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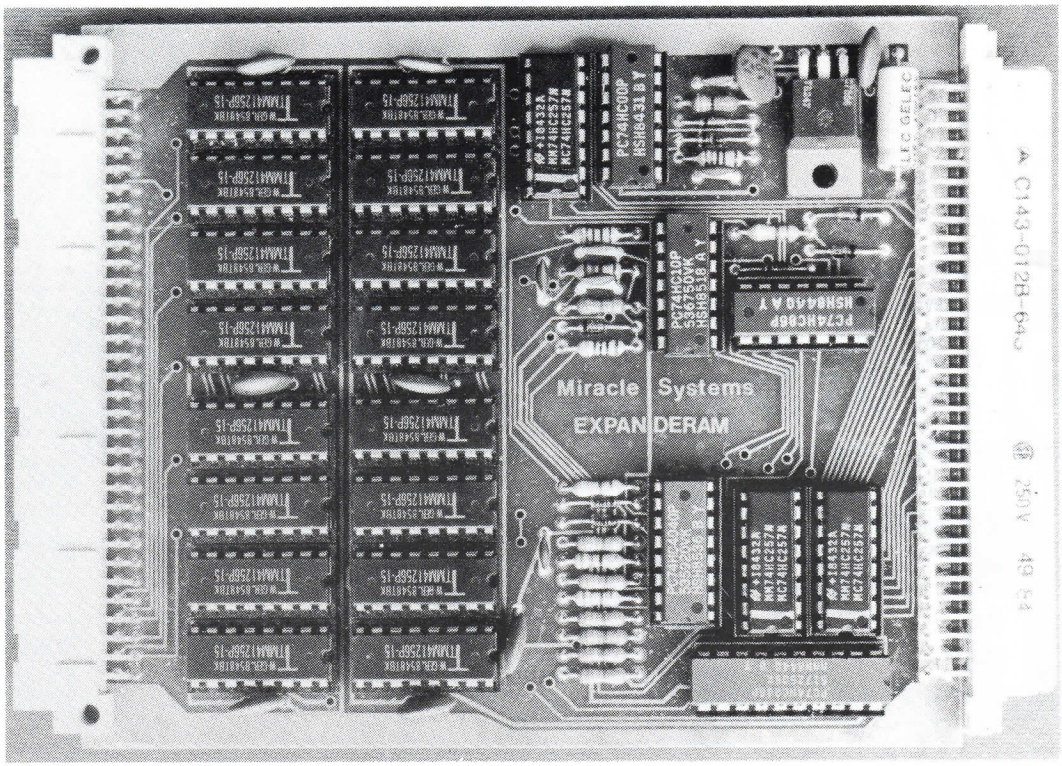

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INCORPORATING QL USER

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QL User
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August 1985 onwards

Sinclair QL World
March 1986 onwards

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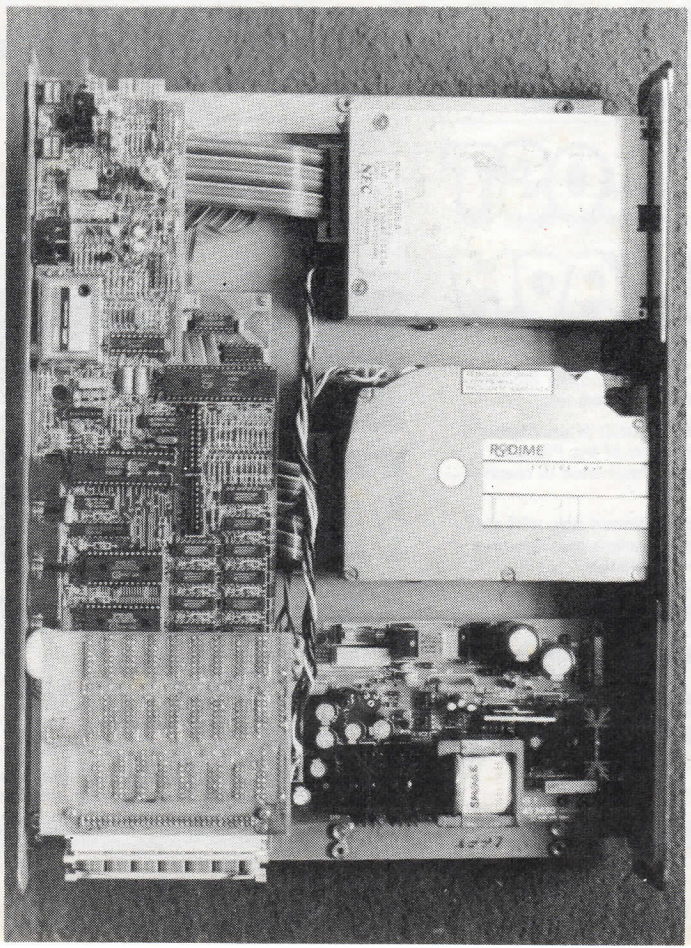
JULY 1986



NEXT MONTH

Psion Organiser II

Merely an electronic File-o-Fax, or an essential QL add-on? We assess the potential of this pocket sized peripheral.

The Forth Protocol

Hard on the heels of Lisp, our next Basic alternative is Forth, the functional language gaining popular appeal.

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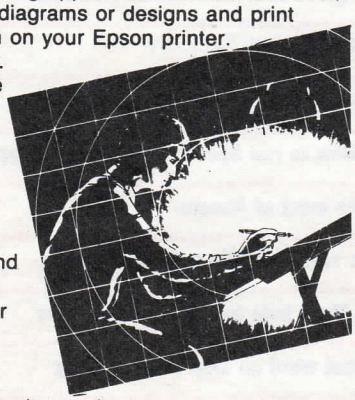

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"Talent is on to yet another winner....."
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COMPARISON WITH OTHER PRODUCTS

	TALENT Assembler Workbench	ADDER Editor/ Assembler	COMPUTER ONE Monitor	COMPUTER ONE Assembler	DIGITAL PRECISION Monitor/Disassembler Version 3.0	METACOMCO QL Assembler Development Kit
Assembler	●	●	X	●	X	●
Monitor	●	X	●	X	●	X
Disassembler	●	X	●	X	●	X
Text Editor	●	●	X	●	X	●
Memory Editor	●	X	●	X	●	X
On-line help	●	●	●	X	X	X
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by Stefan Kuhne

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QL SCENE

Comment

Since the Amstrad takeover of Sinclair research rumours have abounded concerning the future of the QL. About the only concrete account to have emerged from the whole affair so far is the CST upgrade, Thor – see page 18. Meanwhile, speculation continues regarding the QL and the numerous other proposed upgrade machines.

Amstrad have sold the 19,000 QLs obtained from the Sinclair deal to PST, a company which specialises in wholesale distrubtion to retail chains like Marks and Spencer and Tesco. That does not mean we will see a St Michael branded QL. PST will be shipping the machines to Europe, the Middle East, and possibly the U.S. PST reportedly paid Amstrad £2.6m for the deal, which includes 31,000 Spectrums.

That suggests the only stocks of the QL remaining in the U.K. are those held by dealers. That does not mean however, we have seen the last of the QL. Thorn in the U.K. and Samsung in Taiwan both have the capability to manufacture more machines. Whether they do depends on a number of things.

First, they would have to be convinced that there is still a market for the machine and that a viable dealer/distribution network could be established. Second, any attempt to re-launch the QL probably would require the blessing of Amstrad. In view of the company's zeal to rid the U.K. market of the machine, the possibility seems remote.

Meanwhile the efforts of Qdos author Tony Tebby to deliver his new baby, the QLT have taken a new direction. Tebby proposed originally to finance the machine by selling 500 to interested parties, together with a share in the company. If the machine was successful the initial investors would have the option to increase their shareholding.

***Sinclair QL World* attended a meeting of U.K., European and American dealers and distributed at a London hotel. At the meeting certain parties, including *Sinclair QL World,* agreed to provide finance for a prototype QLT, including operating system, which was to be produced in one month.**

Since that time, events have taken a further turn and it now seems more likely that the QLT will be produced by a single company rather than a consortium.

Either way, if the effort applied thus far to producing a QLT is continued, we can, hopefully, look forward to seeing the machine by the end of the year.

Astracom on-line

Swansea-based Astracom has announced a new modem for the QL. The Astrocom 1000 is a multi-standard intelligent modem, providing auto-dial, auto-answer and printer controller facilities.

Costing £173 plus VAT, the modem is complete with serial cable and communications software for the QL. All the major communications standards are provided for; American Bell tones can be provided b y a simple upgrade.

Data transfer is handled by an on-board microprocessor, which also provides split baud rates, such as 1,200/75 for Prestel and general viewdata use. The modem can also be used as a serial-to-Centronics interface; a 6K printer buffer is included in the standard specification.

The previous Astracom foray into the modem field was with the Brightstar modem. The company, then known as Compak Data, entered into a distribution deal with Modem House. The Brightstar, however, never saw the light of day, each company blaming the other for its failure.

Keith Webb of Astracom is more optimistic about the prospects for the new modem. "We have set up a new company, with a new distributor – David Aldridge of Strong Computers – and we are confident that there will not be a repeat of the Brightstar episode."

Drawing on Talent

Talent Computer Systems CAD program *TechniQL* is now available for the QL. The release of the software was delayed because of a problem with the arc drawing routine. It took Talent three weeks to face the problem, which turned out to be to a bug in the Qdos operating system.

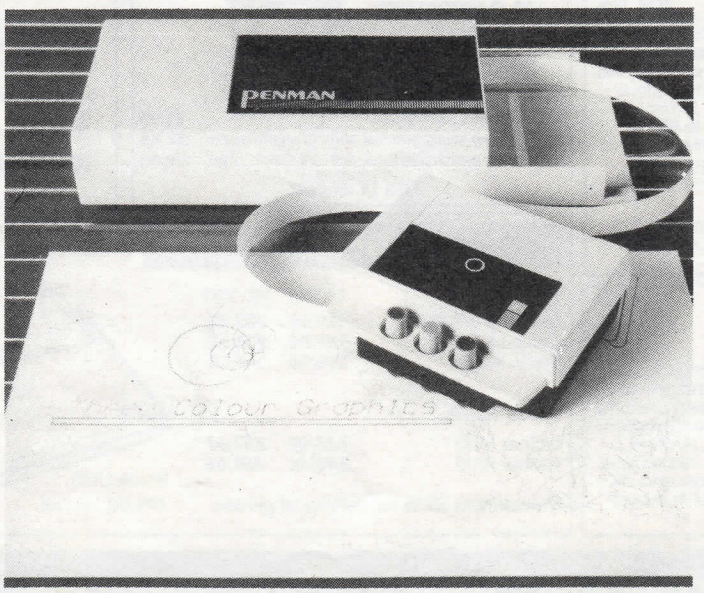
TechniQL features include a cell library of user-defined shapes, selectable grids, and an overlay facility which permits the creation of up to eight super-imposed layers. Drawings many times bigger than the screen can be created and a scrolling window with zoom facility gives access to all areas of the design.

Talent is working on new printer drivers which will allow TechniQL to produce hard copy on a Penman 1 plotter. Costing £249, the three colour plotter produces drawings up to A3 size using an integral free moving robot.

Talent Computer Systems, Curran Buildings, 101 St James Road, Glasgow G4 ONS. Tel: 041 552 2128

Penman Products, 8 Hazelwood Close, Dominion Way, Worthing, West Sussex. Tel: 0903 209081

The Penman 1. A3 output for £249



Precision trio

Digital Precision has added three new packages to its QL software range. Media Manager is a disc and microdrive recovery program. In addition to the usual disc repar facilities it allows data to be imported from differently formatted discs. For example you could transfer data from an IBM PC disc to a microdrive. Media Manager costs £39.95.

Professional Astrologer is an advanced version of the excellent Super Astrologer program. It provides day to day predictions with full text output, so you need not call in Russel Grant to decipher it. The program will also provide a compatability study of two people, something that should probably be used with caution. The program is supplied in four Microdrives and costs £49.95.

Eye Q is an originally titled graphics utility which claims to offer all the facilities of more expensive technical CAD packages for only £24.95. Digital Precision, 222 The Avenue, London E4 9SE.

TRANSFORM LTD. Computer Accessories

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QL KEY DEFINER £9.95
For those who use Quill or SUPERbasic this program is a must allowing you to define up to 2k on each key i.e. simply press ALT and "S" and the program will be saved onto the microdrive and overwritten, press "ALT" and "P" to print current file, press ALT and "G" to go to top of file, ALT and "B" to go to bottom of file, ALT and "D" will type in "Dear Sir" You can type a complete paragraph, phrase or letter by pressing one key.

In basic pressing F5 will bring back the last line typed; you can define keys for EDIT LIST etc.

QL CALC £9.95
This program makes use of the QL's multi tasking facility enabling you to press CTRL and any other key to give you a full calculator; having used the calculator you can return to the current program. This program can be used with Quill, Archive, Abacus and Easel. Features include mouse type operations, keyboard overide, memory and all the standard type features very useful in a busy office.

QL SWITCH £14.95
This program will allow users with extra memory to run QUILL, ARCHIVE, ABACUS and EASEL at the same time, or two ARCHIVE programs and QUILL. Pressing a key will allow you to suspend the current program and switch to the new program.

RAM DISC £14.95
Users with extra memory will with this software be able to set up a ram disc; programs can then be instantly saved and re-loaded. A printer spooler is also included to allow you to print whilst still using your computer.

TOOL KIT £9.95
This program will copy all or selected files, delete one or selected files, display file to screen, change file file name, format, and print multiple copies of Quill files.

MEMORY EXTENSION

MEMORY EXTENSIONS

512k **£125.00**

MONITORS

QL VISION 215.00

PHILIPS 7502 75.00

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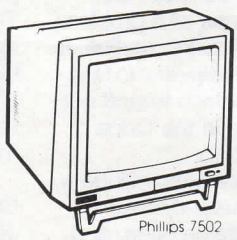

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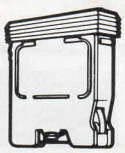

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PRINTERS

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DAISY WHEEL		
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Brother HR15	**349.44**	**401.86**

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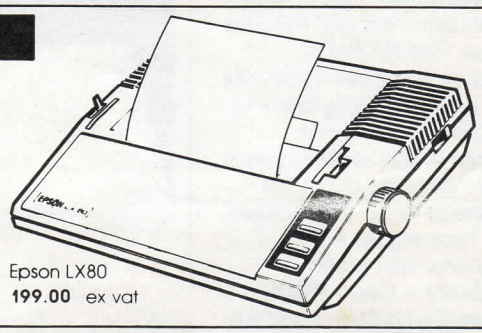

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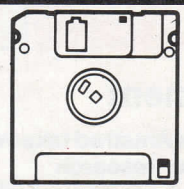

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Centronics interface	**16.95**	**19.50**

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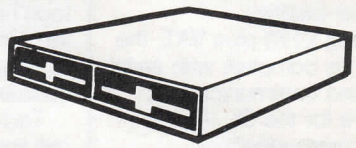

Technology Research Delta	**112.60**	**129.00**
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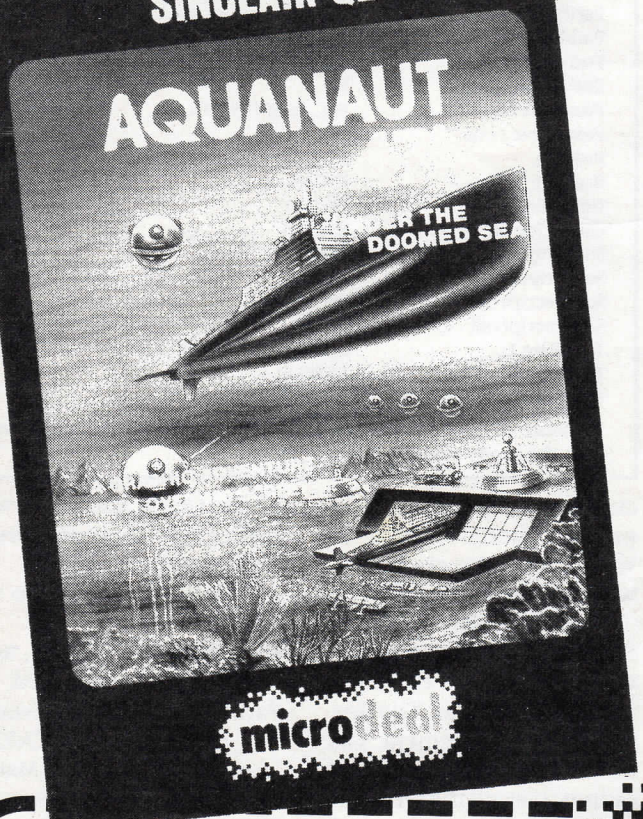

THE KING

This "DONKEY KONG" style arcade classic is now available on your QL. Help poor old Mario rescue his ladylove from the clutches of Guy the Gorilla. All the action of the game that has topped the charts on all other machines

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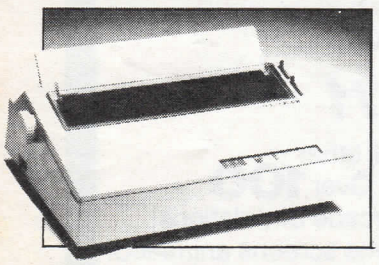
PRINTER
PROFILES

We took five popular printers, hooked them up to the QL, and sorted out the teething troubles to save you the effort. By John Markham.

Have you ever written a program, typed a letter on Quill or used any of the other Psion packages? If so, you probably know how useful a printer can be. Possibly even more vital than disc drives, a printer is often one of the first and most important peripherals people buy for their systems.

What features should you look for in a printer? One of the first problems you are likely to encounter is that of the interface used. There are three major interface types, the Centronics, the RS232 and the IEEE488. Of those, the former two are the most common, being a parallel interface and a serial interface respectively. That refers to the way in which information is passed to the device, either as a single stream of bits (pulses) or as a stream of parallel pulses. At first glance, the parallel method may seem the best but transmission speeds are so much faster than the hardware that it makes no difference in practice. Additionally, the QL has two serial ports – ser1 and ser2 – as standard, whereas a Centronics interface on the printer will require the purchase of a serial-to-Centronics adapter, adding a few pounds extra to an already expensive peripheral.



Another feature to watch for is the speed of printing. That normally is measured in terms of characters per second and will be given for the standard print mode, though often shows a much reduced value for NLQ and other print modes. If speed is vitally important, bear in mind that those figures are usually minima and the effective print speed will be much slower, though assuming that all the figures are equally exaggerated, they can still provide a guideline.

The paper width must also be considered as more characters can be squeezed across a page by choosing a smaller print style, e.g., 132 condensed characters will replace 80 standard pica characters, so look at those, too.

Print styles available vary from printer to printer, but common ones are pica, elite, double-width, condensed, italic, bold – or emphasised – superscript and subscript. Underlining, margin setting, page-length setting and line-spacing should also be taken into account, though most printers provide those options. International character sets are usually available on dot matrix printers, though daisywheel will require the character wheel to be changed.

There are only a few SuperBasic commands which have to be mastered to use your printer. The first is the OPEN statement. Like all the other input and output units on the QL, your printer must be connected to a channel. There are two serial ports, 'ser1' and 'ser2', corresponding to the two sockets at the rear of the machine. Either may be connected to your printer. If, for instance, you had connected the ser1 port, you would use an OPEN statement such as:

OPEN#4,ser1

which would associate channel four with the printer port.

In most cases, that version of the OPEN statement will suffice but some printers require a little more information. Options to the 'ser' device are:

Port Number: '1' or '2', as explained.
Parity: 'e' for Even, 'o' for Odd, 'm' for Mark, 's' for Space.
Handshaking: 'i' for Ignore, 'h' for Handshaking.
Protocol: 'r' for Raw data (no EOF), 'z' for CTRL-Z is EOF, 'c' as 'z', but <CR> acts as a record separator.

If the normal OPEN#c,ser1 does not work, you should check your printer manual for the other options. Normal

BROTHER HR-15
DIP switch settings

#1	Left (Centronics), Right (RS-232C)
#2	Right (40 chars. per line)
#3	Left
#4	Right

Printer driver settings
(If using serial interface)

Parity:	None
Baud rate:	600
End of line code:	CR,LF
End of page code:	None
Preamble code:	DC2
Postamble code:	None
Bold on:	None
Bold off:	None
Underline on:	None
Underline off:	None
Subscript on:	None
Subscript off:	None
Superscript on:	None
Superscript off:	None

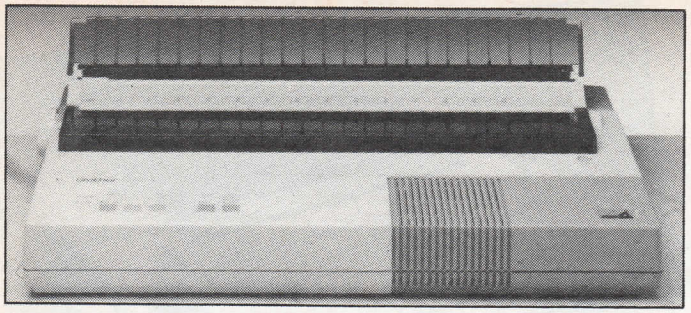
TAXAN KAGA KP-810
DIP switch settings

1-1	OFF	2-1	ON
1-2	OFF	2-2	ON
1-3	OFF	2-3	ON
1-4	OFF	2-4	OFF (For Pica, 80 columns)
1-5	ON	2-5	OFF
1-6	OFF (Hold down FF on power up)	2-6	OFF
1-7	ON	2-7	OFF
1-8	OFF	2-8	OFF
3-1	OFF		
3-2	ON (12" paper), OFF (11" paper)		
3-3	ON		
3-4	OFF		

Printer driver settings

Parity:	None
Baud rate:	9,600
End of line code:	CR,LF
End of page code:	FF
Preamble code:	ESC,@,ESC,R,NUL
Postamble code:	None
Bold on:	ESC,E
Bold off:	ESC, F
Underline on:	ESC,–,1
Underline off:	ESC,–,0
Subscript on:	ESC,S,1
Subscript off:	ESC, T
Superscript on:	ESC,S,0
Superscript off:	ESC,T
Translate 1:	£,ESC,R,ETX,#,ESC,R,NUL
Translate 2:	{,ESC,4
Translate 3:	},ESC,5

Translate '2' and '3' have been set to turn italic mode on and off, with the rarely-used brackets.



BROTHER M-1509
DIP switch settings

1-1	ON	2-1	ON
1-2	ON	2-2	OFF
1-3	ON	2-3	ON
1-4	OFF	2-4	OFF
1-5	ON	2-5	OFF (Epson–compatible
1-6	OFF	2-6	ON
1-7	OFF	2-7	OFF
1-8	ON (RS-232C), OFF (centronics	2-8	OFF
3-1	OFF		
3-2	OFF		
3-3	OFF		
3-4	OFF		
3-5	ON (12" paper), OFF (11" paper)		
3-6	OFF		
3-7	ON		
3-8	OFF		

Printer driver settings
These are for the Taxan Kaga KP-810, when the printer is used in Epson-compatible mode, as initialised by the DIP switch settings above.

commands, such as PRINT and LIST, can now be used with this channel. So:
LIST#4
would list the current program in memory to the printer, and:
PRINT#4, "This will be printed on the printer"
will print the above message.

As with any other device, the printer channel can be closed using the CLOSE statement. In that case, that would be the command:
CLOSE#4

What if things go wrong? If everything is connected correctly, the channel is opened, but the printer refuses to print any information, then the baud rate is one possible problem area. The baud rate signifies the speed of communication through the serial ports and defaults to a rate of 9,600, which is a fairly standard rate. You should check that your printer works at the same speed. In many cases, the baud rate can be changed by a switch in the printer to conform to 9,600. If that is not the case, the SuperBasic command BAUD will allow you to change the rate at the QL end to 75, 300, 600, 1,200, 2,400, 4,800, 9,600 or 19,200 – for transmission only.

Two other SuperBasic commands can also prove useful. One is the COPY command which will allow you to copy information from one device to another. It is often used to copy a file from Microdrive directly to the printer, without first having to specify loading the file into the machine. In that case, the variation COPY_N should be used to copy the file without the file header information.

Another useful command is WIDTH, which can be used to set the print width by sending the column number to the appropriate channel. For instance, in the above case:
WIDTH#4,65
will set the print width to 65 characters.

It is usually possible to set line-length, margins,

PRINTER	BROTHER HR-15	EPSON LX-80	TAXAN KAGA KP-810	BROTHER M-1509	TANDY CGP-115
PRICE:	£399	£225	£225	£495	£99.95
PAPER WIDTH:	15 in. (max.)	8.5 in. (max.)	9 in. (max.)	16 in. (max.)	4 in. (max.)
SUPPLIED I/FACE:	Centronics RS232C	Centronics.	Centronics.	Centronics, R5232C	Centronics.
TYPE:	Daisywheel	Dot matrix.	Dot matrix.	Dot matrix.	Plotter.
BUFFER SIZE:	3K				
PAPER:	Single sheet.	Friction.	Friction.	Friction.	Friction (roll paper).
TYPE STYLES:	Pica.	Pica, Elite, NLQ.	Pica, Elite, NLQ.	Pica, Elite.	
PRINT OPTIONS:	Shadow print. Double strike. Underlining. Proportional spacing.	Italic. Emphasised. Double-strike Enlarged. Condensed. Super/subscript. Underlining.	Italic. Emphasised. Double-strike. Enlarged. Condensed. Proportional. Super/subscript Underlining.	Italic. Emphasised. Double-strike. Enlarged. Condensed. Super/subscript. Underlining. Proportional.	Variable-sized characters.
OFFICIAL PRINT SPEED(S):	13 cps (max.)	100 cps (max.)	140 cps (max.)	180 cps (max.)	12 cps (max.)
CARRIAGE MOVEMENT:	Bi-directional.	Bi-directional.	Bi-directional.	Bi-directional.	
GRAPHICS MODES:	None.	Yes.	Yes.	Yes.	Line drawn, four-colour.
REDEFINABLE CHARACTERS?:	No.	Yes.	Yes.	Yes.	No.
OTHER FEATURES:	Character and line pitch setting. Left, right, top, bottom margin setting. Set page length. Horizontal and vertical tabs. Reverse and half line feeds. Backward print. Colour (of ribbon) print. COPY, from internal buffer.	Character and line pitch setting. Un-directional and half-speed modes. Left, right, top, bottom margin setting. Set page length. Horizontal and vertical tabs. Reverse and variable line feeds. Word processing justification in NLQ mode.	Character and line pitch setting. Un-directional and half-speed modes. Left, right, top, bottom margin setting. Set page length. Horizontal and vertical tabs. Reverse and variable line feeds.	Character and line pitch setting. Un-directional and half-speed modes. Left, right, top, bottom margin setting. Set page length. Horizontal and vertical tabs. Reverse and variable line feeds.	Four print directions. Four pen colours (black, red, green, blue). 16 line types. Reverse line feed. Variety of turtle-like graphic commands.

Continued on page 10

Continued from page 9

line-spacing and such by sending control codes to the printer. The CHR$ command is often used for this. Many of the control codes require to be preceded by the escape character. That cannot be printed, so CHR$(27) is used. For instance, on Epson-compatible machines, emphasised or bold print can be set using the controls <ESCape> and "E". That can easily be sent, say down channel four, if that has been opened correctly, with: (PRINT#4,CHR$(27);"E")

If you have bought a printer to connect to your QL, you are almost certainly intending to use at least one of the Psion packages with it. that will usually be the wordprocessing package. Quill. To make the best use of them with your printer, it is necessary to set up a printer driver for use by the package. That is explained briefly in the QL Manual but could be clarified.

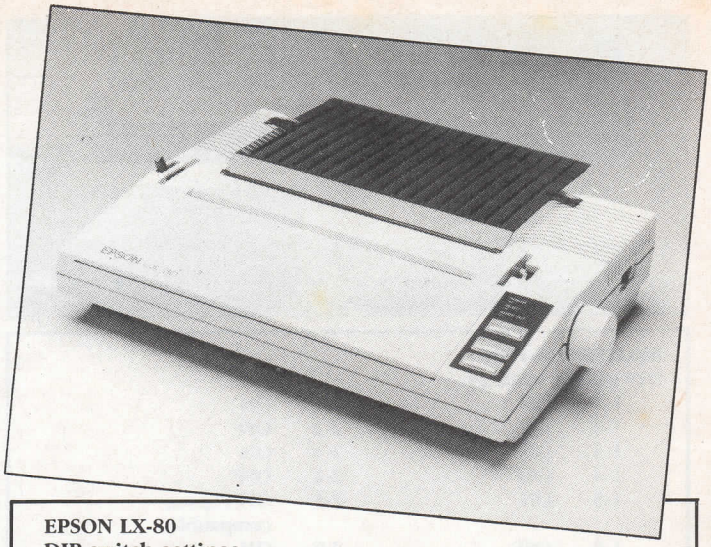
When using one of the packages, it is possible to embed printer information in the text for underlining, bold print, superscripts and subscripts. how does the package know which control codes to send for the different printers? It uses the codes found in the file 'printer_dat'. They can be set up using the INSTALL_BAS program supplied on each cartridge.

