Line 110 then turns sets of hexagons on and off, mostly in turn but with a random element thrown in to simulate musical off-beats. Ideally this program should be connected to the ADVAL (Analog to Digital VALue) port so that it could be activated by a sound input.

Disc drive owners could type in line 105:

```
105 *SAVE HEXAGON 3000 8000
```

Then use Listing II to save having to wait for the "board" to be drawn in future.

One example of graphics that has always fascinated me is objects rotating on the screen. Listing III is a program that produces a Catherine wheel effect.

PROCCIRCLE draws a circle which looks much like a pie chart with each of the segments drawn in consecutive colours 1 to 15 and then back to 1 again, and so on. Colour 0 is not used as it is kept for the background.

Lines 130 to 150 turn each colour on

```
 50 REM (c) The Micro User
 100 MODE2:VDU23;8202;0;0;0;:FORY%=9
59TO0STEP-192:FORX%=63TO1215STEP120:R
EADC%:PROCCIRCLE(X%,Y%,64,C%,85):NEXT
X%,Y%:FORY%=863TO128STEP-192:FORX%=12
7TO1183STEP120:READC%:PROCCIRCLE(X%,Y
%,64,C%,85):NEXTX%,Y%
 110 FORX%=1TO15:VDU19,X%,RND(7);0;0
:FORZ=1TO100:NEXT:VDU19,X%,0;0;0,19,R
ND(15),RND(8)-1;0;0:NEXT:GOTO110
 120 DEFPROCCIRCLE(XO%,YO%,R%,C%,F%)
 130 GCOL0,C%:PLOT4,XO%+SIN(0)*R%,YO
%+COS(0)*R%:FORZ=0TOPI*2 STEPPI/3:IFF
%=85 PLOT4,XO%,YO%
 140 PLOTF%,XO%+SIN(Z)*R%,YO%+COS(Z)
*R%:NEXT:ENDPROC
 150 DATA 7,11,11,10,1,1,10,11,11,7
 160 DATA 8,13,13,9,3,3,9,13,13,8
 170 DATA 1,2,3,15,4,4,15,3,2,1
 180 DATA 8,13,13,9,3,3,9,13,13,8
 190 DATA 7,11,11,10,1,1,10,11,11,7
 200 DATA 12,6,5,14,2,14,5,6,12
 210 DATA 1,2,3,15,4,15,3,2,1
 220 DATA 1,2,3,15,4,15,3,2,1
 230 DATA 12,6,5,14,2,14,5,6,12
```

Listing I

```
 50 REM (c) The Micro User
 100 MODE2:VDU23;8202;0;0;0;:FORX%=1
TO15:VDU19,X%,0;0;0:NEXT:*LO. HEXAGON
 110 FORX%=1TO15:VDU19,X%,RND(7);0;0
:FORZ=1TO100:NEXT:VDU19,X%,0;0;0,19,R
ND(15),RND(8)-1;0;0:NEXT:GOTO110
```

Listing II

21st. Software (ELECTRON VERSIONS AVAILABLE)

PRESENTS A SELECTION OF HARDWARE, UTILITIES & SOFTWARE FOR THE BBC MICRO

TYNESOFT'S COMMONWEALTH GAMES
Cass. £7.95 Disc £11.95 OUR PRICE £6.75 OUR PRICE £10.65
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	R.R.P.	OUR PRICE
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3 CASSETTES
MOON MISSION
BMX ON THE MOON
SPITFIRE COMMAND
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WHO DARES WINS II (disc)	£9.95	£8.95
QUIZ QUEST (disc)	£9.95	£8.95

VINE MICROS ROM SOFTWARE
ADDCOM
R.R.P. £28.00 OUR PRICE £26.00
REPLAY
R.R.P. £35.00 OUR PRICE £31.50
Please state Op. system

NEW **ELITES**
BOMB JACK
Cass. £9.95 OUR £8.95
Disc £14.95 OUR £13.65
AIRWOLF
Cass. £9.95 OUR £8.95
Disc £14.95 OUR £13.65

	R.R.P.	OUR PRICE
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Zalaga	7.95	6.95
Frak	8.95	7.95
ACORNSOFT		
Viewspell Rom	39.95	35.55
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Revs (disc)	17.95	15.85
Revs 4 tracks (cass)	9.95	8.95
Revs 4 tracks (disc)	12.95	11.65
Majic Mushrooms (cas.)	12.95	11.65
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Firebug (disc)	11.50	10.45
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Snooker (disc)	11.50	10.50
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Pole Position	9.95	8.95
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Romit (ROM)	34.00	31.50
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Birdie Barrage	7.95	6.95
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	R.R.P.	OUR PRICE
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Serpents Lair	4.95	3.95
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S.A.S. Commando	4.95	3.95
DR. SOFT (* Disc 40T add £2)		
747 Flight Sim.*	7.95	6.95
Phanton Combat*	9.95	8.95
D.A.C.C.		
Flight Sim 747 (DACC)	9.95	8.95
Bobby Charlton Soccer	11.95	10.95
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Red Arrows	8.95	7.95
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Mineshaft	6.95	5.95
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Combat Lynx	8.95	7.95
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Gisburne's Castle	7.95	6.95
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ELITE		
Commando (cas.)	9.95	8.95
Commando (disc)	14.95	13.65
EPIC SOFTWARE (Disc versions add £2)		
The Wheel of Fortune cas.	9.95	8.45
Castle Frankenstein cas.	7.95	6.55
The Quest of the Holy Grail cas.	7.95	6.55
Kingdom of Klein cas.	7.95	6.55
GOLEM LTD (For disc version add £2)		
Education I	8.00	7.00
Education II	8.00	7.00
Fun with Words	8.00	7.00
Fun with Numbers	8.00	7.00
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Heathrow A.T.C.	7.95	6.95
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and off in turn.

You may have noticed the delay loop in line 140:

```
140 FOR Z=1 TO 40 : NEXT
```

This is included as VDU19 works faster than the micro can scan the screen memory and display it, and without the delay there are some very peculiar effects.

The program takes a fair while to draw the Catherine wheel. If you have a disc drive you could, as in the above example, add line 125 to Listing III and run Listing IV in future to save time:

```
125 *SAVE KATHWHL 3000 8000
```

There are many impressive effects that can be achieved quite simply using VDU19, such as drawing a set of spirals each inside the other and in a different colour, then turning them on and off in turn. Or several inter-connecting cogs to simulate the insides of a clock – always ensuring that none of the frames overlap.

I must mention that the techniques described in this article could not easily be used for games programming. But they are ideal for title pages or stand-alone graphics.

```
  50 REM (c) The Micro User
 100 D%=0:G%=0
 110 MODE2:VDU23;8202;0;0;0;
 120 FORS%=500TO20STEP-20:PROCCIRCLE
(644,511,S%,5,85):NEXT
 130 FORX%=1TO15
 140 VDU19,X%,RND(7);0;0:FORZ=1TO40:
NEXT
 150 VDU19,X%,0;0;0:NEXT:GOTO130
 160 DEFPROCCIRCLE(XO%,YO%,R%,C%,F%)
:G%=G%+1:IFG%=3 G%=1
 170 GCOL0,D%:PLOT4,XO%+SIN(0)*R%,YO
%+COS(0)*R%:FORZ=0TOPI*2 STEPPI/120:I
FF%=85 PLOT4,XO%,YO%
 180 PLOTF%,XO%+SIN(Z)*R%,YO%+COS(Z)
*R%
 190 D%=D%+1:IFD%=16 D%=1
 200 IFG%=1 GCOL0,D% ELSE GCOL0,16-D
%
 210 NEXT:ENDPROC
```

Listing III

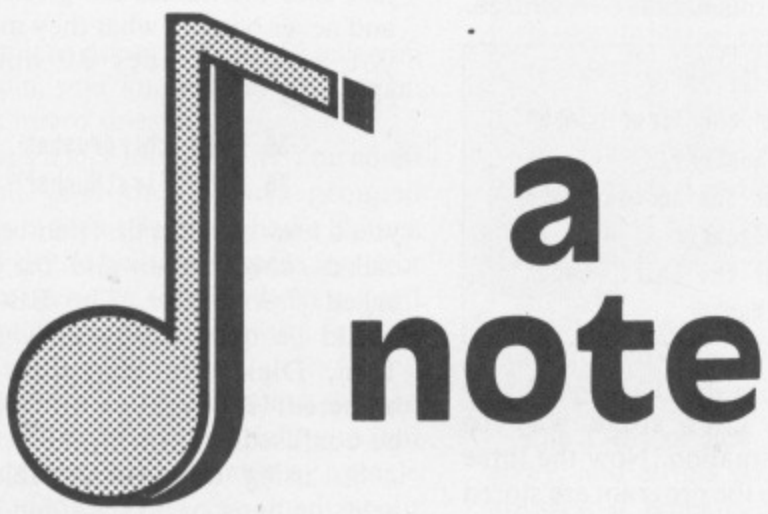
```
  50 REM (c) The Micro User
 100 MODE2:VDU23;8202;0;0;0;:FORX%=1
TO15:VDU19,X%,0;0;0:NEXT:*LO. KATHWHL
 110 FORX%=1TO15:VDU19,X%,RND(7);0;0
:FORZ=1TO40:NEXT:VDU19,X%,0;0;0:NEXT:
GOTO110
```

Listing IV

In finishing I will leave you with another example of what VDU19 can do.

If you have a copy of Air Strike (*Micro User*, May 1983), try replacing lines 62 and 95 with the following and see what happens when you crash:

```
  62 VDU19,0,8,0,0,0,19,3,0,0,0,0:GC
OL0,1:FORN%=1TO50:MOVEA%+32,B%-16:DRA
WRND(1280),RND(1024):VDU19,0,RND(7);0
;0,19,1,RND(7);0;0:NEXT
  95 SOUND0,2,4,50:FORN%=1TO50:MOVEC
%+16,B%-16:DRAWRND(1280),RND(1024):VD
U19,0,RND(7);0;0,19,3,RND(7);0;0:NEXT
:GOTO63
```

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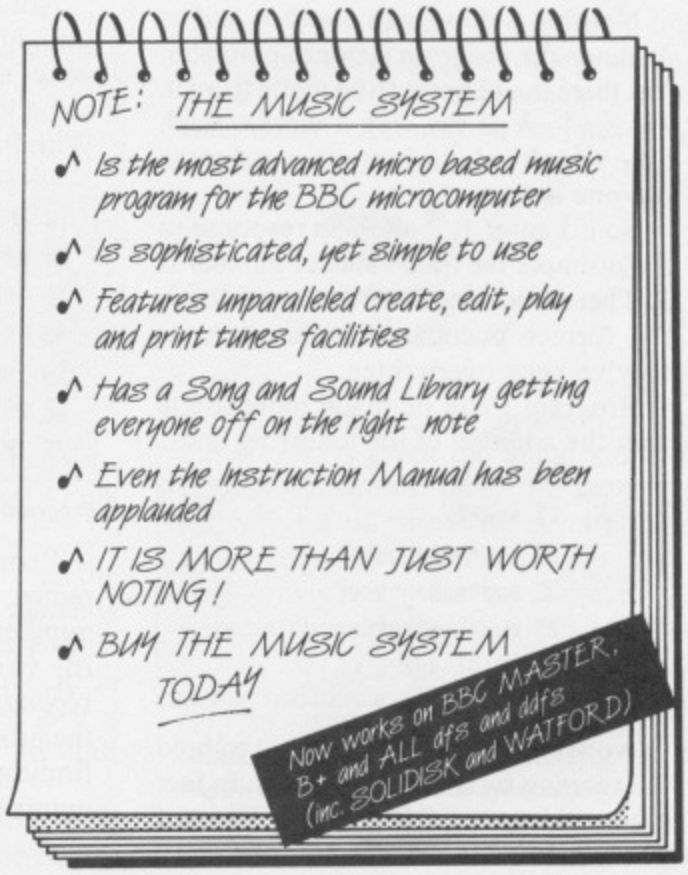

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Farewell loops, hello arrays

By PETE BIBBY

WE have now finished our exploration of the joys of FOR . . . NEXT loops. As you'll recall they're excellent for making the micro repeat short bits of code over and over again.

This month we'll be looking at new ways of handling variables, in the form of arrays. While at first they might seem to have no relevance to our FOR . . . NEXT loops, by the end of the article you might just feel differently.

```
10 REM Program I
20 PRINT "Enter the first number"
30 INPUT number
40 PRINT "Enter the second number"
50 INPUT number
60 PRINT "Enter the third number"
70 INPUT number
```

Program I

I hope you have no difficulty in seeing just how stupid Program I is. All it does is to get the long-suffering user to enter three numbers into the micro via the keyboard, each time storing its value in the numeric variable *number*.

Nothing is done with *number*, and as it stands the program is pretty pointless. Yet there is one point to be made from it. Take a look at the way it works. Each time a fresh value is put into *number* the old one is lost.

So if I enter 1, 2 and 3 in response to the prompts the final value of *number* is 3. There's no record of the 1 and the 2, the former occupants of *number*, as they've been overwritten.

Program I can be made more useful with the addition of the following lines:

```
15 sum=0
35 sum=sum+number
55 sum=sum+number
75 sum=sum+number
80 PRINT sum
```

Now the variable *sum* is used to hold the running total of the numbers. In fact you could use a FOR . . . NEXT loop if you wanted. Go on, try it – you learn programming by programming, not just reading about it.

This is an improvement, but there's still a problem. While we can recall the last figure we entered with the direct command:

```
PRINT number
```

we still have no record of the first two. In this case it might not be so important, but imagine if you were entering cheque values.

Not only would you want the total sum, how much is paid out from or into your account, you might also want some idea of the value of each cheque. With Program I this data is overwritten.

```
10 REM Program II
20 PRINT "Enter the first number"
30 INPUT firstNumber
40 PRINT "Enter the second number"
50 INPUT secondNumber
60 PRINT "Enter the third number"
70 INPUT thirdNumber
```

Program II

Program II goes some way to remedying the situation. Now the three numbers input to the program are stored in the variables *firstNumber*, *secondNumber* and *thirdNumber*. Once the program is run there's no problem in finding out which was the second number entered. You just use:

```
PRINT secondNumber
```

We could even find our sum total with a line such as:

```
80 sum=firstNumber + secondNumber +
thirdNumber
```

So using several variable names helps us keep hold of the values entered into the program, which might come in useful later. Also using meaningful variable names allows us to give an order to the data. After all it's obvious that *firstNumber* was the first number entered, *secondNumber* the second and you can guess where *thirdNumber* came.

But, and it's a big but, while the order may be obvious to us from the variable names, it's not obvious to the micro. It just uses the names it's given as labels and never bothers what they mean. So if you swapped lines 30 and 70 by entering:

```
30 INPUT thirdNumber
70 INPUT firstNumber
```

you'd now have the first number entered called *thirdNumber* and the last one called *firstNumber*. The BBC Micro would be quite happy, they could be Tom, Dick and Harry for all it's bothered. However you would probably be confused.

So using different variable names helps us hang on to data, but while we can pick them so they inform us of the data order, it means nothing to the micro. And, as you'll find as you delve deeper into computing, the order of data can be vital. It's nice to have your pay cheque in your bank account before the bills are taken out of it.

Program III does nothing to solve the situation, but does point in the right direction. In effect it's exactly the same as the previous program except now *number1*, *number2* and *number3* are used to hold the data.

Once the program is run you can

```
10 REM Program III
20 PRINT "Enter the first number"
30 INPUT number1
40 PRINT "Enter the second number"
50 INPUT number2
60 PRINT "Enter the third number"
70 INPUT number3
```

Program III

recall the values used with lines like:

```
PRINT number1
PRINT number3
PRINT number1+number3
```

Notice how similar these variable names are. They all have the same root, *number*, only the number at the end of *number* changes if you see what I mean.

Wouldn't it be nice if you could use a variable name such as *numberx* and, by giving *x* various values, be able to pick out whichever of *number1, number 2* and so on as you wanted? Alas it won't work, as you'll soon find if you try:

```
x=1
PRINT numberx
```

The micro doesn't like it and tells you so. Again, you know what you mean, but the micro doesn't.

Still it's a nice idea, isn't it? You could have all your data values grouped together under one stem name with a number at the end of the stem to select between them. In fact it's such a good idea that Basic allows it in the form of arrays.

By using a DIM command we can DIMension an array of variables so that we can refer to each variable by a single number. Don't worry too much about that last sentence – all it means is that we can put a lot of variables into an ordered list and then pick out whichever one we want by number.

Program IV shows how an array is used. Line 20 introduces a new keyword, DIM. This tells the BBC Micro that it is to set aside memory space for an array, which is a list of variables all having the same root but identified by a different number.

The secret is that the number at the end – the subscript – is held in brackets.

How much space and what the array is to be called comes after the DIM. In this case the array is to be called *number()*. The 3 inside the brackets tells the micro that there are going to be three variables in the array, *number(1), number(2),* and *number(3)*. Initially these elements of the array, as they are known, are given the value 0.

Figure Ia shows the three elements of the array *number()*. Notice that the root or stem of the array is the same for each element. Only the subscript – the number in the brackets – changes for each element.

So *number(1)* and *number (3)* are elements of the same array, *number(),*

number(1)	number(2)	number(3)
0	0	0

a) Initial values.

number(1)	number(2)	number(3)
7	26	4

b) New array contents;

Figure I: Elements of the array number( )

```
10 REM Program IV
20 DIM number(3)
30 PRINT "Enter the first number"
40 INPUT number(1)
50 PRINT "Enter the second number"
60 INPUT number(2)
70 PRINT "Enter the third number"
80 INPUT number(3)
```

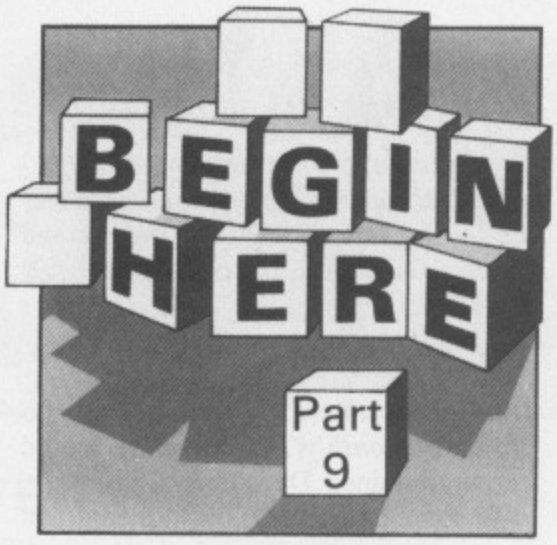
Program IV

but can hold different values. Let's look at Program IV in more detail.

The DIM of line 20 establishes the array, and at this point all its elements are set to 0. Lines 30 and 40 take a value from the keyboard and store it in *number(1)*. The next two lines give a value to *number(2),* while the final lines do the same for *number(3)*.

So if I'd entered 7, 26 and 4 in response to the prompts, the array contents would look like Figure Ib. The previous values of zero would be overwritten.

Once you've dimensioned an array you can use its elements just as you would ordinary numeric variables. You can add them or subtract them or change their value or whatever, as you'll



see if you try lines like:

```
number(3)=number(3)+1
number(2)=number(2)-6
number(1)=-76
```

However you can do much more with array elements than just use them as ordinary variables. After all, we've been pursuing the theme of an ordered list of variables all through the article. Why abandon it now?

But first a confession. When I told you that DIM number(3) created an array of three elements I was misleading. Actually it creates four elements. These are:

```
number(0)
number(1)
number(2)
number(3)
```

Since micros start counting at 0 there's an element *number(0)* which, like the others, is given the initial value 0. Figure II shows how the array is actually set up after values have been given to the other elements.

However I prefer to ignore the element with the zero subscript as it confuses me. For example, suppose you wanted an array to hold your monthly salary for a year. You could do it using a:

number(0)	number(1)	number(2)	number(3)
0	7	26	4

Figure II: All the elements of number( )

```
DIM monthly(11)
```

with *monthly(0)* holding the January

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pay figure, and so on until *monthly(11)* holds the December figure. However to me the subscript seems one out. To me January is month 1, not month 0. I'd settle for:

```
DIM monthly(12)
```

and use *monthly(1)* for January and so on until *monthly(12),* which I would know contained December's figures.

In some quarters this is looked down on as it wastes the first element, *monthly(0)*. In fact I don't always waste it. I tend to use it for other things, such as holding a running total of salary to date or other details about the array such as how many elements actually have values other than 0.

It's up to you, but until you get used to arrays I'd advise pretending that the element with the zero subscript didn't exist.

Program V uses another array, *another()*. This time the DIM of line 20 produces an array of five elements. The rest of the program just goes through the elements of the array giving them values.

Despite my advice I've actually used the element with a subscript of zero. Figure III shows the array elements and their contents.

Notice the way that element *another(4)* is given its value of 7. At line 80 the program uses a variable inside the brackets rather than just a number as before.

Does that remind you of anything? Perhaps FOR . . . NEXT loops, which have a control variable that seems made to go into array subscripts?

● *More on that next time as we look into DIMs, arrays and loops in more detail.*

element	0	1	2	3	4
contents	6	5	3	12	7

Figure III: The array another( )

```
10 REM Program V
20 DIM another(4)
30 subscript=4
40 another(0)=6
50 another(1)=5
60 another(2)=3
70 another(3)=12
80 another(subscript)=7
```

Program V

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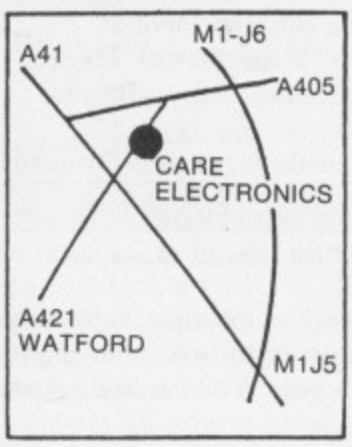

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HAPPY EVENTS

By MIKE STALLYBRASS

THE BBC Micro has the reputation of being a versatile beast, and indeed it is. One of the many features built into the operating system is the generation of events, which allow a user-written routine to be executed whenever an event occurs.

