A Database Publication

THE MICRO USER

Volume 6
Number 8
October 1988
£1.50

Top-selling guide to the BBC Micro, Master, Archimedes and Z88

BUILDING FOR THE FUTURE

BBC Micro in control

MOON PATROL
Play our fast-action arcade spectacular

ADFS CATALOG
Keep a dedicated database of files

COMPRESS
Save more Archimedes screens on your discs

ADDRESS BOOK
Useful extensions for our type-in utility

FONTSTYLE
Producing your own personal stationary

Z88
- The ultimate link
- Choosing batteries

REVIEWS
- Watford DDFS
- Termite interface
- Mary Rose

...plus all the latest software

THE MICRO USER

Managing Editor
Derek Meakin

Group Editor
Alan McLachlan

Features Editor
Peter Davidson

Production Editor
Peter Glover

Assistant Features Editor
Steve Turnbull

News Editor
Mike Cowley

Technical Editor
Mike Cook

Promotions Editor
Robin Nixon

Reviews Coordinator
Pam Turnbull

Advertisement Manager
John Snowden

Advertising Sales
Peter Babbage, Gail Blincow

Tel: 0625 878888 (All depts.)
0625 879940 (Subs.)
Telecom Gold: 72:MAG001
Telex: 265871 MONREF G
Quoting Ref. MAG001
Prestel Mailbox: 614568383
Fax: 0625 879966

Published by:
Database Publications Ltd,
Europa House, Adlington Park,
Adlington, Macclesfield SK10 4NP.
Database Publications is a division of Europress Ltd

Subscription rates for 12 issues, post free:

£18 – UK
£28 – Europe (incl. Eire)
£34 – Overseas Surface
£45 – Overseas Air

ABC 59,727 Jan-June 1986
ISSN 0265-4040

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.

© 1988 Database Publications Ltd. No material may be reproduced in whole or in part without written permission. While every care is taken, the publishers cannot be held legally responsible for any errors in articles, listings or advertisements.

The Micro User is an independent publication and neither the BBC nor Acorn Computers Ltd are responsible for any of the articles in this issue or for any of the opinions expressed.

News trade distribution: Diamond Europress Sales & Distribution, Unit 1, Burgess Road, Ivyhouse Lane, Hastings, East Sussex TN35 4NR. Tel: 0424 430422.

Features

7 News
All the latest events in the ever-changing world of your BBC Micro.

33 Problem Solved
A helping hand with some of those mind-testing hardware problems.

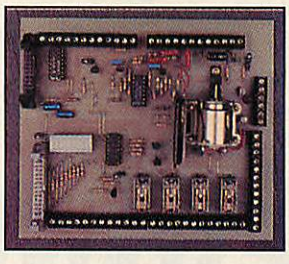
37 FontStyle
Using this useful package to produce a header for your letters.

57 Ceefax Guide
What's coming this month on the telesoftware pages of BBC TV.

60 Hac Man
A wealth of useful hints and news from our resident games expert.

65 Archimedes Q&A
All your questions answered about the top Acorn micro series.

66 Mad Hatter
Our monthly look at adventure games – old, new and revamped.



85 Body Building
Our technical guru flashes the lights on his experimenter's board.

113 Streamer
Get to grips with your Archimedes mouse with this graphics routine.

116 Ample Music
The final part of our series about using Hybrid's music software.

119 Leaky Listing
Test your skill at debugging with another in our occasional series.

120 Library
More high quality routines which you can use in your own programs.

127 Letters
The chance to get your news, views, moans and name into print.

Reviews

19 Software Scene
Our reviewers cast their eyes over the very latest games releases.

71 Watford DDFS
To get more from your discs look no further than this new DFS.

111 Termite
An interface for your BBC Micro that doesn't eat into your pocket?

Game

115 Moon Patrol
Make sure you don't get caught by the Fuzz in this all-action game.

47 BBC Link II
The ultimate way to transfer files and programs between micros.

53 Batteries
Which batteries does your Z88 need to meet your requirements?

Utilities

25 ADFS Catalogue
No more file searching with this fully-compatible disc database.

81 Address Book
Extensions and tips for our popular personal address book.

83 Auto Backup
Safety first: This routine will save files to drives 0 and 1 automatically.

107 Compress
Squeeze Archimedes screens for less space and faster loading.

Education

39 Update
Up-to-the-minute news of the BBC Micro in the world of education.

41 Balance
Easy instruction in the theory of moments with this short listing.

47 Ideal Input
Find out how to interface your software to the Concept keyboard.

52 Power Lego
Context-free computing enters the world of dynamics and control.

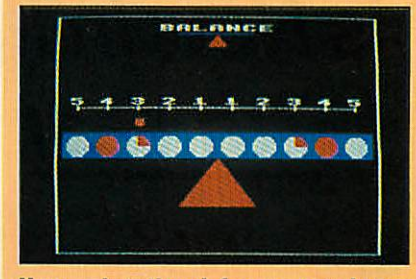
58 Mary Rose
Our reviewer gets to the bottom of this revamped education pack.

Cover story

Add the potential of Lego to Logo's power and you have the ultimate in educational resource packages to attract a wide range of ages.