If you load and run it you will be asked initially whether you are using a standard serial port or a non-standard port. In most cases, the former will be true, non-standard connections occurring only in such situations as when using, say, a Centronics interface through the expansion bus on the left of the machine.

You will then be presented with a choice of printers, including the default Epson FX80. Do not worry if your printer does not appear on this list but choose the one which you reckon to be nearest, or 'OTHER' if none of them seems close.

Whatever choice you make it is a good idea to edit the driver, even if it exactly matches your printer. In that way you can tailor it to suit your own needs. The DRIVER NAME should be your printer name, though you may wish to make a few different copies, even for a single printer. The PORT which you are using will be either 'ser1' or 'ser2'. CHARACTERS PER LINE will depend on the printer paper width and the mode you are using, e.g., condensed mode gives more characters per line.

LINES PER PAGE is set assuming that you are using CONTINUOUS FORMS. If that is not the case, you may wish to change this value. One problem which can occur when using single sheet stationery is that that must be set in the printer driver, so that it stops, having completed the correct number of lines per page, to allow you to change the sheet. You will also have had to put the printer into single-sheet mode, so it will be attempting to stop or give a Form Feed when the end of paper detector is activated – that could be before the appropriate number of lines has been printed, causing problems.



EPSON LX-80
DIP switch settings

1-1	OFF
1-2	OFF
1-3	OFF
1-4	ON (12" paper), OFF (11" paper)
1-5	OFF
1-6	ON
1-7	ON
1-8	ON
2-1	ON
2-2	ON
2-3	OFF
2-4	ON

Printer driver settings

Parity:	None
Baud rate:	9,600
End of line code:	CR,LF
End of page code:	FF
Preamble code:	ESC,@,ESC,R,NUL
Postamble code:	None
Bold on:	ESC,E
Bold off:	ESC, F
Underline on:'	ESC,–,1
Underline off:	ESC,–,0
Subscript on:	ESC,S,1
Subscript off:	ESC, T
Superscript on:	ESC,S,0
Superscript off:	ESC,T
Translate 1:	&,ESC,R,ETX,#,ESC,R,NUL
Translate 2:	{,ESC,4
Translate 3:	},ESC,5

Translate '2' and '3' have been set to turn italic mode on and off, with the rarely-used brackets. Of course, you could change or add to these translations as much as you like.

TANDY CGP-115
DIP switch settings

#1	Left (Centronics), Right (RS232C)
#2	Right (40 chars. per line)
#3	Left
#4	Right

Printer driver settings

Parity:	None
Baud rate:	600
End of line code:	CR,LF
End of page code:	None
Preamble code:	DC2
Postamble code:	None
Bold on:	None
Bold off:	None
Underline on:	None
Underline off:	None
Subscript on:	None
Subscript off:	None
Superscript on:	None
Superscript off:	None

One way round this is to switch off the end of paper detector in the PREAMBLE CODE – another option. For instance, in the Epson FX80 printer driver, the Preamble Code, i.e., the codes sent to the printer immediately prior to printing, are:
ESC,@ — Reset the printer.
and:
ESC,R,NUL — Select USA international character set.

BROTHER HR-15
DIP switch settings

DIP switch SPEC 1

#1	CLOSE
#2	CLOSE
#3	CLOSE
#4	CLOSE
#5-#8	As for paper length

DIP switch SPEC 2

#1	CLOSE
#2	Auto skip perforation
#3	OPEN
#4	Not needed
#5	CLOSE
#6	CLOSE
#7	CLOSE
#8	Unused

Printer driver settings

Parity:	None	
Baud rate:	9,600	
End of line code:	CR,LF	
End of page code:	FF	
Preamble code:	ESC,CR,P	
Postamble code:	None	
Bold on:	ESC,W	– Double print
Bold off:	ESC, &	
Underline on:	ESC,E	– not including spaces
Underline off:	ESC,R	
Subscript on:	ESC,W	– Use for Shadow print
Subscript off:	ESC, &	
Superscript on:	ESC,A	
Superscript off:	ESC,B	

Superscript mode has been set to give red printing.

Now, by adding the sequence:
ESC,8
the 'no paper error' will be made invalid, ensuring that the printer will continue until the QL has printed the necessary number of lines.

The POSTAMBLE CODE concerns the state in which you wish to leave the printer when printing is finished. BOLD ON/OFF, UNDERLINE ON/OFF, SUBSCRIPT ON/OFF and SUPERSCRIPT ON/OFF will all require the appropriate codes for your printer. Obviously some printers will be unable to produce all those types, so any other useful codes could be inserted, thus ensuring easy access from within the package.

Finally, there are 10 TRANSLATE options. They are designed to allow the user to replace characters with a sequence to print special characters. For instance, the Epson in U.S. mode cannot print the & symbol. Therefore the sequence:
ESC,R,ETX — Select U.K. international character set.
— Print the has sign (now a pound).
ESC,R,NUL — Re-select U.S.A. characters.
is used. Of course, there is no reason why you should not use these for any variety of actions. All you need do is choose a few characters which you do not normally use, then give these sequences to select options on your printer, such as enlarged text, condensed text, varying line spacings, italics, and so on.

If you still have difficulties, the printer DIP – Dual In-Line Package – switches which allow you to control features on the printer. You will usually find them located somewhere around the back of the printer in some circumstances – e.g., Taxan Kaga KP-810 – you will have to remove the printer cover to reach them.

One bank of switches, or part of a bank, is often used to control the international character set default. It is often best to choose the U.S. characters, as they give the hash symbol rather than the & sign. As mentioned, the Psion package printer drivers can be set to cope with the & sign in any case.

Another common DIP switch is known as Auto Line Feed. If you printer insists on double-spacing lines, or over-writing characters on the same line instead of throwing a line feed, you should check the setting of this switch.

Other switches control such options as characters per line/right margin, page length, paper-end detector and skip-over perforation.

The Brother HR-10 and HR-15 are both reasonably-priced daisywheel printers. Details of the HR-15 are given and many of those features also apply to the cheaper HR-10. Though slow compared to many printers, the print quality is very good and the only real cause for complaint is the lack of a tractor feed as standard. I would like to thank Neil Warland for information on connecting the HR-10, which should also apply to the HR-15.

Dot matrix printers are by far the most popular form of printer for home use and we looked at three makes. The Epson LX-80 is one of the recent printers in the Epson range, combining all the reliable attributes of the previous range, with a near letter quality print mode. That undoubtedly was developed in response to many other cheap NLQ dot matrix printers which have been appearing. One of the most widespread is the Epson-compatible Taxan Kaga KP-810, which is very similar in operation to the Epson LX-80. The last of the dot matrix printers we tested is an alternative which has appealed to many QL owners, the Brother M-1509. In addition to offering an RS232C serial interface and parallel Centronics as standard, the M-1509 has extra-wide paper, giving 136 normal pica characters per line.

Finally, we decided to look at the Tandy CGP-115 which, if the quantity of letters we have received is a criterion, is a very popular alternative to the standard daisywheel and dot matrix printers. The CGP-115 is a printer/plotter with very different features from the other printers we looked at.

With four colour pens, it has firmware to plot the shapes of ASCII characters characters and can also produce line-drawn graphics.

Unfortunately, there is a trade-off as the CGP-115 can use only 4.5in. roll paper, normally giving 40 characters, with an option for 80 very tiny characters on a line. Nor does this printer have many of the standard features found on the others, such as margin setting.

Psion printer driver mnemonics

Decimal	Hex	Mnemonic
0	00	NUL
1	01	SOH
2	02	STX
3	03	ETX
4	04	EOT
5	05	ENQ
6	06	ACK
7	07	BEL
8	08	BS
9	09	HT
10	0A	LF
11	0B	VT
12	0C	FF
13	0D	CR
14	0E	SO
15	0F	SI
16	10	DLE
17	11	DC1
18	12	DC2
19	13	DC3
20	14	DC4
21	15	NAK
22	16	SYN
23	17	ETB
24	18	CAN
25	19	EM
26	1A	SUB
27	1B	ESC
28	1C	FS
29	1D	GS
30	1E	RS
31	1F	US

Viglen

offer the best alternative to the microdrive

Specially designed to fit neatly into the case of the Sinclair QL, the MCS-Disc Interface Board and companion disc drives are colour-matched to complement your QL computer.
The MCS (Micro Control Systems) disc interface with the offers have zero K of RAM. For 256k of RAM please add £99 inc Vat and zero k for 512k of RAM please add £189 inc Vat.
The 256k and 512k versions also include a centronics printer interface with lead and toolkit on ROM.

3½ inch Single Drive 720K formatted capacity with built-in power supply, in dual case for later addition of a further single drive unit

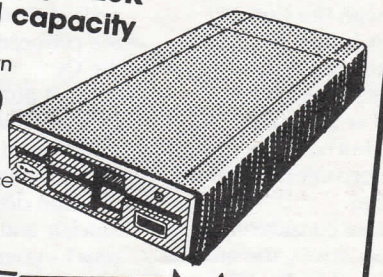
Drive in its own case **£109**

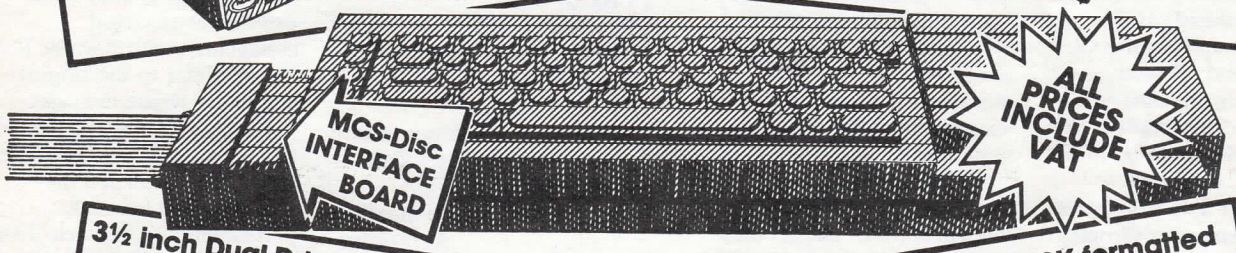
Drive with MCS-Disc Interface **£199**

5¼ inch Single Drive with built-in power supply. 720K formatted capacity

Drive on its own **£149**

Drive with MCS-Disc Interface **£234**





3½ inch Dual Drive 1440K formatted capacity with built-in power supply

Drive on its own **£199**

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Saturday 9.30 – 2.00

5¼ inch Dual Drive 1440K formatted capacity with built-in power supply

Drive on its own **£269**

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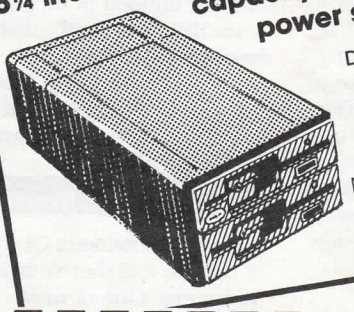
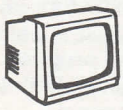


All drives are compatible and ready to plug in and use with all currently available QL Disc Interfaces. When bought with the MCS-Disc Interface, they are ready to plug in and use.

Other peripherals for the QL

MONITORS



Phillips Monochrome Green Model BM7502	£85
Phillips Monochrome Amber Model BM7522	£95
Phillips Colour TV/Monitor Model 1114	£199
Phillips Standard Resolution Colour Monitor CM8501	£199
Taxan Kaga KP8 10 — Canon PW1080A	£249

PRINTERS

Quen Data Daisy Wheel Printer	£168
Serial to Centronics Interface lead for above printers	£19.95
Perspex printer stand for: 80 col. printer	£16.95
136 col printer	£27

Carriage
Please add £12.00 carriage for disc drive, £8 for printers and monitors, £3 for printer stands.

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Credit Cards valid only if signed by card holder
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Signature: _____ QL/7

OPEN

Open Channel is where you have the opportunity to voice your opinions in *Sinclair QL World.* Whether you want to ask for help with a technical problem, provide somebody with the answer, or just sound off about something which bothers you, write to:

Open Channel
Sinclair QL
Petty France
London SW1H 9ED

New boots

Many thanks to your correspondent Martin McHugo for his revised boot program – QL World April 1986 – with which the four Psion programs can be used from one drive. I run a QL with twin Cumana discs, and have revised the program to run on my system with excellent results. The only drawback seems to be that when the resident flp_ext clock supplied with the Cumana interface is in use, it prevents the program automatically resetting after the quit command in the Psion programs, but no doubt there is a way to overcome this; can any reader help?

To anyone considering buying disc drives, the answer must be 'go ahead', as they completely transform the QL into a swift and efficient machine. Many benefits of programs previously used with microdrive can be taken fullest advantage of, especially import/export files which take so long to manouver through the microdrive system.

I am using a serial-interfaced Silver Reed EX44 typewriter/daisywheel printer for printouts, and this has been very effective for some time, if somewhat slow at 12 cps. I have recently decided that, as my use of the computer has increased, I should invest in a dot matrix printer for work other than letter quality. The new Citizen 120D printer appears to offer a good deal for the price of around £200, so how about a test report in the magazine?

C. J. Low
Putney
London

Editor's Reply:
The printers included in this month's profile (see page 8) were selected on the basis of readers' response. If you would like to see your printer featured in a future review, write to us with any information you have, such as printer drivers.

Difficult display

I recently purchased a Philips 7502 monitor for my QL as the display provided a portable black and white television was far from adequate.

At first I was extremely disappointed with the results from the monitor. The top part of the display wavered continually and was difficult to read. I contacted Sinclair Research and they sent me revised instructions regarding the connection of monitors to the QL.

I had purchased a three pin DIN to phono lead at the time I purchased the monitor. I checked the wiring of the lead with the details provided by Sinclair and discovered that pins 1 – composite PAL – and 2 – ground – were connected, instead of pins 2 and 3 – composite monochrome. Resoldering has produced excellent results – the display is now rock steady.

I suggest that any other readers who are experiencing difficulties with display on a monitor check the way in which the connecting lead is wired. Sinclair implied in their letter to me that I was not the first to have such problems.

Roger J. Perkins
Mill Hill,
London.

Bad medium

My family obtained a QL from a relative together with several programs. One of these programs is the amazing QL Chess by Psion, but when the game loaded I found that part of the Psion logo was missing. The program then stopped and the computer display the message 'At line 1415 bad or changed medium'.

I hope that you will help me to find a way to get round this bug and any others that may be within the program.

Niall Chadwick
High Wycomeb,
Bucks.

Editors Reply:
The error occurs when the cartridge has been corrupted the only way round the problem is to make sure you have backup copies of all your important files.

Sound formatting

One is expected to format a new cartridge several times. It is a bore, so I made a looped program to do the job.

I then remembered a police siren routine published in a previous issue. By incorporating this, I can do something else while formatting is going on, and can hear when the formatting is ended. Your readers might be interested in the program.

```
10 CLS
11 PRINT "Format starting"
12 CSIZE 3,1
13 FOR X=1 to 4
14 BEEP
15 FORMAT MDV2
16 BEEP 0,30,37,9000,7,0,0,0
17 PAUSE 20
18 END FOR X
```

If the BEEP is left out of line 14, the siren continues right through the formatting.

Capt. Eric Starling
Ayreshire.

Uneducated QL

I bought my QL in the early days, soon after my daughter was born. I expected that lots of educational software would become available, and that learning to count, read and tell the time would be made fun. Now that she is old enough, I look around for the software, and can find none. Where should I look? Has anyone written a book full of such programs that could be typed in?

David Lerner
Bromsgrove,
Worcs.

Editor's Reply:
We can only agree that there seems to be a dearth of educational software for the QL. If anyone has written a presentable educational program for the QL, send it to ***Sinclair QL World*** and we will consider it for publication in The Progs.

Hot stuff

Having read several letters in *QL User* regarding lock-ups and Microdrive unreliability, and having experienced the same problems myself on a newly aquired QL, I offer the following solution which has completely solved the problem.

On investigation, I must concur with most other observers that the problem is one of heat. The principle source of heat in a QL is the five volt voltage regulator, located on a heatsink in the top left of the case, behind the microdrives.

My solution is to remove the regulator and heatsink, place them outside the case and extend the electrical connection, with 3 wires, from the regulator to the original connector inside the case.

That is easily accomplished, and having tried it temporarily I have now mounted the regulator and heatsink permanently on the back of the case on the right hand side. I cut a hole, through which the wires for the voltage regulator pass to the original connection points. For those who are disturbed at the thought of poking around, it is reassuring to know that the regulator is not soldered in place but simply unplugs without disturbing the PCB.

I would recommend that the regulator is electrically isolated from the heatsink with a mica washer and spacer, and that some heatsink paste is used to improve the conduction of heat to the sink.

Since making the modification I have not experienced a single lock up. Furthermore, in a trial, in which the "clone Abacus" program was repeatedly run eight times in succession, no error messages were reported. Previously I could not run the program more than twice before it would stop.

F. J. Sherman
Madaba,
Jordan.

CHANNEL

Spaced out Quill

I have a U.S. version of the QL with version 2.1 Psion software. I find that I cannot control spacing locally with Quill. As I often use Quill to write academic papers, in which I have to double-space the text but single-space such parts as footnotes and quotations, the inability of Quill to allow me to use different spacings within the same file is very inconvenient.

Do you know if more recent versions of Quill have the capability to change spacing in the middle of the document? If so, how can I obtain the software? Can I exchange my Psion software with a newer version?

Kimaiki Yamaguchi
Pittsburgh,
U.S.A.

Whoops

With reference to the F copy program which appeared in the March, April and May 1986 issues of QL World, I would like to point out a number of errors in the listings printed which you may wish to pass on to your other readers. In the March issue, there is a line omitted in the FCOPY_BAS program, namely: **2600 END DEFine get_device_names**

In the April issue, there are two lines omitted from the spool_code program. At the top of page 52 and after the first instruction **Mulu** #ch_lench, D1, there is a blank line. This should be replaced by the instruction:
MOVE.L #bv_chbas(A6),A2
Base_addr_offset of channel table

Again on page 52, near the bottom of the first column, there is a comment starting "Set the SPL_JOB's initial registers as follows:" Before the next instruction:
(MOVE.L (A7)+,jb_a0(A0))
Preset Job's A2 register to channel_b

There is also a minor error to a comment. On page 50, under the Load/Installation Instructions comment, line 10 of the SuperBasic program states:
*** 10 a** = RESPR (512)
Preset Job's A2 register to channel_b (Note that this can only be done . . .
The spool_code program is in fact 520 bytes in length and, therefore, will not fit into the area allocated. The Boot program in the March issue suggests an allocation of 600 bytes which is obviously enough.

Having made the above amendments, the program should work correctly.

Gerald D. Brook
Mickleover,
Derby.

Named drivers

In reply to Michael Scott's letter in the June issue. It is possible to use other typefaces with Quill, providing you can dispense with some of the existing typefaces, e.g., change the printer driver 'underline' code for the 'double strike' code and the 'superscript' code for 'italics', or any other code of your choice.

The codes for these on my Shinwa CPA 80 are:
: ESC, "G" (double strike)
: ESC, "H" (cancel d/strike)
: ESC, "R", 19 (Elite type)
: ESC, "R", 13 (Pica type)

I keep this printer driver on a separate Microdrive cartridge which I place in mdv1 after I have loaded Quill, as the Quill cartridge contains the normal printer driver. You may have as many printer driver options as you wish, and either keep each on a separate Microdrive cartridge. Alternatively, keep them on your printer driver list in the Quill Install_Bas program, each under a different 'Printer' name to be 'installed' as required.

Jim Knife
Whitehaven,
Cumbria.

Paper chase

Like J. Parsons of Taunton I bought a QL and printer from Dixons and became quite worried when there did not appear to be a source of supply of the thermal paper for the Serial 8056 printer. I hope my experience might be of some help to him and the many others who are in the same predicament.

Having tried Dixons themselves, in fact several branches, I did eventually come across one who was able to supply me with a two of rolls. These were of such poor quality, however, I asked Dixons to take them back, which I must say was done happily and willingly.

Later, browsing in Boots computer department, I discovered that they stocked rolls and sheets of thermal paper for Brother EP44 and HR5 printers. It works in the Serial 8056 and is of superior quality. the paper comes in 30m rolls and 100 sheet packs, both A4. A simple solution but I hope it will be of help.

D. H. Carr
Leeds.

More on typefaces

W. Patrick O'Reilly says in the May issue, he would like a future version of Quill to give him the facility to change printer drivers without returning to Basic. This facility already exists. He can create a variety of different printer_dat files with distinctive names; to change typefaces, all he has to do is copy the appropriate one to his Quill cartridge as printer dat.

This can be done from Qdos by deleting printer dat and copying the appropriate file in its place. From within Quill, the same effect can be achieved by using the backup command.

My Star Delta printer will produce pica, elite, condensed and expanded typefaces as well as bold, underlined, italic, high and low script. To give myself the maximum choice, I installed Quill using the codes for pica type, then copied printer dat as printer pic. I installed Quill again using the codes for elite type and copied the new version of printer dat as printer_eli. I then repeated the exercise using the condensed type codes, and copied printer_dat as printer_con.

If I decide, before loading Quill, I want to print a document in condensed type, I delete printer_dat and copy printer_con as printer_dat. If I only decide while writing the document that I want to use condensed type, I simply backup mdv1 printer_con as mdv1_printer_dat, overwriting the existing file. I have also created new sets of printer_dat files to run the Juki 6100 in my office.

The only limitations on this procedure seem to be the amount of space on the microdrive cartridge and the patience of the user during the initial installation process. If space poses a problem, the extra files could be stored on a separate cartridge.

Using floppy disks obviates any such problem. It also enables you to keep all four Psion programs on one disk, switch between them with a slight development of Martin McHugo's invaluable boot program (in your April issue) and take advantage of the same variety of typefaces from Abacus and Archive by swapping the same printer_dat files.

Peter Singer
London, NW3

Drastic Measures

I am the owner of two QLs and for about six months one of them has always been in for repair. The fault seemed to be symptomatic of a badly-soldered joint but recently I obtained a copy of the QL Service Manual, which recommended that if that a QL is crashing, all ICs in a socket should be removed, the pins cleaned and the ICs replaced. That did the trick, at least for a time, as the QLs were returned apparently crash-free.

AFter a time the problem returned, so I decided to take the plunge and, armed with a soldering iron, removed the IC sockets and soldered-in the ICs directly to the board. Never having noticed that previously fixed heatsinks to all the chips, were still uncooked.

R. B. Delemos,
London W3.

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SUPER ASTROLOGER DE LUXE

By Elmar Duensser

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EYE-Q....THE DEFINITIVE QL GRAPHICS PACKAGE

By Charles Southey

We would love to tell you all about this superb system – but space is short. Take it from us, we've looked at every single graphics & CAD program available on the QL (**£49.95** systems included!) and combined their best features with our own ideas. The result . . . EYE-Q (yes, it is intelligent). Design your own full colour screens with complete ease – all the features are here. We mean that. Fully driven by pop-up menus ★ single key entry ★ several zooms ★ windowing ★ proportional movement ★ paint/fill ★ rubber bands ★ arcs ★ ellipses ★ circles ★ lines ★ files ★ replicable sprites ★ horizontal & vertical stretch ★ reflect ★ invert ★ transfer ★ pan/scroll ★ undo (ie; whoops!) ★ font design editor ★ automatic anti-aliasing ★ graphic screen compression ★ offset display ★ on-screen help ★ XOR/OR cursor with variable width ★ text inclusion ★ freehand movement ★ localised save/load/scroll/pan/recolour/zoom ★ integral sprite editor ★ full range of QDOS colours & stipples available through paintbox ★ user-definable defaults . . . If you already have a graphic system, throw it out. Eye-Q is in a class by itself, a state-of-the-art program from the people who brought you Sprite Generator & SUPERCHARGE. The system is supplied complete with a fully comprehensive A4 manual.

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NEW

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By Colin Opie

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- ★ Direct file copying from other disk formats (PC-DOS, MS-DOS, CP/M, Acorn DFS etc, etc) – this is an amazing facility, to be seen to be believed!
- ★ Text file translation utility
  – expands tabs, converts CR/LF to LF intelligently: converted files may be imported to Quill.
- ★ Disk sector editing for both QL & non-QL disks, with all the usual features
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SUPERCHARGE V1.18

By Simon Goodwin, assisted by Gerry Jackson

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"Superfast, Super compact and Super flexible – produces minor miracles – a superb utility – a 5 star (☆☆☆☆☆) program – a Sinclair User Classic (the highest award given to any program)" ***SINCLAIR USER***

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"The claimed speed increase over SuperBASIC of THIRTY to ONE THOUSAND times was substantiated" ***ZX COMPUTING***

"A runaway success – SUPERCHARGE is dangerously close to being a completely over-the-top raver . . . performance is simply dramatic . . . the final spark that sets the QL software scene alight . . . SUPERCHARGE really shows that you can do things on a QL that you can't on other machines" ***YOUR SINCLAIR***

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NOTE: Only users of SUPERCHARGE Version 1.16 & earlier are recommended to upgrade.

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By Keith Poole

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SUPERFORTH+REVERSI V1.6 By Gerry Jackson

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"Superforth succeeds very well" ***QL WORLD***

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SUPER BACKGAMMON V3.0 By Ian Robinson

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By Derek Jones & Ian Robinson

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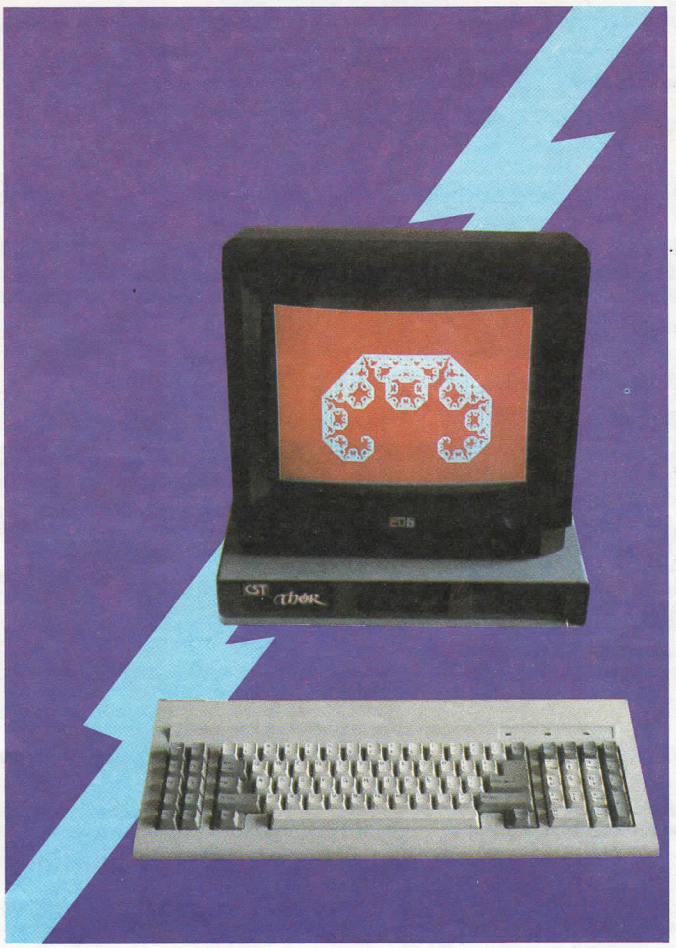
THOR



As the CST Thor prepares to take up position as the first QL successor, Ron Massey visits CST headquarters to check out the prototype.

The QL is to be continued and that is official. Gone are the Microdrives and gone is the black livery but, beneath a new exterior, SuperBasic is alive and well. Cambridge Systems Technology unveiled its new QL derivative at the ZX Microfair. Christened the Thor, the new CST micro is a full-feature machine which includes many of the options which were scheduled for the Sinclair QL+.

Needless to say, in view of the recent uncertainties regarding the future of the QL the latest development has provided a much-needed boost for the morale those involved directly with the production of QL peripherals. That the Thor will also cheer those who have grown to appreciate the power of the QL is undoubted while, at the same time, faith placed in the technology from which the QL has evolved has been vindicated.

A total divergence in appearance, the Thor system includes a separate case, in which the power supply, processing electronics and drives are housed, and a detachable IBM clone keyboard. Of major importance to programmers andend-users alike is the fact that Thor is fully-compatable with existing QL software.

Asked if the program compatibility problem between various versions of the U.K. QLs and versions sold overseas would present similar problems to those observed occasionally at present, a spokesman for CST said that, in his experience, the majority of the difficulties arising from program incompatibility occur through the use of illegal call entry points in a program. With that in mind, perhaps improved distribution of system information will prove a benefit to all concerned.

Intended as a QL upgrade, the basic model Thor will include as standard 640K of memory, a full-specification toolkit, a single 3.5in. NEC floppy disc drive and the associated circuitry for the drive. There is additional circuitry to control four ROM slots, a parallel printer port and a mouse port.

Optional variations are available for the system configuration to include either an additional 3.5in. disc drive or the new CST 3.5in Rodime RO652 20MB Winchester drive. Also launched at Microfair, the Rodime Winchester is available for present versions of the QL as well.

Since the Thor will encompass CST peripherals, an examination of component specification reveals features not readily apparent to casual observation.