Ten different events are recognised by the operating system numbered 0 to 9 – see Table I – covering such things as the interval timer crossing zero and an Escape occurring.

Unfortunately making use of these events has not necessarily been easy because you have always had to write the event routine in machine code – which I find much more tiresome than writing in Basic.

Some other computer Basics, such as the Microsoft Basic supplied with an IBM PC, do allow certain events to be trapped using commands such as:

```
ON KEY(10) GOSUB 2000
```

It would have been nice if the designers of the BBC Micro had given us something similar. They didn't, but all is not lost for the program described here plugs the gap. Admittedly it does involve you in some assembly language programming, but it has already been written and debugged for you.

All you have to do is run the program listed here, save the resulting machine code routines and use them at a later date with any other Basic program you write, adding just a few simple Basic statements to control them.

For the first time it is possible to write Basic programs that can multi-task with some procedures that are called because of outside happenings, not simply because of the program logic itself.

Tne principle behind the Basic eventing routines is simple, but the implementation is a bit more complex.

Firstly a spot of terminology. A Basic program must exist within the machine and would normally be running. I will call this the background program.

A Basic procedure must be defined somewhere within the background program that is to be called whenever a specified event occurs. This procedure can be one that is also used in the normal course of the program. The process of specifying the event to be detected and the procedure to be performed I will term activation.

Once the specified event actually occurs the relevant procedure must be performed and the process of calling the procedure I will call initiation. Whatever is actually running, whether it is the background program or one of the event-initiated procedures, I will call the current program.

Now for the implementation. Whenever a relevant event occurs a flag is set to indicate that one of the event-initiated procedures needs to be executed. The required procedure cannot be called immediately.

If, for example, we interrupted the background program while it was in the middle of redefining a string variable the interrupting procedure might access the old value, the new value, or worse neither.

For machine code buffs the contents of the X and Y registers are also saved as the event is trapped for possible later use by the procedure.

Instead we first need to ensure that all the variables and so on in the background program are in a fit state to be accessed. Fortunately it is possible to do this by a little bit of subterfuge.

During the execution of every statement a check is made by the Basic interpreter that the end of the statement has been found and at the same time the Escape flag is checked.

Although this check is normally done before the statement has been completely executed (except in the case of DIM, INPUT, LOCAL, NEXT, PRINT, READ, and VDU statements when the check is done right at the end) it is always done at a time when all variables are validly defined.

It is the fact that the Escape flag is normally only checked at this point that enables us to break into the execution of the background program in a controlled way.

If the Escape flag is set when it is checked it normally causes a Basic error (number 17) to be generated. By setting the Escape flag the Basic interpreter is forced to interrupt the normal execution of the background program and we can then intercept it on its way to deal with the error.

At this point the required event-initiated procedure can be performed

Event	Caused by	X reg	Y reg
0	Output buffer empty	Buffer number	–
1	Input buffer full	Buffer number	Char. not inserted
2	Char. entering input buffer	–	Character
3	ADC conversion complete	–	Channel number
4	Start of vertical sync	–	–
5	Interval timer crossing zero	–	–
6	Escape detected	–	–
7	RS423 error	6850 status	Received char.
8	Network error	–	–
9	User event	Set by user	Set by user
10	Trace – End of statement reached	n/a	n/a

Table I: Event definitions

From Page 105

quite safely and control can then be returned to the original program as if no Escape error had ever occurred.

The problem is that using the Escape flag only to indicate that the background program should be interrupted, rather than that an Escape has actually occurred, can lead to confusion within the operating system.

Avoiding this confusion causes some of the complexity in the routines described in this article. However it should be noted with the routines that confusion can still arise if you are accessing files on tape, disc or Econet within your Basic program.

Having established that the Escape flag can be used to force a controlled interruption of the background program whenever an event occurs, it is obvious that it can also be used to force an interrupt during the execution of every statement simply by keeping the Escape flag permanently set.

Within the listed routines this is done by recognising another event – number 10 – in addition to those that can be generated by the operating system – numbers 1 to 9. When this pseudo-event is active it ensures that the Escape flag is always set when an end-of-statement check is made by the background program.

This then allows a rather extended TRACE facility to be implemented, whereby a whole procedure can be executed every time a statement of the background program is executed. This could, for example, allow you to display the values of selected variables throughout the execution of the program or to step through the program a single statement at a time.

Because all events occur independently it is possible for several different event-initiated procedures to be running at the same time. To help cope with this a way of assigning priorities has been provided. As each event is activated it is given a priority level between 0 – the lowest – and 15 – the highest.

The effective priority of the background program is –1. As a procedure is initiated a comparison is made with the priority of the current program. If the priority of the initiated procedure is higher the current program is suspended temporarily to allow the higher priority procedure to be run instead.

If it is equal or lower the current program is allowed to run its course and the newly initiated procedure will be executed as soon as it becomes the outstanding one with the highest priority. Once a procedure has been initiated it cannot be reinitiated until it has been executed completely.

However if the initiating event occurs again before its procedure has completely executed, the effective priority is increased by a half and the current program will be interrupted if it is of otherwise equal priority. The X and Y register contents are not however resaved on such a repeated event.

When using these routines they must first be brought into action by:

```
CALL Enable
```

where *Enable* points to the start of the machine code section. At any time they can be disabled again by:

```
CALL Disable
```

Enable and *Disable* can be called as often as you like within your program. It is advisable to call *Disable* immediately before your program finishes. To activate a particular event a statement of the form:

```
PROCset(Evnt%,Prty%,proc$)
```

should be used where *Evnt%* is the number of the event to be activated, *Prty%* is the priority level to apply and *proc$* is the name of the procedure to be called – excluding the PROC, but including any parameters if required. To deactivate the event again use:

```
PROCclear(Evnt%)
```

PROCset and PROCclear can be called as often as you like within your program, not only to activate or deactivate the events but also to alter the priority or the identity of the required event-initiated procedure.

Thus to use the basic eventing routines your Basic program must contain the short definitions of PROCset and PROCclear – as in lines 290 to 360. In addition you must declare an array to hold the required procedure names by using a:

```
DIM £$(10)
```

statement, and the following four variables must be defined:

Enable = Start of the eventing routines

Disable = Enable + 3

Set = Enable + 6

Clear = Enable + 9

Of course within the program as listed, these variables do not need to be separately defined as they are defined during the assembly of the routines.

The machine code routines and associated data use up almost 1k of storage. For simplicity I have located this area immediately below the screen memory – assuming Mode 7 – and have therefore adjusted HIMEM accordingly at the start of the program. Once PROCassemble has been called the routines can be saved with:

```
*SAVE Events 7800 +400
```

Note that this should be done before they are used, otherwise some of the internal flags may be wrongly set. They can then be used at a later date by:

```
*LOAD Events
```

which loads the routines back into the same area. If you wish to locate the routines in a different part of the memory they should be assembled into the location where they will eventually be used.

However I strongly recommend that you initially assemble into the area from &7800 so that the checksum produced by the program on completing the assembly can be verified.

The checksum should be &7E1F if you have Basic I or &A068 if you have Basic II. If the checksum is correct you know that you have typed in all the assembler statements correctly.

If it is wrong you have made an error. Once the checksum has been verified you can alter the location for the code – if necessary by altering the value of *code%* in line 900. The checksum will alter but the code should still be all right.

To demonstrate the use of the eventing routines after they have been assembled the program goes into a short loop with the interval timer, key pressed, Escape and trace events all activated. The demonstration finishes after Escape have been detected 11 times. Have fun.

Full listing starts on Page 126

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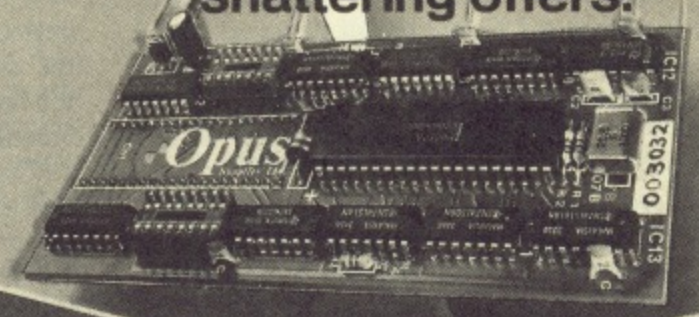

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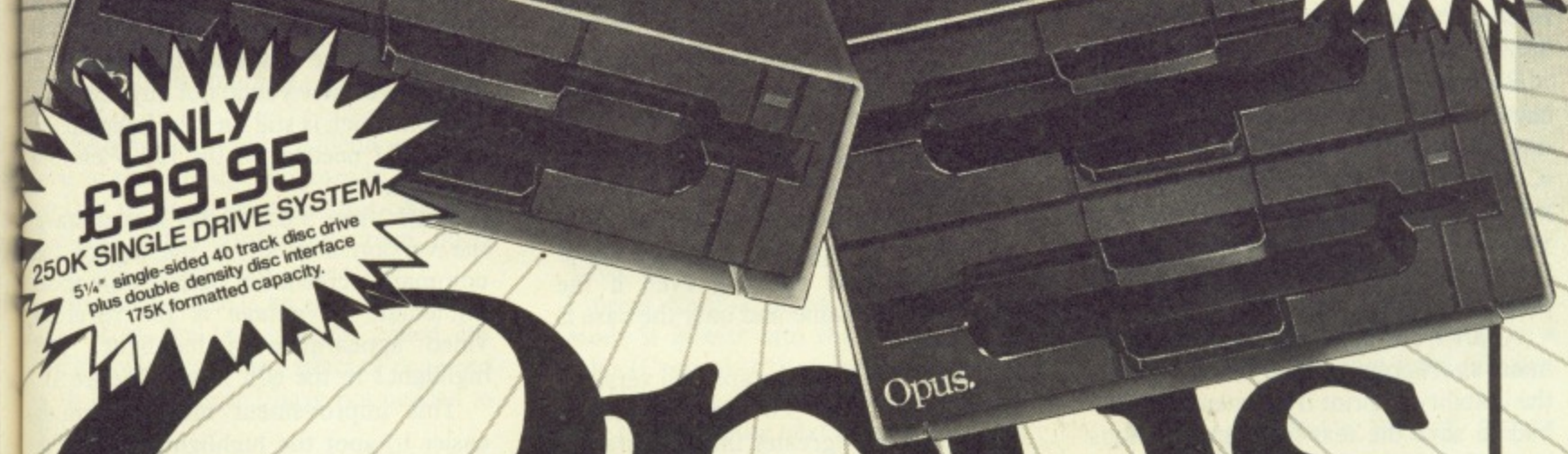

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MASTER CLASS

Part Four

Word-edit OR word-process?

By RORY McCLOY

LET's take a look at two pieces of software built into the Master 128's megaROM: View version 3.0 and Editor, the screen text handler.

I had already experienced View 3.0 on my BBC Model B though, of course, this lacked the extra memory available for each text file in View 3.0 on the Master 128 (28926 bytes free, approximately 4800 text words) or the Master Turbo (48326 bytes free, about 8000 text words).

So what are the differences from the earlier versions of View? Should you upgrade from versions A1.4 or A2.1 at a cost of £23 from Acornsoft if you return your old chip – remembering that you do not get the View Printer Driver included as you do with the full View 3.0 package?

Apart from a sprinkling of bugs the main short-coming of View A1.4 was the inability to print from memory. You had to save the text file first – tedious but safe.

The MPRINT utility program, which comes with the View Printer Driver Disc – see *The Business Micro User* April 1986 – overcomes this deficiency.

View A2.1 could print or screen files from memory, but unless you programmed the Break key with:

```
*KEY10 *WORD|MOLD|MMODE 3|M
```

you could lose text in memory by accidentally pressing Break. View A2.1 also added the FOLD command. FOLD0 and FOLD1 switch the folding facility off and on respectively.

FOLD alone tells you the current status. Folding allows you to ignore the case of the lettering when you are replacing or changing text.

Folding on is the default setting, but with folding off – which I prefer – you can selectively replace or change upper and lower case lettering even if the letters are the same and only the case is different.

If you indent paragraphs on versions of View prior to 3.0 using additional rulers and the "greater than" character > at the site of the indent thus:

```
.. .........>.....<
```

then using the FORMAT command or key f0 to reformat text alteration destroys the indent. You also notice that the cursor starts each indented line at the far left margin and only jumps to the indent when you start typing.

The on/off effect of the margins key Shift+f2 used to type characters to the left of the indent seems unpredictable.

View 3.0 has several significant improvements which, if you are a committed View user like me, you will find worth the upgrade. Indeed if you don't have View yet do not buy the A2.1 version which is still on sale. Save up the extra £21 needed for the full View 3.0 package.

With View 3.0 you no longer have the version number at the top of the command screen, but perhaps the most immediate advantage is the reversed video appearance of highlight1 and highlight2 in the edit mode (Figure I).

This improvement makes it much easier to spot the highlight markers in the text and you are less likely to miss one out when bracketing words or phrases with a highlight effect.

To search for the highlight markers you enter ^ followed by a minus sign for highlight1 or ^ followed by an asterisk for highlight2.

The paragraph indent formatting bug has been cured in View 3.0. The cursor starts each new indented line at the indent column, but can be returned simply to the far left margin by using the cursor-left key, to allow entry of text to the left of the indent. Reformatting takes place normally and preserves the indented section.

The Break key is automatically programmed to perform OLD and return you to View. In practice this isn't absolutely fool proof and on the odd occasion Melissa, my secretary, has managed to lose several letters by

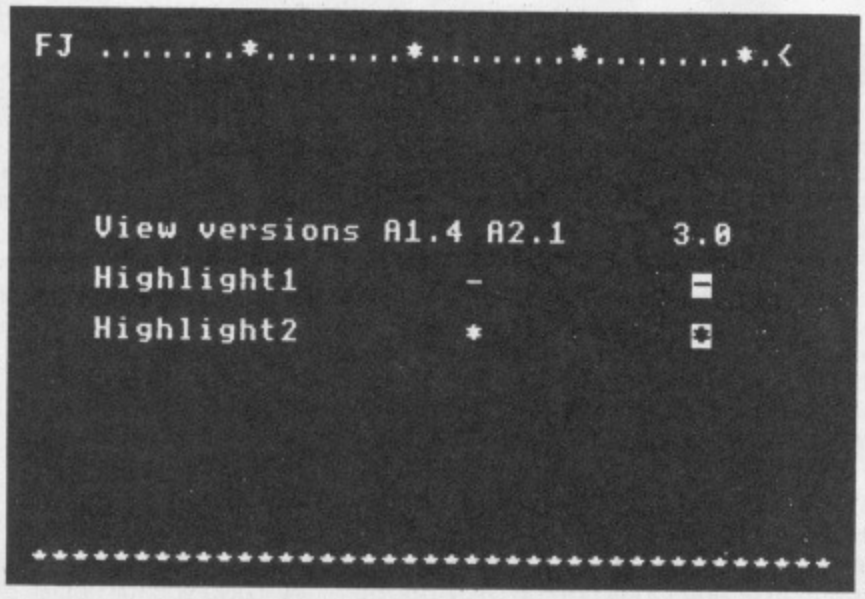

Figure I: Highlight characters on Mode 4 screen

pressing Break on the Master Turbo.

She retires for a cup of tea muttering that she is going to leave me for an Amstrad, and I remain confused and unable to repeat the fault.

When you enter View 3.0 with *WORD View automatically executes a NEW command so unlike earlier versions you are ready to Escape into the edit mode directly. If you are using a Watford 32k RAM board you need *XWORD for View A2.1, but only *WORD for A1.4 or 3.0 versions.

There are several new screen commands with View 3.0 and at last LOAD, SAVE, SHEETS, and SCREEN commands can be abbreviated to L, SA, SH and SC.

SETUP allows you to set the formatting, justification or insert edit modes without recourse to the appropriate Control+function keys, by either including or omitting F J and I after typing SETUP.

Along with FOLD0, SETUP FJI is included in my disc !BOOT file after *WORD so that I can start typing or editing in the insert mode – View defaults to formatting, F, and Justification, J.

NAME followed by a filename allows you to rename the program in memory so that its name appears after editing at the top of the command screen, but I find this of doubtful advantage.

Similarly there is an edit command – placed in the text margin called PB which switches off the effect of page end with PE. However I have not needed to use it yet.

The screen commands SEARCH, REPLACE, CHANGE and FORMAT – in addition to MORE, READ and WRITE of earlier versions – can be used with marked text passages in version 3.0 if followed by the necessary marker numbers.

There's been a lot of interest in the function key definition codes for View since my article on this topic in the April issue of *The Business Micro User.*

I gave the codes for calling those keys which seemed to save the most key entries, namely edit command Shift+f8, highlight1 – Shift+f4, highlight2 – Shift+f5 and set marker – Shift+f7. However I have been asked for the codes to call the other function keys defined in View – with or without Shift or Control.

The origin of these codes was summarised by Peter Thorne in *The Micro User,* December 1984, but I find it useful to have a full list of the codes on the notice board above my Master – Table I.

	f key alone		f key + Shift		f key + Ctrl	
Key	Ascii value	Code	Ascii value	Code	Ascii value	Code
f0	140	!!!L	156	!!!\	172	!!,
f1	141	!!!M	157	!!!}	173	!!-
f2	142	!!!N	158	!!!^	174	!!.
f3	143	!!!O	159	!!!_	175	!!/
f4	144	!!!P	160	!!!space	176	!!0
f5	145	!!!Q	161	!!!	177	!!1
f6	146	!!!R	162	!!"	178	!!2
f7	147	!!!S	163	!!#	179	!!3
f8	148	!!!T	164	!!$	180	!!4
f9	149	!!!U	165	!!%	190	!!5

Table I: Codes for generating Ascii values which represent the equivalent of Ascii codes from pressing the three tiers of function keys

Don't forget !M, which generates Ascii 13, executes a Return. Obviously there is not much point in putting a single key code on to the Shift+Control function key, but the multiple combinations are limited by only your needs and ingenuity. Thus:

```
*FX228,1
*KEY1 !!1.....>!M
```

programs the key f1 so that when I press Shift+Control+f1 in the edit mode it inserts into the text a default ruler (Control+f5) an indent character (>) 10 spaces in from the left margin, and moves to the next line so that I am ready to type an indented paragraph.

The function keys codes work with any version of View and the Editor, but the Master has a real advantage. On the BBC Model B you only have 256 bytes of memory for function key definitions which was quite restrictive if you were entering long text strings to several keys.

On the Master the function key buffer is four times bigger, up to 1k long, so the Bad key error when I exceed the buffer size is a thing of the past.

What about View? Well I think there are several ways Acornsoft could improve the next version, especially since the Model B+ and the Master can accommodate 32k ROMs and so program size is less of a problem.

What about line, column and page counters displayed in the ruler window at the top of the screen? Couldn't we have a built-in pad character? It would also be nice to alter the top and bottom screen scrolling margins, as in Editor, so you can set the number of lines you can see beyond the cursor line before the screen scrolls.

I have lost count of the number of times I have had to stop editing a block of text and use the cursor keys to move beyond where I am typing so that I can see what the lines just out of range of the screen window contain. The answer might be to try using the Edit text formatter in the Master.

In the second Master Class – *The Micro User* July 1986 – I described how excellent Editor was for constructing and altering Basic programs, but it also contains a text formatter which is a whole new ball game that I am only just learning.

By using Editor's PRINT TEXT command (f8) it takes text from memory and uses embedded commands – like Wordwise – to format the text appropriately and display it on the screen or print it out.

Indeed Wordwise users might well warm to its familiar way of doing things, although I suspect it falls short of the capabilities of Wordwise Plus.

The sophisticated formatting facilities provided by the Edit formatter include different paper widths and lengths, printing in bold and underlining, defining headers and footers at the top and bottom of each page, and controlling pagination including odd/even.

Page number registers can have different formats including upper and lower case Roman numerals, centering

From Page 109

and right justification, indenting text, storing standard text and commands for reuse, macros, storing numbers and performing arithmetic with them, generating indexes and contents lists.

The Welcome guide suggests that, although Editor offers a similar range of functions to View, since it does not carry out on-screen formatting, word processing is best done in View.

Yet the Reference Manual Part Two, which is an essential buy before you can start Edit text formatting since none of the commands are given in the Welcome Guide, tells you how to type and format a book – including the index – using Editor.

.af	Assign register format.
.an	Assign register number.
.bb	Begin bold.
.bl	Bold line.
.bp	Begin page.
.bu	Begin underline.
.cc	Set control character.
.ce	Centre line.
.ch	Chain file.
.co	Comment line.
.dm	Define macro.
.ds	Set double spacing.
.eb	End bold.
.ef	Define even page footer.
.eh	Define even page header.
.en	End of .dm, .ef, .eh and so on.
.ep	Begin even page.
.eu	End underline.
.ff	Form feed.
.fo	Define footer text.
.he	Define header text.
.ic	Close index file.
.ig	Ignore.
.in	Set left margin indent.
.io	Open index file.
.ix	Index text.
.ju	Right justify.
.ll	Set line length.
.ls	Set line spacing.
.lv	Leave blank lines.
.ne	Needs lines.
.nj	Do not right justify.
.nn	No new line.
.oc	Output character and count it.
.of	Define odd page footer.
.oh	Define odd page header.
.on	Output character and not count it.
.op	Begin odd page.
.os	Operating system command.
.pl	Set page length.
.po	Set page offset.
.r0-9	Print register contents.
.rf	Right justification.
.sp	Insert spacing lines.
.ss	Set single spacing.
.ta	Set tabs.
.tc	Set tab character.
.ti	Temporary indent.
.tr	Set character translation.
.ul	Underline line.