Discover on Page 52 how Lego has truly entered the world of micro control.

Fun and Games



Have educational fun as you learn the theory of moments in minutes.
– Page 41

Join in the arcade action in our fast action game of the month.
– Page 115

Now you can get . . .

THE MICRO USER

FREE month after month!

That's the extra special offer we are making this month for all readers who take out a subscription to our monthly tape or disc.

It means you will receive £18 worth of magazines completely free of charge!

Details on Page 135

MICRO USER CLASSIFIEDS

The best bargains in the world of the BBC Micro come from fellow readers of *The Micro User*. Turn to **Page 112** to find just what you're looking for – from cheap modems to complete computer systems.

For full details on how the checksums work, see the Get-it-Right article on Page 28 of the February 1988 issue of *The Micro User*.

The Type-it-in symbol indicates that the feature contains at least one full length listing for you to key in on your micro.

NEXT MONTH

CONFUSION
Rubik's Clock solved
LOGOS
Personalised stationery
GAME
Bridg-It for BBC or Z88
FUTURES
Your own expert system

THE MICRO USER

November issue on sale October 5

NEWS beat

Duet in harmony at Music Fair

ACORN struck the right note when it teamed up with Electro Music Research to put the Archimedes through its musical paces at the recent British Music Fair.

It was an ideal opportunity for both companies to demonstrate the versatility of the Archimedes as a musical workstation, and further proof that Acorn is committed to what it sees as a rapidly expanding market.

"The BBC and Master series micros are already widely used in the music technology field", said Ian Laurence, Acorn's sales and marketing director, "and we are already seeing a great deal of interest in powerful, low-cost Archimedes-based systems".

Unlike most computers, the Archimedes features built-in Midi commands for controlling electronic instruments, samplers, keyboards or other computers and sequencers via a plug-in Midi interface board. And it can be used by musicians of all levels as a composing tool, standalone musical instrument, Midi system controller or as a teaching aid.

The speed of the Archimedes processor allows functions such as music scoring, waveform representation and harmonic analysis to be performed in real time.

And this, coupled with the graphics display controller with built in stereo sound, allows a musician to create and manipulate sounds in a way normally associated with mini computers and dedicated electronic systems.

EMR (0702) 335747 has exploited these features to produce the comprehensive Arpeggio Music System for the Archimedes. Managing director Mike Beecher has been demonstrating it to appreciative audiences in primary, secondary and special schools up and down the country.

He was on hand at the show to demonstrate a variety of musical software and hardware, including a preview of the new Studio 24 Plus system which offers a full recording studio environment on the Archimedes.

He was optimistic about the impact the Archimedes will have on a market currently dominated by the Atari ST: "The response has been quite remarkable, considering the strong position of other micros at present in terms of music, with bands like chart-topping L A Mix prepared to take on the Arc once the Studio 24 Plus is completed.

"It's the overall range of things we can do with the Arc that puts it above anything else at present".

Studio 24 Plus will be on sale shortly at £99 for a basic system pack – realistic costing is a keynote of EMR's policy.

"We've had to restructure to allow musicians and schools to use the Arpeggio system at a price they can afford, choosing the programs they need to get started", said Mike, "even though some, like the Studio 24 Plus are designed to professional standard but are simple enough for an eight-year-old to handle".

All EMR's new music products will be on display at the Electron & BBC Micro User Show in November, where a full stand will be equipped with the latest Midi instruments.

Projects deadline

THERE'S still time for entries to be considered for the 1988 Micro User Innovation Awards, the international competition open to all BBC Micro users – individuals, groups, schools, institutions and businesses.

And the projects entered for consideration can be serious, commercial, scientific or just plain fun – entries so far received have covered areas as diverse as GCSE course assessment, robot control and the archaeo-physics of Stonehenge.

The prizes in the BBC Micro section include an Archimedes, while the winner in the Archimedes section will take home a 24 pin Brother 1709 printer.

Closing date for entries is October 14, and an entry form appears on Page 114. Winners will be declared at the Electron & BBC Micro User Show in November.

Bridge that gap

FOLLOWING up on the success of Colossus Chess, CDS Software (0302 21134) has released an equally well implemented version of bridge for the BBC Micro and Master.

Colossus Bridge 4.0 – designed with both novices and experienced players in mind – can be used as either a tutor or an opponent, offering fast response time, the ability to save and load part completed games and an input option for problem solving sessions.

There are also rebid and replay options to allow players to learn from their mistakes.

The program plays the Acol system and incorporates three popular conventions – Blackwood, Stayman and Baron. For the uninitiated, a copy of Begin Bridge by G.C.H. Fox is included in the package. Price £11.99 on tape, £14.99 on 5.25in disc.

Database for Z88

THE Cambridge Z88, already recognised as having strong word processing and spreadsheet capabilities, is now supported by a new database package from Wordmongers (0296 437878).

ZBase is written in a format that will be familiar to users of some of the most popular database packages on the market, hence many off-the-shelf applications can be transferred to run on the Z88.

It's claimed that zBase also makes applications software development easier, while the package certainly gives Z88 users a faster search facility and the ability to index data.