The Thor memory system is the CST RAM-Plus expansion unit. Employing state-of-the-art DRAM technology, RAM-Plus furnishes the usual advantages of external memory systems with regard to processing speed and the more obvious ability to perform fully-fledged multi-tasking, usually severely restricted on a standard QL. In addition, RAM discs may be used with the integral toolkit.

The interface to the QL board is the CST Q-Disc SCSI Winchester/floppy disc system. Although considerably more complex when viewed from the processor end of operation, using the new system is very much like using existing QL Microdrives.

The interface contains a custom PLA chip which performs the SCSI protocol and housekeeping functions, a WD1770 floppy disc controller and a 16KB ROM which contains the Qdos device driver for the Winchester and floppy, as well as the toolkit and other SuperBasic extensions.

Described in the literature as the flagship of the CST fleet of storage devices for the QL, the discrete Winchester is supplied with an integral 3.5in. floppy drive sub-system and is a high-performance drive based on the new SCSI standard. What that means in practical terms is that up to eight SCSI drives can be connected to a single QL.

An exciting peripheral in its own right, having a single storage medium with a 20MB capacity is equivalent to having something in the region of 190 Microdrives continually on-line with access times which have become rocket-propelled as well. For those interested in such things, a Winchester formats to 41,616 sectors.

The Winchester hierachical directory structure enables files to be compartmentalised into types, which is just as well, since a full Winchester can contain as many as 1,000 files. Other file-handling features include file date-stamping, which is continually updated for each file access, modification or back-up.

The Data Management Utility supplied with the system archives only

those files which have been altered since the last back-up was performed. That greatly reduces the time taken for making back-ups of altered files on to the floppy.

The men behind Thor. Graham Priestley (left) and David Oliver of CST.

Another useful feature of the Winchester system is that files in each of the directories are sorted into approximate alphabetical order. Where individual directories become too numerous to view conveniently on a single screen, they can be split into sub-directories.

Providing the greatest degree of flexibility possible, files may also be sent to other directories. That is a useful facility where file types evolve, making previous directory systems redundant.

It is probable that initial interest for the Winchester system will be by database users, although it is certainly equally applicable to any area requiring data or program storage. A comparison of the specification of the storage devices available to the QL provides an interesting insight to the possibilities of the top-of-the-range accessories:

Parameter	Microdrive	Floppy	Winchester
Average random	3.5 sec.	260 ms	96 ms
Ratio	36.5	2.71	1
Worst case	7.0 sec.	680 ms	202 ms
Ratio	34.7	3.37	1
32Kb prog load time	7.8 sec.	2.4 sec	192 ms
Ratio	40.6	12.5	1
Approx. file cap.	100 KB	720 KB	20 MB
Ratio	1	7.2	200
Approx. file count	200	480	1200
Ratio	1	2.4	6
RAM used per drive	512 bytes	1.44 KB	3.6 KB

Those interested in expanding their present QLs to the maximum potential may use the CST range of peripherals in conjunction with a Q+4 expansion system, which is housed as a black plinth on which the QL rests; it interfaces through the normal left expansion port.

Four identical expansion ports, sited at the rear of the plinth, can be used, for example, with a RAM card/disc interface, a video digitiser, an EPROM programmer and/or virtually any other fully Sinclair-compatible device normally requiring exclusive occupation of the sole vital access port.

Although individual CST peripherals for the QL are available, Thor, which includes most of them, will be released on the home market around September. The price for a basic Thor is expected to be around £550, with the top-of-the-range model set at £1,300.

Mail-order marketing in the U.K. will be undertaken by Eidersoft, whose specialisation in 68000-based machines has placed it in the enviable position of having established their integrity.

Marketing plans encompass a full range of services related to the Thor and QL software. Full U.K. user support, both written and verbal, will be available from Eidersoft, which will also be supplying manuals, high-level documentation and co-ordinating warranty servicing.

Eidersoft professional business user support will include loan/exchange units. Other most welcome services will include an offer to purchasers of Thor for the transfer of Microdrive-based programs to disc.

Furthering that goal, plans are being laid for contacting various software houses with a view to transferring their QL programs to disc, with the added assurance that such programs will be made secure from possible pirating.

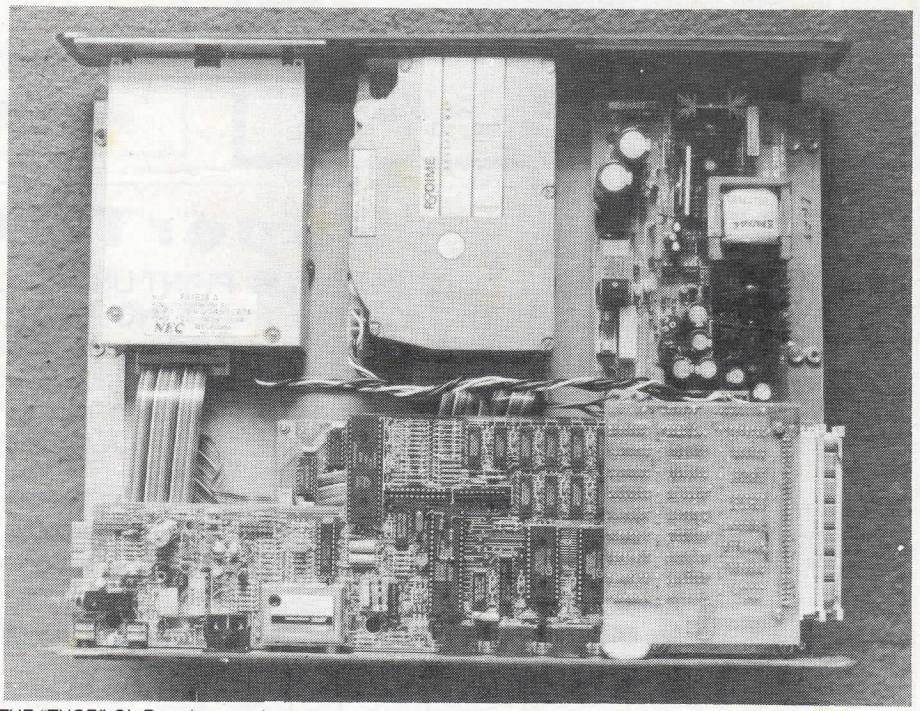
Additional commitments by Eidersoft include the introduction of a professional grade of its Ice system. No longer constrained by the limitation of a maximum of 16K, the new 32K version will include a big number of new features. One of the most obvious will be the replacement of the Microdrive symbol with an icon for Winchester control and the incorporation of the extensive directory system inherent with the new Winchester.

Utilising existing QL boards, Thor obviously features the 68008 processor, with all its virtues and limitations. Where will CST go from here? Already well into the design stages, the eventual CST ultra micro will feature a full-specification 68020 processor. Initially seen as a machine with a minimum of 1MB of RAM in its basic form, on-board features will also include 16-colour enhanced video modes, with the present QL video system as a subset.

Because the 68020 processor includes an 8-bit emulation mode in its instruction set, current QL software will be fully-compatible. Much of the new software written specifically for the 68020 will, however, undoubtedly take advantage of the full processing power of the new chip and 32-bit addressing.

Purchasers of the present Thor system will, as an added bonus, be able to upgrade their machines to the full 68020 specification at a later date.

Regarding availability, the Thor, by anology, can be compared to the Morgan sports car; it is a high-performance, high-quality machine; mostly hand-built; and it will incorporate the ultimate viable innovations.



THE "THOR" QL Board across bottom; memory expansion bottom right; filtered power supply top right; NEC 3½ disc top left; 20M Rodime Winchester top centre.

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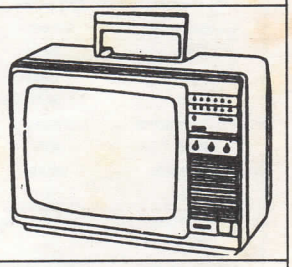

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SPECTRUM SIMULATION

Marcus Jeffery takes last month's simulation a stage closer to the real thing, adding a true Spectrum screen, block graphics and user defined characters.

A variety of problems emerged during last month's delve into methods in which the QL could be used to simulate the Spectrum. One concerned the Spectrum screen requiring 32 columns, each eight pixels wide, and able to display in any of eight colours – even disregarding such items as flash and brightness. The only way to put so many pixels across the screen is to use the entire screen width in MODE 8. If we do that, however, a number of additional problems arise.

One is that the screen is not deep enough if we are to use double-height pixels to match the double-width pixels of the eight-colour mode. Though we can circumvent that either by having only a partial display, or tolerating elongated pixels, and being honest, the Spectrum screen is not exactly square. More important, unless you own a monitor for you QL, you will lose some columns off the side of your TV screen.

Compromising by using only four colours, without flashing, it is possible to display the Spectrum output screen in the middle of the QL display. That method obviously suffers somewhat when converting highly-colourful programs but is sufficient for many applications and has a number of added advantages.

When finally we selected a screen window in the last article, we had been forced to use the 9 x 5 standard QL characters. We can now define a window which has the correct number of horizontal and vertical pixels to simulate the 8 x 8 character matrices found on the Spectrum. That also allows the pos-

Figure 1

```
LOC       OBJECT          STMT          SOURCE STATEMENT

                           1 *
                           2 * Include the new procedures/functions for use with the Spectrum
                           3 *    simulated screen display.
                           4 *
0000'  3078 0110           5          MOVE.W   $110,A0          $110=BP.INIT=Add proc/func
0004'  43FA 0006           6          LEA.L    PROCS,A1         Link in procs/funcs
0008'  4E90                7          JSR      (A0)
000A'  4E75                8          RTS
000C'  0004                9 PROCS    DC.W     4                Number of procedures
000E'  002E               10          DC.W     SPECTRUM-*
0010'  0853 5045 4354 5255 11          DC.B     8,'SPECTRUM'
       4D
001A'  0068               12          DC.W     SPRINT-*
001C'  0653 5052 494E 54  13          DC.B     6,'SPRINT'
0024'  00DC               14          DC.W     SINK-*
0026'  0453 494E 4B       15          DC.B     4,'SINK'
002C'  0106               16          DC.W     SPAPER-*
002E'  0653 5041 5045 52  17          DC.B     6,'SPAPER'
0036'  0000               18          DC.W     0                End of procedures
0038'  0000               19          DC.W     0                Number of functions
003A'  0000               20          DC.W     0                End of functions
                          21 *
                          22 * SPEC Procedure
                          23 *
                          24 * This will clear the screen to a four-colour Spectrum display.
                          25 *    It will also set up the attribute file and new font.
                          26 *
003C'  49FA 01F6          27 SPECTRUM LEA.L    STORAGE,A4
0040'  7010               28          MOVEQ    #$10,D0          D0=MT.DMODE
0042'  4201               29          CLR.B    D1               Mode 4
0044'  4202               30          CLR.B    D2               Monitor mode
0046'  4E41               31          TRAP     #1               Change mode
0048'  700D               32          MOVEQ    #$0D,D0          D0=SD.WDEF
004A'  4241               33          CLR.W    D1               Border Colour
004C'  4242               34          CLR.W    D2               Border Width
004E'  76FF               35          MOVEQ    #-1,D3           Timeout
0050'  207C 0001 0001     36          MOVE.L   #$10001,A0       Window#1
0056'  43FA 0022          37          LEA.L    WIN1,A1          A1=Window#1 information
005A'  4E43               38          TRAP     #3               Redefine window#1
005C'  397C 0000 0004     39          MOVE.W   #0,4(A4)
0062'  38BC 0000          40          MOVE.W   #0,(A4)
0066'  7207               41          MOVEQ    #7,D1            D1 = White paper
0068'  6100 00E4          42          BSR      SPS
006C'  7200               43          MOVEQ    #0,D1            D1 = Black ink
006E'  6100 00AC          44          BSR      SIS
0072'  7020               45          MOVEQ    #$20,D0          D0 = SD.CLEAR
0074'  4E43               46          TRAP     #3
0076'  4280               47          CLR.L    D0               Signal no errors
0078'  4E75               48          RTS                       Return to SuperBasic
                          49 *
007A'  0100 00B0 0080 0020 50 WIN1     DC.W     256,176,128,32
                          51 *
                          52 *
                          53 *
0082'  49FA 01B0          54 SPRINT   LEA.L    STORAGE,A4
```

Continued on page 22

Continued from page 21

sibility of implementing the Spectrum Block graphics characters and User-Defined characters. Additionally, we could also simulate, to some extent, the Spectrum Attribute File.

All of that could easily be done directly from SuperBasic but mainly in the interests of print speed, the basic routines have been written in machine code, with appropriate calls from additional SuperBasic functions and procedures. The assembly code for those SuperBasic machine code extensions is shown in figure one. If you do not have Assembler to hand, figure two shows a SuperBasic hexadecimal loader program.

Type it as shown, then continue typing all the hex numbers from the 'OBJECT' column in figure one, as started in line 2000. When doing that, you must be careful around statements 202, 203 and 317 of the Assembly Code listing. They are storage definition statements. Look at the hexadecimal number after the equals sign in those lines and include that many double zeroes – i.e., "00" – in the hex_loader program.

Having typed-in the loader program, you can save the code to Microdrive with the command:
sbytes mdv1_spectrum, start, 2400
From then, to use the routines, first create some space, using:
start = respr (2400)
then load the code, with:
lbytes mdv1_spectrum, start
and finally set up the procedures by typing: call start

The machine code, when called, creates four new SuperBasic extension procedures. The first is SPECTRUM, which will define an output screen consisting of 32 columns and 22 lines. If you read last month's article, you may remember that the Spectrum had a main window at the top of the screen, and an input window – only two lines high, though this figure can cchange for large quantities of input data – beneath it.

We are really concerned only with output screen information in a Spectrum format, so only the upper window is defined. consequently program development and input will still be handled in the normal way by the QL but output, directed through the new routines, will appear in the Spectrum format.

Two other procedures, SINK and SPAPER, will define the ink and paper colours for the new Spectrum screen. They also set the QL ink and paper colours for window channel one, which has been re-defined, so normal QL commands such as CLS will still work correctly.

In addition, you will notice that a large part of the code consists of a completely

Figure 1 continued

```
LOC      OBJECT          STMT        SOURCE STATEMENT
0086'  3C36 B800          55         MOVE.W  0(A6,A3.L),D6    D6 = Separator
008A'  E80E               56         LSR.B   #4,D6
008C'  0246 0007          57         ANDI.W  #7,D6
0090'  BBCB               58         CMPA.L  A3,A5            No parameters?
0092'  6700 0034          59         BEQ     SPSEP
0096'  4BE7 021C          60 NSTRING MOVEM.L D6/A3-A5,-(A7)
009A'  2A4B               61         MOVEA.L A3,A5
009C'  508D               62         ADDQ.L  #8,A5            Just get one string
009E'  3078 0116          63         MOVE.W  $116,A0
00A2'  4E90               64         JSR     (A0)
00A4'  6600 0058          65         BNE     SPEXIT
00A8'  3A36 9800          66         MOVE.W  0(A6,A1.L),D5    D5 = Character count
00AC'  5345               67         SUBQ.W  #1,D5
00AE'  2A49               68         MOVEA.L A1,A5
00B0'  548D               69         ADDQ.L  #2,A5
00B2'  4281               70 STRCH   CLR.L   D1
00B4'  1236 D800          71         MOVE.B  0(A6,A5.L),D1
00B8'  6100 00AA          72         BSR     PRINT
00BC'  528D               73         ADDQ.L  #1,A5
00BE'  51CD FFF2          74         DBF     D5,STRCH
00C2'  4CDF 3840          75         MOVEM.L (A7)+,D6/A3-A5
00C6'  508B               76         ADDQ.L  #8,A3
00C8'  0C06 0000          77 SPSEP   CMPI.B  #0,D6            <CR> if no separator
00CC'  6600 0028          78         BNE     SNOCR
00D0'  302C 0004          79         MOVE.W  4(A4),D0         Increment Row & Col
00D4'  4200               80         CLR.B   D0
00D6'  0640 0400          81         ADDI.W  #$400,D0
00DA'  3940 0004          82         MOVE.W  D0,4(A4)
00DE'  3214               83         MOVE.W  (A4),D1          Increment attribute adoress
00E0'  0241 FFE0          84         ANDI.W  #$FFE0,D1
00E4'  0641 0020          85         ADDI.W  #32,D1
00E8'  3881               86         MOVE.W  D1,(A4)
00EA'  0C41 02C0          87         CMPI.W  #704,D1          Test for scroll
00EE'  6600 0006          88         BNE     SNOCR
00F2'  6100 00CC          89         BSR     SCROLL
00F6'  BBCB               90 SNOCR   CMPA.L  A3,A5            End of parameter list?
00F8'  6600 FF9C          91         BNE     NSTRING
00FC'  4280               92         CLR.L   D0
00FE'  4E75               93 SPEXIT  RTS
                          94 *
                          95 *
                          96 *
0100'  49FA 0132          97 SINK    LEA.L   STORAGE,A4
0104'  3078 0118          98         MOVE.W  $118,A0          Get parameters
0108'  4E90               99         JSR     (A0)
010A'  6600 0024         100         BNE     EXITI
010E'  70F1              101         MOVEQ   #-15,D0
0110'  0C43 0001         102         CMPI.W  #1,D3            One parameter?
0114'  6600 001A         103         BNE     EXITI
0118'  2236 9800         104         MOVE.L  0(A6,A1.L),D1
011C'  1941 0002         105 SIS     MOVE.B  D1,2(A4)         Place value in Spectrum Ink
0120'  207C 0001 0001    106         MOVE.L  #$10001,A0       A0 = Channel#1
0126'  303C 0029         107         MOVE.W  #$29,D0          D0 = SD.SETIN = Set Ink
012A'  363C FFFF         108         MOVE.W  #-1,D3           D3 = Timeout
012E'  4E43              109         TRAP    #3
0130'  4E75              110 EXITI   RTS
                         111 *
                         112 *
                         113 *
0132'  49FA 0100         114 SPAPER  LEA.L   STORAGE,A4
0136'  3078 0118         115         MOVE.W  $118,A0          Get parameters
013A'  4E90              116         JSR     (A0)
013C'  6600 0024         117         BNE     EXITP
0140'  70F1              118         MOVEQ   #-15,D0
0142'  0C43 0001         119         CMPI.W  #1,D3            One parameter?
0146'  6600 001A         120         BNE     EXITP
014A'  2236 9800         121         MOVE.L  0(A6,A1.L),D1
014E'  1941 0003         122 SPS     MOVE.B  D1,3(A4)         Place value in Spectrum Paper
0152'  207C 0001 0001    123         MOVE.L  #$10001,A0       A0 = Channel#1
0158'  303C 0027         124         MOVE.W  #$27,D0          D0 = SD.SETPA = Set Paper
015C'  363C FFF1         125         MOVE.W  #-15,D3          D3 = Timeout
0160'  4E43              126         TRAP    #3
0162'  4E75              127 EXITP   RTS
                         128 *
                         129 *
                         130 *
0164'  43FA 0394         131 PRINT   LEA.L   SFONT,A1         A1 = Start of Spectrum Font
0168'  0481 0000 0020    132         SUBI.L  #32,D1
016E'  E789              133         LSL.L   #3,D1
```

```
0170' D3C1                  134          ADDA.L  D1,A1          A1 = Start of character data
0172' 3414                  135          MOVE.W  (A4),D2        D2 = Attribute offset
0174' 0C42 02C0             136          CMPI.W  #704,D2        Off base of screen?
0178' 6600 0006             137          BNE     NOSCR
017C' 6100 0042             138          BSR     SCROLL         If so, scroll display
0180' 4282                  139 NOSCR    CLR.L   D2
0182' 3414                  140          MOVE.W  (A4),D2
0184' 5254                  141          ADDQ.W  #1,(A4)        Increment attribute offset
0186' 47FA 00B2             142          LEA.L   ATSTART,A3     A3 = Start of Attribute File
018A' D7C2                  143          ADDA.L  D2,A3          A3 = Attribute address
018C' 142C 0003             144          MOVE.B  3(A4),D2
0190' E70A                  145          LSL.B   #3,D2
0192' D42C 0002             146          ADD.B   2(A4),D2
0196' 1682                  147          MOVE.B  D2,(A3)        Set attribute
0198' 247C 0002 1020        148          MOVE.L  #$21020,A2     A2 = Start of Spectrum screen
019E' 342C 0004             149          MOVE.W  4(A4),D2       D2 = Row & Column
01A2' D4C2                  150          ADDA.W  D2,A2          A2 = Print address
01A4' 5442                  151          ADDQ.W  #2,D2          Increment column
01A6' 0C02 0040             152          CMPI.B  #64,D2         End of line?
01AA' 6600 000A             153          BNE     NOCR           Branch if not
01AE' 0642 0400             154          ADDI.W  #1024,D2       Else increment row
01B2' 143C 0000             155          MOVE.B  #0,D2          and reset column
01B6' 3942 0004             156 NOCR     MOVE.W  D2,4(A4)
01BA' 6100 0034             157          BSR     PCHAR
01BE' 4E75                  158          RTS
                            159 *
                            160 *
                            161 *
01C0' 323C FFF8             162 SCROLL   MOVE.W  #-8,D1         Scroll 8 pixels upwards
01C4' 363C FFFF             163          MOVE.W  #-1,D3         D3 = Timeout
01C8' 303C 0018             164          MOVE.W  #$18,D0        D0 = SD.SCROL = Scroll all window
01CC' 207C 0001 0001        165          MOVE.L  #$10001,A0     A0 = Channel#1
01D2' 4E43                  166          TRAP    #3
01D4' 0454 0020             167          SUBI.W  #32,(A4)
01D8' 397C 5400 0004        168          MOVE.W  #$5400,4(A4)
01DE' 41FA 005A             169          LEA.L   ATSTART,A0
01E2' 323C 029F             170          MOVE.W  #671,D1
01E6' 10E8 0020             171 ATTSCR   MOVE.B  32(A0),(A0)+
01EA' 51C9 FFFA             172          DBF     D1,ATTSCR
01EE' 4E75                  173          RTS
                            174 *
                            175 *
                            176 *
01F0' 41FA 003A             177 PCHAR    LEA.L   COLS,A0        A0 = Start address of Colour Table
01F4' 7807                  178          MOVEQ   #7,D4
01F6' 4282                  179 CLINE    CLR.L   D2
01F8' 142C 0003             180          MOVE.B  3(A4),D2       D2 = Paper colour
01FC' 0202 000E             181          ANDI.B  #14,D2         D2 = Even
0200' 34B0 2800             182          MOVE.W  0(A0,D2.L),(A2) Set paper on screen
0204' 1411                  183          MOVE.B  (A1),D2        D2 = Character pattern
0206' E14A                  184          LSL.W   #8,D2          Duplicate pattern in
0208' 1419                  185          MOVE.B  (A1)+,D2       high and low bytes
020A' 3602                  186          MOVE.W  D2,D3          Store pattern in D3
020C' 4642                  187          NOT.W   D2             NOT pattern for mask
020E' C552                  188          AND.W   D2,(A2)        Set appropriate screen bits to zero
0210' 4282                  189          CLR.L   D2
0212' 142C 0002             190          MOVE.B  2(A4),D2       D2 = Ink colour
0216' 0202 000E             191          ANDI.B  #14,D2         D2 = Even
021A' C670 2800             192          AND.W   0(A0,D2.L),D3  D3 = Correct colour pattern
021E' 8752                  193          OR.W    D3,(A2)        Now OR this to the screen
0220' D5FC 0000 0080        194          ADDA.L  #128,A2        Increment to next screen pixel line
0226' 51CC FFCE             195          DBF     D4,CLINE
022A' 4E75                  196          RTS
                            197 *
                            198 *
                            199 *
022C' 0000 00FF FF00 FFFF   200 COLS     DC.W    $0000,$00FF,$FF00,$FFFF
                            201 *
0234' =0006                 202 STORAGE  DS.W    3
023A' =02C0                 203 ATSTART  DS.B    22*32
                            204 *
04FA' 0000 0000 0000 0000   205 SFONT    DC.B    $00,$00,$00,$00,$00,$00,$00,$00     Space
0502' 0010 1010 1000 1000   206          DC.B    $00,$10,$10,$10,$10,$00,$10,$00     !
050A' 0024 2400 0000 0000   207          DC.B    $00,$24,$24,$00,$00,$00,$00,$00     "
0512' 0024 7E24 247E 2400   208          DC.B    $00,$24,$7E,$24,$24,$7E,$24,$00     #
051A' 0008 3E28 3E0A 3E08   209          DC.B    $00,$08,$3E,$28,$3E,$0A,$3E,$08     $
0522' 0062 6408 1026 4600   210          DC.B    $00,$62,$64,$08,$10,$26,$46,$00     %
```

The final part of the machine code program will appear with the concluding feature in the August issue.

new character font for the QL. It is an exact replica of the printable Spectrum characters. The problem, of course, is that those characters are based round an 8 x 8 grid, so none of the QL print functions will work.

That is where the new procedure SPRINT is used. It will accept any number of STRING parameters and will print the characters in Spectrum format, scrolling fthe screen where necessary. The parameters can be separated using any of the standard separators, normally allowed on the QL, off of which will cause printing to continue immediately after the last character. A NULL separator, such as at the end of a statement, or SPRINT on its own will cause a line feed and carriage return to the beginning of the next line, again scrolling if necessary. So, having set up the system, call the start address by typing:

SINK 0
SPAPER 7

That will give black writing on a white background. Now try a few SPRINT statements, such as:

SPRINT"This should appear in the top corner"
SPRINT:SPRINT:SPRINT:
SPRINT"Followed by some blank lines"
SPRINT"More";"than","one"!" parameter"

The procedure accepts only string parameters. it could easily be made to check for others, by obtaining the value of byte zero – i.e., 0(A6,A3.L) – which is a pointer to the parameter in the Name Table. That first byte is used in the program to obtain the parameter separator but the lowest four bits will also give the parameter type. That would only add to the length of the code and the built-in QL coercron makes the problem trivial. For instance, to output the contents of a numeric variable, just assign it to a string, then use the string variable as a parameter, such as:

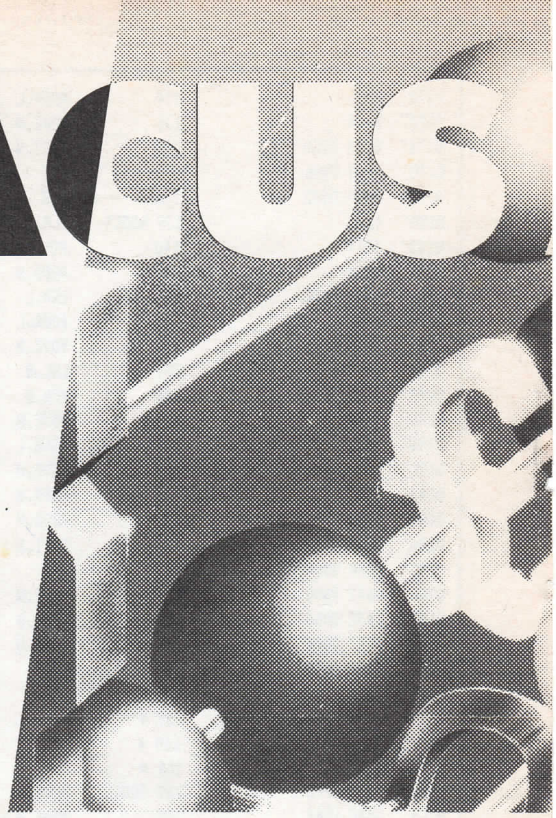
a = 12.5/0.33
a$ = a
SPRINT a$

which will give '37.87879' on the screen. What could be easier?

Figure 2

```
100 CLS
110 start=RESPR(650)
120 PRINT"Loading Hex...";hex_load start
130 CALL start
140 STOP
150 :
160 :
1000 DEFine PROCedure hex_load(start)
1010 :
1020    DEFine FuNction decimal(x)
1030    RETurn CODE(h$(x))-48-7*(h$(x)>"9")
1040    END DEFine decimal
1050 :
1060 byte = 0
1070 RESTORE 2000
1080 READ h$ : IF h$="*" THEN GO TO 1320
1090 IF LEN(h$)<>2*INT(LEN(h$)/2) THEN
1100    PRINT"Odd number of hex digits in: ";h$
1110    STOP
1120 END IF
1130 FOR b=1 TO LEN(h$) STEP 2
1140    hb=decimal(b):lb=decimal(b+1)
1150    IF hb<0 OR hb>15 OR lb<0 OR lb>15 THEN
1160       PRINT"Illegal hex digit in: ";h$
1170       STOP
1180    END IF
1190    POKE start+byte,16*hb+lb
1210    byte=byte+1
1220 END FOR b
1230 GO TO 1080
1320 END DEFine hex_load
2000 DATA "30780110","43FA0006","4E90","4E75","0004"
2010 :
2020 REMark ... and so on ...
```

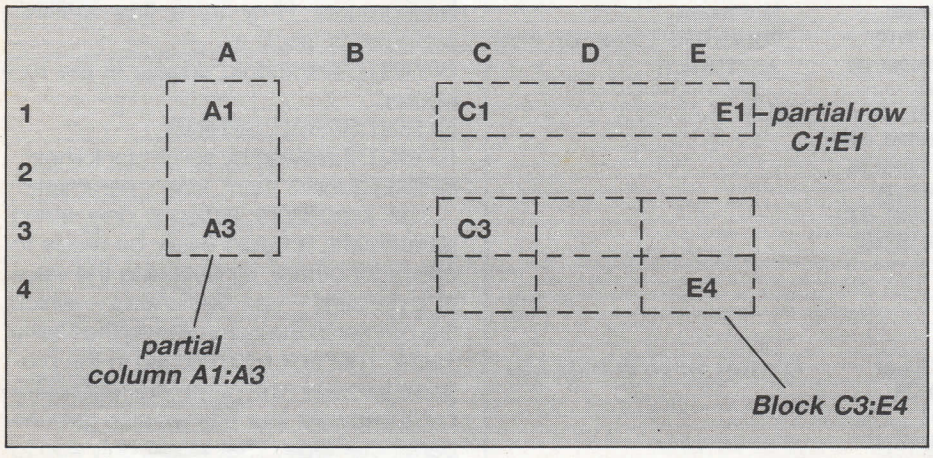
THE ABACUS



Getting Abacus to do anything useful is mainly a matter of placing the appropriate formulae in the correct cells. For that reason the types of formulae you can use govern the kinds of applications for which a spreadsheet can be used. Abacus has an amazing range of functions which can be used to construct formulae often more sophisticated than the average spreadsheet program.