Table II: Edit formatting commands

Editor has more powerful searching and replacing commands than View which become so complicated that I couldn't start to deal with them here. Anyway they require such constant reference to the manual that I doubt I would ever commit them to memory even after greater familiarity.

The following mind-boggling examples from the manual may give you a feel for the capabilities of find/replace:

```
a-ce-z
```

matches any lower case letter except d.

```
FIND STRING $^#*: REM
```

finds Basic comments at start of program lines.

```
^ $/$
```

removes trailing spaces from lines.

```
$ A-Z^A-Z~a-z#/$%1%2$%3
```

puts words that are all in capitals on to lines separate from surrounding text.

When you come to the Edit text formatting commands themselves a feeling of relief and déjà-vu – for Wordwise again – comes over you that common sense and simplicity have been restored.

Table II summarises the two letter commands that are embedded in the text and should give you an idea of the extensive formatting that is possible with Edit. Each is preceded by a full stop as the control character. Therefore:

```
The .butime.eu is .bbnow.eb
```

would result in the following screen or printer output:

```
The time is now.
```

When I first tried these highlight effects in Edit the underlining appeared at the correct column but on the next line down, and the bold text was printed as ordinary text but duplicated on the line below.

A brief read of the error section for the formatter told me that my printer was introducing extra line-feeds after each carriage Return and instead of configuring my Master to ignore line-feeds I should reverse this and alter the DIP switches in my printer so as not to put them in automatically.

Once done the highlights performed correctly. Unfortunately only bold and underlining can be set on the printer by single command codes since, like Wordwise, a printer driver program is not part of the system.

However special print styles or fonts can be sent to the printer using .on – equivalent to VDU1 – but you need a .on code for each Ascii value in the printer control code, which is often three values long.

Only certain commands can be used anywhere in the text – .bb .bu .eb .eu .oc .on .r0-r9 – and the others must be used in paragraphs consisting only of commands. So:

```
.he.bl.ce
Chapter 1
.en
```

would define a standard text header for the top of pages. You can translate how any Ascii character will be printed by:

```
.tr<typed character><printed
character>
```

The Edit formatter contains a pad character – Control+J – which will be printed as a space but not allow the characters on either side to be split during formatting. A nice touch is the possible formats that can be given to the 10 numeric registers r0 to r9 – see Table III.

PROBLEM

I UNDERSTAND it is possible to convert the composite video output from monochrome to colour. I have an upgraded BBC A. Alternatively can one utilise the RGB output?

I wish to be able to record on to either a VHS or low band U-Matic video recorder. – Geoffrey J. Oliver, London W1.

SOLVED

Look at the top right hand corner of the computer board. Next to the UHF modulator you will see a pair of pins or solder pads labelled S39.

Just make this link and you will get a colour signal from the composite video socket. Note this is only applicable to issue 4 and 7 boards.

The register format is altered by using:

```
.af<register number><format number>
```

Register r0 is used as the page number register and page numbering appears as a centered footer at the bottom of each page by default unless changed.

You specify an index file at the start of the text by:

```
.io<index file name>
```

This opens a file of that name and any block of text preceded by .ix and followed by .en will be placed in the file. At the end of the text you close the index file with .ic.

Indexes created in this way can include page numbers provided the .ix to .en commands include the page register. However I do not consider the system as elegant or as powerful for creating formal book indexes as ViewIndex – see *The Business Micro User* April 1986.

The commands .ix and .en at the start and end of a complete file will convert the text containing formatter commands into plain text stripped of commands and saved under the .io filename for use with word-processors such as View which format text as it is entered rather than as it is printed.

All-in-all I think I will stick with the View family and look forward to the release of ViewSpell and ViewPlot. ■

0	Prints 0,1,2	10,11,12	100,101,102
1	Prints 00,01,02	10,11,12	100,101,102
2	Prints 000,001,002	010,011,012	100,101,102
3-7	Prints fields of 4-8 minimum width, similar to formats 0-2		
8	Prints capital Roman numerals O,I,II,III,IV.....		
9	Prints lower case Roman numerals 0,i,ii,iii,iv....		
10	Prints 0,A,B	AA,BB,CC	AAA,BBB,CCC
11	Prints 0,a,b	aa,bb,cc, ...	aaa,bbb,ccc,

Table III: The format numbers which control the formatting of the output from the 10 numeric registers r0 to r9 and set by .af (n) (n)

MY father James is writing a book using View, the ADFS and a Master, and is frequently handling large numbers of disc files under directories which represent chapters.

*He pointed out an error in my second Master Class article in the July issue when I suggested all files on a disc could be locked at once using *ACCESS *.* WRL under the ADFS. It does not.*

*In fact *ACCESS * WRL will lock only all filenames under the root directory $ and *ACCESS directory-name. * WRL will lock all the files under the specified directory.*

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This program has too many superb features to describe adequately here, so please write or 'phone for more information and sample prinouts.

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The moment of truth . . . MIKE COOK on how to design electronic circuits with the help of

A REAL-TIME CARNOT MAP

AT a recent show I was asked how to design electronic circuits for the BBC Micro – not an easy question to answer. What I said was that it is very similar to programming.

In programming you have a set of instructions and the programmer's job is to put them together in a sequence that will perform the required task. With electronics it is exactly the same – you have a set of components and you have to combine them to act as you want.

The major difference is that you have to solder a circuit together and this by necessity takes longer than typing in an instruction. Therefore you tend to plan ahead a lot more with electronic circuits than you tend to do nowadays with program.

I say nowadays as when I first started programming in the early seventies it was on a system known as batch programming. You submitted your punched cards, each one containing a single line of the program, and if you were lucky you got the results back the following day.

Can you imagine trying to learn to program when you are only allowed to type RUN once a day? What that did was to make you put a lot more thought and planning into your program.

My questioner pointed out that the other difference is that you can damage components by connecting them up wrongly. While this is true, if you follow the two golden rules you can't go far wrong.

The most important one for protection of your circuit is – never connect two outputs together. The other rule is for your personal protection – always hold the cold end of your soldering iron.

Electronic hardware is roughly divided into two classes – digital and analog. Digital electronics is fundamentally the simpler of the two, but it can build up to be quite complex.

Digital electronics deals with signals in a binary state. That means the signal can be in one of two states. Just to confuse you we can refer to these states in a number of different ways – high or low, true or false, one or zero, on or off.

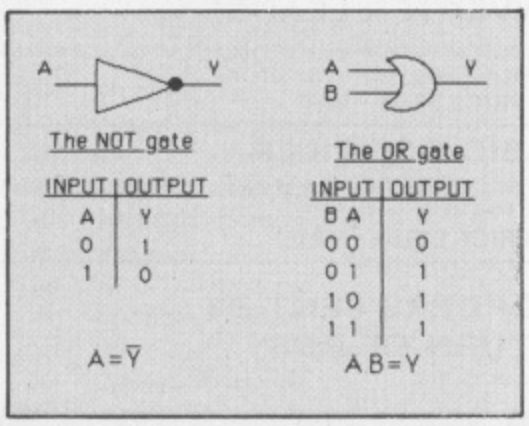


Figure I: The fundamental logic functions

Digital hardware consists basically of gates that perform logic functions with these signals. Figure I shows all the fundamental logic functions that exist. These are the NOT function and the OR function.

Yes, there are only two logical functions – your entire micro consists of a vast collection of these two circuits. You can liken them to machine code instructions – with them you can do anything.

However just as in programming high level languages give you a convenient method of wielding fistfuls of machine code instructions, these logic functions are combined to give you counters, memory and even the microprocessor in a single package.

So a good first step in a true understanding of digital electronics is to look at how these basic logic functions can be built up to perform more complex functions.

There are two classes of logic circuits – combination logic and sequential logic. With combination logic the output of a logic circuit is dependent on the current state of its inputs.

This class of logic circuits is used to make a variety of functions such as multiplexing, encoding and adding circuits as well as read-only memories.

Sequential circuits on the other hand have their outputs dependent upon the current and previous states of the inputs. This class of circuits is used to construct counters, shift registers and read/write memory.

In this article I will consider how to design combination circuits and show how to use your BBC Micro to analyse combination logic circuits.

One way of describing the action of a logic circuit is to have a truth table. This is simply a list of all the possible input states with the corresponding output value. As the number of inputs increases the number of possible combinations of inputs increases.

For each extra input line the number of combinations doubles. This can be expressed mathematically by saying that the number of different input states is 2↑N, where N is the number of input lines. For each different input state there must be a line in the truth table. Figure I shows the truth table of the two fundamental functions.

Another way of describing a logic function is to use an algebraic notation. This is known as Boolean algebra. Input lines at a logic one are expressed as letters and the logic functions as symbols.

For example the OR function is represented by a plus sign so, if we have an output called Y which is the result of ORing together two input lines called A and B, we can write Y=A+B. This is known as a logical expression.

The NOT function is represented by a bar across the top of the letter – hence if we invert the state of a signal with a NOT gate we write Y = $\overline{A}$ or Y equals A bar. So the next time you are told to get notted this simply means stand on your head.

By the way if you invert an inverted signal you get back to what you started with so that A = $\overline{\overline{A}}$ or you say that A bar bar equals A. Perhaps this was first expressed by Shakespeare with his

famous lines from Hamlet "Two B or NOT two B that is the question?", or maybe in the nursery rhyme "Bar bar black sheep".

As we shall see later there is a simple way to turn a certain type of logic expression directly into an electrical circuit. Let's see what we can do with these two fundamental logic functions when we start to play about with them.

To work out the truth table for any circuit you simply have to use a column for each output in the circuit. These outputs can be inputs to other parts of the circuit. By applying the fundamental logic functions at each stage the output can be arrived at.

The circuit in Figure II shows an OR gate being fed with two signals that have been inverted. You start off the truth table by just writing down all the input states. Then we write down the values in the NOT columns, these being simply the inverse of the values in the input columns.

We then take each line of the NOT columns and apply the OR truth table to them. Finally we invert this column to find the output. You can ignore the intermediate results, so the truth table of the circuit is quite simple.

If you examine it you can see that we could express it by saying the output is true if input A AND input B is true. We call this an AND function, but as you can see we have made it out of the NOT and the OR function.

In fact we could have taken the AND function and the NOT function as our fundamental functions and derived an OR function from them in a similar way. The reason why the OR function is taken as being so fundamental is that it takes up less space on a chip to implement, and therefore most chip designers use it.

A most useful logic function is created if the NOT function and the OR function are combined – this gives a NOR gate, an OR followed by a NOT.

THE BEEB BODY BUILDING COURSE

Similarly we can have an NAND function – an AND followed by a NOT.

These are so useful that in practice they are what we use most of the time. The gates are shown in Figure III, the nose on the gate indicating that it contains a NOT function.

As the AND function can also be considered fundamental it has its own symbol. I favour the full stop symbol to represent AND as it is used by the American designers of chips and is the one you will meet in data sheets.

Note however this is not a British standard symbol as we use an up arrow. The full stop also gives a clue as to how the AND will behave when you are manipulating it. The AND behaves in a similar way to a multiplication and the OR in a similar way to an addition.

To express Figure II in symbol form we say that $\overline{A}.\overline{B} = Y$, and as $Y = A+B$ we can say that $\overline{\overline{A}.\overline{B}} = A+B$. If we invert both sides of this equation we can say that $\overline{A}.\overline{B} = \overline{A+B}$ This relationship is known as De Morgan's theorem and I like to think of it as follows:

If a bar goes over an operator – AND or OR function – you can break the bar if you change the function – swap AND for OR.

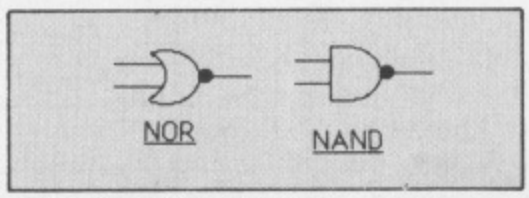
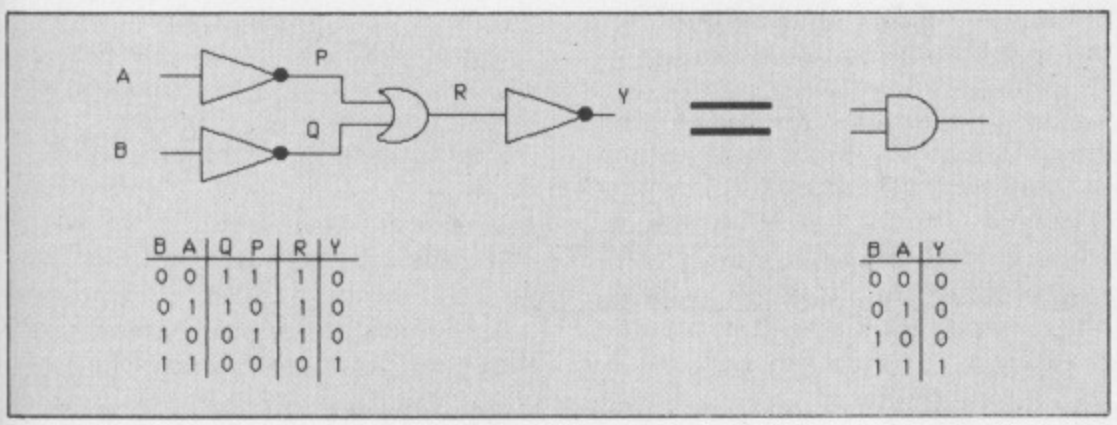


Figure III: Practical circuits



B	A	Q	P	R	Y
0	0	1	1	1	0
0	1	1	0	1	0
1	0	0	1	1	0
1	1	0	0	0	1

B	A	Y
0	0	0
0	1	0
1	0	0
1	1	1

Figure II: The equivalence of the AND to OR function

You don't need to know this to design circuits, but it is part of the proof that the method I will describe works.

Well we can see that given a circuit we can derive its truth table. However in practice you often know what truth table you want and have to design a circuit to produce it: How can this be done?

Basically we start off by designing the truth table and plot it on to a chart known as a Carnot map – pronounced Kar-no. From this we can obtain a minimum Boolean expression and we can then turn this expression into a circuit diagram.

A Carnot map is a development of a Venn diagram, and is shown in Figure IV. A Venn diagram has overlapping areas corresponding to logical states. So you have a circle representing the variable A. Everywhere inside the circle A is true – or one – and everywhere outside it, it is false – or zero.

The Carnot map places these areas into formalised cells, a single cell representing one line on the truth table and the contents of the cell a zero or one representing the output of the circuit.

The point is that as adjacent cells differ only by one variable we can use this property to generate an expression that can be converted into a circuit using the minimum number of gates.

On a two dimensional surface four variables can easily be accommodated on a Carnot map. For each extra variable you need an extra dimension. Fortunately the god of digital electronics only has four fingers so most problems can be reduced to a series of four variable problems.

Figure V shows a four variable Carnot map. To find any line on the truth table simply find the intersection between the appropriate AB column and CD row. When a variable is at a logic zero it has a bar across it.

Each single cell corresponds to a function of four variables, whereas if you take two adjacent cells you can eliminate one of the variables from the function. Therefore a group of two cells can be represented by one three variable function instead of two four variable functions.

In a similar way four adjacent cells represent a function of two variables, and eight cells represent a function of

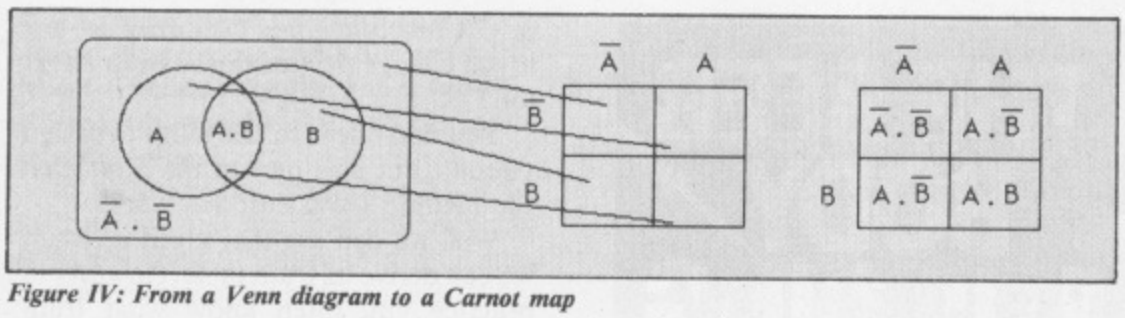


Figure IV: From a Venn diagram to a Carnot map

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one variable. All 16 cells represent a permanent value irrespective of any inputs.

So by plotting our desired truth table on to a Carnot map and grouping cells we can derive a logical expression which can be turned into a circuit.

Note that cells on one edge of the map are adjacent to cells on the other edge. You can think of this as the map curling over to form a sphere shape – try to visualise the four corners all making up a set of four adjacent cells.

To be a valid group it must be a rectangle or square with sides that are a power of two. This means that you can have groups of 1 × 4 or 2 × 2 for a group of four or 2 × 4 for a group of eight.

Groups can overlap, but no group must be completely overlapped by others, otherwise you are using more functions than you need. In order to help you group them correctly there is an algorithm you can follow.

Firstly you must group all cells that are a logic one. Once a cell is in a group it should no longer be considered separately, but can be included in other cell groups. Consider each cell in turn and group – ring with a pen – those cells that are not adjacent to any other cell.

Then consider each cell in turn and look for groups of two. Only ring those cells that can be grouped in one possible way. Again consider each cell in turn, but this time look for groups of four that can only be grouped in one way.

Repeat for groups of eight and, finally, any cells left over must be included in as large a group as possible.

Like many things this sounds very complex in theory. To make matters clearer let's walk through a real example of a design problem.

Suppose you have a seven segment display and wish to drive it from your BBC Micro. You can connect each segment up to a bit in the use port – via a suitable drive of course – but that would mean you could only drive one digit from seven bits. As you want to show 10 or possibly 16 different values – 0 to 9 and possibly A to F for hex numbers – you only need four bits to represent each value. Therefore if you had a seven segment encoder circuit you could drive two digits from your user port.

Such a circuit would have four inputs and seven outputs – one for each segment. What this really means is seven logic functions with common inputs. We can plot each function on a separate Carnot map to derive our circuits.

The first job is to plot the truth table. If we label each segment a to g and each input A to D we can place in the truth table a logic 1 for each segment that needs to be on and a zero if it needs to be off.

As input line A is the least significant bit we place it on the right just as we do in any other number system. You can see this in Figure VI. Note that I have not filled in all the truth table – see if you can complete it.

So for each of the segments we have a separate Carnot map. I have plotted the one for segment g. Now to minimise it we go through the algorithm. If we look at each cell we will see there are no cells that can't be grouped with another.

So we move on to consider those that can be placed in a group of two in only one way. It turns out that there are none of these either. Remember the cells at the edge are adjacent, so cell 4 can be grouped with cell 5 or cell 6.

Next we consider groups of four. Cell 2 can be in a group of four with cells 3, A and B or cells 6, E and A so we leave that cell alone. Cell 3 can only be in a group of four in one way, so we circle the group 2, 3, A and E.

These cells are no longer considered themselves, but may be included in

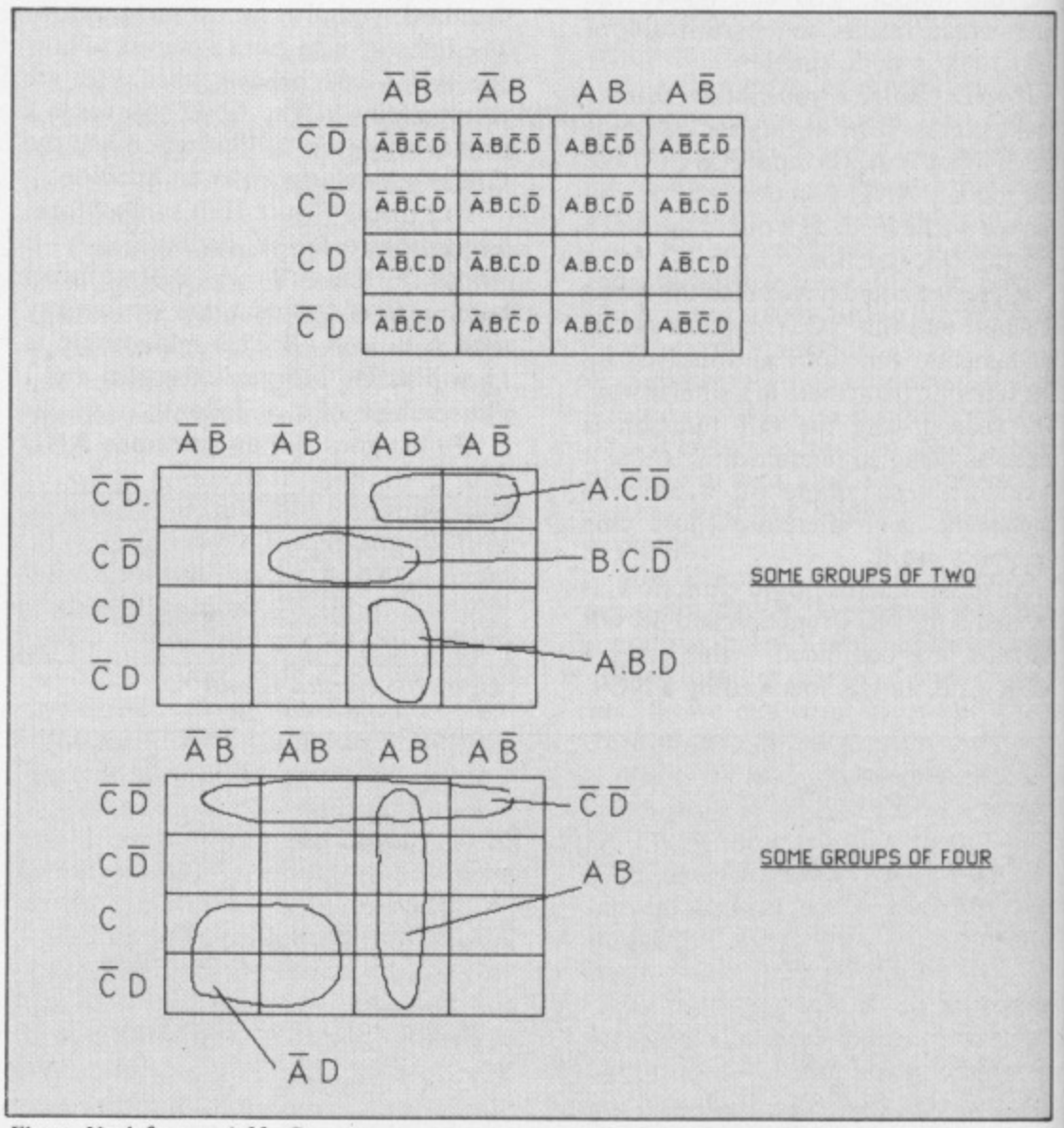

Figure V: A four variable Carnot map

other groups. Next, cell 4 can't be in a group of four, so we pass on to cell 6. This can be in a group of four in only one way, so we circle that group of 2, 6, E and A.