ZBase is supplied on a slot-in rom cartridge priced at £69. A further application developers' version with a run time module should be available by the end of the year.

SOFTWARE FOR THE BBC MICRO & ARCHIMEDES

Archimedes Podule

A plug in podule which accepts up to 7 ROMS or RAM chips (each chip can be up to 128K bytes). Optional battery back-up for the RAM. Includes a full-feature RAM filing system (fully ADFS compatible) allowing storage of files up to a possible 896K bytes, as if they were on disc. Easy to install and comes with a full manual. NB: requires prior installation of a podule backplane. £49.00 + VAT or £59.00 + VAT with battery.

Speech System

Used in conjunction with the TMS 5220, the Speech System (Speech ROM and Text to Speech ROM) enables BBC B users to easily produce the entire range of English speech and intonation from their machines. NEW PRICE: £25.00 + VAT (+£5.75 for the 5220 if required).

Accelerator

The most comprehensive BBC BASIC compiler, with full floating point arithmetic. Can compile to an intermediate G code, which ensures that the object code is compact, but utilities are also provided to convert G code to faster machine code. NEW PRICE: £30.00 + VAT.

Mega-3

Recently released version of Inter-Word, Inter-Sheet and Inter-Chart, all on one 128K chip. BBC: £85.00 + VAT (ask for details of exchanges).

Wordwise Plus

A 40 column word processor with a flexible and simple BASIC type programming language for user specific programs. On ROM for the BBC, disc for the Archimedes.
BBC: £49.00 + VAT.
Archimedes: £20.00 + VAT.

Spell-Master

A 128K spelling checker on ROM, with a 57,000 word dictionary. Can check as you type in Wordwise, Interword or View, allows creation of user dictionaries & dictionary browsing. Crossword, anagram and fuzzy checking features. A completely new version for the Archimedes, with extra features. BBC, Archimedes and Z88: £51.30 + VAT.

Computer Concepts Ltd

Inter-Word

A full WYSIWYG word processor on ROM. Features include ruler controlled margins and tabs, simultaneous on screen display of printer highlights and text alignment, multi column printing, multi file operation, 40/80/120 column screen modes. BBC: £49.00 + VAT. Archimedes: £39.00 + VAT.

Inter-Sheet

An easy to use spreadsheet on ROM. Features include 255 rows × 64 columns with individually adjustable width, full range mathematical functions, selective printing, lockable boxes/rows/ columns, 40/80/132 column screen modes, auto step on. BBC: £49.00 + VAT. Archimedes: £39.00 + VAT.

Inter-Chart

A comprehensive chart and graph plotting program on ROM. Features include bar graphs, pie charts and line graphs (up to 16 in memory at once, overlay/print in any combination) auto/manual labelling, accepts data from file/keyboard. BBC: £32.00 + VAT. Archimedes: £25.00 + VAT.

Inter-Base

A database on ROM, based around a powerful programming language. Features of the card index program include menu operation, variable field length & number of fields per record, unlimited records, full conditional search & sort, fast search via indexes. BBC: £60.00 + VAT.

Gaddesden Place Hemel Hempstead Herts HP2 6EX Telephone 0442 63933
(Access & Barclaycard accepted)

What price your data?

You can cut the cost of running your Z88 – but should you? Peter Davidson presents the options

PEOPLE often ask me whether they should use alkaline or rechargable batteries in their Z88. I usually answer yes and leave as quickly as I can. However, that cop out stops here, so let's consider the design of the Z88 before answering this tricky question.

The machine works off four batteries that produce about 7v when fully charged. A "battery low" warning comes on at around 4.8v, and the display is cut off at about 3.5v. This leaves enough power to retain the memory for a while, giving you a chance to change the batteries, but all is not lost until their output falls to around 1.5v.

Plugging the mains adapter into the Z88 causes a drop of about 1v until it takes over from the batteries. That's why the battery low indicator sometimes comes on as you connect the adaptor – it means your batteries are below about 5.8v. You can clear the warning by switching the micro off and back on, providing that power is coming from the mains.

Now for the batteries themselves. Four alkaline's start their charged lives at around 7v and fall off gradually at a fairly steady rate. They refresh themselves slightly if they're not being used, but let's ignore that to keep things simple. Rechargables start lower – nearer 6v – and retain a full charge longer, but they then fall off rapidly.

If you think about how these two decay patterns fit the voltage levels that cause the battery low warning and retain the memory after the screen fails you'll see that your data is safer if you use alkaline batteries – after all, the Z88 was designed with them in mind. They'll last about 20 hours and you get warnings at sensible intervals.