It is the range of functions which makes Abacus a powerful and mature spreadsheet program and to make the most of them it is essential to know what each one does. That is simple in principle, in that all you have to do is read the description of each function in the manual but that gives you no idea of what the functions might be used for or how they might be used in combination. In this article and next month we will look not so much at the simple definitions of formulae but how they can be used to produce some surprising results.

Figure 1. Partial row/column and block of cells.



The simplest formulae work out results based on the contents of a few cells. For example, **A1+A2+A3** will add the contents of the first three cells in column A. To get anywhere, however, we have to be able to write formulae which can calculate results based on values stored in groups of cells. Abacus allows you to specify groups of cells which form entire columns/rows, partial columns/rows and blocks.

You can refer to an entire column by giving the column letter and to an entire row by giving its row number. Partial columns and rows are specified by referring to the first and final cell. Similarly a block of cells can be specified by referring to the cells at the top left-hand corner and the bottom right-hand corner of the block. For example, A1:A3 is a partial column, C1:E1 is a partial row and C3:E4 is a block, as shown in figure one:

Partial columns/rows and blocks can be used in formulae as part of functions. For example, the function **SUM (cells)** will add the contents of all the cells specified. **SUM(A1:A3)** sums the partial column shown in figure one and **SUM(C3:C4)** adds the contents of all the cells in the block shown in figure one.

There are two types of cell references – *absolute* and *relative*. Unless instructed to the contrary, Abacus assumes that all cell references within a formula are relative to the cell in which the formula is stored. For example, if you enter the simple formula **A1 + A2** in cell A3 it is stored as "add the contents of the cell located two above, i.e., A1, to the contents of the cell one above, i.e., A2" – see figure two:

Figure 2. Relative cell references.

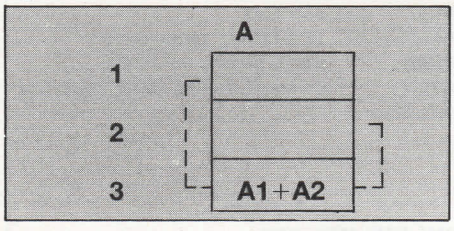


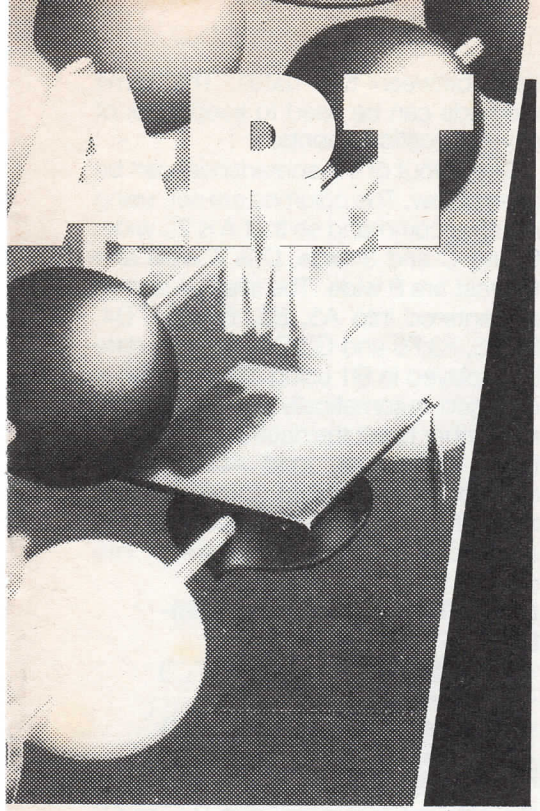
Figure 3. Labels.

	A	B	C	D	E
1	item	cost			
2	paper	5.00			
3	ink	6.00			
4					

The fact that cell references are relative becomes obvious only when you enter automatically a number of copies of the same formulae. If you copy the formulae in A3 to B3, using either the copy or the echo command – F3 followed by C or E – the new formula will read B1 +B2 instead of A1+A2. In the same way if you enter a partial row or column of formulae using **row=** or **col=** it is taken as being relative to the cell over which the cursor is positioned, even if this cell is not included in the partial row or column.

For example, if the cursor is positioned over A3 and you type-in **row=A1+A2 FROM B TO Z** the whole of row 3 from B to Z is filled with formulae which add the two cells just above it – that is the formula B1 + B2 is put into B3 and so on. Notice that in this example the cell A3 was not altered but because the cursor was positioned over it when the formula was typed-in, all other cell references were taken relative to it.

Relative cell references obviously are useful for maintaining the sense of formulae when they are moved from one cell to another but sometimes it is necessary for a cell reference to remain



Mike James introduces some simple mathematics into the Abacus art and applies the formula to household management.

fixed when formulae move. If you construct a spreadsheet so that the current VAT rate is always stored in A1, the formula to work out VAT on an entry in B1 is **B1*A1** and the formula should involve A1 no matter where it was stored. Copying this formula, however, would change both the B1 and A1 references as described. The solution to the problem is to use an *absolute* cell reference, indicated by writing a $ sign in front of it. Absolute cell references are not altered as a formula is moved round the spreadsheet. The correct way to write a VAT formula given earlier is **B1*A1.**

Unusual feature

If you want to see the difference between relative and absolute cell references, place the cursor over cell A1 and enter **row= A1 FROM A TO BL.** You will see that results in each cell in the row containing its own name, i.e., A1 contains A1, B1 contains B1 and so on. If you repeat the process using an absolute reference, **row=$A1 FROM A TO BL** results in every cell in the row containing A1.

An unusual feature of Abacus is its ability to use labels as an alternative method of referring to a cell. A label is nothing more than a cell which contains a text entry. A pair of labels can be used to refer to a single cell in the same row and to the left of one label and in the same column and below the other label. In figure three **paper cost** refers to cell B2 and **ink cost** refers to B3.

A single label can be used to refer to a row or a column but the rules which govern this are a little complicated. Simply speaking a label refers to a column if the nearest cell containing data is immediately below it or a row if the data is immediately to the left of it. In figure three the label cost refers to column B and the label ink to row 3. Labels cannot be used in a reference to a partial column/row or block in a function. For example, **SUM(paper·cost:ink·cost)** will not work but you can use a column or row label as in **SUM(cost).** Abacus will prompt you for the starting and ending rows before entering the formulae into the cell.

Although it seems that when you enter a formula it is stored in the cell concerned, that is not so. Abacus maintains a list of master formulae separate from the cells which make up the spreadsheet. Stored in the cell is a pointer to the appropriate formula in the list.

Saves memory

That apparently roundabout way of doing things is very sensible, because when you enter a number of copies of a formula using **col=, row=**, or the copy or echo commands, only a single version of the formula is stored in the master formulae list and each cell is set to point to it. That not only saves memory but it is very convenient, because editing one copy of the formula using the Amend command changes the entry in the master formulae list and thus all copies of the formula are changed automatically.

While Abacus has a great many functions, the use of many of them is obvious. The SUM function, for example, will add the contents of a number of cells, the SIN function will work out the sine of the specified angle, and so on. Rather than go through a complete and exhausting list we will concentrate on the less straightforward ones and the less obvious uses of some of the more obvious ones.

One of the most powerful Abacus features is the ability to make choices about which formulae to use according to the conditions. The method of making the choice is the IF function:

IF(condition, formula1, formula2)

where **condition** is a logical expression which evaluates to either true, in which case the value of the cell is given by **formula1,** or to false, in which case the value of the cell is given by **formula2.**

The formula can be either numeric or alphanumeric. For example, if you enter **IF(A1=0, "A IS ZERO", 20/A1)** the text **"A IS ZERO"** will appear if A1 is zero and the value of 20/A1 otherwise. This example illustrates one of the most common uses of the IF function avoiding division by zero errors.

In the **condition** part of the IF function you can use the usual symbols to compare values. That is, = for equal, < for less than, > for greater than, <= for less than or equal to, >= for greater than or equal to and <> for not equal. You can also use the logical operators AND, OR and NOT to make up complex conditions. For example, **IF(A1=0 AND A2=0, "BOTH ARE ZERO", A1+A2)** will print **"BOTH ARE ZERO"** if both A1 and A2 are zero and their sum otherwise.

You can also compare text values as part of a condition. **IF(A1="Y", "OK", "BYE")** will print "OK" if A1 contains "Y" and "BYE" otherwise. You may find that Abacus will not let you enter this function if A1 is empty or contains numeric data. The solution is to enter text data – "" will do – into A1 before entering the IF function. It is worth noting that Abacus uses zero to represent false and any non-zero value – usually 1 – to represent true. That can be used to produce some interesting effects. Try entering **row=NOT A1 FROM B TO BL** with the cursor positioned over B1, then set A1 to 0 and 1 as you please.

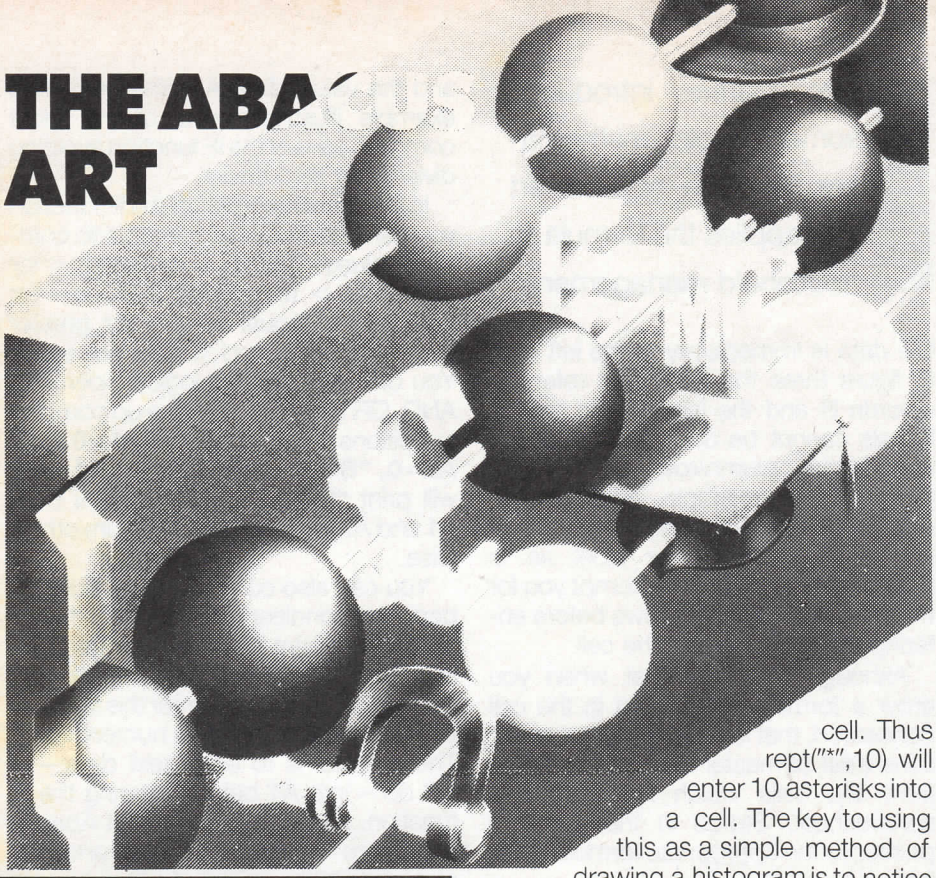
The IF function can be used in some surprising ways. One of the most useful is to check that entries have been made correctly. Suppose three columns of figures are being entered in columns A,B and C and the figures are percentages of a total. In this case the three figures, if entered correctly, should total 100. You can check for that by entering the formula **IF(SUM(A1:C1)=100, "", "INCORRECT ENTRY")** in column D. In the same way you can check that any entry is in the correct range, i.e., 0 to 100, by entering **IF(MAX(A1:C1)>100 OR MIN(A1:C1)<0, "RANGE ERROR", "")** in column E. MAX and MIN are functions which return the largest and smallest values respectively in a group of cells.

Student software

As another example of the use of the IF function, consider the problem posed at the end of last month's article concerning the VAT spreadsheet. Column E contained the Gross price, column F the Nett price and column G the VAT. Ideally we would like to enter either the Gross or the Nett price and have the missing items calculated. That can be achieved easily by entering **IF(F5<>0, F5*(1+D5),0)** in column E from 5 to 23, **IF(E5<>0,E5/(1+D5),0)** in column F from 5 to 23 and **E5-F5** in column G from 5 to 23. The VAT rate is stored in

Continued on page 26

THE ABACUS ART



Continued from page 25

column D. The equations in the Gross price column check to see if there is an entry in the Nett price column. If there is, the Gross price is worked out using it and otherwise a value of 0 is shown. In the same way the formula in the Nett price column checks to see if there is an entry in the Gross price column and if there is the Nett price is worked out from it. In that way no matter which column has a value entered in it and over-writing the existing formula the remaining information is calculated automatically.

If you want to see a high-quality graph of your data – as will be explained later in the series – you can use Easel. If, however, you would like a rough indication of what your data looks like you can plot simple histograms within an Abacus spreadsheet. The simplest method is to use the **rept(text, times)** function which will enter times copies of the text into a cell. Thus rept("*",10) will enter 10 asterisks into a cell. The key to using this as a simple method of drawing a histogram is to notice that times can be a function and, for example, **rept("*",A1)** will print a number of asterisks equal to the value stored in A1. To see simple demonstration enter **col=rept("*",A1) FROM B1 TO B10** with the cursor positioned over B1. Following that you can enter values into A1 to A10 and see an immediate histogram produced. If you would like a scaled histogram the maximum and minimum of the data are required. That can be achieved by entering **MAX(A1:A10)** in A11 and **MIN(A1:A10)** in A12 and then **col=rept("*",40*(A1-$A12)/($A11-$A12)) FROM B1 TO B10.** Notice the use of absolute cell references for the maximum and minimum.

Figure 4. Freezer spreadsheet.

The example spreadsheet this month – see figure four – makes heavy use of Abacus functions. The basic idea is that it keeps track of the contents of a freezer and indicates automatically when they have been kept too long. That is achieved by using the date function which returns the current date, and the days between two dates. The same methods can be used to keep track of any time-critical events.

The layout of the spreadsheet can be seen below. The columns are set, using the Grid command so that A is 20 wide, B and C and 3 wide, D is 4 wide and the rest are 8 wide. The titles as shown are entered into A3, B3, B4, C4, D4, E3:E5, F3:F5 and G3:G5. Today's date is displayed in B1 using date(1). That is changed automatically so long as you remember to set the date/time in SuperBasic before you load Abacus. The number of days when something has been stored is worked out using a very complicated formula entered into column B :-

```
col=IF(B6"0,0,DAYS(DATE(0))-
DAYS(STR(D6,2,0)+"/"
+IF(LEN(STR(C6,2,0))=1,"0","")
+STR(C6,2,0)+ "/"
+IF(LEN(STR(B6,2,0))=1,"0","")
+STR(B6,2,0))) FROM 6 TO 20
```

The main work of this is to convert the date entered in columns B,C and D into a string suitable for use in days. The formula to calculate the time to expire is entered into column G:

col=E6*30-F6 FROM 6 TO 20

and the test to print the word EXPIRED if the item has been stored too long is entered into column H:

col=IF(G6<0, "EXPIRED","") FROM 6 TO 20

If it is also worth entering 1986 as a default year in column D. That leaves the user to enter the description of the item, the day, month and possibly the year it was frozen and its storage life in months.

Easy way

The only difficulty with using this spreadsheet is remembering to set the date clock in SuperBasic before starting Abacus. There is an easy way of getting the QL to ask for the current date whenever Abacus is run and that will be described next month, together with the use of some Abacus commands and some more interesting functions.

Freezer Spreadsheet

	A	B	C	D	E	F	G	H
1	Today's date = 06/05/1986							
2								
3	Item	Date			Storage	Time	Time to	
4		Frozen			Life	Stored	Expire	
5		Day	Mon	Year	(Months)	(Days)	(days)	
6	Pork chops	15	8	1985	6	264	-84	EXPIRED
7	Beef steak	3	10	1985	8	215	25	
8	Clams	4	12	1985	1	153	-123	EXPIRED
9	Chicken	2	2	1986	12	93	267	
10	Ice cream	4	3	1986	1	63	33	EXPIRED
11	Cod	6	5	1986	3	0	90	

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UTILITY FILE

Each month we will be reviewing the latest utilities and programming aids for the QL.

If you are looking for more specialised, entertaining and, at the same time, practical applications for your QL, here is some useful information. Supplied on two Microdrive cartridges, with the documentation on a Quill file, *Sign Designer* is a dedicated multi-tasking system for producing text, glyphs or symbols by employing graphics techniques and calling them from a font file which, consistent with Sinclair tradition, is referred to throughout as "founts".

The first cartridge in the set consists of two programs, a font editor and the Sign Designer. The second cartridge contains five sample fonts, for use with the program cartridge, a copy program and the documentation. Other font designs can be produced and saved to Microdrive or disc.

Sign Designer put to good use.

Aimed at the user working primarily with text, numbers or other more specialised symbols, with Sign Designer fonts, you can produce graphic-generated text in any of four directions, separated by 90 degrees, which is continuously variable in size in terms of either height or width, or both.

The full range of colours and stipples is available in either mode 4 or mode 8; precise positioning and sizing of letters or blocks of text is aided by x-y co-ordinate position indicators.

Options are available for loading either fonts or previously-saved signs; saving signs or new or modified fonts. Loading in a new font, incidentally, displaces the previous font, so it is possible to produce a single design with more than a single typeface.

Producing hard copy is what this utility is about. The Sign Designer printer driver is Epson-compatible. Where banners are being produced, the display is laid out vertically on the screen and the resulting print can be made, mosaic-fashion, from individual letters where really big banners are wanted.

After loading the font editor from the main title page, a system menu, similar to that of the Designer, will appear on your screen. Any of the 160 characters in the QL font repertoire may be utilised in your own font or symbol design.

A good compromise between detail, speed and memory consumption, character segments are built using a parallelogram, of which three points are user-defined and with the QL calculating the fourth.

Serving both as a tutorial for studying the manner in which characters are built and ultimate modification of current fonts, the editor allows you to step through each stage of character structure. With a finite font workspace of 15K – most will, in practice, need only about 5K – the font editor includes an indicator of the number of bytes remaining for individual fonts.

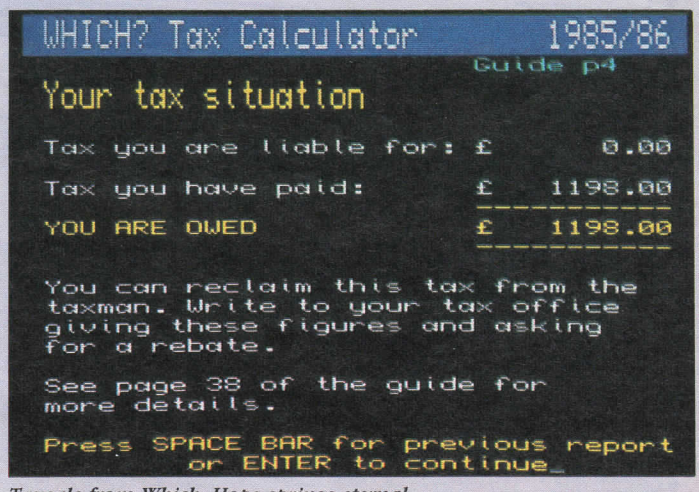
Sign Designer is a delight to use and provides the services of an extremely useful utility. Despite being somewhat specialised, the package represents good value. Described justifiably as user-friendly, first-time users are warned that they should practise with the system to obtain the best results it is capable of producing.

Program: Sign Designer
Price: £18.95
Supplier: D. S. Enterprises
25 Trinity Rise,
London SW2 2QP

Presenting a rather painful subject and dealing with it in a very painless way *Which?* has provided a valuable utility for those who find the maze of Customs and Excise virtually incomprehensible. Supplied on a single Microdrive cartridge and accompanied by a comprehensive edition of the *Which? Tax-Saving Guide, Taxcalc* will also be available on an annual subscription basis for subsequent years. This edition provides tax calculation for the 1985-86 period.

Presented in three parts, the first section deals with entry of your personal history regarding marital status, changes in personal conditions during the financial year covered, and any gross earnings derived from virtually every conceivable source.

Part two deals with other sources of income such as pensions, social security benefits, overtime and fringe benefits. Part three covers expenditure, allowances, interest paid, covenant payments, personal pension plans, business expansion allowances and, finally, the dreaded tax reports.



Taxcalc from Which. Hope springs eternal.

The final report is broken into sections. If used by a married person, the program calculates automatically which method of taxation – either joint or separate returns for husband and wife – is to the greatest advantage. That is shown in two tabulated summaries at the end of part three of the program.

A useful supplement to any accounting system, Taxcalc caters for either self- or full-time employed situations.

Most impressive was the overall presentation of Taxcalc. Each screen page, where relevant, referred to a page in the Tax-Saving Guide for additional information or explanation of the terms used. On completion of each question page, an option is provided to permit you either to edit, re-enter the questions or to go to the next page.

The pages are presented in an uncomplicated manner and the various reports at the end of each section are clear and unambiguous.

Program: Taxcalc
Price: £8.95 Available from Which? on subscription.
Supplier: Consumers' Association, Subscription Department, PO Box 44, Hertford SG14 1SH.

typists alike, Touch Typist includes a complete range of facilities for executing the lessons which utilises the full power of QL graphics in the process.

The QL keyboard is always on-screen and new users are recommended to run through the instructions and keyboard tutorial before starting the lessons. That will provide a familiarity with both the program operation and correct typing procedure – all you two-fingered thunderers, please stand up.

Lesson facilities are included in neat little corners throughout the program. Pressing the escape key displays the pull-down menus at the top of the screen. From them, you can set any of the system controls, which can include selecting any one of the 200 available lessons, which comprise a 1,200-word vocabulary.

If the default settings are accepted you must achieve 15 words per minute and an 86 percent accuracy before proceeding to the next lesson. The required sentence, either in coherent word groups or letter group combinations, appears in a window beneath the screen keyboard.

Target options available can be set for 10 to 60 words per minute and 80 to 100 percent accuracy. You also key indicate which of the two shift keys is required for correct typing procedure.

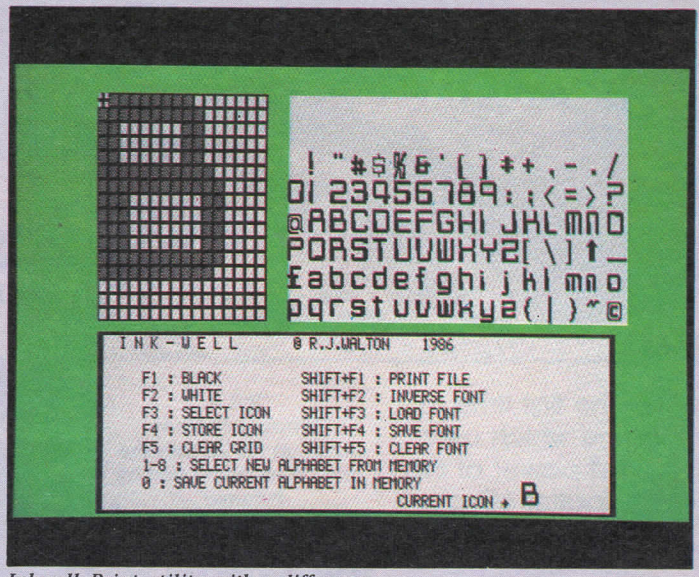
If the target score is achieved, speed and accuracy figures are displayed in their respective windows and, after pressing the space bar, the next screen prompt appears. At the end of a typing session, you can view a graph of your results for each of the lessons completed.

Incorporating virtually every conceivable permutation of lesson requirements, simulating a formal teaching environment, individual sentences, whether composed of words or letter groups, may be used singly, repeated a required number of times or they may be used in groups. At the end of each lesson, assessment is made for either single-sentence speed/accuracy or averaged for each sentence group.

Catering for beginners, speed and accuracy targets may be set as low as 10 words per minute and 80 percent accuracy. Typists with particular requirements can enter their own sentences with which to practise and save them to Microdrive for future use.

It is one of the few programs I have encountered which justifies not having a separate manual. Instructions are available on-screen, at any stage, and are concise, clear, unambiguous and to the point. Touch Typist is a well-presented, useful utility which includes the professional polish of good-quality software.

Program: Touch Typist
Price: £11.95
Supplier: Sector Software, 45 Cheetham Meadow, Moss Side, Leyland, Lancs PR5 3UB



Inkwell. Print utility with a difference.

A font editor and printer utility with a difference, *Inkwell* can be used with virtually any text editor such as Quill or the screen editors from the Talent Assembler Workbench, the Metacomco screen editor and so on, and will, when the text is printed to a drive in the case where Quill is used, make use of printer control codes to alter typeface styles.

On loading Inkwell, you are presented with a screen comprising three windows. The upper right-hand window will contain one of the eight 128-character fonts supplied with the program – others can be designed and saved – when it is called from memory by pressing one of the number keys.

The upper left-hand window contains a 16 x 16 element grid into which individual characters are set for modification or are designed from scratch. The bottom window contains the system prompts and operation controls.

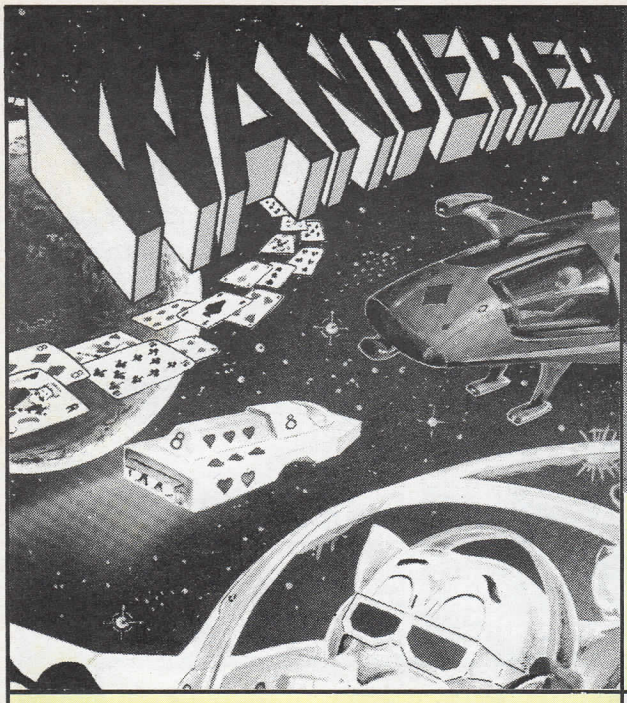
A document – text file – must be made which

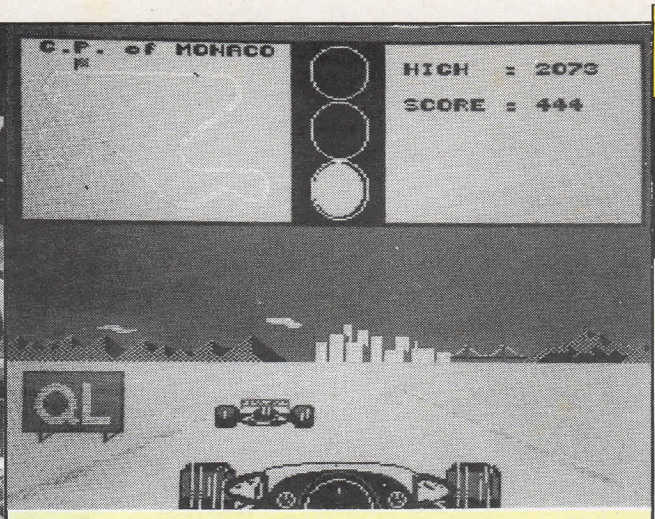
Continued on page 32

Sector Software's Touch Typist.