Cell 5 can't be grouped in fours, so the next ungrouped cell is cell F which is grouped with cells D, B and 9. Finally the only cell left to consider is number 8. This can be in a group of four with cells A, B and 9. There are no groups of eight so we can go back to consider cells 4 and 5.

The largest group we can include these in is a group of two together, so we circle them. Now all the cells are grouped we can read off the Boolean expression.

To derive the minimum expression with the Carnot map the segment will be on whenever a group is active. The form of final expression is known as a sum of products because of the way it looks. It's not actually a sum of products, but a OR of ANDs.

To turn this into a logic diagram each product represents a NAND gate with the outputs of all the gates being fed into another NAND gate as shown in Figure VII. To get the barred variables simply invert them with a NOT gate or inverter.

If you want to prove this circuit will do the job you can draw a truth table exactly as we did before. Those of you who are mathematically minded can prove this works by use of Boolean algebra.

To do this first invert the function, then apply De Morgan's theorem and finally invert the function again. As there have been two inversions the function has not changed, but now it is expressed in terms of NAND gates.

The principals and mechanics of Carnot maps are not that easy to grasp first time around, so I have written a program that allows you to attach your BBC Micro to any logic circuit you are experimenting with and get a real time display of the circuit in the form of a Carnot map.

First you need to connect the micro to your logic circuit – I have designed the program around the user port so the most convenient method is to use the transition board I designed as Body Build pack 1.

As the issue describing it is no longer available I will give a brief description. It is simply a board with an IDC – Insulation Displacement Cable – header plug and screw connectors. The screw connectors are labelled, allowing easy access to the user port connections.

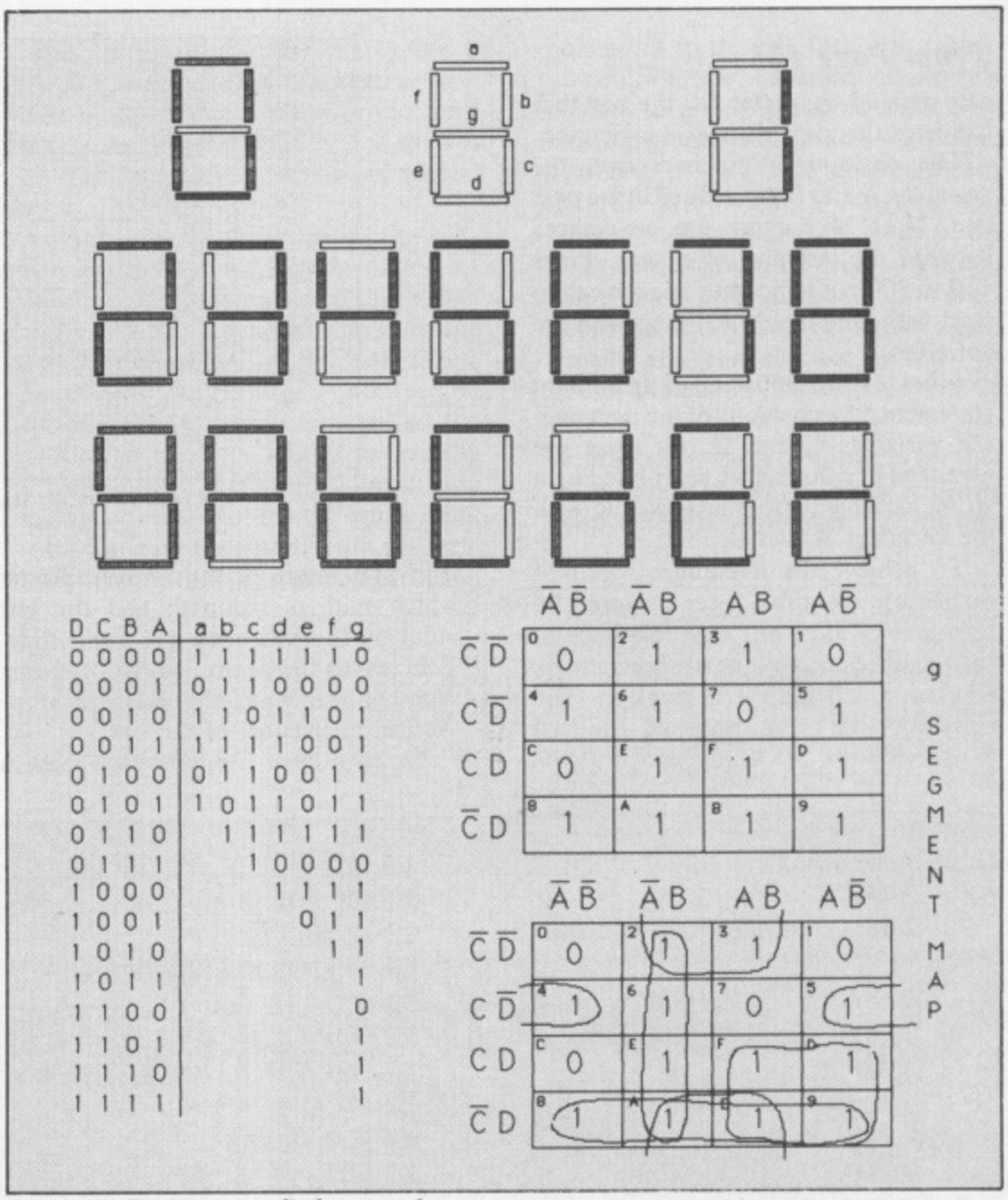

Figure VI: Seven segment display example

Also on the board are 47k pull-up resistors on all 10 user port connections and a LED to show power is on. This is connected to the user port by means of a ribbon cable available as Body Build pack 2.

It is the same cable as is used in all my projects involving the user port. For convenience of board layout the cable is made up unconventionally.

The connectors are clamped on in a vice pointing in the same direction with the polarising notches facing down the cable. Then when the strain relief clip is put on the notches will face outwards and both connectors will point down, as shown in Figure VIII.

Bits 0 to 3 of the user port are used to generate the four input lines to your experimental circuit. The other bits, 4 to 7, are used as inputs to monitor the output of your circuit.

In this way up to four Carnot maps can be shown on the screen at any one time allowing you to monitor four different outputs.

The program has an essentially simple task: To output each logic combination in turn, then read the result and display it in the appropriate cell of the appropriate Carnot map.

Program I does this, but I have optimised it for the greatest possible speed without having to resort to machine code. This has the effect of making it slightly difficult to follow, so a few words of explanation will not go amiss.

After the title and my name – does anyone type that in I wonder? – the user port is initialised in line 130 to have bits 0 to 3 as outputs and the rest as inputs. Then the arrays are defined – more on this later. Line 150 creates a

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user-defined character for the bar that indicates the variable is at a logic zero.

The position of the bars over the variables A and B are defined in the next line. Note here there are six spaces between the last pair of quotes. Lines 170 to 300 put logic ones in each cell to start with, and label each map with the variables.

Lines 310 to 360 read in from data statements the positions of the bars over the variables C and D. As these are arranged in columns we can't build up a string variable to do this as we did with the variables A and B.

To achieve the maximum speed of operation we must precompute the positions of each cell with reference to the value of output it corresponds to as well as which map it belongs to. The simplest way is to hold all the cell positions in a 3D array called *PA%*.

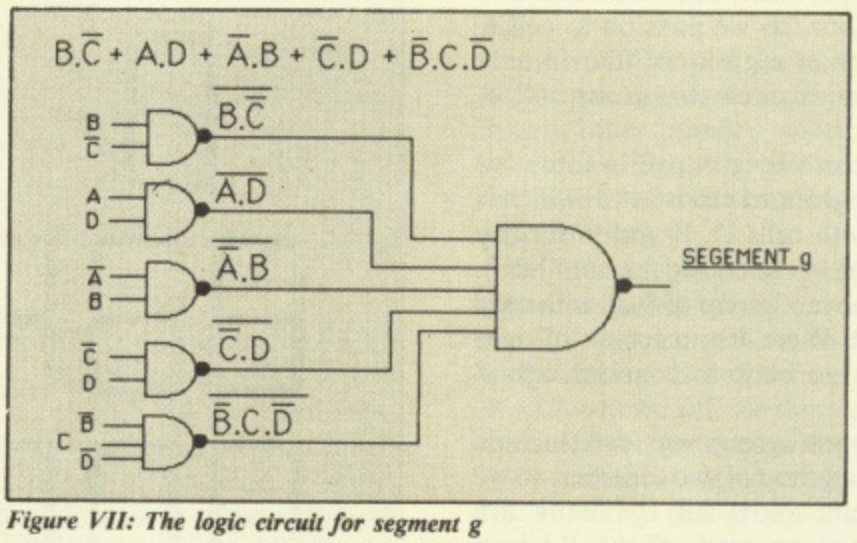

Figure VII: The logic circuit for segment g

The first index of the array indicates which map is required, and the last index is the value we are outputting. This leaves the centre index to indicate whether we want the horizontal or vertical coordinate of the cell.

We then have 128 different values in total. The simplest way would be to read these values from a data statement – however this would be a bit boring to enter.

Also each coordinate pair is made up of a different combination of the same few numbers. Therefore these numbers

```
  10 MODE7
  20 PRINT
  30 PRINT"THE BEEB BODY BUILDING CO
URSE"
  40 PRINT"SEPTEMBER 1986"
  50 PRINT"REAL TIME CARNOT MAP"
  60 PRINT
  70 PRINT"By Mike Cook"
  80 PRINT
  90 PRINT
 100 PRINT"PRESS ANY KEY TO START"
 110 A$=GET$
 120 MODE1
 130 ?&FE62=&0F
 140 DIM PA%(3,1,15),AB%(3),CD%(3)
 150 VDU 23,224,0,0,0,0,0,0,126,0
 160 AB$=CHR$(224)+CHR$(224)+" "+CHR
$(224)+"      "+CHR$(224)
 170 PRINTTAB(0,2)
 180 FOR D=1 TO 2
 190 FOR A=1 TO 4
 200 PRINTSPC(3);"CD ";
 210 FOR C=1 TO 2
 220 FOR B=1 TO 4
 230 PRINT"1  ";
 240 NEXT
 250 PRINTSPC(5);
 260 NEXT
 270 PRINT:PRINT
 280 NEXT
 290 IF D=1 THEN PRINT SPC(5);STRING
$(4,"AB ");SPC(5);STRING$(4,"AB "):PR
INT:PRINT
 300 NEXT
 310 FOR A%=1 TO 6
 320 READ H%,V%
 330 PRINTTAB(H%,V%);CHR$(224)
 340 NEXT
 350 DATA 3,2,4,2,4,5,3,11
 360 DATA 3,17,4,17,4,20,3,26
 370 FOR A%=0 TO 3
 380 READ AB%(A%)
 390 NEXT
 400 FOR A%=0 TO 3
 410 READ CD%(A%)
 420 NEXT
 430 DATA 6,15,9,12
 440 DATA 3,6,12,9
 450 FOR B%=0 TO 3
 460 FOR A%=0 TO 3
 470 D%=(B%*4)+A%
 480 PA%(0,0,D%)=AB%(A%)
 490 PA%(0,1,D%)=CD%(B%)
 500 PA%(1,0,D%)=AB%(A%)+17
 510 PA%(1,1,D%)=CD%(B%)
 520 PA%(2,0,D%)=AB%(A%)
 530 PA%(2,1,D%)=CD%(B%)+15
 540 PA%(3,0,D%)=AB%(A%)+17
 550 PA%(3,1,D%)=CD%(B%)+15
 560 NEXT
 570 NEXT
 580 PRINTTAB(5,14);AB$;SPC(6);AB$
 590 PROC_GRID(164,96)
 600 PROC_GRID(708,96)
 610 PROC_GRID(164,572)
 620 PROC_GRID(708,572)
 630 COLOUR 1
 640 PRINTTAB(18,7);"4";
 650 PRINTTAB(35,7);"5";
 660 PRINTTAB(18,22);"6";
 670 PRINTTAB(35,22);"7";
 680 COLOUR 2
 690 VDU 23,1,0;0;0;0;
 700 REPEAT
 710 FOR B%=0 TO 15
 720 ?&FE60=B%
 730 M%=?&FE60 DIV 16
 740 FOR A%=0 TO 3
 750 IF (M% AND 1) THEN PRINT TAB(PA
%(A%,0,B%),PA%(A%,1,B%));"1"; ELSE PR
INT TAB(PA%(A%,0,B%),PA%(A%,1,B%));"0
";
 760 M%=M% DIV 2
 770 NEXT
 780 NEXT
 790 UNTIL FALSE
 800 DEF PROC_GRID(X,Y)
 810 MOVE X,Y
 820 FOR A%=1 TO 5
 830 PLOT 1,0,380
 840 PLOT 0,94,-380
 850 NEXT
 860 MOVE X,Y
 870 FOR A%=1 TO 5
 880 PLOT 1,376,0
 890 PLOT 0,-376,96
 900 NEXT
 910 ENDPROC
```

Program 1

are read into a holding array in lines 370 to 440, and the final array assembled in lines 450 to 570.

Finally before we start the grid lines have to be drawn around each cell, and this is done by a procedure called PROC_GRID.

It uses the relative plot commands to draw a grid with its lower left hand corner at the coordinates passed to it. Then each Carnot map grid is labelled with the number of the user port bit it is using to monitor the output of your circuit.

With line 690 turning off the cursor lines 700 to 790 continuously monitor your circuit and update the on-screen maps. Line 720 outputs a value to your circuit and line 730 reads its response – we need the DIV 16 as the information coming in from your circuit is in the four most significant bits.

The variable *M%* now contains the contents of one cell on each of the four maps. The next four lines extract and display that information. Line 750 could have been written more simply but it would have needed an extra line, slowing down the loop and producing a slower response. As it is written each of the 128 cells gets updated every second or so.

With nothing connected all the cells should show as logic ones as unconnected inputs assume this value, and we also have pull-up resistors on the user port connector board. Next take a piece of wire and connect it between bit 4 and the earth connector marked E.

All the cells on map four on the screen should change to a logic zero indicating that no matter what input state you have the output is always zero. Now remove the wire from the earth and connect it to the bits 0 to 3 in turn.

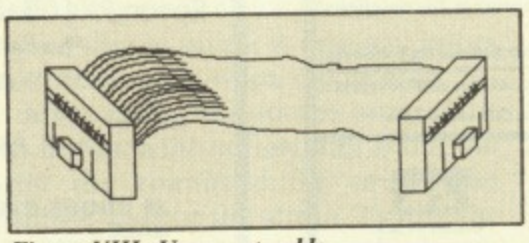

Figure VIII: User port cable

You will see the areas of the map change to give a group of eight ones, indicating only one variable is involved. Studying this will give a much clearer insight into what a Carnot map represents than all the text in the world.

Try predicting what areas of the map will change, then go back and read the description of Carnot maps again. Finally you can connect up our own circuit and monitor its response with the display.

● *Well that about wraps it up for now. Next month we will be using a Carnot map to design our project. See you then.*

Body Build Pack 1: Transition Board £9.95.
Body Build Pack 2: Ribbon Cable £9.

All prices include P&P and VAT. Order from: Musbury Consultants, 8 Fairhill, Helmshore, Rossendale, Lancs. BB4 4JX.

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LEARN

A simple way to make View, Wordwise and Mini Office II even easier to use

By ANDREW VERWER

HAVE you ever used a word processor and needed to repeat some key sequence or text, but not felt it worthwhile to program a function key or write a Wordwise Plus segment to do the job? Well here is a simple utility which has been devised for just such an occasion.

Learn operates with the word processors Wordwise, View and Mini Office II to allow a sequence of key presses to be memorised as they are entered. The two new keys introduced for the Learn function are Ctrl+L to start learning and Ctrl+X to finish learning or execute the learnt key sequence.

All the keys that are normally used in the text editing mode on these word processors can be memorised, including all function keys, Control and Shift keys.

The learnt sequence can be repeated as many times as required at any point in the text. The Escape key, used to enter and exit the text mode, cannot be memorised as it operates in a totally different way to the other keys.

Using Learn has the advantage that the actions are performed as you enter the keypresses, so you can see the results as the sequence is being memorised by the utility.

If an error is made during the learn phase the Delete key can be used to correct it and the correction will be part of the learnt sequence.

I have found this utility so useful that it makes the Wordwise Plus built-in language virtually redundant for all but the most complex tasks.

The number of key strokes learnt is limited, not by the learn utility, but by the operating system which can only hold up to 31 characters in its keyboard buffer. However this is adequate for most applications. If you try to memorise more than this the remaining key presses are ignored.

I will first describe how to load and use Learn and then look at how it works. The description of the operation is not required reading for those who simply want to use the routine.

Learn is a machine code program which resides in memory that is not normally used by the word processors. Program I is a Basic program which uses the built-in assembler to produce the required machine code.

Once run, the machine code can be saved for later use. Even though the Basic program is no longer required it is a good idea to save it in case any errors have been made when typing it in.

After saving the source program it can be run in the normal way and it will print the command for saving the machine code on the screen. Type in the *SAVE command exactly as displayed. It is easy to use the Copy key to do this.

We'll use Wordwise for our example. Enter it in the normal way and from the menu type:

```
*LRN
```

or:

```
*RUN LRN
```

if you are on cassette.

This will load and execute the previously saved machine code and also initialise the event vector which it uses. The routine will remain enabled until the Break key is pressed.

Enter text mode on Wordwise by pressing Escape and type in some text. Everything should behave as normal. Now to teach your machine a lesson.

Make sure you are in text mode then type Ctrl+L – that is, hold down the Ctrl key and press L. Enter a few characters and type Ctrl+X. Now type Ctrl+X again and the characters previously entered should be repeated just as if you had entered them again from the keyboard.

You can move the cursor around the text, type in new text and use options from the menu without affecting the learnt sequence. Next time you type Ctrl+X the sequence will be repeated again.

A new sequence can be learnt at any time by using Ctrl+L followed by the new sequence and then Ctrl+X as before. Remember that pressing the Break key will disable Learn, but it can be reinitialised by typing *LRN again. again.

Try some of the function key commands in the Learn mode, such as those involving markers and marked text. Some are quite useful and amusing things can be accomplished in this way.

One such example is in a manual sorting a list of data such as names. I know there is a program for this job supplied with Wordwise Plus, but it can be quite difficult to tailor it for a particular job.

Learn can be used to move each name entry to the bottom of the text in the order required. Place the cursor on the line of the first name required, type Ctrl+L to enter Learn mode and then copy the current line to the bottom of the text.

In other words, place markers around the current line, send the cursor to the bottom of the text and copy marked text using function key f9.

To get the cursor back to its previous position first place it at the top of the text and then move the cursor to the first marker – f4 followed by f3.

Finally delete the marked text and then finish the learnt sequence with Ctrl+X. Now move the cursor to the next required name and Ctrl+X should move it to the bottom of the text after the previous name.

The above example is far easier to do than to describe, since you can see the results of the keypresses as you enter them.

If your BBC Micro has a disc system you may find it useful to build a !BOOT file to enter Wordwise and initialise the routine automatically when Shift-+Break is pressed.

Wordwise can itself be used to create a suitable file:

```
*WORDWISE
*LRN
```

This should be saved with the

→

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From Page 119

filename !BOOT. The disc option must also be set up by typing from the Wordwise menu:

```
*OPT 4,3
```

If using View it should be called up in the normal way with:

```
*WORD
```

Then initialise the learn utility by typing:

```
*LRN
```

while in command mode. Enter text mode on View and check that all is as normal by typing in some text.

Type Ctrl+L, enter a few characters and then type Ctrl+X. Now type Ctrl+X again to repeat the learnt sequence. Try some of the function key commands in the Learn mode including those with Ctrl and Shift.