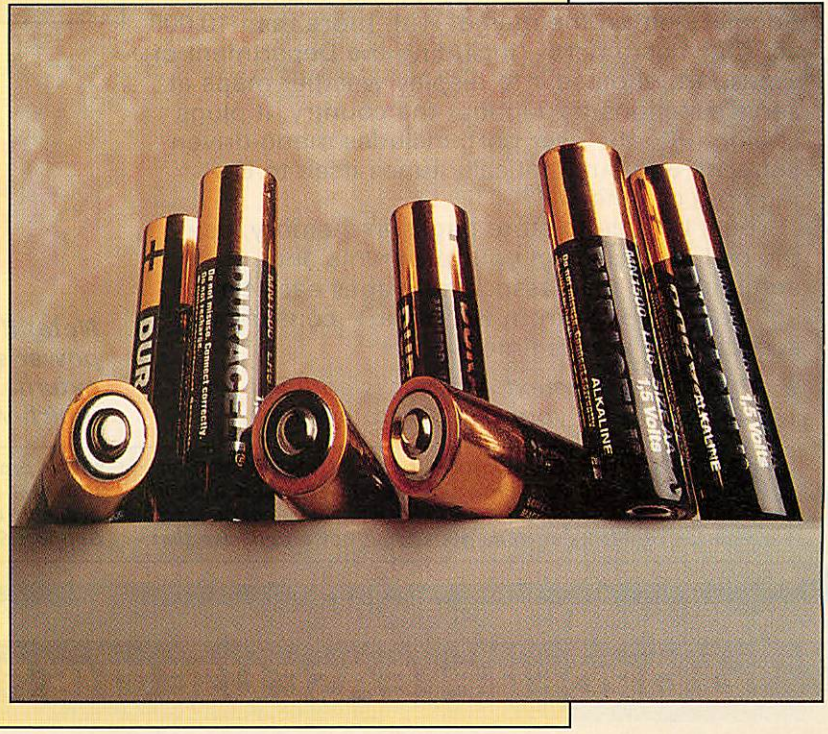
Using them, the battery low warning comes about four hours before the screen display is cut off. Even then, with the low power drain of the Z88 when it's not processing, your data is safe for up to a month.

However, rechargeable batteries start much nearer the level that causes the battery low warning to appear, so a lot of processing will have to be done with that showing. Also, when they are nearly flat and the screen is automatically disabled to retain the memory, rechargeables are at a level where their voltage falls quickly so you may have less than 24 hours before your data is lost.

So is it safe to use rechargeables? The answer is yes, provided you are careful not to let them get too low and take care to copy your data to your BBC Micro regularly, and are not too worried if the data is lost from the Z88 – after all that's why you you copy it over to your BBC Micro.

Alkaline batteries are much more reliable but in the long run will cost more. So it's up to you to choose between data safety and cost.

'This leaves enough power to retain the memory for a while'



Let's get our act together

John Allen presents a powerful way to join your BBC Micro to a Z88

IN the January issue of *The Micro User* we gave you a program for simple transfers between your BBC Micro and a Z88. Since then we've published utilities to backup the whole contents of the memory (March), send and convert files to Wordwise and Mini Office II (June) and to copy Basic programs (July). Now here's BBC Link II – a powerful way to connect your two micros.

What all the previous methods have in common is that they link up with the Z88's Import/Export utility. So in order to use them you need to set one micro to receive and the other to send. As even the most careful of us get these operations mixed up as we try to control two micros at once, Cambridge Computer has come up with an eprom cartridge for the Z88 which allows another machine to take total control of a transfer.

So far the only software to use it is PipeDream – on the Archimedes and PC – and PC Link II – Cambridge Computer's package to connect the Z88 to a PC. As they have no plans to release a BBC Link II we've done our own.

After the eprom has been inserted into the Z88 it is activated by pressing □L and from then on it gets its instructions from a remote computer at the end of a serial link. Instructions that it can deal with include displaying Z88 devices, directories and filenames and sending and receiving files. Used in conjunction with our BBC Link II program, transferring files becomes a doddle. If you haven't a copy of the eprom, don't worry, the whole kit – eprom, lead and the link program – is available complete or as individual parts – see the panel opposite.

Type in the program, save it as LINK and run it. Activate the eprom on the Z88 with □L and, provided everything is OK, pressing any key on the BBC Micro will make the main LINK menu appear. If it doesn't – and you're sure that you have copied the program correctly – there's either something wrong with your lead or you've got one of the early versions of the PC Link II eprom – one that's not labelled as the International version – and the baud rates don't match up.

If this is the case press ESC on the Z88, select the panel – □S – and set the send and receive rates to 9600 baud, parity to *none* and Xon/Xoff to *no*. Then start again.

To use the link, move the blue highlight bar around the options on the BBC Micro screen with the cursor keys and press Return to select.

Let's look at how to transfer a file from the Z88 to the BBC Micro first.

When you first run Link it is set up to transfer files from the Z88's root directory of :RAM.0. You can alter this from the options displayed, but if you change directory remember that the Z88 follows the MSdos conventions – selecting "." means stay in the current directory and ".." will move to the parent one.

The Z88 File option shows you a list of files in the current directory and device and selecting one with the highlight bar means that you want to transfer it to the BBC Micro – if you change your

Turn to Page 76 ▶

A bug in the rom

The early PC Link II roms don't transfer the data correctly. They're fine for text but not for Basic programs or data files. The problem is that bytes in the range &10-&1F on the Z88 were transferred to the BBC Micro as bytes in the range &20-&2F. So if you sent the file back to the Z88 it wasn't the same as when it went.

If you find this problem with your rom you should contact Cambridge Computer who'll exchange it for one that works correctly.