If you have always wished to be able to achieve 60 words per minute or more on your keyboard – or perhaps a plain, steam-powered typewriter – *Touch Typist* may be what you have been seeking. Succeeding admirably as a serious course intended for beginners and experienced have the option of switching off the screen keyboard prompts.

As you type the required letters, the next letter key on the display key turns to yellow. If an incorrect key is entered, the incorrect key turns to red to indicate how far off you were. Sentences requiring the use of the shift





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PYRA
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Popular Computing Weekly
29 March – 2nd April, 1986
Sinclair User Classic
★★★★★

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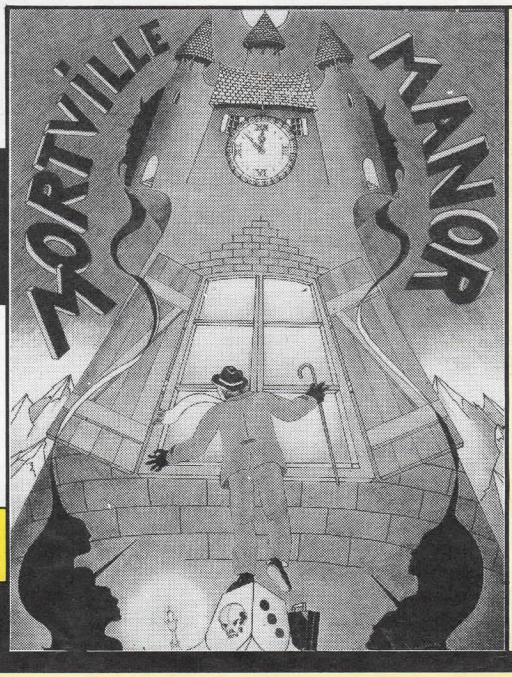

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85 full colour screen
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its deadly charm; a
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The first real graphic
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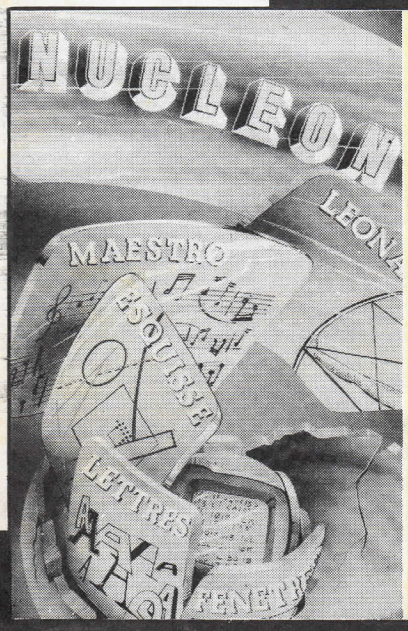

A valuable "Programming Assistant"!

This software comprises a suite of programs and tools (on two microdrives), designed to reduce the labour involved in producing professional results in your own creations. The four main programs all generate AUTOMATICALLY their own SuperBasic programs.

Compact Draw – Superb drawings, created and edited on screen. When you have finished, a SuperBasic program is generated, that will re-draw thepicture! Includes all the features you would expect from a professional design package.

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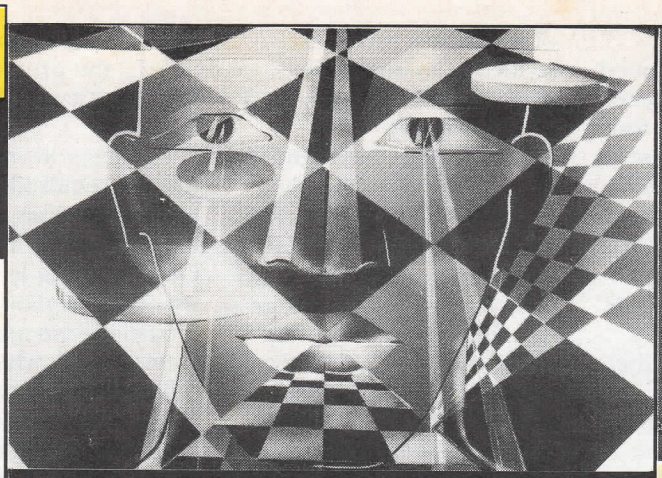
Windows – A utility that will give your programs a smart professional look, by custom designing your screen-display. Create and adjust windows on-screen, anywhere, any size, any colours, shadows, borders, etc.! This program is icon-driven for ease of use.

Maestro – Want to give your programs a little more musical appeal? Finding the unpredictably tricky BEEP command more trouble than it's worth? Maestro could be the answer. Features a two octave pitch range, icon-driven composition, notes displayed on standard musical staves, functions of insertion, deletion, etc.

MIDE
WARE
ENTS:



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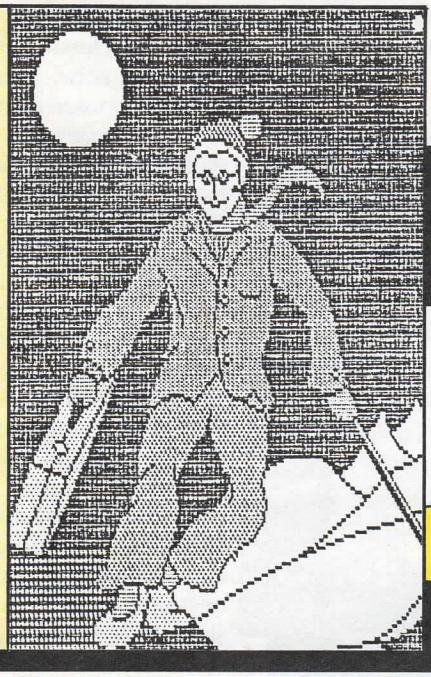

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Continued from page 29

includes the control codes used by Inkwell and are loaded into a suitable editor, e.g., Quill. The codes must enclose the text which is to be modified when it is printed.

The opening control code is a simple pair of hatch symbols – ## – enclosing a series of letters and numbers. Thus, (U2L4CO) would produce a typeface using alphabet (font) 2, with double-line spacing and equally-spaced characters. Details for other variations are described clearly in the manual.

Well-thought-out and professionally presented, Inkerll provides a number of easily-applied features which many people can find difficult otherwise to use. If text is produced with a screen editor, the entire document is written as if it were to be printed on continuous roll paper.

If that is the case, stopping the printer is not important but if cut sheets are being used Inkwell makes use of two different control codes, one for interrupting the printer while the paper is being changed and another which will cause the sections contained in a pair of symbols to be bypassed.

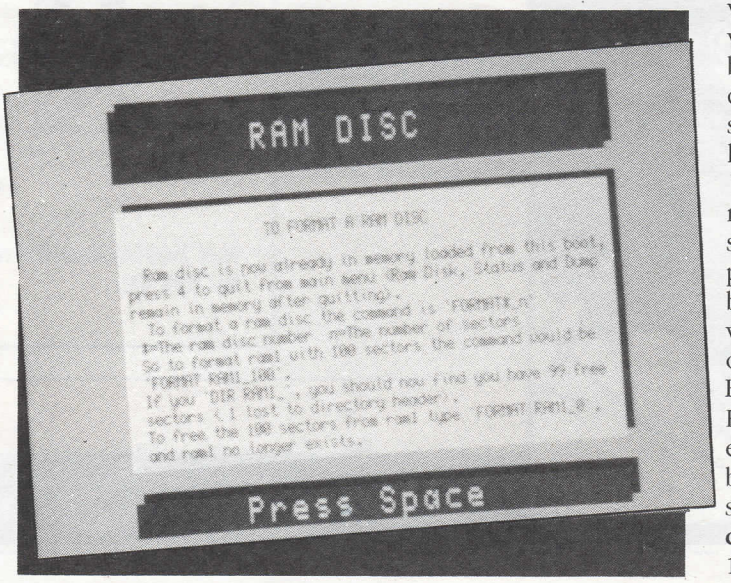
Only one minor point arose during the review which I felt could be improved and that would apply only to people new to Inkwell. When laying-out characters on the grid, use is made of the F1/F2 keys to produce either black or white squares.

The only difficulty with this method of drawing is that, if you take a white-producing cursor across a black square, that is changed to a white square. It might have been better, perhaps, if a method such as the space bar had been used to print either of the two colours when and where required. Having said that, although the system as it stands requires automatisation, it works very well.

As an added bonus, Inkwell can produce glyph fonts for specialised applications. If, for example, you were producing documents which contained musical notation, each letter in one of the alphabet fonts could be converted to a stave containing one of the note symbols.

The typewritten version of such a document would make no sense until it was printed, as the on-screen glyphs would appear in their usual character fonts, enclosed by the relevant control codes. When the document was printed, the conversion would produce whatever symbol the relevant letter represented. For only £9.95, it can only be a good investment.

Program: Inkwell
Price: £9.95
Supplier: Palantir Products, 60 St. Lukes's Road, Bedminster, Bristol.



Ram Disc. Doing its stuff in the background.

Ram Disc is one of those unfortunate utilities which is not fully appreciated until you are used to having it around. Ordinarily it cannot be seen to be working – it just remains in the background doing its stuff.

Comprising of a group of four utilities, the primary function is to enable you to load programs into a reserved area of RAM and to utilise its contents rather than accessing either Microdrive or disc storage. This method of file handling, besides conserving the use of the drives, provides a reduction in access time which has to be experienced to be believed.

Setting aside the required area of RAM is as simple as typing **FORMAT RAM1_100**, which identifies the area as RAM number one and reserves 100 sectors for its use. Files are copied into RAM1 by typing COPY from a device to RAM1. Be sure, however, to copy RAM files before re-setting your QL.

Utilising drive emulation, which is a way of saying that you want the program to look at a RAM disc as if it were a different device, is done by typing RAM_USE mdv. Then, when a running program calls for a file from a drive, it will receive the file from the RAM disc instead. Switching back to a normal state is done by typing RAM_USE RAM or FORMAT RAM1_0, whichever is appropriate.

Provided you have sufficient memory, Quill, for example, may be loaded into a RAM disc – say, RAM1; a file into another RAM disc – say, RAM2; and other programs may be used as required. To utilise Quill, type-in RAM_USE mdv, EXEC_W mdv1_QUILL and you are up and running.

When a file is saved from within Quill when using RAM disc in this way, normally it will ask for a device – default of mdv2_. Proceed as if the device were mdv2_; the program sees RAM2 as if it were the default device.

If storage in other RAM discs is required, set up as many RAM discs as will be needed before loading Quill, keeping in mind whatever memory limitations are applicable to your QL and, when saving, utilise the RAM number relevant to the file. If you use drive emulation, that becomes mdv2 to however many discs you have set up. How does mdv32_ strike you?

Another practical use of *RAM Disc* is for storing temporary files such as those which are printed from Quill when they are to be used for adding control codes utilised by special font programs.

Looking further into the RAM Disc suite, a useful printer spooler is included which will copy up to 10 files with an optional line feed between each. Although the default device is **seri**, the spooler can be used with any legitimate QL device.

RAM Disc copy routine requires that the sequential screen prompts will initiate procedures to make back-ups of selected files or whole cartridges. Rounding-off the utility range is the RAM Disc screen dump. Producing a dump of the entire screen area, this is best utilised by initiating a single-line command – **cls#0:lbytes mdvn_mypic, 131072:DUMP**. That will clear #0 of the command, load the picture and proceed with printing it.

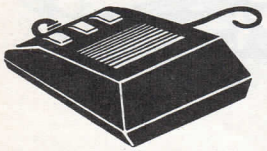
Representing very good value, RAM Disc is an invaluable aid to anyone interested in getting on with the job in the shortest time. Perhaps of equal importance, using RAM Disc instead of constant accessing of Microdrives will prevent a considerable amount of wear and tear.

Product: Ram Disc
Price: £14.95
Supplier: D. S. Enterprises, 25 Trinity Close, London SW2 2QP

EIDERSOFT
SYSTEMS & SOFTWARE

ADMINISTRATION ONLY 0708 852647

QL MOUSE



Eidersoft are pleased to announce a superior QL Mouse with full supporting software using the ICE system. The three button **mice mouse** in beautiful QL black, comes complete with **ICE** in ROM and the **ARTice mouse graphics** program. The mouse is interfaced via the ROM cartridge port, which gives a very smooth and fast response that will not be outrun. Mouse control is implemented on all packages that use the ICE system.

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ICE ★★★★★ Sinclair user classic	£24.95
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Q+ DISK SYSTEMS

Eidersoft and **PCML** are pleased to announce a new range of superior disk systems based on PCML/NEC hardware and a package of Eidersoft software. The systems are aimed at the professional QL user who requires stylish looks, a high degree of reliability and co-ordinated icon software and mouse.

A distinctive feature of the package is the inclusion of the new **Eidersoft QL Mouse** with co-ordinated software and the new NEC CMOS third height 3.5" disk drives, which run much quieter, cooler and more reliably than most 3.5" drives. The disk systems are completely QL style and colour co-ordinated in black (including leads).

There are two systems available, which are fully upgradable. The Q+Disk System consists of a standard PCML disk interface (with built in toolkit commands) complete with twin 3.5" third height NEC disk drives, QL Mouse and the Eidersoft software package, which consists of ICE, a disk database, a jotter notepad, various conversion programs and a printer spooler on disk. **The Q+Executive System** is identical but has a 256k Ram disk interface and the CHOice multitasking software. A module is available to expand the Executive System to the full 640k Ram. Both systems come complete with a bound manual covering disk, mouse and software operation.

~~**Q+DISK SYSTEM £399.00**~~ **Special introductory offer only £375 + £9 P&P**
Disk interface without memory (upgradable) + 2×3.5" NEC disk drive + ICE + Mouse + added special utility software.

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Disk interface with added 256k memory + 2×3.5" NEC disk drives + ICE + Mouse + added special utility software.

***EXECUTIVE UPGRADE TO FULL 640K £95**

IMPORTANT NOTICE

The recent announcement of the take over of the Sinclair name and marketing rights by Amstrad may have caused some concern to QL owners. Don't panic.

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Eidersoft pledges support of QL owners through 1986/87. To make sure that you are informed of recent developments and new products send in the coupon below.

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"The game, however old the idea is, is probably the best version of Pacman for any micro computer." PCW February 1986.

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- ☐ ICE Toolkit £10.95
- ☐ ICE System £59.95
- ☐ Q+Executive ..... £475.00 + £9.00 P&P
- ☐ Q+Disk System ..... £375.00 + £9.00 P&P
- ☐ IMPACCT ..... £179.95 complete (state disk/microdrive)
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- ☐ Spook £10.95
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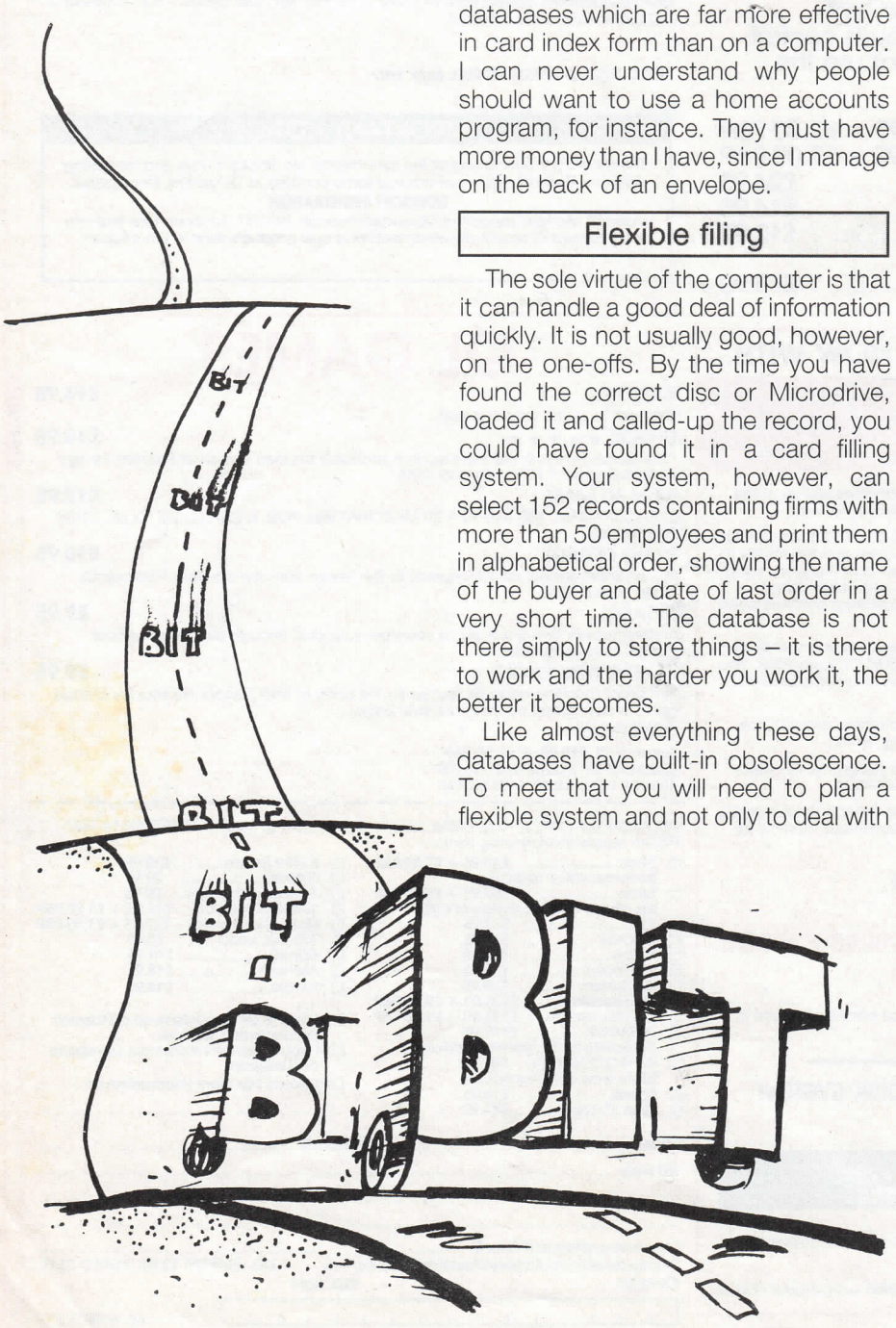
QL WORLD JULY

SOFTWARE APPLICATIONS

In the second of his articles on how to create the perfect business environment for your QL, Brian Holley lays down some guidelines for database users, including how to avoid falling into the clutches of the Data Protection Registrar.



Computers are logical contraptions but in a very linear kind of way. One bit pursues another along the highways and byways which make up the data bus – jargon for electronic motorway – and each is processed one after the other by the tollgate at the end of the road. It is a monotonous routine, but important, and as essential for the database planner to remember as the law of gravity. Using a database means using a tool of logic and if the planner works illogically, so will the system. Result – a pile-up.

If you are thinking of constructing a database you must first have a reason for using one. There are some databases which are far more effective in card index form than on a computer. I can never understand why people should want to use a home accounts program, for instance. They must have more money than I have, since I manage on the back of an envelope.

Flexible filing

The sole virtue of the computer is that it can handle a good deal of information quickly. It is not usually good, however, on the one-offs. By the time you have found the correct disc or Microdrive, loaded it and called-up the record, you could have found it in a card filling system. Your system, however, can select 152 records containing firms with more than 50 employees and print them in alphabetical order, showing the name of the buyer and date of last order in a very short time. The database is not there simply to store things – it is there to work and the harder you work it, the better it becomes.

Like almost everything these days, databases have built-in obsolescence. To meet that you will need to plan a flexible system and not only to deal with

external factors, but to respond to the changing demands which will emerge as the system begins to be used – I have reached Mark V with one of my databases. So do not think that once your database is established it is there for good in exactly the same format. On the other hand, you do not want to have to make radical changes every week, so the system has to be thought through very carefully initially.

The cliche user-friendly does not apply only to meaningful menus and a lack of blind alleys; it also means screens which are not too crowded, fields which are ordered logically and codes which are easy to recognise. It is annoying when you enter an address and discover that the designer has allowed three lines of 25 characters. That means that line one will not always accommodate all of the first address line, but line three is too long. Look at the information likely to be entered in any one field and then determine reasonable lengths for fields before you begin. It can save hours of frustration later.

Keep it clean

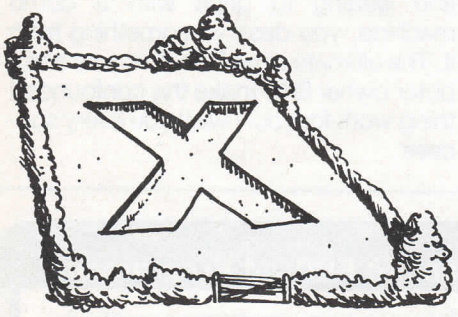
You must convince yourself that the information you are putting into each field will earn its keep. Every field must be necessary to provide sorts, searches, reports or mail shots. You may have more information than you need for the computer system. Keep it in a manila file; do not clutter the machine with things about which it does not need to know. That will help to keep the record short so that you can put more records on to a disc or Microdrive and it will keep screens uncluttered so that the data on them is easier to read.

It is better to code some information which can save space and make searches more effective. For instance, on suppliers' records you may want to indicate the type of goods acquired. In

that case a one-or two-letter code like this might help:
tr=timber bk=brick at=asphalt
ct=cement etc

In devising codes it is useful to have a convention for creating them. The foregoing codes consist of the first and last letter of the item. You need another convention to avoid duplication where more than one item has the same first and last letter, perhaps the first and last but one letter. Whatever you choose, be consistent. As far as possible I like codes to be mnemonics, so I usually avoid numbers which I do not find very memorable and stay with letters.

Status fields can be useful tools. These are single-character fields which are either 'on' or 'off'. If there is something in the field, usually an 'x', it is on. Empty and it is off. Searching is made easier and you can save memory. That can be used as a means of highlighting outstanding orders or invoices, or even as a warning to check the manual file



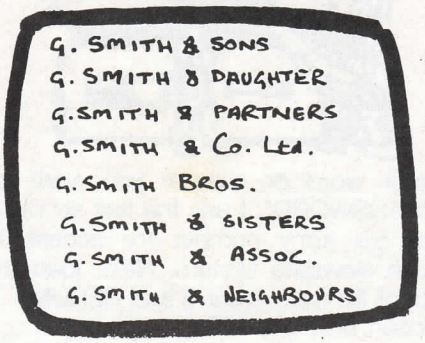
before doing anything with a certain computer record. The latter is one way of dealing with difficult items on the computer which are now covered by the Data Protection Act.

The Act does not apply to data held in manual systems, so you can indicate on your computer record that you are holding more delicate information separately by using a status field.

The order in which fields appear on the screen will also determine how efficiently input and amendments can be handled. As a general rule, data which is unlikely to change much should go to the end of the layout and that which is most volatile at the beginning. That will mean that when the database is in use update time can be reduced, because the operator does not have to key through a number fields to reach the one which needs changing.

Data like Date of Entry, showing the date the record was first input, should be the last field, since that will never change. Latest Update, on the other hand, should occur first for obvious reasons.

The first rule of data input is disciplin This is where conventions are again in portant. You can avoid several nervou breakdowns by creating ground-rule for input. Company names can be en tered in all kinds of ways. "J Porridge",



"J. Porridge", or "J. Porridge & Son Co. Ltd." might all refer to the same organisation. The human mind is capable of almost endless variations on this theme, so you could have 15 or 20 records all containing different data about the same firm if you do not take steps to avoid it.

I suggest that firms' names should be entered without using full stops and always having an ampersand rather than 'and'. The full title is always entered. This simple rule should obviate most of the difficulties which can arise with this type of data.

You may also need to consider whether you are happy for "J Porridge" to be printed-out in the J section alphabetically or whether you want your lists in telephone directory order. In the latter case, you will need to create two

fields for the name, one containing the name as you want it printed on letters and the other as you want it ordered on lists. If your lists are not very long that may not matter but when dealing with a good deal of data it could be essential.

Another important variation on a theme which can be a useful addition to a database is a field called salutation. You do not want letters written which begin "Dear Mr. W H Smith & Co Ltd," do you? Some of your contacts you will know personally, so the salutation field will contain "Bill". For others with whom you will have a more formal relationship you will enter "Mr. Smythe-Biggot".

That is good practice for mail shots but is also useful for less extensive word processing facilities, since it humanises the machine so that it does not appear to come between you and your client.

Fortunately, since Archive is a programming language rather than a Basic database package, you can format your searches and output style in a very flexible way. Printed output can become an extension of the computer system if used thoughtfully. I said earlier that looking-up individual records to obtain information from them was not the most efficient way to use the machine. You will probably find the information more quickly on a printout and you are not so likely to upset the person keying-in the 50 new customer records you accumulated that morning by interrupting.

Put it in print

Printouts are an excellent medium for analysis. You can pore over them, flipping quickly from one section to another much more effectively than scanning one screen at a time. Coloured highlight pens can be used to select salient factors. It is amazing what different perspectives you can get on your business when you carry-out reviews of that kind. When your machine prints sorted lists of clients or customers you can begin to quantify aspects of your business to promote more efficient marketing, better budgetary control and improved publicity and canvass targetting.

Linking your database to a word processor via one or two packages on the market will provide you with an extremely powerful tool. If you are thinking about mail shots, however, remember that you have a printer not a duplicator. That means that if you want to send 100 or so letters you may have to tie up your machine for several hours while it does the job.

It also means that you will need continuous letter-heads if you want to avoid someone standing beside the printer feeding it pieces of paper. Long runs are usually best duplicated or, better still, instant-printed. The role of the computer is then to print labels and perhaps a list of addressees.

The word processor in business is better for the short-run letter, or setting-up the long-run letter for printing and for raising orders, invoices and statements. Of course, the pre-requisite for that facility is a daisywheel printer or good near-letter-quality machine. A machine having variable pitch and proportional spacing is useful, since you can set up very professional-looking documents and save the expense of typesetting. If your database contains inform-

ation by which it is possible to identify an individual you must be registered under the Data Protection Act which came into effect on May 11, 1986. Registration documents can be obtained from any Post Office and the completed form should be returned to the Registrar with a fee of £22.

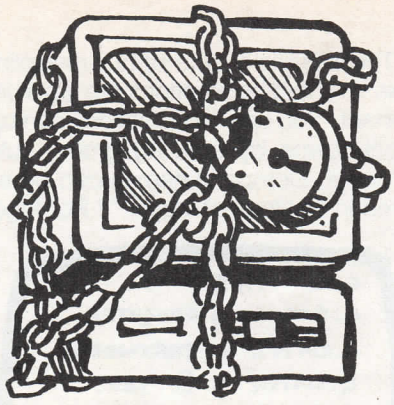
Under the terms of the Act the owner of a database must take steps to ensure that personal information cannot be accessed by unauthorised persons. That means that access to your database should be via a password system, so that the first thing that happens on booting-up a file is that you are required to enter a code or password before you can enter the system.

Data protection

Here are some program lines you can insert into the boot file on your Archive Microdrive or disc. First you will need to record your password on an invisible file. Do that by entering this program directly from the keyboard:

OPEN_NEW#3,mdv1_ :PRINT#3, "PASSWORD":CLOSE#3

By calling your file any number of spaces it will not appear on the directory. Clearly you must substitute what-



ever word or number you want for "PASSWORD". I use the first six digits of old army number for access to one viewdata system. Next, load the boot file from Archive and RENUM. Insert after line 100:

*101 OPEN_IN#3,mdvi_* (However many spaces you used to name your file)
102 INPUT#3,pword$
103 CLOSE#3

Then after line 110

iii password

Then add this PROCedure to the end of the program:

200 (pmt)

As you enter your password only question-marks will appear on the screen, so that no-one looking over your shoulder can learn the secret. It is by no means foolproof but should serve the purpose.

You will also need to ensure that any printouts containing personal information of which you wish to dispose are burned or shredded. If the dustman finds your list of bad debtors, you could be fined.

Regardless of the Data Protection Act, you will want to keep your data safe and sound so back-ups should be taken at the end of each day, or even the end of each session if they are long ones. I suggest five back-up discs, one for each day of the week. That means that the worst possible disaster, except one, is where you have lost four days input – not a very likely occurrence.

Do not label your back-ups by the day of the week, because at bank holidays or annual leave you may find yourself over-writing your most recent back-up. It is better to label them 1 to 5 and use them in sequence, recording which one has been used in a daily back-up book.

If, like me, you have spend hours deciphering obtuse computer manuals and getting to grips with a dumb machine, you deserve something from it. The ultimate aim of the business computer owner is to make the confounded thing work for you. I wish you every success.

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LISP

THE LANGUAGE

Charles Gerrard concludes our look at the language of Artificial Intelligence and reviews the Metacomco Lisp Development System.

In this final article in the Lisp series we look at the final few Lisp functions and some of the uses of the language. We also examine the pros and cons of the Metacomco Lisp Development System.

To begin, however, a few of you may still be waiting for your QL to grind out the first solution to the Knight's Tour problem. Unfortunately, there are so many possibilities to try on an 8 x 8 board that the exhaustive search algorithm presented is unlikely to find a solution this side of Christmas.