The name sorting example, described previously for Wordwise, can be accomplished just as easily with View and Mini Office II using similar functions.

The utility uses the BBC Micro's powerful event handling facilities to detect a keypress event. As soon as any event occurs the OS effectively jumps to an event handling routine whose address is saved in locations &220 and &221. This so called vector is in RAM and so can be changed to the address of our routine.

When the utility is initialised the machine code is loaded into memory and execution is started from the start of the routine at line 170 of the listing. This saves the old event vector for later use and puts the address of our event handler – designated *entry* in the program – in its place.

'Learn improves ease of use and flexibility. Why not try it out?'

The keypress event is enabled in lines 250 to 270 using OSBYTE 14. OSBYTE is entered via a direct jump (JMP) rather than the more usual jump to subroutine (JSR). In this way control is passed back to the current word processor when the osbyte subroutine is finished.

This initialisation will cause the micro to execute the code at *entry* every time a key is pressed. The BBC Micro however has facilities for many different events, so the Learn routine must first check that the event which occurred is the keypress event we are waiting for, which is event number 2.

By good design the operating system places the event number in the accumulator before entering any event handler. This is checked in line 300. If it was other than event 2 control is passed to the old event handler via the old event vector at line 330.

Having decided that a keypress has occurred the routine must find out which key was pressed. The osbyte &91 call in line 380 is used to retrieve the last character from the keyboard buffer. This character is then checked against the codes for Ctrl+L (&0C) and Ctrl+X (&18) so that the appropriate action can be taken.

The learnt sequence is stored in a buffer called *buff* starting at page &C and the number of characters learnt is saved in *count*. The current mode – whether learning – is saved in *lrnflg* as true (&FF) or false (0). Lines 420 to 450 set *lrnflg* to true and zeros *count* if Ctrl+L is pressed.

If Ctrl+X is pressed lines 500 to 540 check *lrnflg* and if previously set true – currently learning – reset it to false.

If *lrnflg* was already false the routine branches to line 560 where after checking that the buffer contains a previously learnt sequence, the stored sequence is retrieved a character at a time and inserted into the keyboard buffer using an osbyte &8A call.

In this way when control is eventually passed back to Wordwise it is just as though the learnt sequence had been typed in on the keyboard.

If neither Ctrl+L or Ctrl+X have been typed the routine branches to line 740 where the Learn mode is checked. If *lrnflg* is true the routine at lines 720 to 770 add the key that was pressed to the buffer and increment *count*.

Learn has been found to work with other ROM-based software in addition to Wordwise and View. It should work with most ROMs that don't use Ctrl+X or Ctrl+L. Unfortunately BBC Basic does use these.

The routine uses two pages of memory – one at &A00 for the machine code itself and 32 bytes at &C00 for the buffer. These addresses are set up in line 110 and can be changed if particular ROMs use these pages for other purposes.

Hopefully you will find the addition of Learn to a spreadsheet or database package improves ease of use and flexibility. Why not try it out? ■

Full listing starts on Page 122

PROBLEM

WHAT is the longest length of ribbon cable that can be supported between the 1MHz port and your user port expansion board?

I intend to use one of these boards to drive a user port multiplexed line board. Your two boards plus the interface boards are to be housed in a card rack powered by its own 5V switchmode PSU.

What modifications to your boards or precautions are needed to protect the 1MHz port against reverse power flow if the two supplies are not switched together?
– Andrew Howlett, Reading.

SOLVED

There are no hard and fast rules as to how long a cable can be hung on to the 1MHz bus before it crashes, you just have to try it and see. The longest I have used was one metre and that worked OK.

I have also powered the expansion board from a separate supply without any ill effects. As there is no 5 volt supply from the bus you can't get reverse power flow.

Mike Cook

From Page 121

```
  10 REM LEARN
  20 REM by Andy Verwer
  30 REM (c) The Micro User
  40 REM Detects a keypress event
  50 REM CTRL L - enter learn mode
  60 REM CTRL X - leave learn mode
  70 REM or if not in learn mode
  80 REM execute sequence.
  90 osbyte=&FFF4
 100 evntv=&220
 110 code=&A00:buff=&C00
 120 true=&FF:false=0
 130 FOR pass%=0TO2STEP2
 140 P%=code
 150 [OPT pass%
 160 .initialise
 170 LDA evntv    \Set up event vect
or
 180 STA evold
 190 LDA evntv+1
 200 STA evold+1
 210 LDA #entry MOD&100
 220 STA evntv
 230 LDA #entry DIV&100
 240 STA evntv+1
 250 LDA #14      \Enable event 2
 260 LDX #2
 270 JMP osbyte
 280 .entry
 290 PHP:PHA      \Save P & A regist
ers
 300 CMP #2       \Keypress event ?
 310 BEQ event2
 320 PLA:PLP      \No, retrieve P &
A and
 330 JMP (evold)  \Jump to old event
 vector
 340 .event2      \Yes, save remaini
ng registers
 350 TXA:PHA:TYA:PHA
 360 LDX #0
 370 LDA #&91
 380 JSR osbyte   \Get chr from buff
er
 390 TYA
 400 CMP #&0C     \Is it CTRL L ?
 410 BNE noCTLL
```

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```
 420 LDX #true    \Yes, enter learn
mode
 430 STX lrnflg
 440 LDX #0       \Reset buffer coun
t
 450 STX count
 460 CLC:BCC return
 470 .noCTLL
 480 CMP #&18     \Is it CTRL X ?
 490 BNE noCTLX
 500 LDA lrnflg   \Yes, now check le
arn mode
 510 CMP #true
 520 BNE nolrnflg \Not in learn mode
 530 LDA #false   \Leave learn mode
 540 STA lrnflg
 550 CLC:BCC return
 560 .nolrnflg
 570 LDA count
 580 CMP #0       \Check buffer not
empty
 590 BNE exec
 600 CLC:BCC return
 610 .exec        \Execute learnt se
quence
 620 LDX #0       \Point to buffer s
tart
 630 .loop
 640 LDY buff,X   \Pick up chr from
buffer
 650 TXA:PHA      \Save buffer point
er
 660 LDX #0
 670 LDA #&8A
 680 JSR osbyte   \Insert chr into k
eyboard buffer
 690 PLA:TAX      \Retrieve buffer p
ointer
 700 INX
 710 CPX count    \Done yet ?
 720 BNE loop
 730 CLC:BCC return
 740 .noCTLX      \Not CTRL L or X !
 750 PHA          \Save chr
 760 LDA lrnflg   \In learn mode ?
 770 CMP #false
 780 BNE learn    \Yes,
 790 PLA          \No, retrieve chr
 800 CLC:BCC return
 810 .learn       \Add chr to buffer
 820 PLA          \Retrieve chr
 830 LDX count
 840 STA buff,X   \Add it to buffer
 850 INX          \Increment buffer
count
 860 STX count    \and save it
 870 .return
 880 PLA:TAY:PLA:TAX:PLA:PLP
 890 RTS
 900 ]
 910 evold=P%
 920 count=P%+2
 930 lrnflg=P%+3
 940 !P%=0:P%=P%+4
 950 NEXT
 960 PRINT" *SAVE LRN ";~code;" ";~P
%
```

This listing is included in this month's cassette tape offer. See order form on Page 149.

PROBLEM

SINCE July 1983 when I bought the Amcom DFS and subsequently upgraded for the 6502 Second Processor version, everything has been 100 per cent – until last week.

Then, for some peculiar reason, the DFS has apparently lost is PAGE setting of &1500 and now records PAGE &1900 as per the standard Acorn DNFS (which is still fitted).

If I now remove the DNFS the Amcom DFS correctly reads PAGE &1500 as before, but upon re-inserting the DNFS PAGE goes back to &1900. – I.S. Crawford, Banbury.

SOLVED

The Amcom system grabs its own workspace and then supresses the other filing system. What is happening is that the DNFS is not being supressed and so it is grabbing its own workspace.

I could be that the DNFS is getting in first somehow or that the Amcom system is not working properly. Perhaps the Amcom PROM has gone a little faulty or some other ROM is upsetting things.

Look also for bad sockets or loose contacts on the ROM board and check that the Amcom system has highest priority.

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Opus.

From Page 33

```
  10REM Pear Picker
  20REM By F.J.E. McPherson
  30REM (c) The Micro User
  40IFPAGE<>&E00 GOTO2500
  50ONERROR IFERR=17 THEN RUN ELSE M
ODE7:PRINT:REPORT:PRINT" at line "STR
$(ERL):END
  60MODE7:VDU23;8202;0;0;0;
  70PROCintro
  80MODE1
  90DIM A%(15,4),S%(10),N$(10)
 100FOR Q%=1 TO 10
 110S%(Q%)=190-(Q%*20-15)
 120N$(Q%)="Plastered Patrick"
 130NEXT
 140SC%=0:LIMIT%=(54-A%)*100
 150FOR Q%=0 TO 15
 160FOR W%=0 TO 4
 170A%(Q%,W%)=0
 180NEXT
 190NEXT
 200M%=0:SCL%=0
 210CLS
 220ENVELOPE 1,1,-2,-2,-1,25,50,155,
126,0,0,-1,126,126
 230ENVELOPE 2,2,5,0,-5,5,5,5,126,0,
0,-10,126,126
 240ENVELOPE 3,2,16,8,0,5,10,20,126,
0,0,-4,126,126
 250VDU 23;8202;0;0;0;
 260VDU 19,1,1,0,0,0
 270VDU 19,2,2,0,0,0
 280VDU 19,3,6,0,0,0
 290VDU 23,225,192,248,252,254,254,2
55,255,254
 300VDU 23,226,3,31,63,127,127,255,2
55,127
 310VDU 23,227,120,48,0,0,0,0,0,0
 320VDU 23,228,30,12,0,0,0,0,0,0
 330VDU 23,231,3,3,3,3,3,7,7,15
 340VDU 23,232,192,192,192,192,192,2
24,224,240
 350VDU 23,233,0,0,0,24,24,0,0,0
 360VDU 23,234,0,0,48,48,48,48,48,48
 370VDU 23,235,0,0,207,0,0,0,0,207
 380VDU 23,236,0,0,63,63,0,0,0,0
 390VDU 23,237,33,0,0,33,33,33,33,33
 400VDU 23,238,0,0,192,193,65,255,78
,174
 410VDU 23,239,0,0,192,217,89,255,78
,174
 420VDU 23,240,0,240,144,159,255,98,
243,99
 430TREE$=CHR$5+CHR$18+CHR$0+CHR$2+C
HR$226+CHR$225+CHR$10+CHR$8+CHR$8+CHR
$227+CHR$228+CHR$8+CHR$8+CHR$18+CHR$0
+CHR$1+CHR$231+CHR$232+CHR$4
 440MAN$=CHR$238
 450FENCE$=CHR$5+CHR$18+CHR$0+CHR$3+
CHR$234+CHR$8+CHR$18+CHR$0+CHR$1+CHR$
235+CHR$4
 460DFENCE$=CHR$5+CHR$18+CHR$0+CHR$3
+CHR$236+CHR$8+CHR$18+CHR$0+CHR$1+CHR
$237+CHR$4
 470PROCsetup
 480PROCmove
 490END
 500DEF PROCsetup
 510COLOUR 1
 520PRINT TAB(5,1);"Hiscore ";S%(1);
" by ";N$(1)
 530COLOUR 3
 540PRINT TAB(5,5);"INCOME= ";SC%
 550PRINT TAB(5,3);"Number of pears
left = ";
 560FOR Q%=1 TO 8
 570FOR W%=1 TO 5
 580MOVE Q%*128+32,W%*128+28
 590PRINT ;TREE$;
 600NEXT
 610NEXT
 620MOVE 32,768
 630PRINT STRING$(19,FENCE$);STRING$
(19,FENCE$)
 640MOVE 32,32
 650PRINT STRING$(19,FENCE$);STRING$
(19,FENCE$)
 660FOR Q%=1 TO 24
 670MOVE 40,Q%*32-16
 680PRINT ;DFENCE$;
 690MOVE 1220,Q%*32-16
 700PRINT ;DFENCE$;
 710NEXT
 720FOR Q%=1 TO 9
 730PROCaddapple
 740SOUND 2,2,10,1
 750NEXT
 760ENDPROC
 770DEF PROCmove
 780TIME=0
 790X%=20:Y%=20
 800TX%=19:TY%=20
 810TX1%=1:TY1%=0
 820PROCaddapple
 830REPEAT
 840IF RND(4)=1 THEN PROCcd
 850IF TIME>LIMIT% THEN TIME=0:PROCa
ddapple:PROCcd
 860X1%=X%:Y1%=Y%
 870X%=X%-INKEY(-67)+INKEY(-98)
 880IF (X%<3) OR (X%>36) THEN X%=X1%
 890W%=(X%+1)/2
 900Y%=Y%-INKEY(-105)+INKEY(-73)
 910E%=(Y%+3)/2
 920IF (W%/2<>INT(W%/2)) AND (E%/2<>
INT(E%/2)) THEN X%=X1%:Y%=Y1%
 930IF (Y%>30) OR (Y%<9) THEN Y%=Y1%
 940PRINT TAB(TX%,TY%);" ";
 950COLOUR 1
 960TX%=TX%+TX1%:TY%=TY%+TY1%
 970TW%=(TX%+1)/2:TE%=(TY%+3)/2
 980IF (TW%/2<>INT(TW%/2)) AND (TE%/
2<>INT(TE%/2)) THEN TX%=TX%-TX1%:TY%=
TY%-TY1%:PROCcd:GOTO 1000
 990IF TX%>36 OR TX%<3 OR TY%>30 OR
TY%<9 THEN TX%=TX%-TX1%:TY%=TY%-TY1%:
PROCcd
1000PRINT TAB(TX%,TY%);CHR$240;
1010COLOUR 3
1020PRINT TAB(X1%,Y1%);" ";
1030PRINT TAB(X%,Y%);MAN$;
1040W%=(X%-1)/2
1050IF (Y%-1)/4=INT((Y%-1)/4) AND Y%
>9 AND W%/2=INT(W%/2) AND X%>3 AND X%
<35 THEN PROCtest
1060IF X%=TX% AND Y%=TY% AND MAN$=CH
R$239 THEN SC%=SC%+2:SCL%=SCL%+2:SOUN
D 3,3,10,1:MAN$=CHR$238:M%=M%-1:PRINT
 TAB(28,3);M%;" ":PRINT TAB(14,5);SC%
;" "
1070IF SCL%=16 THEN PROCcleared:UNTI
L -1:GOTO 150
1080IF M%>19 THEN UNTIL -1:PROCend
1090UNTIL 0
1100ENDPROC
1110DEF PROCaddapple
1120M%=M%+1
1130PRINT TAB(28,3);M%;" "
1140RS%=RND(2)
1150RT%=RND(8):RTY%=RND(5)
1160RX%=(RT%*4+RS%)*32:RY%=(RTY%*4)*
32
1170IF A%((RT%*2)-3+RS%,4-(RTY%-1))=
1 THEN 1140
1180A%((RT%*2)-3+RS%,4-(RTY%-1))=1
1190MOVE RX%,RY%
1200GCOL0,3
1210VDU 5:PRINT ;CHR$233;:VDU 4
1220ENDPROC
1230DEF PROCtest
1240IF MAN$=CHR$239 THEN ENDPROC
1250IF A%((W%-(X% MOD 2)-1),(Y%-1)/4
-3)=1 THEN PROCappledrop ELSE ENDPROC
1260A%((W%-(X% MOD 2)-1),(Y%-1)/4-3)
=0
1270ENDPROC
1280DEF PROCappledrop
1290SOUND 1,1,255,10
1300GCOL3,3:VDU5
1310FOR Q%=(32-Y%)*32 TO (31-Y%)*32
STEP -4
1320MOVE X%*32,Q%+32
1330FOR W=1 TO 150:NEXT
1340VDU 233
1350MOVE X%*32,Q%+28
```

```
1360VDU 233
1370NEXT
1380VDU 4
1390MAN$=CHR$239
1400PRINT TAB(28,3);M%;" "
1410ENDPROC
1420DEF PROCcd
1430IF TX1%=0 AND TY1%=0 THEN 1440 E
LSE TX1%=0:TY1%=0:ENDPROC
1440TX1%=RND(3)-2:TY1%=RND(3)-2
1450ENDPROC
1460DEF PROCcleared
1470FOR W=1 TO 5000:NEXT
1480FOR Q%=1 TO M%
1490SC%=SC%-1
1500PRINT TAB(14,5);SC%;" "
1510FOR W=1 TO 250:NEXT
1520SOUND 0,1,100,1
1530NEXT
1540FOR W=1 TO 1500:NEXT
1550FOR Q%=1 TO 25
1560FOR W=1 TO 150:NEXT
1570SC%=SC%+1
1580SOUND 2,2,10,1
1590PRINT TAB(14,5);SC%;"  "
1600NEXT
1610LIMIT%=LIMIT%-75
1620IF LIMIT%<50 THEN LIMIT%=50
1630ENDPROC
1640DEF PROChiscores
1650PROCd(31)
1660PLACE=1
1670FOR Q%=1 TO 10
1680IF S%(Q%)>SC% THEN PLACE=PLACE+1
1690NEXT
1700COLOUR 1
1710PRINT TAB(4,15);"   You are rank
ed ";PLACE;" out of TEN"
1720PRINT TAB(4,17);"  Please enter
your name below."
1730PRINT TAB(7,19);:INPUT N$:N$=LEF
T$(N$,18)
1740FOR Q%=10 TO PLACE STEP -1
1750N$(Q%)=N$(Q%-1)
1760S%(Q%)=S%(Q%-1)
1770NEXT
1780CLS:PRINT TAB(9,2);"Pear Picker'
s TOP TEN"
1790N$(PLACE)=N$
1800S%(PLACE)=SC%
1810FOR Q%=1 TO 10
1820COLOUR (Q% MOD 3)+1
1830PRINT TAB(8,Q%*2+3);"`";S%(Q%)
1840PRINT TAB(13,Q%*2+3);".....";N$
(Q%)
1850NEXT
1860PRINT ''''TAB(9);"Press any key
to continue"
1870FOR Q%=1 TO 800
1880FOR W%=1 TO 3
1890VDU 19,W%,((Q%+W%) MOD 3)+2,0,0,
0
1900NEXT
1910A$=INKEY$(25)
1920IF ASC(A$)<>-1 THEN Q%=800
1930NEXT
1940ENDPROC
1950DEF PROCend
1960VDU 4
1970COLOUR 131:COLOUR 0
1980PRINT TAB(14,13);"Unfortunately"
1990PRINT TAB(8,15);"there are now 2
0 pears";TAB(14,17);"on the trees,";T
AB(6,19);"and due to your inadequacy,
";TAB(10,21);"you have been fired."
2000COLOUR 3:COLOUR 128
2010FOR W=1 TO 15000:NEXT
2020IF SC%>S%(10) THEN PROChiscores
2030CLS
2040PRINT TAB(3,10);"Do you want ano
ther game ?"
2050A$=GET$
2060IF A$="N" THEN END
2070IF A$<>"Y" THEN VDU7:GOTO 2040
2080GOTO 140
2090END
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

```
2100ENDPROC
2110DEF PROCd(L%)
2120PRINT TAB(8,L%);"Press any key t
o continue";
2130*FX15 0
2140A=GET
2150CLS
2160ENDPROC
2170DEF PROCintro
2180PL%=1
2190READ Q$
2200IF Q$="END" THEN GOTO 2400
2210PRINT
2220R%=RND(7)+128
2230IF Q$="3" THEN PROCd(23):GOTO 21
90
2240IF LEFT$(Q$,1)<>"2" THEN 2300
2250Q$=RIGHT$(Q$,LEN(Q$)-1)
2260FOR Q%=1 TO 2
2270PRINT TAB((35-LEN(Q$))/2);CHR$14
1;CHR$R%;Q$
2280NEXT
2290GOTO 2190
2300REPEAT
2310W$=MID$(Q$,PL%,37)+" "
2320PL%=PL%+38
```

```
2330REPEAT
2340W$=LEFT$(W$,LEN(W$)-1)
2350PL%=PL%-1
2360UNTIL RIGHT$(W$,1)=" "
2370PRINT 'TAB((38-LEN(W$))/2);CHR$(
R%);W$;
2380UNTIL PL%>LEN(Q$)
2390GOTO 2180
2400PRINT TAB(0,10);CHR$133;"What le
vel (1-5)  (5=most difficult)";:A%=GE
T
2410IF A%<49 OR A%>53 THEN VDU 7:GOT
O 2400
2420ENDPROC
2430REM *** It is very important to
put in the space before the final quo
tation  marks !! ***
2440DATA "2Pear Picker","In this gam
e you are a pear picker who must try
and pick pears one at a time and get
them to the tractor. "
2450DATA "If you manage to collect e
ight of these you are promoted to a f
aster growing field. However, if you
allow twenty or more pears to be left
 on the trees, you lose your job. "
2460DATA "Unfortunately you also hav
e the problem that the driver of the
tractor is the farmer's son (Plastere
d Patrick), who drives in a rather er
ratic manner. "
2470DATA 3
2480DATA "2C O N T R O L S","To cont
rol the wheelbarrow use the following
 controls : "
2490DATA "Z.......left ","X.......ri
ght ","*.........up ","?.......down "
,3,END
2500*KEY0 *TAPE|M FORI%=0TO TOP-PAGE
STEP4:I%!&E00=I%!PAGE:N.|MPAGE=&E00|
MO.|MRUN|F|M
2510VDU21:*FX138,0,128
```

This listing is included in this month's cassette tape offer. See order form on Page 149.