EXCLUSIVE READER OFFER

We have arranged with Cambridge Computer to make the BBC Link II eprom available to our readers. Together with this month's *Micro User* disc and a BBC Micro/Z88 lead you have all you need for easy transfer of files between the two machines.

And, as a bonus, you'll also have the other listings from this issue. The prices are:

Z88 eprom and BBC Micro disc £28.95

Complete kit: Z88 eprom, BBC Micro disc and lead £34.95

ORDER FORM ON PAGE 135

◀ *From Page 75*

mind simply press Escape or select Quit. Link will suggest a valid BBC Micro filename: If that's acceptable just press Return and the file will be sent. Or you can type in another name – including drive and directory if required – and this will be used.

The other options on the main menu allow you to show a list of BBC files in the current directory and transfer them to the Z88 using a similar procedure to the one we've just described for sending files the other way. You can also select an option to let you enter star commands, for example to change the current drive or directory. Be careful not to use commands like *COPY which destroy user memory.

The final option is Quit. This allows you to leave Link and also tells the Z88 rom that you've finished so the micro can revert to its previous suspended activity. You should note that while the rom is active on the Z88 the machine will not time out, so you should quit if you're not intending to use the link for a while.

Finally, there are a few things worth noting: Because the program can only display up to 32 menu options on the screen at a time you may find that not all of the Z88 files – or the whole of an ADFS directory – is shown. In that case, moving the highlight bar down when it's at the bottom of the display will show another page of up to 32 entries. You can move up and down between any number of pages simply by moving the highlight bar up or down over the page boundary. ADFS users will find that the menu of BBC Micro files will display directory names among those of the files. If you select one of them, Link assumes that you want to move it and will display its contents.

Finally, you need to make sure that there is enough space for the file in your selected Z88 device as Link does not check for the Z88 running out of space. Unfortunately, to do this in Basic would slow Link down to about half its present speed and pressure of space precludes its implementation in machine code.

The menu system

The menuing system can be used as part of other programs. It's contained in PROCmenu and PROCborder. The parameters for PROCmenu are:

title$	The title of the box
no%	The number of items to display
pos%	The item to be initially highlighted

The text items to be displayed should be in the array *list$*.

Line 1560 needs to be changed to CLS and 1810 becomes just ENDPROC. Lines 1570 and 1580 should be modified to contain your heading. PROCmenu should only be entered in MODE 7 (or MODE 135 on the BBC Master).

```
  10 REM BBC-Link II for Z88
  20 REM by John Allen
  30 :
  40 DIM list$(150),dirs$(20)
  50 DIM command 100
  60 PROCassemble
  70 device$=":RAM.0/":dir$="":nodir%=0
  80 MODE7
  90 *FX7,7
 100 *FX8,7
 110 *FX4,1
 120 *FX15,0
 130 PRINT ""Make Sure the Link progr
amme is""running on the Z88 and then""
press any key":X$=GET$
 140 CALL z88
 150 PROCsynch:IF K%<0 THEN CALL key:PR
INT 'CHR$(131);"No connection":GOTO 120
 160 ?&80=27:CALL send
 170 ?&80=ASC"A":CALL send
 180 CALL rec:IF ?&80 <> 27 THEN GOTO 1
390
 190 CALL rec:IF ?&80 <> ASC"Y" THEN GO
TO 1390
 200 CALL key:PRINT 'CHR$(131);"Link es
tablished"
 210 TIME=0:REPEAT:UNTIL TIME=150
 220 act%=1
 230 ON ERROR GOTO 240
 240 RESTORE:FOR I%=0 TO 5:READ list$(I
%):NEXT
 250 PROCmenu("Select action",5,act%)
 260 act%=action%-1
 270 ON action% GOTO 300,380,490,550,70
0,1090
 280 :
 290 REM  Quit
 300 PROCsynch
 310 ?&80=27:CALL send
 320 ?&80=ASC"Q":CALL send
 330 CALL rec:CALL rec
 340 CALL key:*FX4,0
 350 MODE7:PRINT "BBC / Z88 Link finis
hed.":END
 360 :
 370 REM  get Z88 device
 380 PROCsynch
 390 ?&80=27:CALL send
 400 ?&80=ASC"H":CALL send
 410 I%=0
 420 REPEAT
 430 CALL dev:I%=I%+1:list$(I%)=$name%
 440 UNTIL $name%=""
 450 PROCmenu("Select device",I%-1,2)
 460 IF action%>1 THEN device$=list$(ac
tion%-1)+"/"
 470 GOTO 240
 480 :
 490 REM '*' command
 500 CALL key:VDU31,0,13:INPUT "*" comm
and$
 510 ON ERROR REPORT:GOTO 530
 520 PROCoscli(command$)
 530 ON ERROR GOTO 240
 540 PRINT '" Press any key":X%=GET:GOT
O 240
 550 :
 560 REM  get Z88 directory
 570 PROCstring("D",device$+dir$,0)
 580 I%=0
 590 REPEAT
 600 CALL dev
 610 I%=I%+1:list$(I%)=$name%
 620 UNTIL $name%=""
 630 PROCmenu(device$+dir$+" select dir
",I%-1,2)
 640 IF action%=1 OR list$(action%-1)="
." THEN GOTO 240
 650 IF list$(action%-1)=".." AND nodir
%>0 THEN nodir%=nodir%-1 ELSE nodir%=nod
ir%+1:dirs$(nodir%)=list$(action%-1)
 660 dir$="":IF nodir%>0 THEN FOR I%=1
TO nodir%:dir$=dir$+dirs$(I%)+"/":NEXT
 670 GOTO 240
 680 :
 690 REM  send BBC file
 700 CALL key:CALL bbcfiles
 710 K%=0:FOR I%=1 TO 48-con?5
 720 list$(I%)=""
 730 FOR J%=1 TO name%?K%
 740 add$=CHR$(name%?(K%+J%))
 750 IF add$<>" " THEN list$(I%)=list$(
I%)+add$
 760 NEXT
 770 K%=K%+name%?K% +1
 780 NEXT
 790 PROCmenu("Select BBC file",I%-1,1)
 800 IF action%=1 THEN GOTO 240
 810 file$=list$(action%-1)
 820 $name%=file$:CALL ftype
 830 IF ?&80=1 THEN H%=OPENIN file$ ELS
E PROCoscli("DIR "+file$):GOTO 700
 840 CALL key:VDU28,0,24,39,3:CLS:VDU26
 850 VDU31,0,6:PROCborder("Transfer fil
```