The good news is that the program can still easily be tested by altering the routines to work on a small board, say 5 x 5. To do that, change the two board sizes in function OFFBOARD from 8 to 5. Then change the total number of squares to be visited from 64 to 25 in the main KTOUR routines. Re-running the program will give a solution in two minutes.

Additionally, figure one shows a SuperBasic solution to the problem, using exactly the same method, which should help to explain how the Lisp version works. Again it can be changed for different board sizes just by changing the assigned value of the variable n%.

Until now, all the Lisp programs we have considered have placed their result, in the form of a list or atom, on to the screen, because that has been the value to which the function called has evaluated. For example, the Knight's Tour problem returned the list of squares, where each square was a list composed of two atoms, showing the row and column. We included an OUTPUT function which tidied this slightly by using the PRINC statement.

You could not be blamed for thinking that the I/O facilities of the language seem poor; there are no wonderful colour graphics and such. To a large extent that is true, though as we will see later, specific Lisp implementations try to make use of the machine I/O capabilities. In general, output is performed by one of the functions PRIN, PRINC, PRINT and PRINTC.

PRIN and PRINT are useful when you want to make the output readable by further Lisp routines. When using those functions, any special characters, such as spaces and parentheses, have the escape character '!' inserted before them. Characters such as periods and parentheses have special properties within the language, in this case for dotted pairs and forming lists. That makes it very difficult to include them in items passed to other Lisp functions when not wanting to use them in that way.

Another method

In the Knight's Tour program, the function OUTPUT was able to avoid this handicap by using the built-in variables LPAR, RPAR and BLANK to give the left and right parentheses and the space character. Another method of doing it is to place the '!' character before any special character. This, then, is the use of PRIN and PRINT, the only difference being that PRINT inserts a carriage return at the end of the output list.

It should by now be reasonably clear that PRINC and PRINTC are similar, the

latter including a carriage return, but they evaluate and print their arguments, without inserting any escape characters. Layout can be handled using spaces (BLANK) and additional carriage returns using the built-in variable CR.

In most Lisp systems, input is achieved by use of the READ function, which requires no arguments. That will simply pause, waiting for keyboard input, finishing with a carriage return. The input must be a number, an atom or a list. It is common on micro implementations to have the function READLINE and it is certainly included in the Metacomco Lisp package. It will read a complete line of characters, terminated with a carriage return, and return them as a single identifier. Additionally, Metacomco Lisp also has the function GETCHAR which will read and return a single character, requiring no terminating carriage return.

There are many other important language funcations whose use only becomes apparent when you try to write programs in Lisp. They include such functions as MAP and MAPC which allow a specified function to be applied to all the CDR or CAR elements of a list structure. REVERSE and REVERSEWOC will reverse the order of all the items in the top level of a list, the latter destroying the original list while the former simply returns a copy of it.

Other functions

Other important functions include FLATTEN which, given a list structure as its argument, will search through the structure, placing all the atoms into a single-level list structure. If that seems a little complex, imagine our structure diagrams from the first article and try to squash a deep structure into a single line.

Other functions which you are likely to encounter when you first start running programs are RESET, GCTIME and TIME. Creating and changing all those list structures tends to leave plenty of garbage – i.e., structures which will never be used again – lying around in memory. Consequently, Lisp has to make frequent garbage collections, based on the available memory to be able to re-use that space.

RESET re-sets the system clock and GCTIME gives the amount of time spent in garbage collection, TIME being the remainder. Another function, CLOCK, will return the time since the last re-set in hours, minutes and seconds. When running a program, the system will inform you of every garbage collection and two additional functions, MESSON and MESSOFF, allow you to specify the amount of information included in them.

An essential programming function is the Backtrace, handled by TRACE and UNTRACE. Written properly, it is reasonably simple to minimise the errors in a Lisp program but when something goes wrong, it can be a horrendous task to find the problem.

The backtrace will give a complete readout of the current structure when an error occurs, tracing back the program flow through the immediately prior functions, showing the structure at those points. First-timers are likely to look upon it with awe, wondering what it all means, but analysis normally will show exactly what the error is. Of course, finding why the error occurred in the first place is another problem.

Many other functions exist but a very important function, from the point of view of the Lisp programmer, is the Lisp structure editor. Written in Lisp, it allows the user to step through the CAR and CDR elements of function, while changing any of the current list structures. New users are liable to find this editing method tiresome after the conventional line-editing technique but it can be very useful once you understand it.

Unfortunately as , or if, functions are allowed to grow, this editing method becomes more time-consuming and consequently less useful. Hence, Metacomco has also included a more standard screen editor in its package.

The Metacomco Lisp Development System is supplied on a single Microdrive cartridge, complete with a fairly comprehensive manual. Costing

Continued on page 40.

Figure 1

```
100 REMark *** SuperBasic Knight's Tour ***
110 :
120 n% = 5   :   REMark ** Board size
130 CLS
140 :
150 DIM board%(n%,n%),tried%(n%,n%),pos%(n%*n%,2),dir%(8,2)
160 :
170 RESTORE
180 FOR direction = 1 TO 8
190     READ dir%(direction,1)
200     READ dir%(direction,2)
210 END FOR direction
220 :
230 DATA -2, 1,-1, 2, 1, 2, 2, 1
240 DATA  2,-1, 1,-2,-1,-2,-2,-1
250 :
260 FOR row = 1 TO n%
270     FOR col = 1 TO n%
280         board%(row,col) = 0
290     END FOR col
300 END FOR row
310 :
320 REMark ** Initialise Start Square
330 :
340 move% = 1
350 x% = 1 : y% = 1
360 board%(x%,y%) = move%
370 tried%(x%,y%) = 0
380 pos%(move%,1) = x% : pos%(move%,2) = y%
390 :
400 REMark ** Main Solution Loop
410 :
420 REPeat moves
430     IF move% = 0 THEN
440         PRINT"No solution with this start square!"
450         STOP
460     ELSE
470         tried%(x%,y%) = tried%(x%,y%)+1
480         IF tried%(x%,y%) = 9 THEN
490             board%(x%,y%) = 0
500             move% = move% - 1
510             x% = pos%(move%,1)
520             y% = pos%(move%,2)
530         ELSE
540             IF legal THEN
550                 move% = move% + 1
560                 pos%(move%,1) = a%
570                 pos%(move%,2) = b%
580                 board%(a%,b%) = move%
590                 tried%(a%,b%) = 0
600                 x% = a% : y% = b%
610                 IF move% = n%*n% THEN EXIT moves
620             END IF
630         END IF
640     END IF
650 END REPeat moves
660 :
670 REMark ** Print Solution
680 :
690 FOR row = 1 TO n%
700     FOR col = 1 TO n%
710         x$ = "  " & board%(row,col)
720         PRINT x$(LEN(x$)-2 TO);
730     END FOR col
740     PRINT
750 END FOR row
760 STOP
770 :
780 DEFine FuNction legal
790     a% = x% + dir%(tried%(x%,y%),1)
800     b% = y% + dir%(tried%(x%,y%),2)
810     IF a%<1 OR a%>n% OR b%<1 OR b%>n% THEN
820         RETurn 0
830     ELSE
840         IF board%(a%,b%) > 0 THEN
850             RETurn 0
860         ELSE
870             RETurn -1
880         END IF
890     END IF
900 END DEFine legal
```

Continued on page 39.

LISP
THE LANGUAGE

£59.95, it is by no means inexpensive. The manual, though detailing the language very well, contains no tutorial sections, so an additional Lisp language guide is an essential extra, adding to the cost. Comparing the price to other List implementations, it is more costly than the Acornsoft Lisp package with which it is compatible but much cheaper than similar versions for the average PC.

As with other Metacomco languages, the system is invoked initially with either EXEC or EXEC_W. You are then given the option to change the window size prior to the loading of the standard Lisp image. That image makes available all the standard functions, including those detailed later. An installation program allows the user to set the default window sizes before the program is loaded and the standard image can be modified easily by using the function:

(SAVE image)

which saves the entire Lisp workspace to Microdrive, including any additional functions you may have written.

If the file of this name is available in Microdrive 1 when the system is started, it will be loaded into the Lisp workspace area. With the standard Lisp image, and no other jobs running, there is approximately 55K of workspace available, which should be more than sufficient for the majority of applications.

As with most implementations for this size of micro, the package contains a list interpreter rather than a compiler, though compiled versions are available. That tends to make the Lisp rather slow compared to other languages running general applications. It is essential that Lisp be running the correct type of program. If you intend to use it for fast graphics and number-crunching forget it, but when used for complex data structure manipulations it comes into its own and can easily beat many other interpreted languages.

The functions available in the standard Lisp image are very similar to the ones available with the BBC Micro implementation. Even such functions as VDU, used for screen-handling – windows, colours and the lettering on the BBC have been included, though they cannot perform the functions of the BBC version.

Additionally, many extra functions have been included to take advantage of the QL and the standard image has been enlarged to include extra general functions. They tend to be useful additions which were omitted from the BBC version because of space restrictions. Sharing so much with the BBC implementation, an excellent starter book is *Lisp on the BBC Microcomputer* by Arthur Norman and Gillian Cattell.

Probably the most noticeable Metacomco additions to the standard Lisp functions are those to handle the graphics. The necessary CLS and MODE functions have been included. Also present are CIRCLE, CIRCLEAT, CIRCLE AT POINT X,Y, FILL and POINT – to plot a single point. Additionally, turtle graphics have been included, with the commands DRAW, DRAWTO, HOME, MOVE, MOVETO, TURN and TURNTO. Most other graphics can be handled with the SCREEN function, giving access to many of the QDOS TRAP 3 calls. That allows the user to manipulate window borders, colours and stipples, and character sizes. WINDOW, for setting-up and changing screen channels and SCALE, completes the graphics functions.

Completing Files

File-handling has been well covered with a variety of commands, allowing opening and closing of files and character, lists or complete files to be read or written in a single command. There is also the RDF function which, given a filename parameter, will execute the Lisp code in the file. Coupled with the output functions detailed earlier – whereby Lisp can re-read information which has previously been output – those commands are more than adequate for all file-handling.

Also included on the Lisp Microdrive are a sizeable number of example programs. They include a sort program, a 'prettyprinter' – to format Lisp functions – examples of the turtle graphics, an animal-guiessing game, a very simple adventure game, arbitrary precision arithmetic, and a program which calculates the shortest distance between two cities. most of the programs will be found as examples in the *Lisp on the BBC Microcomputer book.*

Conclusion

By now you should have a reasonable knowledge of Lisp techniques and I hope have been impressed with the importance of list processing. There seem to be two main disadvantages with Lisp which tends to make people wary of the language. First, writing Lisp programs, as we saw in the previous article, is very different from writing programs in a more conventional language and trying to write your first Lisp program can be a headache.

Second, a large percentage of programs written for the home micro can better be done using other languages. Given a program written in, say, SuperBasic, it is possible to convert it to work in Lisp. Doing so, however, may require complete re-writing of the program structure because of the vast differences between the two languages.

So why should you start to learn Lisp? Well, perhaps you should not, it is vital that Lisp be used to perform the functions it does best unless you are looking for something intellectually stimulating there is little point in using the language.

The most-mentioned applications are knowledge-based systems and artificial intelligence programs, though it is unlikely that your uses will fall conveniently into one of those catagories. Generally, Lisp can be used for anything which does not involve large number-crunching and is best at those applications involving large or complex data manipulation. Another plus is that the Metacomco Lisp package uses 28-bit integers, giving good numerical accuracy, with an integer range of: 134217728 to 134217727.

The language of the future? Perhaps Lisp is at present doing battle with languages such as Prolog, with its automatic pattern-matching, and other functional languages such as Forth and Logo, both of which are easier for the first-time user. Certainly languages of this type are becoming more widespread in an effort to distance the user from machine considerations and Lisp is as good a place as any to start.

QL Storage *from* CST

QDISC

Now containing the complete QL Toolkit software as well as an easily used Ram-Drive device driver, the CST QDisc is the longest established and most widely used floppy disc controller for the QL computer. The QDisc interface may be used with virtually any 3.5" or 5.25" floppy disc drives including, of course, CST's dual slim-line 720K (1 Megabyte unformatted) high performance, 80 track double sided drives. The Toolkit software provides a wide range of SuperBASIC commands and functions designed to allow the full power of the QL to be realised without resorting to machine code programming, giving access to job control, random access I/O, character sets, wild card file handling and so on. The Toolkit is included in the QDisc firmware, so it is ready for use as soon as the system is switched on, as is the Ram-drive device driver, which allows any unused memory to be used as a high speed storage medium, ideal for temporary results, and for saving screen images for high speed displays. Naturally the Ram-drive may be used to maximum advantage when used on a QL with additional memory such as the RAM-plus.

RAM plus

Expanding the QL's memory from 128K to the maximum 640K, the CST RAM-plus is based on the latest 256K DRAMs to give full speed no wait-state operation and is housed in an elegant aluminium case which matches the QL and provides an expansion port allowing a peripheral interface, such as a QDisc floppy or Winchester controller to be plugged in. Adding high speed memory to the QL has several advantages: all QL programs run faster, including ones that make heavy use of disc or microdrive as QDos uses spare memory for buffering data; increased data space is available for SuperBASIC, Psion and other application packages and the QL's multitasking ability is greatly enhanced by the ability to load several large programs simultaneously. The extra memory can also be used to advantage with the Ram-drive firmware supplied with the QDisc. For customers who have already purchased an earlier QDisc controller, the Ram-drive software can be supplied on floppy disc at a small charge.

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The flagship of the CST fleet of storage devices for the QL is the 20 Megabyte Winchester drive with integral floppy drive. The system is housed in a compact metal case with integral power supply and is interfaced to the QL by a small controller card. The floppy specification is the same as the standard QDisc; the Winchester is a high performance drive unit based on the new SCSI standard, which allows up to eight drives to be connected to one QL (available to special order). The Winchester firmware is fully compatible with standard microdrive and floppy QDos drivers, and also supports heirarchical directories and file date stamping. The directory structure allows files to be separated into compartments; for example, programs can be held in one directory while data for various projects can be held in other directories. This is essential when a disc can hold over 1000 files! Date stamping of files is used to keep a record of the last time every file on the Winchester was accessed, modified or backed up. This allows the Data Management Utility supplied with the system to archive only those files which have been changed since the last backup was performed. This greatly reduces the time taken to perform regular backups.

CST

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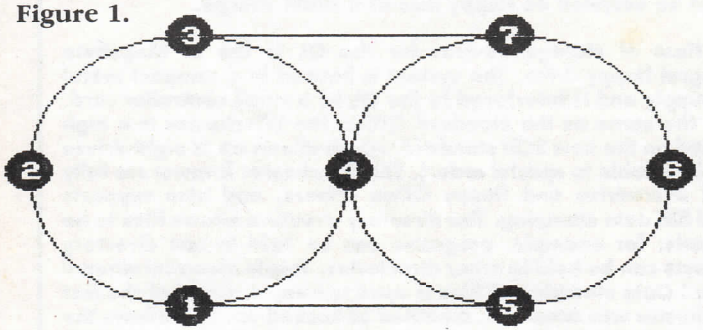
PUZZLE PAGE

Resident problem poser, Marcus Jeffery, puts the question to habitual doodlers, expresses some surprise at the efforts made to solve the May puzzle, and provides the solution for those who tried, but failed.

Figure 1.



Do you doodle? I mean mess about drawing silly shapes on a scrap of paper, because you have nothing better to do. I find myself doing a lot of doodling, particularly when trying to devise a problem for this page.

The reason I am telling you this is that I found one doodle especially interesting. it was a figure-eight with two vertical lines joining the two sides. Something like a combined 'O' and 'B'. Anyway, I was wondering what would happen if number locations were placed on the figure, and several substitutions were devised. Hence the following problem.

Figure one shows the puzzle in its target position. When writing down a position, the numbers should be written in this order. Thus, the position in figure one can be written as:
6 2 3 4 5 6 7

There are six possible moves from any position, indicated by the letters A to F. They will either rotate the complete figure, or one of the two circles. Figure two shows the moves, and the positions which would result if they were applied to the original position in figure one. One final point; a series of moves can be shown by writing down a string of the movement letters. So, to get to the position:
4 1 2 7 3 5 6
you would use the sequence 'CF. Those moves give:

Figure 2.

MOVE	TYPE	RESULT (FROM: 1 2 3 4 5 6 7)
A.	Complete Clockwise	5 1 2 4 6 7 3
B.	Complete Anti-clockwise	2 3 7 4 1 5 6
C.	Left Clockwise	4 1 2 3 5 6 7
D.	Left Anti-clockwise	2 3 4 1 5 6 7
E.	Right Clockwise	1 2 3 5 6 7 4
F.	Right Anti-clockwise	1 2 3 7 4 5 6

	1	2	3	4	5	6	7
C:	4	1	2	3	5	6	7
F:	4	1	2	7	3	5	6

That covers the preliminaries. Now for the questions. The first one is fairly easy, and with a little thought, should not even require powering up the QL. All I want is the minimum number of moves necessary to change the sequence:
6 2 4 5 1 7 3
into the target position.

Now this part is a little more difficult but need not take too long. I would like you to find a position – i.e. number sequence – which requires more moves – or as many – than any other sequence to reach the target position. For instance, if you find a position which, when making the best possible move at each step, would require, say, 60 moves to reach the target position, and all other possible positions take 60 or less, then that is the answer. Incidentally, I am afraid 60 is not the correct answer. Having found the sequence, just write on the entry form, the number of moves necessary to reach the target position and the sequence which you have found.

Obviously, programming is likely to play an important role in answering the final part, and I would be very interested in any elegant solutions which you produce. If possible try to keep the programs short.

RULES:

All entries must be written on the panel provided on this page. Any other form of entry will be disqualified. Entries must be sent by post to:
PUZZLE PAGE,
Sinclair QL World,
79-80 Petty France,
London SW1H 9ED
to arrive no later than Monday, July 14, 1986.

The winner will be the first correct entry drawn out of the editor's hat, if I have not eaten it first. In the event that nobody submits the correct solution, the winner will be the person with the nearest answer.

All entries will be judged by the Editor whose decision is final. No correspondence will be entered into regarding the result.

ENTRY FORM

Minimum number of Moves:_____

Worst case:

Moves necessary:_____

Number Sequence:_____

Name:_____

Address:_____

_____

_____

SOLUTIONS

Figure 4.

```
100 CLS
110 DIM costs%(12,12),result%(12,12),used%(12,12)
120 FOR i = 1 TO 12
130    FOR j = 1 TO 12
140       READ costs%(i,j)
145       result%(i,j) = costs%(i,j)
146       used%(i,j) = costs%(i,j)
150    END FOR j
160 END FOR i
170 :
180 DATA 99, 7,43,37,26,42,17, 2,23,28, 9, 7
190 DATA 25,99,50,40,10,16, 2,28,39,16,30,30
200 DATA 49,27,99, 4,50, 4, 3, 1,12, 4,44, 4
210 DATA 29,41,41,99,38,12, 5,37,42,49,41,47
220 DATA 10,12,13, 1,99,42,35,27, 2,11,18,15
230 DATA 42,39, 3,36,41,99,38, 3, 7,35,28,42
240 DATA 21, 5,29,31,38,47,99,30,12,49,11,48
250 DATA 42,25, 5,32,33,34,36,99, 7,39,17,30
260 DATA  2,12,20,18,11,42,30,24,99, 5, 1,10
270 DATA 12, 4,18, 8,37,49,33,32,50,99, 5,15
280 DATA 29,23,10,40,28,11,39,20,35, 6,99,13
290 DATA 44,40,24,12,27,47, 3,16,32,15, 8,99
300 :
310 REPeat reduce_loop
320    changed = 0
330    FOR i = 1 TO 12
340       FOR j = 1 TO 12
350          IF used%(i,j) < 99 THEN
360             FOR k = 1 TO 12
370                IF result%(i,k)+result%(k,j) <= costs%(i,j) THEN
380                   used%(i,j) = 99
390                   result%(i,j) = result%(i,k) + result%(k,j)
400                   changed = -1
410                END IF
420             END FOR k
430          END IF
440       END FOR j
450    END FOR i
460    IF NOT changed THEN EXIT reduce_loop
470 END REPeat reduce_loop
480 :
490 PRINT"     A  B  C  D  E  F  G  H  I  J  K  L"
500 FOR i = 1 TO 12
510    PRINT CHR$(64+i);": ";
520    FOR j = 1 TO 12
530       IF used%(i,j) = 99 THEN
540          PRINT" **";
550       ELSE
560          x$ = "  " & used%(i,j)
570          PRINT x$(LEN(x$)-2 TO );
580       END IF
590    END FOR j
600    PRINT
610 END FOR i
```

Could it be that things are getting tough in Puzzle Land?

Only five of the solutions we received for the Galactic Network Problem had the correct answer.

Figure 3.

	A	B	C	D	E	F	G	H	I	J	K	L
A:	**	7	43	37	26	42	17	2	23	28	9	7
B:	25	**	50	40	10	16	2	28	39	16	30	30
C:	49	27	**	4	50	4	3	1	12	4	44	4
D:	29	41	41	**	38	12	5	37	42	49	41	47
E:	10	12	13	1	**	42	35	27	2	11	18	15
F:	42	39	3	36	41	**	38	3	7	35	28	42
G:	21	5	29	31	38	47	**	30	12	49	11	48
H:	42	25	5	32	33	34	36	**	7	39	17	30
I:	2	12	20	18	11	42	30	24	**	5	1	10
J:	12	4	18	8	37	49	33	32	50	**	5	15
K:	29	23	20	40	28	11	39	20	35	6	**	13
L:	44	40	24	12	27	47	3	16	32	15	8	**

So how do you solve the problem? There are a variety of methods for tackling this sort of thing. One of the most obvious starting points is to reduce the size of the problem. Based on the original network – figure three – it is far too expensive to have every connection. We can, however, reduce the number of connections quite significantly. That is done by the program in figure four.

The program will search through the network, considering all nodes, which it labels 'i' and 'j', indicating the 'from' and 'to' nodes. There will be a cost, Cij associated with this. The program then looks at all the other destinations, trying to find a node 'k', such that the cost of Cik + Ckj (i.e. i to j, via k) is the same or lower. If a node of this type is found, then there is no point in building the link from 'i' to 'j', so this can be removed from the network. The program will continue to loop through this procedure until it goes through the complete network without being able to remove a link. This results in the much reduced problem shown in figure five.

From here on, things are fairly easy. You may remember that I specified the transportation network must allow for any single link breaking down. That implies each system must have at least two hyper-space devices, either to the same or different systems. Obviously all the systems must be connected, so we can deduce that every row of our table must be filled, and each row must contain at least two devices. Technically minded readers might like to know that this is the minimum configuration for a network of this type, and corresponds to a 2-regular, 3-connected isograph.

Now, even a complete exhaustive search strategy is possible. Starting with the smallest numbers in each row, and working up until you find a feasible solution. That will show the final network to consist of two devices for each of the reversed links in figure five.

Figure 5.

	A	B	C	D	E	F	G	H	I	J	K	L
A:	**	7	**	**	**	**	**	2	**	**	9	7
B:	**	**	**	**	10	16	2	**	**	16	**	**
C:	**	**	**	4	**	4	3	1	**	4	**	4
D:	**	**	**	**	**	12	5	**	**	**	**	**
E:	**	**	**	1	**	**	**	**	2	**	**	**
F:	**	**	3	**	**	**	**	3	7	**	**	**
G:	**	5	**	**	**	**	**	**	12	**	11	**
H:	**	**	5	**	**	**	**	**	7	**	**	**
I:	2	**	**	**	11	**	**	**	**	5	1	**
J:	12	4	**	8	**	**	**	**	**	**	5	15
K:	**	**	10	**	**	11	**	**	**	6	**	13
L:	**	**	**	12	**	**	3	16	**	**	8	**

That gives the network shown in figure six, with a total cost of 114 billion credits. Now surely that was not all that difficult.

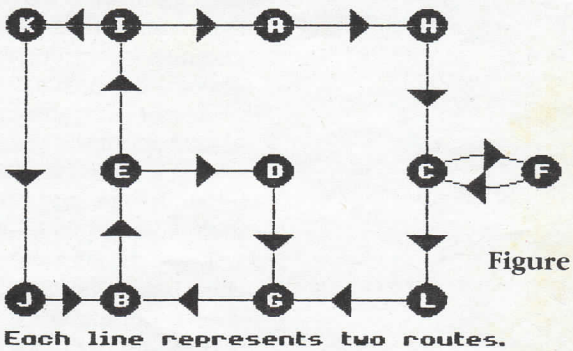
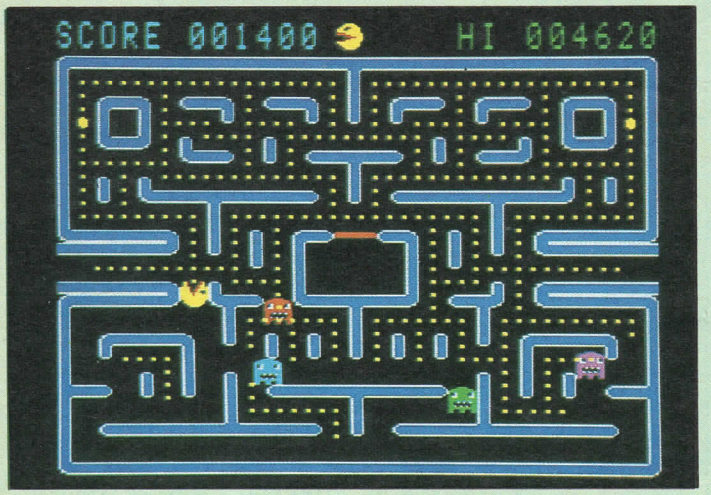


Figure 6.

Certainly, Ian Coggins from Cheshire didn't think so, he is the winner, and will receive a year's free subscription.

SOFTWARE FILE

Our man in hot pursuit.



The flow of games software into the *Sinclair QL World* offices continues unabated. Ken McMahon picks up a joystick in one hand and a pen in the other to review the latest releases.

Gobble Gobble Spook

Pacman by any other name. For those who do not take an interest in such things, Pacman ranks about third in the arcade machine all time hall of fame, behind Space Invaders and Galaxians. Both of these games are variations, to one degree or another, on the pacman theme. *Gobble Gobble* is published by Eigen Software, *Spook* by Eidersoft.

Spook is the nearest thing to the genuine article – if that is what you are looking for. The little yellow munchman must be guided round the maze eating dots with the ghoulies in hot pursuit. There are four outsize dots, or power pills, strategically placed about the maze which, if eaten, turn the ghoulies blue and render them susceptible to attack.

When the first maze is completed, you get to try your hand at a more complicated one. Spook features doors which open and close at intervals, cutting off vital escape routes. Periodically, pieces of fruit appear which can be munched for bonus points.

Gobble Gobble has a few major differences. On completion of each screen you are presented with a more difficult layout and alternative monsters, if you can call them that. You start off with the familar 'spooks', but they then turn into scissors, hammers, kites, metronomes, – there are 20 variations in all.

If you are looking for a fast and frantic game I would recommend Spook. Gobble will probably appeal more to less experienced players who prefer the more humourous, inventive approach.

Spook £10.95
Eidersoft
The Office
Hall Farm
North Ockenden
Upminster
Essex RM14 3QH

Gobble Gobble £9.95
Eigen Software
45 Bancroft Road
Widnes
Cheshire WA8 0LR

The Pawn

The Pawn was released by Magnetic Scrolls for the QL three or four months ago and evoked interest in the adventure world but few reviewers paid attention to it until Magnetic produced the ST version. Now some reviewers are raving about the game but not about the playability – more about the spectacular graphics on the ST version.

We all know good graphics – and from what I have seen, the graphics are incredible – do not make a good game, so instead of waxing lyrical about the graphics and other trimmings, I decided to see how the adventure fares on the QL as a purely text-only game.

For those who may not yet know about The Pawn here is some idea of the plot. Wandering down the high street one bright morning, you pass a strange-looking chap. Suddenly you feel a sharp blow on your head. On waking you are in the land of Kerovnia, which is in a state of political unrest, mainly because of the assassination of Queen Jendah by, supposedly, the Roobikyoub dwarf master blenders of excellent malt whisky. Because of that treachery the dwarfs have been banished by good King Erik but – and that is where you figure – did they assassinate the Queen or was it a plot by the Farthington Real Ale Company to get rid of competition?

Needless to say, it is for you to unravel the threads of the plot.

Rob Staggles has provided a very good story, full of humour and very descriptive text on which Anita Sinclair can work her programming magic. The parser works well, accepting long complicated commands such as "Get all except the cases but not the violin case then kill the man-eating shrew with the contents of the violin case, remove the shrew's tail and use it to tie the pole and the noose together." Impressive, but who will type-in a command of that nature? You can easily play the game by using verb/noun input and the occasional sentence.

I found some of the problems rather taxing. Trying to find a light is very easy after you figure what must be done; it involves finding three colours, described in the program as a blue, a green and a red. Try mixing them and see what happens. Taking the nourishment of life to the Guru seems difficult but

Spook – cutting off vital escape routes.

what do you put into a bowl, and what turns into what?

Trying to move boulders is not easy, unless you have some form of lever and, if that is not strong enough, the shirt makes a useful commodity for tying things together.