From Page 106

```
10 REM BASIC EVENTING
20 REM Suitable for BASIC I or II
30 REM By Mike Stallybrass
40 REM (c) The Micro User
50 MODE7
60 HIMEM=&7800
70 PROCassemble
80 CALL Enable
90 DIM £$(10)
100 PROCset(10,1,"trace(Z%)")
110 PROCset(6,6,"esc")
120 PROCset(2,0,"key")
130 PROCclock
140 Z%=0
150 TIME=0
160 CLS
170 REPEAT
180 T1=TIME/100
190 INPUT TAB(5,15) "Input ?" A$
200 PRINT TAB(5,16) "You input " A$
210 PRINT TAB(5,18) "Running time"
T1 " secs"
220 FOR I%=1 TO 100
230 NEXT
240 UNTIL Z%>10
250 PROCclear(6)
260 CALL Disable
270 END
280 :
290 DEFPROCset(X%,Y%,p$)
300 £$(X%)=CHR$&F2+p$+";"
310 CALL Set,£$(X%)
320 ENDPROC
330 :
340 DEFPROCclear(X%)
350 CALL Clear
360 ENDPROC
370 :
380 DEFPROCclock
390 DIM clock 15
400 P%=clock
410 [OPT 0
420 LDA #&04
430 LDX #(clock+10)MOD256
440 LDY #(clock+10)DIV256
450 JMP &FFF1
460 ]
470 PROCtimer
480 ENDPROC
490 :
500 DEFPROCtimer
510 CLS
520 VDU 7
530 INPUT TAB(0,0) "How many second
s delay until next clock" '"interrupt
 occurs (1-60)? " S%
540 IF S%<1 OR S%>60 THEN S%=60
550 clock!10=-100*S%
560 clock?14=&FF
570 CALL clock
580 PROCset(5,10,"timer")
590 ENDPROC
600 :
610 DEFPROCesc
620 Z%=Z%+1
630 CLS
640 VDU 7
650 PRINT TAB(0,3) "This is printed
 by a Procedure that" '"is called whe
never an ESCAPE Event" '"occurs.  It
has now happened "; Z% " times"
660 PRINT TAB(0,7) "Press any key t
o resume normal running"
670 K%=GET
680 PRINT TAB(0,8) "Key Pressed!" K
%
690 T2=TIME
700 REPEAT
710 UNTIL TIME-T2>100
720 CLS
730 ENDPROC
740 :
750 DEFPROCkey
760 PRINT TAB(0,20) "You Pressed A
Key!" INKEY(0) ?(vreg+2)
770 T3=TIME
780 REPEAT
790 UNTIL TIME-T3>100
800 PRINT TAB(0,20) SPC(39)
810 ENDPROC
820 :
830 DEFPROCtrace(X%)
840 PRINT TAB(0,24) "Trace :" ERL T
IME/100 X%;
850 ENDPROC
860 :
870 DEFPROCassemble
880 :
890 cp_pointer = &37
```

PROBLEM

I AM doing a project at college which includes the use of the analogue port and would like to know what each of the 15 pins do. In the User Guide it does not explain what they do or what the symbols on the circuit diagram stand for.
– C. Groombridge, Bolton-le-Sands, Lancs.

SOLVED

The pin number descriptions are as follows.
1: +5V – allows you to get power from the micro.
2: 0V – The other line for extracting power.
3: 0V – Same as pin 2.
4: CH3 – Voltage input 0 - 1.8V, read with ADVAL(4).
5: Analogue ground. Essentally 0 volts but use it as the reference signal for all voltage inputs as it is connected to the 0V line close to the analogue to digital converter and so should minimise stray pickup.
6: 0V – Same as pin 2.
7: CH1 – Same as pin 4 put read with ADVAL(2).
8: Analogue ground. Same as pin 5.
9: Light pen strobe. This input will latch the current state of the counters addressing the screen memory. After a pulse on this input you can look at the latched value in the CRT controller and work out where the spot was on the display screen when this input was pulsed.
10: PB1 – a digital input meant to be used for a fire button on joysticks. To read it ADVAL(0) AND 2 will return a value of 0 if this line is connected to 0 volts or a value of 2 if it is open circuit or connected to +5V.
11: Vref – All the voltage measurements on the CH inputs are measured relative to this voltage. It is about 1.8V.
12: CH2 same as pin 4 but read with ADVAL(3).
13: PB0 same as pin 10 but read with ADVAL(0) AND 1 it will return a value of 1 if open circuit or 0 if connected to zero volts.
14: Vref – Same as pin 11.
15: CH0 same as pin 4 but read with ADVAL(1).

```
  900 codeX = HIMEM
  910 osbyte = &FFF4
  920 :
  930 basicX=2+(?&8015=ASC"1")
  940 IF basicX=1 THEN PROCbas1 ELSE
PROCbas2
  950 :
  960 FOR IX=0 TO 2 STEP 2
  970 PX=codeX
  980 :
  990 [OPT IX
 1000 :
 1010 .Enable
 1020 JMP enable
 1030 .Disable
 1040 JMP disable
 1050 .Set
 1060 JMP set
 1070 .Clear
 1080 JMP clear
 1090 :
 1100 .enable
 1110 SEI
 1120 LDA #brkv1 MOD256
 1130 LDX #brkv1 DIV256
 1140 CMP &202
 1150 BNE enable1
 1160 CPX &203
 1170 BEQ check2
 1180 :
 1190 .enable1
 1200 LDY &202
 1210 STA &202
 1220 STY brkv0
 1230 LDY &203
 1240 STX &203
 1250 STY brkv0+1
 1260 :
 1270 .check2
 1280 LDA #evnt1 MOD256
 1290 LDX #evnt1 DIV256
 1300 CMP &220
 1310 BNE enable2
 1320 CPX &221
 1330 BEQ check3
 1340 :
 1350 .enable2
 1360 LDY &220
 1370 STA &220
 1380 STY evnt0
 1390 LDY &221
 1400 STX &221
 1410 STY evnt0+1
 1420 :
 1430 .check3
 1440 LDA #oswd1 MOD256
 1450 LDX #oswd1 DIV256
 1460 CMP &20C
 1470 BNE enable3
 1480 CPX &20D
 1490 BEQ check4
 1500 :
 1510 .enable3
 1520 LDY &20C
 1530 STA &20C
 1540 STY oswd0
 1550 LDY &20D
 1560 STX &20D
 1570 STY oswd0+1
 1580 :
 1590 .check4
 1600 LDA #rdch1 MOD256
 1610 LDX #rdch1 DIV256
 1620 CMP &210
 1630 BNE enable4
 1640 CPX &211
 1650 BEQ endenable
 1660 :
 1670 .enable4
 1680 LDY &210
 1690 STA &210
 1700 STY rdch0
 1710 LDY &211
 1720 STX &211
 1730 STY rdch0+1
 1740 :
 1750 .endenable
 1760 LDX #0
 1770 STX pendflag
 1780 DEX
 1790 STX curevnt
 1800 CLI
 1810 BIT flags+10
 1820 BPL exitenable
 1830 LDA #&40
 1840 STA pendflag
 1850 LDA #&7D
 1860 JSR osbyte
 1870 :
 1880 .exitenable
 1890 RTS
 1900 :
 1910 .disable
 1920 SEI
 1930 LDA brkv0
 1940 STA &202
 1950 LDA brkv0+1
 1960 STA &203
 1970 LDA evnt0
 1980 STA &220
 1990 LDA evnt0+1
 2000 STA &221
 2010 LDA oswd0
 2020 STA &20C
 2030 LDA oswd0+1
 2040 STA &20D
 2050 LDA rdch0
 2060 STA &210
 2070 LDA rdch0+1
 2080 STA &211
 2090 LDA #&7C
 2100 JSR osbyte
 2110 CLI
 2120 RTS
 2130 :
 2140 .oswd1
 2150 JSR hide_esc
 2160 JSR oldoswd
 2170 JMP show_esc
 2180 :
 2190 .oldoswd
 2200 JMP (oswd0)
 2210 :
 2220 .rdch1
 2230 JSR hide_esc
 2240 JSR oldrdch
 2250 JMP show_esc
 2260 :
 2270 .oldrdch
 2280 JMP (rdch0)
 2290 :
 2300 .hide_esc
 2310 PHP
 2320 PHP
 2330 PHA
 2340 TXA
 2350 PHA
 2360 TSX
 2370 LDA &105,X
 2380 STA &104,X
 2390 LDA &106,X
 2400 STA &105,X
 2410 LDA pendflag
 2420 STA &106,X
 2430 ORA #&80
 2440 STA pendflag
 2450 AND #&40
 2460 BEQ esc_clear1
 2470 LDA #&7C
 2480 JSR osbyte
 2490 :
 2500 .esc_clear1
 2510 PLA
 2520 TAX
 2530 PLA
 2540 PLP
 2550 RTS
 2560 :
 2570 .show_esc
 2580 PHP
 2590 PHA
 2600 TXA
 2610 PHA
 2620 TSX
 2630 LDA &104,X
 2640 BMI esc_clear2
 2650 LDA pendflag
 2660 AND #&40
 2670 STA pendflag
 2680 BEQ esc_clear2
 2690 :
 2700 LDA #&7D
 2710 JSR osbyte
 2720 :
 2730 .esc_clear2
 2740 LDA &103,X
 2750 STA &104,X
 2760 PLA
 2770 TAX
 2780 PLA
 2790 PLP
 2800 PLP
 2810 RTS
 2820 :
 2830 .nointercept
 2840 PLA
 2850 TAY
 2860 PLA
 2870 JMP (brkv0)
 2880 :
 2890 .exitintercept
 2900 PLA
 2910 TAX
 2920 PLA
 2930 TAY
 2940 RTS
 2950 :
 2960 .brkv1
 2970 PHA
 2980 TYA
 2990 PHA
 3000 LDY #0
 3010 LDA (&FD),Y
 3020 CMP #&11
 3030 BNE nointercept
 3040 BIT pendflag
 3050 BVC nointercept
 3060 :
 3070 PLA
 3080 TAY
 3090 PLA
 3100 PLA
 3110 PLA
 3120 PLA
 3130 TYA
 3140 PHA
 3150 TXA
 3160 PHA
 3170 LDA #&7C
 3180 JSR osbyte
```

→

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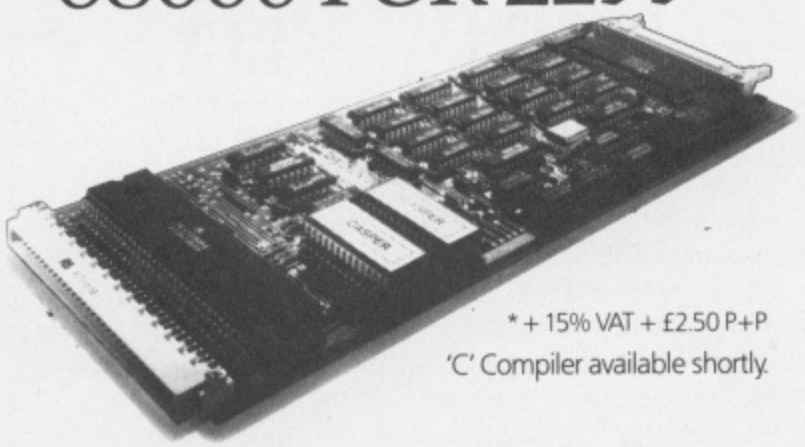

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VISA VISA

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```
3190 BIT flags+10
3200 BVS dointercept
3210 LDA #&60
3220 ORA flags+10
3230 STA flags+10
3240 :
3250 .dointercept
3260 LDA #&DF
3270 LDX curevnt
3280 BMI nocurevnt
3290 LDA flags,X
3300 ORA #&E0
3310 :
3320 .nocurevnt
3330 LDX #&FF
3340 LDY #&0A
3350 :
3360 .next
3370 CPY curevnt
3380 BEQ lower
3390 CMP flags,Y
3400 BCS lower
3410 TYA
3420 TAX
3430 LDA flags,X
3440 :
3450 .lower
3460 DEY
3470 BNE next
3480 :
3490 CPX #&FF
3500 BEQ exitintercept
3510 AND #&DF
3520 STA flags,X
3530 LDA curevnt
3540 PHA
3550 STX curevnt
3560 CPX #&0A
3570 BNE notrace2
3580 JSR find_line_no
3590 :
3600 .notrace2
3610 JSR push_strings
3620 LDY #0
3630 LDX #&0A
3640 LDA #&0D
3650 JSR trans1
3660 LDX #&19
3670 LDA #&1C
3680 JSR trans1
3690 LDX #&24
3700 LDA #&3F
3710 JSR trans1
3720 STY &36
3730 JSR push_strings
3740 :
3750 LDX curevnt
3760 LDA lo,X
3770 STA &0B
3780 STA &19
3790 LDA hi,X
3800 STA &0C
3810 STA &1A
3820 LDY #1
3830 STY &0A
3840 STY &1B
3850 LDA #&F2
3860 JSR execute_PROC
3870 :
3880 JSR pull_strings
3890 LDY #0
3900 LDX #&0A
3910 LDA #&0D
3920 JSR trans2
3930 LDX #&19
3940 LDA #&1C
3950 JSR trans2
3960 LDX #&24
3970 LDA #&3F
3980 JSR trans2
3990 JSR pull_strings
4000 :
4010 LDX curevnt
4020 LDA flags,X
4030 AND #&9E
4040 STA flags,X
4050 LDA #0
4060 BIT flags+10
4070 BPL notrace3
4080 LDA #&7D
4090 JSR osbyte
4100 LDA #&40
4110 :
4120 .notrace3
4130 STA pendflag
4140 PLA
4150 STA curevnt
4160 JMP dointercept
4170 :
4180 .trans1
4190 STA &36
4200 .more1
4210 LDA 0,X
4220 STA &600,Y
4230 INY
4240 INX
4250 CPX &36
4260 BNE more1
4270 RTS
4280 :
4290 .trans2
4300 STA &36
4310 .more2
4320 LDA &600,Y
4330 STA &0,X
4340 INY
4350 INX
4360 CPX &36
4370 BNE more2
4380 RTS
4390 :
4400 .otherevent
4410 TXA
4420 LDX wk2
4430 PLP
4440 JMP (evnt0)
4450 :
4460 .evnt1
4470 PHP
4480 SEI
4490 STX wk2
4500 TAX
4510 LDA flags,X
4520 BPL otherevent
4530 AND #&60
4540 BNE repeat_call
4550 :
4560 LDA pendflag
4570 ORA #&40
4580 STA pendflag
4590 BMI set_flags1
4600 LDA #&7D
4610 JSR osbyte
4620 :
4630 .set_flags1
4640 LDA wk2
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

```
4650 STA xreg,X
4660 TYA
4670 STA yreg,X
4680 LDA #&60
4690 :
4700 .set_flags2
4710 ORA flags,X
4720 STA flags,X
4730 TXA
4740 LDX wk2
4750 PLP
4760 RTS
4770 :
4780 .repeat_call
4790 LDA #&01
4800 BNE set_flags2
4810 :
4820 .set10
4830 LDA #&40
4840 STA pendflag
4850 LDA #&7D
4860 BNE set0
4870 :
4880 .set
4890 PHP
4900 TYA
4910 PHA
4920 TXA
4930 PHA
4940 SEI
4950 LDA #&0E
4960 CPX #&0A
4970 BEQ set10
4980 BCS exit1
4990 :
5000 .set0
5010 JSR osbyte
5020 LDA &601
5030 STA zp_pointer
5040 LDA &602
5050 STA zp_pointer+1
5060 PLA
5070 TAX
5080 LDY #0
5090 LDA (zp_pointer),Y
5100 STA lo,X
5110 INY
5120 LDA (zp_pointer),Y
5130 STA hi,X
5140 PLA
5150 AND #&0F
5160 ASL A
5170 ORA #&80
5180 STA flags,X
5190 BNE exit2
5200 :
5210 .exit1
5220 PLA
5230 PLA
5240 :
5250 .exit2
5260 PLP
5270 RTS
5280 :
5290 .clear
5300 PHP
5310 TYA
5320 PHA
5330 TXA
5340 PHA
5350 SEI
5360 LDA #&7C
5370 CPX #&0A
5380 BEQ clear10
5390 BCS exit1
5400 LDA #&0D
5410 :
5420 .clear10
5430 JSR osbyte
5440 PLA
5450 TAX
5460 PLA
5470 LDA #0
```

→

From Page 129

```
5480 STA flags,X
5490 BEQ exit2
5500 :
5510 .brkv0
5520 OPT FNdata(2)
5530 .evnt0
5540 OPT FNdata(2)
5550 .oswd0
5560 OPT FNdata(2)
5570 .rdch0
5580 OPT FNdata(2)
5590 :
5600 .curevnt
5610 OPT FNdata(1)
5620 .pendflag
5630 OPT FNdata(1)
5640 .wk1
5650 OPT FNdata(1)
5660 .wk2
5670 OPT FNdata(1)
5680 :
5690 .flags
5700 OPT FNdata(11)
5710 .lo
5720 OPT FNdata(11)
5730 .hi
5740 OPT FNdata(11)
5750 .xreg
5760 OPT FNdata(10)
5770 .yreg
5780 OPT FNdata(10)
5790 ]
5800 NEXT
5810 :
5820 S%=0
5830 FOR J%=code% TO P%-1
5840 S%=S% EOR (J% MOD 256*?J%)
5850 NEXT
5860 PRINT "Code assembled. Area use
d &"; ~code% " to &" P%
5870 PRINT '"Entry points" TAB(5) "E
nable  : &"; ~Enable TAB(5) "Disable
: &" Disable TAB(5) "Set     : &" Set
 TAB(5) "Clear   : &" Clear
5880 PRINT '"Data tables" TAB(5) "fl
ags   : &"; ~flags TAB(5) "xreg    :
&" xreg TAB(5) "yreg    : &" yreg
5890 PRINT '"Checksum = &";~S% ''"Pr
ess any key to continue with the" '"d
emonstration, or ESCAPE to exit"
5900 X=GET
5910 ENDPROC
5920 :
5930 DEFFNdata(X%)
5940 FOR P%=P% TO P%+X%
5950 ?P%=0
5960 NEXT
5970 =I%
5980 :
5990 DEFPROCbas1
6000 execute_PROC = &B1C6
6010 find_line_no = &B3F6
6020 push_strings = &BDCA
6030 pull_strings = &BDE3
6040 ENDPROC
6050 :
6060 DEFPROCbas2
6070 execute_PROC = &B197
6080 find_line_no = &B3C5
6090 push_strings = &BDB2
6100 pull_strings = &BDCB
6110 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 149.

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How to put block graphics in their place

£10 Prize letter

SINCE reading Jim Notman's article on the teletext Screen Editor in the August 1984 issue of The Micro User, *I have had great fun drawing teletext screens, but with some frustration. This is due to the necessary search for the various block graphics and corresponding lower case letters.*

I therefore set about making a procedure for plotting the blocks in the place where I required them.

The first move was to make use of f0, the 128 key, which appears not to be used.

By toggling this key the graphic block calling routine can be run. On calling the procedure the keys Q, W, A, S, Z, X in upper or lower case toggle the small graphic blocks on or off in the pattern of the arrangement of the keys.

At the same time the lower case letter for the symbol is displayed at Char in the status line.

To exit the routine, f0 is again pushed. I had to overcome the CHR$127 problem on the full block selection, by trapping 127 and inserting 255.

I found this a saving from what was a time consuming exercise of looking through the chart for the block graphic arrangement.

The corresponding letter which appears on the base line at Char can then of course be copied if more than one of the same graphic is required. – **Chris Jackson, G4NAB.**