Watford Electronics

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774 Tlx: 8956095 Fax: 01 950 8989

Acorn
The choice of Experience

Shop Hours: 9am to 6pm (Mon.-Sat.) Thursdays 9am to 8pm
All prices exclusive of VAT; subject to change without notice & available on request.
Credit Card Orders (ACCESS & VISA) Tel (0923) 33383 or 50234 (24 Hours)

The choice before and after the experience

Archimedes micro

System	Basic	Mono	Colour
305	£685	£735	£885
310	£799	£855	£999
310M	£859	£919	£1085
440	£2399	£2459	£2625

(Securicor carr. £10 on Micros)

Archimedes SPECIAL OFFER

FREE, £125.00 worth of Hardware
With every Archimedes Micro purchased from us, we are giving away absolutely **FREE** a 5¼", double sided disc drive with PSU, (1 Megabyte unformatted), plus the special Archimedes interface cable, worth **£125**. This package is absolutely essential if you want to run BBC software or IBM software with your Archimedes, in the emulation mode.
(P.S. This offer does not apply with 0% finance scheme mentioned in column two).

- 0.5 Mb RAM for 305 £149
- Podule Backplane £37
- ROM Podule (Computer Concepts) £48
- ROM Podule (C C) with Battery Backup £59
- ROM Podule (takes five 8 bit ROMs, of 16, 32, 64 or 128K) £56
- Archimedes Ref Manual £29
- ARM Assem. Lang Prog Manual £12
- 2nd 800K floppy disc drive (for 305, 310 & 410) £118
- Econet Network Board £40
- Backplane for 2 podules, with fan (305, 310) £39
- I/O Podule (with User port, Analogue port & 1MHz bus) £85
- MIDI add-on to I/O Podule £38
- MIDI Expansion Card £66
- Real time Video Digitiser (Watford) £249
- Sound Sampler (Armadillo) £105
- 20 Mb Hard Disc & Controller Card £469

WORDPROCESSORS

Wordwise +	£18	Pipedream	£95
Image Writer	£25	View	£49
Interword ROM	£35	Viewspell	£32
1st Word Plus	£79	ViewIndex	£12
Archie Spell Master	£49		

DATABASES

AlphaBase	£39	Viewstore	£49
System's Delta Plus			£60

SPREADSHEETS

Intersheet ROM	£35	Viewsheet	£49

BUSINESS GRAPHICS

GammaPlot	£30	Interchart ROM	£22

INTEGRATED PACKAGES

Logistix – Database, Spreadsheet, Time Management & Business Graphics £95

PC EMULATION Pack

(for 310, 410 & 440), including MSDOS 3.21 £79

GRAPHICS, ART & DESIGN

Interchart	£25	Gamma Plot	£30
Artisan	£31	Gamma Plus	£60
Support Disc	£17	**Autosketch**	£69
Toolkit (Beebug)	£32	Toolkit (Clares)	£31
Arc Termulator	£59	Zarch	£16

LANGUAGES

ANSI 'C'; ISO-PASCAL; FORTRAN 77;	£95 each
Cambridge LISP; PROLOG X	£181 each
Archimedes Assembler	£199
TWIN EDITOR	£27

0% (APR) FINANCE

*For a limited period, Watford Electronics are able to offer the Archimedes range of microcomputers at **0% (APR)** finance. Credit facility available subject to status. Please inquire for further details.*
(Watford Electronics are Licenced Credit Brokers)

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.
By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. NO SOLDERING is involved. Supplied complete with necessary lead.

Only £19

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Micro.

By Popular demand we are now supplying refurbished and fully guaranteed BBC Micro Model B with Disc Filing System

(Please telephone for price & availability)

New
Archimedes On-site Maintenance now available

(Please write in for further details)

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. This is a complete package, with its own power supply, ready to interface with your BBC Micro. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

New low price **£185**

CREDIT TERMS now available. Please telephone or write in for further information.