Meeting Kronos is a delightful experience as he slides to a stop in front of you – it reminded me of the Silver Surfer – and offers you a letter; but ask about the wristband you are wearing before taking the note and the chest, then give the chest to somebody like yourself.

I will not spoil your enjoyment by revealing anything else. Suffice it is to say there is which to do before you complete your task.

Overall, The Pawn is an excellent adventure. Nevertheless, do not be misled by various pictures of the game in some magazines. The QL version is strictly text-only and, as the graphic version will be availble only on the ST and Amiga, I do not see the point in raving about them.

Magnetic Scrolls Ltd

Vroom

With a name like *Vroom* what else could it be other than a Grand Prix simulation A vacuum cleaner simulation? – Ed. Vroom puts you in the hot seat of a Formula One racing car on the starting grid of one of six Grand Prix circuits. A plan of the circuit appears on the top left of the screen so you have an idea of where you are going. As the lights change from red to green you must put your foot flat down, or rather your joystick far forward, for maximum acceleration.

It takes a time to get the hang of steering. The car travels straight until left or right joystick is applied in which case, obviously enough, it turns. The tricky part comes when you want to straighten up. This happens automatically when you centre the joystick, but there is a considerable delay, so some skilful judgment is required when cornering. Even more skill and dexterity is required to overtake the opposition. There is just sufficient room on the road to pass other cars without going on to the grass verge, which will slow you drastically.

As someone who finds racing simulations impossibly addictive I must admit to being totally engrossed with Vroom. You cannot proceed to the later, more difficult stages until you have mastered the earlier ones – the best incentive ever devised to keep you trying.

The graphics are pleasantly featuring impressive sunsets, seascapes and towering cities far in the distance. The only things lacking are a reasonable dashboard – speed is indicated digitally – and tyres which look as if they are really moving.

Othello

Otherwise known as Reversi, *Othello* is the

Vroom puts you in the hot seat.

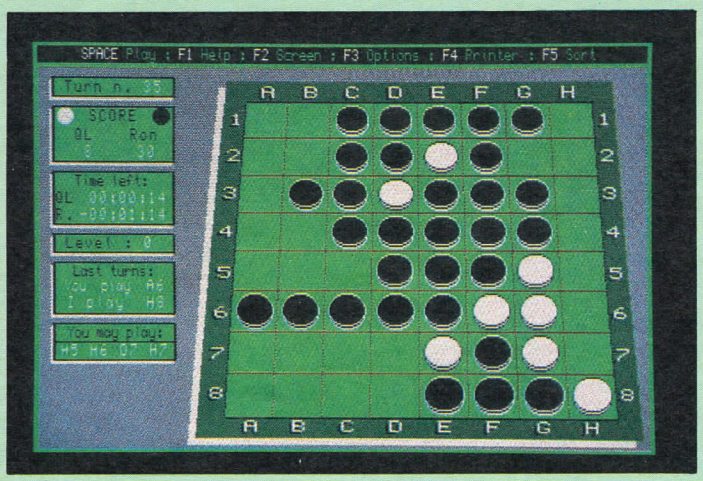
Continued on page 46

Continued from page 45

popular board game played on the 8 x 8 grid with counters. More complicated than draughts but less so than chess just about places it in context.

Each player – black and white – takes it in turn to lay a counter on the board. The object is to trap lines of your opponent's counters between two of your own, thus converting them to your colour. At the end of the game the player with most counters on the board is the winner. Like most games of the type it is easy to pick up, but difficult to master.

The Pyramide version of the QL has just about everything you could ask for and a few things besides.



The features are very similar to those you would expect to find on a good chess program. The rules and instructions are included on the program in menu form. The board can be displayed either in 3D or as a plan view. Other on-screen information includes a chess type clock, move number, current score, and a list of possible valid moves.

There are nine levels of play giving response times of between two seconds and half and hour and an additional level on which the computer matches your clock. you can set up the board in a position of your choice, change sides or levels during play, take back silly moves, or just play a straightforward game. Partially completed games can be saved and reloaded and printouts obtained of each move.

Whether you are a novice or a true afficianado of the game, I think you would be hard pushed to find a better version of Othello on any micro.

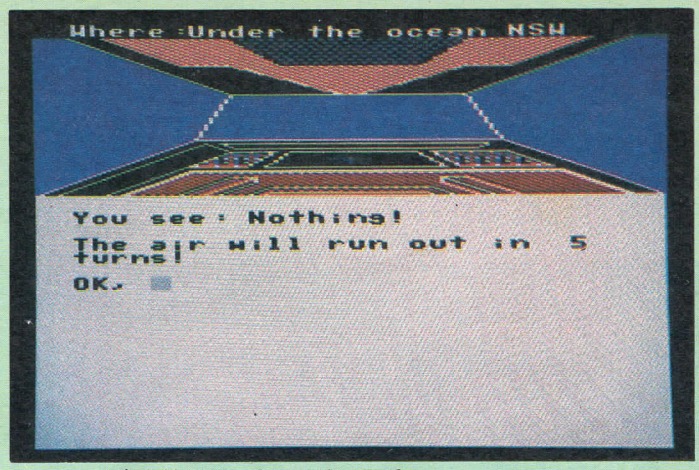
Othello £14.95
Vroom £14.95
Rio Promotions Ltd,
28 Waverley Grove,
London N3 3PX

Aquanaut 471

It is the 21st century. Because of the dreadful mess they have made of the environment, humans have abandoned the planet surface to live in vast undersea cities. For those who do not like fish, these are not easy times in which to live.

Marine menus are not the only problem. The inhabitants of Trident Dome are in trouble and their service droid, Huey-14, has signalled for help. As Aquanaut 471, you must travel to Trident Dome to discover the nature of the problem and sort things out. *Aquanaut 471* is an arcade adventure in the true sense of the word. The adventure plot is interspersed with various action screens requiring manual, rather than mental agility.

Initially you find yourself floating on the surface in your submarine. Only one way to go from here – down. The first task is to actually find Trident Dome and to



Aquanaut 471. Traverse the murky depths.

accomplish this you will need to map the underwater passages. As you trverse the murky depths you can gaze out upon the seascape as the radar makes it silent sweep. None of this is very useful, but it looks pretty.

Once the dome has been located you must dock the submarine, an operation carried out more easily with a joystick if you have one. The dome is depicted as a 3D maze and, as with the rest of the game you move around either by typing in directions or using the cursor keys or joystick. There are various items to be collected, some are useful for opening doors and deactivating force fields, others are totally irrelevant.

As with most adventures, the secret is to do the appropriate thing at the proper time and make a map as you progress. Do not, whatever you do, open the hatch in the lounge. As for the arcade screens, the only advice is to practise. They get more difficult, but, with time, none are insurmountable. You can save the game at any stage, so no death, no matter how untimely is completely disasterous.

As a fairly inexperienced adventurer I found Aquanaut had just the right mix of action and adventure to make it both enjoyable and a challenge.

It seems to be the month for versions of other peoples' games. Donkey Kong, Crazy Kong, call it what you like, essentially, they are all one and the same. King Kong has captured the beautiful, desirable whatshername and you must rescue her from his evil clutches.

This is the one that spawned the phrase 'platform game'. You, or rather the little man, must run up and down steel girders while Kong throws barrels at him. The idea is to reach the top, at which point, gorilla grabs girl and screen number two comes up.

Why am I so jaded with the game? Probably because I have just spend three hours playing it and could not get past the third screen. it is very difficult indeed. That kind of challenge may appeal to you, but be prepared for hard work and long hours.

The graphics are reasonable, though nothing spectacular. I think my main objection is that the QL is worthy of better, more original ideas.

Aquanaut 471
The King
Microdeal Ltd
Box 68
St Austell
Cornwall PL25 4YB

Our complete software guide turned out to be so comprehensive there was no room for it in this issue.

It will appear either next month, or in the September issue as a pull out guide.

If you produce games, utility, or business software and would like to be included, write and let us know.

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Mushyman
J M Dower

Mushyman is very partial to mushrooms, but tends to be indiscrimate in his choice of fungal delicacies. Guide him to the blue mushrooms for a time bonus, but beware the green ones which are poisonous.

Full instructions are included with part one of the program in last month's issue.

```
1440 END DEFine EXTRA_MUSHES
1450 :
1460 DEFine PROCedure screen_init
1470 AT #0,1,7:INK #0,6:PRINT #0,"SCORE"
1480 AT #0,1,22:PRINT #0,"LIVES"
1490 AT #0,3,1:PRINT #0,"BONUS"
1500 AT #0,3,15:PRINT #0,"TARGET"
1510 AT #0,3,28:PRINT #0,"LEVEL"
1520 INK #0,7
1530 AT #0,1,13:PRINT #0,score
1540 AT  #0,1,28:PRINT #0,FILL$("¦",lives)
1550 AT #0,3,34:PRINT #0,level
1560 END DEFine screen_init
1570 :
1580 DEFine PROCedure title
1590 WINDOW 448,20,32,216
1600 CSIZE 1,0:AT 0,9:INK 4:PAPER 0
1610 PRINT"+mushyman+"
1620 WINDOW 448,200,32,16
1630 CSIZE 0,0:PAPER 0
1640 END DEFine title
1650 :
1660 DEFine PROCedure map
1670 LOCal x,y
1680 DIM scr$(20,37)
1690 RESTORE 1780
1700 FOR y=1 TO 20
1710 READ scr$(y)
1720 NEXT y
1730 BEEP 0,255,100,10,1,0
1740 INK 2:AT 19,0:PRINT scr$
1750 BEEP
1760 END DEFine map
1770 :
1780 DATA "######################################
"
1790 DATA "#                                    #
"
1800 DATA "#                                    #
"
1810 DATA "#                                    #
"
1820 DATA "#                                    #
"
1830 DATA "#                                    #
"
1840 DATA "#                                    #
"
1850 DATA "#                                    #
"
1860 DATA "#                                    #
"
1870 DATA "#                                    #
"
1880 DATA "#                                    #
"
1890 DATA "#                                    #
"
1900 DATA "#                                    #
"
1910 DATA "#                                    #
"
1920 DATA "#                                    #
"
1930 DATA "#                                    #
"
1940 DATA "#                                    #
"
1950 DATA "#                                    #
"
1960 DATA "#                                    #
"
1970 DATA "######################################
"
1980 :
1990 DEFine PROCedure defchar
2000 set=167722
2010 old=PEEK_L (set)
2020 news=RESPR(875)
2030 FOR N=0 TO 875 STEP 4
2040 POKE_L news+N,PEEK_L (old+N)
2050 END FOR N
2060 POKE_L set,news
2070 RESTORE 2180
2080 numberofchars=11
2090 FOR char=1 TO numberofchars
2100 READ c$:c=CODE(c$)
2110 charpoke=news+10+(c-32)*9
2120 FOR dat=1 TO 9
2130 READ d:POKE charpoke+dat,d
2140 END FOR dat
2150 END FOR char
2160 END DEFine
2170 :
2180 DATA "@",0,0,56,84,124,68,56,0,0
2190 DATA "#",124,124,124,124,124,124,124,124,12
4
2200 DATA "+",0,0,56,124,124,56,56,56,0
2210 DATA "$",16,56,16,56,124,68,124,68,124
2220 DATA "m",0,36,124,192,116,84,68,0,0
2230 DATA "u",0,68,68,192,100,100,56,0,0
2240 DATA "s",0,60,64,192,12,76,56,0,0
2250 DATA "h",64,64,88,192,104,72,80,0,0
2260 DATA "y",0,68,68,192,124,4,120,0,0
2270 DATA "a",0,112,8,192,68,68,56,0,0
2280 DATA "n",0,0,88,192,100,100,100,0,0
2290 :
2300 DEFine PROCedure game_over
2310 BEEP 0,100,200,20,20,1
2320 RECOL 0,2,2,2,2,2,2,2
2330 FOR N=1 TO 20
2340 SCROLL 10
2350 NEXT N
2360 BEEP
2370 map
2380 AT 9,14:INK 7:PRINT "GAME OVER"
2390 REPeat TCP
2400 FOR N=1 TO 255
2410 key=KEYROW(1)
2420 INK N:AT 9,11:PRINT "++":AT 9,23:PRINT " ++ "
2430 IF key THEN EXIT TCP
2440 NEXT N
2450 END REPeat TCP
2460 GO TO 100
2470 END DEFine game_over
```

XREF
A J Butteriss

This debugging utility was written by Mr Butteriss for his own use, but it was so useful he decided to share it with *Sinclair QL World* readers.

XREF analyses your SuperBasic program and provides a file or printout of all identifiers and variables, the lines on which they appear, and details of their type i.e. integer, string, array.

```
1 REMark ***********************************************
*************
2 REMark
3 REMark                    QL SuperBasic XREF
4 REMark
5 REMark             A.J.BUTTERISS
7 REMark ***********************************************
*************
98 REMark
99 REMark   set up global values, declare arrays etc
100 p=1:numvars=0:kw$="":inrec$="":nextoflow=(-1000)
110 sp$="DIM FuNction PROCedure REPeat "
120 DIM occs% (1000,25) :longs$=""
130 MODE 4
140 WINDOW #1,512,30,0,0:WINDOW #2,512,180,0,30:WINDOW #0,
```

```
512,40,0,210:FOR i=0 TO 2:INK #i,4:PAPER #i,0:CLS #i:BORDE
R #i,2,6
150 CSIZE #2,3,1:AT #2,2,6:PRINT #2," QL-SuperBasic-XREF "
:CSIZE #2,1,1:AT #2,5,15:PRINT #2," Copyright 1985  A.J.Bu
tteriss "
160 CSIZE #2,0,0
165 REMark       get program name & set up display
170 AT #0,1,20:INPUT #0,"Enter file name (e.g. mdv1_xref)
";f$
180 AT #1,0,0:PRINT "      Processing ";f$:CLS #0
190 OPEN #4,f$
200 AT #1,0,50:PRINT "Currently reading line "
210 REPeat r1
215 REMark        the main loop
220 inrec$=""
230 linenum=getline
240 AT #1,0,73:PRINT #1,linenum
250 PRINT #2,inrec$;
260 p=1
270 IF linenum=0 THEN EXIT r1
280 l=LEN(inrec$)
290 REPeat r5
300  analyse
310 IF kw$="REMark" THEN EXIT r5
320 IF p>=l THEN EXIT r5
330 p=p+(inrec$(p)=" ")
340 END REPeat r5
350 END REPeat r1
360 sortnames
370 printlist
372 REMark         END OF MAIN LOOP
375 REMark *********************************
380 DEFine FuNction getline
385 REMark GET A LINE OF BASIC FROM THE PROGRAM FILE
390 LOCal i,j,a$
400 REPeat r2
410 a$=INKEY$(#4,-1)
420 IF EOF(#4) THEN RETurn 0
430 inrec$=inrec$ & a$
440 IF CODE(a$)=10 THEN i=" " INSTR inrec$:j=inrec$(1 TO i
):RETurn j
450 END REPeat r2
460 END DEFine
465 REMark *********************************
470 DEFine PROCedure analyse
471 REMark       Go through the line and find keywords/vari
ables
480 LOCal k
490 IF p>=l THEN RETurn
500 IF inrec$(p)=" " THEN p=p+1:GO TO 490
510 IF CODE(inrec$(p))=34  THEN
520 p=p+1:p=p+(CHR$(34) INSTR inrec$(p TO))
530 IF p=0 THEN
540 p=l:GO TO 490
550 ELSE
560 p=p+1:GO TO 490
570 END IF
580 END IF
590 cd=CODE(inrec$(p))
600 SELect ON cd
610 ON cd=65 TO 90:getkw:RETurn
620 ON cd=97 TO 122:getvw:RETurn
630 END SELect
640 p=p+1:GO TO 490
650 END DEFine
655 REMark *********************************
660 DEFine PROCedure getkw
665 REMark   get keyword from program line and deal with i
t
670 LOCal k
680 kw$=""
690 REPeat r3
700 kw$=kw$ & inrec$(p)
710 p=p+1
720 IF (CODE(inrec$(p))<=64 OR CODE(inrec$(p))>=91) AND (C
ODE(inrec$(p))<=96 OR CODE(inrec$(p))>=123) THEN EXIT r3
770 END REPeat r3
780 END DEFine
785 REMark *****************************************
790 DEFine PROCedure getvw
795 REMark          find full identifier/variable name
800 vw$=""
810 REPeat r4
820 vw$=vw$ & inrec$(p)
830 p=p+1
840 IF CODE(inrec$(p))<=96 OR CODE(inrec$(p))>=123 THEN
850 k=inrec$(p) INSTR "$%_0123456789"
860 IF k=0 THEN EXIT r4
870 END IF
880 END REPeat r4
890 buildtable:AT #1,1,30:PRINT #1,"Number of vars = ";num
vars
900 END DEFine
905 REMark *****************************************
910 DEFine PROCedure buildtable
915 REMark        store name in table (if new variable), u
pdate table of line numbers
920 LOCal i,j,k,a$,n%,l,b$,k1
930 vw$=CHR$(7) & vw$ & CHR$(7)
940 a$="000":l=LEN(vw$)-1
950 IF vw$(1)="$" THEN a$(2)="S"
960 IF vw$(1)="%" THEN a$(2)="I"
970 IF kw$<>"" THEN i=kw$ INSTR sp$:IF i>0 THEN a$(3)=kw$(
1)
980 i=vw$ INSTR longs$
990 vw$=vw$ & CHR$(140) & a$ & CHR$(141)
1000 IF NOT i THEN
1010 numvars=numvars+1
1020 longs$=longs$ & vw$ & CHR$(8) & numvars & CHR$(9)
1030 occs%(numvars,1)=2
1040 occs%(numvars,occs%(numvars,1))=linenum
1050 occs%(numvars,1)=occs%(numvars,1)+1
1060 ELSE
1070 j=CHR$(140) INSTR longs$(i TO):k=CHR$(141) INSTR long
s$(i TO):b$=longs$(i+j TO i+k-2)
1080 FOR k1=1 TO 3:IF b$(k1)="0" THEN b$(k1)=a$(k1)
1090 longs$(i+j TO i+k-2)=b$(1 TO 3)
1100 j=CHR$(8) INSTR longs$(i TO):k=CHR$(9) INSTR longs$(i
 TO):a$=longs$(i+j TO i+k)
1110 n%=a$
1120 IF occs%(n%,1)=25 THEN
1130 IF occs%(n%,25)=0 THEN
1140 occs%(n%,25)=nextoflow:n%=ABS(nextoflow):nextoflow=ne
xtoflow+1:occs%(n%,1)=2
1150 ELSE
1160 n%=ABS(occs%(n%,25)):GO TO 1120
1170 END IF
1180 END IF
1190 occs%(n%,occs%(n%,1))=linenum
1200 occs%(n%,1)=occs%(n%,1)+1
1210 END IF
1220 kw$=""
1230 END DEFine
1235 REMark *****************************************
1240 DEFine PROCedure printlist
1245 REMark          output the tables in report format
1250 LOCal i,j,p,a$,b$,page,lines
1260 howtoprint
1270 i=1:p=1:page=1:lines=66
1280 FOR x=1 TO numvars
1285 IF lines>60 THEN newpage
1290 b$=""
1300 i=" " INSTR ray$(x,1 TO 20)
1305 PRINT #2
1310 PRINT #2,ray$(x,1 TO i),
1320 IF NOT displayonly THEN PRINT #4:PRINT #4,ray$(x,1 TO
 i),
1325 lines=lines+2
1330 a$=ray$(x,21 TO 23)
1340 IF a$(2)="I" THEN b$=b$ & " Integer "
1350 IF a$(2)="S" THEN b$=b$ & " String "
1360 IF a$(3)="P" THEN b$=b$ & " Procedure "
1370 IF a$(3)="F" THEN b$=b$ & " Function "
1380 IF a$(3)="R" THEN b$=b$ & " Repeat variable "
1390 IF a$(3)="D" THEN b$=b$ & " Array "
1400 index=ray$(x,24 TO 26)
1410 j=2
1420 PRINT #2,b$:PRINT #2:IF NOT displayonly THEN PRINT #4
,b$:PRINT #4
1425 lines=lines+1
1430 REPeat r6
1440 PRINT #2,occs%(index,j),:IF NOT displayonly THEN PRIN
T #4,occs%(index,j),
1445 lines=lines+((j MOD 12) = 0)
1450 j=j+1
1460 IF occs%(index,j)=0 THEN EXIT r6
1470 IF occs%(index,j)<0 THEN index=ABS(occs%(index,j)):j=
2
1475 IF lines>60 THEN newpage
1480 END REPeat r6
1490 PRINT #2:PRINT #2:lines=lines+2
1500 IF NOT displayonly THEN PRINT #4:PRINT #4
1510 END FOR x
1512 PRINT #2:PRINT #2:PRINT #2,TO 30,"END OF LISTING"
1515 IF NOT displayonly THEN PRINT #4:PRINT #4:PRINT #4,TO
 30,"END OF LISTING":CLOSE #4
1520 END DEFine
1525 REMark *************************************
1530 DEFine PROCedure sortnames
1540 LOCal i,j,temp$,p
1550 CLS #2:AT #2,10,10:PRINT #2,"Collating Variables.....
......."
1560 AT#1,0,50:PRINT #1,"    Now sorting.....................
      "
1570 DIM ray$(numvars+1,26)
1580 p=1
1590 ray$(numvars+1)="zzzzzzzzzzzzzzzzzzzz"
1600 FOR i=1 TO numvars
1610 j=CHR$(7) INSTR longs$(p TO)
1620 k=CHR$(140) INSTR longs$(p TO)
1630 temp$=FILL$(" ",26)
1640 k=k-3:temp$(1 TO 20)=longs$(p+j TO p+k)
1650 k=k+3:j=CHR$(141) INSTR longs$(p TO):j=j-1
1660 temp$(21 TO 23)=longs$(p+k TO p+j)
```

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```
.670 j=j+3:k=CHR$(9) INSTR longs$(p TO):k=k-1
.680 temp$(24 TO 26)=longs$(p+j-1 TO p+k-1)
.690 ray$(i)=temp$
.700 p=p+k+1
.710 END FOR i
.720 AT #2,10,10:PRINT #2,"  Sor"
.730 alphasort ray$,numvars
.740 AT #0,0,50:PRINT "Printout now available":CLS #2
.750 END DEFine
.755 REMark ****************************************
.760 DEFine PROCedure howtoprint
.770 LOCal a$
.780 displayonly=0
.790 CLS #2:AT #2,4,15:PRINT #2,"Select output option:-"
.800 AT #2,7,15:PRINT #2,"0 - To print results on SCREEN O
ILY"
.810 AT #2,9,15:PRINT #2,"1 - To print results on SER1 pri
nter"
1820 AT #2,13,15:PRINT #2,"3 - To print results on MDV1"
1830 AT #2,11,15:PRINT #2,"2 - To print results on SER2 pr
inter"
1840 AT #2,15,15:PRINT #2,"4 - To print results on MDV2"
1850 REPeat r7
1860 a$=INKEY$(-1)
1870 IF a$>="0" AND a$<="4" THEN EXIT r7
1880 END REPeat r7
1900 IF a$="1" THEN BAUD 300:OPEN #4,ser1c
1910 IF a$="2" THEN BAUD 300:OPEN #4,ser2c
1920 IF a$="3" THEN temp$="mdv1_" & f$(6 TO) & "_xrf":DELE
TE temp$:OPEN_NEW #4,temp$
1930 IF a$="4" THEN temp$="mdv2_" & f$(6 TO) & "_xrf":DELE
TE temp$:OPEN_NEW #4,temp$
1940 displayonly=(a$="0")
1960 END DEFine
1970 REMark ****************************************
1980 DEFine PROCedure alphasort(a$,numparts)
1990 LOCal i,r1,j,temp$
2000 CLOSE #4
2010 FOR i=numparts TO 1 STEP -1
2020 AT #2,14,22:PRINT #2,i;" Passes left.    "
2030 FOR j=1 TO i
2040 IF a$(j,1 TO 20)>a$(j+1,1 TO 20) THEN temp$=a$(j):a$(
j)=a$(j+1):a$(j+1)=temp$
2050 END FOR j
2060 END FOR i
2070 END DEFine
2080 REMark ****************************************
2100 DEFine PROCedure newpage
2110 LOCal i
2120 FOR i=1 TO (66-lines):PRINT #2:IF NOT displayonly THE
N PRINT #4
2125 IF NOT displayonly THEN PRINT #4,TO 20,"Cross-referen
ce listing of ";f$(6 TO),TO 65,"Page ";page:PRINT #4:PRINT
 #4:PRINT #4
2130 PRINT #2,TO 20,"Cross-reference listing of ";f$(6 TO)
,TO 65,"Page ";page:PRINT #2:PRINT #2:PRINT #2:lines=5:pag
e=page+1
2150 END DEFine
```

3D Noughts & Crosses
T J Arnfield

This version of what was probably one of the first games ever written for a micro adds a whole new dimension to noughts and crosses.

The game is played on a 4x4x4 grid with red and green markers in place of the usual symbols. If you think noughts and crosses is easy try playing 3D OXO and you will never feel the same again.