```
 145 IFa=128 THEN PROCgrap
hic:PROCwrite:PROCcursor:GO
TO160
 2220 DEFPROCgraphic:VDU160
,8:IN$="QqWwAaSsZzXx"+CHR$1
28+CHR$128
 2230 REPEAT
 2240 A=INSTR(IN$,GET$):A=(
A+1) DIV 2:IF A=0 THEN2240
 2250 IF A<7 THEN PROCtoggl
e
 2260 UNTILA=7:ENDPROC
 2270 DEFPROCtoggle
 2280 DATA 1,2,4,8,16,64
 2290 RESTORE2280
 2300 FOR B=1 TO A :READ b:
NEXT
 2310 A%=135:bits=((USR(&FF
F4) AND &FF00)/&100) EOR b
:A%=bits:IFA%=127 THEN A%=2
55
 2320 CALL&FFEE:A%=8:CALL&F
FEE:PROCread:a=bits:ENDPROC
```

Variations of GCOL

I USE my BBC Micro almost entirely as a word processor with View, but am also interested in graphics.

My knowledge of Basic is sparse, but I have quite a number of graphic programs which from time to time I pick up and alter.

Recently playing about with a program, the auto key overran after GCOL.

As a result I tried out quite a few numbers and was amazed at the response. I went through hundreds, thousands, on to millions and ended up with billions.

By elimination I found that the highest number the micro would accept is 2147483647. Add one unit to this and it comes up with "Too big".

Am I correct in assuming that each number from 0 to 2147483647 gives a different image?

If this is so I calculate that one change of program a day would take 5,883,516.14 years.

In view of the fact that I am 77 years old this month I fear that there will not be much hope of me doing it. – **H.S. Dalling, Barry, S. Glamorgan.**

● There are only 16 variations of GCOL – GCOL 0 to 15. They repeat every 256, so, for example, GCOL3,x and GCOL515,x will do the same.

GCOL 16,x to GCOL 255,x will do one of the other 16, but at random and could be different in different computers.

2147483647 is the largest integer the BBC Micro can handle. You get "Too big" if you type X%=2147483648.

Win a tenner

● *Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. Writers of the three most interesting letters will each receive a £10 prize.*

Driving a bargain

I TOTALLY agree with the comments made in the "Where to buy?" article in the June 1986 issue of The Business Micro User. *However the ignorance applies not only to business hard/software, but in general. This is especially so as regards disc drives and stems from two factors:*

Firstly the general practice of wholesalers-cum-suppliers in buying all sorts of disc drive boards and selling them under their own brand name.

Fair enough so long as they stick to the same make and say so, but some buy whatever boards come cheaper at the time and sell them as the same model.

This may be satisfactory if the specifications are identical, especially the step, settle time and head load.

These of course will be needed to set the disc drive timing links in the micro itself to get the most efficient usage.

Secondly how many dealers

Cheat challenges

I AM fed up with the perpetual moans of Elite commanders, culminating in Nicholas Dorgu's letter in the July issue of The Micro User *complaining about Elite Cheat, or should it be Elite Bleat?*

Surely they realise that, like cheating at Patience, the cheaters only cheat themselves.

To date nobody seems to have realised that Elite Cheat can provide a new challenge.

Creating a Super ship gives no satisfaction to the truly Elite. The alternative is to cheat downwards.

I created a spacecraft with no lasers, no missiles, no fuel, no credits and a one ton cargo bay. Having earned Elite status the hard way I retained this to give me moral support.

I then set out from Lave hunting for pirates armed only with my energy shields to use as a battering ram.

It was hard, slow work earning credits and running back to the space station with them. Docking minus the front sights can also be a bit tricky.

It took me three long evenings to equip my ship and complete the two missions but I am, after all, a grizzled old Elite commander aged 55.

The young whizz kids should beat that easily. Come on you Elite commanders, stop complaining and find out how good you really are. – **Commander Peter Phipps, Stockport, Cheshire.**

From Page 133

would you say have any idea of what or where the disc drive timing links are in the BBC Micro?

How many have any notion of how to set the drive links on the drive board, or what or where the terminator link is?

In all fairness to the dealers I think the fault is with the wholesalers who should make more readily available the true name of the drive together with timing data in their advertisements, as well as giving details of the location and switching of the links within the actual drive.

Retailing and advertising methods for disc drives in particular leave a lot to be desired and should be tightened up.

At present there is nothing stopping a supplier switching from a fast drive to a slower one and still using the same serial number without anyone being the wiser.

Certainly the make of a disc drive, with or without the trade wholesaler's name, should be clearly stated in an advertisement.

It should also be shown on a specification plate on the outer cover of the drive, which could also give voltage, amperage and linkage information. – **E.A. Allchin, Bridgwater, Somerset.**

Tokens trouble

AM I to assume that you have lost interest in the many thousands of us who still use Basic 1?

I have been trying for weeks to get Catalog II running, and have been anxiously waiting for modifictions to be published to allow it to run on Basic 1.

I have amended OPENUP to OPENIN – lines 1740, 2410 – but the program still will not run correctly – mainly in regard to the PROCsave and PROCrestore features.

Is this failure due to other amendments required for Basic 1 machines, or is it due to other errors? – **Ken Langham, Croydon, Surrey.**

● Our listings are taken from working copies of the program, which are tested on several computers including a Basic I micro.

Although Catalog II worked on Basic I, due to tokens being interpreted differently on Basic II the OPENINs listed as

£10 Prize letter

Wisdom on Wizadore

LAST year I got Wizadore from Imagine. Frustration soon set in, but through trial and a lot of error I managed to crack it.

Here is the complete solution, for those frustrated players who are still unable to complete the game:

Proceed across the small bridge in front of you, and while avoiding the guard and the arrows of the bowman climb the ladder and collect the first scroll.

Descend the same ladder and the ladder almost directly below to the ground. Jump the gap in front of you and run to the right.

At the second gap just fall down it and go down the stairs and the ladder. Being very cautious and avoiding all the nasties jump all the gaps until you reach the next set of stairs which you should climb.

Continue to the right to another set of stairs which lead back to the surface. Climb this and carry on right. Jump over the arrows, then climb the first ladder you come across, kill the guard and descend the next ladder on your right in order to get the second scroll.

Now go back the way you came up until you reach the point you first descended below the surface: down the gap, down the stairs, down the next stairs, over the gaps, up the ladder, up the stairs and through the gap.

You should now be on the surface again. Proceed to the left and drop down the first gap.

Go down the stairs and next ladder, and avoiding all the usual nasties jump across the gaps until you reach the other side.

Go up the ladder, along, and up the stairs until you are on the surface once again.

Go to the right and after a short time you should see the third scroll. Climb the ladder, collect the scroll and carry on right to pick up the extra life.

Now double back and drop down the gap which you came out of not so long previously.

Go down the stairs and then down the first ladder which you come to and go down the ladder on your immediate left, so that you are on the same level as the guard and the extra life.

Kill the guard with your newly acquired scroll and collect the extra life. Then go down the gap on your left to the next level.

Go down the stairs and the next ladder. Jump the gaps and climb the ladder on the other side. Jump across the next two gaps and then descend the next two ladders.

Once you are on the ground run to the right. Drop down the gap to the next level and descend the stairs.

You should now see two big cells and the first part of the sword which you are trying to collect. Cross the gaps, use the various ladders until you reach the ground. Run right and collect the first part of the sword. Go back the way you came to the previous two levels. Climb the ladders and go right. Once on the surface drop down the second gap.

Go right, but instead of climbing down the second set of steps go down the ladder which is prior to them. Continue down to the next level and right to get your extra life.

Keep going right by crossing gaps and descending ladders. You should reach the floor where you must run to the left. Drop down the gap to the next level.

Go down the stairs and proceed to the left. Don't go down any ladders, but go to the extreme left of the screen and up.

Ascend the stairs in front of you, go over the gaps and up the stairs to collect the second piece of the sword which is now in front of you. Double back down the ladders and go through the gap in the floor.

Go down the stairs and down the ladders to the ground floor. Carry on through the gap which is now on your right, down the stairs, down the ladder, across the bridge and jump the consecutive gaps.

Proceed up the ladder and then up the stairs to the next level.

Climb the following two ladders and once again go across the gaps, up the ladder on the opposite side and then go up the stairs to the next level.

Climb the ladders directly in front of you, but leave the bottle for the time being. Continue across the gaps and up the ladder on the far side.

Go across the next two gaps. Below you will see the dragon, but don't despair – he doesn't get off scott free. Take the stairs to the next level.

Go up the ladder and the next set of stairs. Go down the ladder to pick up your extra life, then up the ladder and the next set of stairs to the surface.

Ascend the next two ladders and cross the drawbridge to collect the extra life. Go down the two ladders on your right and collect the final piece of the sword.

You will notice that the castle has no drawbridge. You must now back track to the dragon, with the sword assembled in the correct order.

Proceed down the ladders until you are on the same level as the dragon. Run towards it taking care to avoid its fiery breath, and run straight into it.

Providing the sword is assembled in the correct order the micro will do a little ditty and the dragon has snuffed it. Pick up the bottle and go back towards the castle.

On arrival you will see that there is now a drawbridge. Cross it and just keep going. You will now see the secret game code. – **R.J. Allen, Taunton, Somerset.**

OPENUPs.

We're sorry for this minor slip, but as far as we know there are no other errors in the listings.

Catalog II update

CONGRATULATIONS on another excellent program – Catalog II – in the May issue of The Micro User.

Only one small niggle. I found that after using the program the auto-repeat delay and auto-repeat rate are not set back to normal by either pressing the Break key, or PROCfx after a CHAIN or LOAD.

*The default values for *FX 11 and *FX 12 are 32 and 8 respectively, not 20 and 2 as in the listing.*

*Altering *FX 12,2 in lines 230 and 1200 to *FX 12 will reset both *FX 11 and *FX 12 to their correct default values.* – **J.L. Bulmer, Brighstone, Newport.**

Programs reversed

THANKS for publishing my case conversion letter in August Micromail. Unfortunately a couple of errors have crept in during your transcription.

Less important is that the names of Programs I and II were reversed, and line 10 of Program I – as printed – should read UPPERCASER.

There is an error in your Program I which prevents it working. Line 130 should read: 130 BCS nochange. – **Peter Vasey, South Shields, Tyne and Wear.**

Mode 7 screen dump

THANK you for providing screen dumps for the JP101 printer.

Unfortunately they do not cope with Mode 7 screens, which are the only ones for which I am ever likely to require a screen dump facility.

So how about a screen dump routine for Mode 7, and preferably one that can be used in conjunction with the Micronet software – Version 4 in my case? – **I.M. Fitzwilliam, London.**

● You will be pleased to know that we'll be covering this in a forthcoming issue.

Protect your programs

£10 Prize letter

*WHILE writing a program recently I decided to put some measure of protection on it. The Escape key is easy enough to trap with a simple *FX200,1, but the major problem was the Break key.*

Originally I trapped it with:

```
*KEY10 *FX200|MOLD|MRUN|M
```

This was fine until somebody tried Control+Break. Eventually, I wrote a small piece of code to intercept the Break key and define it permanently as a function key. I found this useful, but realised that the program would have a lot more potential if you could simply program the Break key as if it were a normal function key and still stay through Control+Break.

So I expanded the program to the final version shown below. Input should be just as if you were defining a normal function key. The resulting code will remain through all combinations of Control, Shift, Delete and Break.

The code uses &900-&9FF to store the message, so writing anything here will probably cause the micro to crash.

*Also do not include any commas in your input as the program will think you are entering another string. You can use Space instead of a comma in a *FX command.*

One last thing – if you get screenfuls of garbage when you first run the program just press Space to continue. – **Nigel Scott, Crowborough, East Sussex.**