BBC MASTER

MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus £125 worth of FREE OFFER (see below) **£379**

SPECIAL OFFER

FREE . . . £105 worth of Hardware & Software

*Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and **Watford's** 3½", double sided 1 Megabyte (unformated) single disc drive complete with cables, ready to connect to the micro – with every BBC Master purchased from us this month.*

BBC MASTER with Turbo Board + above SPECIAL OFFER £513

512K Processor Add on Board "inc. Mouse and GEM package" £90

Master 128K plus 80186 Co-processor (incl. Mouse & GEM pack) plus above SPECIAL OFFER £459

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module			£116
Econet Module for the Master			£40
Twin ROM Cartridge for Master			£7.50
Quad ROM Cartridge for Master			£11
Universal Processor Adaptor			£75
Master Reference Manual I		(No VAT)	£14
Master Reference Manual II		(No VAT)	£14
Master Advance Ref. Manual		(No VAT)	£19
64K Upgrade Kit for B+			£32
Acorn 1770 DFS Kit complete			£49
ECONET Upgrade Kit for BBC			£42
ALL ECONET UPGRADES Available			
ARIES' Professional IEEE Interface			£238
Acorn IEEE Interface Complete			£265
Morley Teletext Adaptor with ATS Rom			£99
Filestore E01	£699	Filestore E20	£599
Filestore E01 & E20 together			£999

BBC MASTER COMPACT

System 1	Standard Package	£299
System 1A	System 1 + TV Modulator	£315
System 2	System 1 + Green Hires Monitor	£345
System 3	System 1 + Medium Res Colour Monitor	£469
RS232 Kit for BBC Compact		£25
Additional 3½" Drive for BBC Compact (Securicor carriage £7)		£90

65C102 2nd PROCESSOR

(65C102 replaces the original Acorn 6502 2nd Processor)

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

£159

Z88 Sinclair's Portable Micro

The worlds first, truly portable Micro. It is A4 size, only an inch thick and weighs under 2lbs. Ideal for use when travelling or as a personal organiser.

Only: £239

FREE

With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

Mains Adaptor	£8.65
32K RAM Pack or 32K EPROM Pack	£17.35
128K RAM Pack or 128K EPROM Pack	£43.40
512K RAM Pack	£169
Z88 Spellmaster for Pipedream	£51
Z88 to BBC Link	£21.70
Z88 to PC Link II	£30
Z88 EPROM ERASER	£34.75
Serial Printer Cable	£8.65
Parallel Printer Cable	£24.00
Z88 Modem	£145
Z88 Soft Carrying Case	£8.50
Sinclair Z88 Computing Book	£9.95
AA Nicad Rechargeable Battery	£1.50
Battery Charger, Compact & Fast (3 Hours)	£6

CO-PRO Adaptor

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.

With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

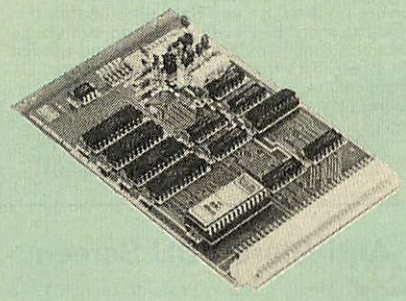
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro to add a second Co-processor externally.

Watford, brings power to your BBC at only:

£35 (carr £5)

Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied). Cont.

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

Watford Electronics are Appointed & Authorised DEALERS / REPAIR CENTRE for Acorn Computers Ltd Microvitec Monitors Panasonic Printers

NEW

BBC PCB DESIGNER

At last! A PCB design package for the BBC Micro that eclipses some industry CAD software. Hard to believe, isn't it? Just look at some of the impressive package specification:

- Library Component Designer
- Component Library (over 200 parts)
- Component List Editor
- NetList Editor
- PCB Board Designer
- Plotter Driver
- Dot Matrix Printer Driver

This integrated suite of programs is packed full of sophisticated PCB related features making the design of a circuit board a dream instead of a nightmare.

Input for the design may be manual or Auto mode.

Some of the PCB Designer's features are:

- Over 120 library pad sizes/shapes
- Four colour adjustable palette
- Zoom range 2:1 to 1:4
- Highlighting of specific tracks
- Normal and surface mounted components
- Rapid screen review
- Menu driven
- Variable gridlock
- Switchable measurement grid
- Pre-select pan/scroll facility
- Large 24" x 24" Board size
- Copy route facility
- Connectivity held at all times
- Ratsnesting of part connections
- Auto-plaement of text references
- Text linked to parts
- Automatic placement of vias
- Printer and plotter outputs provided
- Comprehensive manual

TYPES OF PLOT OUTPUT

Top and bottom track artworks, top and bottom silkscreens, solder resist mask, drilling detail drawing and check plot. All these may be with pad holes on/off, scale of 2:1 or 1:1, board edge on/off, 90 degres rotation, mirror image, width of pen, x & y offsets and batch plots to disc.