```
10 REMark 3 D noughts and crosses
20 REMark T.J.Arnfield
30 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - -
40 CLEAR
50 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - -
60 initialise :REMark all game data and varables
70 display_board true% :REMark display empty board - once
only
80 REPeat until_no_more_games
90    init_for_new_game
100    REPeat until_end_of_game
110       IF whos_go% = you% THEN
120          move% = get_your_move
130       ELSE
140          move% = generate_my_move
150       END IF
160       update_board(move%) : result% = update_game_tabl
es (move%)
170       IF result% <> game_not_over% THEN EXIT until_end
_of_game
180       whos_go% = whos_go% * -1
190    END REPeat until_end_of_game
200    new_game% = game_over (result%)
210    IF NOT new_game% THEN EXIT until_no_more_games
220    display_board false%
230 END REPeat until_no_more_games
240 CLOSE #4 : CLOSE #5 : STOP
250 REMark - - - - - - - - - - - - - - - - - - - - - - - -
 - - - - -
260 DEFine FuNction generate_my_move
270   LOCal i,j,p%,sq%,my2_count%,your2_count%,val,maxval,
pathv
280   CLS #5 : PRINT #5,"  MY MOVE":PRINT #5,"    ...THINK
ING"
290   IF moves% < 2 THEN
300      PAUSE 75
310      IF board%(1) = 0 THEN RETurn 1
320      IF board%(4) = 0 THEN RETurn 4
330   END IF
340   IF moves% > 4 THEN
350      p% = 0
500               IF pathv = 2 * you% THEN your2_count% =
your2_count% + 1
510               val = val + ABS(pathv) + .2 + 5E-2 * (pa
thv > 0)
520            END IF
530         NEXT j
540            IF my2_count% > 1 THEN RETurn i
550            IF your2_count% > 1 THEN sq% = i * -1
560            IF val > maxval AND sq% >=0 THEN
570               maxval = val : sq% = i
580            END IF
590         END FOR j
600      END IF
610   END FOR i
620   RETurn ABS(sq%)
630 END DEFine
640 REMark - - - - - - - - - - - - - - - - - - - - - - - -
 - - - - -
650 DEFine FuNction find_square (path%)
660    LOCal i
670    FOR i = 1 TO 4
680       IF board%(winning_paths%(path%,i)) = 0 THEN RETu
rn winning_paths%(path%,i)
690    END FOR i
700    STOP : REMark software error
710 END DEFine
720 REMark - - - - - - - - - - - - - - - - - - - - - - - -
 - - - - -
730 DEFine PROCedure update_board (m%)
740    board%(m%) = whos_go% : moves% = moves% + 1
750    fill_previous_square
760    print_square m%,(whos_go%+3),1,true%
770 END DEFine
780 REMark - - - - - - - - - - - - - - - - - - - - - - - -
 - - - - -
790 DEFine FuNction update_game_tables (sq%)
800 LOCal i,p%
810    FOR i = 1 TO sq_to_path%(sq%,0)
820       p% = sq_to_path%(sq%,i)
830       IF path_value(p%) <> dead% THEN
840          IF path_value(p%) * whos_go% < 0 THEN
850             path_value(p%) = dead%
860             dead_paths% = dead_paths% + 1
870             IF dead_paths% = 76 THEN RETurn stalemate%
880          ELSE
890             path_value(p%) = path_value(p%) + whos_go%
900             IF path_value(p%) = 4 * whos_go% THEN
910                highlight_winning_path (p%)
920                RETurn whos_go%
930             END IF
940          END IF
950       END IF
960    END FOR i
970    RETurn game_not_over%
980 END DEFine
990 REMark - - - - - - - - - - - - - - - - - - - - - - - -
 - - - - -
1000 DEFine FuNction get_your_move
1010    LOCal x%,x,k%
1020    CLS #5 : PRINT #5, "    YOUR MOVE"
1030    FOR x = 1 TO 64 : IF board%(x) = 0 THEN x%=x : EXI
T x
1040    REPeat until_enter
1050       print_square x%,7,0,false% : x = x%
1060          REPeat get_cursor
```

```
1070              k%=CODE(INKEY$(-1))
1080              IF k% = 10 THEN EXIT get_cursor
1090              IF k% = 32  THEN x%=find_next_sq (x%,16)
: EXIT get_cursor
1100              IF k% = 192 THEN x%=find_next_sq (x%,-1)
: EXIT get_cursor
1110              IF k% = 200 THEN x%=find_next_sq (x%,1) :
 EXIT get_cursor
1120              IF k% = 216 THEN x%=find_next_sq (x%,4) :
 EXIT get_cursor
1130              IF k% = 208 THEN x%=find_next_sq (x%,-4)
: EXIT get_cursor
1140           END REPeat get_cursor
1150        print_square x,0,0,false%
1160        IF k% = 10 THEN RETurn x%
1170     END REPeat until_enter
1180 END DEFine
1190 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
1200 DEFine FuNction find_next_sq(start%,offset%)
1210     LOCal x%
1220     x%=start% :REMark  x% = (start%+offset%+63) MOD 64
 + 1
1230     REMark IF offset% > 0 THEN offset% = 1 : ELSE offs
et% = -1
1240     IF offset%=16 THEN x%=(x%+15)DIV 16*16:offset%=1
1250     REPeat find_empty_sq
1260        x%=(x%+offset%+63)MOD 64 +1 : REMark IF board%(
x%) = 0 THEN RETurn x%
1270        IF board%(x%) = 0 THEN RETurn x%
1280        REMark x% = x% + offset% : IF x% = 0 OR x% = 65
 THEN x% = (x%+63) MOD 64 + 1
1290     END REPeat find_empty_sq
1300 END DEFine
1310 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
1320 DEFine PROCedure fill_previous_square
1330    IF prev_ink <> 0 THEN INK #4,prev_ink : print_x% =
save_x% : print_y% = save_y% :fill_square 1,false%
1340 END DEFine
1350 REMark - - - - - - - - - - - - -- - - - - - - - - - -
 - - - - -
1360 DEFine PROCedure print_square (sq%,ik%,fill%,half_sq%
)
1370    LOCal plane%,col%,row%,locink%
1380    plane% = invert ((sq% - 1)DIV 16)
1390    row%    = invert(((sq% - 1)MOD 16 )DIV 4)
1400    col%    = (sq% - 1)MOD 4
1410    print_x% = x0% +(col%*xsq%)+(row%*(x01%-x0%)DIV 4):
REMark +5
1420    print_y% = y0% + (plane%*y_diff%) +(row%*ysq%):REMa
rk  +1
1430    INK #4,ik%
1440    IF half_sq% THEN
1450       save_x% = print_x% : save_y% = print_y% : prev_in
k = ik%
1460    END IF
1470    fill_square fill%,half_sq%
1480    INK #4,0
1490 END DEFine
1500 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
1510 DEFine FuNction invert (n%)
1520     IF n%=0 THEN RETurn 3
1530     IF n%=1 THEN RETurn 2
1540     IF n%=2 THEN RETurn 1
1550     RETurn 0
1560 END DEFine
1570 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
1580 DEFine PROCedure fill_square (fill%,half%)
1590    FILL #4,fill%
1600    IF NOT half% THEN
1610       LINE #4,print_x%+3,print_y%+1 TO print_x%+xsq%-1
,print_y%+1 TO print_x%+xsq%-3+(x01%-x0%)DIV 4,print_y%+ys
q%-1 TO print_x%+1+(x01%-x0%)DIV 4,print_y%+ysq%-1 TO prin
t_x%+3,print_y%+1
1620    ELSE
1630       LINE #4,print_x%+3,print_y%+1 TO print_x%+xsq%-1
,print_y%+1 TO print_x%+1+(x01%-x0%)DIV 4,print_y%+ysq%-1
TO print_x%+3,print_y%+1
1640    END IF
1650    FILL #4,0
1660 END DEFine
1670 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
1680 DEFine PROCedure highlight_winning_path (path%)
1690     LOCal i,sq%
1700     FOR i = 1 TO 4
1710        sq% = winning_paths%(path%,i)
1720        print_square winning_paths%(path%,i),7,1,true%
1730     END FOR i
1740 END DEFine
1750 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
1760 DEFine PROCedure init_board_variables
1770     x0%=10:y0%=4: x1%=50:y1%=24: x01%=30: x11%=70: y_
diff%=24
1780     xsq% = (x1%-x0%)DIV 4 : ysq% = (y1%-y0%)DIV 4
1790 END DEFine
1800 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
1810 DEFine PROCedure display_board (init%)
1820    prev_ink = 0
1830    IF init% THEN
1840       PAPER #4,0 : INK #4,7 :CLS#4
1850       FOR i = 0 TO 3
1860          FOR j = 0 TO 4
1870             fromx% = x0% +(j*(x01%-x0%)DIV 4) : fromy%
 = y0% + (i*y_diff%)+ (ysq%*j)
1880             IF j = 0 THEN
1890                FILL #4,1
1900                LINE #4,fromx%,fromy% TO fromx%+x1%-x0%
,fromy% TO fromx%+x1%-x0%,fromy%-2 TO fromx%,fromy%-2 TO f
romx%,fromy%
1910                FILL #4,0
1920             END IF
1930             LINE #4,fromx%,fromy% TO fromx% + x1%-x0%,
fromy%
1940             fromx% = x0% + j * xsq% : fromy% = y0% + i
*y_diff%
1950             LINE #4,fromx%,fromy% TO fromx% + x01%-x0%
,fromy% + y1%-y0%
1960             IF j = 4 THEN
1970                FILL #4,1
1980                LINE #4,fromx%,fromy% TO fromx%+x01%-x0
%,fromy%+y1%-y0% TO fromx%+x01%-x0%,fromy%+y1%-y0%-2 TO fr
omx%,fromy%-2 TO fromx%,fromy%
1990                FILL #4,0
2000             END IF
2010          END FOR j
2020       END FOR i
2030    ELSE
2040       FOR i = 1 TO 64
2050          IF board%(i) <> 0 THEN print_square i,0,1,fal
se%
2060       END FOR i
2070    END IF
2080 END DEFine
2090 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
2100 DEFine FuNction  game_over (res%)
2110     LOCal r% : r% = true%
2120     CLS#5
2130     IF res% = you% THEN PRINT #5,"      YOU WIN"
2140     IF res% = me%  THEN PRINT #5,"       I WIN"
2150     IF res% = stalemate% THEN PRINT #5,"  STALEMATE"
2160     PRINT #5,"ANOTHER GAME ? Y/N";
2170     REPeat another_game
2180        q$ = INKEY$(#5,-1)
2190        IF q$ = "y" OR q$ = "Y" THEN EXIT another_game
2200        IF q$ = "n" OR q$ = "N" THEN r% = false% : EXIT
 another_game
2210     END REPeat another_game
2220     CLS#5 : RETurn r%
2230 END DEFine
2240 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
2250 DEFine PROCedure init_for_new_game
2260     moves% = 0 : dead_paths% = 0
2270     FOR i = 1 TO 76 : path_value(i) = 0 : END FOR i
2280     FOR i = 1 TO 64 : board%(i) = 0 : END FOR i
2290     IF RND < .5 THEN whos_go% = you% : ELSE whos_go% =
 me%
2300 END DEFine
2310 REMark - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - -
2320 DEFine PROCedure initialise
2330     DIM board%(64) , winning_paths%(76,4) , sq_to_path
%(64,8)
2340     DIM path_value (76)
2350     MODE 4
2360     BORDER #1,0 : PAPER #1,0 : BORDER #2,0 : PAPER #2,
0 : CLS #1 : CLS #2
2370     OPEN#4,scr_226x206a143x0 : BORDER #4,2,4 : PAPER #
4,7
2380     OPEN#5,con_226x44a143x211 : BORDER #5,2,4 : PAPER
#5,0 :INK #5,7 : CLS #5 : CSIZE #5,2,1
2390     instructions
2400     init_winning_paths
2410     init_board_variables
2420     true% = (1=1) : false% = (1=2)
2430     first% = true% : you% = -1 : me% = 1
2440     game_not_over% = 0
2450     stalemate% = 99
2460     dead% = 99
2470     PRINT #4:PRINT #4:PRINT #4,"  PRESS ANY KEY WHEN Y
OU'RE READY":PAUSE
```

Continued on page 52

```
2480 END DEFine
2490 REMark - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
2500 DEFine PROCedure init_winning_paths
2510    LOCal x%,no_of_datasets%,first%,sq_inc%,path_inc%,
no_of_paths%,val%
2520    x% = 1
2530    READ no_of_datasets%
2540    FOR i = 1 TO no_of_datasets%
2550       READ first%,sq_inc%,path_inc%,no_of_paths%
2560       val% = first%
2570       FOR j = 1 TO no_of_paths%
2580          FOR k = 1 TO 4
2590             winning_paths%(x%,k) = val%
2600             sq_to_path%(val%, 0) = sq_to_path%(val%,
0) + 1
2610             sq_to_path%(val%, sq_to_path%(val%,0) ) =
 x%
2620             val% = val% + sq_inc%
2630          END FOR k
2640          val% = val% - 4 * sq_inc% + path_inc%
2650          x% = x% +1
2660       END FOR j
2670    END FOR i
2680 END DEFine .
2690 REMark - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
2700 DATA 16
2710 DATA 1,1,4,16
2720 DATA 1,4,1,4
2730 DATA 17,4,1,4
2740 DATA 33,4,1,4
2750 DATA 49,4,1,4
2760 DATA 1,15,1,16
2770 DATA 1,5,16,4
2780 DATA 4,3,16,4
2790 DATA 1,17,4,4
2800 DATA 1,20,1,4
2810 DATA 13,12,1,4
2820 DATA 4,15,4,4
2830 DATA 1,21,0,1
2840 DATA 4,19,0,1
2850 DATA 13,13,0,1
2860 DATA 16,11,0,1
2870 DEFine PROCedure instructions
2880    CLS #4:INK #4,0
2890    PRINT #4,"       3D NOUGHTS AND CROSSES"
2900    PRINT #4,"       ======================"
2910    PRINT #4," This is noughts and crosses played"
2920    PRINT #4,"          on a 4x4x4x4 grid."
2930    PRINT #4," The object of the game is to get 4"
2940    PRINT #4,"    in a line through the grid."
2950    PRINT #4," When it is your turn to move,  use"
2960    PRINT #4," the cursor keys to move the cursor"
2970    PRINT #4," in the indicated direction, or the"
2980    PRINT #4," SPACE bar to move it into the next"
2990    PRINT #4,"                plane. "
3000    PRINT #4," When you have  located the desired"
3010    PRINT #4," square,press the ENTER key to make"
3020    PRINT #4," your move.  ALL WILL BECOME CLEAR."
3030    PRINT #4
3040    PRINT #4," PLEASE WAIT WHILE I INITIALISE THE"
3050    PRINT #4," COMPUTER VARIABLES  AND THE BOARD."
3060 END DEFine
```

QL Palette
Dilwyn Jones

This neat little utility should prove a useful aid to the budding artist. Any of the QL's colours can be displayed on the screen together with the corresponding codes. The colours can be displayed in either mode 4 or 8 and you can experiment by changing the stipple pattern.

```
100 REMark --- QL Palette Program ---
110 REMark --- Dilwyn Jones
120 CLEAR
130 PAPER#2,0
140 MODE 8
150 INITIALISE
160 mde=8:stip=0
170 AT#0,5,25:PRINT#0,CHR$(190);
180 TINT 0,0
190 REPeat choice
200   key=CODE(INKEY$(-1))
210   SELect ON key
220     =48 TO 51:IF stip<>key-48 THEN
TINT stip,key-48
230     =27:EXIT choice
240     =52:IF mde=8 THEN CHANGE_MODE
mde
250     =56:IF mde=4 THEN CHANGE_MODE
mde
260   END SELect
270 END REPeat choice
280 WINDOW 448,200,32,16
290 WINDOW#0,448,40,32,216
300 STOP
310 :
320 :
330 DEFine PROCedure CHANGE_MODE (m)
340   BORDER#0,0:BORDER 0
350   CLS:CLS#0
360   IF m=8 THEN
370     MODE 4
380     m=4
390   ELSE
400     MODE 8
410     m=8
420   END IF
430   INITIALISE
440   IF m=4 THEN AT#0,5,22:PRINT#0,CH
R$(190);"    ":REMark 3 spaces
450   IF m=8 THEN AT#0,5,22:PRINT#0,"
  ";CHR$(190):REMark 3 spaces
460   TINT stip,stip
470 END DEFine CHANGE_MODE
480 :
490 :
500 DEFine PROCedure TINT (previous,s
tipple)
510   LOCal colour,shade
520   AT#0,5,12+2*previous:PRINT#0," "
530   AT#0,5,12+2*stipple:PRINT#0,CHR$
(190)
540   AT 0,0
550   FOR colour=0 TO 63
560     shade=64*stipple+colour
570     PAPER shade
580     PRINT"      ";:REMark 5 spaces
590     PAPER 0
600     PRINT shade;"    "(1 TO 4-LEN(sh
ade));:REMark 3 spaces
610   END FOR colour
620   previous=stipple
630 END DEFine TINT
640 :
650 :
660 DEFine PROCedure INITIALISE
670   WINDOW 512,256,0,0
680   PAPER 0:INK 7:CLS
690   WINDOW 436,162,38,16
700   CLS:BORDER 1,7
710   WINDOW#0,436,72,38,182
720   BORDER#0,1,7
730   PAPER#0,0:INK#0,7:CLS#0
740   CSIZE 2,0:CSIZE#0,2,0
750   AT#0,1,12:PRINT#0,'STIPPLE    MOD
E   QUIT':REMark 3,3 spaces
760   BLOCK#0,12,10,144,25,2
770   BLOCK#0,12,10,168,25,2
780   BLOCK#0,12,10,192,25,2
790   BLOCK#0,12,10,216,25,2
800   BLOCK#0,6,5,150,25,4
810   BLOCK#0,12,5,168,30,4
820   BLOCK#0,6,10,192,25,4
830   BLOCK#0,6,5,216,25,4
840   BLOCK#0,6,5,222,30,4
850   AT#0,4,3:PRINT#0,'press     0 1 2
 3    4  8     ESC':REMark 4,1,1,1,3,2,
4 spaces
860 END DEFine INITIALISE
```

MICRODRIVE EXCHANGE

In return for a small administration charge (per program — including a royalty for the author), we will copy onto blank microdrives any or all of the featured programs.

Each program will be a direct copy of the published listing, or an extended version of that listing where the program in question was too long to print in full (programs for which an abridged version has been published are marked with an asterisk).

It must be stressed that we are not selling the software itself, nor providing any guarantee that it performs any particular function (though we do check every program that is to appear in *Sinclair QL World*), we are merely offering a service to readers who wish to obtain *Sinclair QL World/QL User* programs on drive rather than by typing them in straight from the page.

HOW TO ORDER

Listed below are programs which have appeared as listings inside *QL World/QL User* and *Sinclair QL World*.

To the right of each program entry is a small box, which you should mark with a bold cross if you want to order that program.

Once you have put a cross next to all the programs you wish to have copied onto microdrive, simply complete the rest of the order form and send it along with your PO/cheque AND BLANK FORMATTED DRIVE to:

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London SW1.

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Please allow 28 days for delivery.

ORDER FORM

Author	Language	Program Name	Price	Issue	Size
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Pocket sized monitor with comprehensive facilities					
A Didcock	(B)	Connect4	£1.00	Sept	15 ☐
Pit your wits against the QL					
Shergold & Tose	(B)	*Golf	£2.00	May	35 ☐
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A subtle blend of machine code and SuperBasic that produces a versatile sprite designer and high speed animator					
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A high resolution multi-coloured map of the world for geography buffs					

B = SuperBasic, AO = Assembler + Object Code (ready to run), MB = Machine Code + Basic loader

Name _____

Address _____

_____

No of programs ordered ..... Total cost £ .....

Total sectors (max 200 per drive) .....

No of drives sent .....

No of drives required ..... @ £2.50 each £ .....

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Please copy onto microdrive the programs above which I have indicated with a cross. I enclose a cheque/PO to the value of £ ..... (made payable to *QL World*). I understand that *Sinclair QL World* only undertakes to SUPPLY these programs (copied onto microdrive) and accepts no liability for their operation as defined by the author. Neither can *Sinclair QL World* supply additional information about any of the listings other than that originally printed. Any article reprints required must be ordered and paid for separately at £1 each inclusive of post and packing (£2 overseas). Please mark the envelope Dept. LB.

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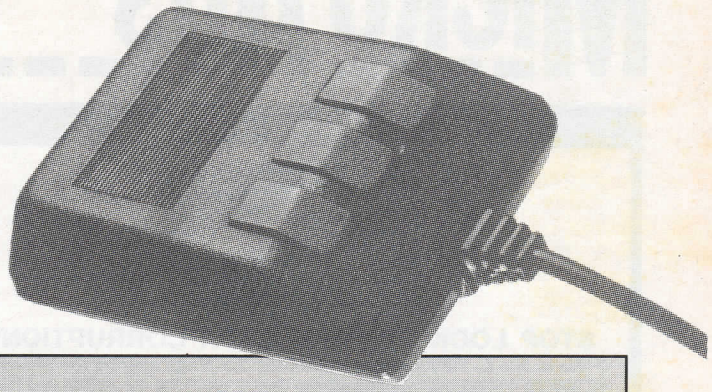

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The complete package normally would cost £89.95. All you have to do to have one for nothing is to complete the questionnaire below and return it to Sinclair QL World before Monday, July 21, 1986.

On that date we will hold the prize draw and the senders of the first six surveys drawn from the sack will be invited to the *Sinclair QL World* offices to be presented with a mouse.

If you do not want to tear your copy of the magazine a photocopy will suffice. As well as the chance to win a mouse you will be helping us to produce an even better magazine, so fill in the questionnaire and post it today.

1. Do you own a QL? YES ☐ NO ☐

2. Do you own or use another computer in addition to the QL?

YES ☐ NO ☐

If yes, please state which .....

3. Which of the following peripherals do you own or intend to buy in the next 12 months?

	OWN	INTEND TO BUY
Joystick	☐	☐
Mouse	☐	☐
Monitor	☐	☐
Disc drive	☐	☐
Expansion card	☐	☐
Modem	☐	☐
Printer	☐	☐

Other (please specify) .....

4. Would you consider selling your QL and buying another computer in the next 12 months?

YES ☐ NO ☐

If yes, which computer would you buy?

Amstrad PCW 8256/8512	☐
Atari ST512/1024	☐
Commodore 128/Amiga	☐
IBM compatible	☐
QL upgrade (e.g., THOR, QLT)	☐

Other (please specify) .....

5. Which types of software packages do you own or intend to buy in the next 12 months?

	OWN	INTEND TO BUY
Games	☐	☐
Education	☐	☐
Programming/languages	☐	☐
Home accounts	☐	☐
Graphics	☐	☐

6. How many other people read your copy of *Sinclair QL World?*

None ☐ One ☐ Two ☐ Three ☐ More ☐

7. Which articles in *Sinclair QL World* interest you most?

Games reviews ☐ Utilities reviews ☐
Programming features ☐ Business articles ☐
News ☐ The Progs ☐

8. How often do you buy the following magazines?

	Every Issue	Often	Sometimes	Never
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9. What most influences your choice of software/hardware?

Magazine review ☐ Magazine advertisements ☐
Friend's opinion ☐ Price ☐
Publisher's reputation ☐

Personal details. Please answer the following if you wish to be included in the prize draw.

10. Sex MALE ☐ FEMALE ☐

11. Age

UNDER 16	16-24	25-30	30-40	40-55	Over 55
☐	☐	☐	☐	☐	☐

12. Occupation .....

13. Salary: £5K ☐ £5K-8K ☐ £8K-10 ☐
£10K-15K ☐ £15K-20K ☐ £20K ☐.
This is confidential and may be included if you wish.

Name .....

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Send to: Sinclair QL World (Survey)
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MICRO ADS

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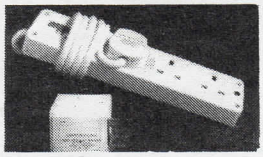

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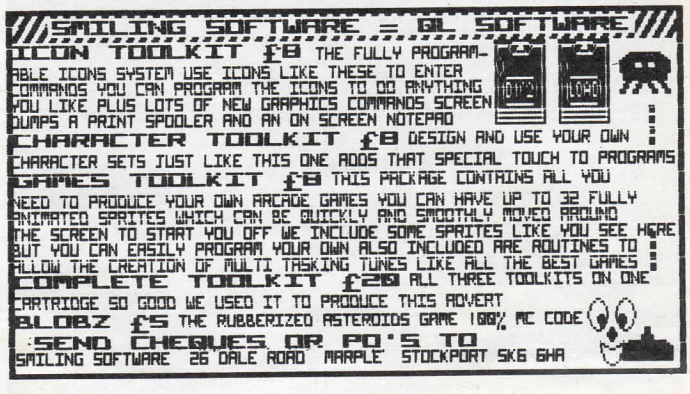

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Multistandard Intelligent Modem

THE COMPREHENSIVE SOLUTION

For your QL communications needs – covers all the major international FSK modem modes permitted in UK

300/300 baud CCITT V21 Answer & Originate
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Auto-dial and Auto-answer

Centronics interface with 6KB buffer – for serial to centronics conversion or for printing incoming modem data.

Comes complete with communications software for the QL – Prestel emulation, 40/80 column terminal emulation, text file transfer. N.B. software works with expanded QLs.

SO CLEVER, IT'S SIMPLE

Onboard microcomputer ensures correct data exchange with QL and provides split baud rates for V23 modem modes.

The Astracom 1000 is controlled by software commands from keyboard or the communications software provided. Automatically reports mode and status and has inbuilt help menu.

Auto-scan feature puts modem in correct mode to respond to incoming carrier.

TOTALLY INDEPENDENT

The Astracom 1000 has its own power supply and can be used with any computer that has a serial port, and so will work with a successor to your QL. Astracom intend to provide communications software for a wide range of computers.

The Astracom 1000 is 7 inches wide by 8 inches deep and 1.5 inches high. It comes complete with software, manual and serial cable, all for

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Not BT approved,
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SUPER Q-BOARD BY SANDY

DESCRIPTION

This is the complete upgrade for the QL completely contained in the Sinclair specified expansion unit.

It looks the same as a normal interface except that the disk socket is moved towards the front of the Sinclair moulding making room for a parallel printer port to be inserted.

Inside together with the disk interface is a full 512K of RAM and the Eprom contains the most comprehensive of Super Basic commands of any interface. A unique feature is be able to set up a printer buffer within RAM.

The design of this unit is of such a high standard that we would suggest that it will not be bettered. Ideal for the work environment and the discerning home user.

SUPERBASIC EXTENSIONS

SPL SPL_USE:- File spooler.
JOBS AJOB SPJOB RJOB:- Job control.
GET BGET PUT BPUT FPOS:- Direct access files.
FLEN FTYP FDAT:- File enquiry functions.
FOPEN FOP_IN FOP_NEW FOP_OVER FOP_DIR VIEW:- Examining a file.
WDIR WSTAT WDEL WDEL_F:- Wild card commands.

STAT:- Drive statistics.
WCOPY:- Wild card copy.
RENAME TRUNCATE
DATA_USE:- Default directory.
CLOCK:- Resident clock.
EXTRAS:- Listing extensions.
FORMAT RAM_200:- Creates 200 sector RAM disk.
RAM_USE FLP:- RAM disk emulates FLP.

PAR:- Parallel printer port with default buffer of 128 bytes.
PAR_USE SER:- Emulates Serial ports.
PARF_3K:- *** form feed with 3K buffer.
PARC_400:- ***<CR> in place of <LF> with 400 byte buffer.
FLP_USE MDV:- Discs emulate MDV
FLP_SEC:- Security level.
FLP_START:- Start up time.
FLP_TRACK:- Number of tracks.

EXPANDERAM 512K

The Miracle Systems Expanderam Plugs into the main port on the left of the QL and has an extension plug to enable a disk interface to be plugged in. The advantages of this method of upgrading are that the QL warranty is not effected and it runs 1.7+ times faster. A cover is supplied with it to protect the cct. boards.

512K INTERNAL RAM UPGRADE

The 512K RAM is supplied on a printed cct. board, and the procedure to upgrade is:-

1. Open QL using posidrive screwdriver.
2. Remove main ROM and plug the board in its socket.
3. Remove main processor and bend up two pins.
4. Put main processor back in socket.
5. Solder four wires onto processor.
6. Put ROM into socket on new board.
7. Solder capacitor onto 5V regulator and test QL.
8. If all is well put screws back in QL.

This upgrade gives the QL a total 640K of RAM and any disk interface can be used with it.
A 90 day Warranty is offered on the QL excluding drives when fitted by us.

CUMANA INTERFACE

The Cumana Interface extends onto the Expanderam or can be plugged into the QL expansion port if the internal RAM upgrade is adopted. It has an alternate EPROM fitted which contains RAM-DISK function as well as the normal toolkit commands.

DUAL DISK DRIVES

3.5" 720K X 720K Dual Cumana drives with NEC mechanisms boxed side by side supplied with all upgrades.

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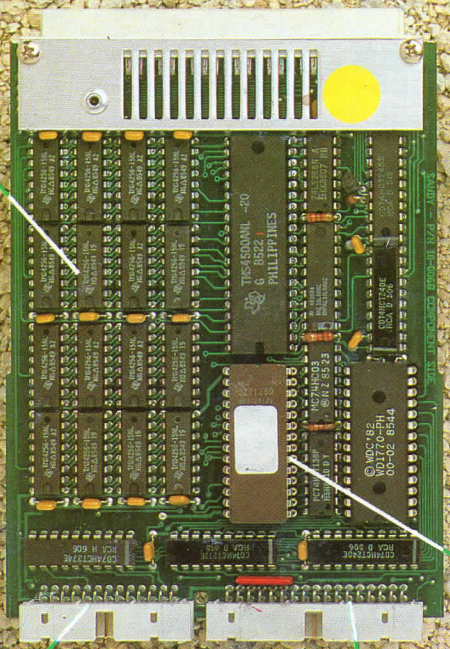
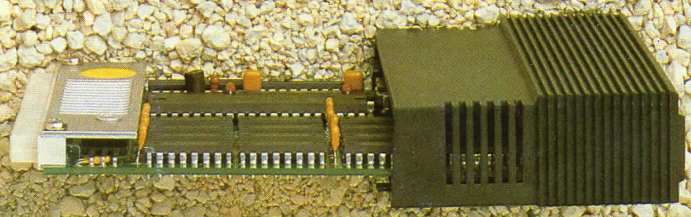


512 K MEMORY



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- FLP_USE (CHANGE THE NAME)
- RAM_USE (RAM DISK UTILITY)
- SPL (PRINTER SPOOLER)
- PAR_USE (CENTRONICS PORT)
- CLOCK (RESIDENT CLOCK)
- FLP_SEC (FLOPPY SECURITY LEVEL)
- VIEW (FILE EXAMINATION)
- WCOPY (WILD CARD COPY)
- AND MANY OTHERS...

NEW TOOLKIT COMMANDS (TONY TEBBY DESIGN)

CENTRONICS PRINTER PORT

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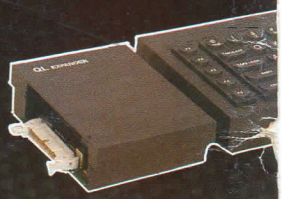

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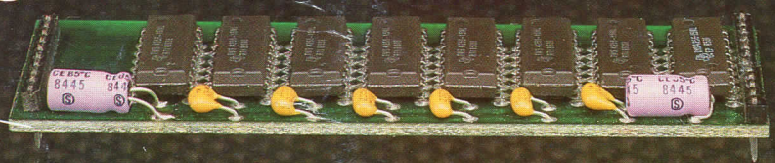

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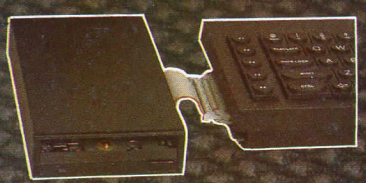

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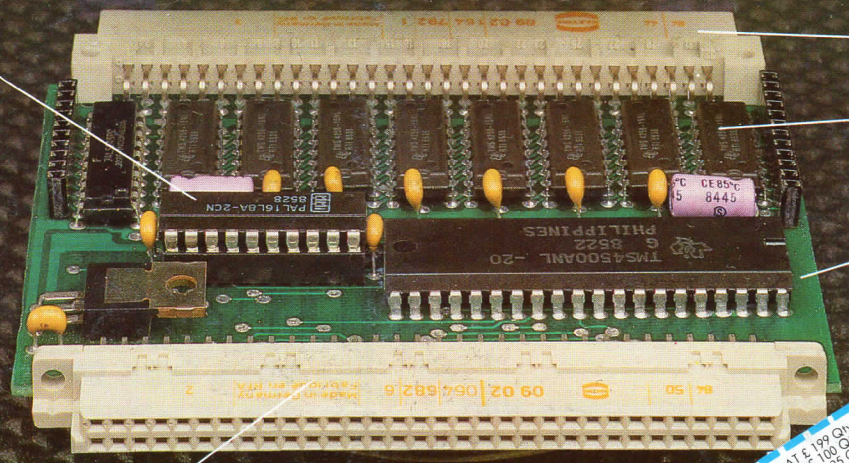

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