```
  10 MODE7
  20 PRINT"Please type in
your key definition."''"(eg
,";CHR$134"!H(C) MICRO USER
!J!U!M";CHR$135;")"
  30 PROCpresent
  40 PRINT''"New Definitio
n :-"
  50 INPUT'"] "M$
  60 FORI%=1TOLEN(M$)
  70 IFMID$(M$,I%,1)="|"PR
OCchange(I%)
  80 NEXT
  90 PROCprogram
 100 CLS:PRINT"O.K."':END
 110 END
 120 DEFPROCprogram
 130 FORI%=&900TO&9FF STEP
4
 140 I%!0=0
 150 NEXT
 160 FORO%=0TO2STEP2
 170 P%=&900
 180 [OPTO%
 190 BCC ended
 200 .loop1
 210 LDY message,X:CPY#&FF
:BEQ ended
 220 INX:STX&80
 230 LDA#&8A:LDX#0
 240 JSR&FFF4:LDX&80
 250 BNE loop1
 260 .ended
 270 RTS
 280 .message
 290 ]
 300 $P%=M$
 310 P%=P%+LEN(M$)
 320 ?P%=&FF
 330 NEXT
 340 !&287=&9004C
 350 ENDPROC
 360 DEFPROCchange(L%)
 370 CH%=(ASC(MID$(M$,L%+1
,1)))-64
 380 M$=LEFT$(M$,L%-1)+CHR
$(CH%)+RIGHT$(M$,(LEN(M$)-L
%-1))
 390 ENDPROC
 400 DEFPROCpresent
 410 po%=&918
 420 IF?po%=0 GOTO510
 430 PRINT'"Present defini
tion :-"''"] ";
 440 REPEAT
 450 chr%=?po%
 460 IFchr%=127 GOTO500
 470 IFchr%>31 AND chr%<12
7 PRINTCHR$(chr%);
 480 IFchr%<32 PRINT"!";CH
R$(chr%+64);
 490 po%=po%+1
 500 UNTILchr%=&FF ORINKEY
-99
 510 PRINT
 520 ENDPROC
```

Luckless graphics

I RECENTLY took up your offer to buy the Olivetti JP101 printer. I've had no luck with the graphics.

Can you point me at a screen dump program that works for this printer?

Also is there a way I can get your Mini Office II to do its graphics properly? – **G.G. Turburville, Sawbridgeworth, Herts.**

● There was a screen dump for your printer in the August 1986 edition of *The Micro User*.

To use it with Mini Office II save the screen – Control +S – then use this program to dump the screen.

Shortage of £s

USING a BBC Micro with a Smith-Corona Fastext 80 printer, I have been unable to get the printer to print the £ sign.

It appears in the correct position on the monitor, but on paper it comes out as an apostrophe. I contacted Acorn about this, but on following their instructions got exactly the same

MICROMAIL

From Page 135

result. The supplier of the printer did not want to know and suggested I use the instruction manual, which does not use the correct type of Basic for the BBC Micro.

Also there are different types and sizes of type on the printer as it is a dot matrix, but I have been unable to work out the correct commands to use this either.

I have tried to translate the printer manual into the correct format without success – either I get an error message or nothing happens.

I have also tried to use a screen dump program in conjunction with a couple of different graphics programs.

The result is a column of @ signs at the left hand margin, but otherwise a blank sheet of paper.

I presume I need to adjust the program because of the type of printer I am using. Once again can you advise me?

The dealer told me that the computer and printer were fully compatible, but I am now beginning to wonder about that. **– I.P. Wright, Nether Heyford, Northampton.**

● To print the £ sign you need to select the UK character set. As with most printer manuals the method to do this is written as ESC R n.

ESC is character 27 and R is character 82, which is found by **PRINT ASC("R")**. n is the number of your character set – 2 for UK on the Smith-Corona.

So to select the UK character set you need to send 27,82,2 to your printer.

This is achieved by typing VDU1,27,1,82,1,2 because the next number following a VDU1 is sent to the printer.

If you then put # in your text it will print as £. Some word processors allow you to define the £ sign so you could type £ and it would print as such.

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

The screen dump you tried was not for a Smith-Corona printer.

Most dumps are for Epson printers, and although your machine is compatible with the BBC Micro it will need a screen dump specifically written for it rather than one that is for an Epson-compatible printer.

Confessions of a faint-hearted Micro User

Tales from the crypt

Dear Trev,

Have you ever watched any of those late night horror movies? You know, the kind where the heroine, Flora, on being told that the local fauna includes vampires immediately decides to go for a midnight stroll in the graveyard because she can't sleep. And you know that the sucker's going to be sucking blood before the night's out.

Irritating aren't they? You think to yourself "No one can be that stupid". Well I know someone who can be. Me.

Why oh why did I let myself get involved with Doreen? Surely for once in my life I could get up enough courage to run away. But no, I had to say "Yes", and that's how I ended up at her place.

Of course it had to be done surreptitiously. Andrea's been none too keen on my being alone with women since I demonstrated my beeb to the local Girl Guides.

As it was I was able to put Doreen off for a couple of weeks while I "looked for the right window of opportunity", as computer companies say just before they launch a doomed micro. Sadly, however, A. went to Notre Dame for the weekend with the Bellringers on a Quasimodo pilgrimage.

Doreen picked me up outside the Ram and Buffer. "My car's a rusty Volkswagen", she'd told me. I recognised it from the "Polo – the car with the holes" sticker in the rear window.

On the back seat was a shotgun – "Just in case I see any of my pupils". She was still in her work clothes – a flak jacket (complete with "Teachers do it after school" badge) and knee pads.

"Been teaching karate?" I asked.

"No, needlework" she replied, ending the conversation until we got to her place. Remember the house from Psycho? No sooner was I in than she was dragging me upstairs to see her Master.

"Go on then", she said, "how do you turn it on?" In no time at all I had the brute working. I didn't dare not to. Still I couldn't believe that a computer teacher could know so little about it.

"Well the guy who used to do the job got it on the strength of his saying that he used a ZX81 to control the central heating. We only found out later that he used to hit the pipes with it when there was an airlock.

"But how did you get the job?"

"I was the only one who didn't attend the meeting that decided."

With that we turned to exploring a disc that she'd been given by the ex-expert. And fascinating it was too. There was a lovely game called Catharsis where you chased kids round a classroom and beat them up when you got them in a corner. Better still was the Keith Joseph Emulator – a long, elaborate program that actually did nothing.

However what really intrigued Doreen was the timetable program that was supposed to sort out which teacher taught what where when and to whom – leaving only the question "Why?" Apparently it was top secret and no one was meant to have a copy of the thing.

"How did you get hold of it?" I asked.

"The kids threw it in as a sign of goodwill during one of the ransom negotiations."

Although the program looked straightforward I just couldn't figure out how it worked.

"How come Miss Smith has so few classes when everyone else has so many?" I asked when I'd run it for the tenth time.

"She's the games mistress.

"But our PE teachers were always doing something. You never saw them without a ball in their hands.

"Possibly, but she teaches French" she answered darkly.

After that I tried using some of my own software, none of which worked. I remember complaining to a man from Acorn about this at the last Micro User show and being told that the Master and Model B were compatible, but my definition of compatibility wasn't compatible with his.

I was saved from further embarrassment by a sheet of flame erupting from the Master.

"I knew you'd be hot stuff, Bob", she cried, with a look that suddenly made A. seem very dear and precious and gentle. I shall draw a veil over the rest.

Anyway I must go – the moon's full and I think I'll pay a call on that nice Mr Frankenstein who lives up the road.

Yours,

Bob

PS: Did you know that a mention of GCSE has the same effect on teachers as garlic has on vampires?

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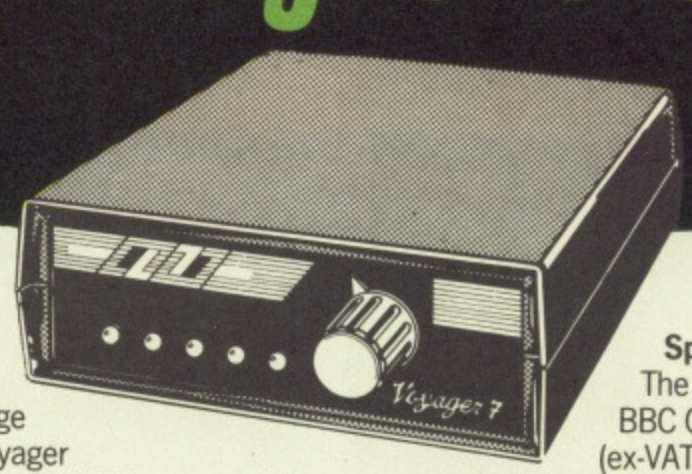

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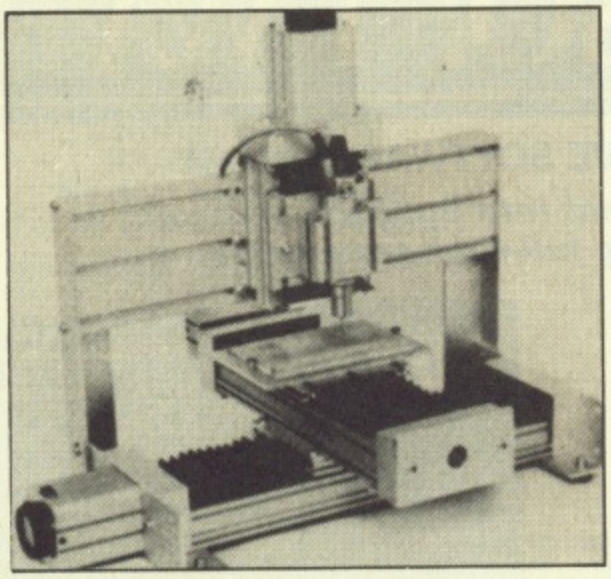

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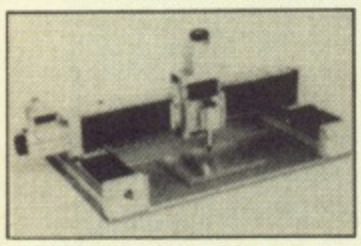

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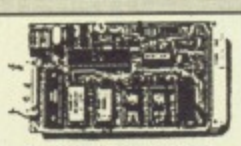
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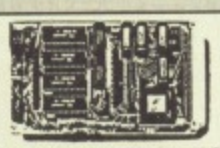
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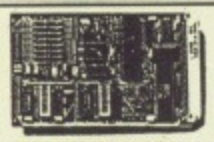
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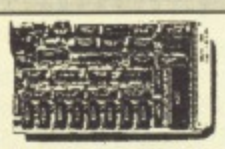
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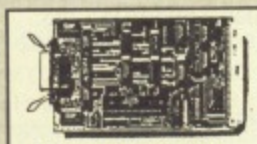
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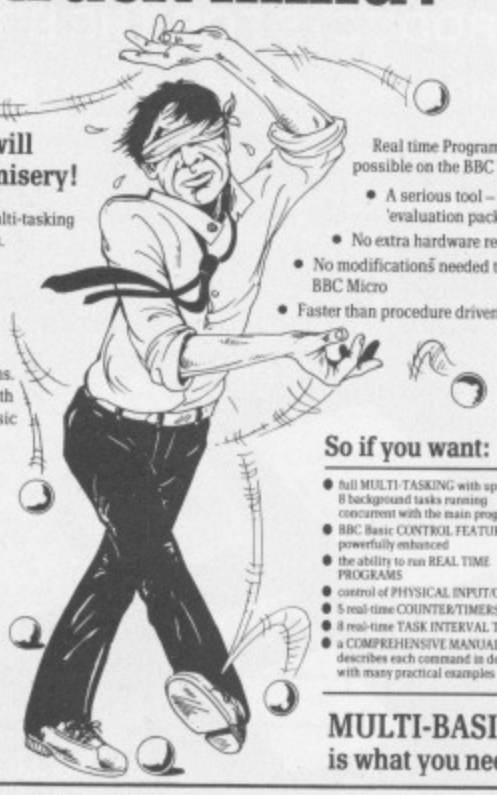

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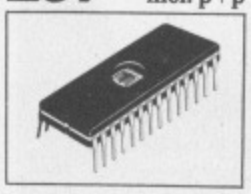

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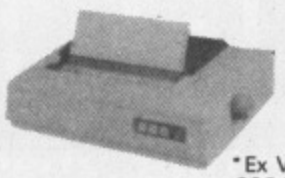

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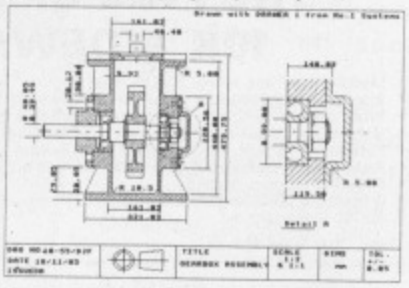

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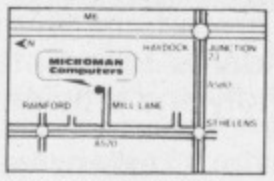

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No. 13 September 1986

NEWSLETTER

Link with stars

WRITER and photographer David Cotton leads a busy and sometimes glamorous existence as a freelance journalist based on the Continent.

Everywhere he goes on assignment he takes along his portable Brother EP44 typewriter/terminal and accoustic coupler to file his articles using the MicroLink telex service.

"I write my copy on the portable, which has limited word processing facilities for up to about 600 words, then dump it in batches to my mailbox for telex transmission and later for further processing on my BBC Micro when I am back in my office in Holland", says David.

"A lot of my work is for magazines and involves TV and film stars, and I use MicroLink to contact people like these who I need to interview and photograph".

David has a useful tip for globe-trotting, portable-owning MicroLink users: "International travel with a computer can be a disaster.

"The word computer to customs officers is guaranteed to cause all sorts of problems as they try and decide if that Electron you are carrying back for your 7-year-old son is an illegal import full of pirate IBM software.

"I truthfully point out that my machine is nothing more than a typewriter, and hide the accoustic coupler at the bottom of my clothes bag".

The security connection

ALL the many facets of MicroLink's value added services are proving useful to one of the world's most prestigious independent watchdogs on security affairs.

The London-based International Institute for Strategic Studies has for 30 years monitored shifts in the balance of power and in the arms race, and has provided a forum for unbiased discussion of the global strategic situation.

It uses MicroLink's telex facility to keep in touch with its 3,500 members in 80 countries, to correspond with those who have attended its conferences, and to make travel and hotel arrangements for its 35 permanent staff and 12 researchers, as well as for handling membership renewals and ordering publications from around the world.

But the institute also appreciates the more sociable aspects of the services which MicroLink provides.

Says IISS systems manager Helen Rayner: "We find some of the other facilities like FloraLink as useful as, say, the international Official Airlines Guide – and personally I find TheatreLink fascinating for its up-to-date information on the London shows".

... and research

THAT eminent government research establishment the National Physical Laboratory is using MicroLink to move the data it requires for its important research and development projects.

Fast and efficient exchange of information and transmission of documents is achieved through the medium of MicroLink's electronic mail facility.

Thirteen mailboxes have been distributed among the establishment's divisions, which are mainly involved with high-level physics.

Previously the Laboratory subscribed directly to Telecom Gold, but discovered that MicroLink was more economical and had more facilities.

YOUR chance to join MicroLink – Page 97

Magazines go on database

NEW and valuable information services are now available to business users of MicroLink via a special gateway to the Datasolve database.

Following the success of putting its international news and current affairs service World Reporter on-line, Datasolve has opened up a complementary range of advertising and marketing databases.

It includes electronic versions of the publications Campaign, Marketing, PR Week, British Rates and Data and Marketing Surveys Index.

The new databases went live just three months after World Reporter's debut.

Datasolve marketing manager Hilary Whelan said: "These prestigious advertising and marketing databases will increase appeal to the many business users of MicroLink".

MicroLink users can log on to the new databases simply by entering a single command.

Travel talk

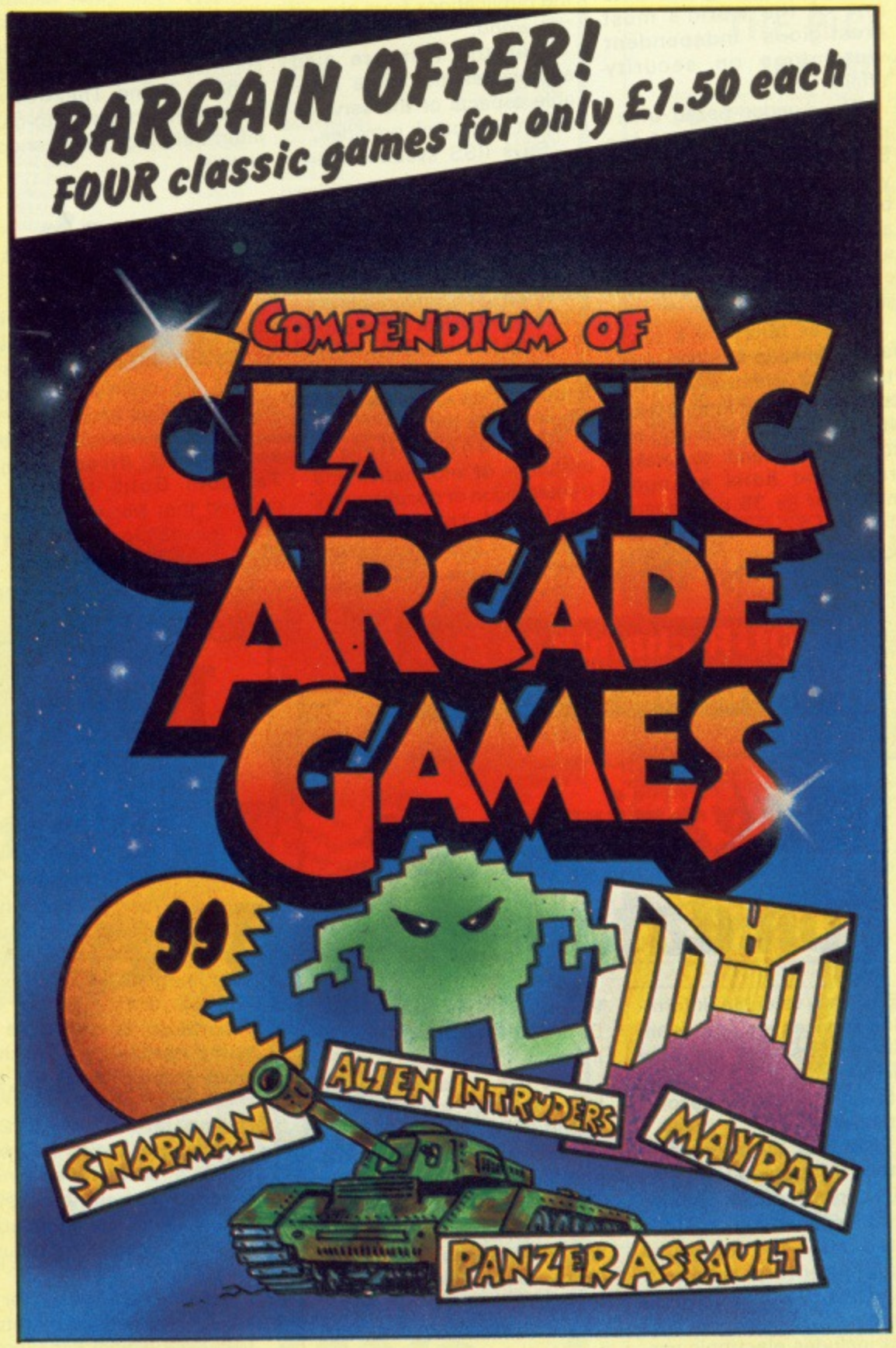
ONE of the jewels in the crown of British Rail is the Euston Travel Centre which offers the most comprehensive travel information service imaginable.

Now that mine of information is available to computer owners in their own homes through the medium of MicroLink.

The latest addition to MicroLink's British Rail section is a facility for obtaining information from the Euston Travel Centre by completing a simple electronic request form.

Information asked for is swiftly transmitted by return to the subscriber's mailbox – or sent by snail mail if preferred.

Here's something SPECIAL from THE MICRO USER



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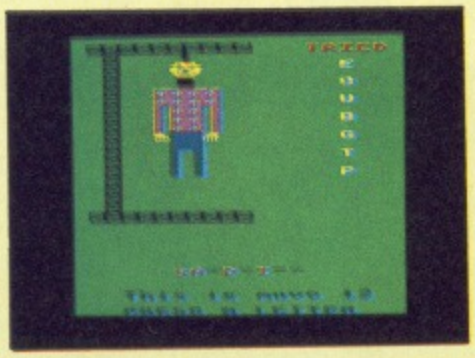

HANGMAN
Improve your child's spelling with this fun version of the popular game

ODD MAN OUT
Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM AT THE BACK OF THIS SECTION

Two bonus programs AND a lower price!

In addition to the rich feast of programs from the pages of *The Micro User* this month's tapes and discs include two big extras:

* ***Rockfall:*** Tired of the same old arcade games? Looking for new challenges? Well come diamond mining in Rockfall and you'll find unlimited action. Mastering the eight hazardous levels of the standard game is only a beginning – *You can go on to create your own, even more testing screens.* So as you increase in skill, Rockfall increases in difficulty.

* ***Any Questions?:*** An extended version of our multiple choice question creater *(see Page 47),* incorporating full colour, complete analysis of results and hard copy options. Also included are two sample files of O-level mathematics and general studies questions.

And we've taken 50p off the price of our monthly tapes and discs, making them the best program bargain ever for the BBC Micro!

Also on the September tape or disc: Pear Picker, avoid Plastered Patrick in your attempts to become a professional fruit picker. **Basic Events,** a versatile routine to control events from Basic. **Learner,** teach your word processor to remember those key sentences. **View Preview,** a useful program to preview pages of View files, complete with highlights. **VDU19,** programs to demonstrate the illusion of animation.

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All the programs from the last 12 months of The Micro User are available on tape and disc!

AUGUST: Harbour Command, protect a Cornish town. **Fruit Machine,** a gambler's favourite. **Mouse Organ,** AMX mouse music utility. **Flash,** alternative flashing colours. **String Formatter,** prevent end of line word splitting. **M/C Games,** random number and key detection routines.

SEPTEMBER: Ball Lightning*, tame the lightning. **Quarters,** game of skill. **6502 Games,** a simple arcade game. **Variable Lister,** track your variables. **Smiley Hunt,** Al's game. **Error handling,** the vital routines.

OCTOBER: Karate, superb martial art action. **Solitaire,** all-time favourite. **Scroller,** text scroll utility. **Case,** an ON PROC command. **Disc Scan,** search for disc files. **Adventure,** avoid the vampire.

NOVEMBER: Whodunnit, solve the murder. **Gloop Gulp,** zany arcade action. **Basic Analyser,** take the drudgery of debugging. **Wordwise F/keys,** get the most from your word processor. **Sideways,** sideways screen clear. **New Modes,** Modes 8, 9 and 10. **Disabler,** prevent star command clashes.

DECEMBER: Wizard's Castle*, recover a diamond from the necromancer's lair. **Squares,** 'join the dots' strategy. **McBase,** powerful database. **Alphabet Train,** early spelling. **Basic Analyser,** the vital cross reference tables. **Wordsquare Creator,** to create your own puzzles. **Dumper,** how your programs affect memory. **Subhunt,** the final listing. ***Plus the listings from Body Building and Adventures.***

JANUARY 1986: Megaroids, exciting space action. **Claustrophobia,** alone in a maze. Can you get out of the maze in one piece? **Fives,** mind bending noughts and crosses. **Music Editor,** translate musical notation. **Wordsquare Solver,** the program to help you solve them. **Find and replace,** find and replace any item of text in a Basic listing. **Discopy,** copy and/or rename files. **S-sound,** sounds into electronic effects. **Alice,** another baffling problem.

FEBRUARY: Tipaka, can you escape the Logan King's castle in one piece? **USS Endeavour,** fast and exciting space invader action, and it's in machine code. **Ploy,** hours of enjoyment with this brain teasing strategy game. **Up-and-downloader,** an invaluable programming aid for loading and saving. **Fast Verify,** a superb utility for verifying saved disc files. **Disc Assembler,** assemble multi-part source files to disc. **Shift and Echo,** more electronic effects from the Body Building course. **8271,** using OSWORD to format a disc in a special way. **Elite Cheat,** the easy way to the top.

MARCH: Morris Miner, collect the keys and escape the mine before your time runs out in this levels and ladders spectacular. **Poster Puzzler,** a sliding block simulation to provide hours of fun for the whole family. **Quicksort,** a fast machine code sort routine that uses and teaches recursion. **Character Sets,** a program to create and display your own fonts. **8271,** four programs to complement the last article in the series. **Sound Sampler,** two programs from the Body Building course. **Eleusis,** another mind bending puzzle from Alice.

APRIL: Ghouls of Azzod, can you escape from Azzod manor with its monsters, moving floorboards and venomous plants? **Mousetrap,** you'll need skill, strategy and a lot of luck in this very simple but infuriating chase game. **Character Sets,** outputting characters using Epsom compatible bit-imaging. **Special Fonts,** create interesting displays with this utility to give alternative fonts. **Notepad,** forget scraps of paper with this electronic jotter. **Hexer,** a hexadecimal loader for use in the machine code series. **Hyperspace,** another puzzler from Alice. **While Wend** and **While Wend Demo,** two listings from the mail pages.

MAY: Cavern Quest*, can you collect the diamonds before your oxygen runs out, avoiding the falling boulders as you go? **4-Site,** a mindbending 3-dimensional adaptation of noughts and crosses needing foresight. **Catalog II,** disc operations achieved quickly with a single key press. **Taming the Tube,** turning the 6502 second processor on and off by software. **Character Sets,** creating slim characters for use in Modes 2 and 5. **Alice,** another intriguing puzzle from our adventurer.

JUNE: Pendragon*, alone in a sugar factory, can you keep the evil yellow perils away from the sugar cubes, while positioning the four diamonds? **Spacebase,** as commander of a solitary spacebase you must defend Earth from the invading hoarde of aliens. **Rainbow,** whether doodling or creating works of art, this lightpen graphics utility will keep you happy for hours.

JULY: Royal Wedding, celebrate the most exciting royal event of the decade with this superb sliding block puzzle. **Dual Catalog,** feel restricted with the Acorn DFS maximum of 31 files? This utility to provide 56 on one side of a disc will solve your problems. **Viewgen,** what you see is what you get with this printer driver generator for View. ***PLUS digitised picture of Andrew and Sarah (disc only).***

AUGUST: Fruit Worm, can you survive the dangers of the deadly garden? **Upper,** force all your input into upper case. **Inkjet,** a printer test and two screen dumps for the ink jet printer. **Safer,** prevent accidentally overwritten files. **Hash,** a suite of programs illustrating searching techniques. **Geiger,** the software for the Body Building course.

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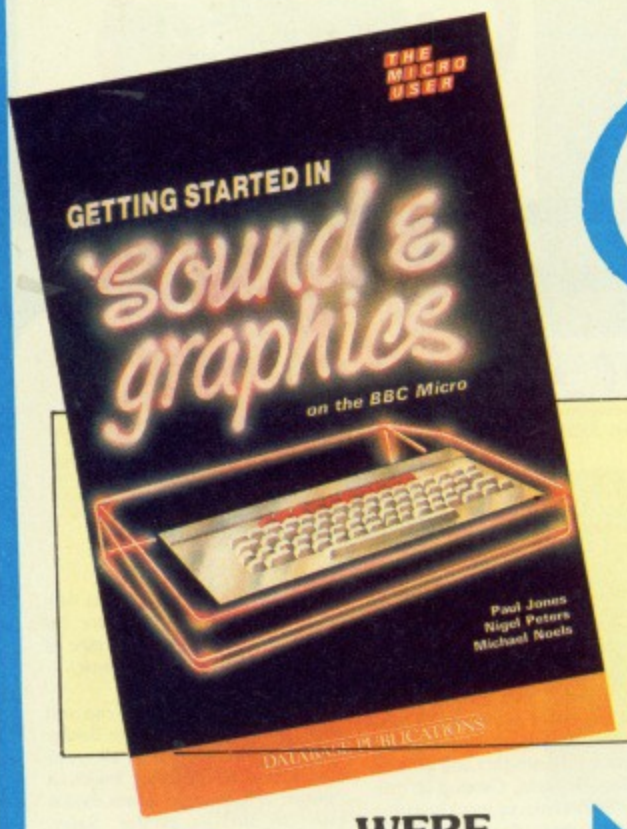

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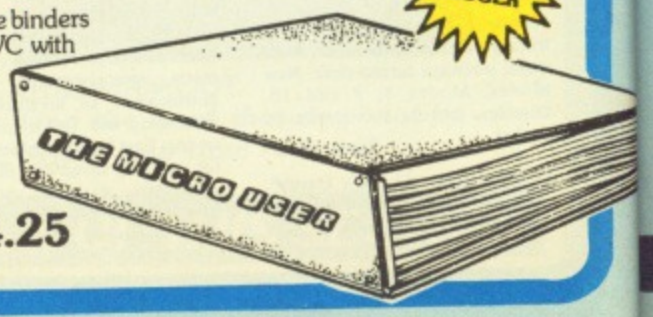

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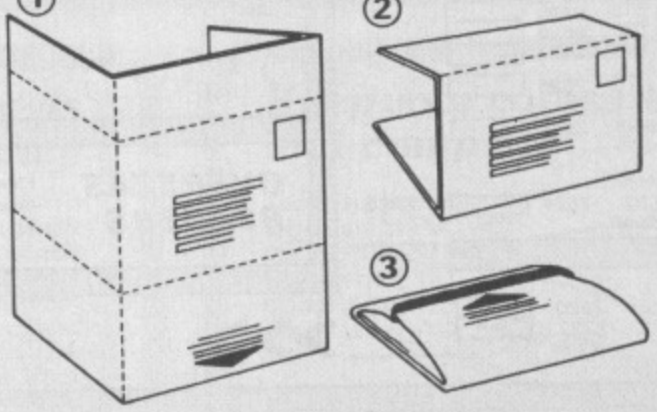

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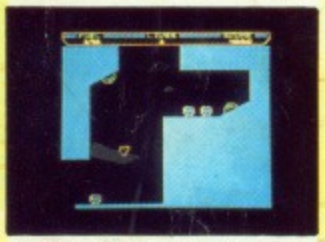

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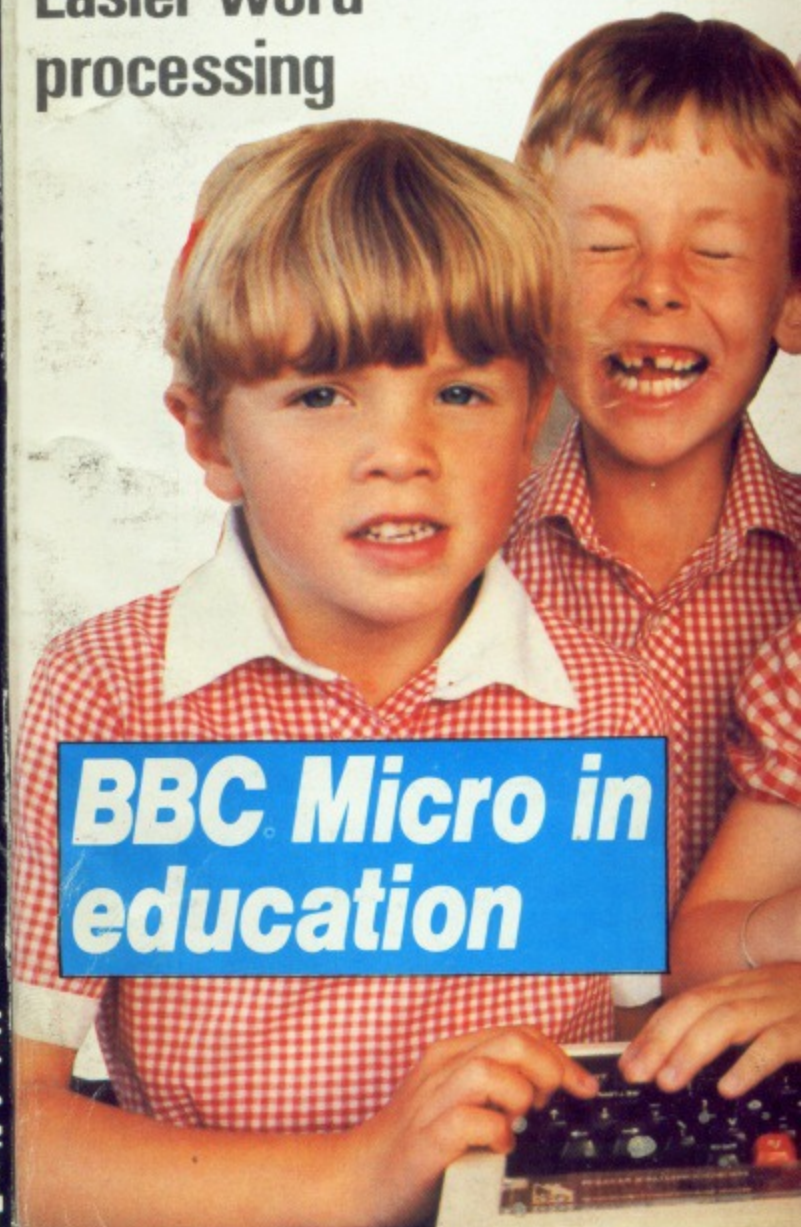

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