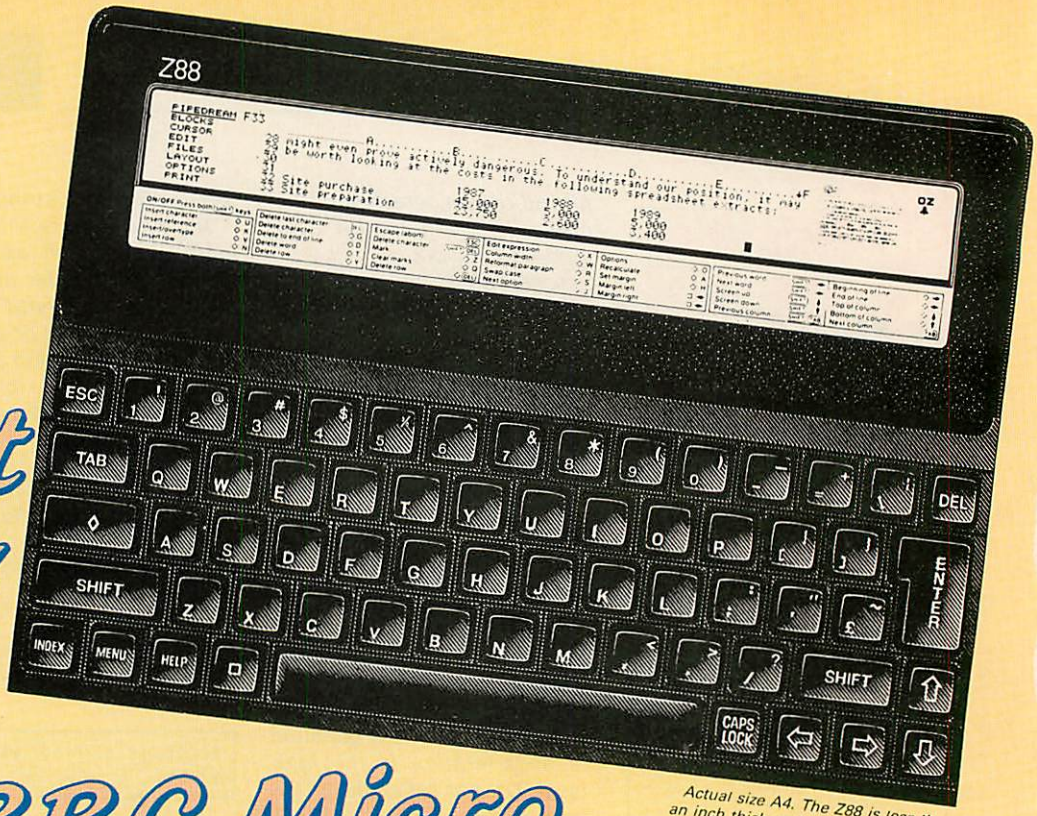
The above is only a taste of the superb features of this software, surely capturing previously unknown performance from the BBC Master computer. BBC B owners will need to fit at least one block of sideways RAM, Shadow screen memory and a disc drive. A trackerball or a mouse is also required.

Introductory Offer: £99

(Please write in for further technical details)

Continued

It's the latest – and the most exciting add-on for the BBC Micro



Actual size A4. The Z88 is less than an inch thick and weighs under 2lbs!

The Sinclair Z88 is the world's first truly portable, truly full-facility computer. And because it uses BBC Basic it is the ideal companion for the BBC Micro and Master.

Use it on the move!

Because it weighs less than a bag of sugar, it's an ideal travelling companion. Word-process your letters, memos or reports while on the move – then when you're back home or in the office transfer your files to your BBC Micro – it's done in seconds!

Solid-state storage

The Z88 doesn't need bulky disc drives. Memory is stored in solid-state interchangeable packs measuring 2½in square. Extra ram and eprom packs are available from suppliers such as Watford Electronics.

What the Z88 offers:

- 32k of ram built in, easily expandable to 416k.
- New supertwist LCD screen for sharp, clear viewing.
- Built-in word processor, spreadsheet, database, calculator, diary, calendar, comms, real-time clock and alarm – all included in rom.
- BBC Basic with integrated Z80 in-line assembler.
- Runs on four AA batteries, or use a mains adaptor.
- Printer editor to drive a wide range of printers.
- Detailed 218-page manual.

SPECIAL OFFER!

Exclusive to readers of *The Micro User* – the Z88 comes complete with a disc of games and utilities you can transfer direct from your BBC Micro with the FREE lead supplied.

The disc and lead can be bought separately for £22.70 from the address given on the coupon.

ONLY £249 plus VAT

ORDER TODAY

ORDER FORM

Please send me a Z88 with FREE disc and BBC Micro/Master lead for **£286.35** (£249 + VAT).

☐ Cheque enclosed payable to Database Electronics

☐ Please debit my Access/Visa no:

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Expiry date_____

Signed_____

Name_____

Address_____

Allow 28 days for delivery Postcode_____

SEND TO: Database Electronics, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.

Telephone orders: *0625 879920*
Orders by Prestel: *Key *89 then 614568383*
MicroLink/Telecom Gold: *72:MAG001*

MU10